Experiences with capacity reductions on urban main roads – rethinking the need for urban road capacity?

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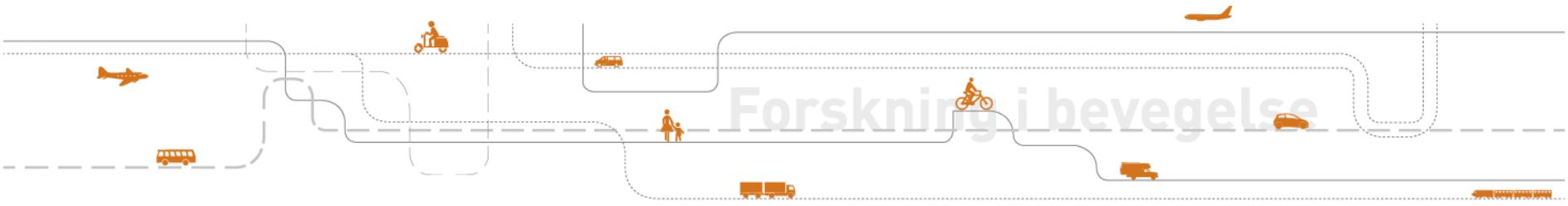


Studying natural experiments in Oslo

- 2015 - 2020: Substantial changes in different parts of the transport systems in Oslo, Norway
- Including temporal capacity reduction on 10 main road tunnels
- A golden opportunity for research, knowledge, learning and innovation
- Large-scale research project: Studying effects and consequences of changes in urban transport systems – for the systems and the users
- Here: Results from a pilot study – The Smestad tunnel

Tunnel	ÅDT	Åpningsår	Lengde
Ring 1			
Hammersborgtunnelen	18 500	1989	381 m
Vaterlandstunnelen	18 500	1990	369 m
Ring 3			
Brynstunnelen	66 000	1970	267 m
Tåsentunnelen	50 000	2000	1338 m
Smestadtunnelen	48 700	1983	494 m
Granfosstunnelen	32 000	1992	2197 m
E18 og E6			
Operatunnelen (del Festning)	72 200	1990	1741 m
Operatunnelen (del Ekeberg)	67 000	1995	1525 m
Operatunnelen (del Svartdal)	27 500	2000	1251 m
Vålerengtunnelen	56 000	1989	832 m

The Smestad tunnel

Results from a pilot study - preliminary

- Before-situation: Dual tunnel, two lanes in each direction
- About 50 000 vehicles/day
- Two lanes closed due to construction works - capacity reduced by about 50 per cent (June 2015 – May 2016)
- Information campaign up front – warning of congestions and delays
- Mitigation measures

Hypotheses

Behavioural adaption (from literature, a.o. Cairns et al. 2001):

- Rerouting
- Changes of transport mode
- Starting earlier or later
- Travelling more seldom/ more home office

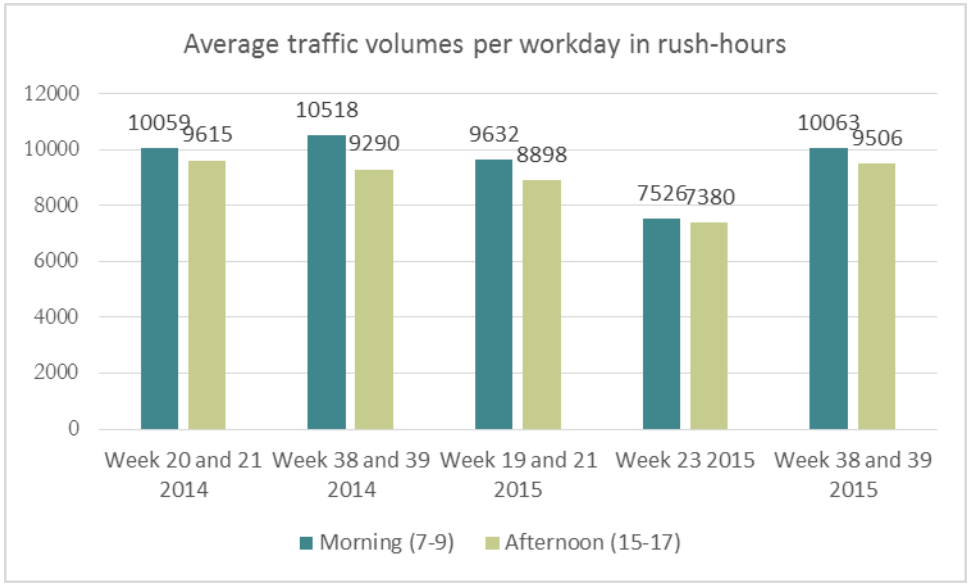
Effects and consequences:

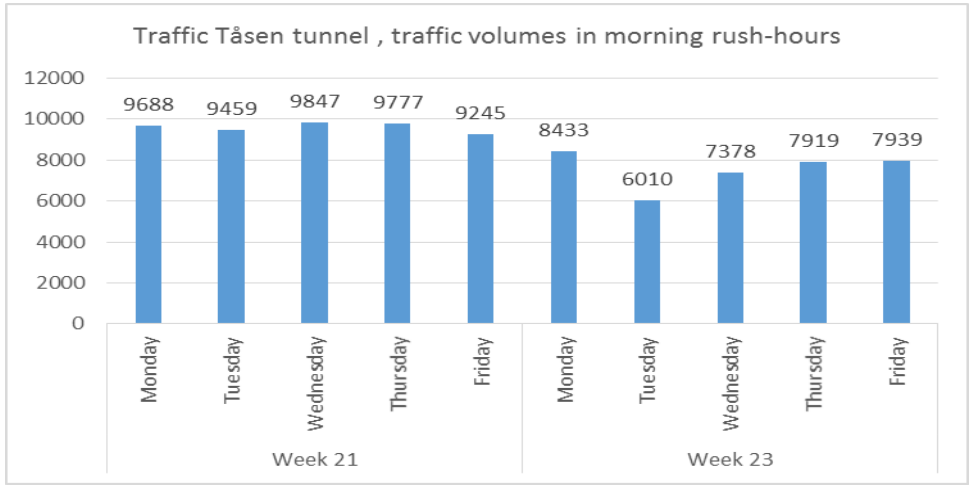
- More congestion, delays etc. on this and other routes, and on other modes
- Increased travel time, changes in travel behaviour, changes in household routines, changes for freight operators

Methods, data (in the pilot)

- Case study design
- Data collected in two-week periods before, right after and three months after the capacity reduction was implemented (and similar weeks in 2014 where available)
- Data (included in analyses reported here):
  - Traffic volumes, speeds, etc. from counting points (cars, bicycles)
  - Passenger data, etc. for public transport
  - Surveys to employees in 10 companies located in affected area before (May 2015, 247 respondents) and in the stable situation (September 2015, 313 respondents)
  - Data from the fleet steering systems of a large freight operator
  - Interviews with truck-drivers right after (June 2015) and in the stable situation (September 2015)

Findings: Traffic volumes on this link





First week (morning rush)

- Minus 25 % (2500 vh) compared to 2014
- Minus 22 % (2100 vh) compared to week 19 and 21)
- Stable under way: Back to normal

First days (morning rush)

- Minus 37 % (3500 vh) first day compared to prev. Tuesday

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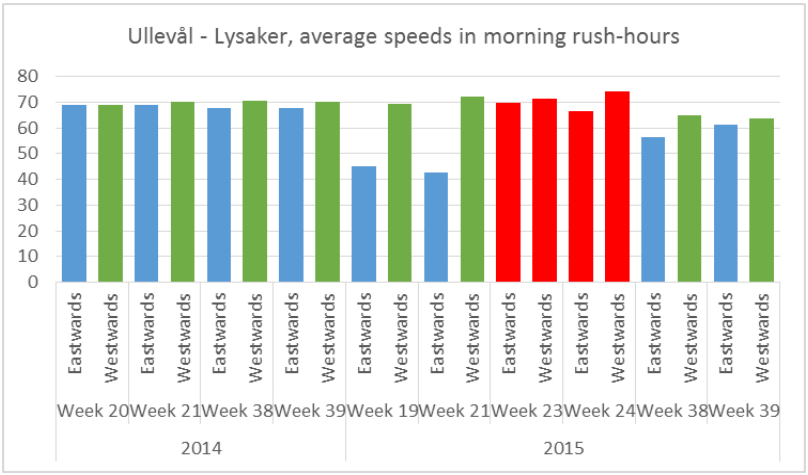
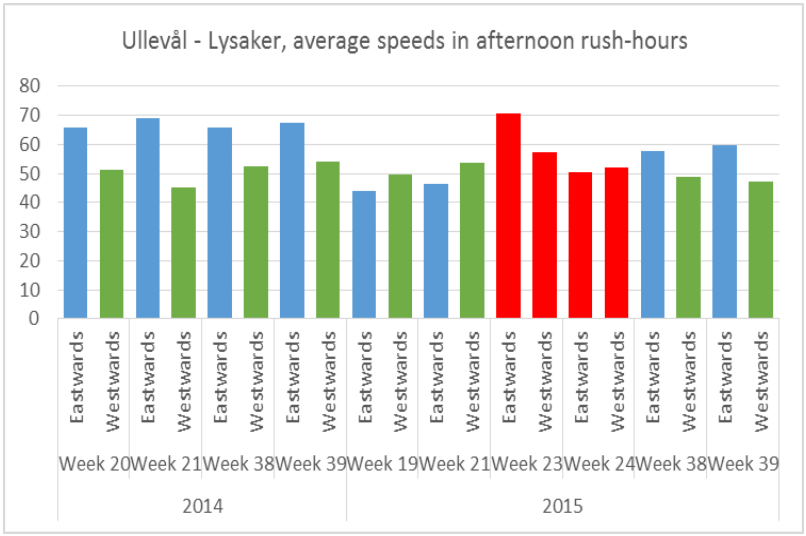
Speed and delays on this link

Measured: 9 kilometre link including the Smestad tunnel





Morning rush:

- Normal state – freeflow
- Delays the weeks before
- Right after: freeflow
- Stabil under way – some extra delays (0,6 and 1,8 minutes)

Afternoon rush:

- Freeflow eastwards, delays westward
- Delays the weeks before
- Right after: some extra delay
- Stabil underway: Some extra delays (1,2 and 0,8 minutes)

Reported: 10 minutes extra delay

Somewhat increased variability

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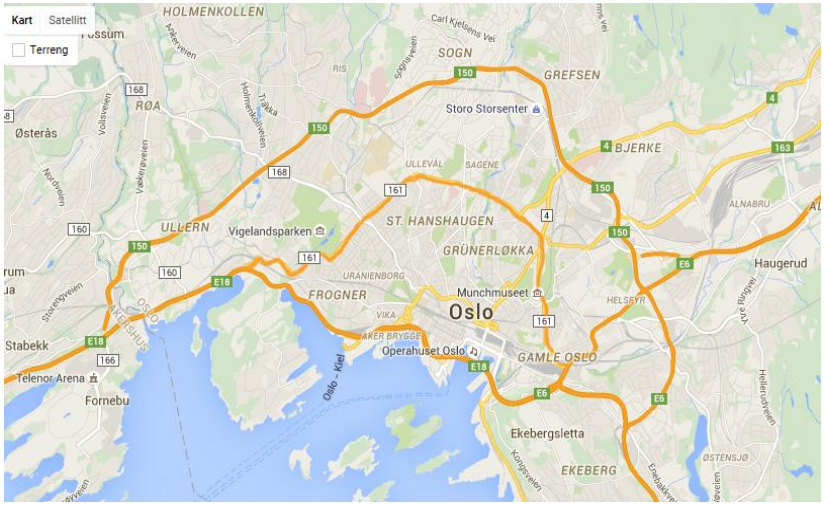
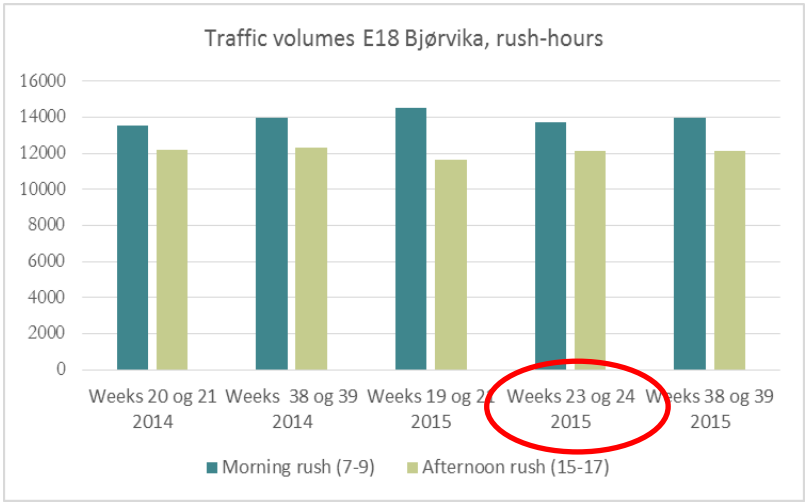
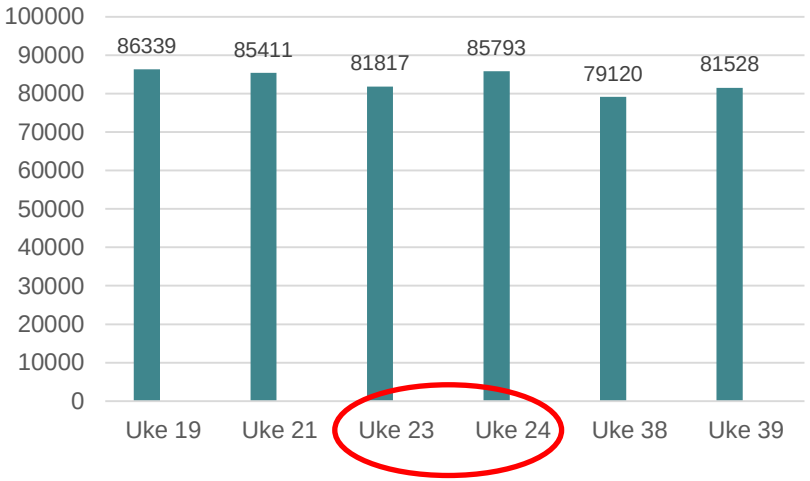
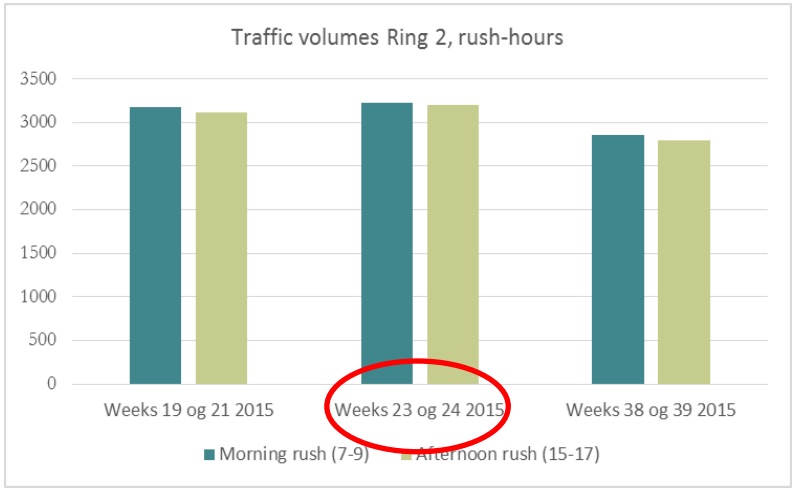
No rerouting found

On alternative main roads and smaller roads









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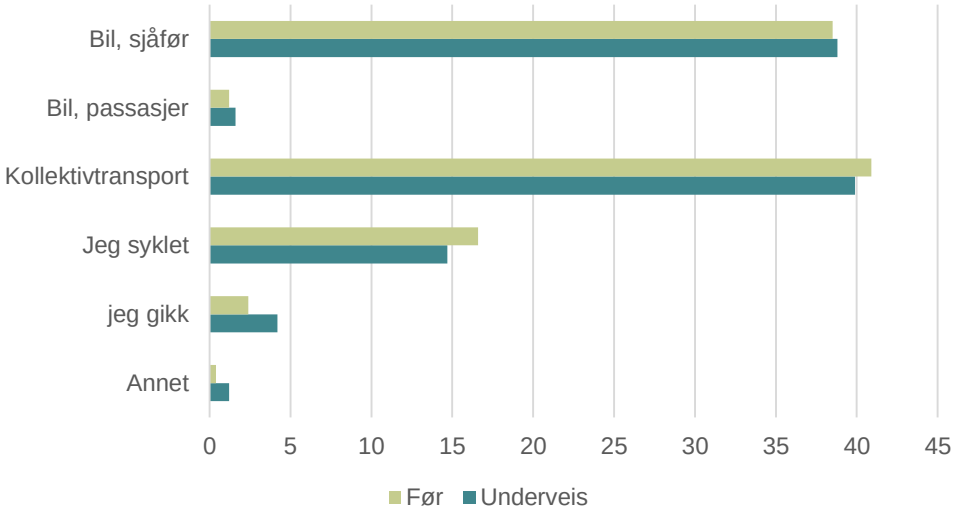
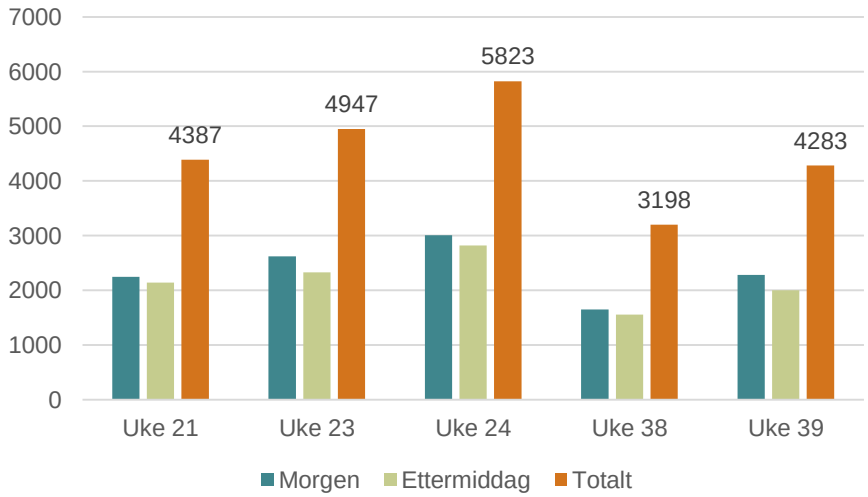
Changes of mode?

- From survey (comparing before and stable under way): No significant changes



- From counting: More bicyclists <u>first weeks</u>



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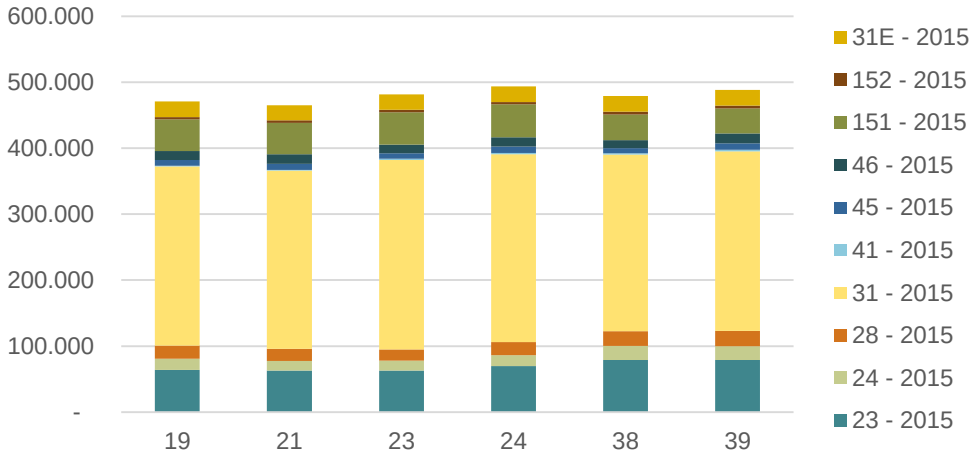
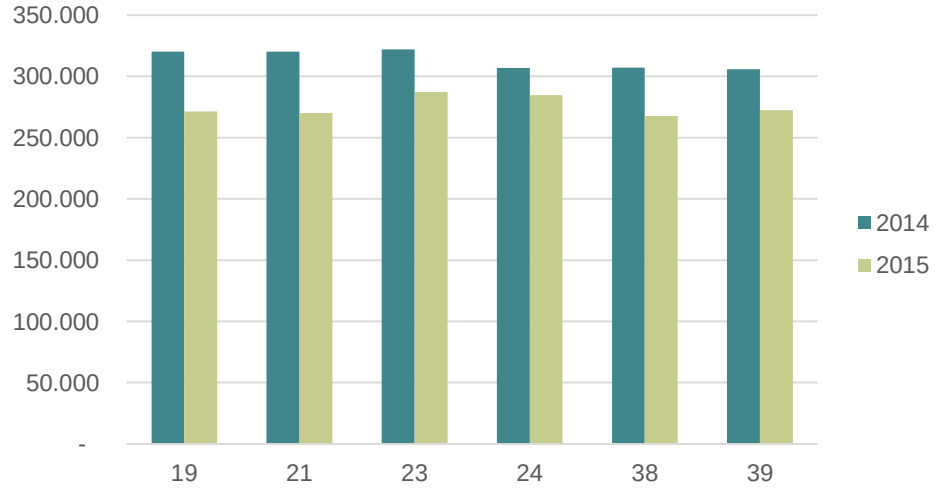
Change of mode?

- From counting: More public transport first weeks?

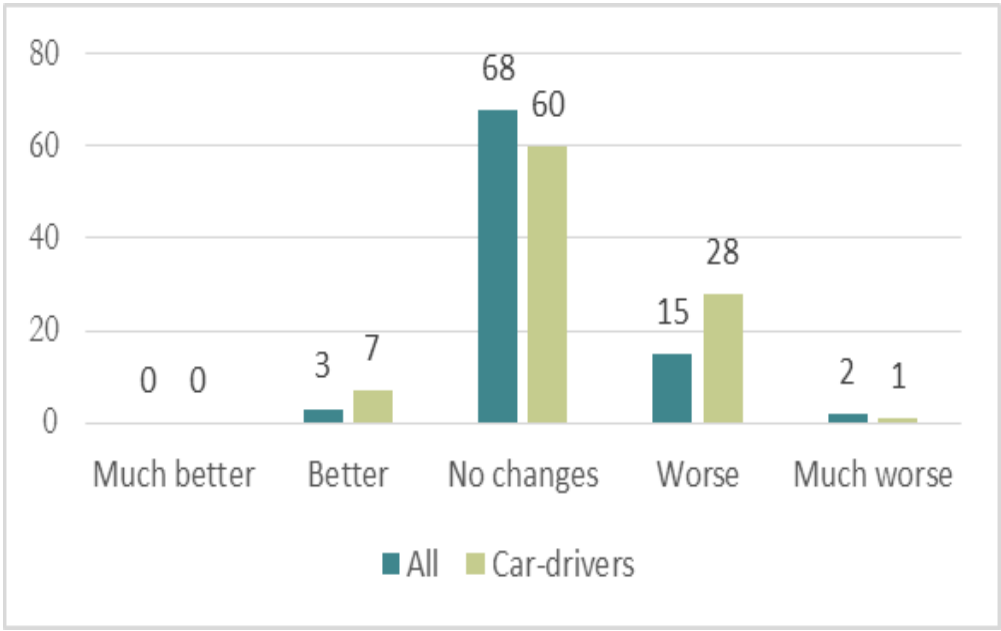




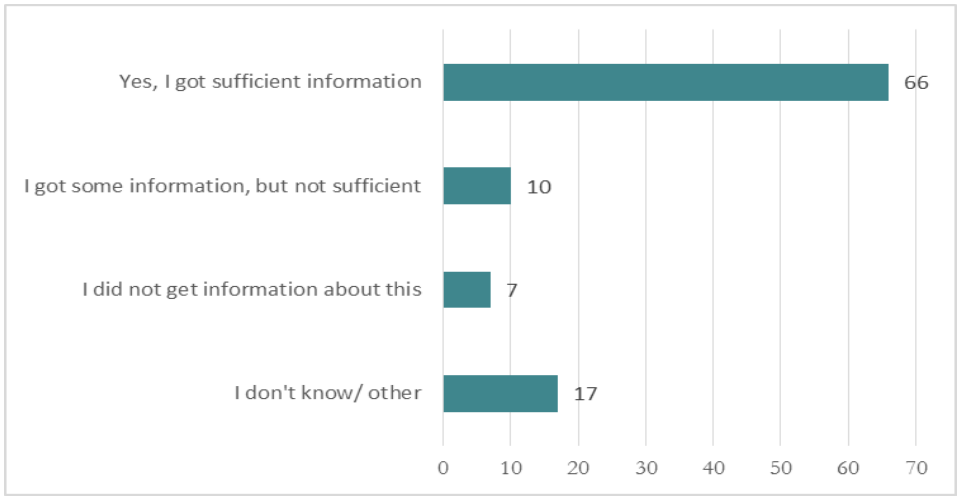
Effects and consequences

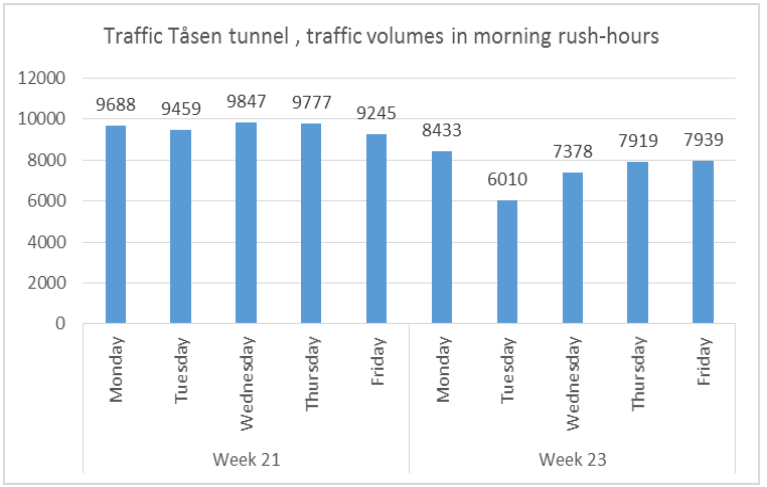
Comparing before and in stable under way situataion

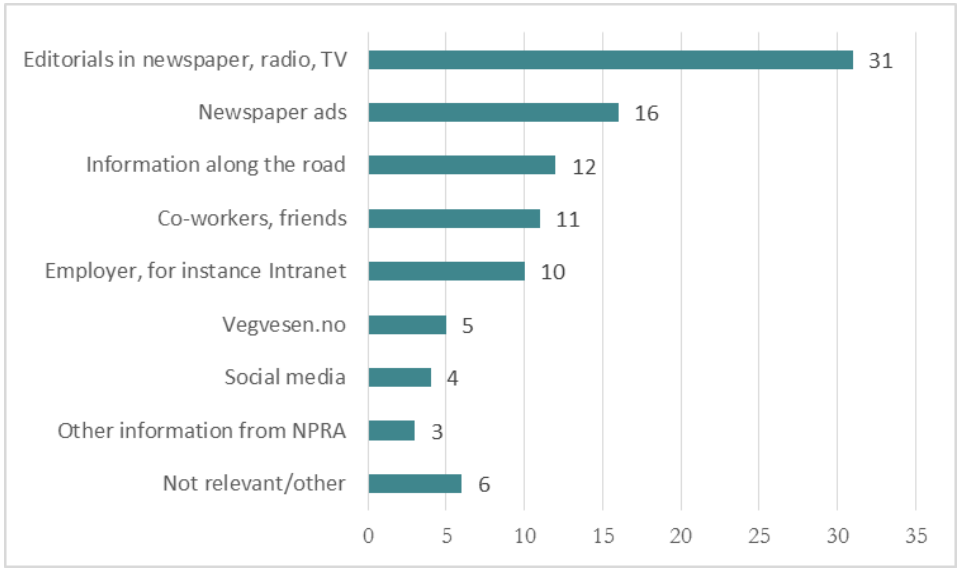
- If they had experienced that their travel to work had become better or worse:
- 32 % of car drivers and 6 % of PT-users reported increased travel time
- Average 10 – 11 minutes
- Consequences for the household (changes in responsibilities etc.) – less than 5 %
- Freight transport – no effects or consequences (delivery-precision, rerouting, delays, stress…)



Successful information campaign







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Summing up – what happened?

- Two lanes closed - capacity reduced by about 50 per cent
- Congestions and chaos were expected
- Communicated this in successful information campaign
- People adjusted the first week – traffic down 37/25/22 % in morning rush, a little less in afternoon rush
- No/marginal extra congestion and delays
- Adaption to ‘no congestion’ - traffic volumes back to normal – only marginal increases in delays
- Stable underway situation – no effects or consequences measured

Reflections

What this is it NOT a case of:

- It is not a case of capacity being reduced below traffic volumes in the tunnel – the tunnel had capacity enough to carry all the traffic (about 50 000 vehicles per day) also with one lane in each direction

What is this a case of?

- Exaggerated expectations of congestion and chaos due to road capacity reductions
- *Expectations* of increased congestions led to behavioural changes – urban commuters do have alternatives

Smarter use of existing road capacity?

- Stated objectives by Norwegian Government and Cities: Zero growth in urban road traffic volumes combined with improved transport quality for segments of the traffic
- Obvious solution: Using existing road capacity differently
- Hindered by fear of chaos and negative consequences
- Theory and experiences across countries: Capacity reductions cause less problems and negative consequences than expected
- Results can open up discussion on smarter and more targeted use of road capacity as alternative to investing in new road infrastructure and capacity
- Contributing to transforming urban mobility!

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I hope for input on:

- Others' experiences with doing similar research (data, method, findings…) – our project is very much ongoing!
- Research and other works on 'understanding and handling congestion in urban road transport systems' (mainly works 'on reality' – not so much on transport models)
- ate@toi.no

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Thank you!

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Research question (Smestad case)

- How did the capacity reduction in affect the traffic on this link (traffic volumes, speeds, congestion levels)?
- How did commuters (all modes) and freight transport adapt to the capacity changes?
- Which effects and consequences were experienced in other parts of the transport systems (alternative roads, public transport system, bicycle network)?
- What were the consequences of their adaptions or non-adaptions for commuters and freight transport?
- Did the information measures reach the public and the users of the road, and did they have any effects?

Research questions (whole project)

- How do different actors (travelers, freight and commercial traffic, PT) adapt to the capacity changes?
  - *Changes in mode, timing, destination, route, travel frequency, etc..*
- How do these adaptions affect the transport systems?
  - *Traffic volumes, delays, crowding, redistribution of traffic, etc.*
- How can urban congestion better be understood and handled?
- What are the consequences of adaption for travelers, public transport, freight and commercial transport?
- Do information and mitigation measures work? What can improve?
- How can the situation be used to calibrate and improve transport models and other methods?
- How can the new knowledge be used in future planning and development of transport systems?

Aim - relevance

- Aim:
  - Documenting effects and consequences of changes in the urban transport systems for the transport systems and for users of the transport systems (commuters, PT-passengers, freight transport, taxis)
- Highly relevant for two main reasons:
  - Improving authorities' knowledge of responses and adaptions to such changes, and on efficiency of mitigation- and information measures
  - Strengthening the knowledge base for developing the more efficient and climate-friendly urban transport systems for the future
- Close cooperation with transport and planning authorities, as well as other transport actors

Objectives for the research

Exploit the opportunity of a natural experiment to:

i. Analyse adaption strategies and how those affect travellers and freight transport, the transport systems, society and environment
ii. Develop our ways of understanding and handling congestion in urban road transport systems
iii. Analyse effects of information campaigns and mitigation measures, and improve these
iv. Verify and improve methods and transport models
v. Explore new possibilities for developing environmentally friendly and efficient urban transport systems for the future

Also:

- Explore the use of New data (GPS) and Big Data (mobile phones)
- Pilot a digital platform for data sharing

Work packages

WP1: Management scientific quality, expenses

WP2: Data gathering and sharing

WP3: System perspective: effects and consequences for travelers, transport system, society and environment

- better understanding and handling of urban congestion

WP4: Travelers' perspective: adaption strategies and how they affect them (travels to work, freight, taxi)

WP5: Mitigating measures and information strategies

WP6: Verify and further develop models and methods

WP7: Implications for analyses, planning, and development of the future's urban transport systems

- For example, in discussions about how road capacity can be used more smart/efficiently / sensible / targeted

WP8: Dissemination


Rehabilitering av tunneler i Oslo
1. halvår 2015
2. halvår 2015
1. halvår 2016
2. halvår 2016
1. halvår 2017
2017
2018
2019
2020
Smestadtunnelen*
Granfosstunnelen*
Brynstunnelen*
Tåsentunnelen**
Ekeberg***- og Svartdalstunnelen
Festningstunnelen*
Vålerengtunnelen*
Vaterland- og Hammersborgtunnelen
*Kun ett tunnelløp er stengt om gangen **Tåsentunnelen: natt- og helgestenging
***Ekebergtunnelen: døgnsperring sommer 2017/2018, natt- og helgestenging resten av perioden