Microsimulation model of the main road network of South-Eastern Finland

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1. Background

- Traffic situation has changed during last years
- Transit volumes of Finnish harbors and general cargo export to Russia have increased significantly
- The majority of freight traffic runs through South-Eastern part of Finland
- Proportion of the heavy traffic is 25%
- 3 international border stations:
  - Vaalimaa
  - Nujamaa
  - Imatra
2. Problem description

Growth of the heavy traffic produced follows problems:

- Risks to traffic safety
- Noise and air pollutions
- Fairly rapid destruction of road wear

Foto: Finnra
3. Scope of studies

Implemented by Ramboll in co-operation with Finnish Road Administration (Finnra)
4. Pilot project

4.1 Scope of the study

The pilot project was performed in order to:

- study the effects of ever growing heavy vehicle traffic on traffic performance on the main road network
- evaluate the feasibility of microsimulation as a modelling tool of geographically large traffic network
- produce an evaluation and planning tool for future traffic planning needs
4. Pilot project
4.2 Network modelling

- A scope of the pilot area

- The created simulation model covers an area over 100 x 40 kilometers
4. Pilot project

4.2 Network modelling

- The road sections were divided to model links base on
  - Number of lanes
  - Speed limit
  - Major changes in road geometry

- All the major intersections were modelled accurately
- The major border stations were included to model
- The 3 scenarios was simulated:
  - Present traffic volumes
  - Two future growth scenarios 2005-2015: slow (36 %) and fast (42 %) of heavy vehicles
4. Pilot project

4.3 Results

Simulation pointed out road sections that are most sensitive to the growth of heavy vehicle volumes

- The traffic conditions weaken
  - most around cities
  - close to the Russian border

- Impacts of the vertical geometry
  - slows down heavy vehicles
  - other traffic queuing behind a slow trucks

- Problem at the multi-level junctions
  - is merging the queued main traffic flow from the merging ramps

The growth scenarios the travel times to the border stations increase 4-6 min (3-4 %)
4. Pilot project

4.3 Improvement actions

- Efficiency of border control
- Larger parking areas for queuing heavy trucks
- Vehicle overtaking possibilities at 2 lane roads
- Traffic capacity enlargement
5. Additional study

5.1 Scope of the project

- The objectives:
  - Modelling for two alternative roads
  - Verify the traffic distribution between 2 roads
  - Evaluate impacts of improvement measures on speed, travel time and traffic performance

The model developed in the previous pilot project was used.
5. Additional study

5.2 Model description

- The model taking into account an influence of the vertical geometry on heavy vehicle’s speed and acceleration

- Modelling of overtaking lanes for heavy traffic
  - Such modelling has not previously been done in Finland

- Modelling of improvement measures as example:
  - Construction parking place at the Vaalimaa
  - Bypass around of Hamina
  - Grade-separated intersections
  - Upgrade some road sections from single lane to two lane per direction
5. Additional study

5.3 Results

- Future improvements were simulated
- Travel time and speed were compared for different improvement actions
- Highway 26 is easier and faster than roadway 387
- Overtaking lanes for heavy vehicles decrease:
  - queues and risk of dangerous overtaking
  - travel time of passenger cars by 7 min
  - average speed of heavy vehicles
Conclusions

01 The simulation model quite realistically express the traffic conditions

02 Functionality of the road network and possible bottle necks were evaluated

03 The simulation model can be used as a basis in the future
   1) road planning
   2) traffic modeling projects
   3) network evaluation studies