



Concept Symposium 2018

Governing Megaprojects – Why, What and How

Neglected and Underestimated Impacts of Transport Investments

Based on the recent Concept Report no. 54, this presentation aims to call attention to the fact that there may be neglected or underestimated negative impacts that are not taken into account in the cost-benefit analyses of transport investments. This study was initiated in a response to the public debate about the wider economic benefits of transport investment projects. An understanding seems to have emerged among stakeholders, planners, consultants, and some researchers that some components are usually omitted in cost-benefit analyses of transport investment projects, which are positive and potentially large. There is a need to balance this picture and focus on some weaknesses in the cost-benefit analyses that lead to underestimating or even ignoring negative impacts.

The neglected and underestimated negative impacts differ in type. The presentation will focus on four main categories of negative impacts that are normally neglected or underestimated: i) Disadvantages pertaining to the construction period, ii) neglected environmental impacts, iii) induced traffic, urban sprawl, and negative implications, and iv) underpricing of environmental assets. It is the sum of these impacts of different origins that led us to argue that the cost side of the analysis may be considerably underestimated. These negative impacts are not necessarily new or unrecognized by researchers, but they are rarely mentioned in the public debate about the shortcomings of cost-benefit analyses.



Petter Næss

Professor
Norwegian University of Life Sciences,
Department of Urban and Regional Planning
Norway

The Concept Symposia on Project Governance

The Norwegian Ministry of Finance and the Concept Research Program hosts every second year a symposium on project Governance. Project governance, in brief, is concerned about investments and their outcome and long-term effects. In view of the problem at hand, the aim is to ensure that the best conceptual solution is chosen, that resources are used efficiently and anticipated effects realized. Resource persons from ministries, governmental agencies, academia, international organizations, and industry are invited. In order to facilitate professional exchange and direct communication between participants, the number of individuals is restricted. The aim is to initiate further international cooperation and research on important issues related to project governance.

<https://www.ntnu.edu/concept/concept-symposium>

Neglected and underestimated impacts of transport investments



Presentation at the Concept symposium 2018, Stavanger,
September 6, 2018

Professor Petter Næss, Norwegian University of Life Sciences

Four main categories of negative impacts that are normally ignored or underestimated

- Disadvantages pertaining to the construction period
- Neglected environmental impacts
- Induced traffic, urban sprawl, and negative implications
- Underpricing of environmental assets

Disadvantages pertaining to the **construction period**

- Such effects are disregarded in the current CBA framework, and not even mentioned among the non-monetary set of impacts



Disadvantages pertaining to the construction period

Community Impacts

- Neighborhoods and Businesses
- Construction-period Safety and Security
- Construction Employment
- Community
- Safety and Security

Transportation Effects During Construction

- Traffic Disruptions
 - Construction Vehicle Traffic
 - Parking
- Additionally, if relevant
- Marine Operations
 - Marine Traffic

Construction-period Visual Changes

Construction-period Air Quality

Construction-period Noise and Vibration

- Construction Noise
- Traffic Noise During Construction
- Construction Vibration
- Explosives

Hazardous Wastes

Water Resources and Water Quality

Natural Resources

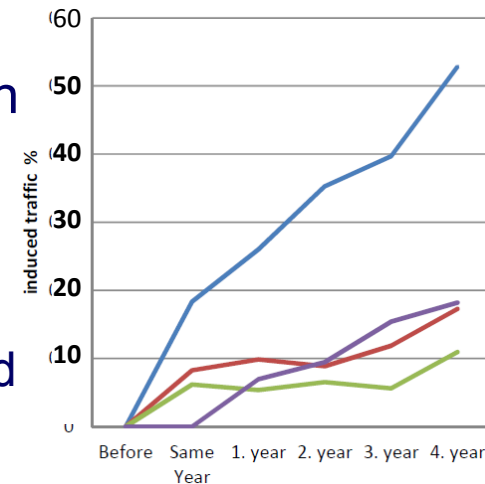
Categories of temporary effects during construction activities identified by California Department of Transportation

Neglected **environmental impacts**

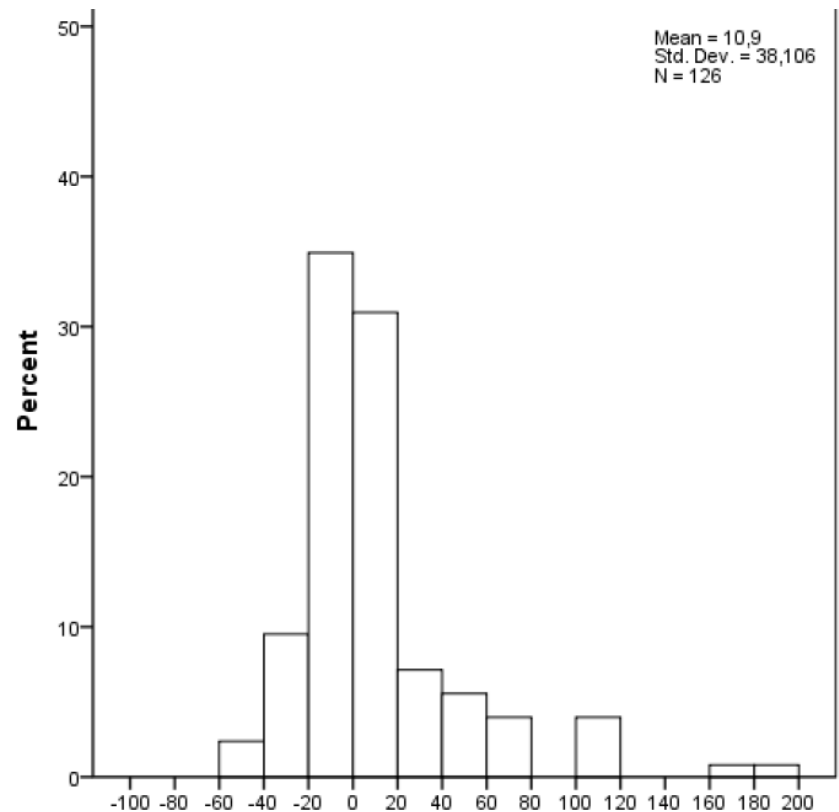
- Greenhouse gas emissions from **road construction** (sometimes included in the analysis, but sometimes not)
- **Micro plastic particles** impacting on marine environments
- **Land conversion related impacts:** Not well captured by either market prices (e.g. on farmland) or willingness-to-pay investigations (e.g. ecosystems and biodiversity)
- Land conversion and landscape impacts from **infrastructure construction** and **induced urban sprawl**

Underestimation of induced road traffic

- Internationally, traffic forecasts have often ignored induced traffic completely
- In Denmark, this was the case until a few years ago for all traffic models except the one for Copenhagen metropolitan area
- In Norway, the main traffic models have since a couple of decades ago included **short-term** induced traffic
- But the Norwegian traffic models cannot really deal with **long-term induced traffic** resulting from
 - relocations,
 - urban sprawl and
 - changes in the public transport provision due to increased competition from car travel
- Traffic development in the ‘**no-build alternative**’ is often assumed to be as the national average. This will lead to
 - overestimation of the traffic growth in corridors where congestion is present, and
 - overestimation of the decline in travel speeds in the “zero alternatives”

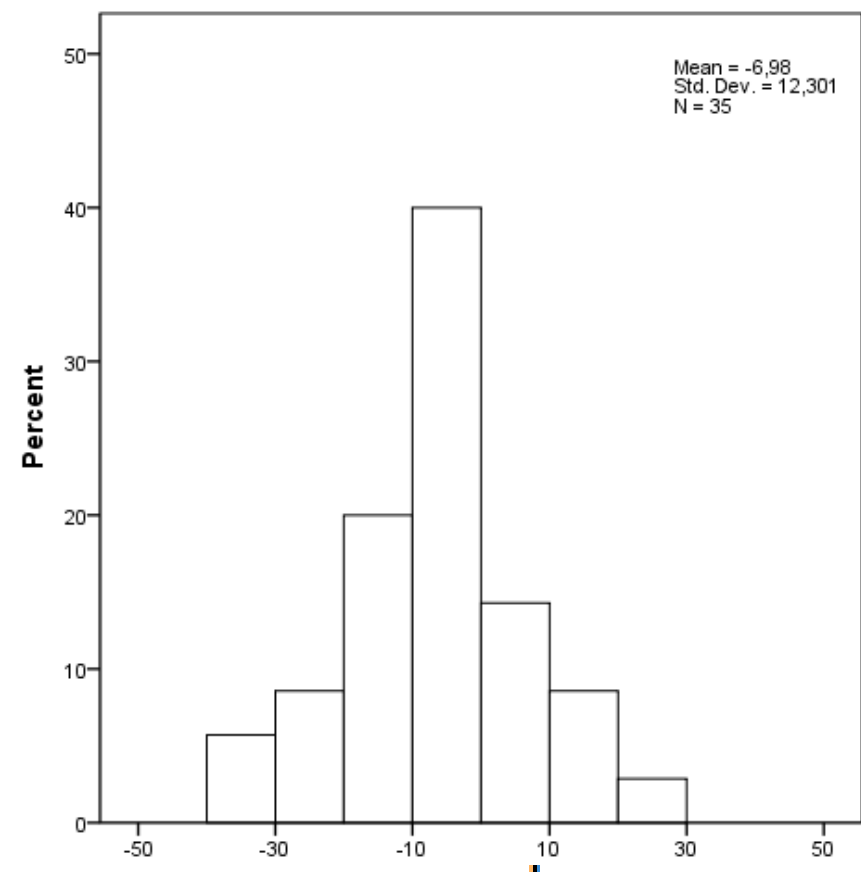


Traffic forecasts for a sample of completed Scandinavian and British road projects tend to be underestimated...



			Statistic	Std. Error
Accuracy	Mean		10,90	3,395
	95% Confidence Interval for Mean	Lower Bound	4,19	
		Upper Bound	17,62	

.... whereas the forecasts for ‘no-build’ alternatives tend to be overestimated... (Source: Nicolaisen & Næss, 2015)



			Statistic	Std. Error
Accuracy	Mean		-6,9821	2,07922
	95% Confidence Interval for Mean	Lower Bound	-11,2076	
		Upper Bound	-2,7566	

If the samples of the previous slides are representative, the difference in road traffic volumes between 'build' and 'no-build' alternatives is on average underestimated by some **15-20%**

- Most likely, such underestimation is a result of ignoring **induced traffic**
- This can cause dramatic bias in the cost-benefit analyses of road projects
- Even with a difference in forecasted traffic of only 5% between a 'build' and 'no-build' alternative, the consequence to the CBA results of ignoring induced traffic can be severe, as shown in the case of Nordhavnsvej (next slide)

Example: the Nordhavnsvej project in Copenhagen



Impact factor	Model including induced traffic	Model ignoring induced traffic
AADT on main link	22,820	21,740
Total travel time savings (mil. DKK)	2,749	4,589
Changes in fuel consumption (tons)	483	-284
Changes in CO ₂ emissions (tons)	1,525	-897
Changes in noise level (weighted score)	167	162
Changes in safety (accidents involving personal injury)	-0.3	-1.2
Net present value (mil. DKK)	403	2,157
Internal rate of return (%)	5.6	8.1
Benefit ratio per invested capital unit	0.2	1.1

Negative land use related effects resulting from infrastructure construction

- **Direct** environmental impacts from construction of the infrastructure itself
- Urban **sprawl**
- Need for **additional local infrastructure** investments
- Reduced quality of **public transport**
- Negative impacts on lifestyle and **public health**
- **Lock-in effects**, from freedom to necessity



OVERSIKTSBILDE: Den røde ovale sirkelen viser området Nord-Gruppen vil bebygge. Håkøybrua øverst i bildet og Håkøya til høyre.

Har planer for 750 boliger

Med ny forbindelse mellom Tromsøya og Kvaløya vedtatt står Nord-Gruppen klar til å bygge inntil 750 boliger på Kvaløya.

Environmental impacts of **urban sprawl** resulting from infrastructure construction

(source: Litman, 2016)

Increased Pavement Area	More Dispersed Development
<ul style="list-style-type: none">• Reduced open space (gardens, parks, farmlands and wildlife habitat).• Increased flooding and stormwater management costs.• Reduced groundwater recharge.• Aesthetic degradation.	<ul style="list-style-type: none">• Reduced open space (farmlands and wildlife habitat).• Longer travel distances, more total vehicle travel.• Reduced accessibility for non-drivers, which is inequitable (harms disadvantaged people).• Increased vehicle traffic and resulting external costs (congestion, accident risk, energy consumption, pollution emissions).



Reduced travel time savings due to 'regional enlargement' and urban sprawl

- People tend to **expand their radius of action** rather than using travel time savings from higher travel speed for non-travel purposes,
- Thus there will not be any **travel time savings**, or at least they will be **much smaller** than claimed. (Cf. David Metz (2008): "The myth of travel time savings".)
- In Great Britain, average traveling speed increased by 44% from 1972/73 to 2009, yet the **time spent traveling** also **increased** by 5% (DfT, 2010, in Banister, 2011)



Mobility as **freedom** turning into mobility as a **necessity**

- In a **short term**, transport investment allowing faster travel may give **accessibility benefits**, for example to an extended job market
- In the **longer term**, the increased access to distant jobs that local residents may experience is counterweighed by **higher competition for locally available jobs from non-local residents**
- Increased travel speeds thus tend to not only make it possible, but also **necessary** for people to transport themselves longer distances to reach daily and weekly activities



Lock-in and path dependency effects on the overall land use and transport system

- Mobility-increasing transport investments tend to **increase the spatial separation between activities** and create more mobility-demanding built environments and location patterns
- The very physical entities of sprawling built environments and high-capacity road infrastructure represent large '**sunk costs**' that might have to be **written off within a sustainable mobility paradigm**
- Such spatial structures also contribute to **shape lifestyles, contracts and mobility cultures** incompatible with sustainable mobility
- This makes it **politically more difficult** to implement policies aiming to promote a transition toward a sustainable mobility paradigm



Increase in **traffic accidents** and emissions due to **traffic increase**

- Induced travel not accounted for implies that more people than predicted will be exposed to the risks of **traffic accidents**, **noise** and **air pollution**
- **Trips do not start and end on the slip roads of a new highway**, but from origins to destinations all over the city and the region,
- The increasing traffic caused by a new or expanded highway will therefore, if induced traffic is underestimated or ignored, **expose a larger than predicted number** of people to noise, air pollution and risk of accidents along local roads



Effects on **public health** due to **less walking and cycling**

- Transport projects that make driving easier can reduce walking and cycling to relevant destinations (and can also reduce the use of non-motorized modes to and from public transport stops)
- Although increased use of 'active' modes of transportation is often measured as an important goal in public health policy, **negative impacts of highway projects on levels of walking and cycling** are usually **ignored** in CBA



Effects on public health due to encroachments on landscapes and green outdoor recreation areas

- This is an effect beyond what might be reflected in any assessment of 'willingness to pay' or 'compensation demand' in standard CBA
- Such public health effects include impacts via changed levels of **physical activity** in outdoor recreation as well as impacts on **mental health** from loss of beautiful amenities
- Some Norwegian empirical evidence of such effects exists, e.g. research by Kine Thorén et al. and by Geir Aamodt



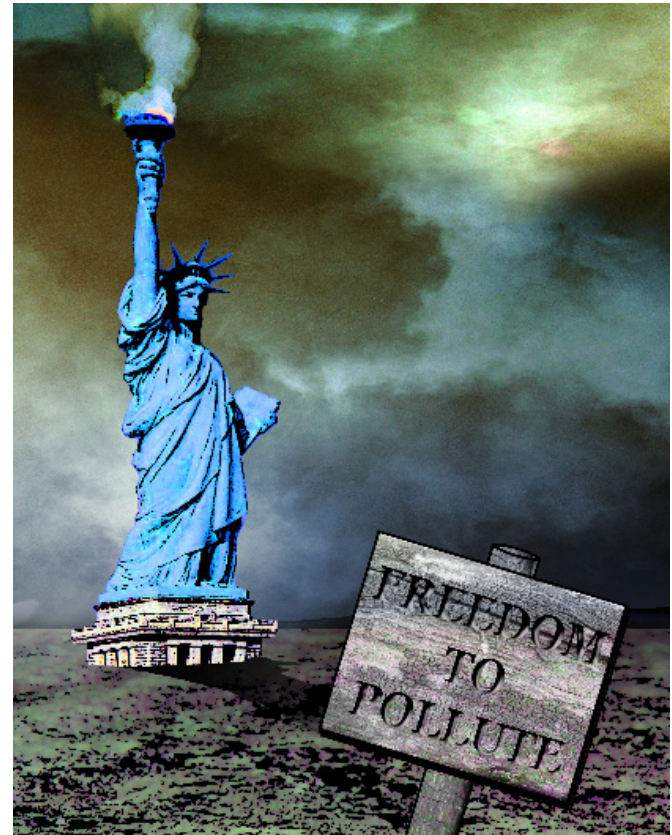
Underpricing of environmental assets

Even if the CBA accounted for the physical environmental effects in a complete and realistic way (which is not the case), the impact might still be underestimated if the **price per unit** is too low.



Underpricing of greenhouse gas emissions

- The current unit price for **CO₂ emissions** in road sector cost-benefit analyses in Norway is **250 NOK (2015) per ton**, increasing to 370 NOK in 2020 and further to 930 NOK in 2050 (NPRA, 2014)
- No real price adjustment is assumed after 2050
- The consequence of using carbon prices at this low level is that **greenhouse gas emissions rarely influence the cost-benefit analysis results**



Discounting rates for long-term effects: Lowered, but still leading to serious underestimation of negative impacts

- A **climate disaster** in 150 years, causing damage to a country of **more than its gross domestic product**, would – with conventional discounting – be equivalent to a **very small cost today** (Small, 1998)
- Most countries use much higher discount rates than those in Norway
- Norwegian discounting rules still imply that an impact occurring in 100 years from now will have a present value of only **4–5% of its non-discounted value**.
- The discounting of future impacts of global warming places **alternatives that generate high greenhouse gas emissions** in a much more **favorable** light than would otherwise be the case
- This may lead to the **preference for such solutions** rather than lower-emission alternatives.
- Similar bias occurs for other long-term environmental consequences, e.g.
 - loss of **biodiversity** and **biological productivity** due to local pollution,
 - **fragmentation of natural areas** represented by transport infrastructure construction.

Bias against future generations

- The justification for discounting future consequences is based on **expectations of continuous economic growth**: if we will be ten times richer in the future, paying a cost of 1000 USD then will affect our welfare much less than if we pay the same amount today
- This justification depends upon the highly contested assumption that growth can go on **continually** without running into **environmental limits**
- From a **moral** perspective, discounting rates can only logically apply when the people benefiting from a development are the same as the people suffering the costs
- A motorway built today may give **short-term benefits to contemporary car travelers**, while the **negative** impacts of its contribution to global warming will mainly affect **future generations**, no matter how rich they might become



Conclusions

- Neglected or underestimated impacts in CBA may not only be positive (as often claimed), but also **negative**
- Some impacts are ignored, or accidentally omitted, due to **practical measurement problems** or poor data
- Other impacts are missing due to more **fundamental weaknesses** of the CBA method
- The **combined** effect of environmental effects being neglected, severely underestimated due to traffic being underestimated, and underpriced, may be **substantial**
- Possible **solutions** could be
 - improved **transport models**
 - improved **valuation**
 - **constraining** the cost-benefit analysis
 - more careful treatment of **non-monetary impacts**
 - using **other methods** (EIA, MCA) instead of or in hybrid forms with CBA