

Calculation model for estimating the demand of truck parking areas along motorways

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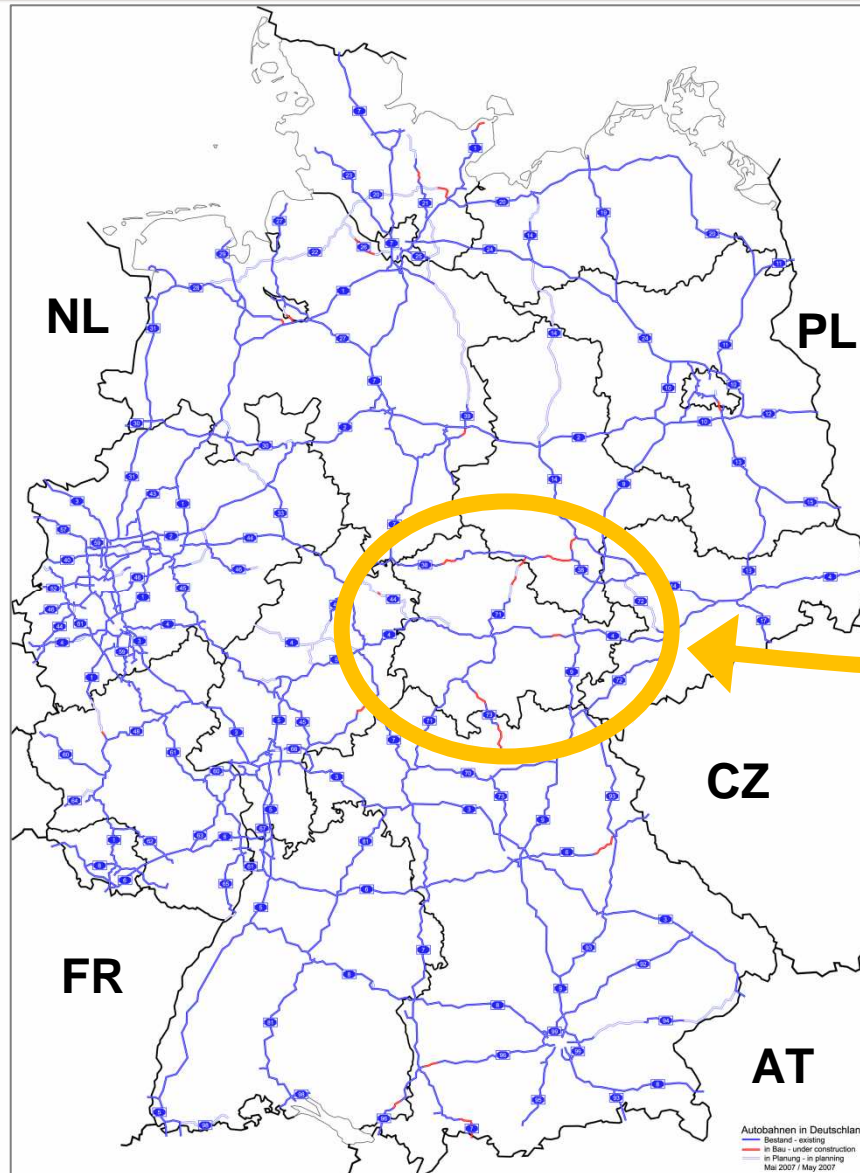
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Introduction



Thuringia

Introduction



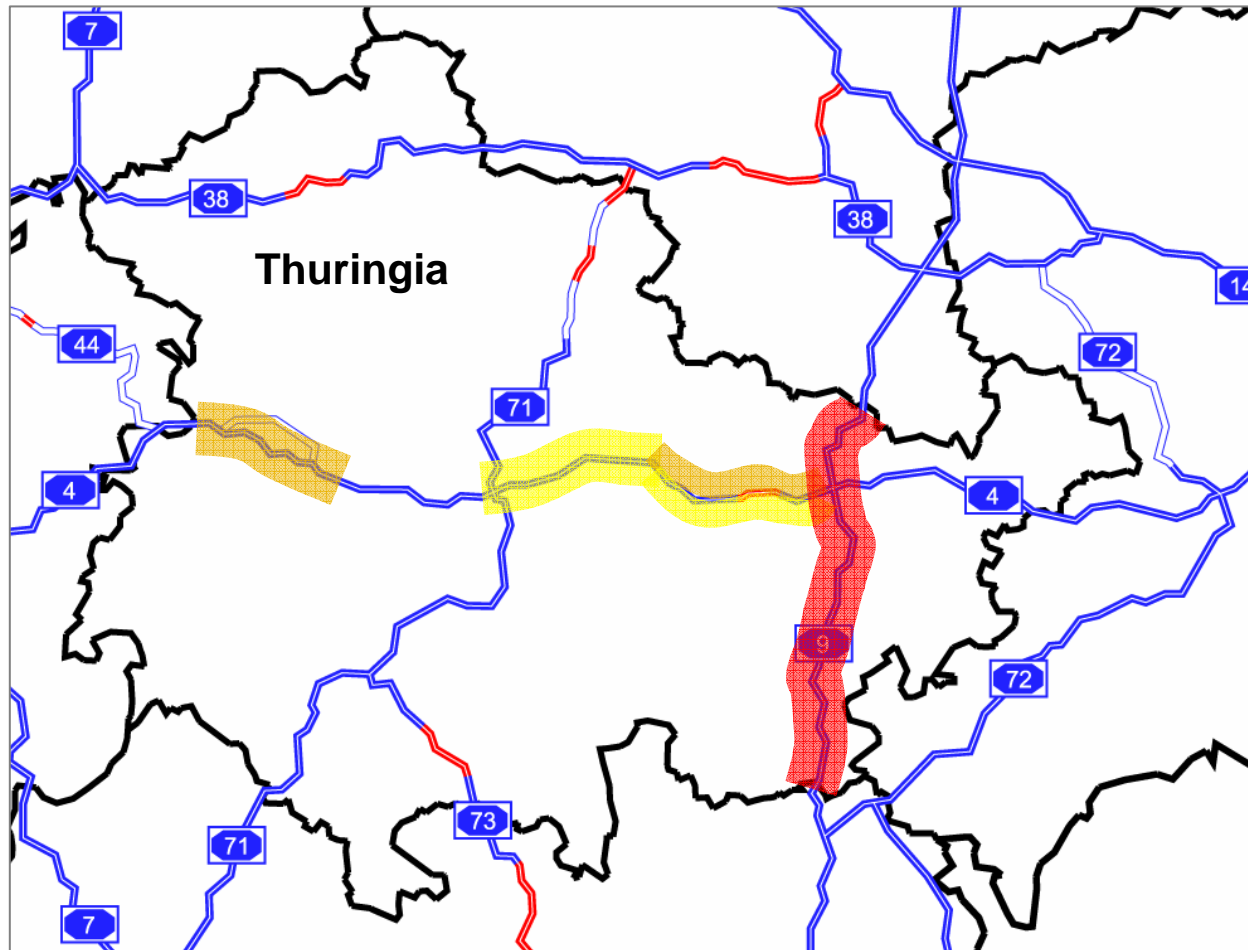
Introduction



Introduction



Introduction



Parking area deficit



very high



high



medium

parking deficit based on calculation (\triangleq observations)

- **Reduced security through not correctly parked trucks**
- **Exceeding of daily driving times**
- **Additional traffic**

$$\frac{TPS}{km} = \frac{DTV}{\emptyset DD}$$

TPS = truck parking spaces

DTV = daily traffic volume of trucks larger 3.5 tons

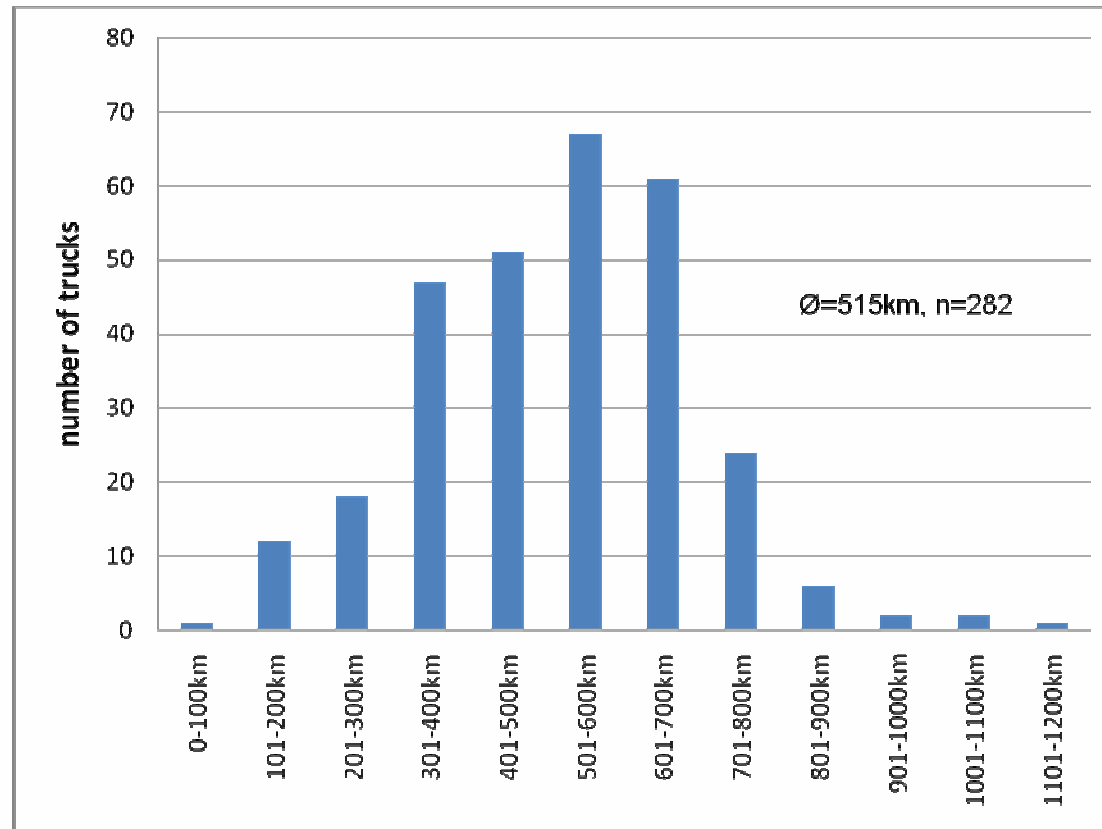
**$\emptyset DD$ = average daily driving distance
of trucks (HGV) per day**

e.g.: DTV = 5.000 ; $\emptyset DD$ = 500 km

→ demand = 5000 HGV / 500 km = 10 TPS/km

Determination of $\emptyset DD$ →

Procedure



**Driving distance
of truck drivers
before long-time
pause (> 8 h)
(=daily journey)**

ØDD = 515 km

**This value is partly transferable to other EU countries.
The value depends on the driving-time regulations and
its compliance and control.**

Procedure

$$\frac{TPS}{km} = \frac{DTV}{\emptyset DD} \times \frac{\emptyset PD}{24h}$$

**$\emptyset PD$ = average parking duration
(regularly 11 h, shortened 9 h)**

e.g.: $\emptyset PD = 12$ h

→ Demand = $5000 / 500 \times 12 / 24 = 5$ TPS/km

Measurement: $\emptyset PD = 9$ h 41 min = 9.68 h

Transferability of $\emptyset PD$ similar to $\emptyset DD$.

Procedure

$$\frac{TPS}{km} = \frac{DTV}{\emptyset DD} \times \frac{\emptyset PD}{24h} \times \frac{24h}{t_N} \times P_N$$

t_N = night-time

P_N = proportion of cumulated pausing time within night-time t_N

e.g.: $t_N = 12$ h (5 p.m. to 5 a.m.), $P_N = 0.9$

→ Demand = $5000 / 500 \times 12 / 24 \times 24 / 12 \times 0.9 = 9$ TPS/km

Procedure

$$\frac{TPS}{km} = \frac{DTV}{\emptyset DD} \times \frac{\emptyset PD}{24h} \times \frac{24h}{t_N} \times P_N$$

t_N = night-time

P_N = proportion of cumulated pausing time within night-time t_N

Measurements: 1387 of the 1626 long-time pause resting hours were spent between 5 p.m. and 5 a.m.

$\rightarrow P_N = 0.853$

P_N varies in other regions (distances to centres of freight origins, just-in-time, night-time regulations)

Procedure

$$\frac{TPS}{km} = \frac{DTV}{\emptyset DD} \times \frac{\emptyset PD}{24h} \times \frac{24h}{t_N} \times P_N \times P_{LD}$$

P_{LD} = proportion of long-distance traffic

e.g.: $P_{LD} = 0.8$

→ Demand = $5000 / 500 \times 12 / 24 \times 24 / 12 \times 0.9 \times 0.8 = 7.2$ TPS/km

Determination of P_{LD} with statistics →

Procedure

P_{LD} = proportion of long-distance traffic = 0.813

long-distance = driving distance > 150km (long-time rest periods by drivers with cargo travel distance of 150-350km!)
+ foreign HGV

Proportion within the total road transport haulage (in tkm)

Assumptions:

-distribution of cargo transport haulage = vehicle transport haulage

-proportion of short- and long-distance traffic same in Thuringia as in Germany

-cargo transport distances are equally distributed on motorways and other roads

P_{LD} varies in other regions (regional cargo transport, transit)

Results

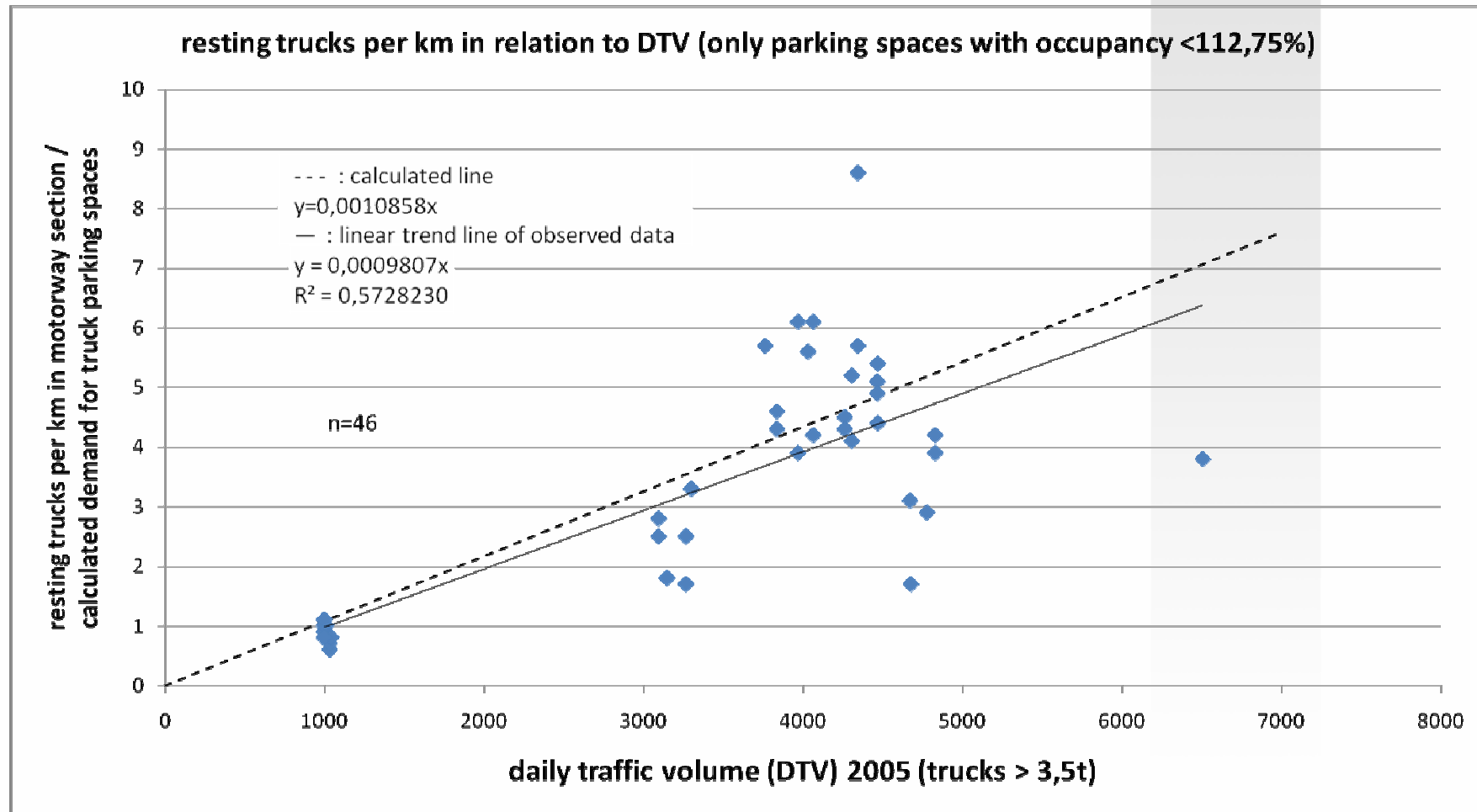
$$\frac{TPS}{km} = \frac{DTV}{\emptyset DD} \times \frac{\emptyset PD}{24h} \times \frac{24h}{t_N} \times P_N \times P_{LD}$$

$$\frac{TPS}{km} = \frac{DTV}{515km} \times \frac{9.68}{24h} \times \frac{24h}{12h} \times 0.853 \times 0.813$$

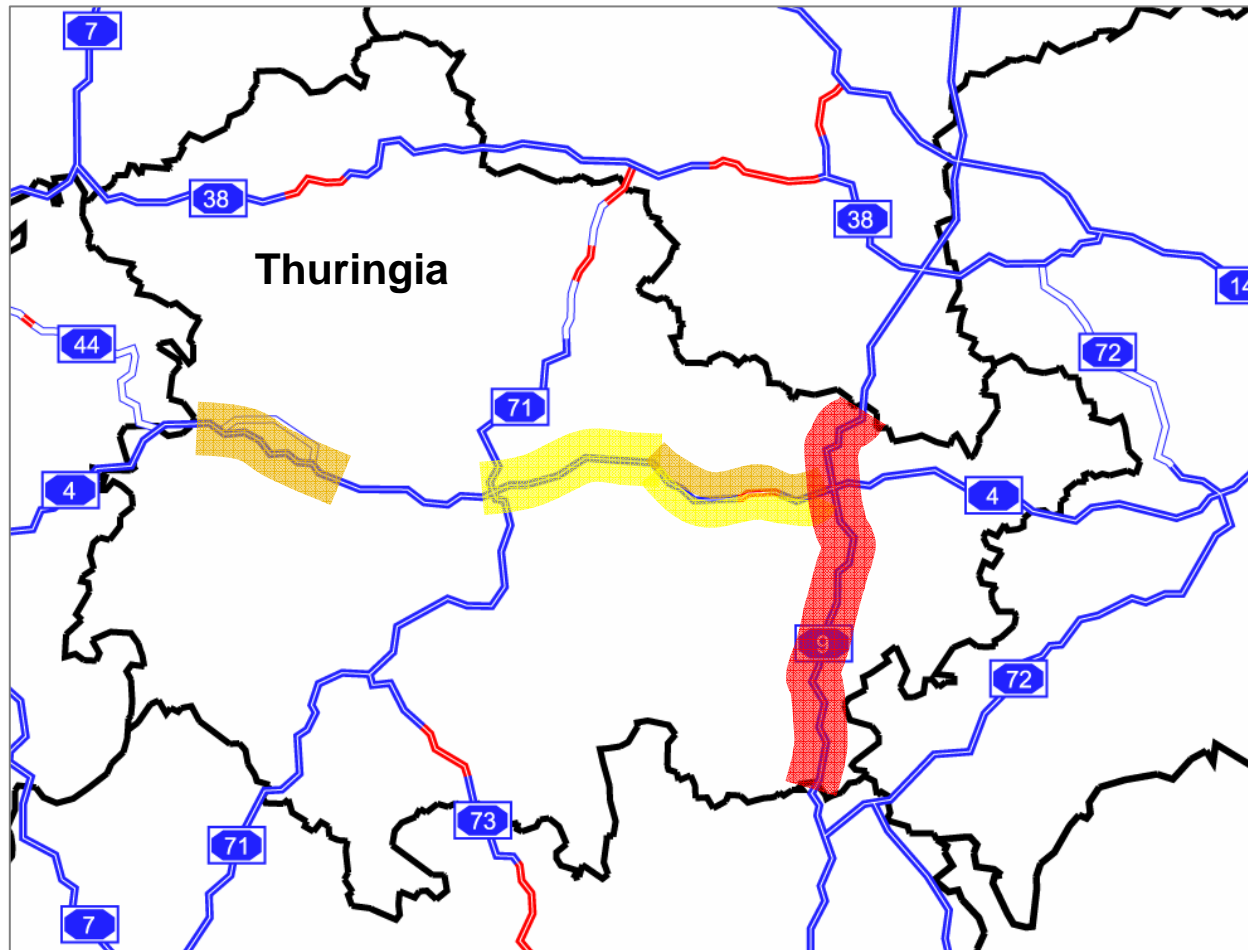
$$\frac{TPS}{km} = \frac{DTV}{921km}$$

921 km → modified driving distance

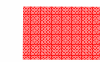
Results



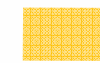
Results



Parking area deficit



very high



high



medium

parking deficit based on calculation (\triangleq observations)

Conclusion

- **calculation of current demand of truck parking spaces**
- **fast and flexible, goal-oriented**
- **adoptable in other regions with according adjustments**
- **contribution to the solution of the acute parking over-occupancy in many areas of Europe**

Before building new parking spaces:

- **better use of existing parking spaces (telematics)**
- **dialogue with truck drivers**

Avoiding traffic:

- **Does parking shortage limit truck cargo transport?**
- **Does extended parking space generate new truck traffic instead of environmentally friendlier rail transport?**