# Accident models ++ for choice of type and design of roads

- Motorway network (phase 1)
- Other road segments in rural areas (phase 2)
- Intersections and roundabouts in rural areas (phase 3)

# Purpose

The purpose of the project is to set up:

- **Accident models** for well-specified road segments and intersections; e.g. a 4-lane motorway segment with hard shoulders, without street lighting, without sharp curves, with 130 km/h speed limit, and so on.
- **Accident Modification Factors** (AMF) that can be used to calculate what happens if the well-specified road segment or intersection has a slightly different design; e.g. if the 4-lane motorway segment does not have hard shoulders or has a 110 km/h speed limit.
- **Calculation tools** that are spreadsheets, which can estimate the number of accidents and injuries of many types/designs of roads/intersections based on the above mentioned accident models and AMFs.

# Practical use

The accident models, AMFs and calculation tools may be used in the following processes:

- **Planning of new roads and intersections**: To explore and estimate safety impacts of alternatives.
- **Reconstructing existing roads and intersections**: To identify safety measures and/or estimate safety impacts of specified changes to existing design.
- **Elaborating design recommendations**: To estimate safety impacts in absolute terms (not just percentages) of design choices that may be used in cost-benefit-analyses (CBA) or multi-criteria-analysis (MCA) in order to make recommendations.

# The basics

We set up relatively simple accident models (negative binomial) for well-specified designs:

Segments: Accidents = $a \cdot AADT^{P} \cdot Length$

Intersections: Accidents = $a \cdot AADT^{P1} \cdot AADT^{P2}$

By multiplying the models with AMFs it is possible to obtain an estimate of accidents for another design than the design the accident model is based upon:

Estimate: Accidents = $a \cdot AADT^{P} \cdot Length \cdot AMF_1 \cdot AMF_2 \cdot \ldots$

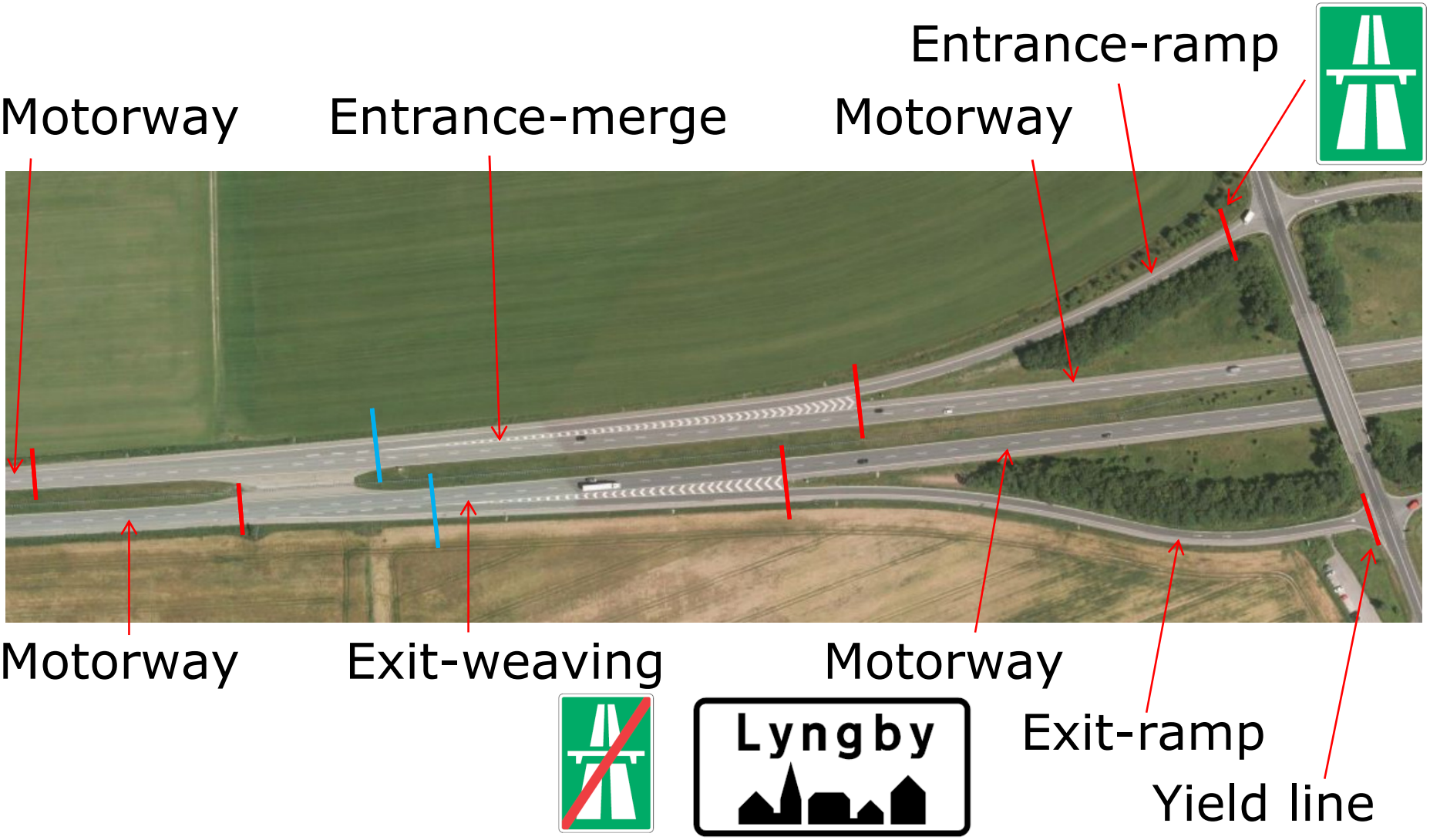
# Phase 1: Motorway network

Work process:

1) Defining and splitting the motorway network into segments on the basis of geometry, markings and signage – includes recording the design (completed)
2) AADT and accidents on defined network (completed)
3) Defining and splitting the motorway network on the basis of "homogeneous" units in terms of accident occurrence (completed)
4) Setting up accident models (not started)
5) Setting up AMFs (started, not completed)
6) Setting up calculation tools (not started)

# Phase 1: Motorway network

## Defining the motorway network (example):



# Phase 1: Motorway network

| Type | Sub-type | Number of elements | Length (meters) | | | |
|---|---|---|---|---|---|---|
| | | | Shortest | Average | Longest | Total |
| Motorway | Ordinary (2-5 lanes) | 1,223 | 19 | 1,612 | 17,332 | 1,971,315 |
| | Lane reduction | 10 | 100 | 192 | 290 | 1,922 |
| | Lane increase | 4 | 110 | 145 | 200 | 580 |
| | Total | 1,237 | 19 | 1,596 | 17,332 | 1,973,817 |
| Weaving/merge (ghost island + auxiliary + taper) | Exit | 527 | 6 | 227 | 665 | 119,740 |
| | Entrance | 525 | 55 | 393 | 1,049 | 206,284 |
| | Successive (entrance-exit) | 21 | 247 | 677 | 1,945 | 14,215 |
| | Motorway diverge | 26 | 115 | 410 | 1,440 | 10,654 |
| | Motorway merge | 30 | 78 | 485 | 1,378 | 14,557 |
| | Total | 1,129 | 6 | 324 | 1,945 | 365,450 |
| Ramp | Exit | 462 | 5 | 251 | 825 | 116,036 |
| | Entrance | 457 | 5 | 258 | 1,103 | 117,753 |
| | Direct connector | 76 | 49 | 388 | 956 | 29,507 |
| | Parallel lane | 43 | 2 | 210 | 485 | 9,036 |
| | Successive (entrance-exit) | 18 | 165 | 331 | 587 | 5,966 |
| | Ramp diverge | 52 | 23 | 113 | 408 | 5,870 |
| | Ramp merge | 38 | 34 | 196 | 480 | 7,441 |
| | Total | 1,146 | 2 | 255 | 1,103 | 291,609 |
| Service area | Service station, rest area, etc. | 87 | 25 | 469 | 1,111 | 40,822 |
| | Bus stop | 6 | 65 | 105 | 181 | 631 |
| | Total | 93 | 25 | 446 | 1,111 | 41,453 |
| Dual-way (two-lane road) | | 21 | 53 | 203 | 505 | 4,269 |
| Total | | 3,626 | 2 | 738 | 17,332 | 2,676,598 |

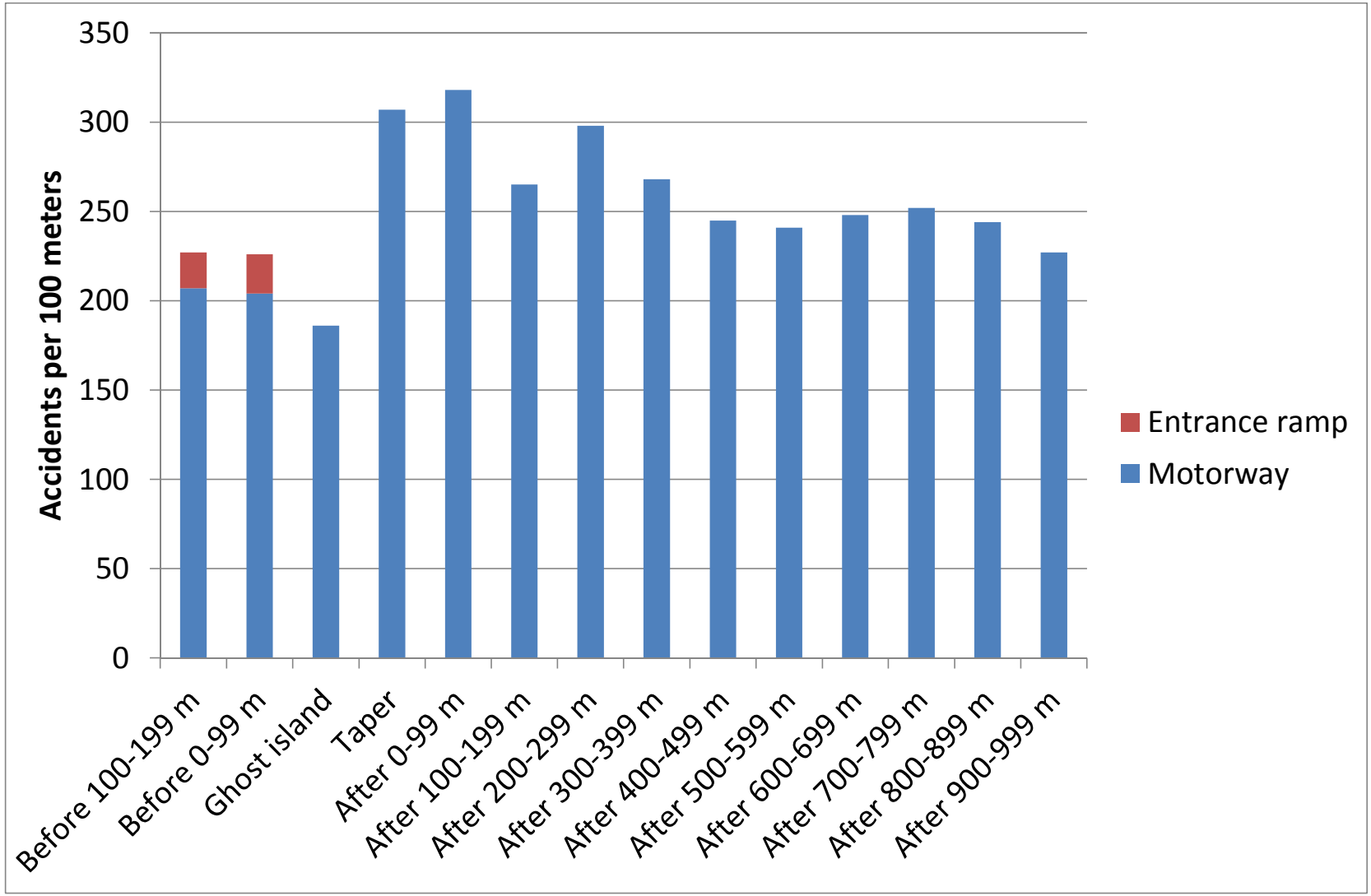
# Phase 1: Motorway network

| Type | AADT 2012 | | | | Accidents 1985-2012 | |
|---|---|---|---|---|---|---|
| | Number | Lowest | Average | Highest | Accidents | Injuries |
| Motorway | 1,237 | 2,753 | 18,177 | 57,187 | 24,416 | 6,825 |
| Weaving/merge | 1,125 | 3,340 | 20,319 | 58,272 | 5,858 | 1,360 |
| Ramp | 1,124 | 91 | 3,275 | 22,576 | 1,180 | 260 |
| Service area | 54 | 111 | 967 | 2,902 | 129 | 20 |
| Dual-way | 20 | 658 | 3,968 | 9,971 | 39 | 19 |

# Phase 1: Motorway network

Trafitec

## Getting “homogeneous” units: Example: Entrance merge



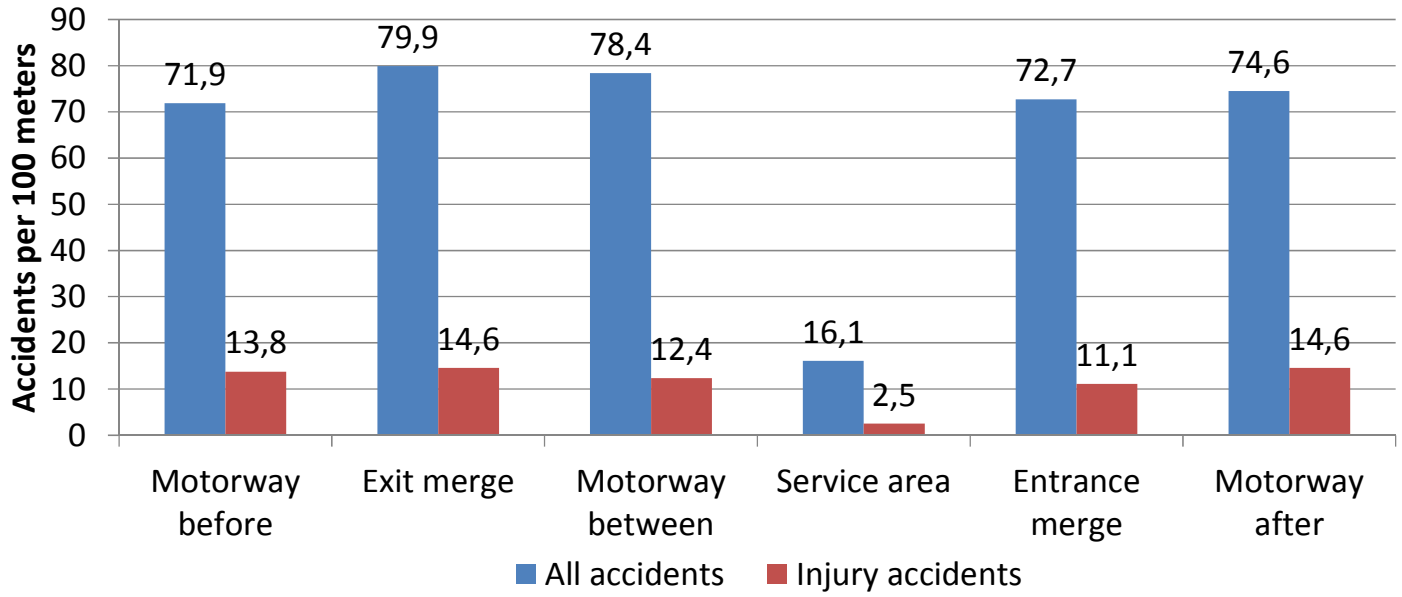
# Phase 1: Motorway network

## Accident models – motorway network

NOT COMPLETED

# Phase 1: Motorway network

## Service area (not bus stop) AMF - ???:



# Phase 1: Motorway network

Trafitec

Some accident modification factors (AMFs) (preliminary):

| Type | Description | AMF | |
|---|---|---|---|
| | | Accidents | Injuries |
| Motorway | From 2 to 3 traffic lanes | 1.03 | 1.03 |
| Motorway | Anti-dazzle screens in median | 1.01 | 0.96 |
| Motorway | Add hard shoulder | 0.74 | 0.83 |
| Motorway | Add street lighting | 0.94 | 0.94 |
| Weaving/merge | Increase of entrance taper by 30 m | 0.89 | 0.89 |
| Weaving/merge | Increase of exit taper by 30 m | 0.93 | 0.93 |
| Ramp | Diamond to cloverleaf | 1.82 | 1.82 |
| Ramp | Short diamond to long diamond | 0.62 | 0.62 |
| Ramp | Exit downhill to exit uphill | 0.96 | 0.96 |