



Norwegian University of
Science and Technology



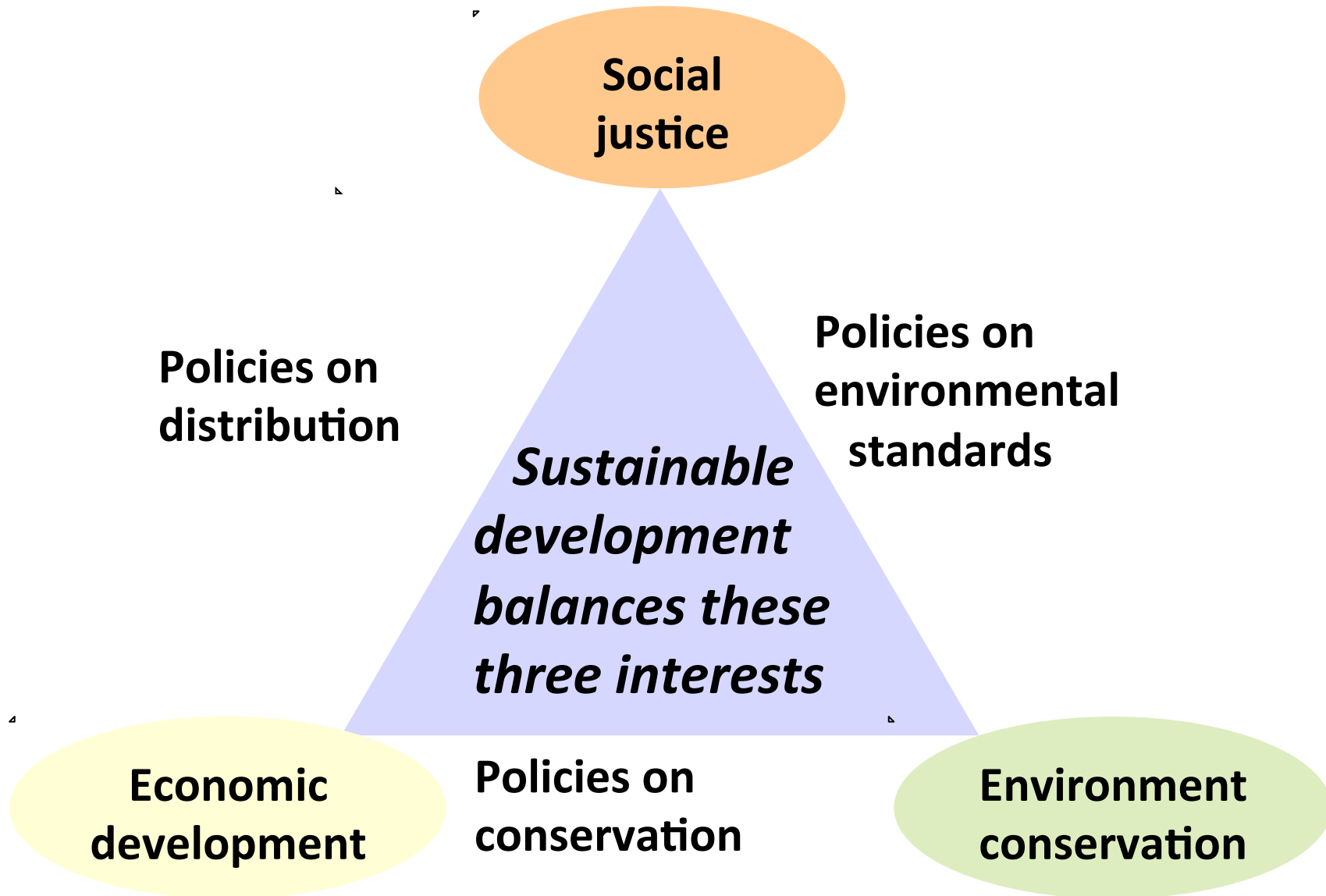
Sustainable Urban Development

The City of Trondheim as an example

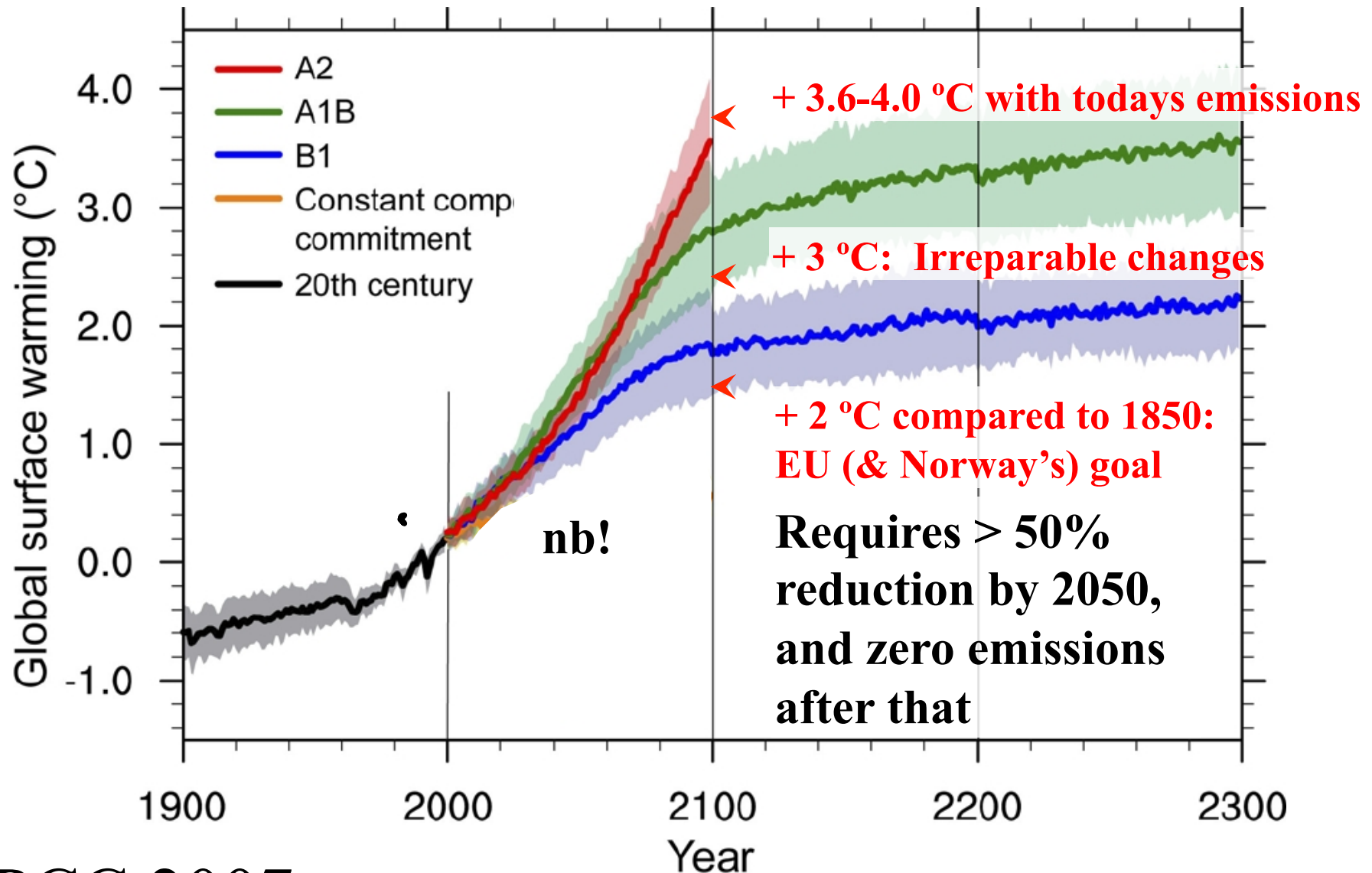
Tor Medalen
Professor

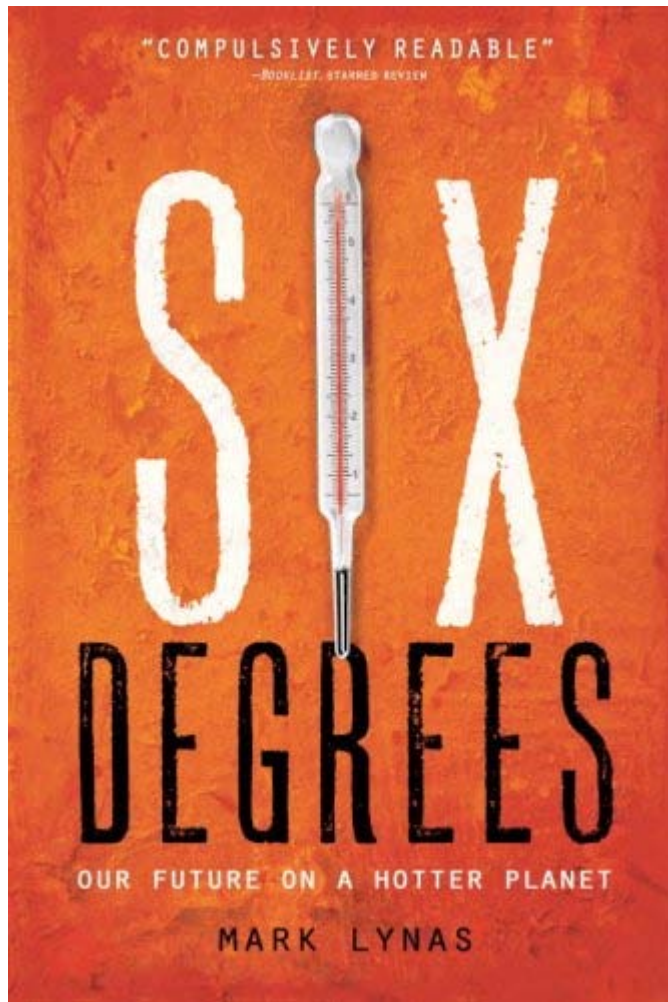
Department of Urban Design and Planning
Faculty of Architecture and Fine Art, NTNU

Sustainable development defined



The reason why sustainable development is important - the global climate





There are written many books on the subject. Some are dystopic, some are in denial of the phenomenon of global warming and some think we can fix this.

But – we do not have all the time in the world

Average rise in global temperature and impacts thereof

* Today's level is approximately 387 ppm (387 litre CO₂ for every million litre air)

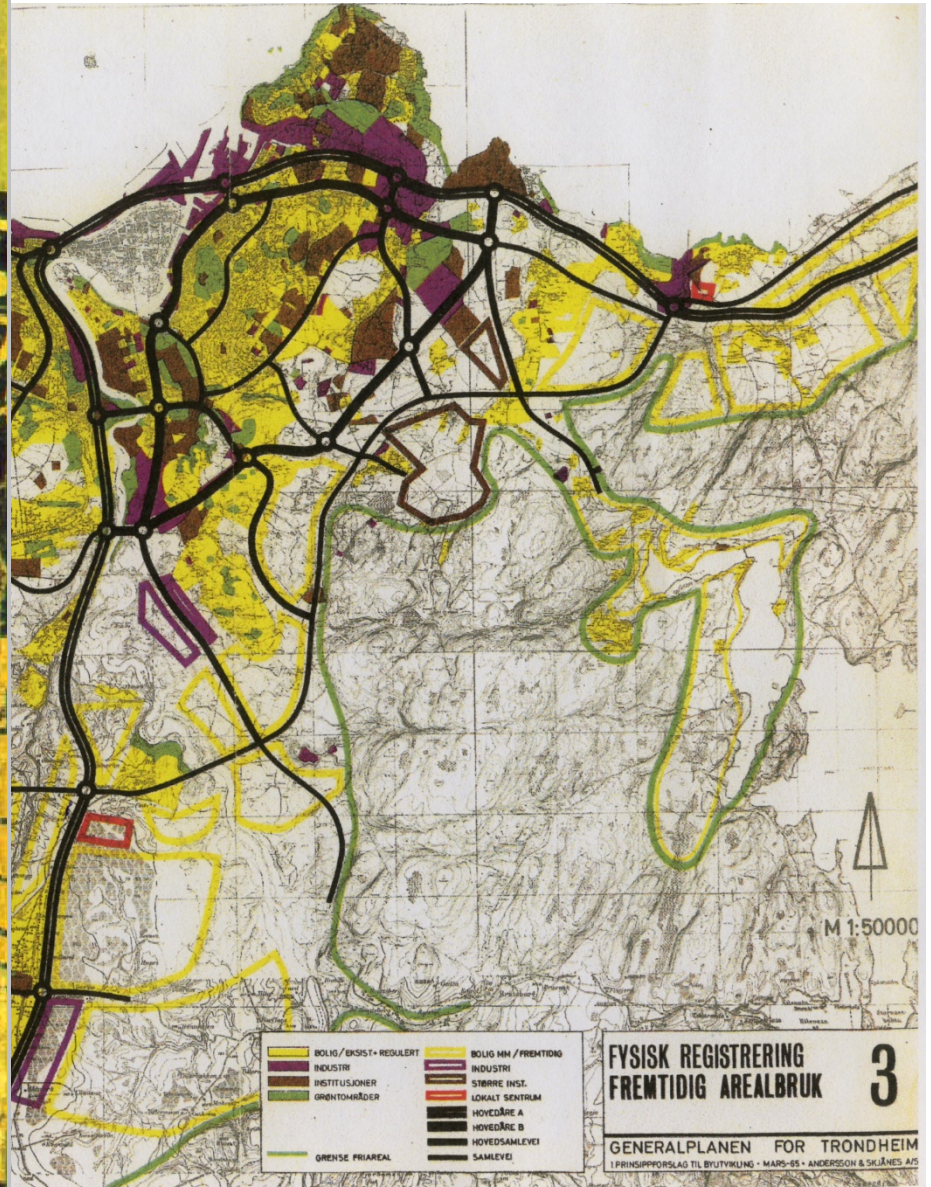
| Increase in temperature | CO ₂ -level | Commentary | Thresholds that... |
|-------------------------|------------------------|--|---------------------------------------|
| + 1 ° C more | 350 ppm * | Probably unavoidable | |
| + 2 ° C more | 400 ppm | Can be achieved if global reductions of emissions are obtained within 2015 | |
| + 3 ° C more | 450 ppm | Can be...within 2030 | Carboncycle-feedback |
| + 4 ° C more | 550 ppm | Can be within 2050 | Metan-feedback in Siberia |
| + 5 ° C more | 650 ppm | Will happen with stable increase of emissions | Release of metan-hydrat in the oceans |
| + 6 ° C more | 800 ppm | Will happen with large levels of emissions | Most forms of life on earth end... |

MIXED BLESSING

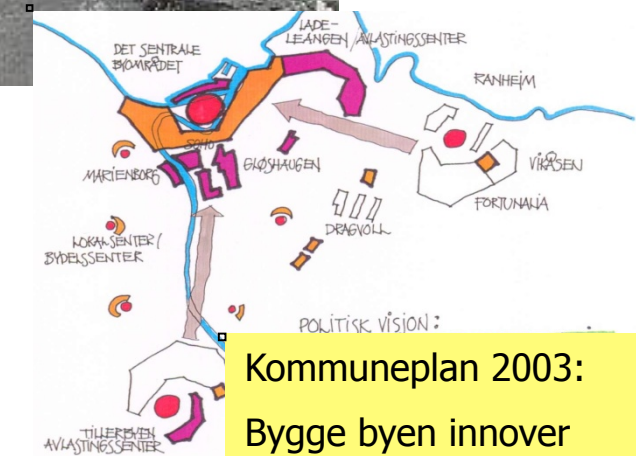
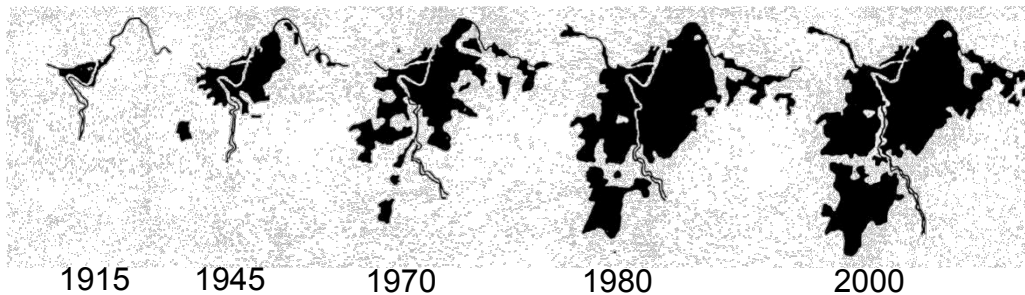
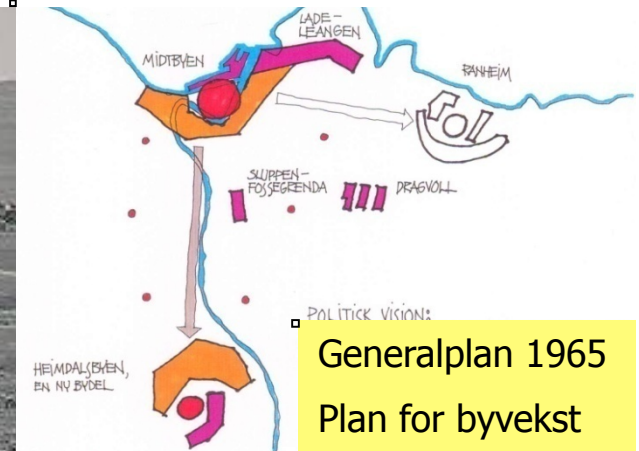
The Motor in Britain



C.D. Buchanan



After 2000 Trondheim should densify more...



Land use and land use planning

- Before / 1980
 - Sprawl
 - Zoning

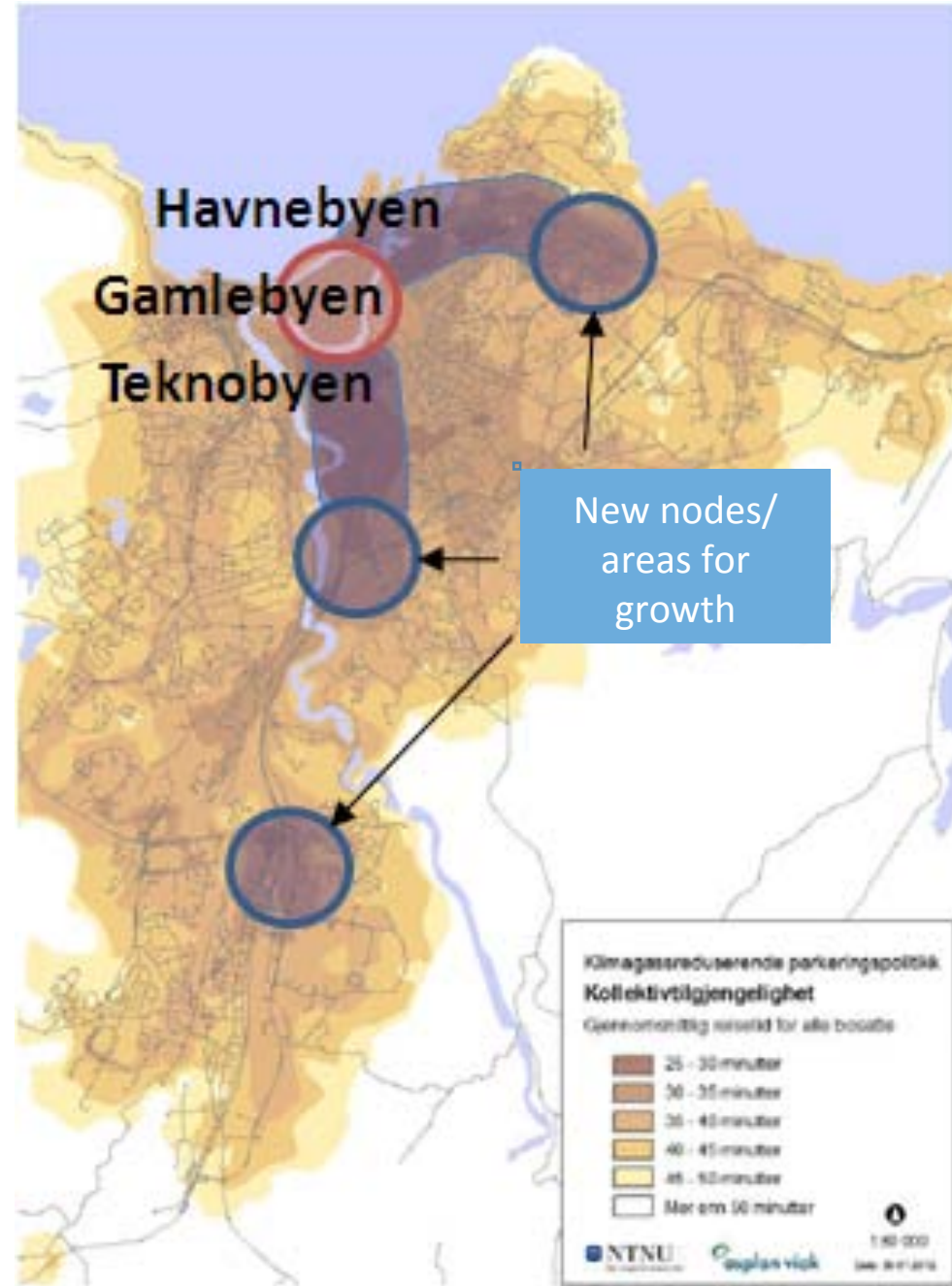
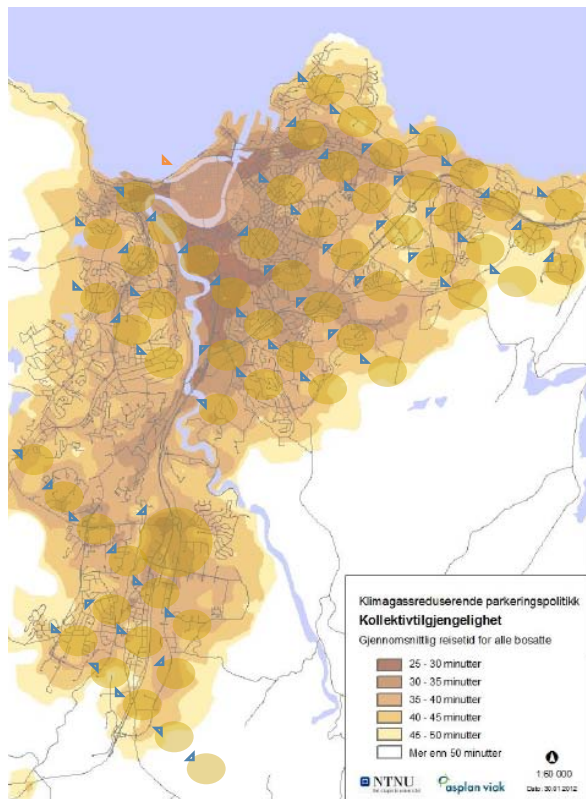


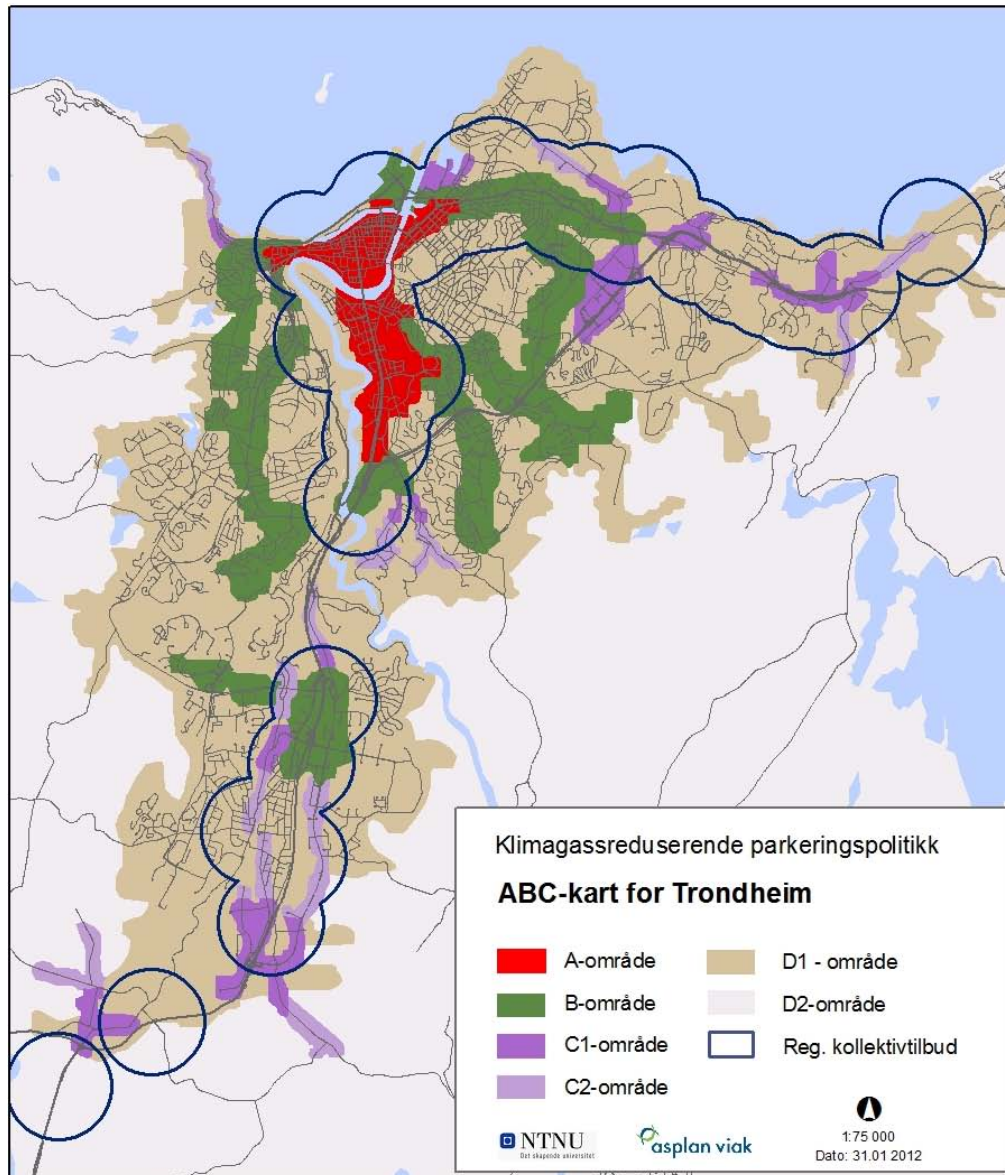
- Now / Since 2010 (or gradually since 2000)
 - Densification
 - Mixed land use



The structure of destinations is important

The challenge was to locate new areas for growth





A-områder: God tilgjengelighet for kollektivtrafikk, syklist og fotgjengere.

B-områder: Middels god tilgjengelighet for kollektivtrafikk, syklist og fotgjengere.

C1-områder: God tilgjengelighet for bil og tungtrafikk (inntil 1000 meter fra kryss på E/ R-veg langs veg med god standard).

C2-områder: God tilgjengelighet for bil og tungtrafikk (fra 1000-2000 m fra kryss på E/ R -veg langs veg med god standard).

D1-områder: Byområder med relativt god tilgjengelighet, men uten hovedårer for bil og kollektivtrafikk.

D2-områder: Områder med relativt dårlig tilgjengelighet for alle.

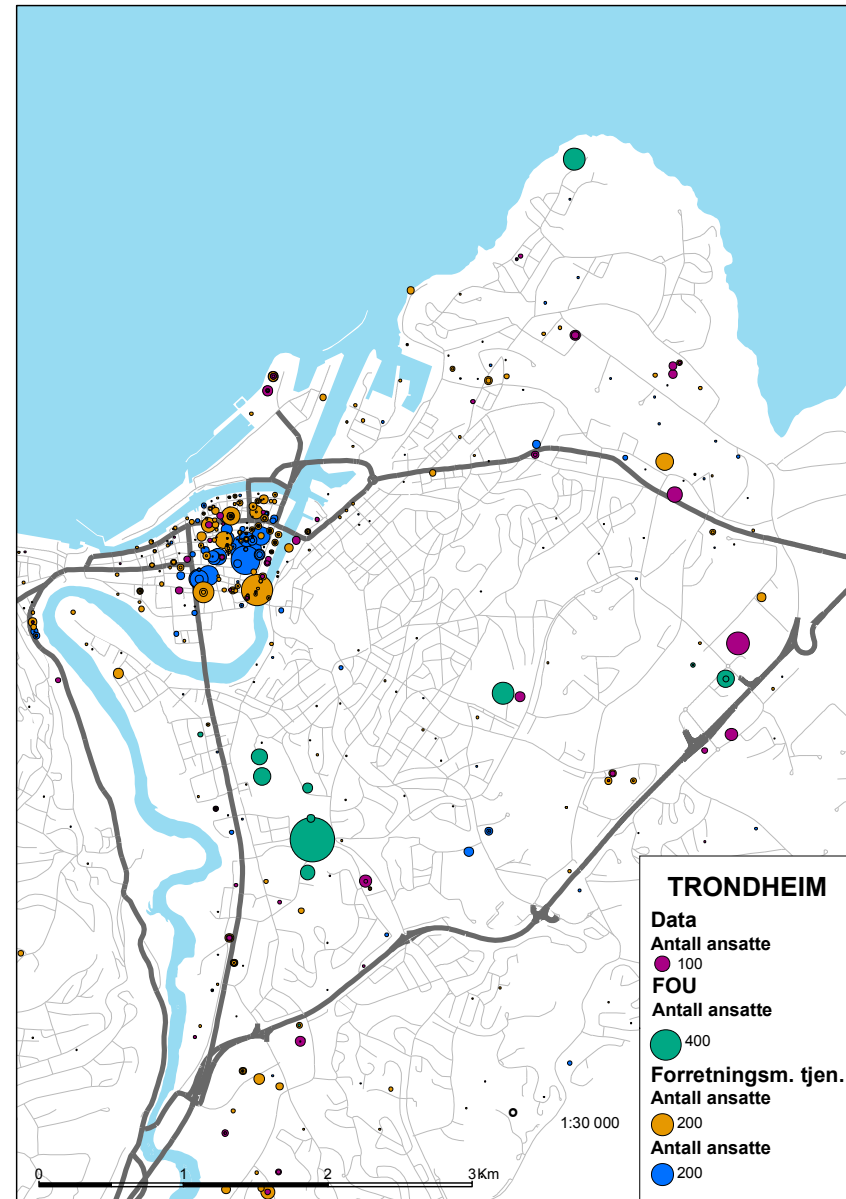
Location map (ABC-map) for Trondheim from 2012 as a result of research project between NTNU, The Municipality of Trondheim and Norplan Ltd (a national consultancy).

Trondheim is our lab

Densification works (almost)

- **The development 1983-2001:**
 - 10.500 new work places.
 - i.e. 14 % of all work places
 - 73 % is located in the central areas
 - Finance: 83 % in CBD/Midtbyen
 - ICT: In central areas (59 %) and 15 % in CBD/Midtbyen
 - Services: 63 % in the central areas and 49 % in CBD/Midtbyen
 - Central areas are approximately the same as the public transit zone

Research project conducted by IRIS (Stavanger), Norplan Ltd. And NTNU as part of the Norwegian Research Council's program for urban research (2000-2005)



Transport and transportation planning

- Before / 1980
 - Car
 - Predict and provide
- Now / Since 2008 (or gradually since 2000)
 - Public transit / "walcynng"
 - Adapt to environmental standards



The ch
cities a

vegian
n plan

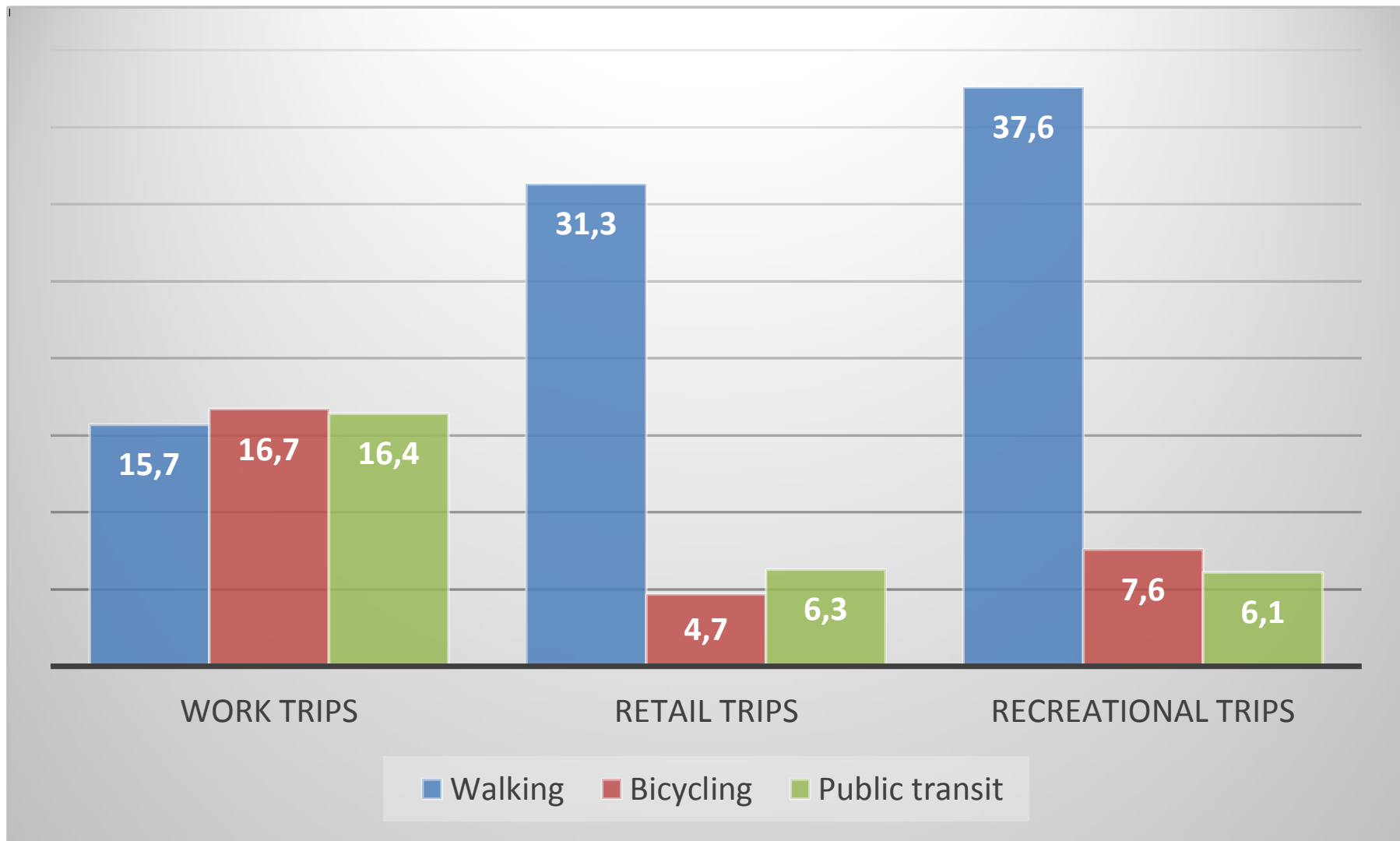


STILL STUCK in TRAFFIC

**COPING WITH PEAK-HOUR
TRAFFIC CONGESTION**

ANTHONY DOWNS

Travel behaviour in Trondheim – environmental friendly modes 2013



Driving

Walking + 32 %

Bicycling + 32 %

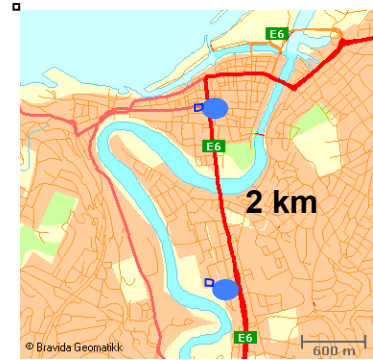
Less driving

More driving as passenger

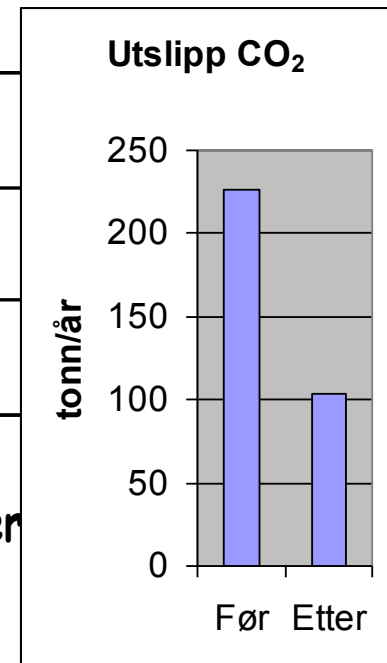
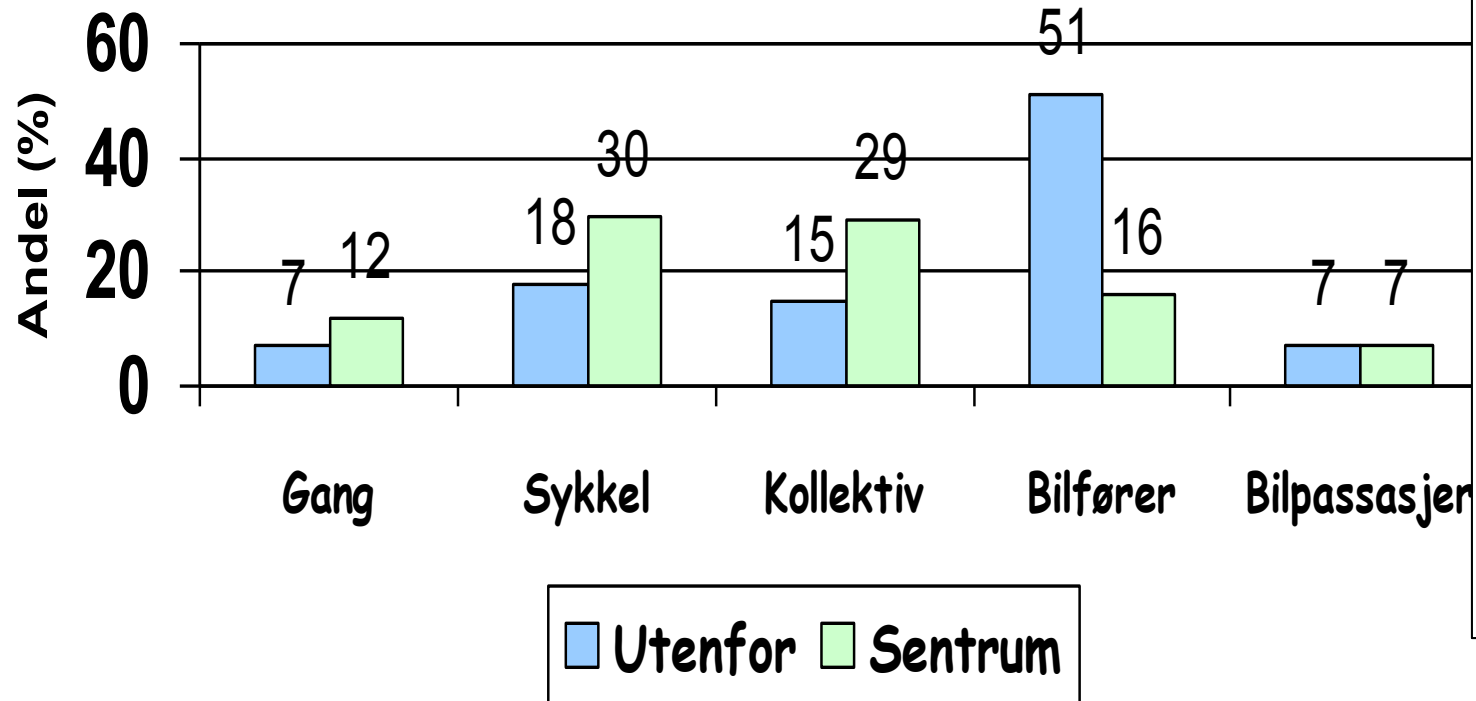
Public transit + 50 %

By 2030 environmental friendly transport must increase

The impact of different localizations



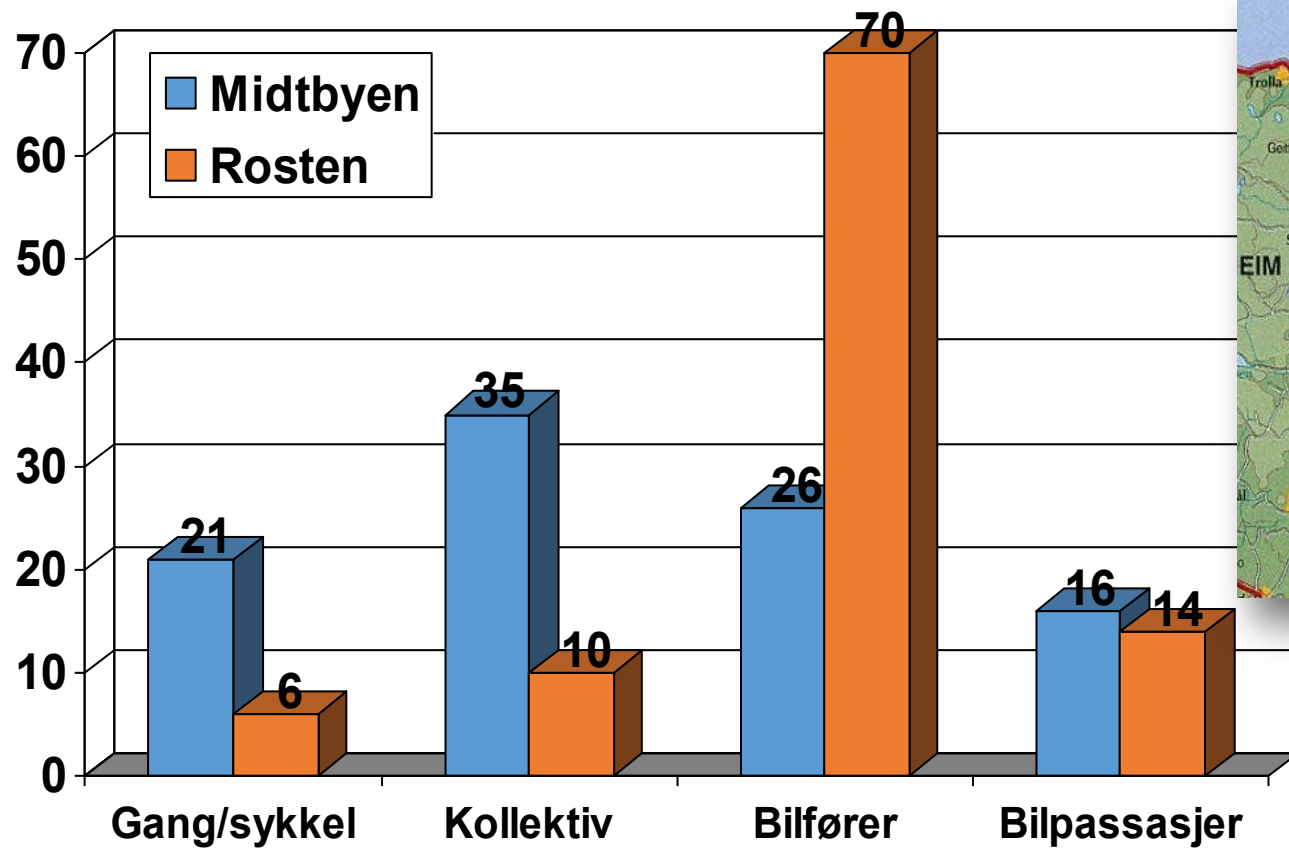
Reisemiddelbruk Trondheim kommune



**Less
emissi¹⁶**

Location and modes of travel in Trondheim

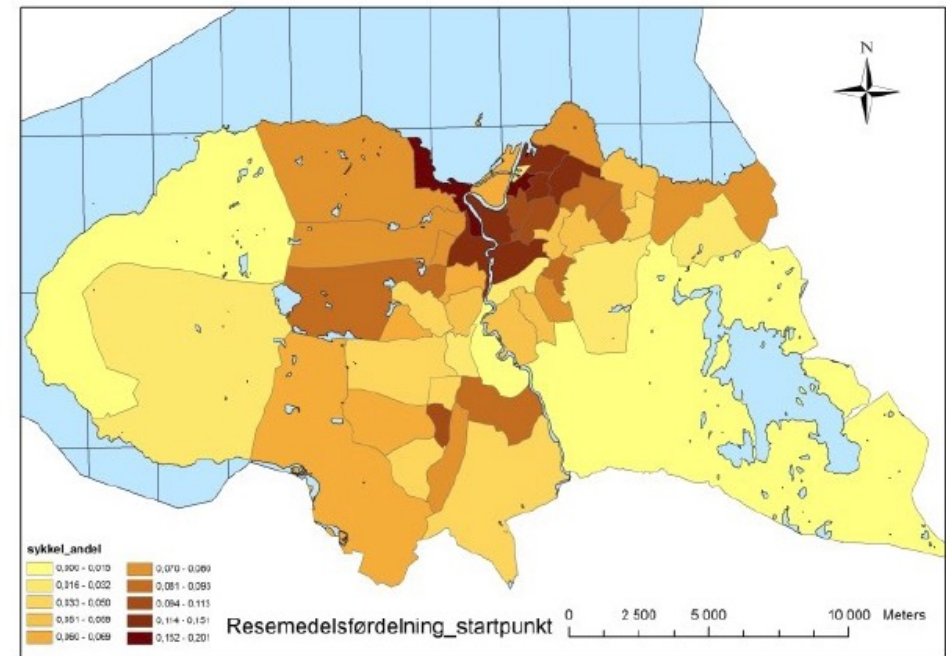
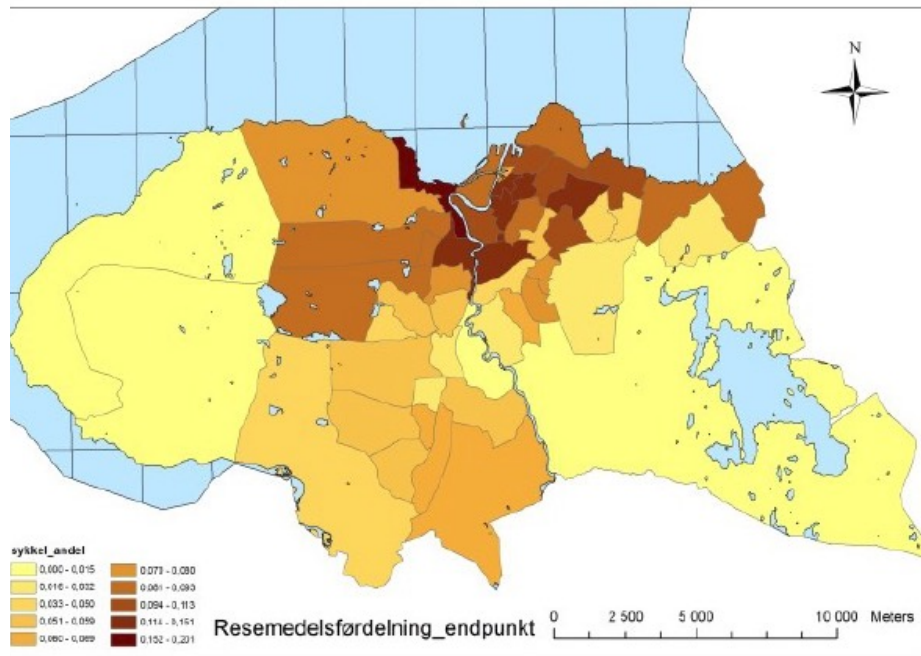
The move by Fokus bank from CBD to Rosten
– effects on travel behaviour



Physical and demographical factors significance for the pattern of bicycle trips (Simon Öhlin's master thesis 2013)

Share of bicyclists regarding destination

origin



There are need for new
infrastructure



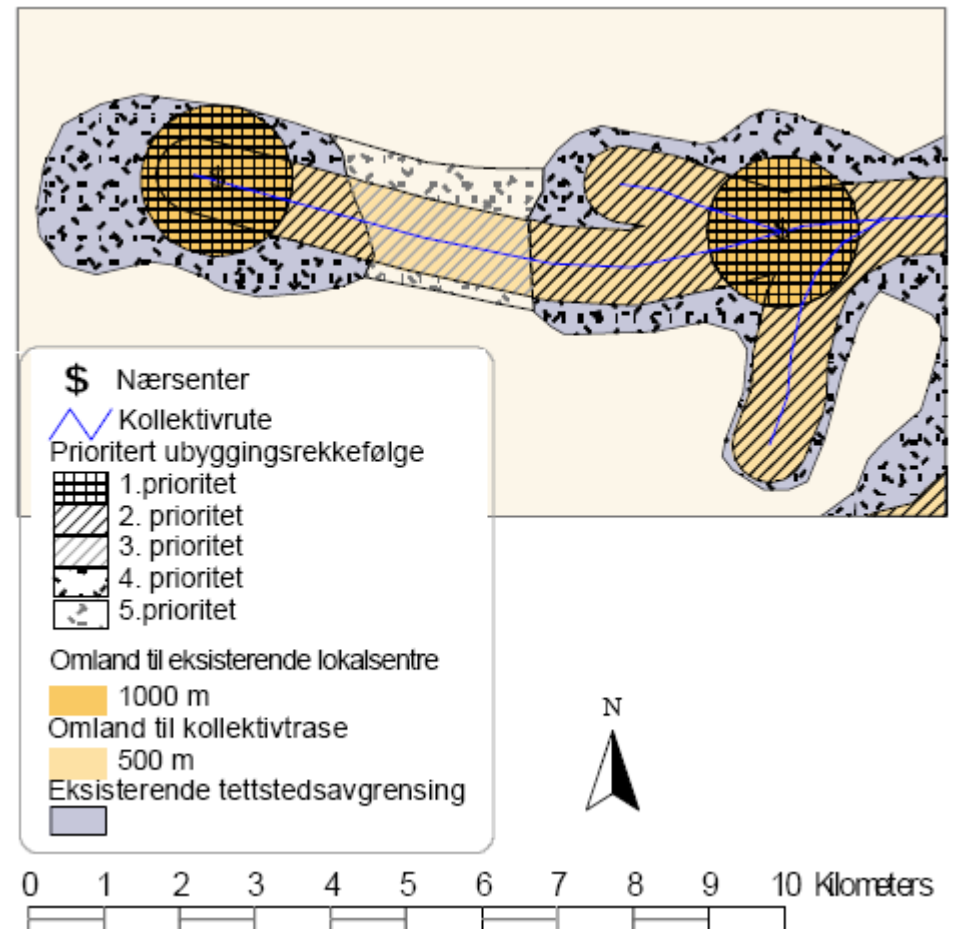
Prioritize public transport

- Public transport needs separate lanes
- Public transport must be better financed
 - Government support
 - Reward arrangement should continue
 - More support to public transport in general
 - User payment
 - Higher prices/fares?
 - Transferred from car traffic's congestion charge



Land use planning for "green" transport

- Limit sprawl
 - Densify existing areas
 - Existing nodes/
junctions
 - Establish new nodes
 - Put up new buildings in existing areas
 - Put up new building in extension of existing urban areas



An aerial photograph of a residential area, likely in Norway, showing a river winding through the landscape. The area is densely packed with houses and buildings, interspersed with green spaces and trees. The text is overlaid on the upper left portion of the image.

Saupstad Kolstad
Case for
residential participatory
schemes fostering improved physical
outdoor areas and social inclusion

Overgangen til grønn energi krever gigantiske investeringer – men åpner samtidig store muligheter, også for norsk næringsliv.

En grønn verden er mulig – men prisen er enorm

Aftenposten
10th of August 2015

A green world is possible but the cost is enormous

8500 billions NOK