

Status on Danish Effort in Capacity and Level of Service Analyses

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Traffic Infrastructure Projects: Recommendations for Capacity and Level of Service Evaluation

The primary recommendation is to provide the best possible estimates on traffic demand, and that the capacity and level of service are calculated and evaluated for the project.

In many cases projects are evaluated for an estimated traffic load 15 years after completion.

Design hours are typically 30. or 100. highest hour of the year.

No classification of LOS, but a project is evaluated on results for eg. average speed, delay and vol/cap-ratio. No recommended values.

Often used models:

- Emme2 for route choice
- DanKap for macroscopic analysis of capacity and level of service
- VISSIM for microscopic analysis of traffic operations and level of service

DanKap Characteristics:

- Deterministic (statistical) capacity and level of service calculation tool on macroscopic (traffic stream) level
- DanKap consists of theoretical and empiric (regression) submodels
- DanKap covers models for road sections, unsignalized intersections with yield signs on minor roads, roundabouts, signalized intersections and freeway ramp junctions
- Use of gap acceptance theory for driver behaviour in unsignalized intersections

continued

.... DanKap Characteristics

- DanKap results are average speed and volume to capacity ratio for road sections, and average delay, queue length and v/c-ratio for intersection approach lanes
- Models and parameters are described in the capacity manual
- Parameters based on observations of Danish traffic operations

Example of DanKap result table

DanKap
 Filer Rediger Hjælp

Signalkryds , Resultat

Ny Kommunevej
 Tid på dagen: spidstime
 Trafik: NyKommunevej

Parametre: Vejregler

Vejgren	Kørespor	Middelforsinkelsen og kølængden i tilfartssporet		
		B	t s/Kt	n 5% Kt
Hovedgaden V	V	0,32	24	5
Hovedgaden V	L	0,53	21	10
Hovedgaden V	L	0,53	21	10
Hovedgaden V	H	0,83	41	12
Hovedgaden Ø	V	0,64	33	8
Hovedgaden Ø	L	0,44	19	9
Hovedgaden Ø	L	0,44	19	9
Hovedgaden Ø	H	0,55	23	8
Ny Kommunevej N	V	0,25	33	1
Ny Kommunevej N	LH	0,26	18	6
Ny Kommunevej S	V	0,40	26	6
Ny Kommunevej S	LH	0,65	25	13

Maskinelt beregnet omløbstid
 Maskinelt beregnede grøntider
 Omløbstiden er 78 sekunder

Fase	Grøntid	Mellemtid efter
1	21	4
2	14	6
3	27	6

Tilbage Tilbage til projektvalg Udskriv Mellemregninger

The capacity manual and DanKap are still improved

- Despite the growing use of microsimulation analysis, there are no plans to stop further development of the macroscopic capacity models described in the capacity manual and included in DanKap
 - because it is quick to use, does not require expert skills by the user, "gives the first results"
 - but recommendations on use of microscopic models (Vissim) are being developed

Microscopic Simulation versus Macroscopic Analytical Models SIDE 8

Recommended type of model tends to be:

Microscopic simulation when:

More intersections or road sections need to be evaluated together

Special solutions for road network elements

A need for detailed evaluation of eg. signal programs or detector locations

Accurate and detailed traffic volume estimates available

Need for special result variables or statistical measures

Macroscopic models when:

Evaluation of an isolated road section or intersection

Common type of road or intersection

Only aggregated or inaccurate traffic estimates available

Only results like average speed or delay for traffic streams required

A need for a "first estimate" or for quick results

Manuals Presenting Recommended Procedures

Danish Capacity Manual, first edition 1999, revised 2005 and 2008. New edition planned for 2010. DanKap reflects the models and parameters of the manual.

The planned 2010 edition includes results of recent research, particularly modifications for 2 lane highway analysis, - besides revised values of some parameters for other models.

Microsimulation Manual, under preparation, planned publication medio 2010.

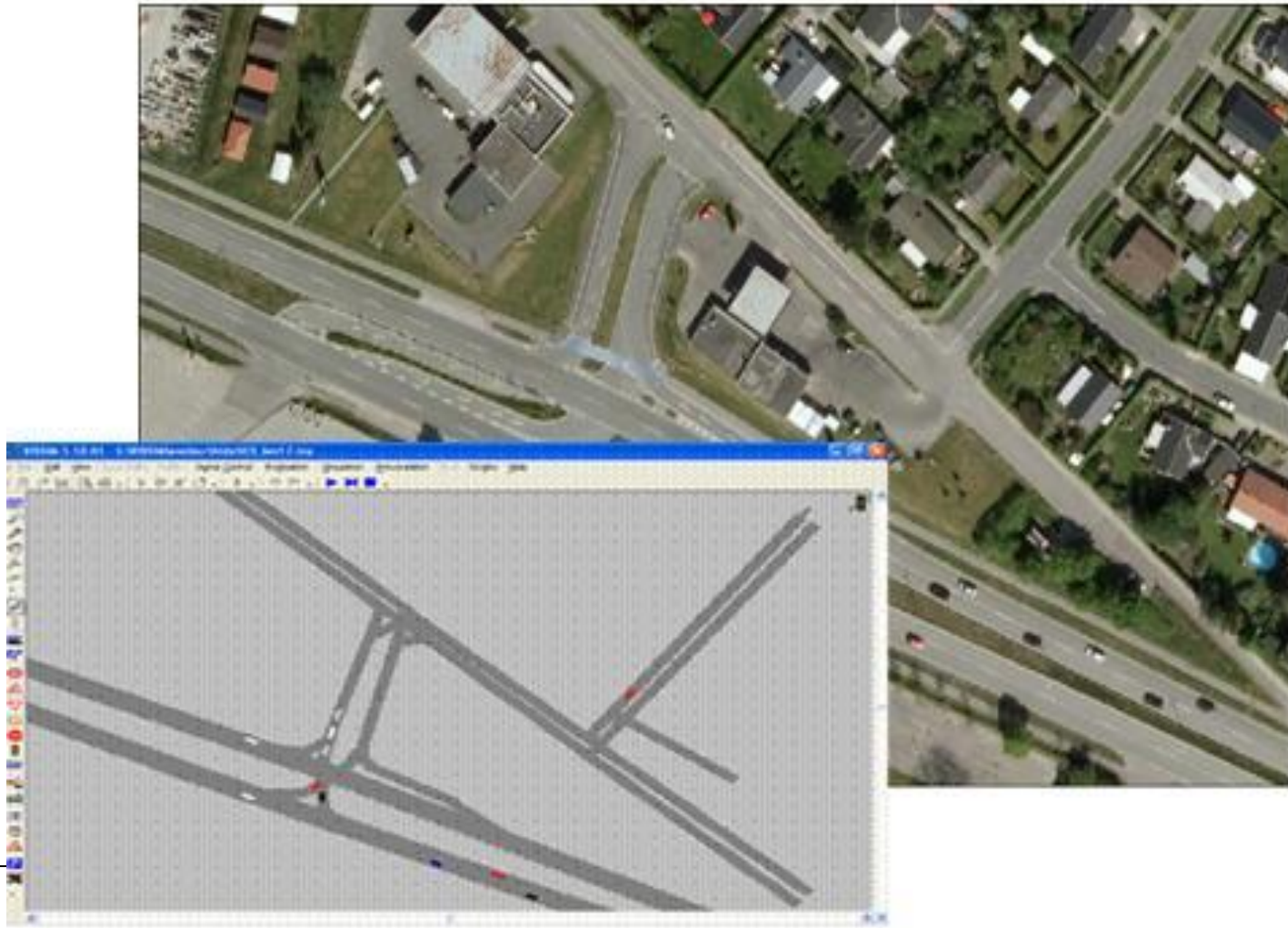
The manual advises road administration project managers and model analysts in procedures for using road traffic microsimulation, and it makes proposals on parameter settings and calibration procedures.

Examples on Research Projects

- Two lane highway traffic operations (finished)
- Driver perception on level of service (not finished)
- Critical gap, follow up time and passenger car equivalents in unsignalized intersections (not finished)
- Passenger car equivalents and driver's choice of approach lane in two lane roundabouts (completed)
- Weaving section capacity and level of service (not yet started)
- Road work traffic operation (continued)
- Influence of trucks on freeway traffic operation (not yet started)
- Influence of slow agricultural vehicles on 2 lane highway traffic operation (not started)

Presentation of Capacity and Level-of-Service Projects

Manual for Use of Microsimulation Models



Background

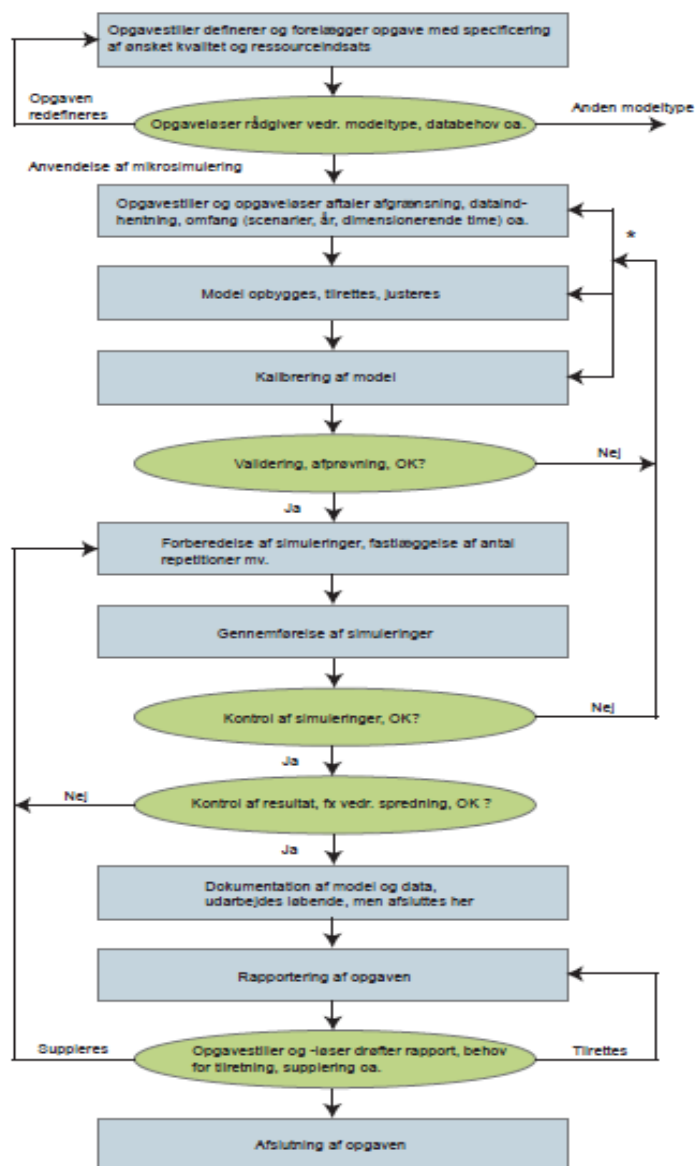
1. Microsimulation has since the year 2000 been a rapidly growing way to assess traffic operation and traffic infrastructure projects
2. The current national capacity manual is developed for macroscopic analysis
3. Microsimulation software is always developed abroad with parameters and submodels designed for the country of origin
4. Previously, the emphasis of capacity investigation results has been on traffic stream models and not for micro models
5. Some times road administration project managers and model specialists do not understand each other very well !

Manual Contents

- Microsimulation model concepts
- Choice: Macro or micro level model for specific problems
- Proposed procedure for traffic operation analysis by microsimulation
- Setting up a microsimulation model, eg. concerning geographic and time space limits
- Interpretation of microsimulation model results
- Calibration of microsimulation models
- Parameter setting in models

Focus on

- Road administration project manager needs for knowledge about simulation models, analysis procedures, model input and results
- Advising model developers in calibration procedures and parameter settings
- Making more likely to get similar results regardless of which consultant has carried out the analysis
- Creating a connection between the existing capacity manual and microsimulation models
- Models developed on the Vissim software which has shown to be the dominant (almost the only !) platform for setting up microsimulation models in Denmark



A. Forberedelse Er der argumenteret for, at det er relevant at anvende mikrosimulering i

- Er et kvalitetsniveau svarende til opgavens art, foreliggende data, ressourceindsats og opgavestilleren ? OK ?
- Er det overvejet, om der (relativt let) kan skaffes yderligere relevante data til løsningen ? OK ?
- Er der indgået aftale med opgavestilleren om hvilke timer, der analyseres ? OK ?
- Er den valgte geografiske afgrænsning af modellen og konsekvensen heraf relevant ? OK ?
- Er det gennemtænkt, om der ved opgaven er særlige forhold, der taler for eller imod anvendelse af mikrosimulering ? OK ?
- Er en relevant kalibreringsindsats overvejet ? OK ?
- Er en relevant valideringsindsats overvejet ? OK ?

B. Modellering Er der gennemført kalibrering og validering ?

- OK ?
- Er simuleringen checket ved visuel betragtning, og er eventuelle fejlagtige resultater (f.eks. unaturlige stop, urimeligt valg af kørespor, forkert sammenfletning af kørespor, etc.) blevet identificeret og rettet op på ? OK ?
- Må der gøres ekstra antagelser, justeres på parametre, - og i givet fald, justeres på inputdata ? OK ?
- Er den tidsmæssige afgrænsning (dvs. indsvingningstid og sluttid) af opgaven relevant og trollet om den burde justeres ? OK ?
- Anses resultater af modelkørslerne som rimelige, og er årsagen til eventuelle afvigelser undersøgt ? OK ?
- Antal gennemførte repetitioner, eventuelt fastsat på grundlag af konstante resultater ?

C. Rapportering Fremgår det tydeligt overalt i rapporten, hvilket vejnet (forslag, kilde), hvilket scenario, kilde), hvilken time på året, hvilken køretøjstypesammensætning og hvilke resultaterne repræsenterer ?

- OK ?
- Er der udarbejdet dokumentation, og indgår den i rapporten, eller henvises der til den ? OK ?
- Er det kontrolleret, at rapporten besvarer de spørgsmål, som er stillet i forbindelse med opgaven ? OK ?
- Er eventuelle overraskende resultater af analysen kommenteret ? OK ?
- Er der gjort rede for eventuelle vigtige justeringer, tilretninger eller ændringer i forberedelsen eller analysen, og som det er vigtigt, at læseren er bekendt med ? OK ?
- Indgår i dokumentationen ?

Calibration and Validation

- Guideline for model calibration and validation
- Examples of basic situations for calibration: Model parameters and proposed data for comparison between model and reality
- Procedures on parameter selection and check of calibration



Parameter setting guidelines for:

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Traffic assignment

Car following parameters and parameters for weaving and lane change



Parameters for giving way in unsignalized intersections



Parameters describing traffic operation in signalized intersections



Parameters describing vehicle performance and driver behaviour