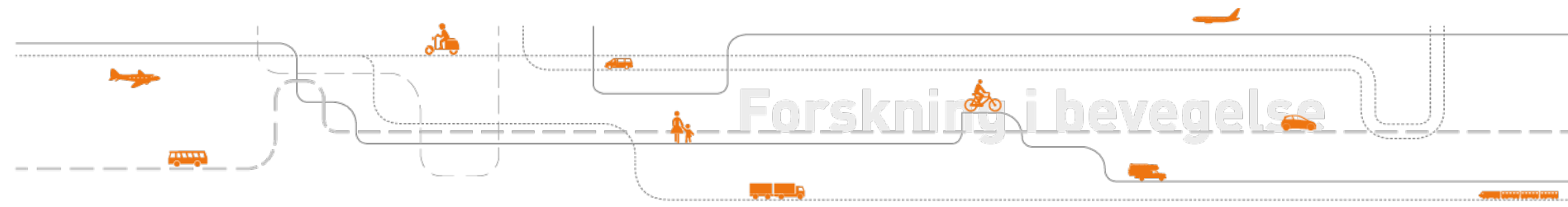


Utfordringer i transportsektoren

Gunnar Lindberg

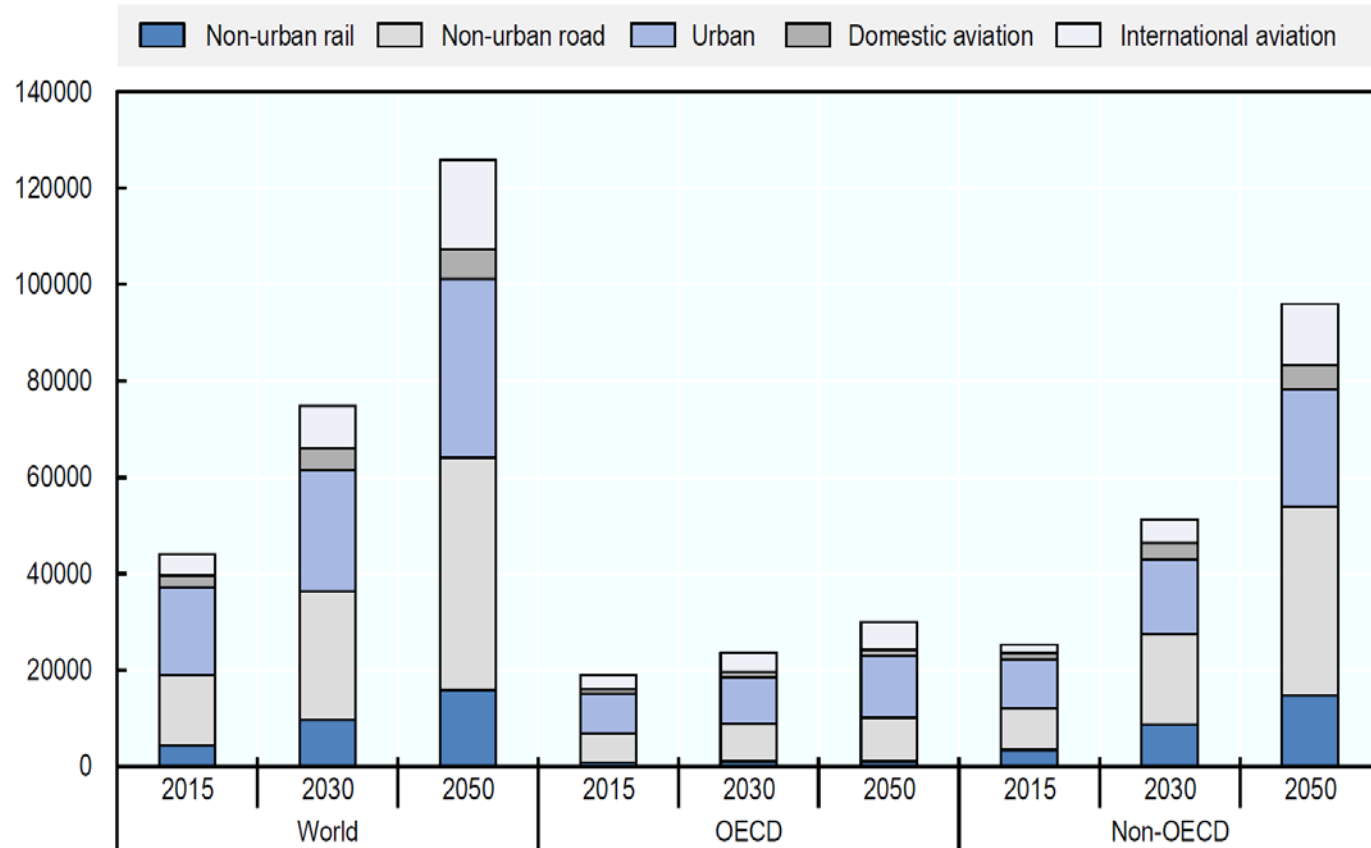


Hva driver transportbehov

- Befolkning (størrelse og demografi)
 - Økonomi (inntkomst)
 - Handel
-
- Globalt – flere og rikere
 - Handel – trenger mer, ?

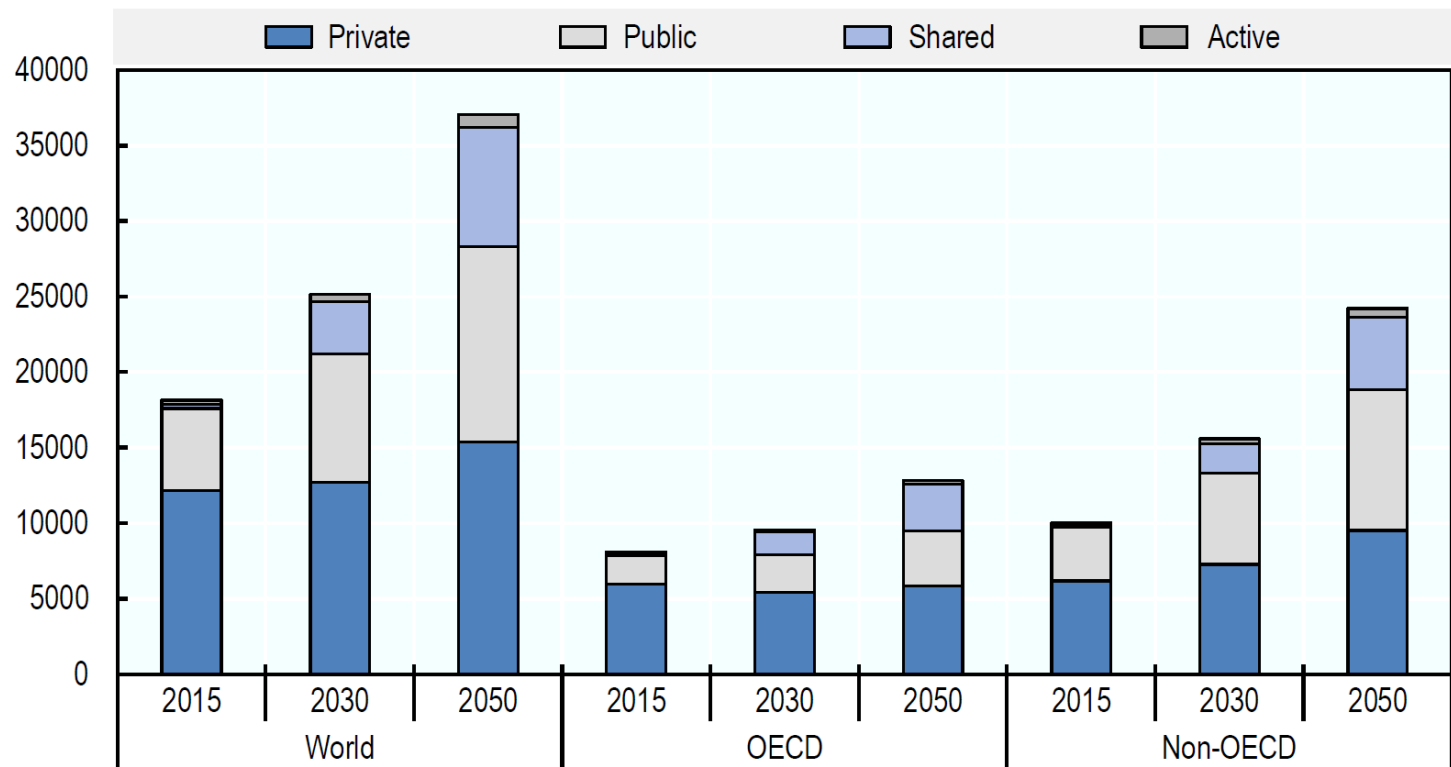
Person transport globalt

Figure 1.3. **Demand for passenger transport by mode**
Current demand pathway, billion passenger-kilometres



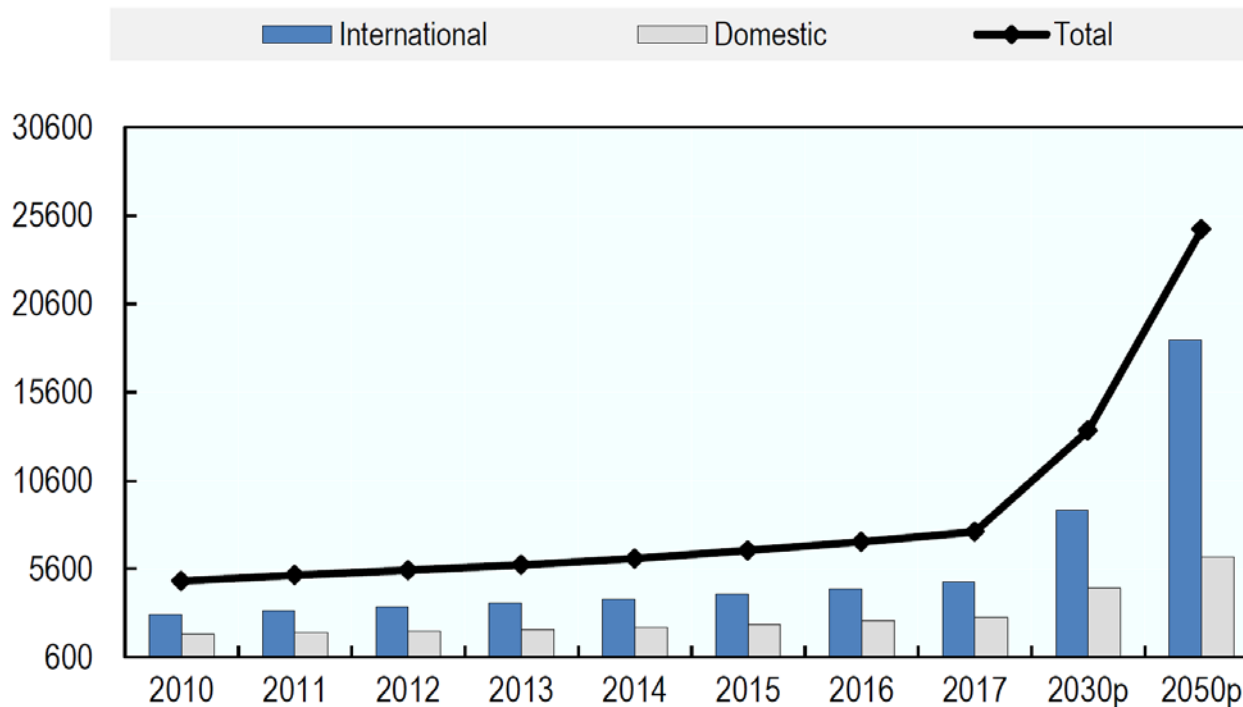
Bytransport – person - globalt

Figure 1.4. **Urban passenger-kilometres by mode group**
Current demand pathway, billion passenger-kilometres



Flytransport – person - globalt

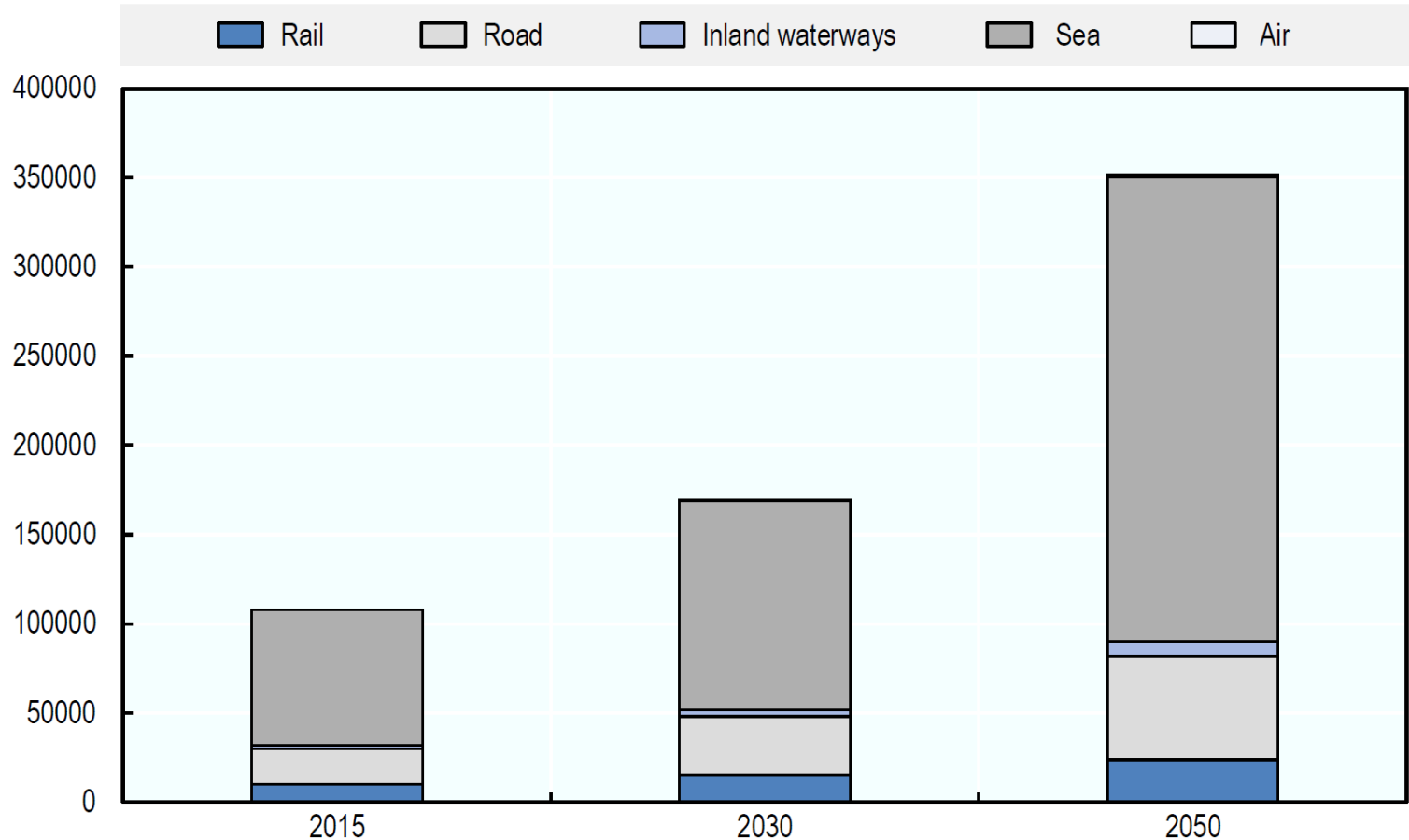
Figure 1.9. **World air passenger traffic, international and domestic**
Billion passenger-kilometres



Source: ICAO (2018), Annual Report of the Council 2017 for data through 2017. Data for 2030 and 2050 are ITF predictions from the current demand pathway using region of origin.

Gods transport globalt

Figure 1.12. **Freight transport demand by mode**
Current demand pathway, billion tonne-kilometres












Utfordringer (Norge) før denne utvikling












- KLIMA
 - URBANISERING
 - GLOBAL KONKURENSE EVNE
 - VELFERD
-
- TRENDER
 - Automatisering
 - Store data
 - Delingsøkonomi

Policy

Table 2.2. Overview of the ITF current ambition and high ambition scenarios

Mitigation measures			
Assumption	Sector	Current Ambition	High Ambition
 Car access restrictions	Urban passenger	By 2050, 20% of car trips are affected by constraints (e.g. low emission zones)	By 2050, 40% of car trips are affected by constraints
 Pricing disincentives for car use	Urban passenger	0%-20% higher than the expected purchase power of travellers by 2050, depending on the region	10%-40% higher than the expected purchase power of travellers by 2050, depending on the region
 Mass public transport supply	Urban passenger	Past trends continue to 2050	Past European trends continue to 2050 for all world regions
 Transport integration / Mobility as a service	Urban passenger	By 2050, 20% of travellers use MaaS solutions to plan their journeys	By 2050, 50% of travellers use MaaS solutions to plan their journeys
 Urban density	Urban passenger	Depending on the region, either stable or slight urban sprawl by 2050	Depending on the region, urban densification of 5-10% by 2050
 Carbon pricing	Non-urban passenger	Modest increase by 2050	Substantial increase by 2050
 International Trade, coal and oil consumption	Freight	Moderate reductions (following ENV-Linkages model (ENV-OECD), Chateau et al., 2014)	Accelerated reductions
 Logistics efficiency	Freight	Moderate efficiency improvements following the IEA NPS (IEA, 2018b)	Moderate efficiency improvements following the IEA NPS (IEA, 2018b)
 Efficiency improvements and electric vehicles	Urban passenger, Non-urban passenger, Freight	Moderate efficiency improvements and electric vehicle uptake following the IEA NPS (IEA, 2018b)	Substantial efficiency improvements and widespread electric vehicle uptake following the IEA EV30@30 Scenario (IEA, 2018a) For freight, same as the Current Ambition Scenario

Disruption

Potentially disruptive developments			
Assumption	Sector	Current Ambition	High Ambition
 Autonomous vehicles	Urban passenger, Non-urban passenger, Freight	Continuation of current levels of uptake (0-2.5% of car trips and 0 - 1.25% of bus trips are autonomous by 2050, depending on the region)	Continuation of current levels of uptake
 Shared mobility	Urban passenger, Non-urban passenger	Continuation of current levels of uptake	Continuation of current levels of uptake for urban passenger and increase for non-urban passenger
 Teleworking	Urban Passenger	2-20% of trips are affected by 2050, depending on the region	3-25% of trips are affected by 2050, depending on the region
 Long-haul low-cost air carriers	Non-urban passenger	Continuation of current levels of uptake (very low share of low-cost carriers on long-haul flights)	Continuation of current levels of uptake
 Energy innovations in aviation	Non-urban passenger	Alternative fuels are four times more expensive relative to conventional fuels	Alternative fuels are three times more expensive relative to conventional fuels
 Ultra-high-speed rail	Non-urban passenger	Range of electric planes reaches 1 000 km by 2050 Development of conventional high-speed projects already underway and where economically feasible	Range of electric planes reaches 1 600 km by 2050 Development of conventional high-speed projects already underway and where economically feasible
 E-commerce	Freight	Slight increase in urban freight demand (5% in more developed regions by 2050).	Slight increase in urban freight demand (5% in more developed regions by 2050).
 3D printing	Freight	Negligible effect	Negligible effect
 New trade routes	Freight	Planned infrastructure capacity and connectivity improvements	Planned infrastructure capacity and connectivity improvements
 Energy transition for long distance heavy freight	Freight	Continuation of current fuel composition and technologies	Accelerated uptake of new energy sources and technologies
 High Capacity vehicles	Freight	5% of inter-urban road freight adopts HCVs. 50% increase in truck load and 20% decrease in costs per tonne-kilometre (where HCVs are adopted)	5% of inter-urban road freight adopts HCVs. 50% increase in truck load and 20% decrease in costs per tonne-kilometre (where HCVs are adopted)

Utfordringer (Norge) før denne utvikling

- KLIMA
 - URBANISERING
 - GLOBAL KONKURENSE EVNE
 - VELFERD
-
- TRENDER
 - **Automatisering**
 - Store data
 - Delingsøkonomi

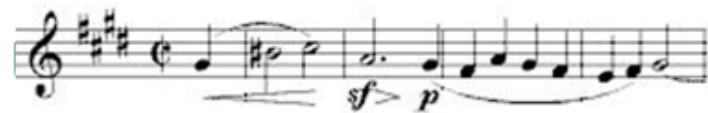
Transport er Tjenste sektor

1. Primary
2. Manufacturing
3. Service
 - No goods > but satisfies a need
 - Passenger transport
 - Consumption and Production simultaneously
 - *Frisør*
 - *Person transport*
 - *Live music*

Innkomst og Tid i Tjenestesektoren

- Innkomsten øker med 3% per år
- Antall timer har lenge vært konstant på 24 timer/døgn

- Tiden blir mer kostbar



▪ Beethoven String Quartet No. 14.

▪ Ca 40 min



= 160 min

▪ Baumol (1967) "Macroeconomics of unbalanced growth: the anatomy of urban crises"



Tjenstesektoren

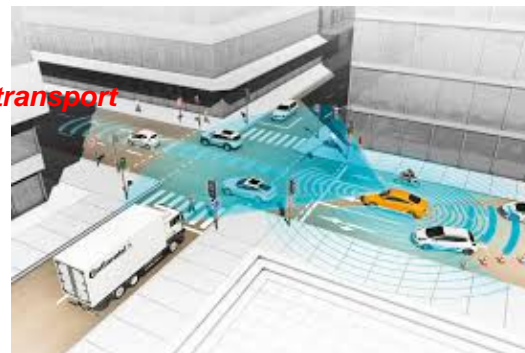
1. Primary
2. Manufacturing
3. Service
 - No goods > but satisfies a need
 - Passenger transport
 - Consumption and Production simultaneously
 - *Frisør* ?
 - *Person transport* > «Beam me up, Scotty», **bruke tiden til annet**
 - *Live music* > LP, CD, Spotify,...
 - No storage possible
 - *Variation in demand* > *variation in production*
 - *Congestion / Over capacity*



Automatisk transport – bruke tiden til annet



> Individuell transport blir kollektiv transport



Hva hender i en by med automatiske kjøretøy?



Source: ITF CPB 2016

To fallstudier (finns mange i verden med samme resultat)

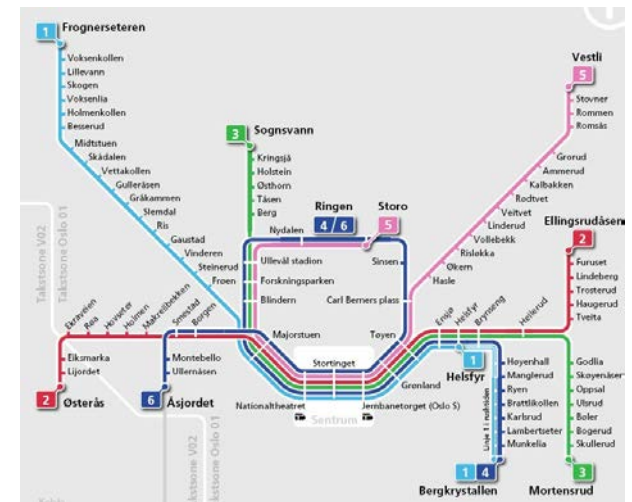
- A. Small safe driving buses for sharing



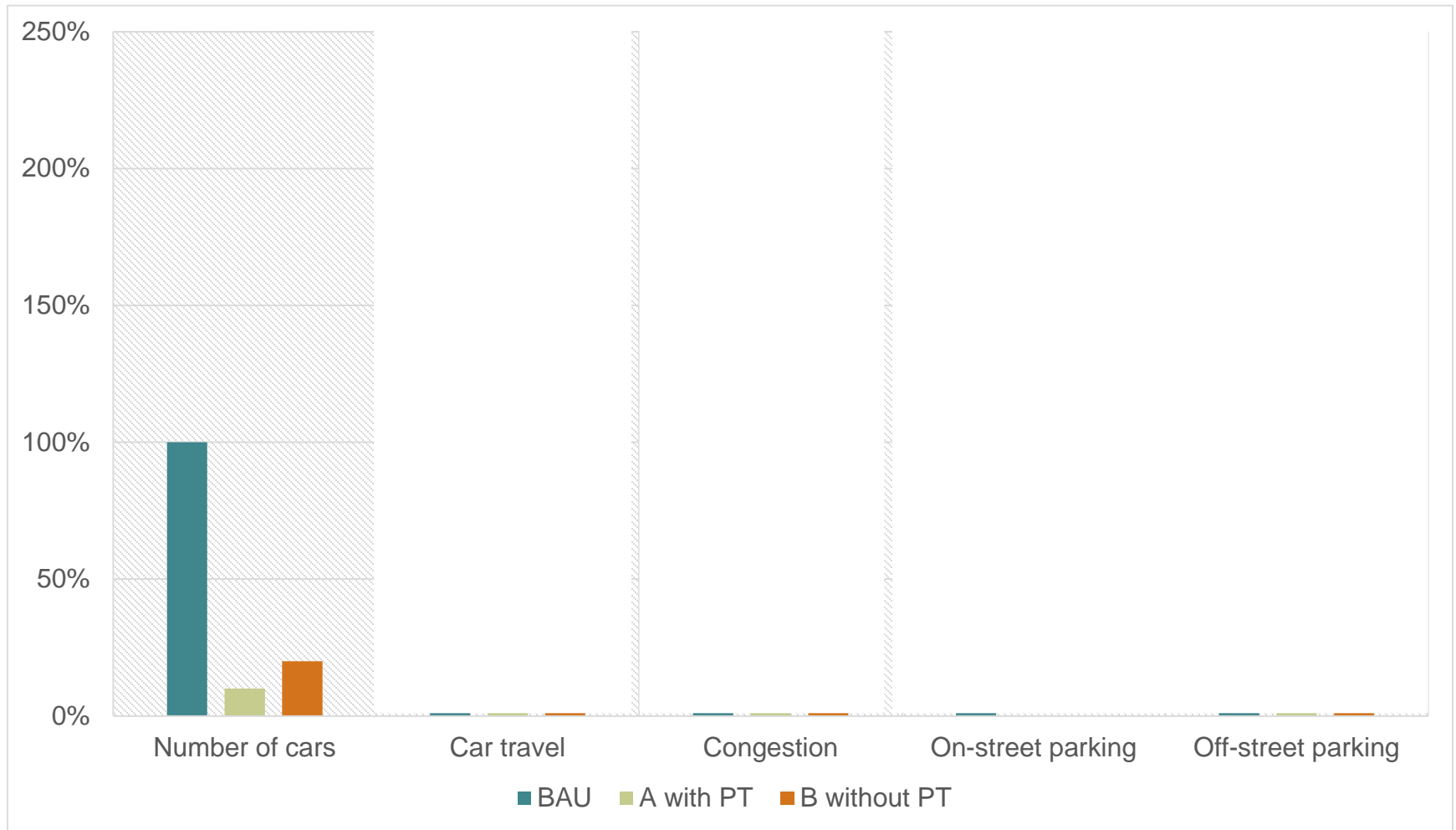
- B. Your own self driving car



- Combined with high capacity public transport, or not

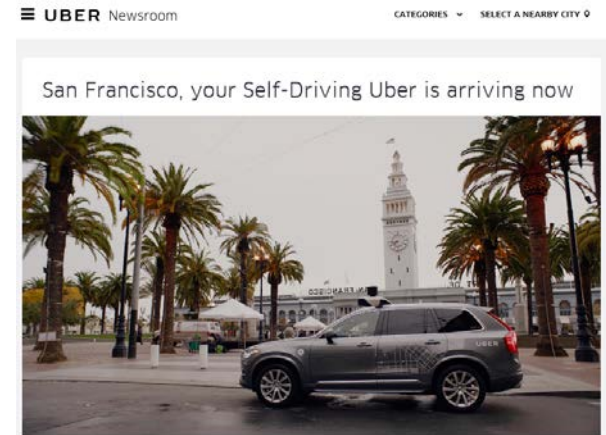


Med samme mobilitet

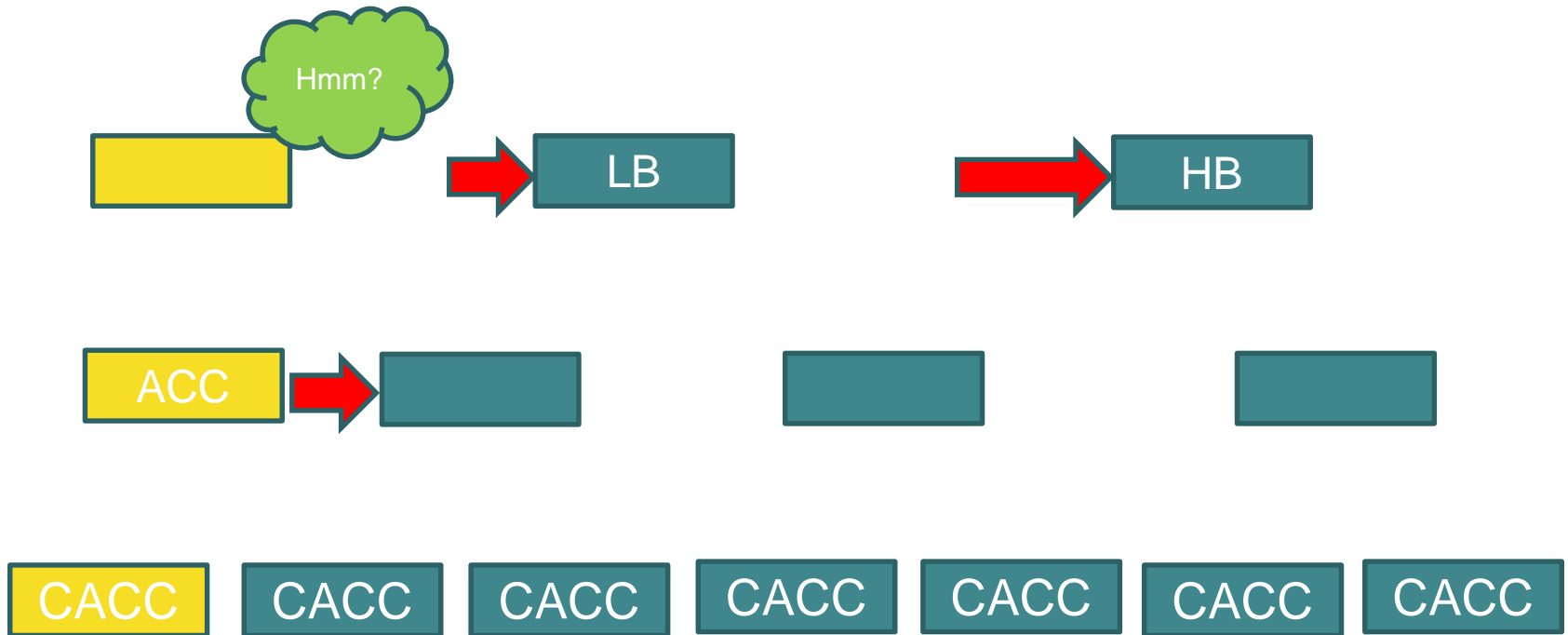


Hva vet vi?

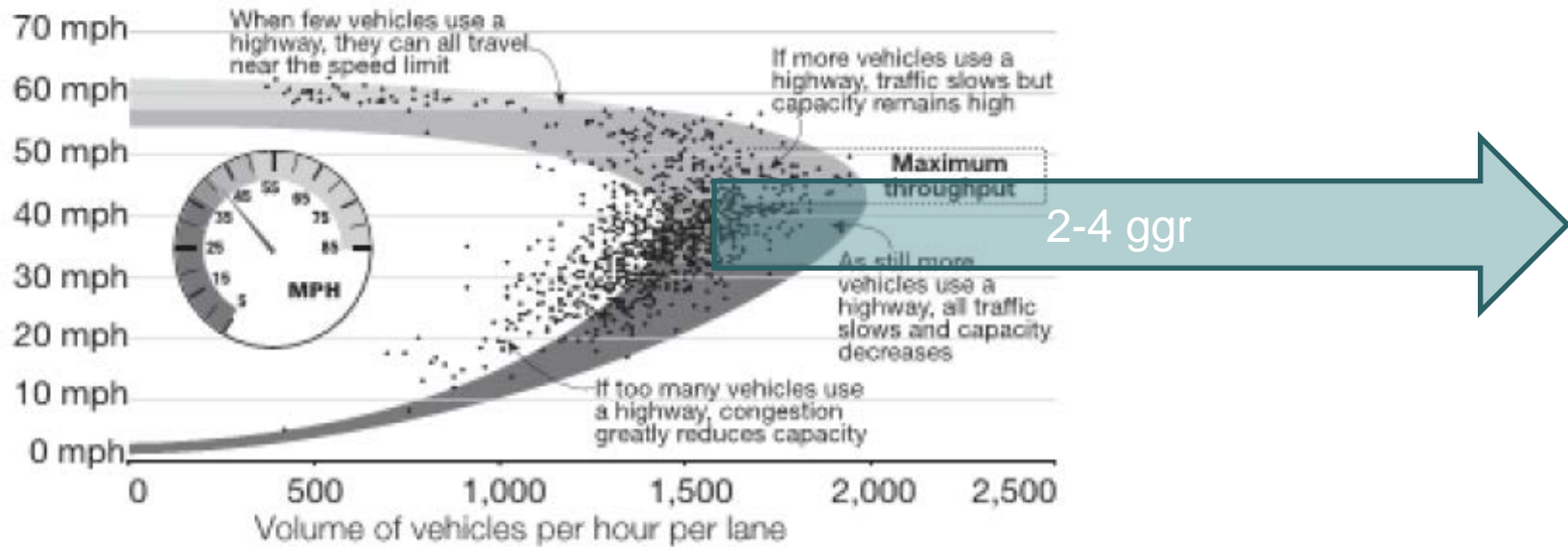
- Increased road safety – yes
- Environmental benefit?
- Less cars needed – selling ride not cars
- Free street space (less parking) – need to lock in
- Better capacity utilization



Kapasitetsbehovet reduseres med ny teknologi



Konsekvens



Kollektivtransport mister en fordel – må vare offensiv

Self driving – unproductive driving time can be changed to productive (incl. leisure) time

- *i) The “cost” advantage of PT disappears*
- *ii) The “time reduction” benefits of car travel disappears*
- *lii) The “optimal” speed is reduced*



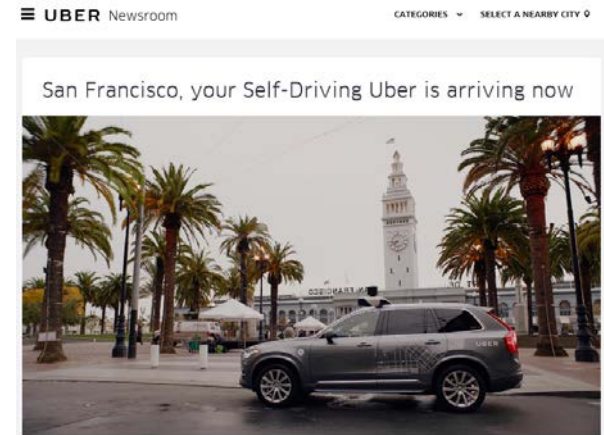
Tabell 1: Ombordtidsverdier (2009 kr/t) for korte reiser under 70 km etter transportmiddel og reiseformål.

	Bilfører	Kollektivt	Ferge	Hurtigbåt
Reiser til/fra arbeid	85	59		
Andre private reiser	72	54		
Alle private reiser*	74	56	124	84
Tjenestereiser	380	380	380	380
Alle reiser*	85	62		

*Aggregert med utgangspunkt i data fra RVU 2009. For ferger og hurtigbåt er utvalget i RVU for lite til å foreta en aggregering.

Hva vet vi?

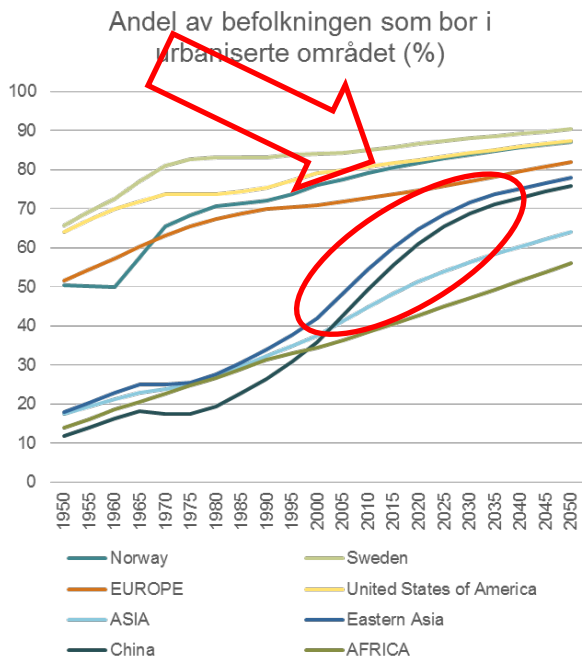
- Increased road safety – yes
- Environmental benefit?
- Less cars needed
- Free street space (less parking) – need to lock in
- Better capacity utilization
- All can drive
- **More car transport with lower speed**



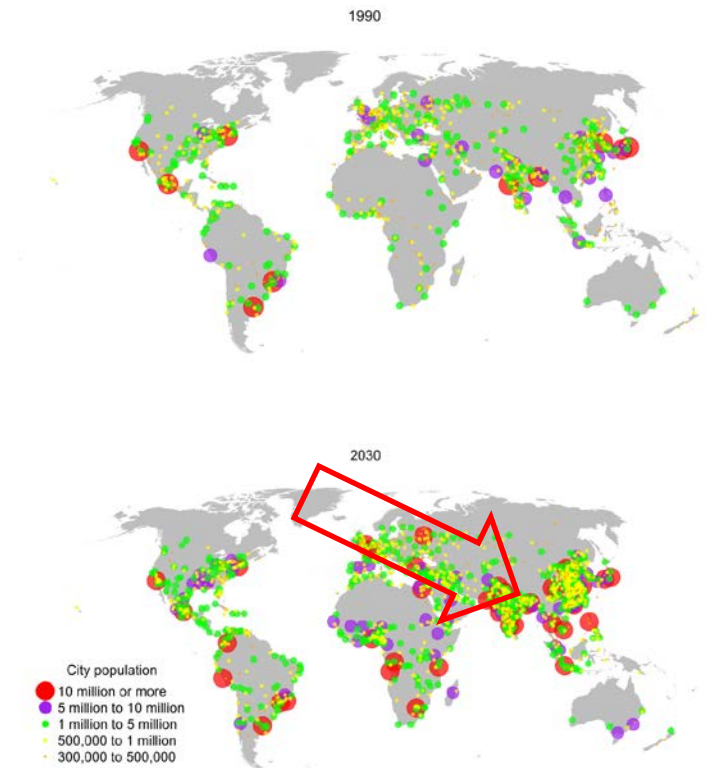
Utfordringer (Norge) før denne utvikling

- KLIMA
 - **URBANISERING**
 - GLOBAL KONKURENSE EVNE
 - VELFERD
-
- TRENDER
 - **Automatisering**
 - Store data
 - Delingsøkonomi

Urbanisering



United Nations, Department of Economic and Social Affairs, Population Division (2015). *World Urbanization Prospects: The 2014 Revision, (ST/ESA/SER.A/366)*.

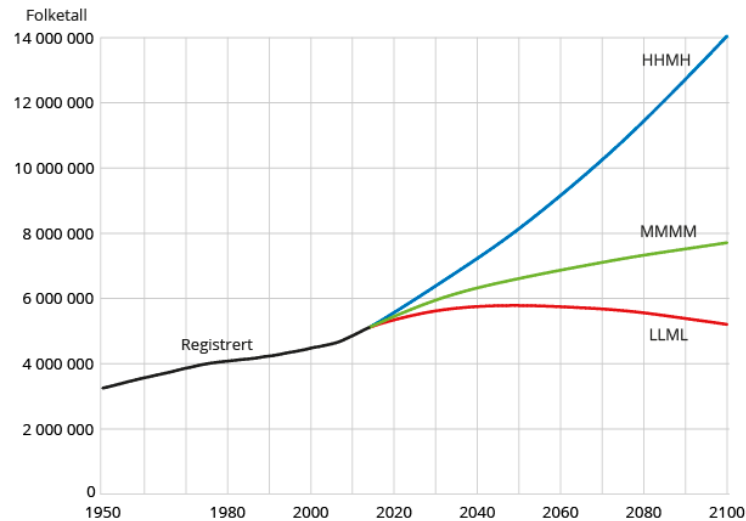


For cities with 300,000 or more inhabitants in 2014. The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations.

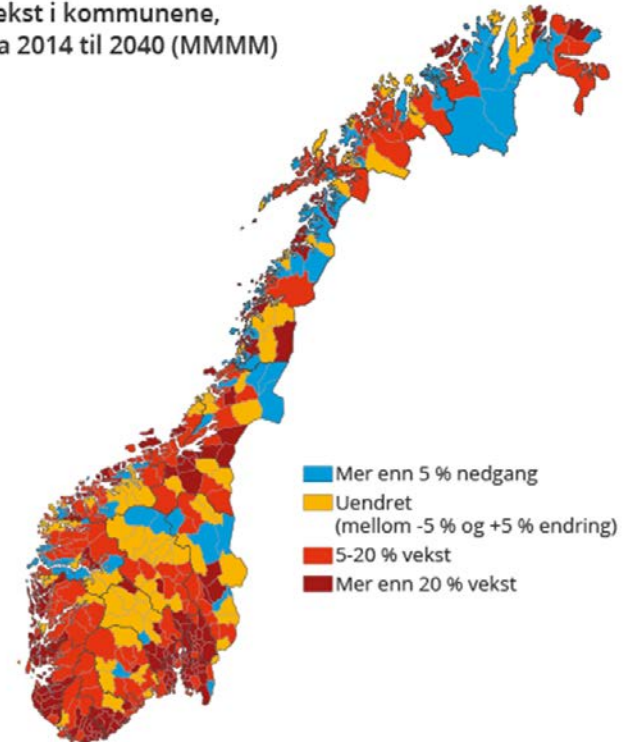
Men trenden fortsetter også i Norge...

Figur 3. Befolkningsvekst i kommunene, prosentvis endring fra 2014 til 2040 (MMMM)

Figur 1. Folketall per 1. januar. Registrert og framskrevet i tre alternativer



Kilde: Statistisk sentralbyrå.



Kilde: Statistisk sentralbyrå.



Hvorfor er dette interessant?

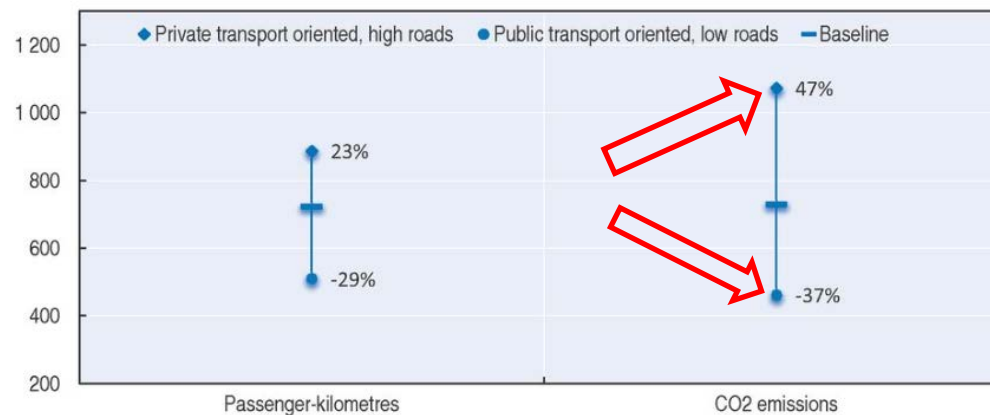
1. Hva blir klimaeffektene av en rikere urban befolkning?
2. Klimatiltak i byer – urban form viktig
3. Er agglomerasjons-effektene nødvendige for en høy tilvekst?

Hva blir effekten av en rikere urban befolkning - India?

Figure 4.19. **Modal shares under different policy scenarios in Indian cities, 2010 and 2050**
Passenger-kilometres



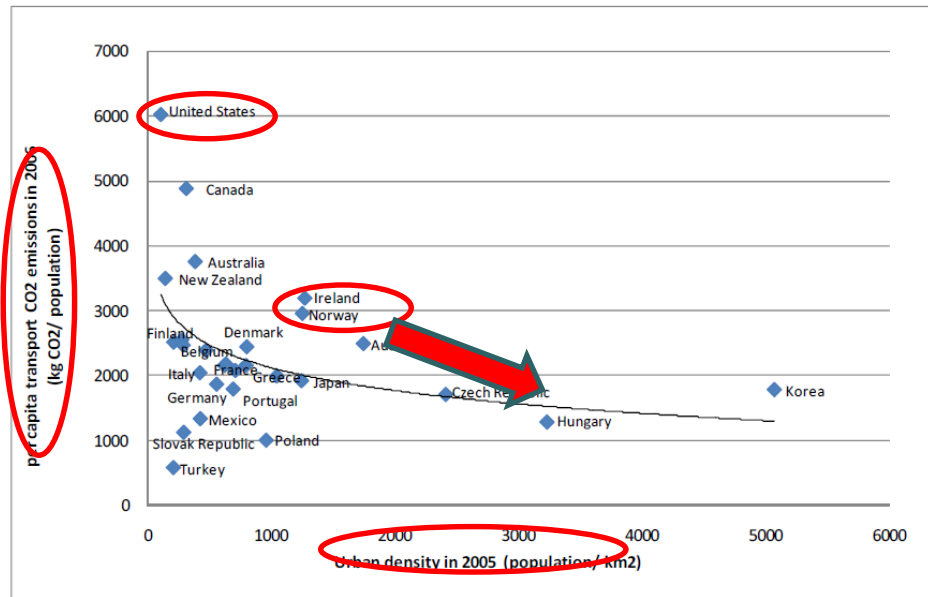
Figure 4.21. **Growth in mobility and CO₂ emissions under different scenarios in Indian cities**
2010 = 100



Mindre transport - Kompakt by

Figure 1.22. Urban Density and Carbon Emissions in Transport

Per capita carbon emissions produced by transport activities and urban (PU areas) density



Notes:

Urban density was calculated on the basis of PU areas.

Iceland and Luxemburg were not included in the sample as the OECD Regional Database identifies no predominantly urban (PU) regions in those countries.

Source: Own calculations based on data from the OECD Regional Database and IEA (2008c), *CO₂ Emissions from Fuel Combustion*, OECD Publishing, Paris.



...og attraktiv... (?)



Urbaniseringen framover

- Mega cities kan om de utvikles feil, bli klima verstinger
- Urbanisering og kompakte byer
 - *Men de må være attraktive (agglomerasjonseffekter?)*
 - *Kollektivtransport har (i dag) «economics of scale» - økt mulighet i kompakte byer*
 - *Effektive kollektivtransportsystem (high-capacity)*
 - *Mer gåing og sykling*
 - *Men hva med autonom transport? (kollektivtransport)*
 - + kan løse Last mile
 - - Dør til dør bil konkurrerer ut kollektivtransport
 - Urban sprawl?
 - Byttepunkter city - region



Utfordringer (Norge) før denne utvikling

- KLIMA
 - URBANISERING
 - **GLOBAL KONKURENSE EVNE (Handel, krav på effektivitet, liberalisering)**
 - VELFERD
-
- TRENDER
 - **Automatisering**
 - Store data
 - Delingsøkonomi



Internasjonal handel

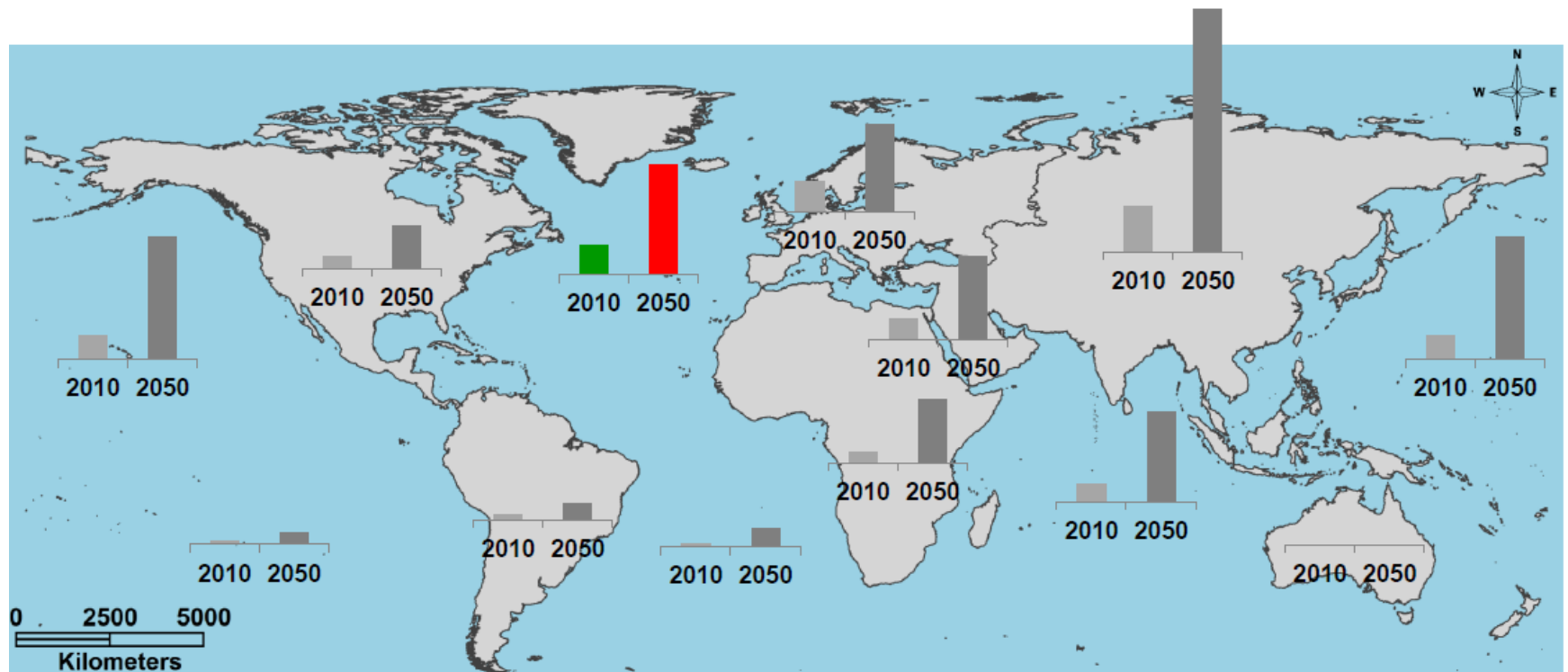
- Internasjonal handel øker hurtigere enn BNP
 - *Handel har økt 27 ganger fra 1950 – 2010*
 - *3X hurtigere enn BNP*

- *Økt inntøkt og differensiering*
- *Stordriftsfordeler og lavere (relative) transportkostnader*

- *OECD forecast*
 - *Økning i internasjonal godstransport 4,3 ganger 2010 – 2050 (tkm)*

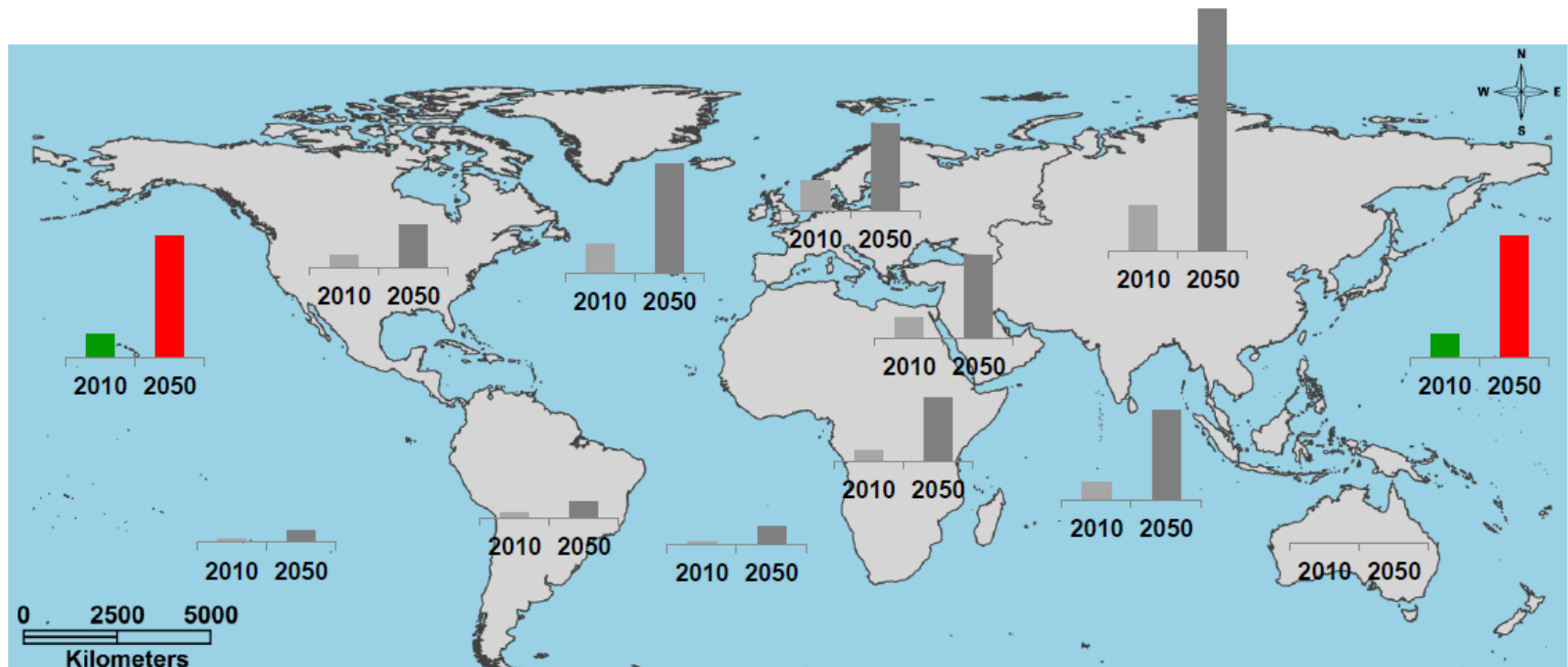
 - *Nya mønster*
 - *Og mer «hinterland» transport (10%)*

North Atlantic remains important, but...

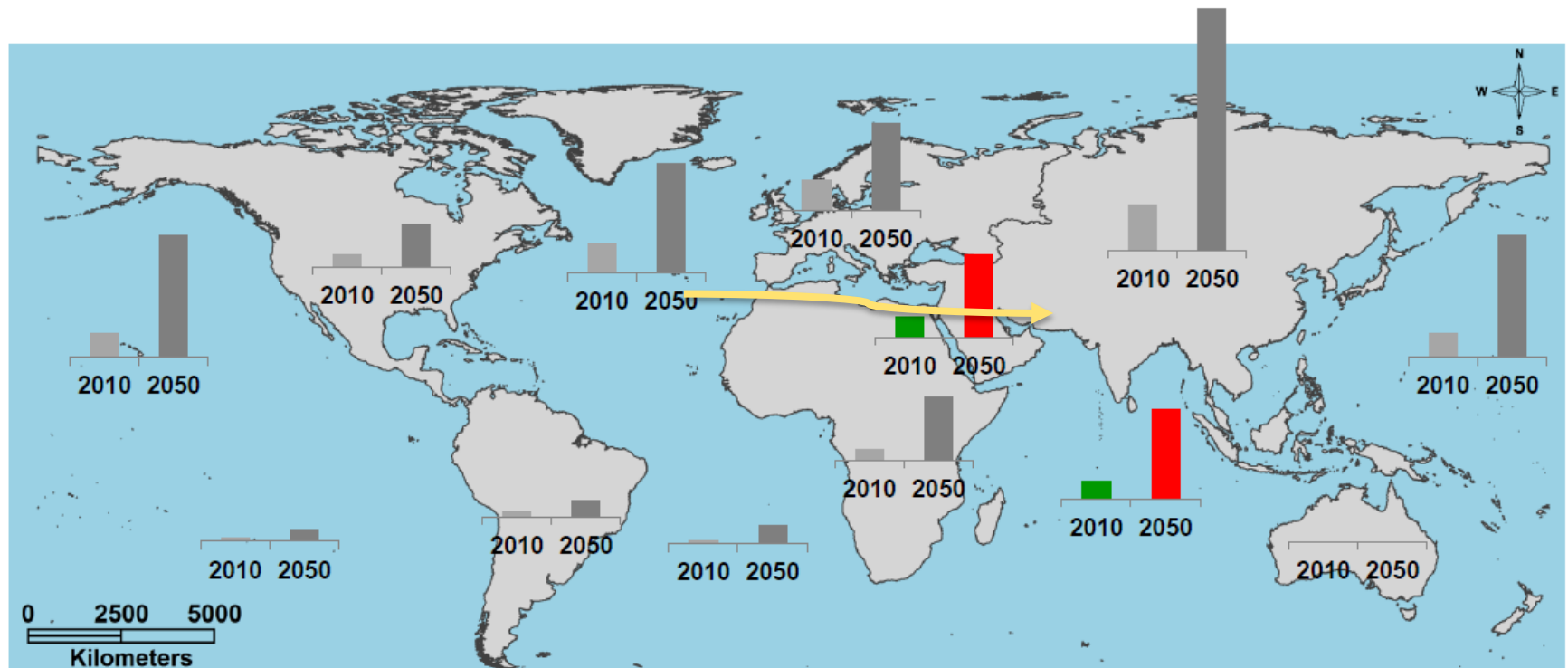


Source: Jari Kauppila OECD/ITF

North Pacific surpasses North Atlantic volume

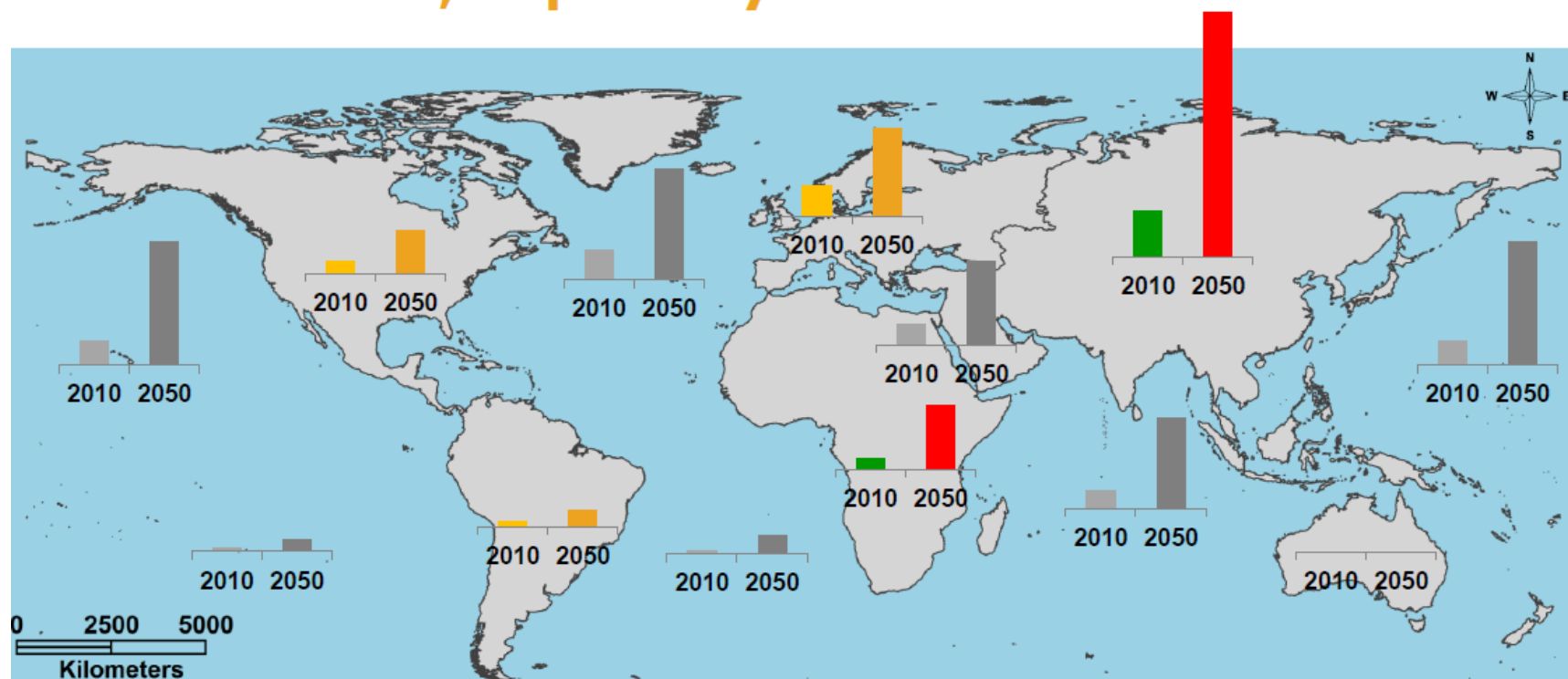


Strong increase in volume in the Indian Ocean and the Suez Canal





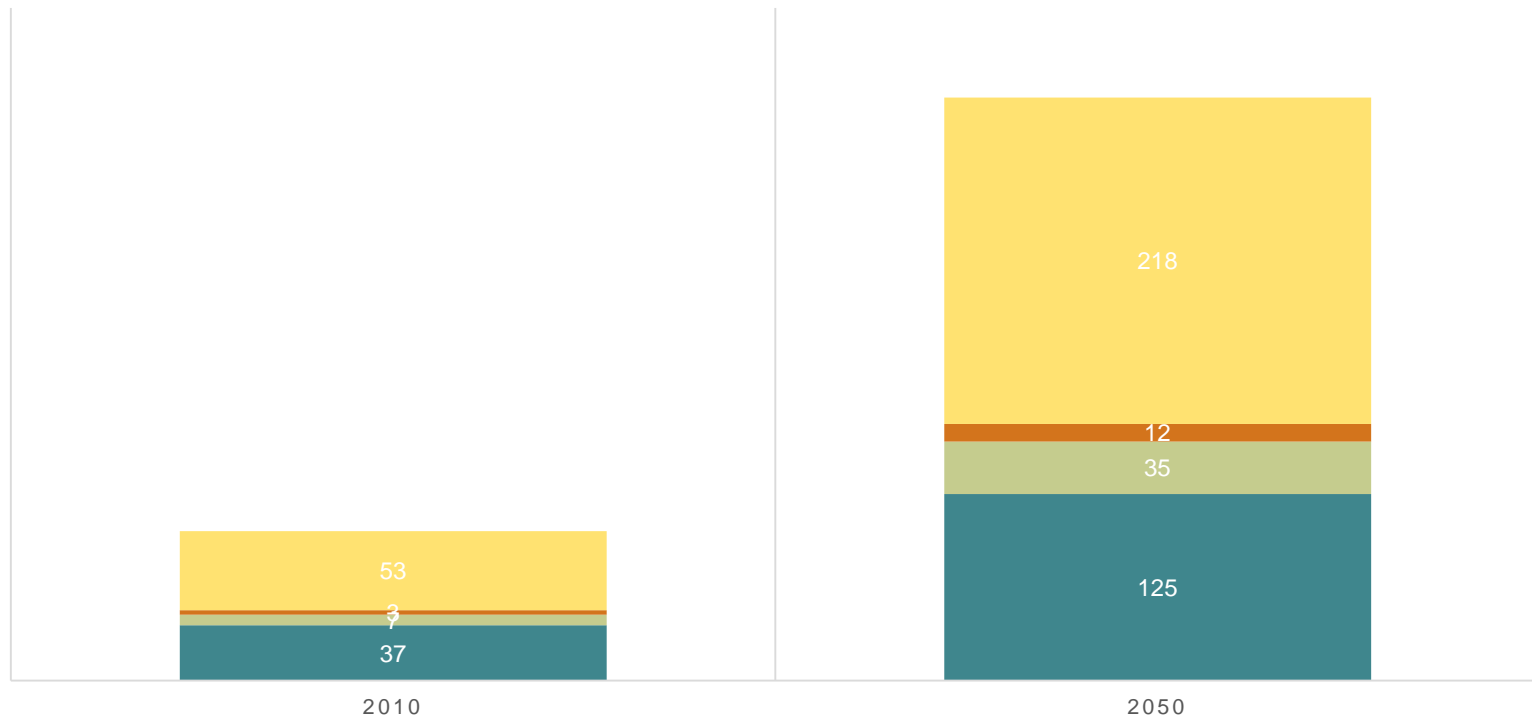
Significant future pressure for inland connections, especially in Asia and Africa



Klima konsekvenser – hinterland transport

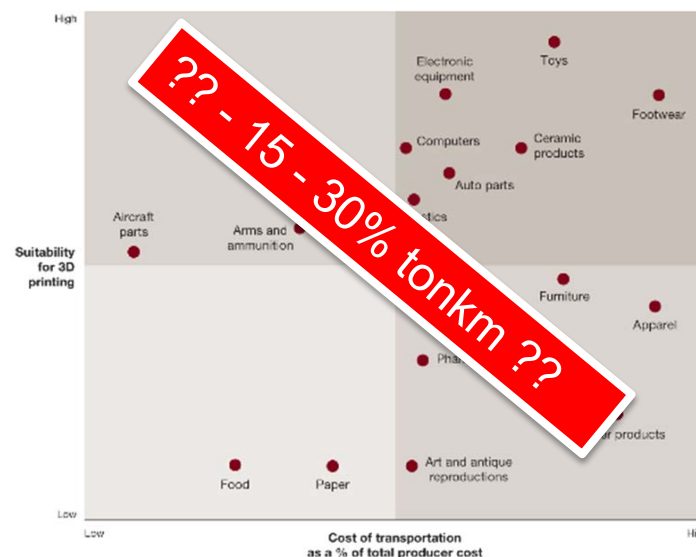
ØKNING I CO2 UTSLIPP FRA INTERNASJONAL
HANDEL (TOTALA UTSLIPP 2010 = INDEX 100)

■ Sjøfart ■ Luft ■ jernbane ■ Veg



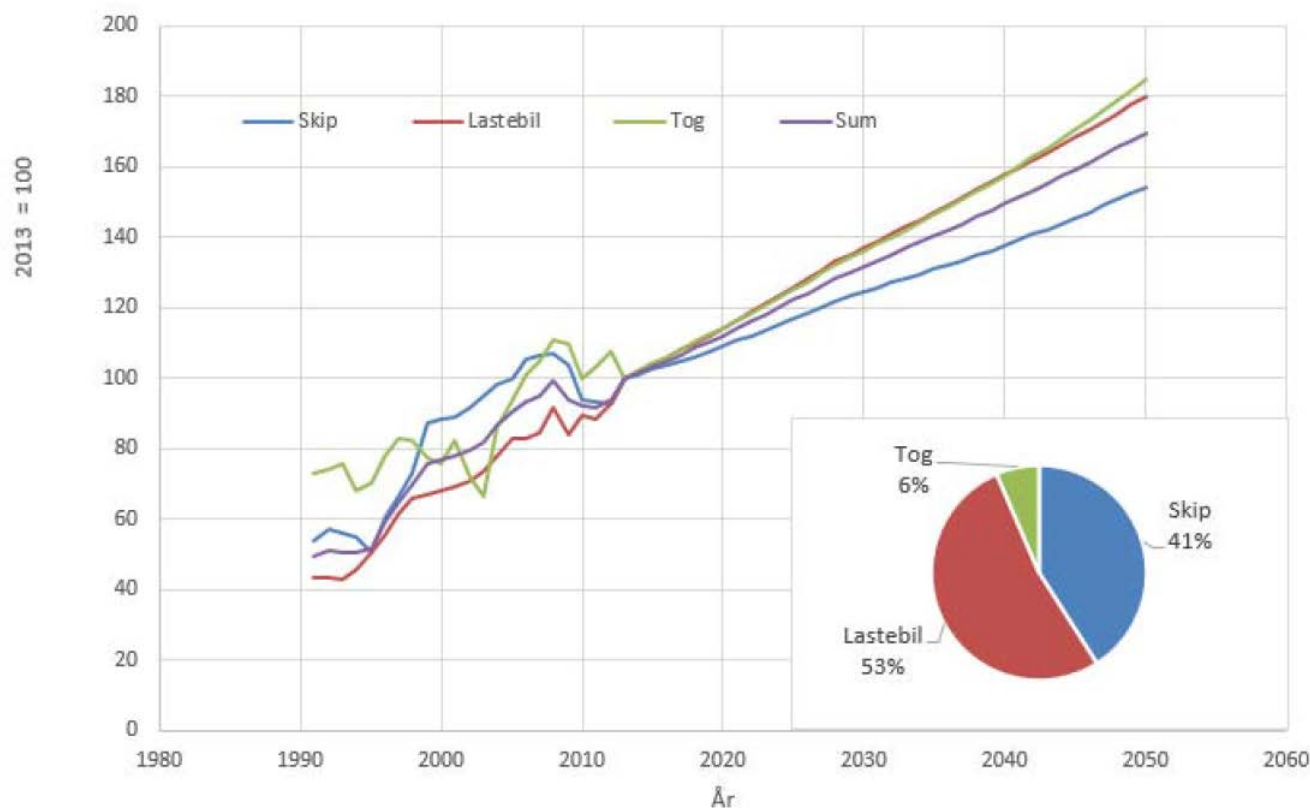
Disruptivt» – e-commerce, 3-D printing

- Inga skal fordeler > spesialisert lokal produksjon
- Mer «custom design»
- Integrert produksjonsprosesser
- Konsekvenser:
 - 1. Mindre transport til konsument
 - Mindre veitransport?
 - Mindre lager?
 - 2. Mindre prosessintern logistikk
 - 3. Mer bulktransport av råvara
- Lang frem i tiden for at konkurrere med tradisjonell produksjon med skal fordeler



Kilde:
PWC

Innenlands transport til 2050

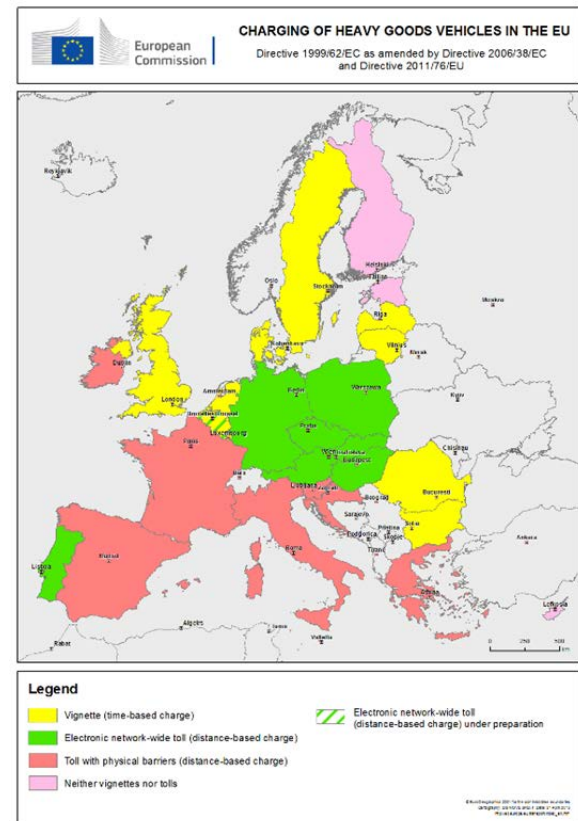


Figur 5.1. Historisk utvikling i innenriks transportarbeid 1991-2013, markedsandeler i 2013 og estimert utvikling 2014-2050. Eksklusive råolje og naturgass.

Tror vi på mer handel kanskje vi må tro også på en åpnere transport marked

En åpen transportmarked påvirker skatte og avgifts metoder

- Nasjonale skatter eller
- Territorielle skatter/avgifter



.. og høyere krav på effektivitet - Modulvogntog – større lastebiler gir miljø- og effektivitets fordeler



... og krav på bedre infrastruktur..

- WEF Competitive index

	Norge	Sverige	Germany
Transport Infrastructure	37	24	7
Quality of Road Infrastructure	74	25	10
Quality of Rail Infrastructure	36	21	7
Quality of Port Infrastructure	13	11	9
Quality of Airport Infrastructure	6	21	13

...og dermed bedre beslutt (i NTP)

Tabell 15: Gjennomsnittlig nettonytte per budsjettkrone og andel lønnsomme prosjekter

	Norge		Sverige	
	Gjennomsnittlig NNK	Andel lønnsomme prosjekter (NNK>0)	Gjennomsnittlig NNK	Andel lønnsomme prosjekter (NNK>0)
Samtlige valgte prosjekter	-0,18	31 %	0,36	56 %
Bundne prosjekter	-0,18	34 %	0,50	66 %
Øvrige prosjekter i planen	-0,17	22 %	0,83	74 %
Prosjekter med tilgjengelighet som hovedformål (>60 % av nytte er tilgjengelighetsnytte)	-0,08	38 %	0,49	61 %
Prosjekter med blandet hovedformål (både trafiksikkerhet og tilgjengelighet står for minst 40 % av nytten)	-0,59	4 %	0,16	52 %
Prosjekter med trafiksikkerhet som hovedformål (>60 % av nytte er trafiksikkerhetsnytte)	-0,69	6 %	0,18	47 %



Hvorfor har vi vokst i handel – befolkning, innkomst men også innovasjon som gir lavere kostnader



Stuveriarbetare i hamnen. 31 augusti
1953. Gefle Dagblad.



The MV Maersk Mc-Kinney Moller, the
world's biggest container ship

The IdealX



- 1792 - Boxes used for combined rail- and horse-drawn transport in England
- Second World War - US government used small standard-sized containers to quickly and efficiently unloading and distributing supplies.
- 1956 - Malcom McLean's ship Ideal X made its first voyage (from Port Newark to Houston in the USA). It had 58 metal container boxes
 - *Malcom P. McLean, a trucking entrepreneur bought a steamship company to bypass regulation with the idea of transporting entire truck trailers with their cargo still inside.*

Container in USA 1956 - 1966

- Loading cost

- *Standard bulk ship* - \$5.86 per ton
- *IdealX* - \$ 0.16 per ton



- Ports, railroads, truck,...

- Containers could be moved seamlessly between ships, trucks and trains.

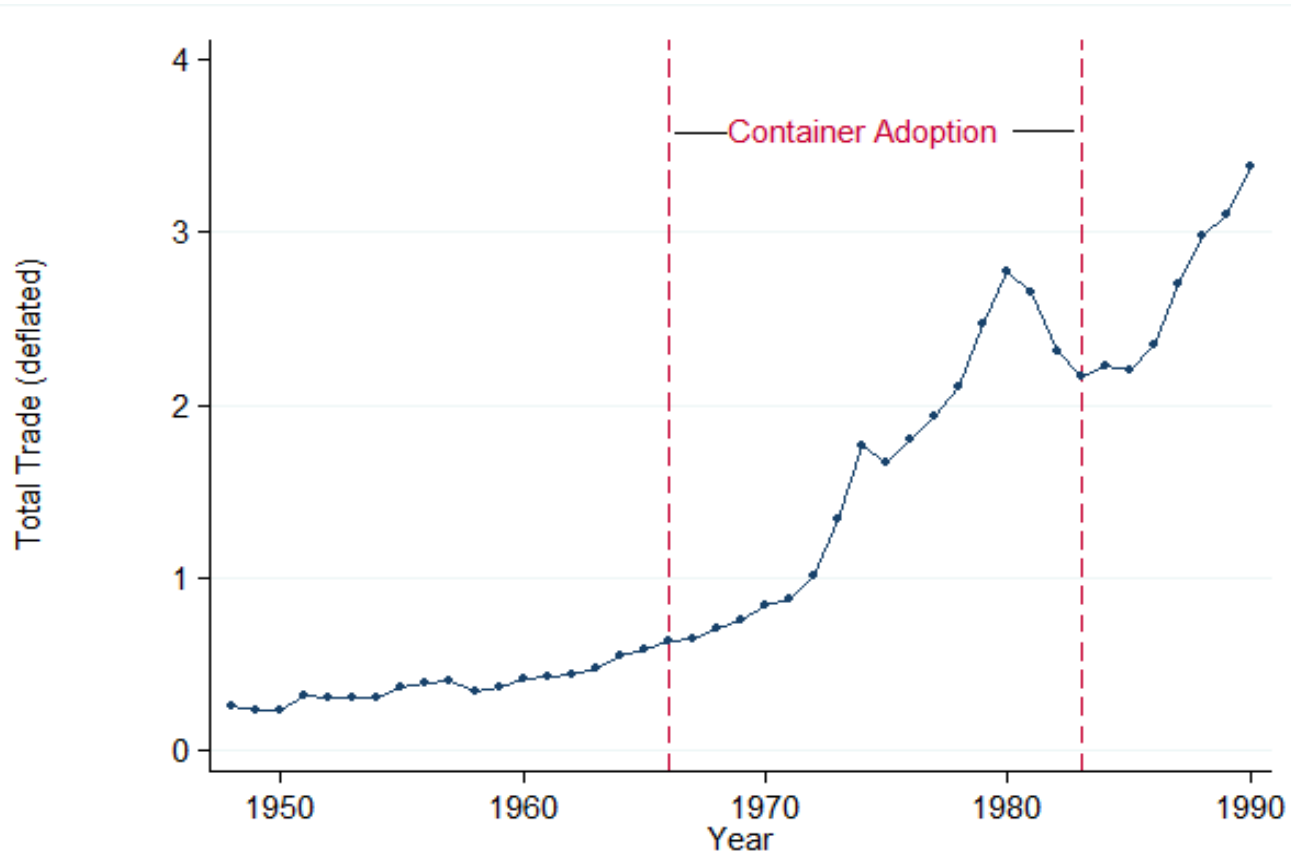
- 1961 - Federal maritime board – standard 8x8 ft and 10, 20, 30 or 40 ft. Investment subvention only for these standards

1966 - Transatlantic

- 1965 – ISO standard
 - *the 20-foot (TEU) and 40-foot lengths (FEU)*
 - **Leasing companies**
- 1966 – Transatlantic trade (UK, NL, Germany)

	Before 1966	Container 1970/71
Productivity of dock labour	1.7 tons per hour	30 tons per hour
Average ship size	8,4 GRT	19,7 GRT
Port concentration (Europe-Australia)	11	3
Insurance cost	£0.24 per ton	£0.04 per ton
Transport time incl loading/unloading (Europe- Australia)	70 days	34 days

Global trade

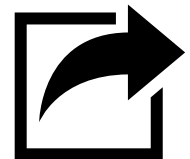


Source: Authors' own calculation

Bernhofen, D.M., Z. El-Sahli, R. Kneller 2016

Innovasjon trenger ikke å være high – tech

- En container er avansert som en
- Business models, Regulering, Organisering og markned
- Globalisering er en av tidens viktigste trender
- Containeren (en av) nøkkelen til global trade.



Utfordringer (Norge) før denne utvikling

- KLIMA
 - URBANISERING
 - GLOBAL KONKURENSE EVNE (Handel, krav på effektivitet, liberalisering)
 - VELFERD
-
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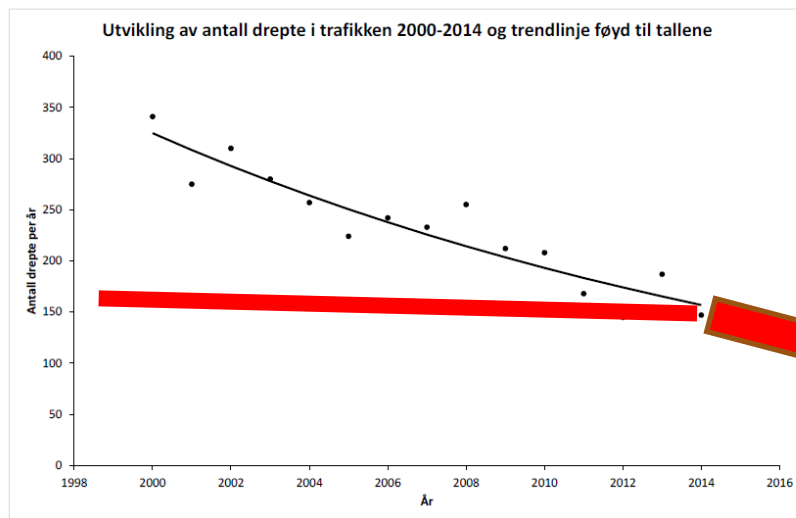
UN Sustainable Development Goals



SDG 3: Good health and well-being

3.6 By 2020, halve the number of global deaths and injuries from road traffic accidents

1.4 mill. dødsfall per år

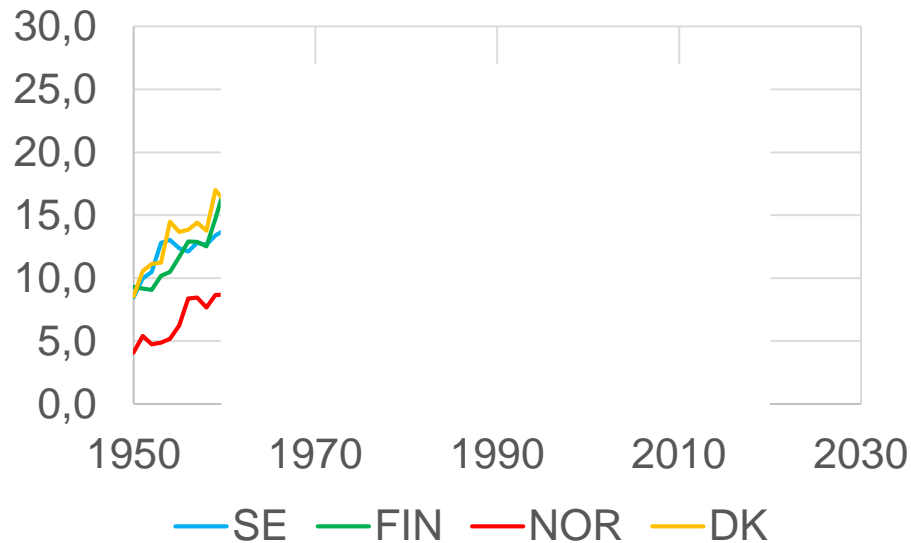


Figur 5: Utvikling av antall drepte i trafikken 2000-2014 og trendlinje som beskriver utviklingen



Er det mulig? – eksempel Trafikksikkerhet

Persons killed in road traffic accidents reported by police per 100 000 inhabitants

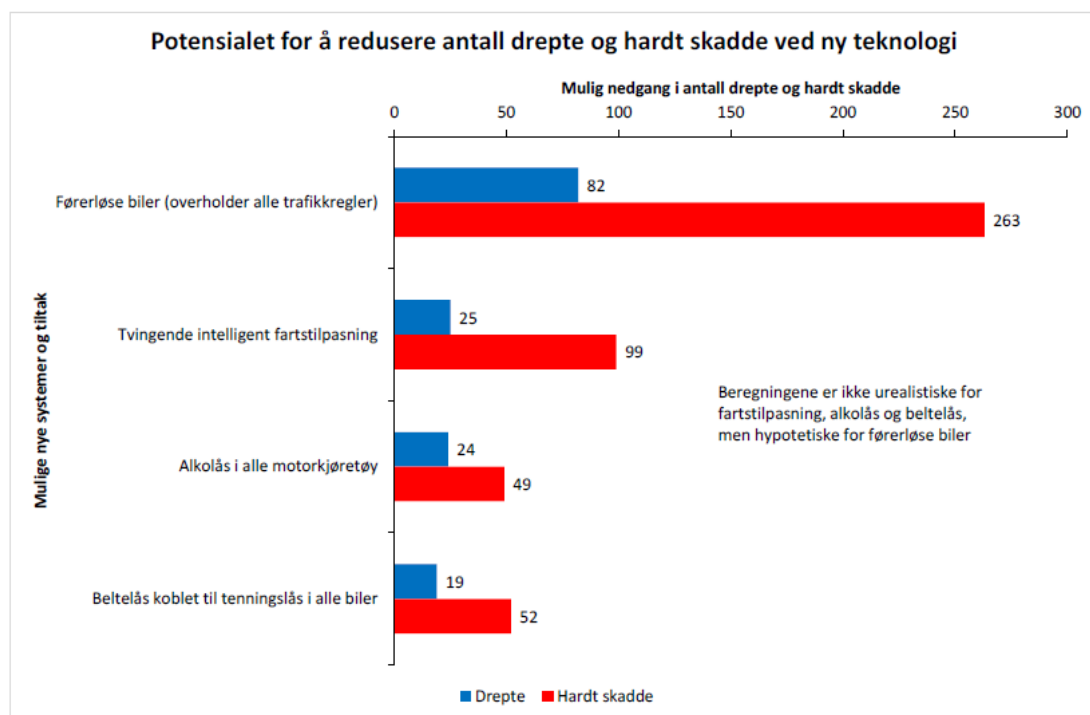


CO2 globalt <> TS «lokalt»

Country	Total number of road fatalities, 2015	Road fatalities per 100 000 population, 2015
Norway	118	2.3
Sweden	259	2.6
United Kingdom	1854*	2.9*
Switzerland	253	3
Netherlands	531	3.1
Denmark	180	3.2
Spain	1688*	3.6*
Ireland	166	3.6
Israel	322	3.8
Japan	4859	3.8
Germany	3475	4.3
Finland	260	4.7
Australia	1207	5.1
Iceland	16	5.3
Canada	1908*	5.4*
France	3464	5.4
Austria	475	5.5
Italy	3381*	5.6*
Slovenia	120	5.7
Luxembourg	36	6
Portugal	638*	6.1*
Hungary	647	6.6
Belgium	755	6.7
Czech Republic	732	6.9
Greece	805	7
New Zealand	320	7
Poland	2938	7.6
Lithuania	241	8.3
Korea	4621	9.1
United States	32675*	10.2*
Chile	2140	11.9
Argentina	5279*	12.4*

Veitiltak – Kjøretøytiltak – Kontrolltiltak

Men det store løftet kan komme med ny teknologi – men det kommer ikke frivillig



Figur 10: Mulig nedgang i antall drepte eller hardt skadde med nye tiltak

Kilde: TØI rapport 1417/2015 Rune Elvik, Alena Høye

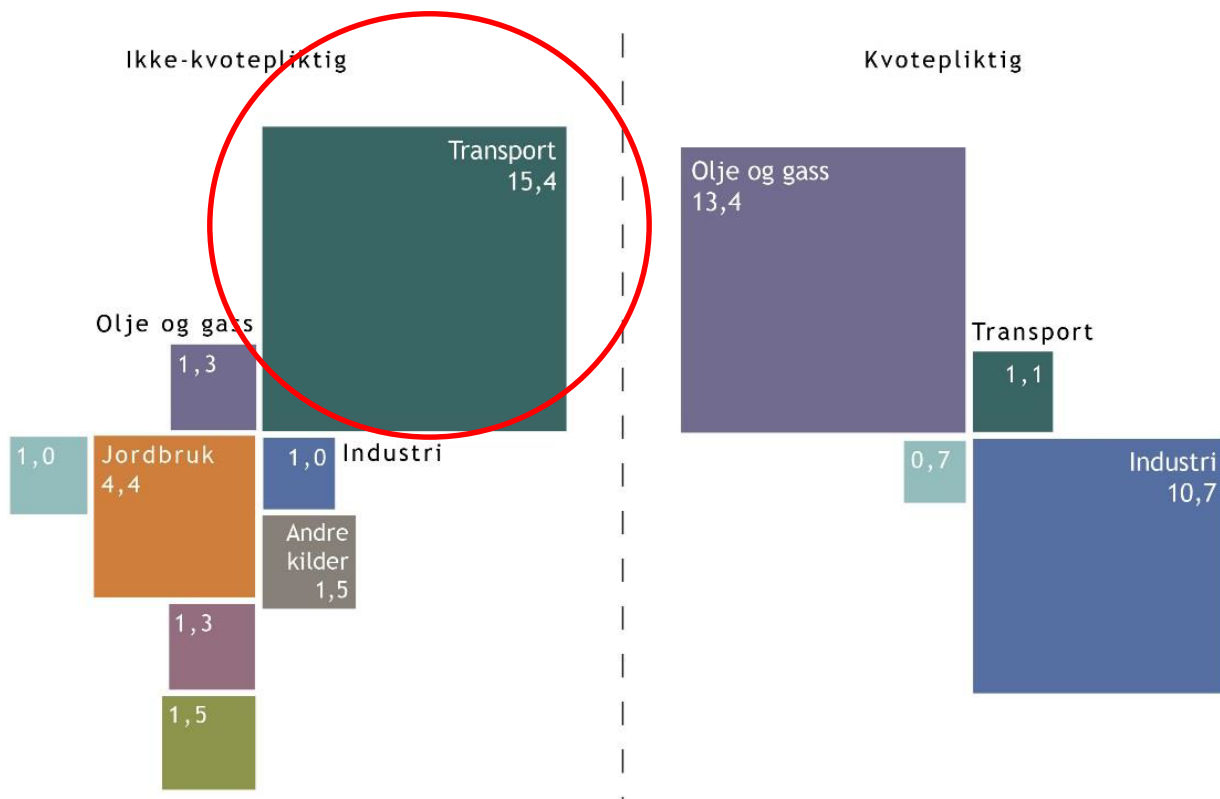
Utfordringer (Norge) før denne utvikling

- **KLIMA**
 - **URBANISERING**
 - **GLOBAL KONKURENSE EVNE** (Handel, krav på effektivitet, liberalisering)
 - **VELFERD**
-
- **TRENDER**
 - **Automatisering**
 - **Store data**
 - **Delingsøkonomi**

Klima

Norske utslipp av klimagasser i 2014

Utslipp til luft (millioner tonn CO₂-ekvivalenter)



■ Energiforsyning ■ Bygg ■ Avfall

Kilde: Miljødirektoratet 2016

Klima

- Klima stor utfordring for transport
 - Tidligere fokus på «avoid and shift»
- Hurtig teknisk utvikling (og politisk enkelt)
 - I dag alt fokus på «improve»
- (Kommer det gå?)
- Kollektivtransportens klimafordel minsker
 - Elbilen - 1/3 driftskostnader
 - Økt konkurranse fra bilen?



Utfordringer (Norge) før denne utvikling

- KLIMA
 - URBANISERING
 - GLOBAL KONKURENSE EVNE (Handel, krav på effektivitet, liberalisering)
 - VELFERD
-
- TRENDER
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Takk