

# Road Safety: Strategies and Philosophies

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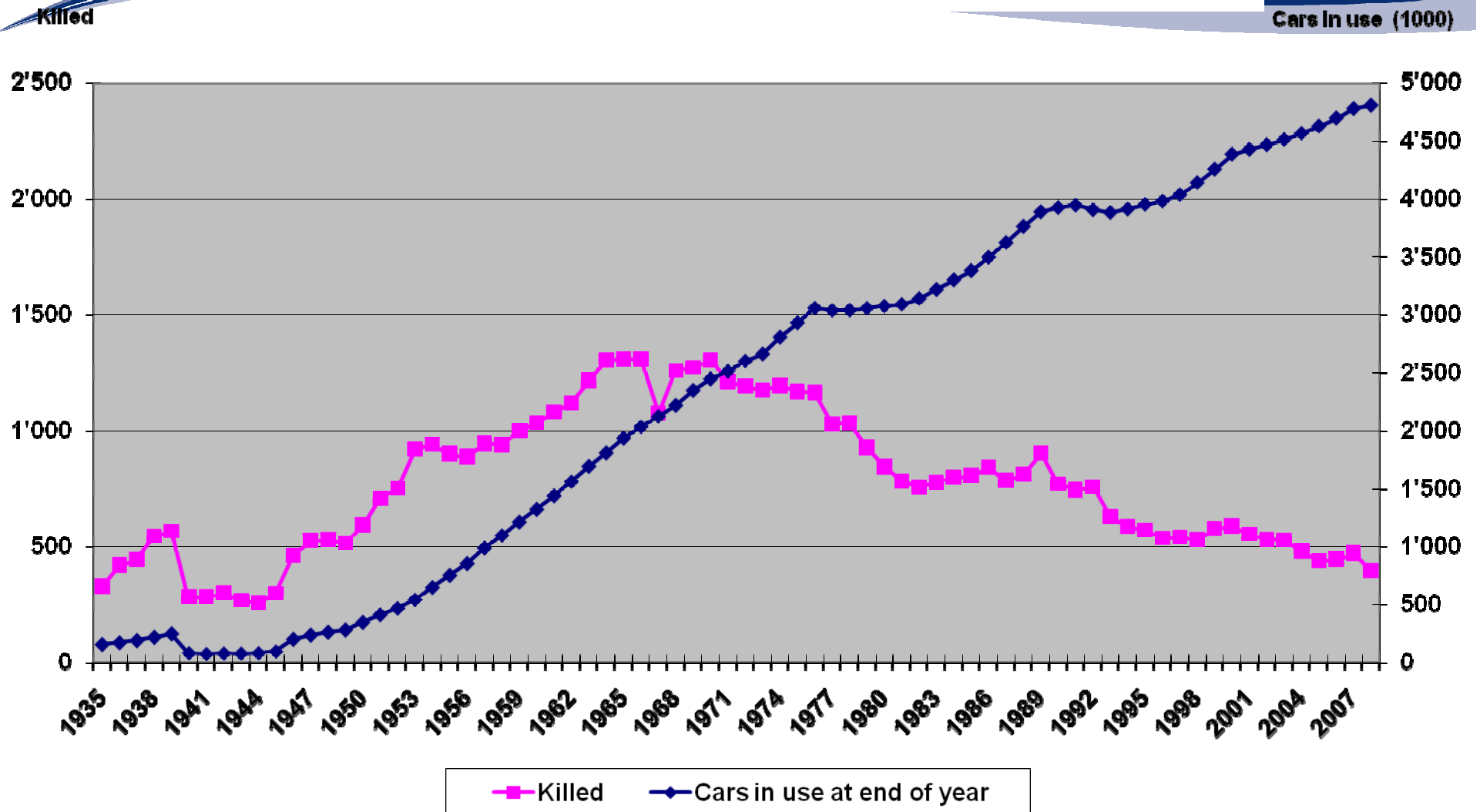
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# SWEDEN 2009



POPULAT.	9.2 MILJ
MOTORVEH.	4.8 MILJ
DRIVING LIC.	5.9 MILJ
FATALITIES	~ 400

## Persons killed in road traffic and cars in use in Sweden 1935-2008



Development

## Four approaches to Road Safety

Vehicle based safety systems

Injury prevention through vehicle-,  
road- and street design matched by  
appropriate speed

Traffic rules and regulations

All responsibility on the  
Road User

Time

# 15 years ago Sweden started to look for a new long-term road safety strategy

- Already one of the safest countries in the world (6 killed/100.000 inhabitants (2008: 4.4/100.000 inh., Oct. 2009: 3.7/ 100.000))
- Traditional strategy: fighting speeding, drunk driving, promoting safe driving, seat-belts etc..
- More of the same – or?

# Gradual improvement or eradication strategy?

- Targeting a 3-5% improvement per year leads to “more of the same” approaches
- Trying to *solve* a problem create “what if..?” solutions that could be more innovative and effective

## Gradual improvement or eradication strategy? (cont.)

- Sweden choose both strategies, because..
  - It is important to have continuity in some areas
  - Eradication strategy is riskier but *more rewarding* if successful

# Vision Zero: a Safe Traffic Concept

## History

- On October 9, 1997 the Road Traffic Safety Bill founded on "Vision Zero" was passed by a large majority in the Swedish Parliament. This represents an entirely new way of thinking with respect to road traffic safety.

## Goal

- The long term goal is that no-one shall be killed or seriously injured within the Swedish road transport system.



# Ethics

“It can never be ethically acceptable that people are killed or seriously injured when moving within the road transport system”

Why? Partly because being a road user is not a voluntary activity

# New approach to responsibilities

- Historically main responsibility on the road user (blame the victim approach)
- Vision Zero suggests a shared responsibility

## **New approach to responsibilities (cont.)**

- The designers of the system are always ultimately responsible for the design, operations and use of the road transport system and are thereby responsible for the level of safety within the entire system.
- Road-users are responsible for following the rules for using the road transport system set by the system designers.
- If road-users fail to obey these rules due to a lack of knowledge, acceptance or ability, or if injuries still do occur, the system designers are required to take the necessary further steps to counteract people being killed and seriously injured

# THE TYLÖSAND DECLARATION

## Articles

1. Everyone has the right to use roads and streets without threats to life or health
2. Everyone has the right to safe and sustainable mobility: safety and sustainability in road transport should complement each other
3. Everyone has the right to use the road transport system without unintentionally imposing any threats to life or health on others

**Changing  
Lanes**

**ROAD SAFETY SUMMIT  
SEPTEMBER 3-5 2007**

# THE TYLÖSAND DECLARATION

## Articles

4. Everyone has the right to information about safety problems and the level of safety of any component, product, action or service within the road transport system
5. Everyone has the right to expect systematic and continuous improvement in safety: any stakeholder within the road transport system has the obligation to undertake corrective actions following the detection of any safety hazard that can be reduced or removed.

# Road users have the right to know about the safety of cars and roads

examples

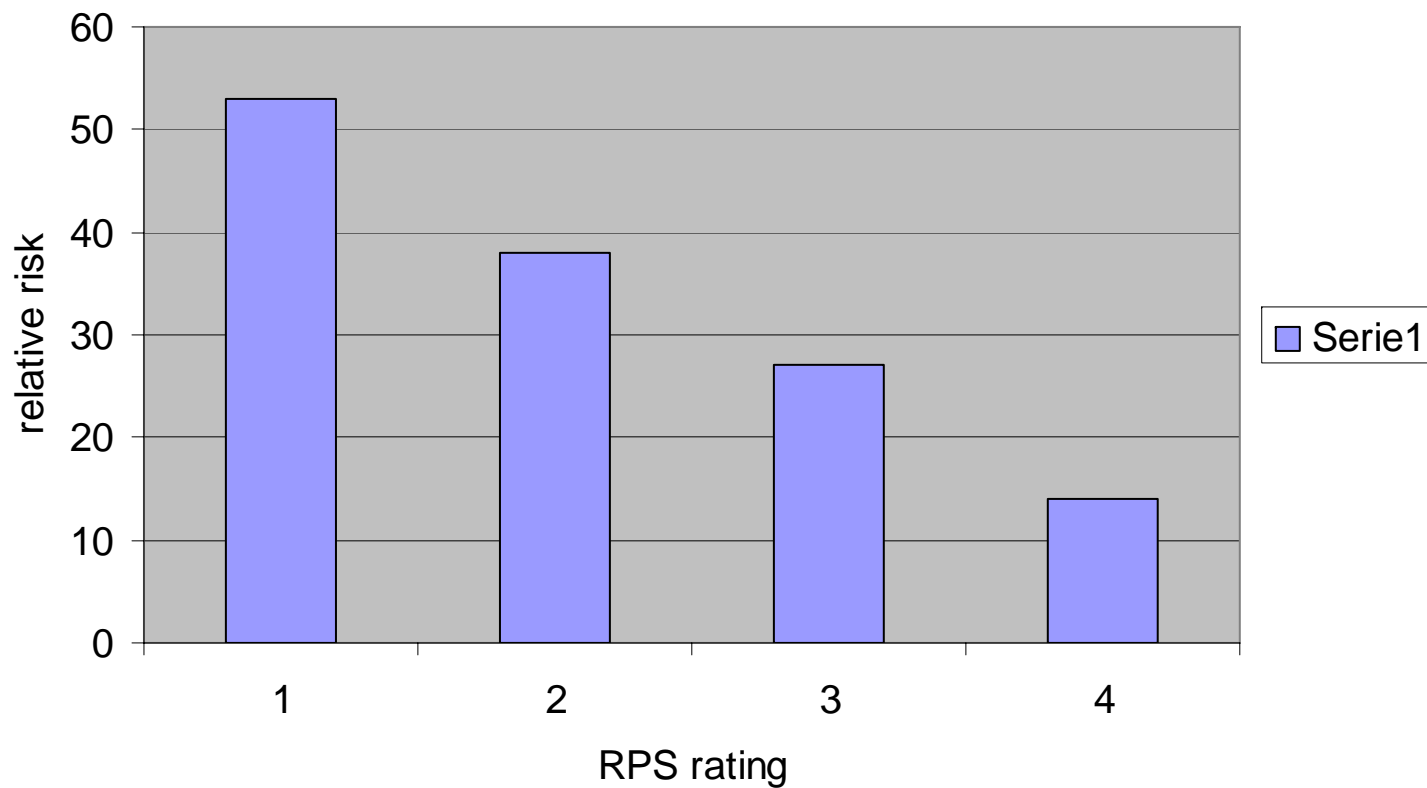
NCAP for vehicles  
([www.euroncap.com](http://www.euroncap.com))



## Ncap results:

- Every “star” reduces injury risk with 12%
- The presence of a Seat Belt Reminder (SBR) increases seat belt use to more than 99% (new cars sold in Sweden have SBR in 85%)
- Electronic Stability Control (ESC) reduces crash involvement by 20 – 40% (99% of new cars in Sweden have ESC)

Relative risk of fatality and severe injury for 1 to 4  
star rated roads (RPS) in Sweden

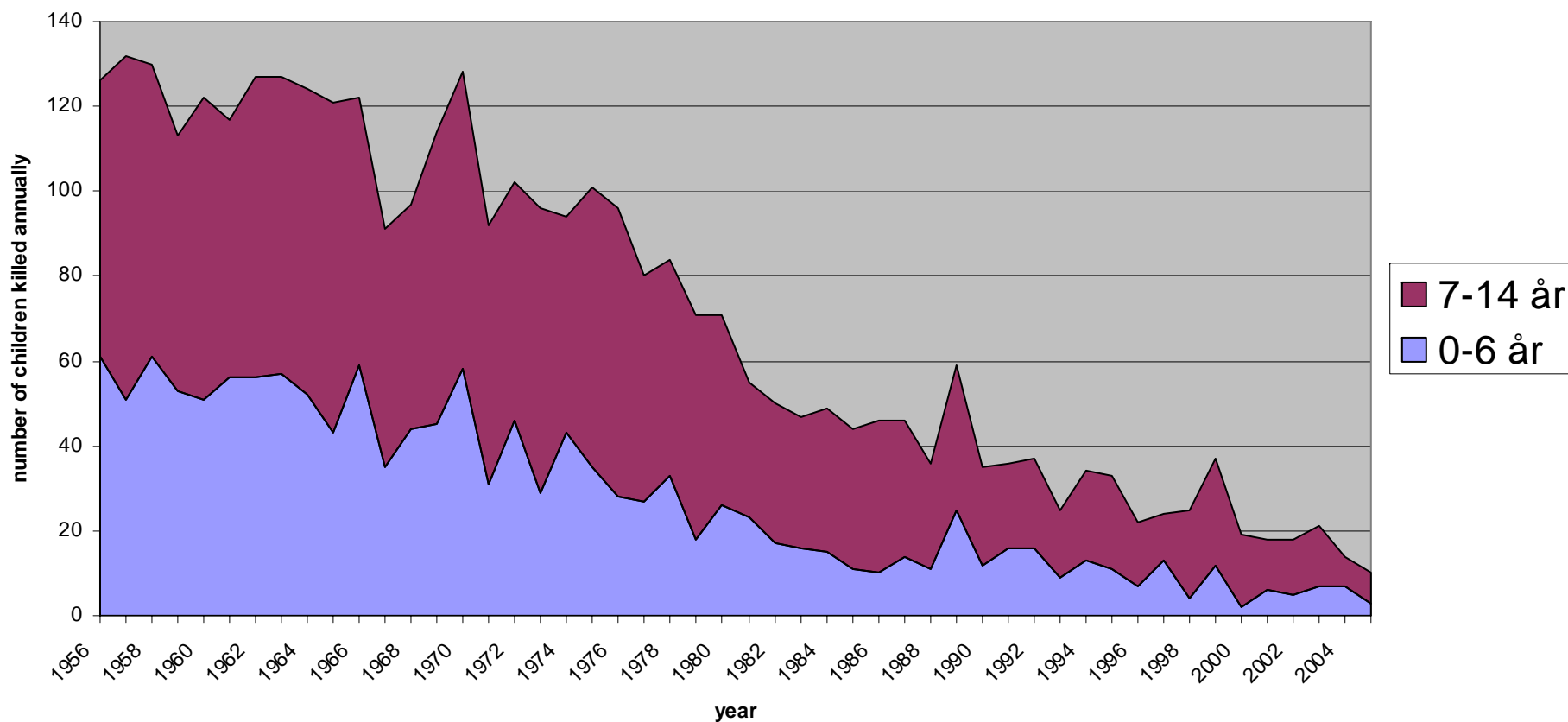




# Vision Zero safety results and future targets

- 15 years ago 6 killed/100.000 inhabitants/year
- 2008: 4.4 killed/100.000 inhabitants/year
- Oct 2009: 3.7 killed/100.000 inhabitants/year
- Target 2020 = 2.2 killed/100.000 inhabitants/year
- Future strategies leading to less than 1 killed/100.000 inhabitants/year

## Children killed in traffic in Sweden 1956-2005



# Swedish Policy for Traffic Safety for Children

- The safety of children is not a question for the child as a road user— parents and society should protect the child
  - Education for parents, school staff, traffic engineers etc
  - Measures focussed on safe environment (bicycle lanes etc), bicycle helmets, child seats in cars, safe school busses (belts, alcohol interlock >50% of all school busses have alcolock)
- Result of this strategy is a fatality rate of
  - Less than 1 killed/100.000 children/year (0-14)

# The health sector has contributed to vision zero in many ways

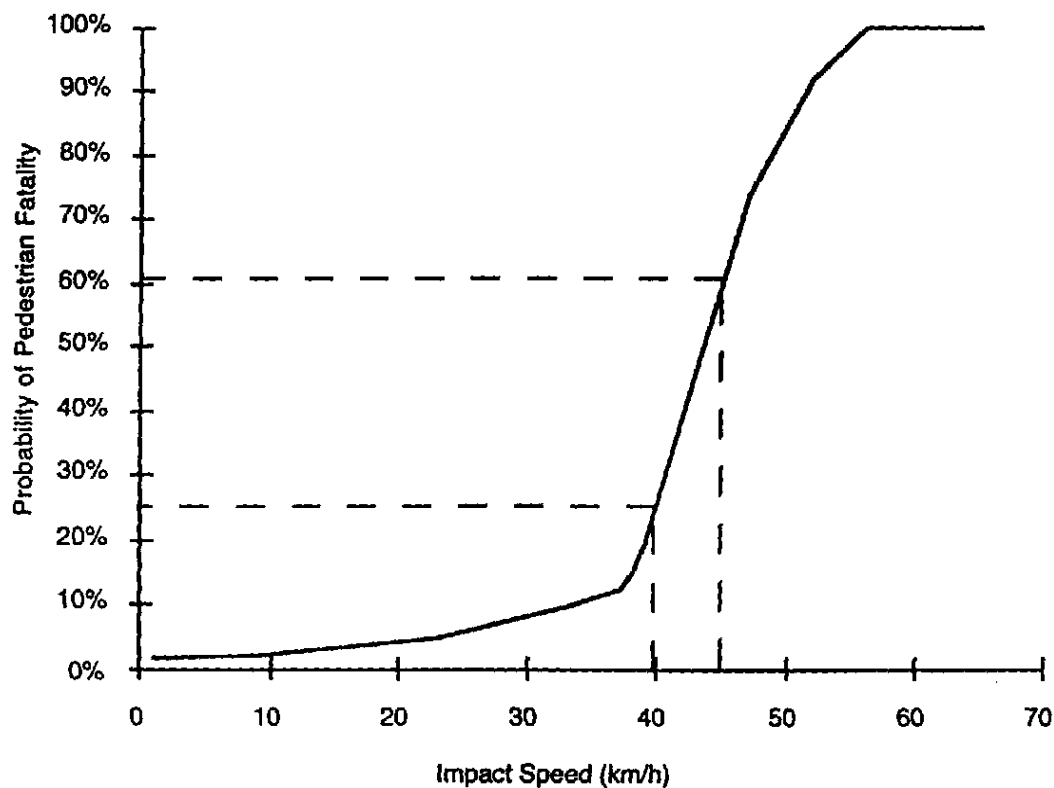
- Idea of disease eradication—smallpox eradication paved the way, showed it was possible
- Principles of occupational health and safety
- Biomechanics—a combination of engineering and biological sciences laid the groundwork for engineering improvements in vehicle, roadway, and helmet design
- Improved emergency services reduce post-crash injury and death
- Developing tools and approaches to reducing drink driving and impaired driving

## **Vision Zero Safety philosophy**

- Inspiration from other areas ( i.e. occupational health and safety)
- People make errors, mistakes and misjudgements
- There are biomechanical tolerance limits
- The chain of events can be cut at many places

# Probab. of pedestrian fatality as a function of impact speed

Figure 2: Probability of Pedestrian Fatality by Impact Speed.  
Derived from the Interdisciplinary Working Group for Accident Mechanics (1986) and Walz, Hoefliger and Fehrmann (1983)

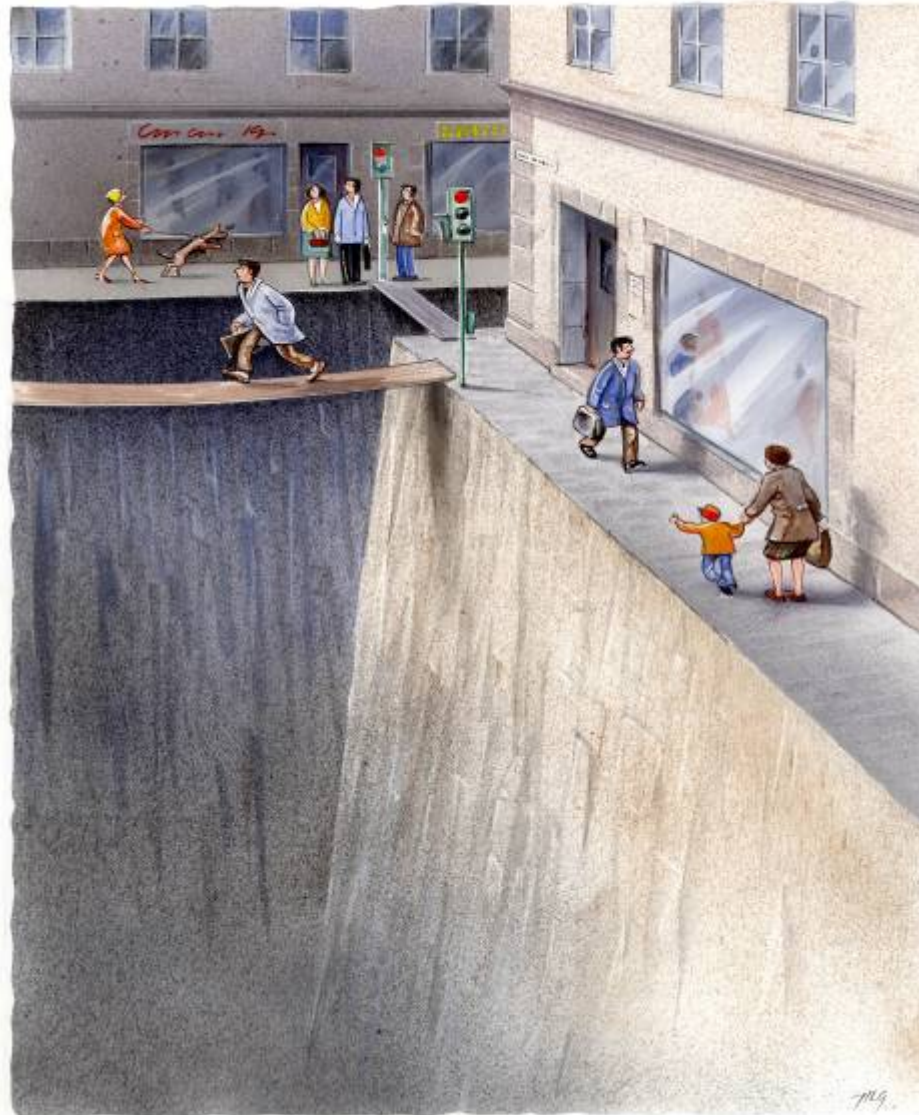


# Kinetic energy

- But – people are blind to kinetic energy!
- That's why you can't put all responsibility on the road user



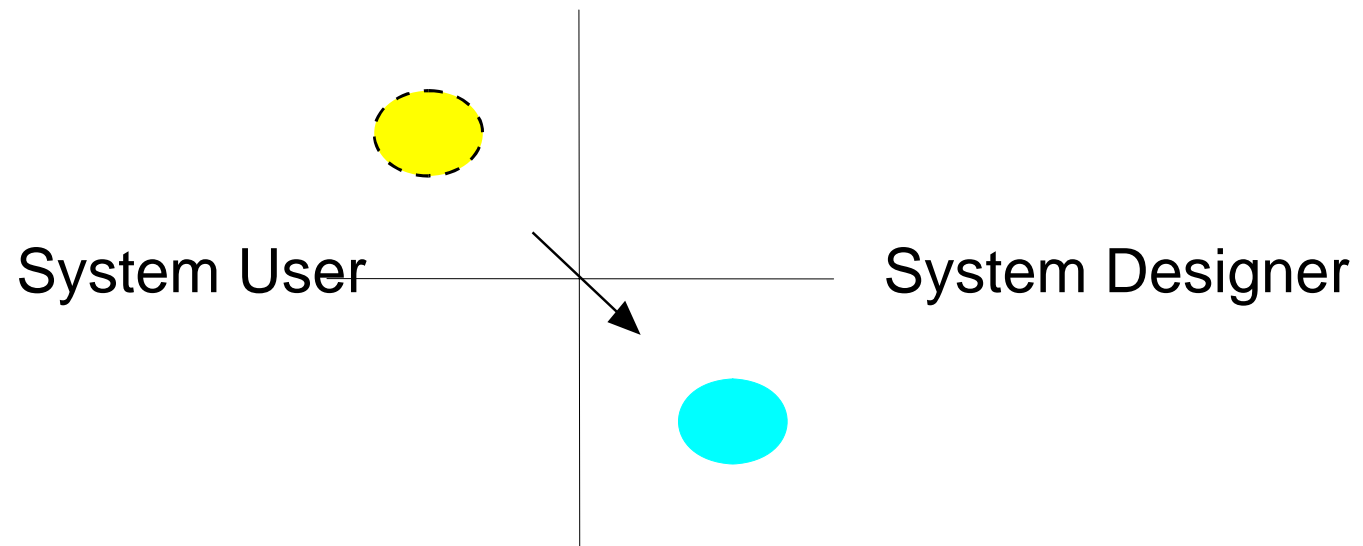








Problem of Accidents



Problem of Injury

# Vision Zero philosophy Integration and Separation.

1. Vulnerable road users should not be exposed to motorised vehicles at speeds exceeding 30 km/h
2. If 1. cannot be satisfied then separate or reduce vehicle speed to 30 km/h
3. Car occupants should not be exposed to other motorised vehicles at speeds exceeding 50 km/h in 90 degree crossings
4. If 3. cannot be satisfied then separate or reduce angle or reduce speed to 50 km/h

# Vision Zero philosophy

## Integration and Separation (cont).

5. Car occupants should not be exposed to oncoming traffic (other vehicles of approximately same weight) at speeds exceeding 70 km/h or 50 km/h (if oncoming vehicles are of considerably different weight)
6. If 5. cannot be satisfied then separate, homogenise weights or reduce speeds to 70 (50) km/h
7. Car occupants should not be exposed to the road side in speeds exceeding 70 km/h or 50 km/h (if road side contains trees or other narrow objects)
8. If 7. cannot be satisfied separate, remove objects or reduce speed to 70(50) km/h









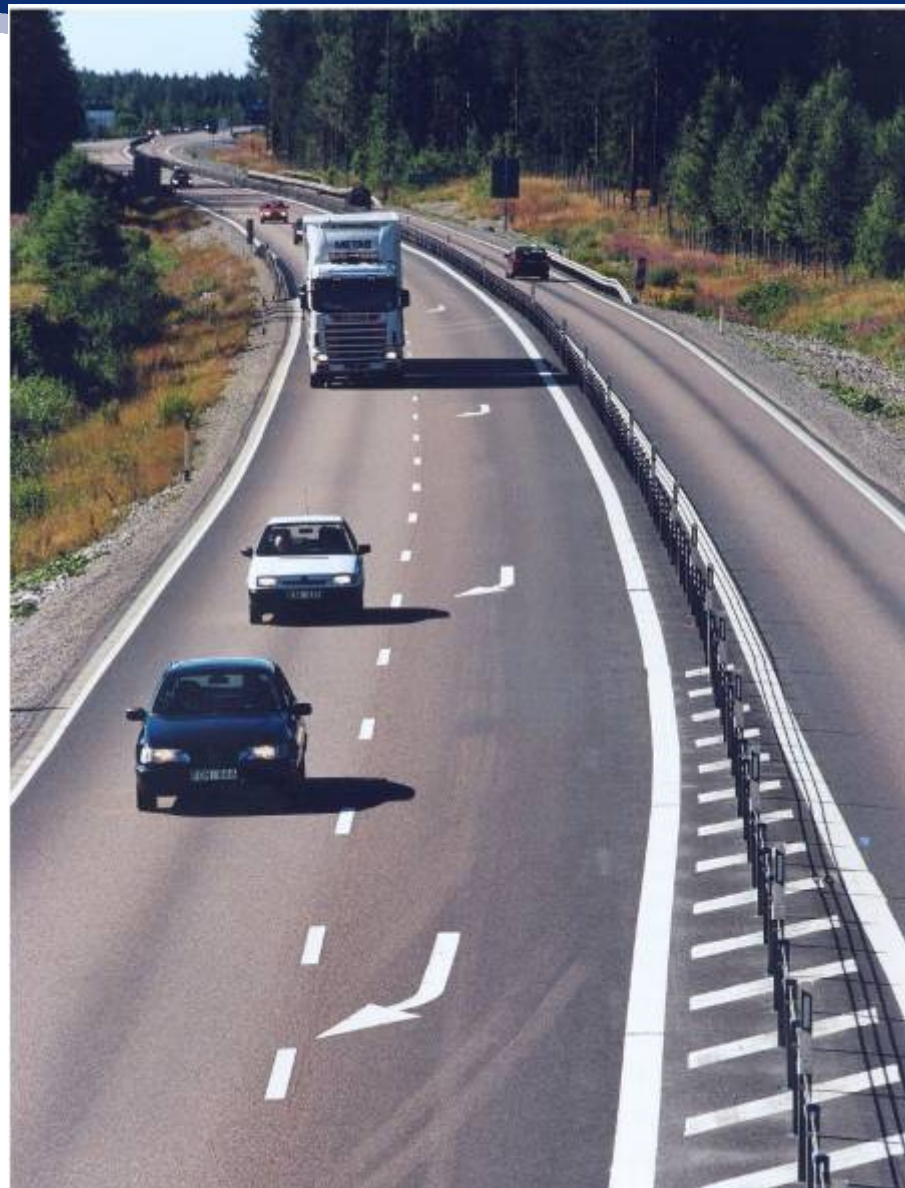


Reduction in  
Motorcycle  
fatalities -83%

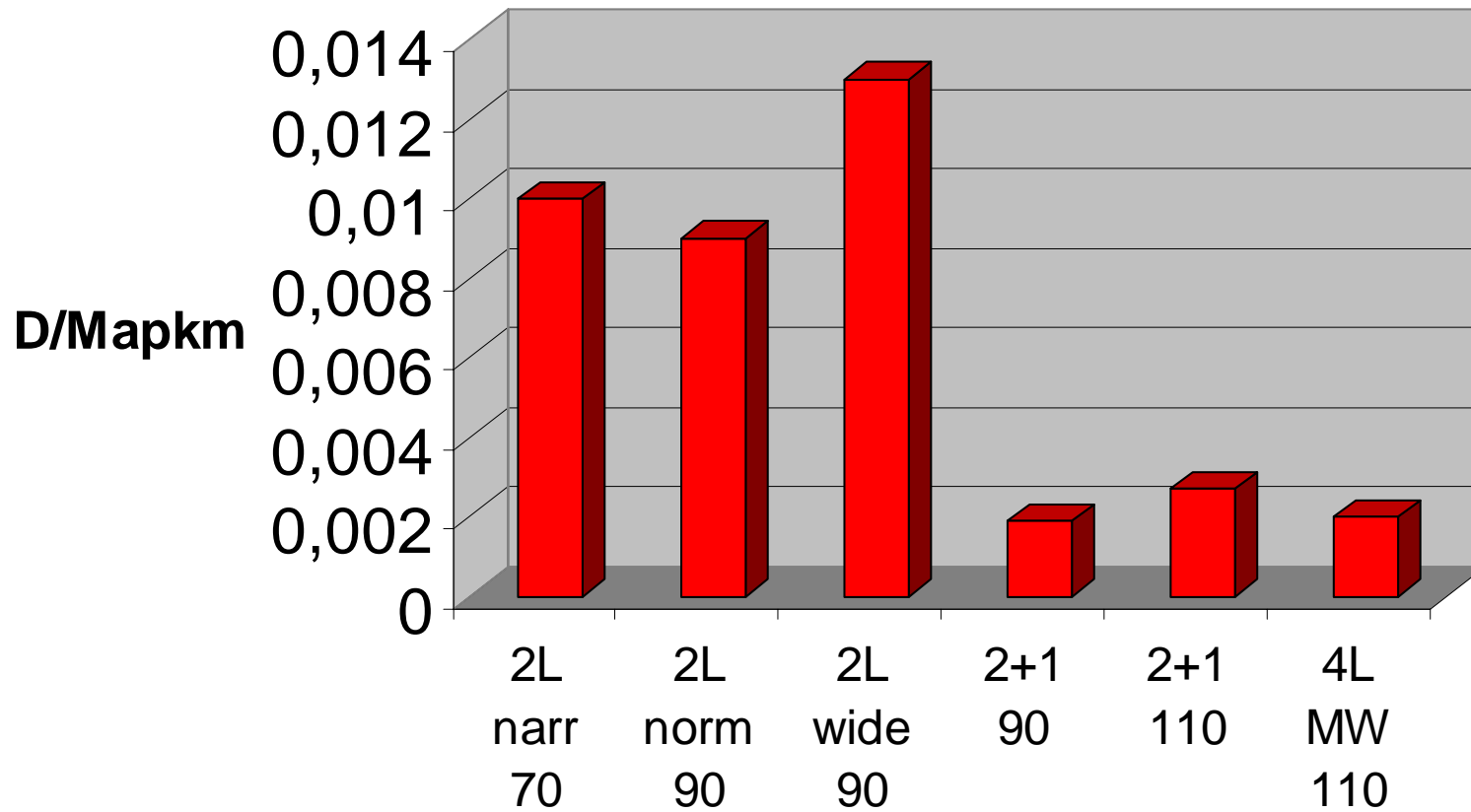
Typical view of Exclusive Motorcycle Lane

## 2+1 roads

- First built in 1998
- Now 2000 km
- Up to 90% reduction in fatalities
- Production cost 200-300 US\$/m
- Popular among road users



## Fatality rate



## Injury prevention by coordination road design/speed



- 10 years ago, 25% of vehicle mileage on national roads was median separated, today 52%
- 30 km/h were vulnerable are mixed with vehicles
- Roundabouts replaced crossroads
- New speed limit system were speed is set due to road design

## Injury prevention by coordination road design/speed

- Most effective approach so far
- National-, regional-, or local processes
- In 10 years 70% of the traffic safety problem seen in the mid 90's solved
- Stagnation phase in Sweden reached

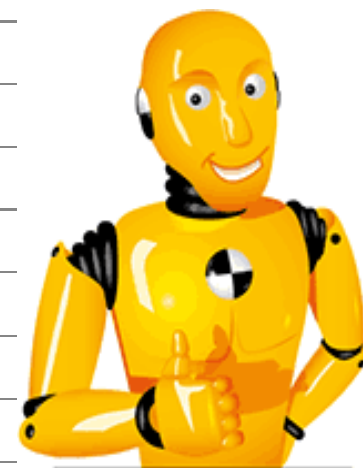
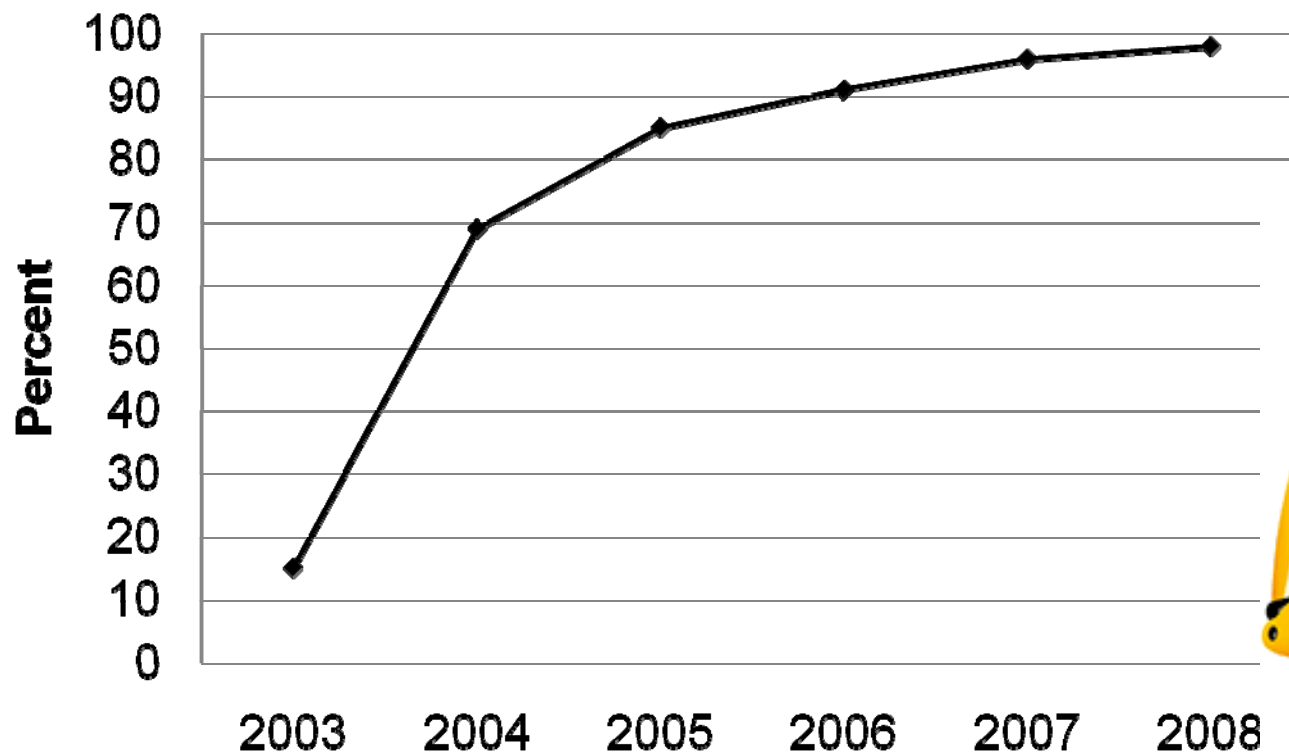


## Vehicle based Safety Systems

”Industry does not deliver until they are forced by regulation” is no longer true, at least not generally

- Most new systems are not regulated

## New Car Sales with ESC (Sweden)



**CHOOSE  
ESC!**

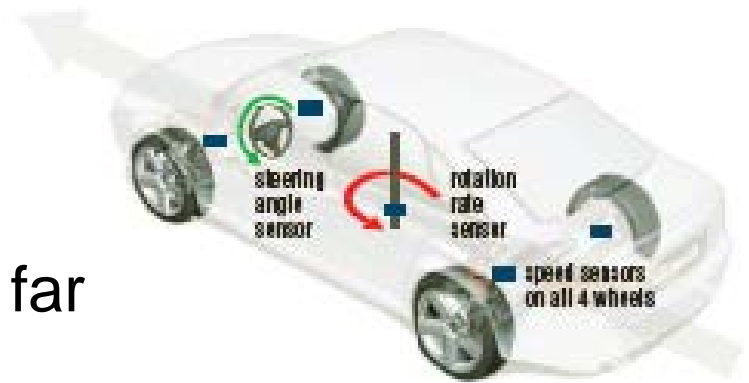


”Industry does not deliver until they are forced by regulation” is no longer true, at least not generally

- Most new systems are not regulated
- Most manufacturers have internal targets beyond regulated level

## Vehicle based safety systems

- Global development
- Fastest phase of development so far
- Automotive industry has research and development capacity beyond society  
*100 billion euro annually for safety development. (source CLEPA)*
- Solves classical safety problems in a new way

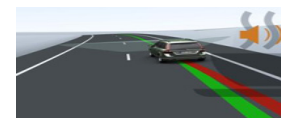


## Existing examples

- Where can you learn MC braking technique that reduces fatality and injury risk by 50% (ABS)
- Where can you learn driving technique for slippery roads that reduces fatality and injury risk by 25% (ESC)
- What kind of regulation or enforcement prevents drunk driving as well as a vehicle with alcolock ?

## New technologies with high potential

- Impaired driving (alcohol / fatigue)
- Seat belt reminders (50% unbelted in fatal crashes)
- Speed limit recognition and driver support (Speed Alert / ISA)
- Autonomous emergency braking
- Lane departure warning/assistance/control
- ESC



## Conclusions

- Natural next step in development of vision zero (human errors shall not lead to fatal or severe crashes)
- Relative fast implementation
- Integrated safety systems
- New interfaces
- New roles



## Road safety trends in business

- Travepolicies
- Purchasing demands on products and services
- Labeling systems
- Systematic work: ISO 39001



**Road safety is on the market!**

# ISO 39001 Road-traffic Safety management system

- A management system for road traffic safety can help organisations to be better
- It should use structures similar to existing management standards (ISO 9001 for Quality Management and ISO 14001 for Environmental Quality Management)
- It should clearly define "Road Traffic Safety" – Vision Zero and the Tylösand Declaration may form the basis
- It should handle the complex interfaces between an organisation and the road transport system
- It should use a predefined set of road traffic safety performance indicators

# Sweden is implementing its 5th generation management system for road safety

- Continue to build on the strengths of Vision zero
  - Responsibility of system designers, ethics, user-rights, etc
- More comprehensive management system
  - Includes all relevant stakeholders and all their relevant activities
  - Simultaneous strategic-, tactic-, and operative planning
  - Transparent and open presentation of targets and results on various levels of detail



# Sweden is implementing its 5th generation management system for road safety (cont.)

- Strategic planning is made on national level but with broad collaboration of public-, private-, and civil organisations
- Operative planning is always made within each organisation (supported by ISO 39001 management system)
- Tactical planning is a negotiation

# Sweden is implementing its 5th generation management system for road safety (cont.)

- Operative results are always produced and presented by each organisation
- National targets and results are aggregated and/or produced on national level
- Results are made public annually at “Result conferences” and in publications

# Thank You!

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