Safe Cities as Part of a Safe World
Walter Niewöhner, Edmonton, 11th July 2018

A Safe World
Content

▸ DEKRA company
  DEKRA Accident Research

▸ Vision Zero in Cities
  ▸ DEKRA Map
  ▸ International Comparison
  ▸ Analysis

▸ Current and Future Accident Situations

▸ Conclusions
DEKRA Company

In over 50 countries
44,000 employees
in 12 business services

ensure SAFETY
at home, at work and on the road
GLOBAL MARKET LEADER WITH 26 MILLION TECHNICAL VEHICLE INSPECTIONS PER YEAR.

- Vehicle inspections for all types of vehicles
- Safety tests for trucks
- Technical inspection of motorcycles
- Special vehicle tests
- Inspection of hazardous goods vehicles
- Single operating licenses
- Alternation approvals
- Workshop tests

VEHICLE INSPECTION

Global presence in 30 countries worldwide with own test locations.
DEKRA
Service Examples

Child seat

Toys

Play area
DEKRA
Service Examples

Railroad trailers

Fire behaviour of bus seats

Industrial facilities
Accident Research

Basis

- Databases
  + accident database based on DEKRA expertises
  + database concerning technical defects in vehicles
  + external databases (GIDAS, FARS, STATS19, …)

- Different tasks
  external customers (association, ministry, OEM, …)
  internal customers (support for other departments)
  self given tasks (e.g. Vision Zero Map)
Task coming from police / prosecuting attorney:

“locating the accident cause”

includes demounting
+ locating the problem
+ calculating the influence to the accident

2,000 – 3,000 technical investigations / year
Accident Research

- Benefit calculation of Advanced Driver Assistance Systems
- Traffic surveys
- Show solutions regarding road safety problems
Vision Zero (1)

Vision Zero ➙ Safe System Approach

no fatalities + no severe injuries

... Shared Responsibility
addresses all stakeholders (infrastructure, vehicle, human)
including politics, media
including every single road user

➔ Cultural Change
Vision Zero (2)

Vision Zero
It is a fantastic aim
Is this realistic?
Will we see this aim?

Vision Zero is a very big project. Big projects are always separated in parts.
1. Rural road (without motorways)
2. Motorways
3. Urban area

Where would you like to start with Vision Zero?
Vision Zero Map

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>USA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data of Cities</td>
<td>2494</td>
<td>740</td>
</tr>
<tr>
<td>ZeFa-Cities</td>
<td>991</td>
<td>162</td>
</tr>
</tbody>
</table>

ZeFa - one year without road fatality

www.dekra-vision-zero.com

Data from IRTAD members
Interactive Vision Zero Map
Example Section of USA
## City Overview

ZeFa – Zero Fatalities at least one year without road fatalities

<table>
<thead>
<tr>
<th>Country</th>
<th>Number of Cities</th>
<th>Number of ZeFa-Cities</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&gt; 50,000</td>
<td>&gt; 100,000</td>
</tr>
<tr>
<td>Austria AT</td>
<td>9</td>
<td>5</td>
</tr>
<tr>
<td>Belgium BE</td>
<td>29</td>
<td>9</td>
</tr>
<tr>
<td>Czech Republik CZ</td>
<td>22</td>
<td>6</td>
</tr>
<tr>
<td>Finland FI</td>
<td>20</td>
<td>9</td>
</tr>
<tr>
<td>France FR</td>
<td>117</td>
<td>39</td>
</tr>
<tr>
<td>Germany DE</td>
<td>183</td>
<td>80</td>
</tr>
<tr>
<td>Greece GR</td>
<td>61</td>
<td>12</td>
</tr>
<tr>
<td>Hungary HU</td>
<td>21</td>
<td>9</td>
</tr>
<tr>
<td>Italy IT</td>
<td>147</td>
<td>45</td>
</tr>
<tr>
<td>Japan JP</td>
<td>548</td>
<td>267</td>
</tr>
<tr>
<td>Lithuania LT</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Luxembourg LU</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Netherlands NL</td>
<td>73</td>
<td>27</td>
</tr>
<tr>
<td>Norway NO</td>
<td>11</td>
<td>6</td>
</tr>
<tr>
<td>Poland PL</td>
<td>86</td>
<td>39</td>
</tr>
<tr>
<td>Serbia RS</td>
<td>26</td>
<td>14</td>
</tr>
<tr>
<td>Slovenia SI</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Spain ES</td>
<td>145</td>
<td>61</td>
</tr>
<tr>
<td>Sveden SE</td>
<td>21</td>
<td>7</td>
</tr>
<tr>
<td>Switzerland CH</td>
<td>10</td>
<td>6</td>
</tr>
<tr>
<td>United Kingdom UK</td>
<td>216</td>
<td>110</td>
</tr>
<tr>
<td>United States US</td>
<td>740</td>
<td>294</td>
</tr>
</tbody>
</table>

Total: 2,494 > 50,000, 1,052 > 100,000
Fatalities in Urban Areas
Why start with 50,000 inhabitant cities?

<table>
<thead>
<tr>
<th>Year 2012</th>
<th>Germany</th>
<th>France</th>
<th>USA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>3,600</td>
<td>3,653</td>
<td>33,561</td>
</tr>
<tr>
<td>Rural Roads</td>
<td>2,538</td>
<td>2,626</td>
<td>18,461</td>
</tr>
<tr>
<td>Urban Roads</td>
<td>1,062</td>
<td>1,027</td>
<td>15,100</td>
</tr>
</tbody>
</table>

City Size (Inhabitants)

- < 5,000: 609 (57.3 %), 747 (72.7 %), 8,020 (53.1 %)
- 5,000 - 20,000: 20,000 - 50,000: 77 (7.3 %), 108 (10.5 %), 1,797 (11.9 %)
- 50,000 - 100,000: 77 (7.3 %), 108 (10.5 %), 1,797 (11.9 %)
- 100,000 - 300,000: 150 (14.1 %), 84 (8.2 %), 2,496 (16.5 %)
- > 300,000: 226 (21.3 %), 88 (8.6 %), 2,187 (14.5 %)
Vision Zero Map

Biggest city without road fatality per country

<table>
<thead>
<tr>
<th>Country</th>
<th>Biggest ZeFa city</th>
<th>inhabitants (2011)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria AT</td>
<td>Salzburg</td>
<td>150,887</td>
</tr>
<tr>
<td>Belgium BE</td>
<td>Elsene</td>
<td>82,202</td>
</tr>
<tr>
<td>Czech Republik CZ</td>
<td>Liberec</td>
<td>101,865</td>
</tr>
<tr>
<td>Finland FI</td>
<td>Espoo</td>
<td>259,383</td>
</tr>
<tr>
<td>France FR</td>
<td>Rennes</td>
<td>206,604</td>
</tr>
<tr>
<td>Germany DE</td>
<td>Aachen</td>
<td>260,454</td>
</tr>
<tr>
<td>Greece GR</td>
<td>Larisa</td>
<td>145,981</td>
</tr>
<tr>
<td>Hungary HU</td>
<td>Szombathely</td>
<td>79,534</td>
</tr>
<tr>
<td>Italy IT</td>
<td>Reggio di Calabria</td>
<td>185,577</td>
</tr>
<tr>
<td>Japan JP</td>
<td>Fuchu</td>
<td>247,126</td>
</tr>
<tr>
<td>Lithuania LT</td>
<td>Alytus</td>
<td>54,437</td>
</tr>
<tr>
<td>Luxembourg LU</td>
<td>Luxembourg</td>
<td>103,641</td>
</tr>
<tr>
<td>Netherlands NL</td>
<td>Almere</td>
<td>193,163</td>
</tr>
<tr>
<td>Norway NO</td>
<td>Stavanger</td>
<td>199,237</td>
</tr>
<tr>
<td>Poland PL</td>
<td>Zielona Góra</td>
<td>117,253</td>
</tr>
<tr>
<td>Serbia RS</td>
<td>Čačak</td>
<td>113,383</td>
</tr>
<tr>
<td>Slovenia SI</td>
<td>Maribor</td>
<td>94,984</td>
</tr>
<tr>
<td>Spain ES</td>
<td>L'Hospitalet de Llobregat</td>
<td>253,782</td>
</tr>
<tr>
<td>Sweden SE</td>
<td>Uppsala</td>
<td>140,454</td>
</tr>
<tr>
<td>Switzerland CH</td>
<td>Lausanne</td>
<td>127,821</td>
</tr>
<tr>
<td>United Kingdom UK</td>
<td>Wandsworth</td>
<td>308,304</td>
</tr>
<tr>
<td>United States US</td>
<td>Alexandria (VA)</td>
<td>148,892</td>
</tr>
</tbody>
</table>

Status December 2017
## Cities in Alberta

<table>
<thead>
<tr>
<th>City</th>
<th>Years with Zero Fatalities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calgary</td>
<td>0</td>
</tr>
<tr>
<td>Edmonton</td>
<td>0</td>
</tr>
<tr>
<td>Red Deer</td>
<td>1</td>
</tr>
<tr>
<td>Lethbridge</td>
<td>1</td>
</tr>
<tr>
<td>Medicine Hat</td>
<td>1</td>
</tr>
<tr>
<td>Saint Albert</td>
<td>4</td>
</tr>
<tr>
<td>Grande Prairie</td>
<td>0</td>
</tr>
<tr>
<td>Fort McMurray</td>
<td>2</td>
</tr>
<tr>
<td>Sherwood Park</td>
<td>5</td>
</tr>
</tbody>
</table>
Current Status

Vision Zero map

Data pool of
- Germany: Fatally + severely injured for each city
- Other countries

www.dadalos.d.org
Data Analysis of Cities (1)
International Comparison

![Graph showing the relationship between city size and fatalities per year (per 100,000 inhabitants)]
Zero Fatalities in Cities

- **Question A:**
  Why some cities seem to be safer than others?
  What are the causes of different „levels of fatalities“?

- **Question B:**
  What is the influence of the different causes?

- **Question C:**
  Are there suitable measures fitting the causes?
Data Analysis of Cities (2)

Data of Germany

- Analysis of possible factors
  City area, traffic area, employees, unemployed, share of retirees, in-commuter, out-commuter, modal split (public transport, pedestrian, bicyclist, vehicle), ...
  ➔ Which factors are influencing how?

Severely injured /100,000 inhabitants as average value

summarize 2009 … 2015 severely injured road users compare to number of inhabitants
Data Analysis of Cities (3)
Data of Germany

Severely injured /100000 inhabitants
as average value

summarize 2009 … 2015 severely injured road users
compared to number of inhabitants

Example:
Kerpen
63,569 inhabitants
141 severely injured road user (2009 … 2015)
⇒ 31.7 severely injured road user / year /100.000
inhabitants
Cities in suburb area seem to have an advantage regarding road safety in relation to cities far away from a bigger city.
DEKRA Road Safety Activities

Increase knowledge regarding road safety

by

➤ Publishing road safety reports
➤ Supporting fleet operators
➤ Explaining visibility problems
DEKRA Road Safety Reports

- Car
- Truck
- Motorcycle
- Pedestrians + Bicyclists
- People + Technology
- Rural Roads
- Urban Mobility
- Future Based on Experience
- Passenger Transport
- Best Practices
Pedestrian Accident (1)
DEKRA Accident Analysis

Do you see the pedestrian?

How dark is darkness?
Is there a typical value for darkness?

➔ ADAS
Pedestrian Accident (2)

Comment of a pedestrian:
„I thought the lights of the car were on, so he is able to see me.“

Typical accident at daylight:
Pedestrian coming from the right (e.g. between parked vehicles).

Typical accident at night time:
Pedestrian coming from the left, first crossing the oncoming lane.
Pedestrian + Bicycle Accidents
Share of Fatalities Depending on Lighting Conditions

Road Safety Related Activities
Caps for Children to Improve Their Conspicuity
Road Safety Related Activities
Caps for Children to Improve Their Conspicuity

Example

<table>
<thead>
<tr>
<th>Year</th>
<th>DEKRA child caps</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>74,600</td>
</tr>
<tr>
<td>2005</td>
<td>120,600</td>
</tr>
<tr>
<td>2006</td>
<td>150,300</td>
</tr>
<tr>
<td>2007</td>
<td>180,000</td>
</tr>
<tr>
<td>2008</td>
<td>182,500</td>
</tr>
<tr>
<td>2009</td>
<td>185,300</td>
</tr>
<tr>
<td>2010</td>
<td>192,700</td>
</tr>
<tr>
<td>2011</td>
<td>194,500</td>
</tr>
<tr>
<td>2012</td>
<td>195,800</td>
</tr>
<tr>
<td>2013</td>
<td>203,900</td>
</tr>
<tr>
<td>2014</td>
<td>208,700</td>
</tr>
<tr>
<td>2015</td>
<td>210,100</td>
</tr>
<tr>
<td>2016</td>
<td>227,700</td>
</tr>
<tr>
<td>2017</td>
<td>215,000</td>
</tr>
</tbody>
</table>
Right Turning Trucks

Analysis

Accidents happen mainly
- At daylight
- Dry weather (sunlight)
- Unusual often involved municipality trucks or site vehicles
- Two typical pre-crash movements
- Stopping in front of turning manoeuver
- Slowing down + turning without stopping
Right Turning Trucks
First Contact

- 57% Front, o. n. A.
- 7% Frontseite, rechts
- 20% Seite re., vor VA
- 14% Seite re., Bereich VA
- 2% Seite re., vor SS o. n. A.
- 7% Seite re., Bereich SS
- 0% Seite re., Bereich HA
- 0% Seite re., hinter HA
- 0% Seite re., hinter SS o. n. A.

Frontseite, links
11%
2%
7%
20%
14%
2%
7%
0%
0%
0%
0%
Accident Research
Improvement new mirrors

proximity mirror
group V mirror

wide angle mirror
group IV mirror

New 2003/97/EU
Old 71/127/EWG
Accident Research

Mirror Adjustment
Blind Spot of Trucks
Old Mirror System

Source: DEKRA Expert report
Accident Research

Mirror Adjustment

developed from Daimler, DEKRA + MAN
Problem of a Left Turning Cyclist (1)

Theoretical Situation

A elderly cyclist is driving on a road with 15 km/h.
A big truck is following with 50 km/h.

Observation of the truck driver:
There is a cyclist. I had to pass him in some seconds.
He is turning his head. At the same time there is a minor movement of the cyclist to the left.
Now the cyclist has turned back his head and continues to drive straight ahead.

• What do you think about the interpretation of the truck driver or the cyclist?

When the truck driver passes the cyclist the cyclist moves directly to the front of the truck.
Problem of a Left Turning Cyclist (2)

Cyclist Point of View

Cyclist interpretation:

„I turned my head.
There is no vehicle.
I can turn to the left.“

![Diagram of cyclist turning left with vehicle in the blind spot]
Problem of a Left Turning Cyclist (3)

Truck Drivers Point of View

Truck drivers interpretation:

„The cyclist wants to turn left, because he turned his head.

The cyclist moved a bit to the left and moved back to the straight direction.

The cyclist saw me. I can pass.“
Problem of a Left Turning Cyclist (4)
Physical Explanation

Everybody is able to turn the head by 90° (perfect value).
When both hands remain on the handlebar (typical for elderly cyclists), there is no additional turn resulting from the body. The total head turn is 90°.
The field of view is less than 180° (~10° on each side are missing).

➔ The truck is not visible ~15m behind the cyclist. It is in the blind spot of the cyclist.

The speed difference (50 – 14km/h = 36km/h = 10m/s)
➔ Less than 1.5s until the truck reaches the cyclist.

<table>
<thead>
<tr>
<th>not visible angle</th>
<th>10°</th>
</tr>
</thead>
<tbody>
<tr>
<td>Position cyclist</td>
<td>0.3m</td>
</tr>
<tr>
<td>(distance to the right)</td>
<td></td>
</tr>
<tr>
<td>Central position of the truck</td>
<td>0.35m</td>
</tr>
<tr>
<td>(distance to the right)</td>
<td></td>
</tr>
<tr>
<td>Truck width</td>
<td>2.55m</td>
</tr>
<tr>
<td>road markings invisible</td>
<td>&gt;16.7m</td>
</tr>
<tr>
<td>left truck corner invisible</td>
<td>&gt;14.7m</td>
</tr>
</tbody>
</table>
Problem of a Left Turning Cyclist
Theoretical Results

Für den Radfahrer ist die linke Ecke des Kfz ab ca. 14,7 m unsichtbar

Nimmt man für den Radfahrer eine Geschwindigkeit von 15 km/h und für den Lkw-Fahrer eine Geschwindigkeit von 50 km/h an, so erhält man eine Differenzgeschwindigkeit von 35 km/h

Leitet der Lkw-Fahrer nun einen Bremsvorgang ein, ist er 1 s später bereits 5 m hinter dem Fahrrad. Die Kollision mit dem jetzt abbiegenden Radfahrer ist nicht mehr vermeidbar!

„Er ist mir direkt vor das Fahrzeug gefahren!“
Analysis of Remaining Fatalities in Stuttgart

Stuttgart (~600,000 inhabitants)

In 2012 fatally injured road user: 7

Pedestrian vs. Tram: 4

Nico, keep our ears open!

Hanna Stop!

www.sicherzust.us.de
Tested Measure to Avoid Accidents Between Pedestrians and Trams

Cologne and Augsburg tested ground lights

No positive effect
Seat Belt Use
Parameter Vehicle Age

DEKRA investigation in Germany observed car occupants (19,519 persons)

Higher use of seat belts younger cars

influence of seat belt reminder
Belted Driver + Unbelted Child
Summary

- It is possible to reach zero road fatalities
- There is now a possibility to show „save“ areas instead of statistics regarding fatalities
- Pedestrian fatalities include a high share of night accidents
- Bicycle accidents happen mostly under perfect conditions
- The seat belt use is necessary everywhere

Thanks for the support of the IRTAD members
Measurements to Improve Road Safety

Implementation of Advanced Forward-Looking Safety Systems
Consumption of mineral water per capita + year

△ 137 liter

⇒ 16 boxes (with bottled water)

Town with 500,000 inhabitants

- 8 million boxes with mineral water per year
- 1 articulated trucks carries 1,632 boxes
  (48 boxes = 1 europallet, 34 europallets = 1 articulated truck)
- 8 million boxes water per year △ ~ 4,900 articulated trucks
- 16 articulated trucks per day, only for the necessity of bottled water!
Selected Accident Examples
Bicycle Accident with Municipal Vehicle
Practice Example
Visibility in the Mirror
Practice Example

Truck
Practice Example
Usage of Seat Belts by Heavy Truck Drivers

Speed 30 km/h

Load to the knee joint: torque 500 Nm in wrong direction

How to understand?
Measurement which Degrades Road Safety
Roundabout with „Art“ on the Central Island
Thank you!

COMMITTED TO

SAFETY