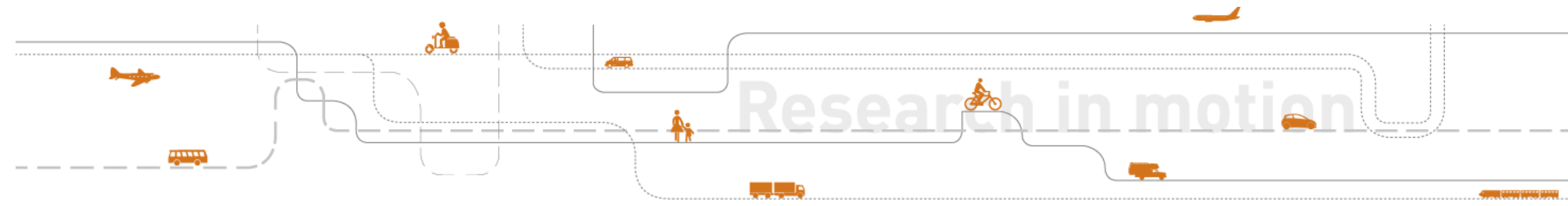


# Reallocation of road and street space in Oslo: Input to discussions on measures for zero-growth in traffic

**Future of Urban Mobility in the Context of Societal Challenges, Prague, 19.10.2022**

Aud Tennøy, PhD Urban and Regional Planning  
Chief Researcher Sustainable Urban Development and Mobility  
Institute of Transport Economics (TØI), Norway



# Important societal goals:

- **Attractive cities** – good places to live and run businesses
- **Vibrant cities** – city centre, people, social, lively, urbanity
- **Just and inclusive cities** – accessibility, affordable housing
- **Public health** – active transport, belonging, access to green
- **Reducing land take** – bio-diversity, nature, farming, CO2
- **Zero growth in road traffic volumes**, CO2, energy, all above

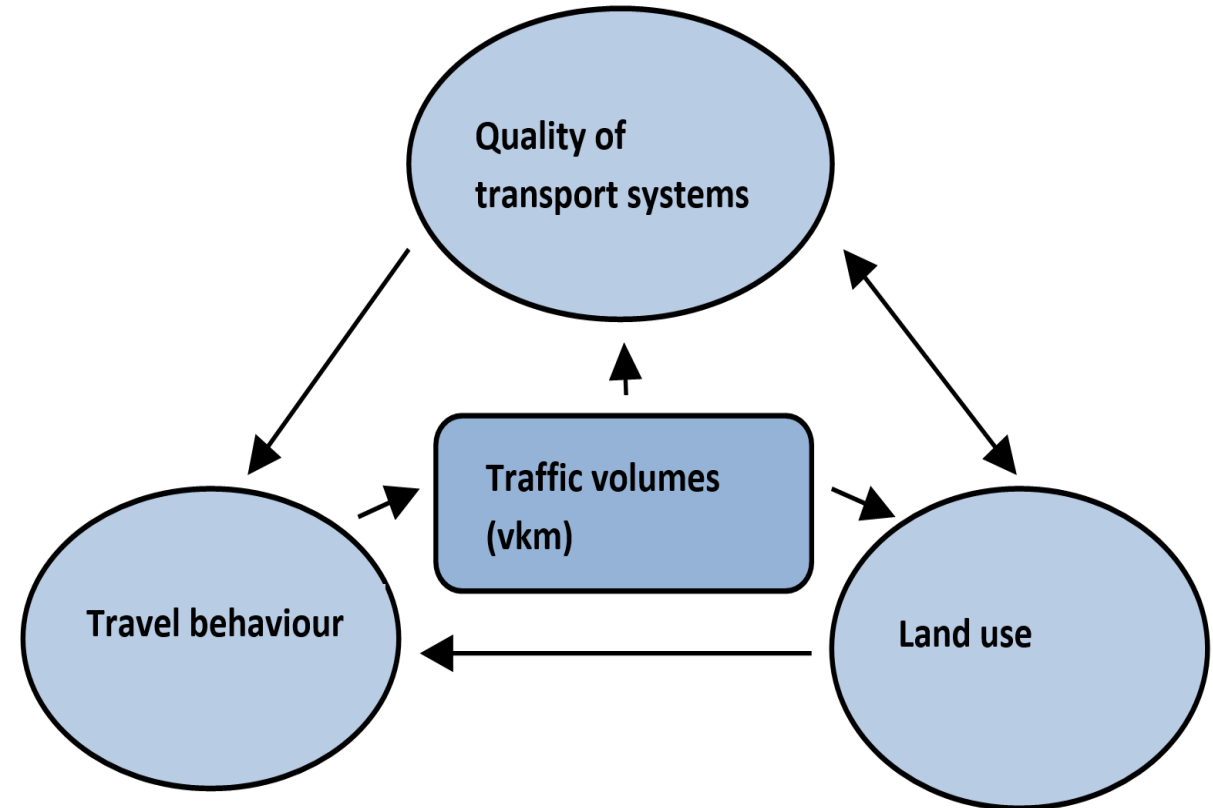


# The Zero-Growth Objective

- *Zero-growth*: Increasing transport demand caused by rapid population growth in urban regions shall not cause growth in passenger road-traffic volumes (total VKT in the urban region), most larger cities have traffic *reduction* goals (defined in the National Transport Plan, 2013, 2017, 2021)
- Requires that inhabitants reduce their average daily car traffic volume (VKT) by making fewer trips, shorter trips and/or lower shares of trips as car drivers
- Strategy: Developing land use and transport systems in ways reducing transport demand, car dependency and traffic volumes

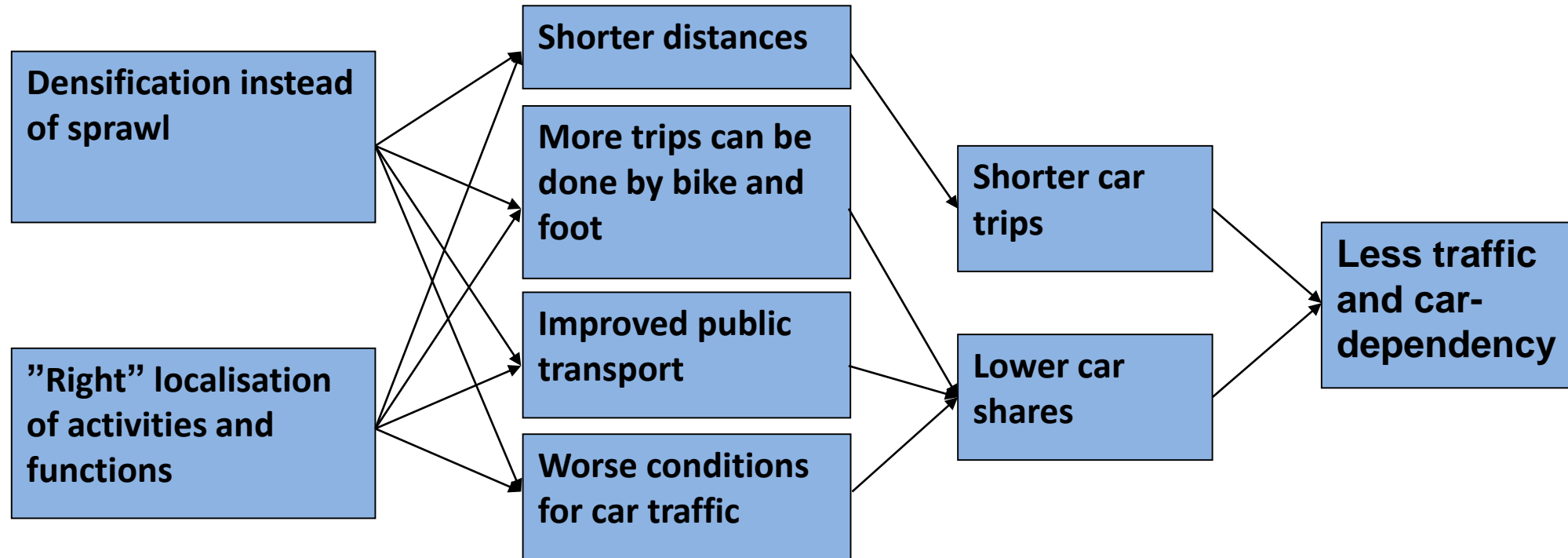
# Strategies for achieving zero-growth or reduction

- Land use development as central densification and transformation rather than sprawl

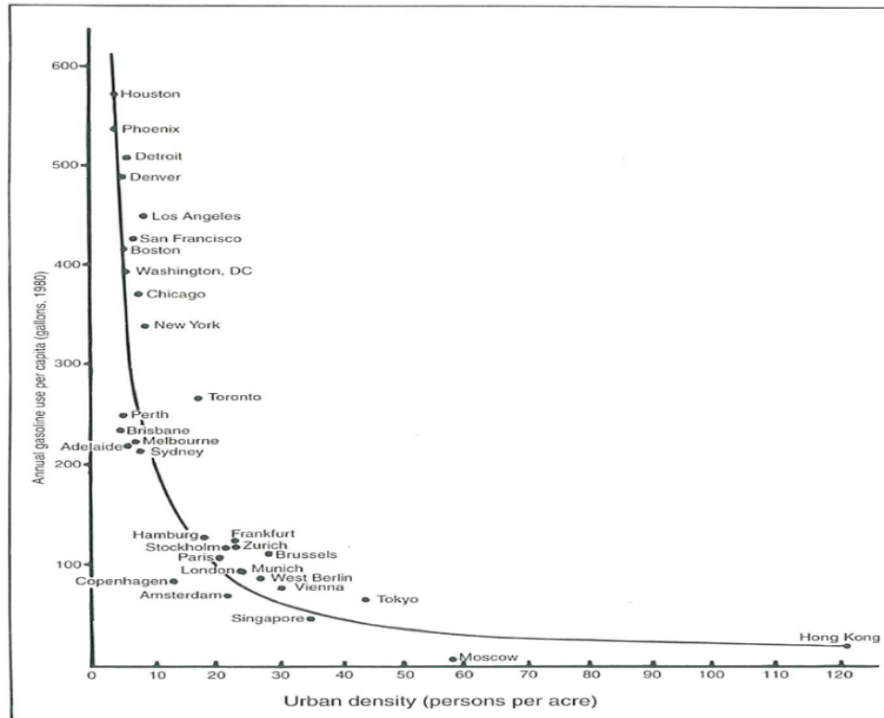


# Land use – traffic volumes

Land use defines the frame conditions for travel behaviour: Where, how often and by what mode



# High overall densities result in less traffic (and land take)

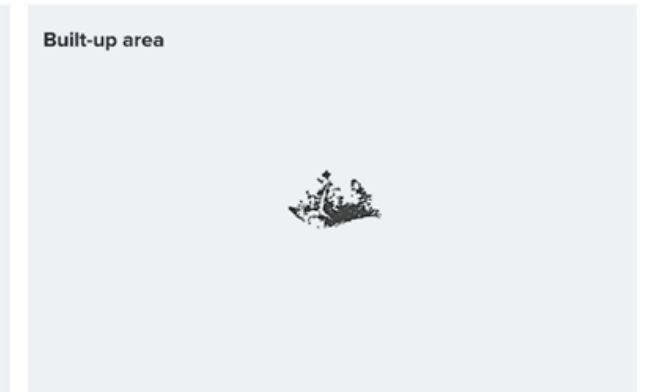


Newman og Kenworthy (1989)

## Atlanta and Barcelona have similar populations but very different carbon productivity

Atlanta

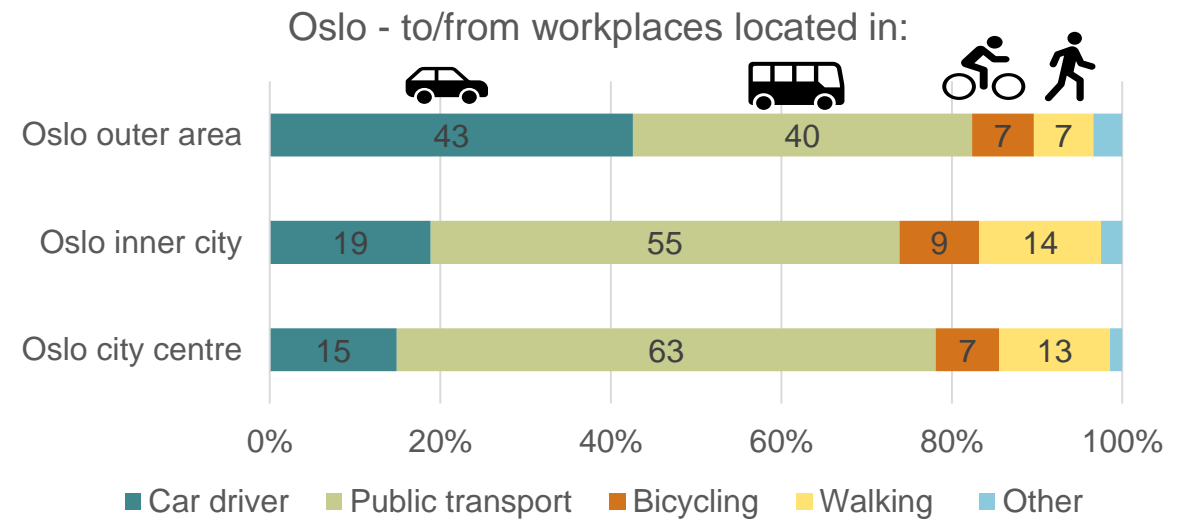
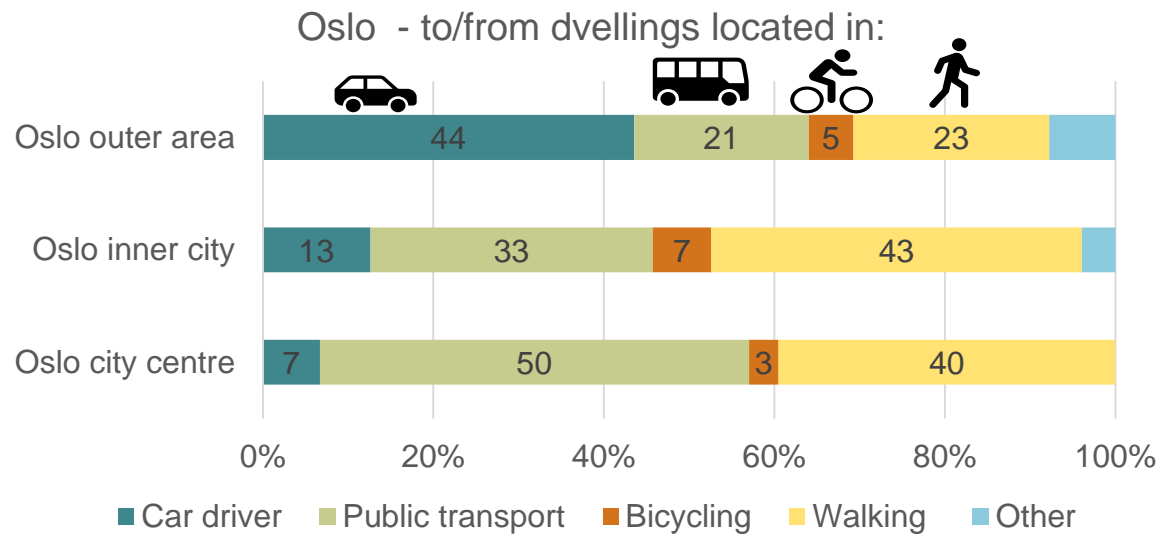
Barcelona



Population	Urban area	Transport carbon emissions	Population	Urban area	Transport carbon emissions
<b>2.5</b> million	<b>4,280</b> km <sup>2</sup>	<b>7.5</b> tonnes CO <sub>2</sub> /person (public + private transport)	<b>2.8</b> million	<b>162</b> km <sup>2</sup>	<b>0.7</b> tonnes CO <sub>2</sub> /person (public + private transport)

Bertaud og Richardson 2004

# Localization in urban structure affects modal choice



Tennøy et al. (2021; 2022), based on NTS 2013/14 og 17/18



# Quality of transport systems: We get more of what we facilitate for

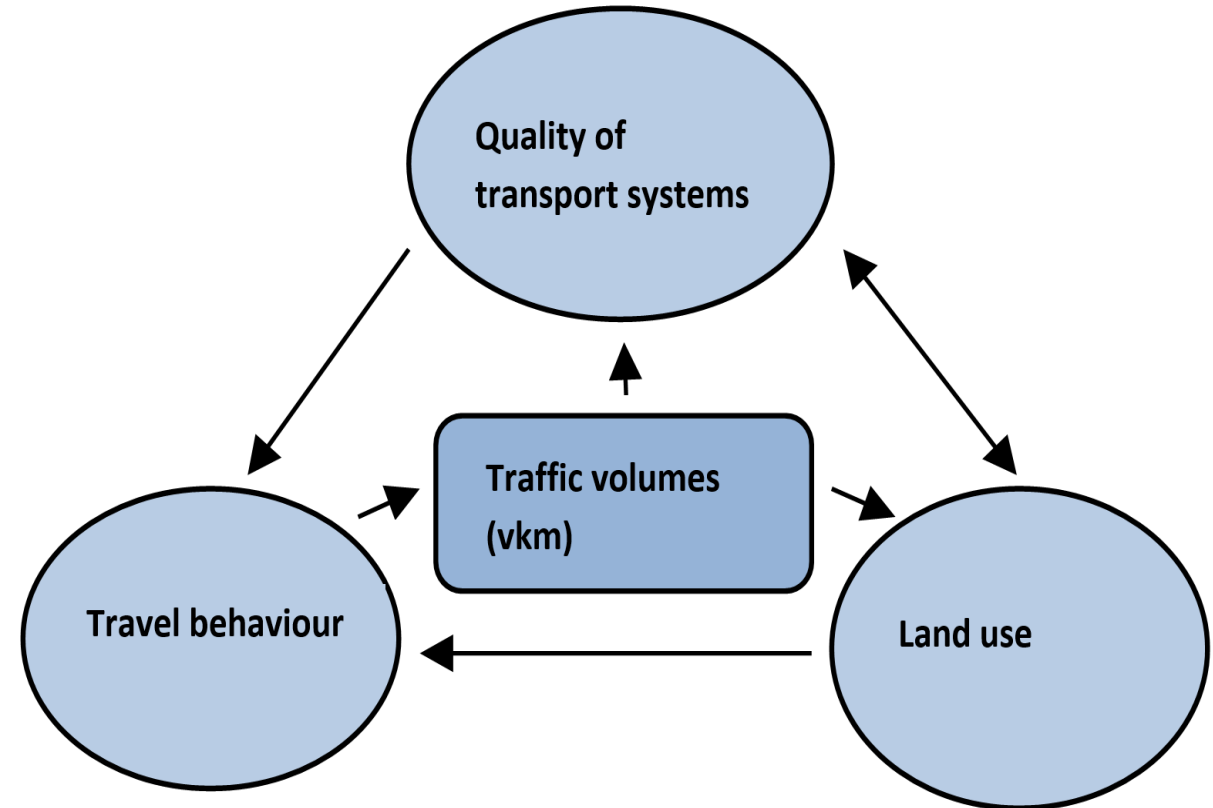
- If we want people to shift from private car to other modes, the *relative competitiveness* of those modes versus the car needs to improve
- If we want people to shift from other modes to the private car, the *relative competitiveness* of the private car versus other modes needs to improve





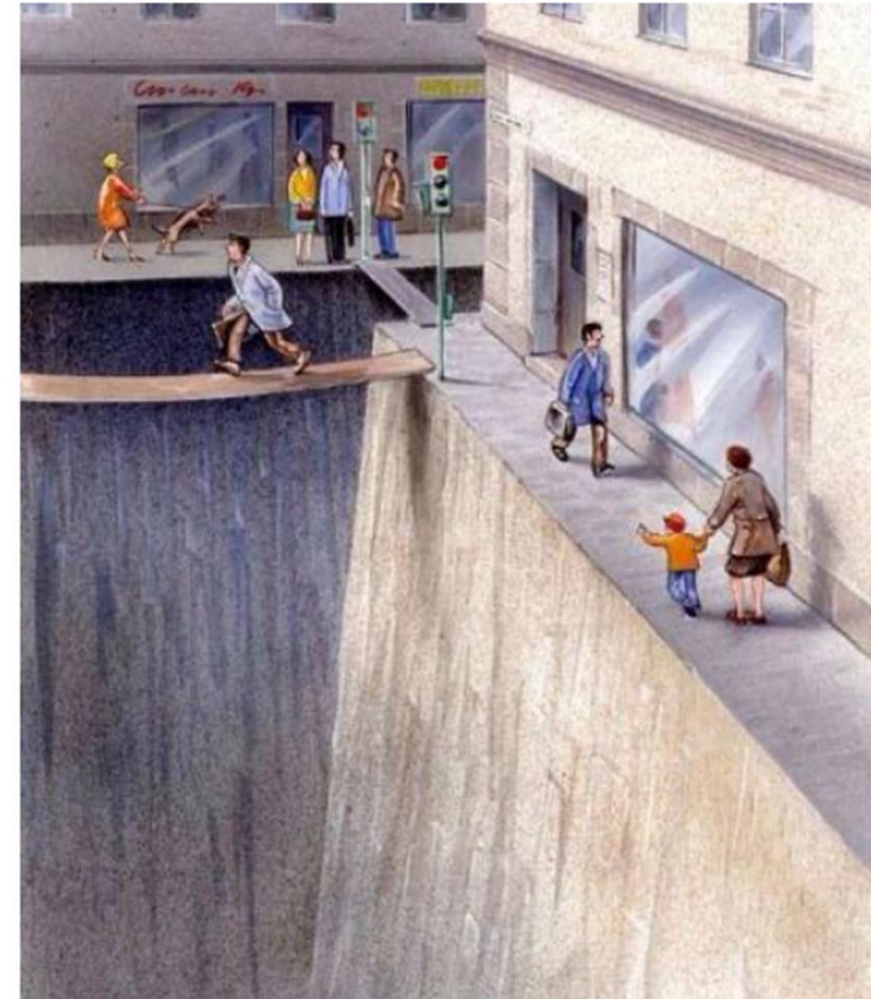
# Strategies for achieving zero-growth or reduction

- Land use development as central densification and transformation rather than sprawl
- Improving conditions for walking and bicycling
- Improving public transport services
- Restrictions on accessibility by private car
- Road tolling - as a restrictive measure and for funding



# Reallocation of road and street space to other modes

- Obvious part of the solution when aiming at improving the competitiveness of sustainable modes versus the private car
- Often hindered by exaggerated fear of chaos and negative consequences
  - Cairns et al. (2002)



# The BYTRANS project

Substantial changes planned in the Oslo transport systems in 2015-2020

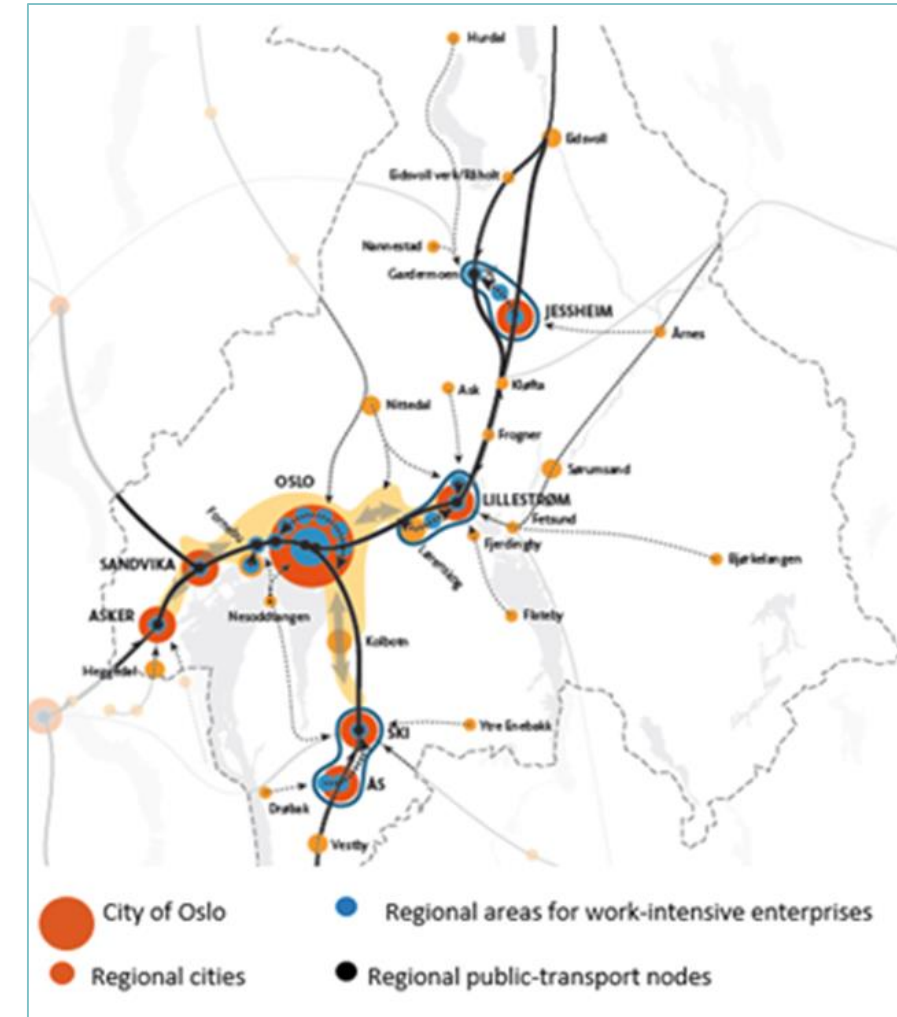


Natural experiments!

Great opportunity for research, knowledge production, learning and innovation

# Context: Oslo Urban Region

- Approximately 1,3 million inhabitants (2018)
- Strong population growth:
  - 20% from 2008-2018 in the region
  - By 60 000 in the region 2014-2019
  - Of these 30 000 in Oslo municipality 2014-2019
- Stated objectives:
  - Halving CO2-emissions from 2015-2030
  - Oslo: Reducing traffic volumes by 20% by 2023
- Regional plan (2015)
  - Stopping sprawl, densification in selected 'regional towns', much of the development in Oslo city
  - Rail, subway and road infrastructure projects





# The BYTRANS project

- Studying adaptations to, and effects and consequences of, changes in urban transport systems
- Cases: Main road tunnels, city centre, subway-system, other, total
- Key data collection methods (referred to here):
  - Traffic data (volumes and speed) from local and national road authorities
  - Surveys to and interviews with commuters to businesses located within Oslo municipality, every year from 2015 to 2019, 5400 – 6500 respondents per survey

# Capacity reduction in 10 main road tunnels

## A 'proxy' for reallocating road space to other uses

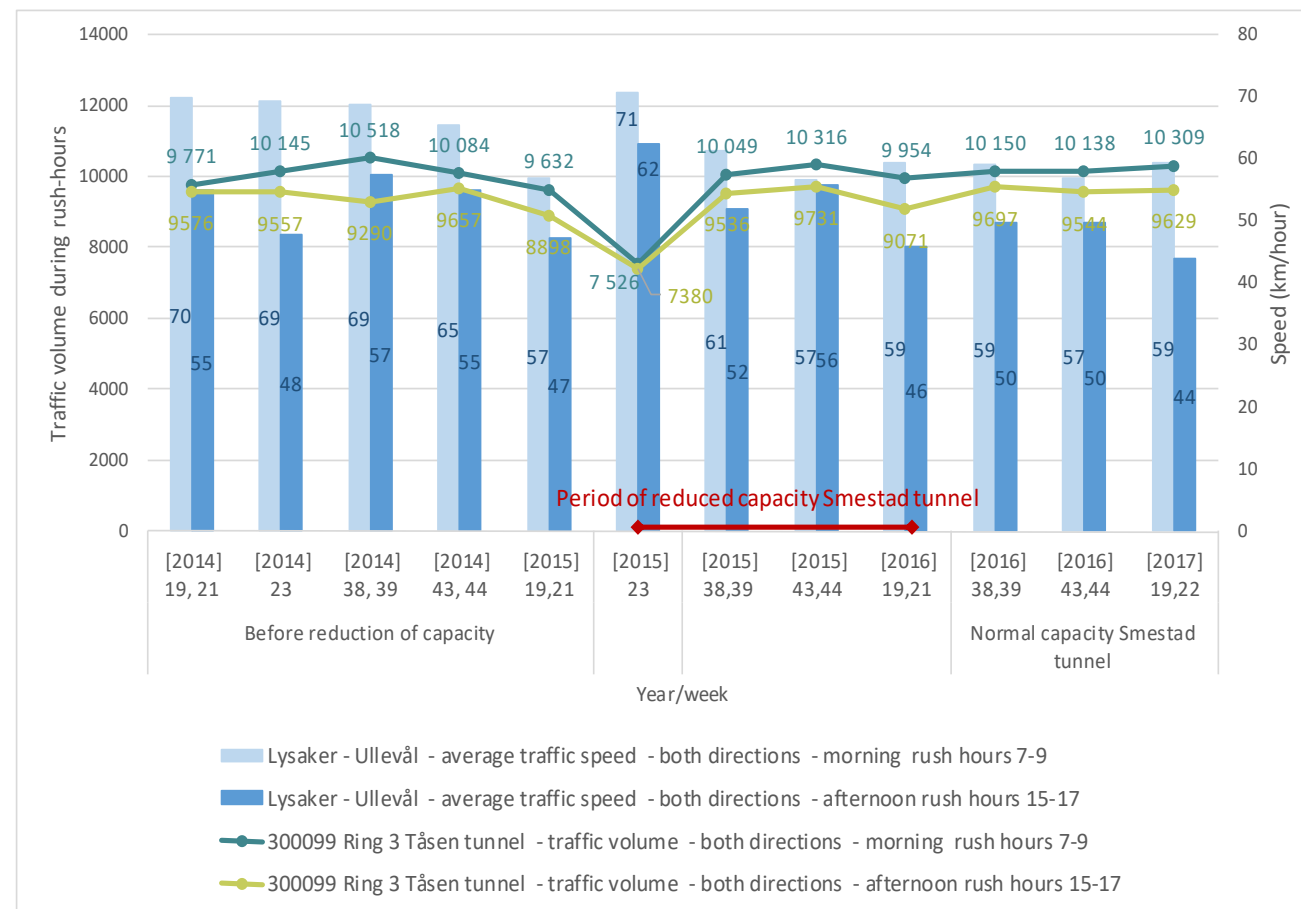


Illustration: Norwegian Public Roads Administration



# Case Smestad tunnel

- **AADT 50 000**
- **Capacity reduction, 4 to 2 lanes**
- **June 2015 to June 2016**
- Speed limits reduced from 70 to 50 km/h
- **Expected significantly increased congestions (4 hours extra was mentioned!)**
- Successful information campaign
- Traffic down 37% and 33% first day (in rush) – and down in total system
- No reduction in average speed
- **In stable situation (with 2 lanes):**
  - **Traffic volumes back to normal**
  - **Average speeds as normal**
  - **Somewhat increased variability**
- Had enough capacity, also with two lanes
- No adaptations, effects or consequences
- **Exaggerated fear of negative consequences**



Tennøy et al. (2016)

# Smestad morning rush hour traffic, 2 May 2015



Photo: Aud Tennøy



Photo: Norwegian Public Roads Administration

# Case Bryn tunnel

- AADT 70 000 vehicles per day
- Already (somewhat) congested during rush hours
- Capacity reduction, 4 to 2 lanes, from February 2016 to April 2017(14 months)
- Speed limits reduced from 70 to 50 km/h
- Successful information campaign
- Expected significantly increased congestions here and in the wider road transport system ('chaos')

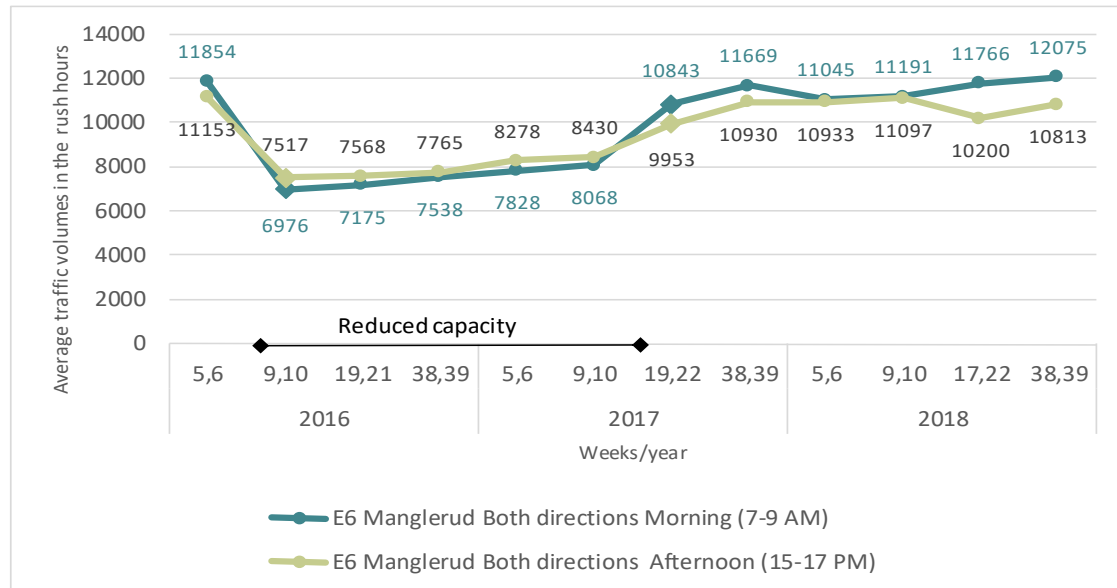




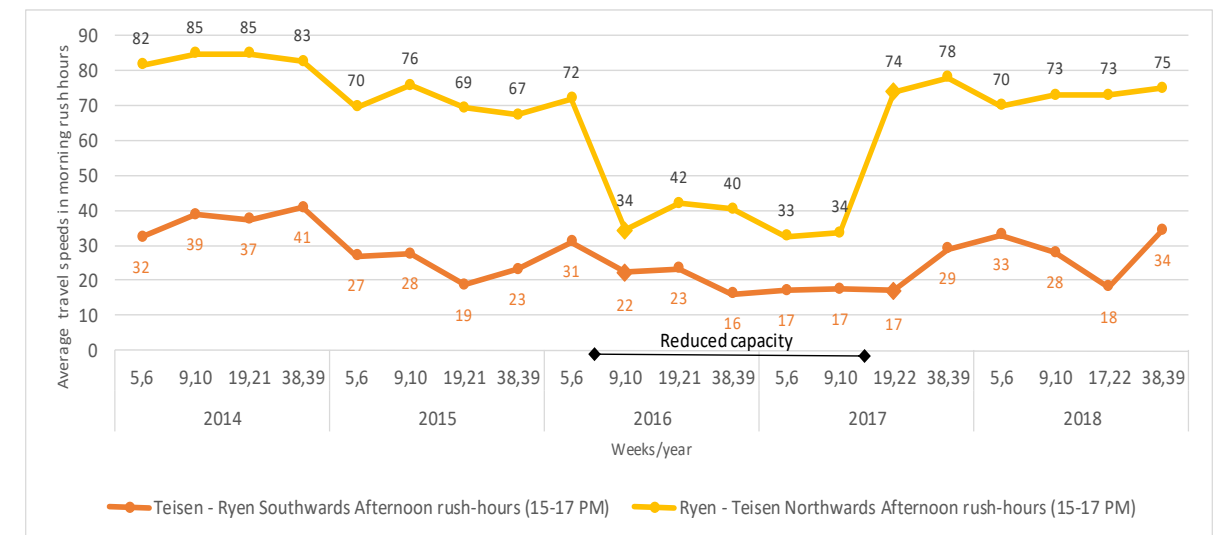
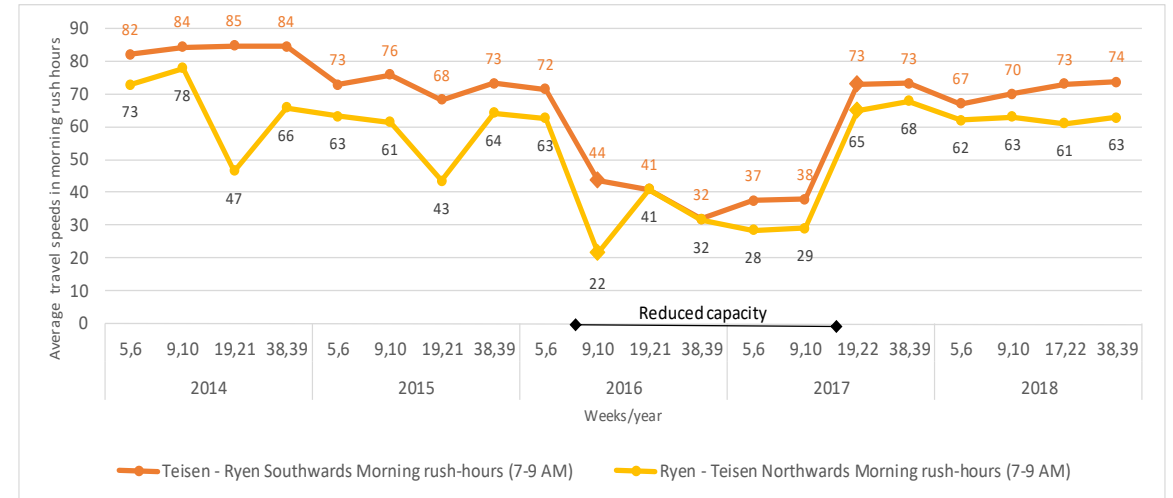
# Bryn tunnel – changes to the traffic situation

- Traffic reduction in the tunnel: 26-34% during rush hours, 23 % per day (working days)
- Speed was significantly reduced in rush hours
- The disturbances were mainly limited to the areas close to the tunnel (we checked)
- 2-4% traffic increase on local roads

## Traffic volumes, rush hours

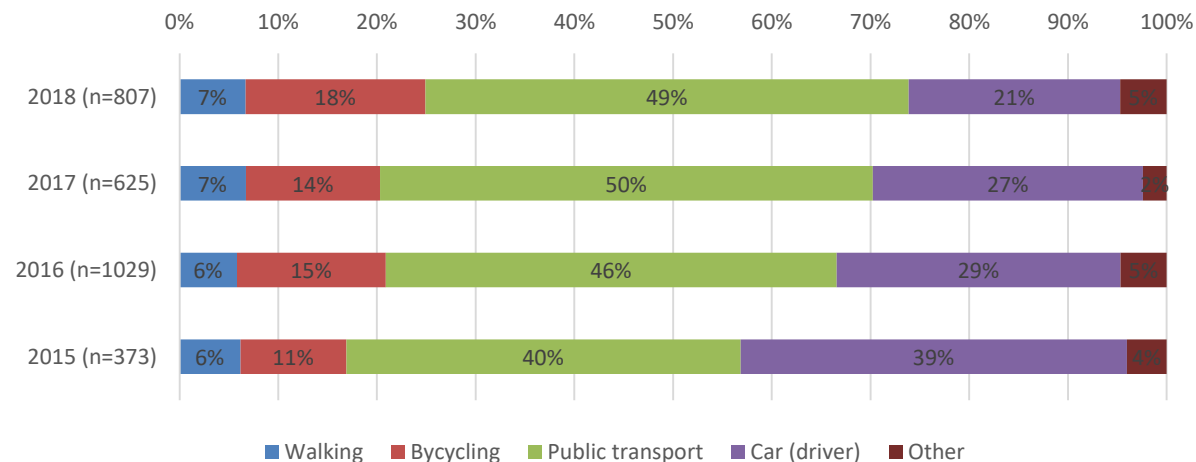


## Average speed, rush hours



# Adaptation, commuters to businesses in the Bryn area

- Most continued travelling as before
- Some chose other routes on the main road system
- Some adjusted times (but no 'rush hour slide')
- Small increase in home office usage
- Major change in modal choice on commutes
  - Subway line serving the area was reopened in 2016



# Effects and consequences for commuters to the Bryn area

## ■ Effects

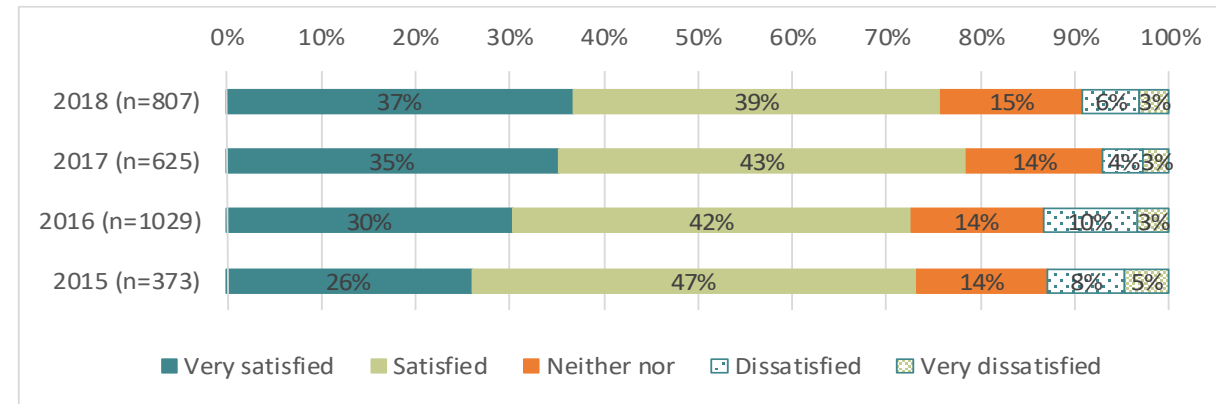
- Increased travel time (7,5 – 12 minutes in rush hours and rush directions)
- Worsened punctuality

## ■ Consequences

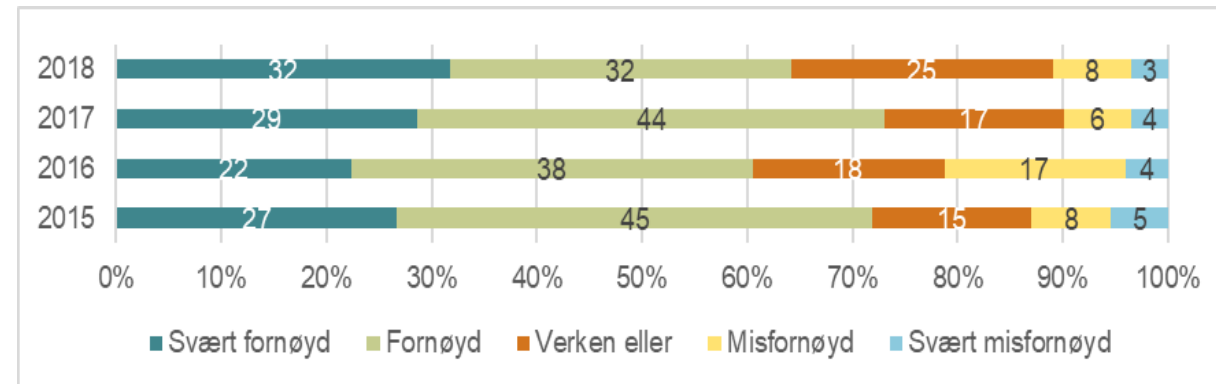
- Routine changes in the household (12%)
- Commute satisfaction, all, no significant changes
- Commute satisfaction for car users - reduced
  - 21% dissatisfied in 2016, 60% satisfied

## ■ Effects and consequences far less severe than expected

How satisfied are you with your commute? All.



How satisfied are you with your commute? Car drivers.





# Case Oslo city centre: Reallocation of street and parking space to other uses

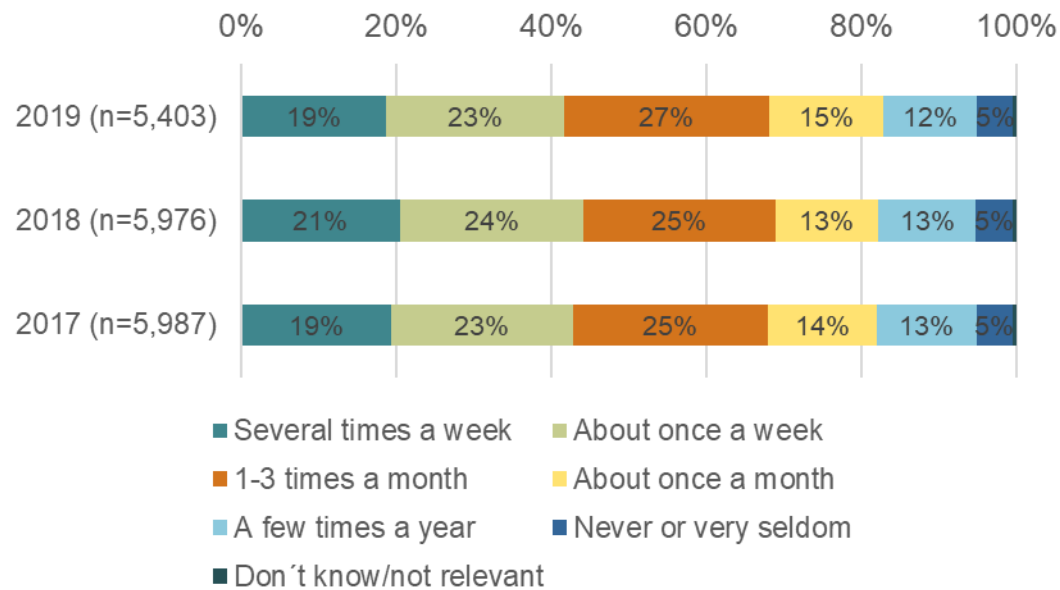
- 2018: Most (760) on-street parking spaces removed
- 2019: Through-driving barriers
- Bike-lanes, wider sidewalks, more pedestrian areas
- Some feared people would stop using the city centre



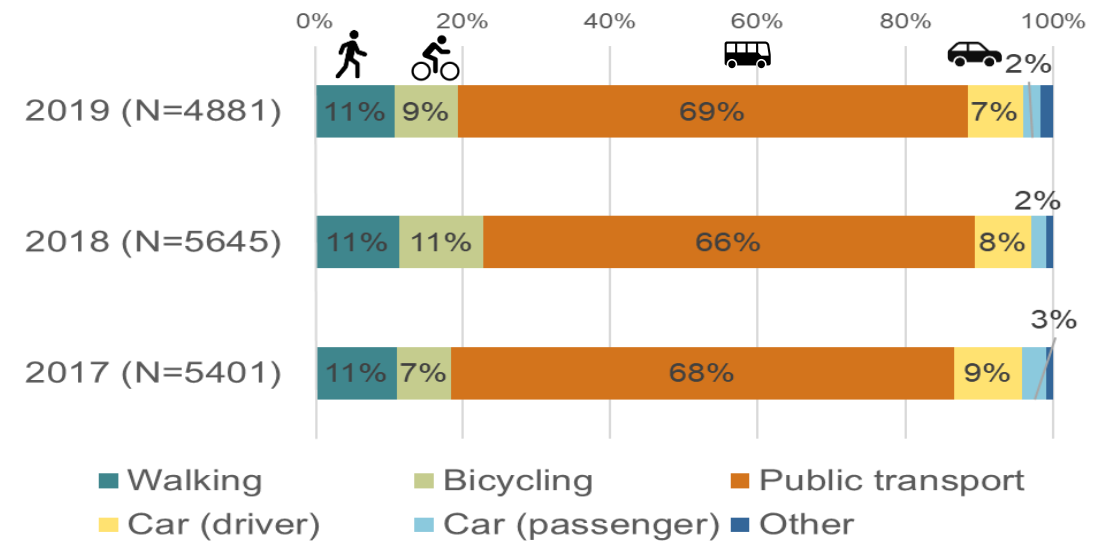
# Adaptations: How often they visit, how they travel

Leisure trips, except travels to/from work

## How often do you visit the city centre?



## How did you travel last time you were in Oslo city centre?

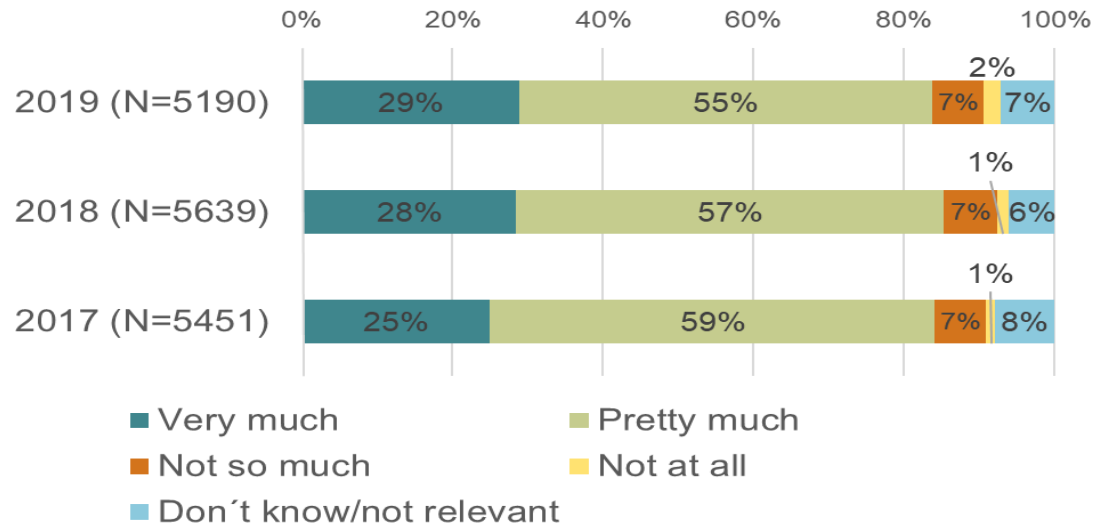


Hagen and Tennøy (2021)

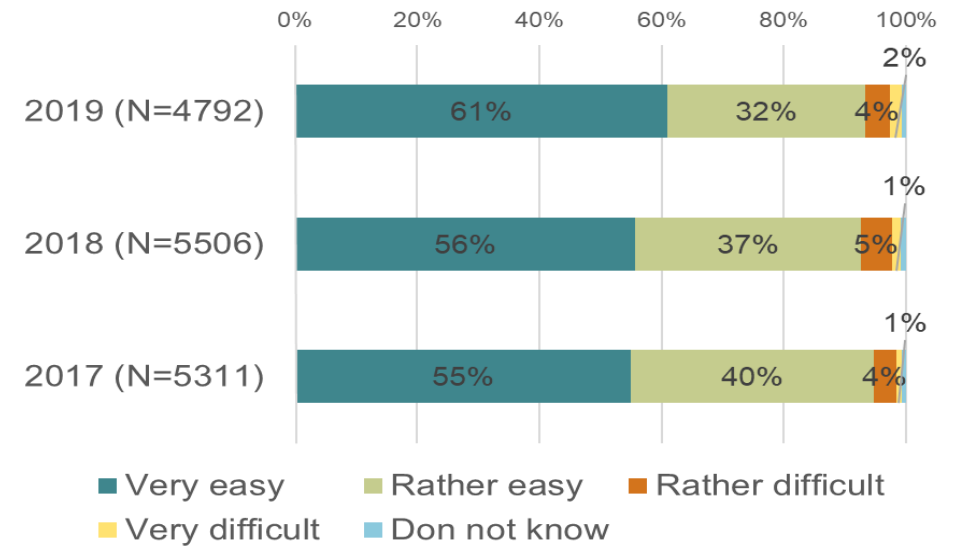
# Effects and consequences

## Leisure trips, except travels to/from work

How do you like visiting the city centre?



How easy is it to travel to Oslo city centre this time of the year?

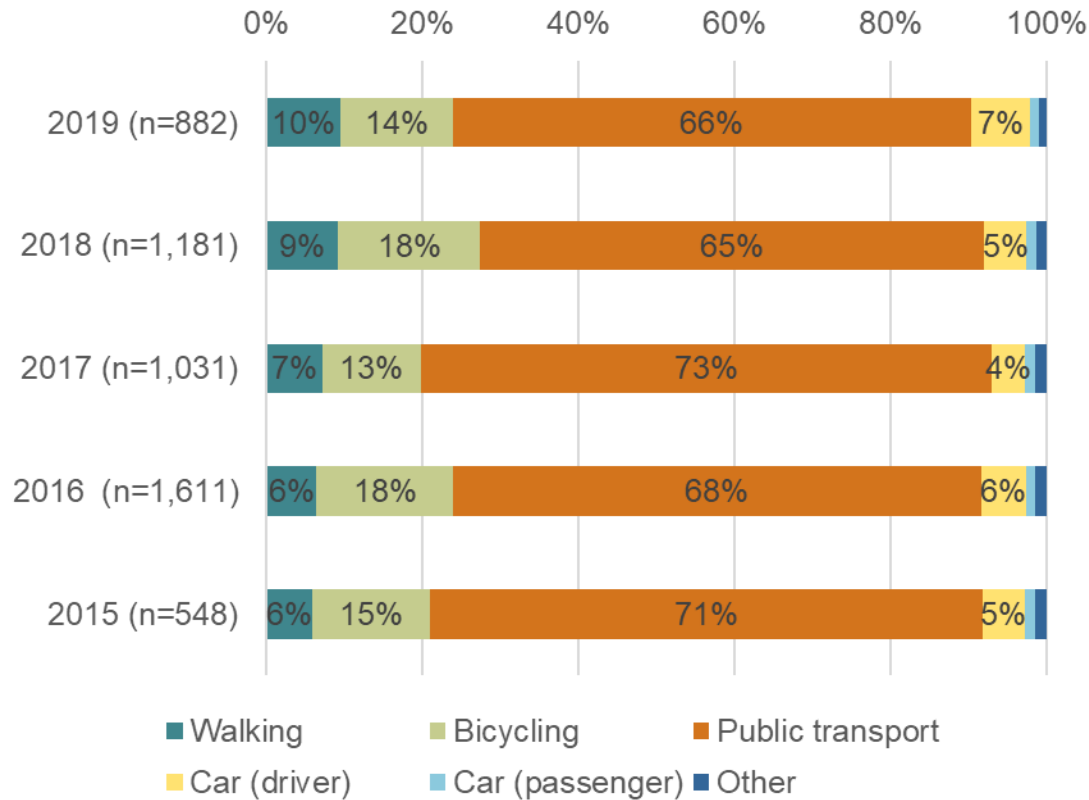


Hagen and Tennøy (2021)

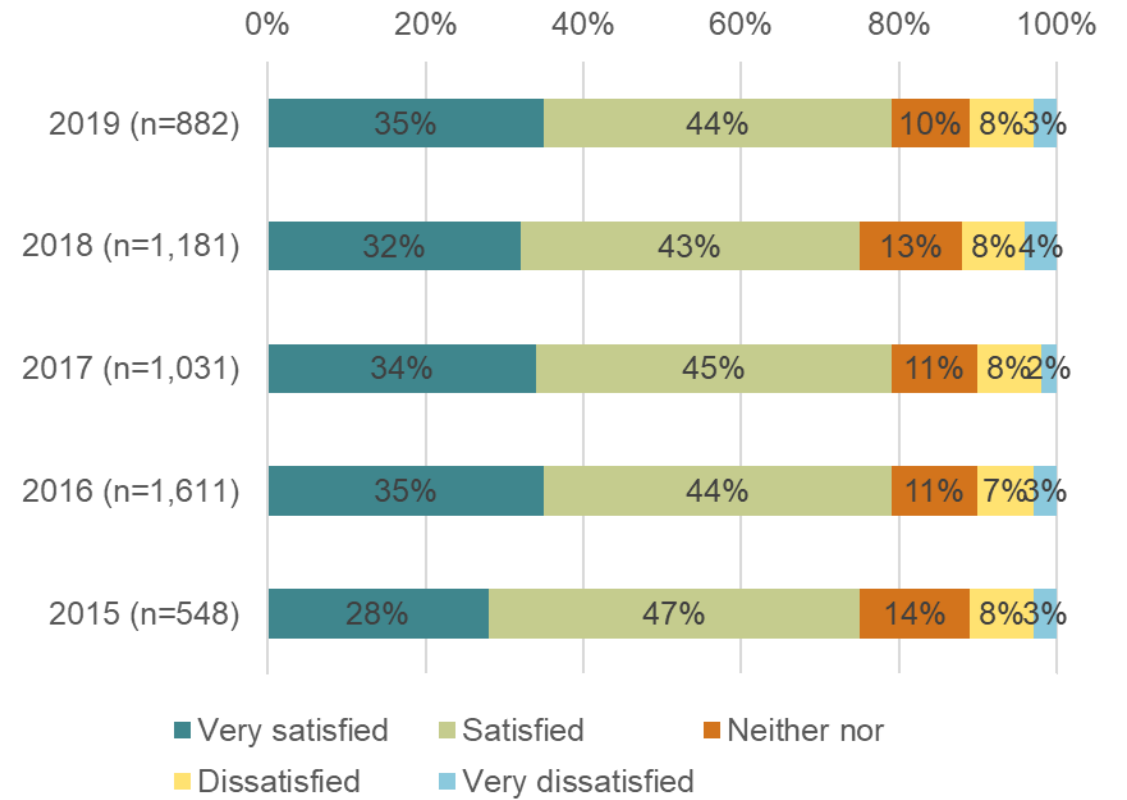


# Commuters to the centre: Mode and commute satisfaction

## Transport mode on commutes to the centre



## Commute satisfaction



# Reallocating on-street parking to bicycle lanes

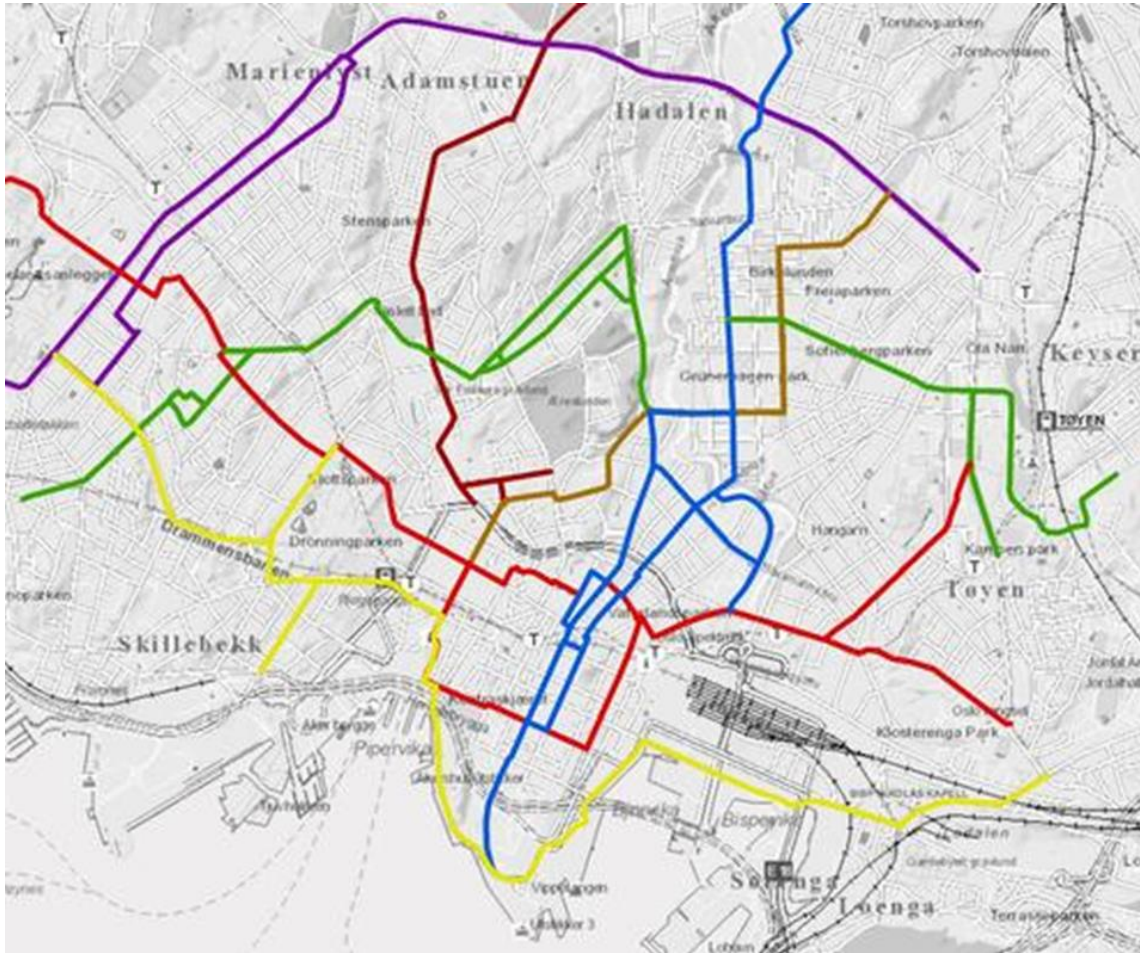


Illustration: Oslo municipality



Photo: Aud Tennøy

# Results, reallocation of road and street space

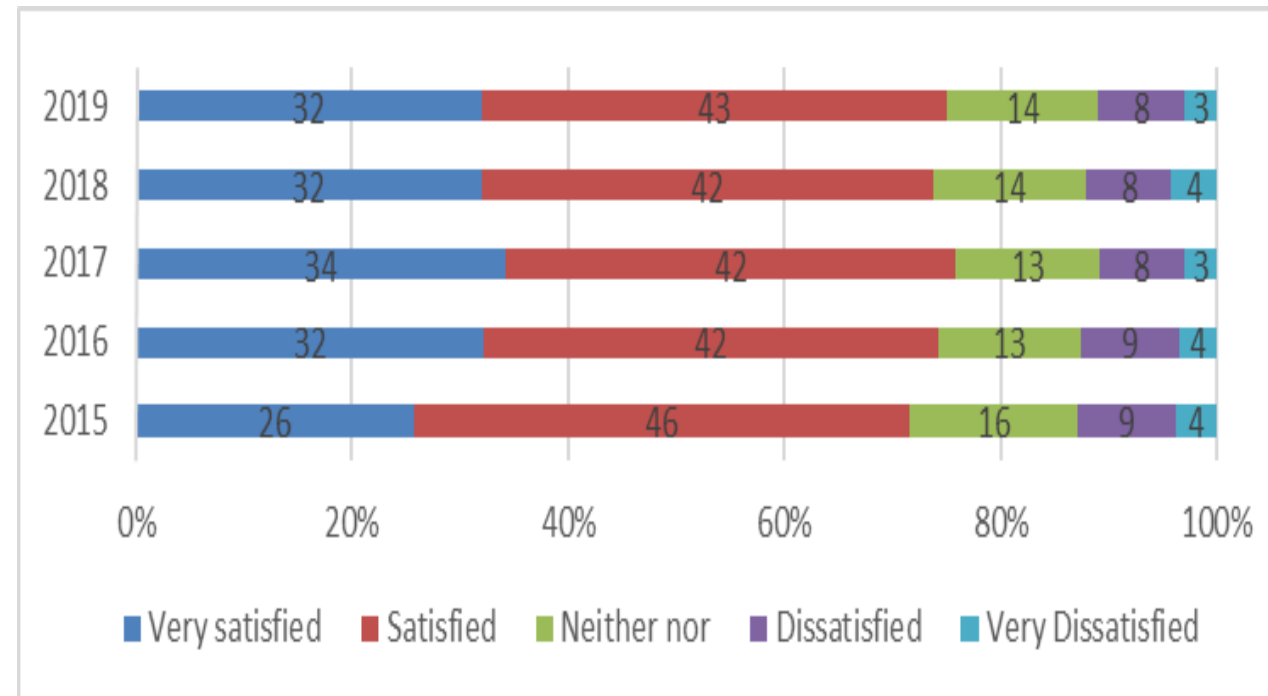
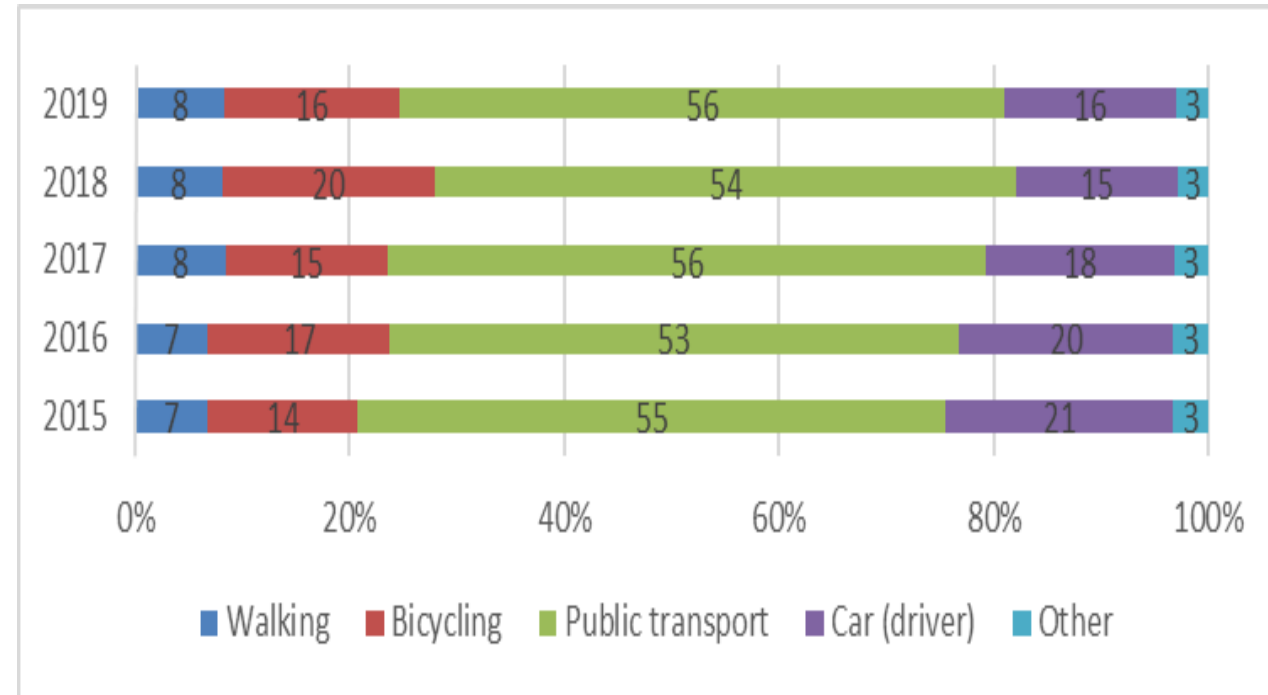
- Smestad tunnel: No adaptations, negligible effects, no consequences
- Bryn tunnel: Some adaptations, increased delays, no severe consequences
- Oslo City Centre: Almost no adaptations, effects or consequences (so far)
- Reallocating on street parking to bicycle lanes: Well-received (not surveyed)
- **In all cases: Exaggerated fear of negative effects and consequences**
- The City Government was re-elected, and has continued the work



# Totality of changes

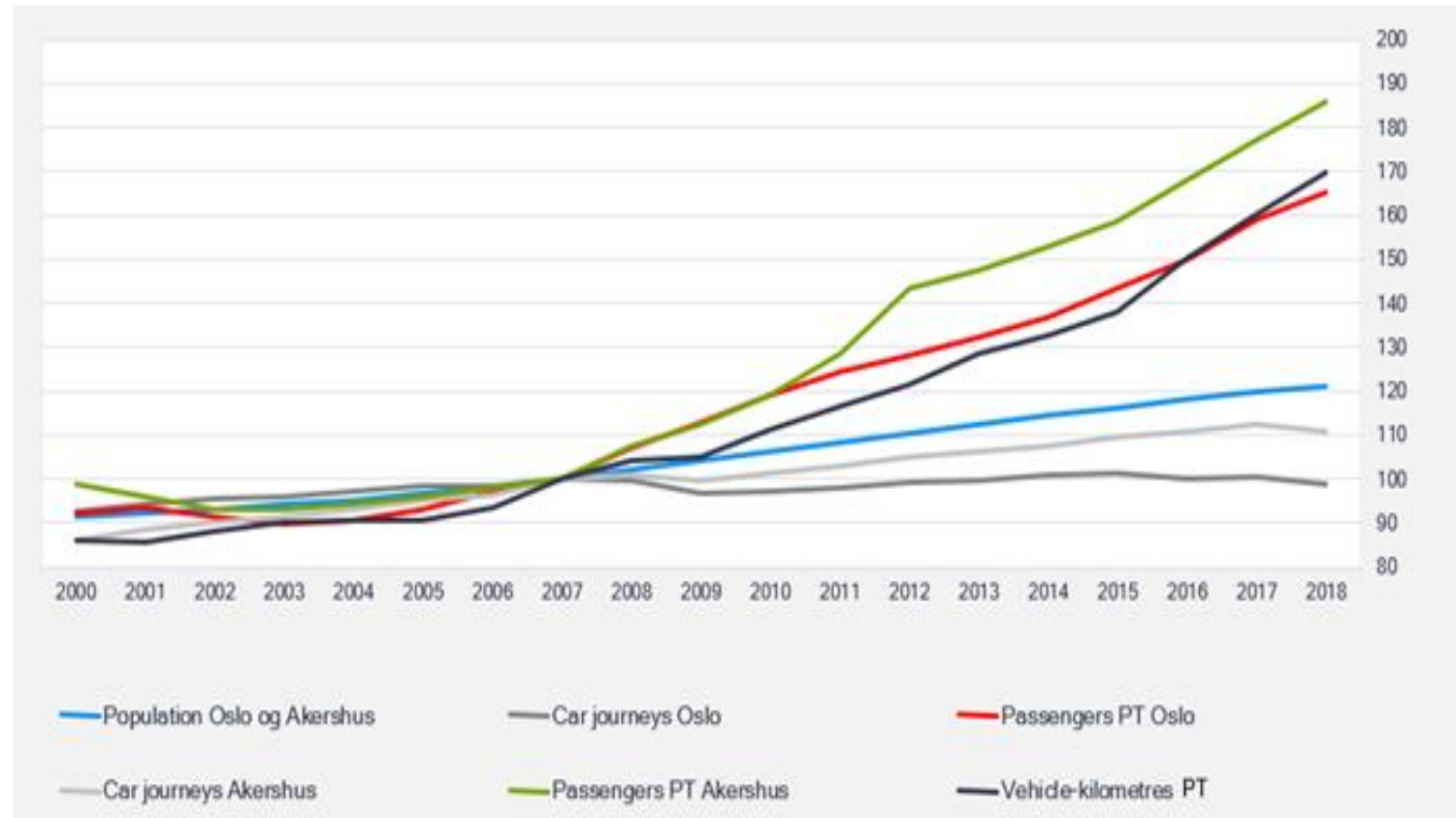
- Urban development (mostly) as densification within the city
- Reduced accessibility by car
- Improved accessibility by bike and by foot
- Improved public transport services
- Car-usage on commutes down from 21 to 16%
- Commute satisfaction stable and high, around 75% (very) satisfied

Tennøy and Hagen (2020)



# Oslo Urban Region – development since 2007

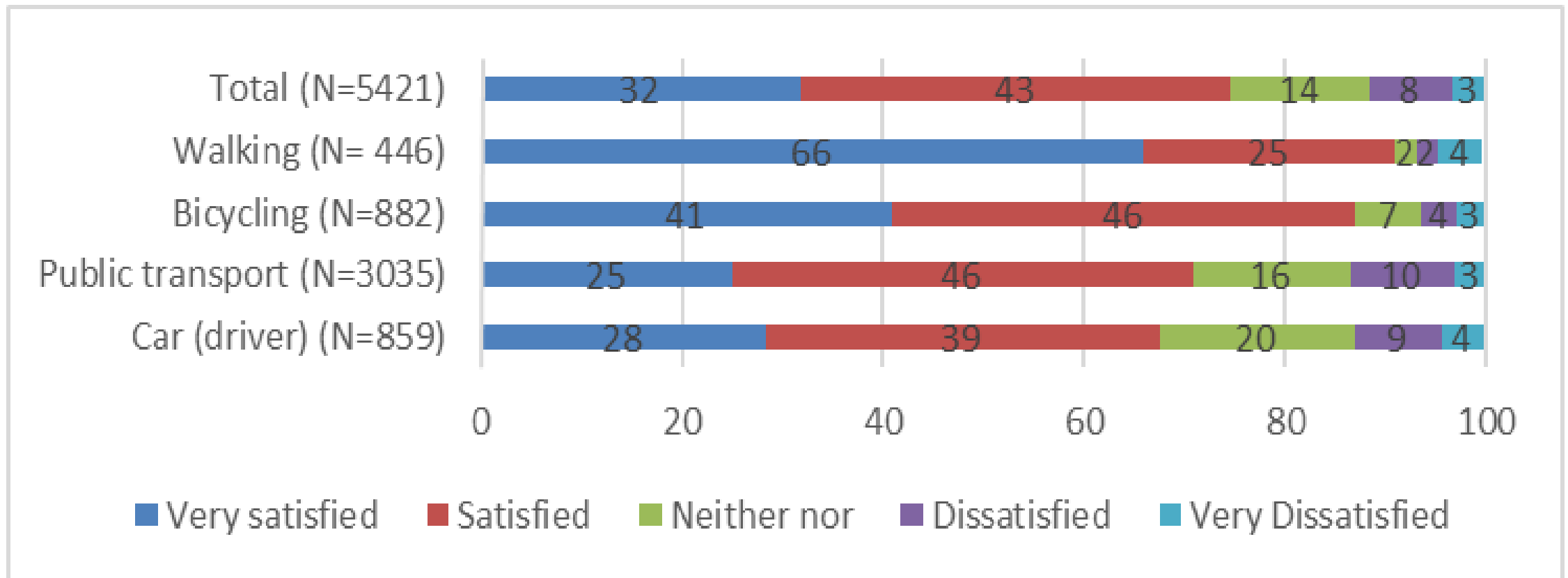
- Strong growth in PT services
- Strong growth in PT passenger
- Population growth
- Weaker growth in car trips  
(All is relative)



Source: Ruter

# Happiest commuters by bike and by foot! Car-drivers also quite happy...

How satisfied are you with your commute at this time of the year? May 2019



# Conclusion

- Negative effects and consequences following reallocation of road, street and parking space to other uses were far less severe than expected and predicted
- The fear of 'chaos' and negative consequences was exaggerated
- This is in accordance with findings from other studies:
  - Other similar cases in Norway (Asplan Viak 2008, Torp and Eriksen 2009)
  - American cases (Brown et al. 2017, Taylor and Wachs 2014)
  - Similar cases (63) from all over the world (Cairns et al. 2002)

# So What?

**Reallocating urban road and street space to other uses caused fewer and less negative effects and consequences than anticipated, meaning:**

- Reallocation of road, street and parking space to other uses are feasible alternatives
- Wider possibilities and more alternatives when planning for the future!
- Cities, centres and urban transport systems can easier be developed in ways contributing to reducing traffic volumes and making cities more efficient, liveable, enjoyable, healthy, walkable, bikeable....
- Less need for (and benefit of) expanding road space and road capacity
- Space, planning capacity, investments, etc. can be used in ways more effectively contributing to achieving societal goals

# Important societal goals:

- **Attractive cities** – good places to live and run businesses
- **Vibrant cities** – city centre, people, social, lively, urbanity
- **Just and inclusive cities** – accessibility, affordable housing
- **Public health** – active transport, belonging, access to green
- **Reducing land take** – bio-diversity, nature, farming, CO2
- **Zero growth in road traffic volumes**, CO2, energy, all above











# Some more references

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Thank you!





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# The recipe for achieving all the goals

- Land use development as central densification and transformation rather than sprawl
- Strengthening city centres
- Improving conditions for walking and bicycling
- Improving public transport services
- Restrictions on/ not facilitating for car-usage



# Truck drivers (Bryn)

## **Adaptation:**

Drove mainly as before

Some changed route, and  
some trip-timing

## **Effects:**

Increased congestion (16%)

Increased time-usage (14%)

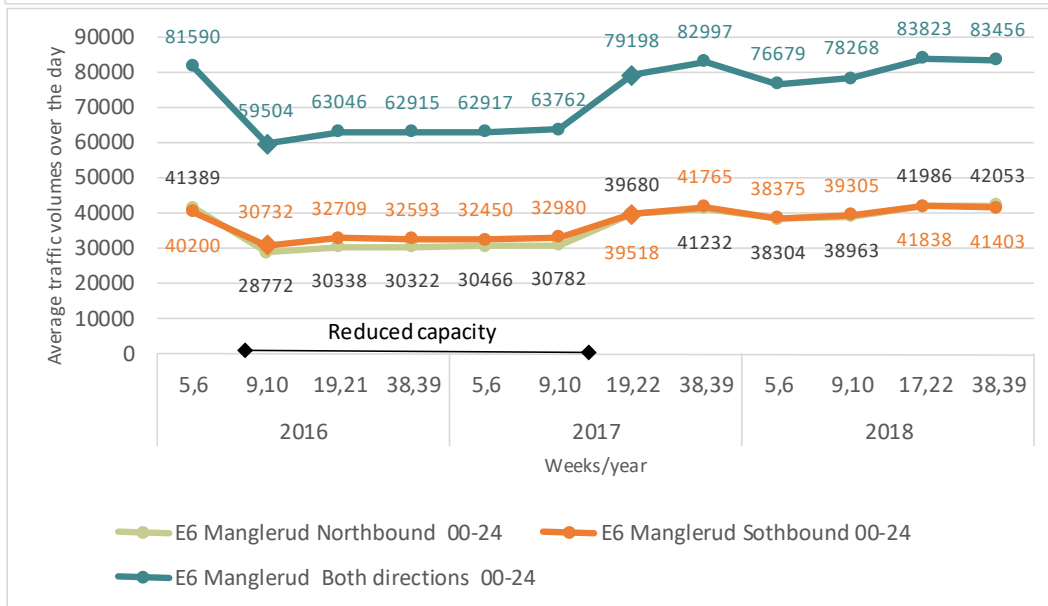
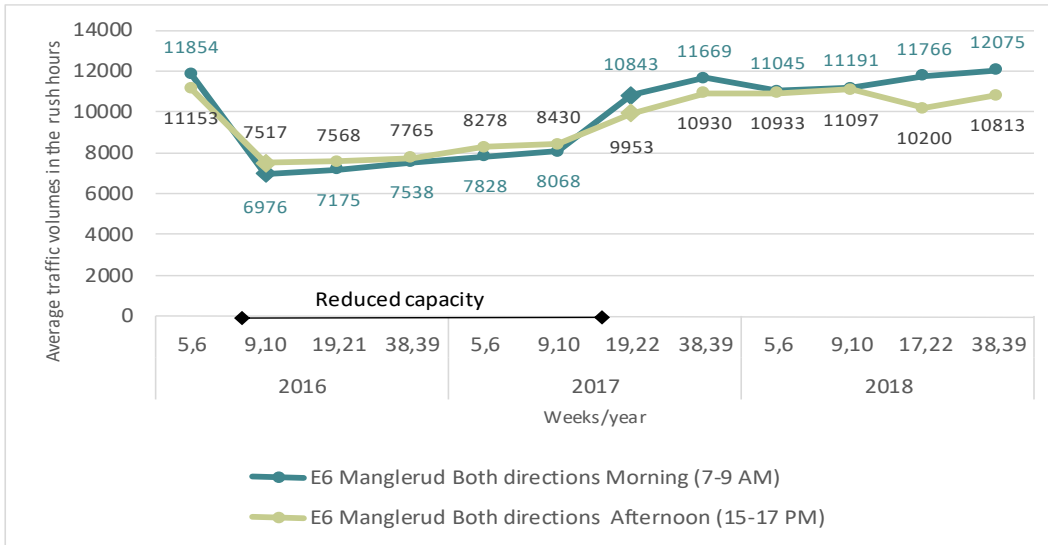
## **Consequences:**

More stress and frustration (15%)

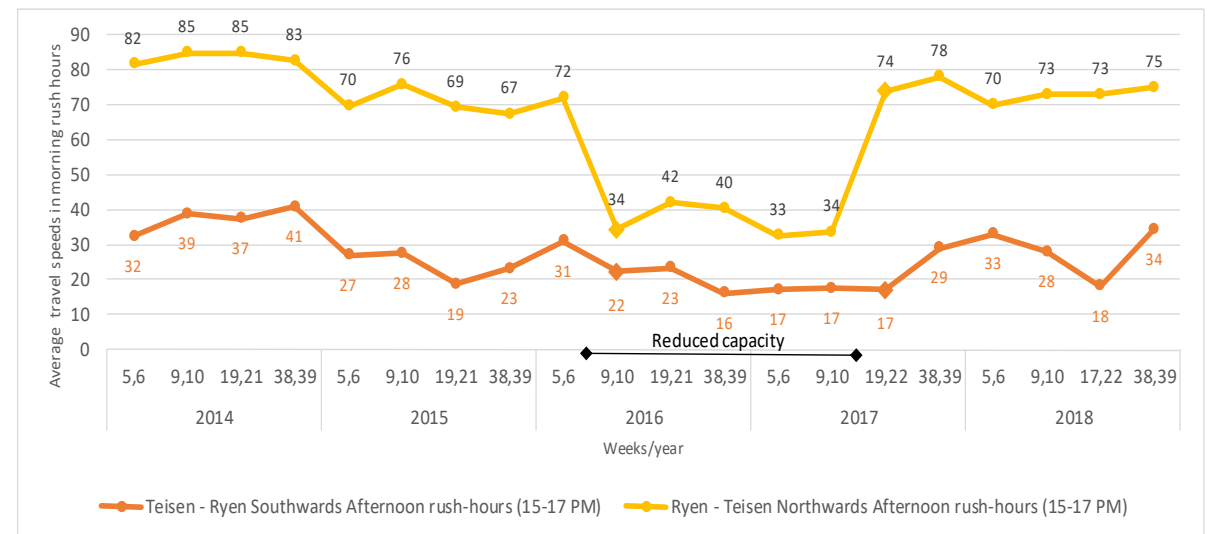
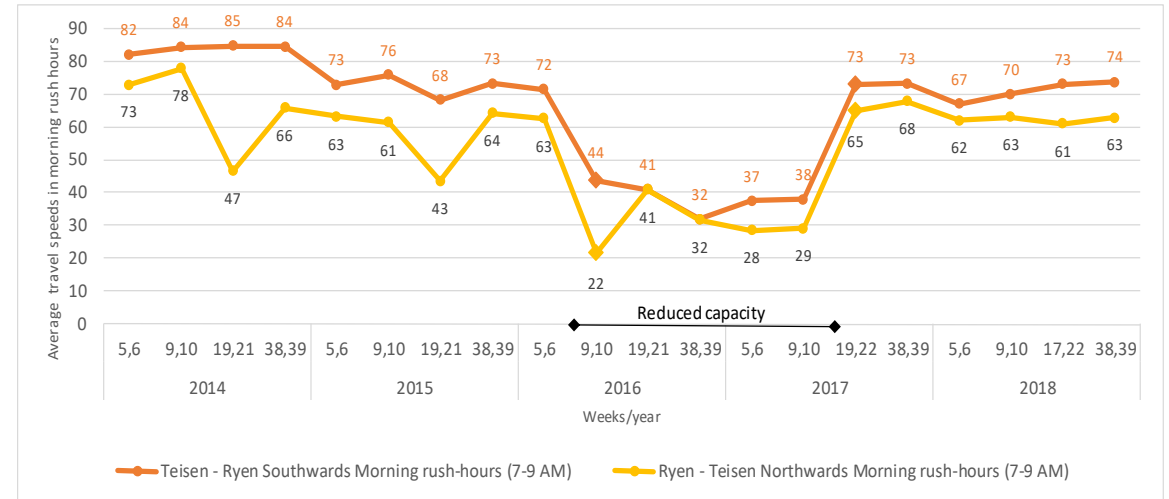
More inconvenient work hours (13%)

More unpredictable work-days (10%)

# Bryn tunnel

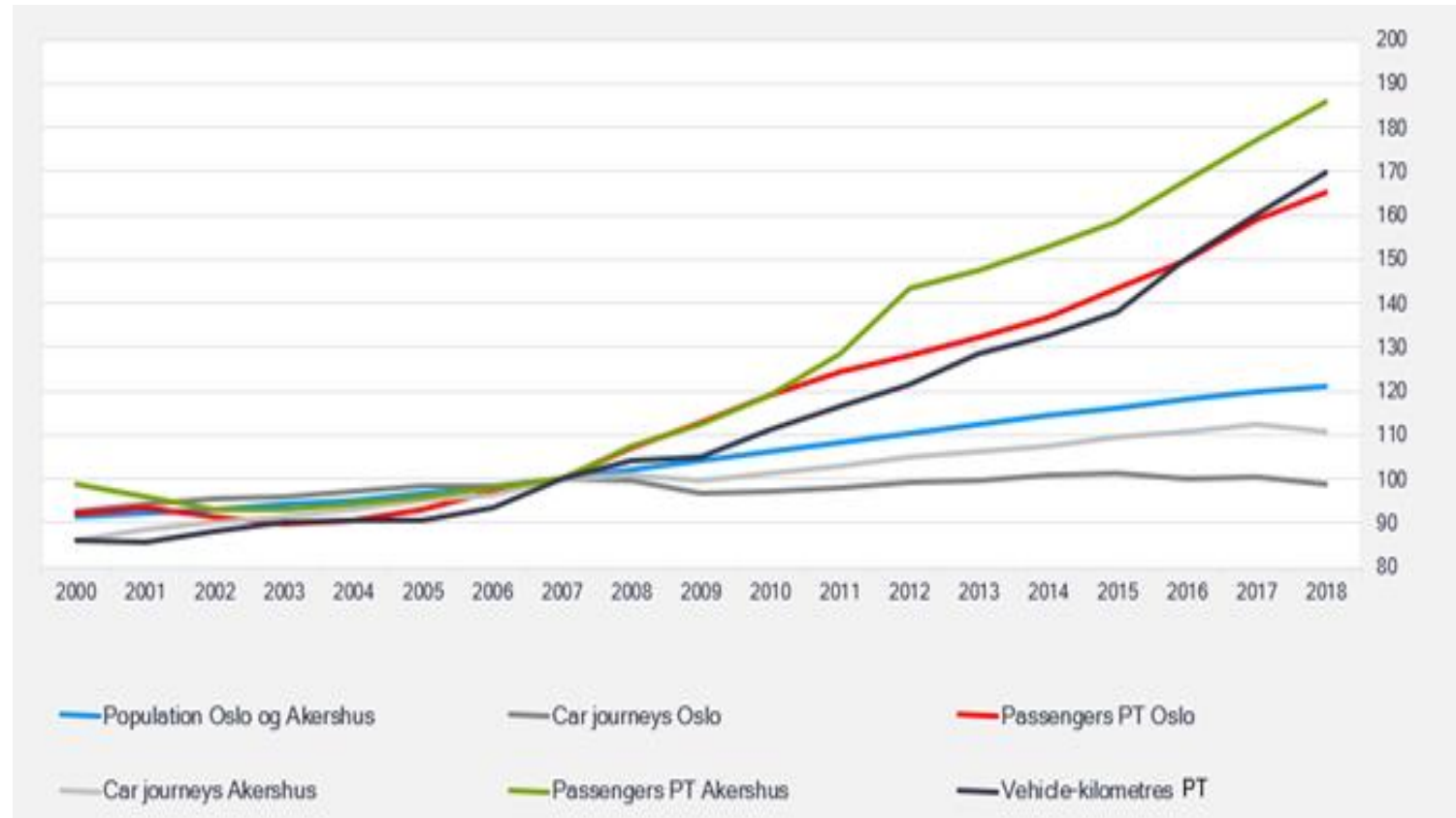


## Average speed, rush hours



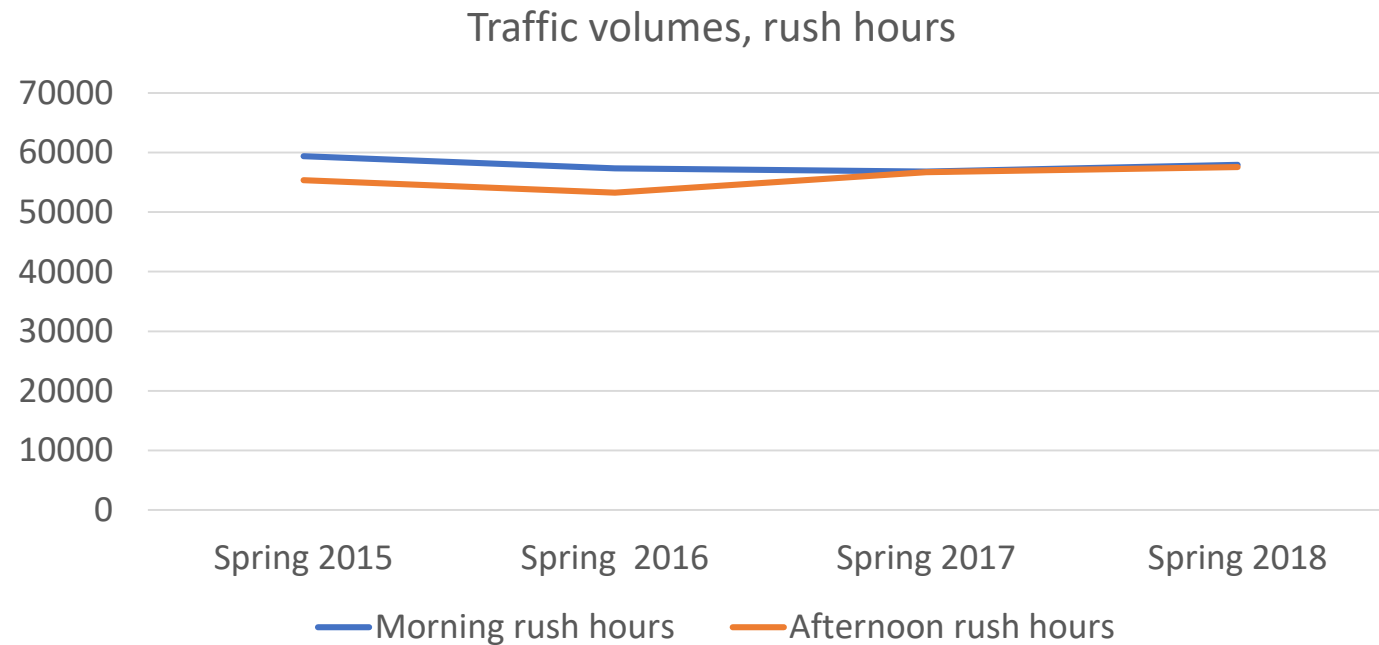
# Oslo Urban Region – development since 2007

- Strong growth in PT services
- Strong growth in PT passenger
- Population growth
- Weaker growth in car trips  
(All is relative)



Source: Ruter

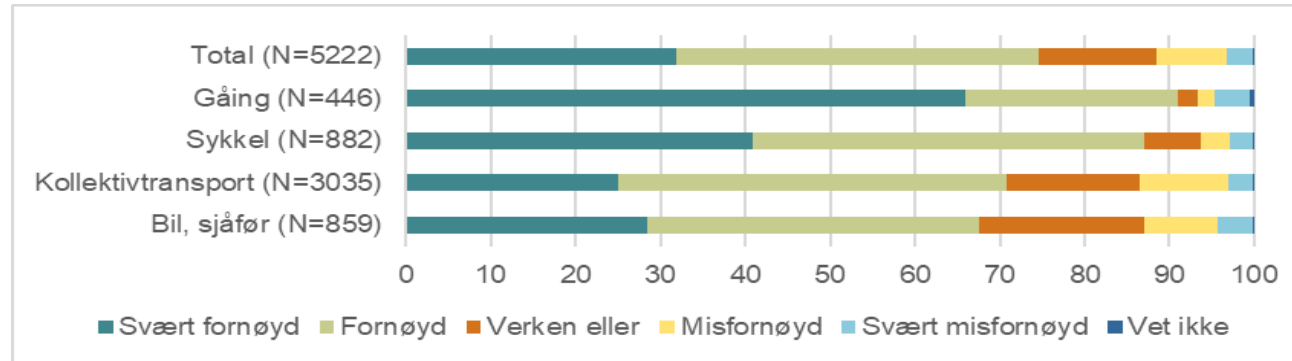
# Traffic, total of five registration points



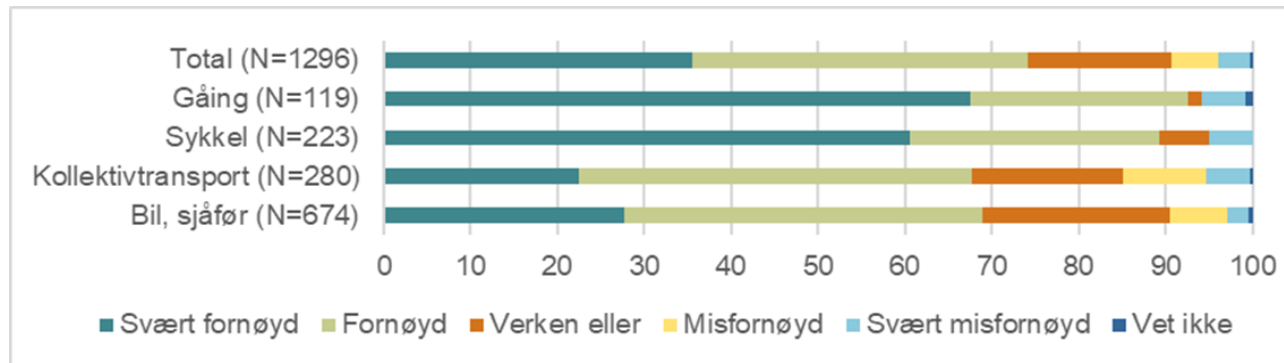


# Same also in smaller cities

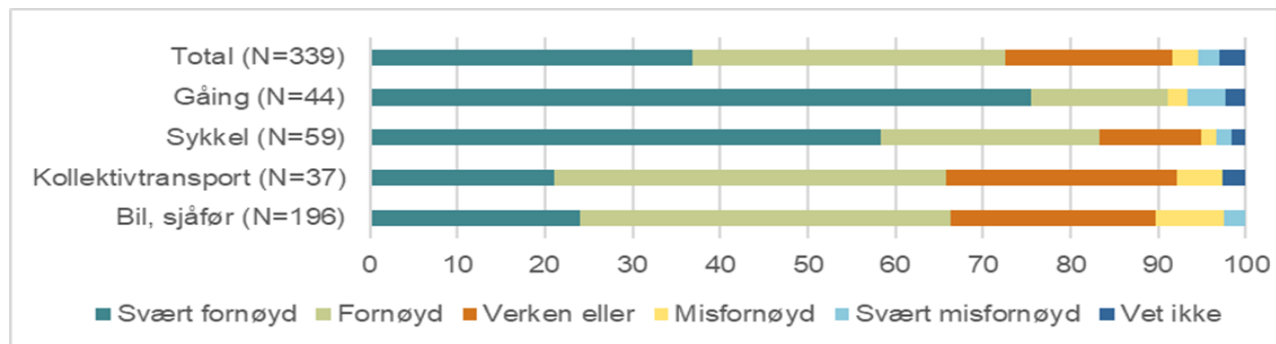
## Oslo



## Kristiansand



## Hamar



# Urban Growth Agreements (NTP)

## Key tools for achieving Zero-growth

- Binding agreements between national, regional and municipal authorities on how to develop land-use and transport systems towards zero-growth
- Regions: Suggesting and analysing alternatives, decisions made politically
- Funding: Toll rings, ordinary budgets, state grants 66% of investments for large infrastructure projects, PT and roads
- Different options, decided by and for each urban region:

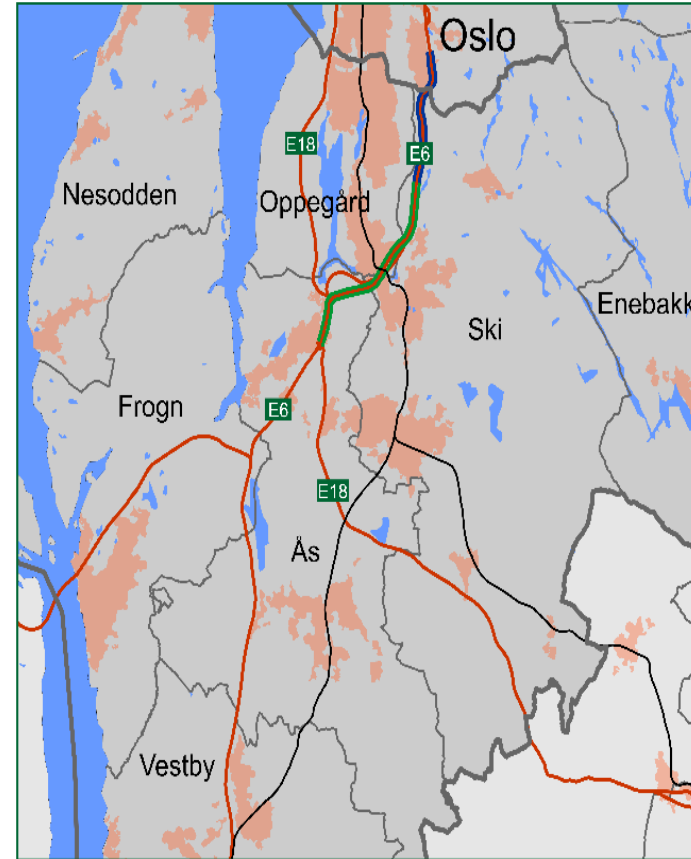
Source: Norwegian Public Roads Administration



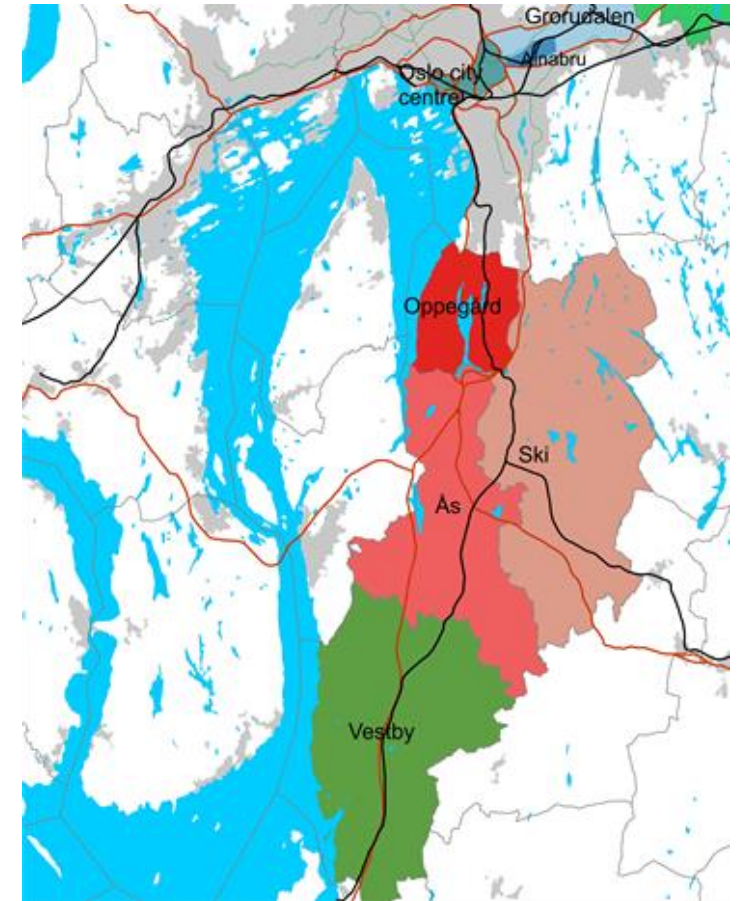
# Example

## Increased road capacity E6 from Oslo, southbound

- Expanding E6 from 2 to 4/5 lanes (completed 2009)
- Main road crossing Oslo border in south, connecting Oslo with outer urban areas, south-eastern parts of Norway and Sweden
- AADT (2015) 50 000 vehicles per day
- Oslo metropolitan area: about 1 000 000 inhabitants

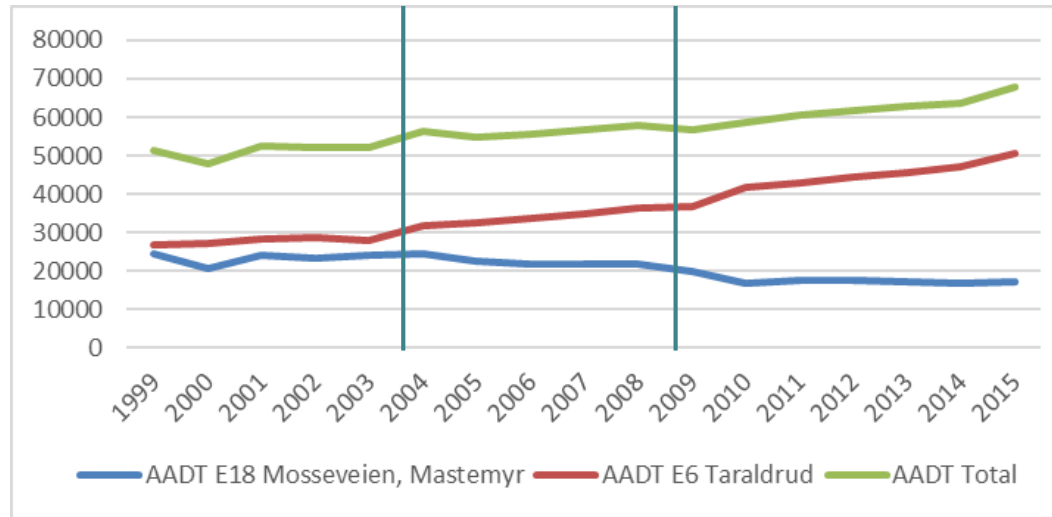


 New road, finished 2009  New road, finished 2004



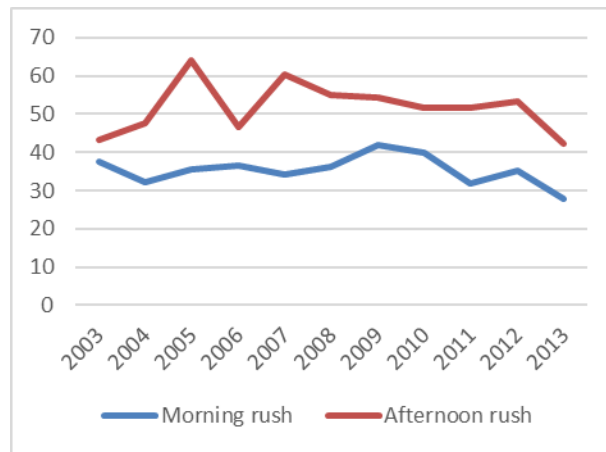
# Result: Increased traffic, no congestion reduction

AADT

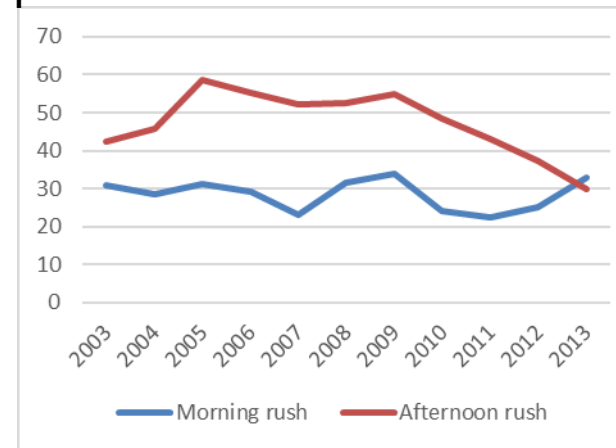


Total  
Expanded road  
Relieved road

Speed rush hours - expanded road



Speed rush hours – relieved road



# Improving conditions for walking and cycling

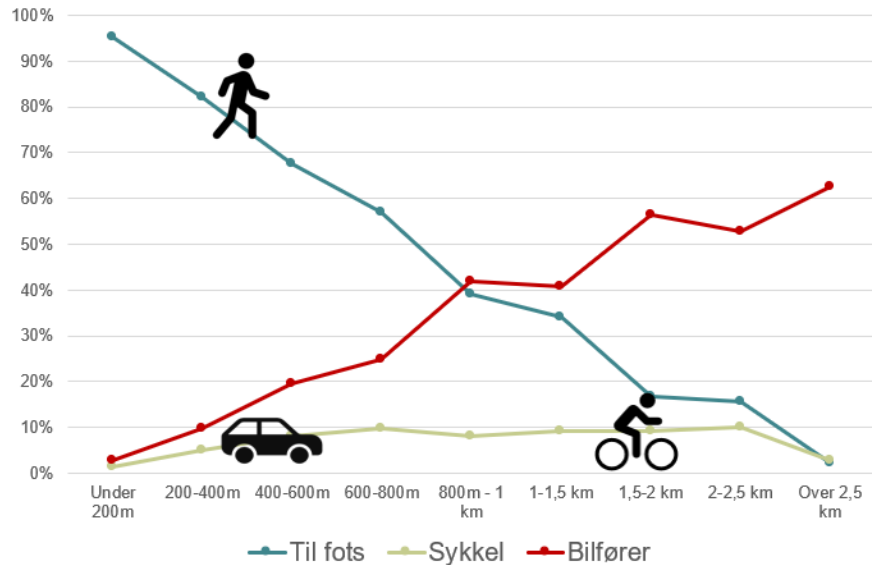


Foto: Aud Tennøy

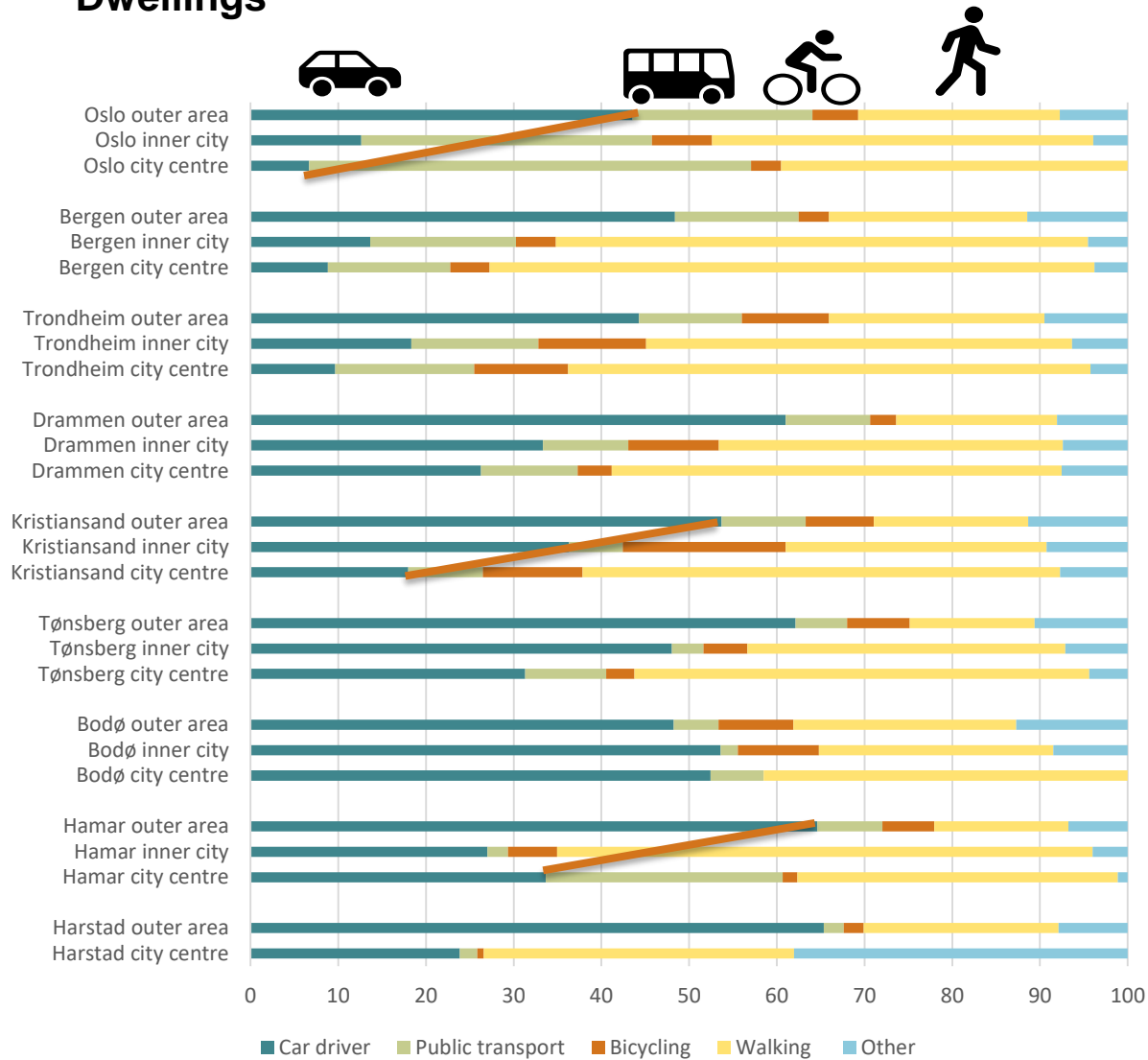
- Land use – short distances
- Safe, comfortable, interesting
- Separate pedestrians and cyclists
- Bicycle infrastructure
- Walkability
  - Build streets – not roads
- Down- prioritization of car traffic
  - Speed, parking, etc.
- Holistic and long terms strategies  
(Pucher et al., 2010; Forsyth og Krizek, 2010)



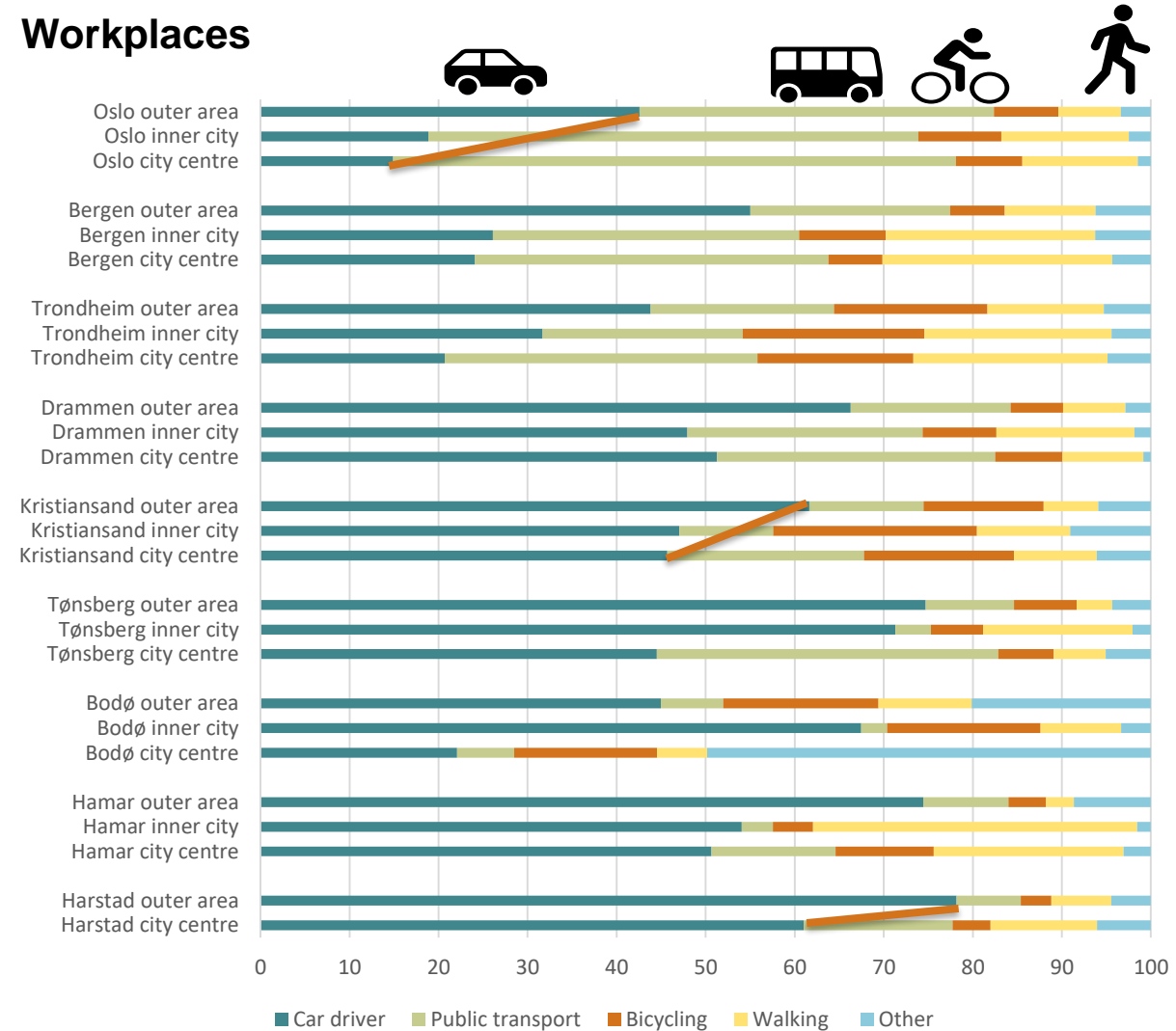


# Localization in urban structure affects modal choice

## Dwellings

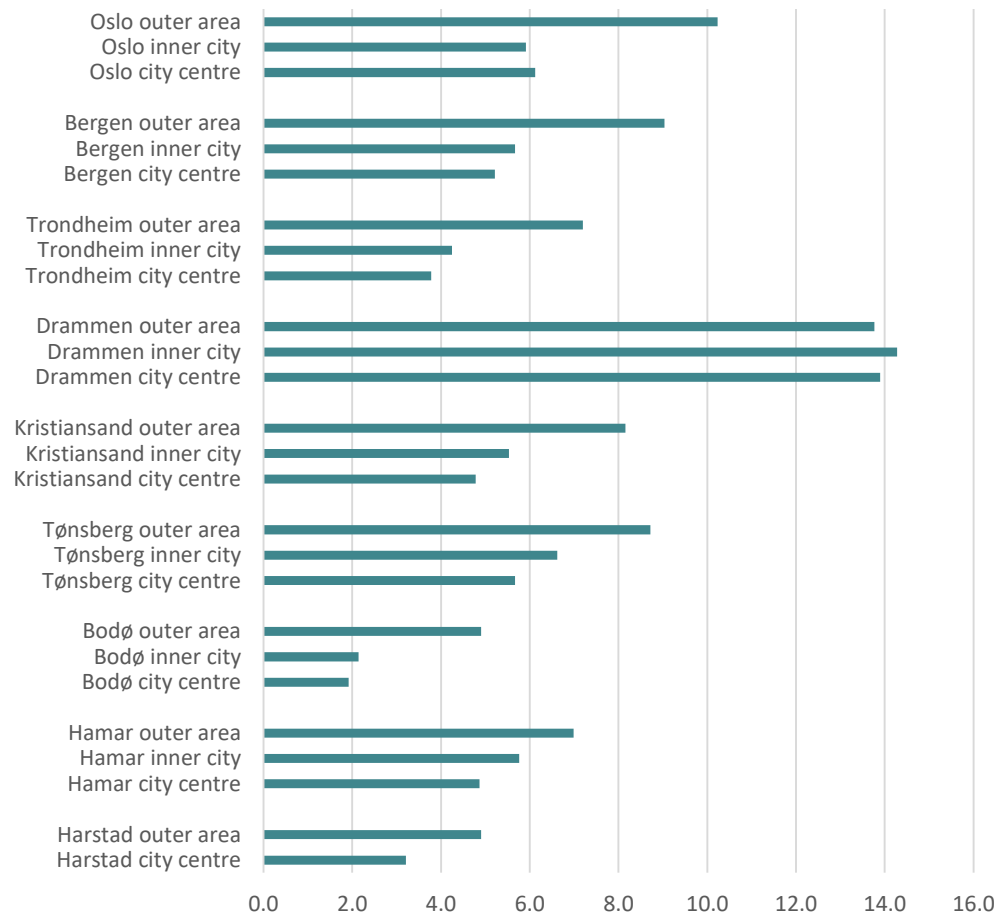


## Workplaces

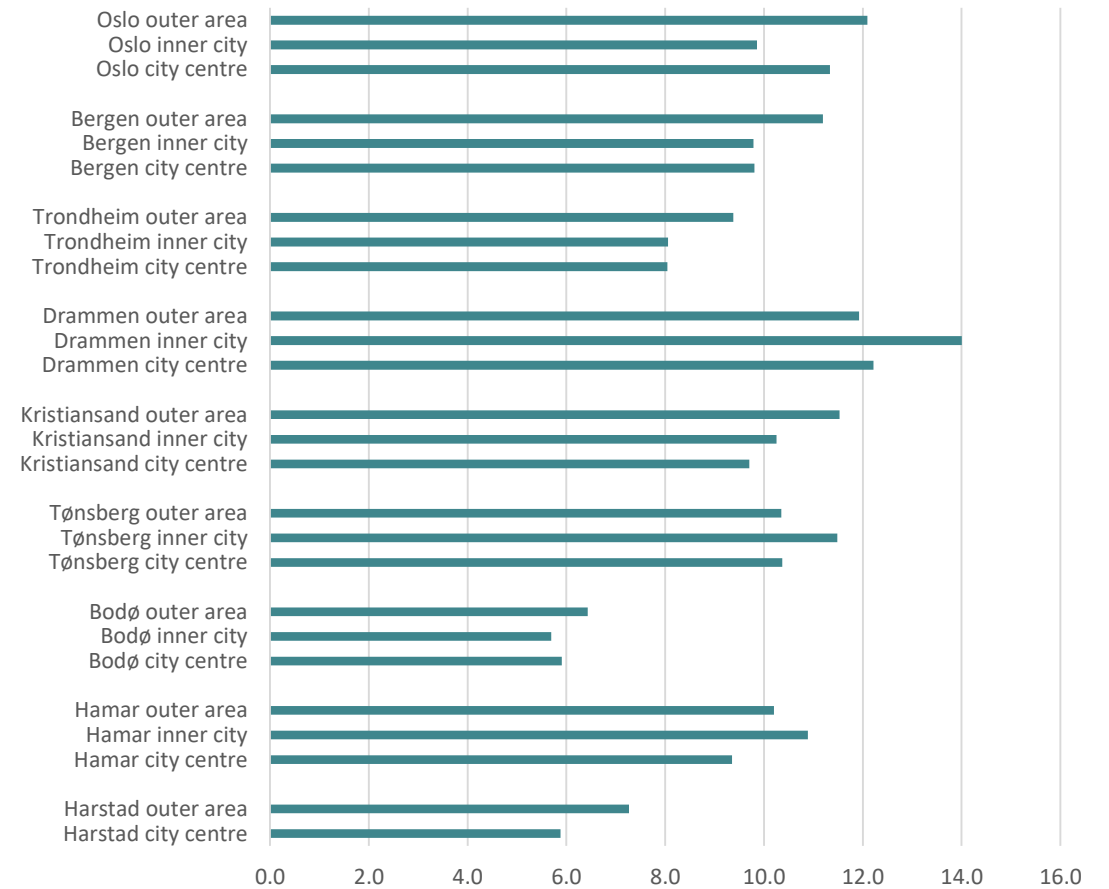


# Commuting distances increase with distance to city centre

## To/from dwellings

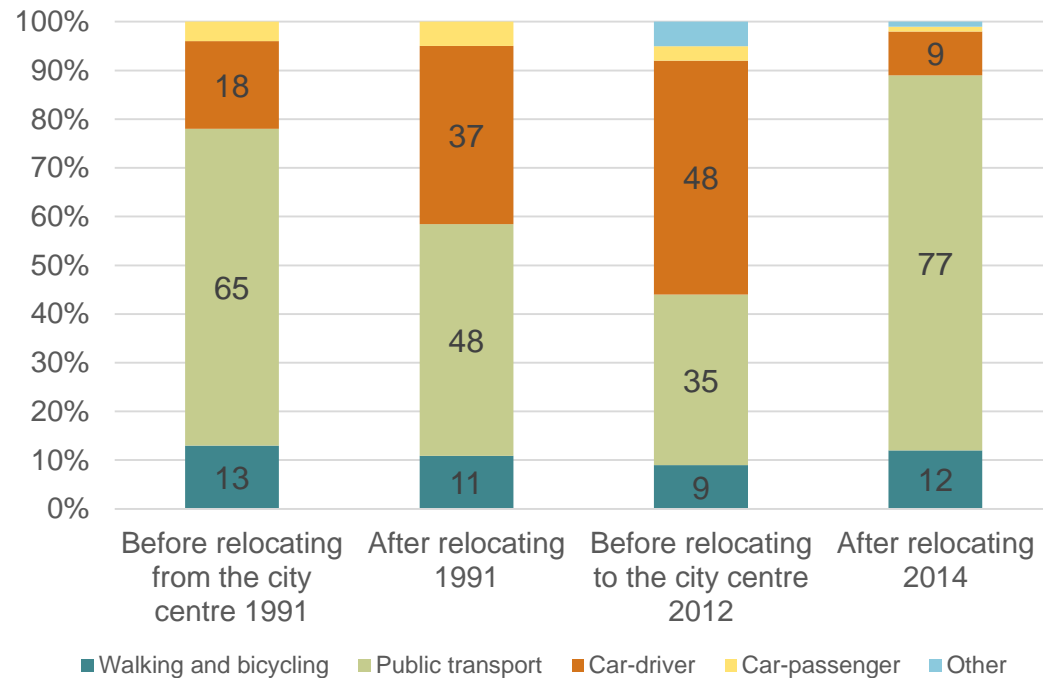


## To/from workplaces

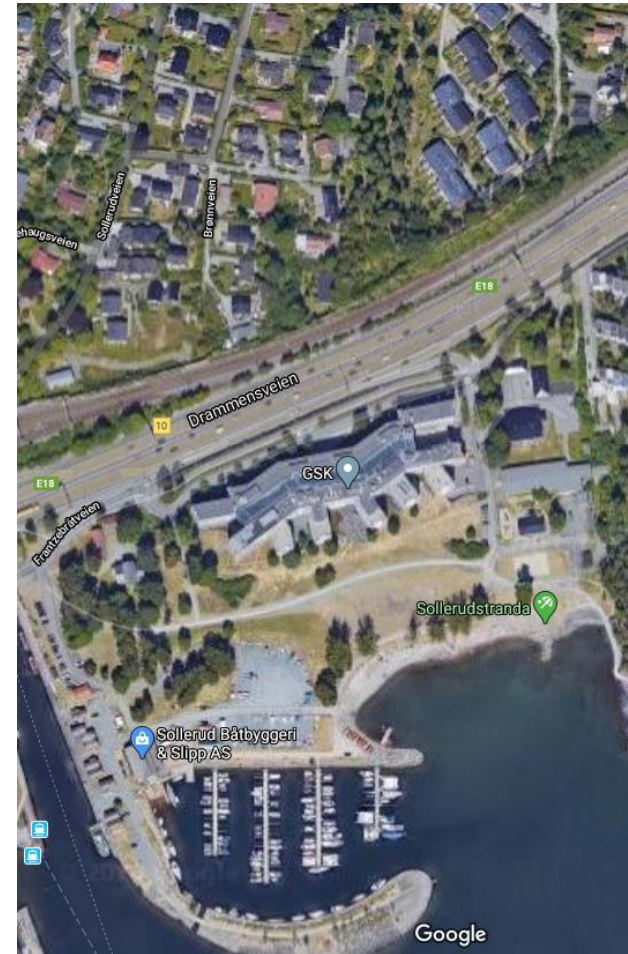


# When work-places relocate

**Oslo – insurance company relocating first from the city centre, and then back**



Christiansen and Julsrud (2014)



# The recipe for achieving all the goals

- Land use development as central densification and transformation rather than sprawl
- Strengthening city centres
- Improving conditions for walking and bicycling
- Improving public transport services
- Restrictions on/ not facilitating for car-usage

