

Safe, clean and affordable mobility

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The current road transport system

- Major public health problem
- Major mismatch between components of the system
- Trade-off between health and benefits allowed
- Unclear responsibilities
- Unclear safety philosophy
- Weak driving forces for change

The Concept of Safety

A safe road transport system is a system where mobility does not lead to serious health losses!

Is it possible, is it affordable, does it conflict with environment, does it reduce mobility and is it a desire from the public?

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.

Ethical platform


- Human life and health is paramount
- Life and health can not, in the long run, be traded against other benefits
- Mobility is a function of the safety level

Shared responsibility

- Historically main responsibility on the road user
- In Vision Zero the responsibility is shared between road users and system designers

Shared responsibility

System designers are responsible for the design, operation and the 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 the users fail to comply with these rules due to a lack of knowledge, acceptance or ability, the system designers are required to take the necessary further steps to counteract people being killed or injured.

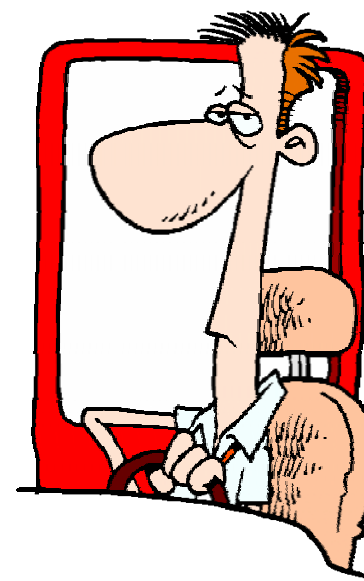
Safety Philosophy

”Any well functioning man-machine system brings the failing human into the loop”.

”Blaming the victim approach is a catastrophe to prevention”.

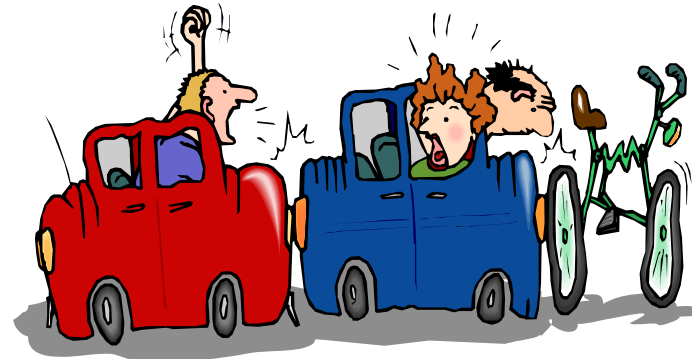
“Rule of Science”

“We shall only use the best possible methods and base our action on the failing human”



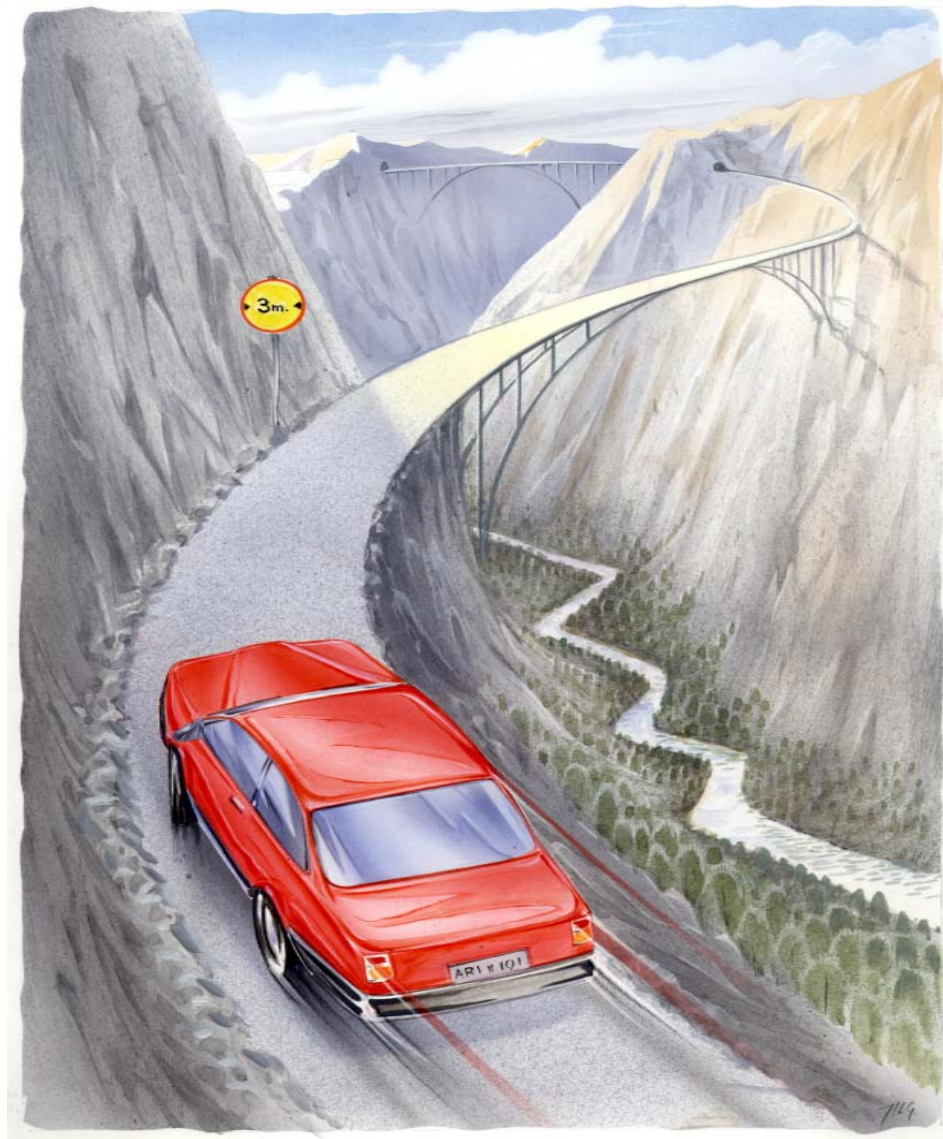
“Rule of Science” - cont.

“The biomechanical tolerance of the human is the limiting factor for the road transport system”



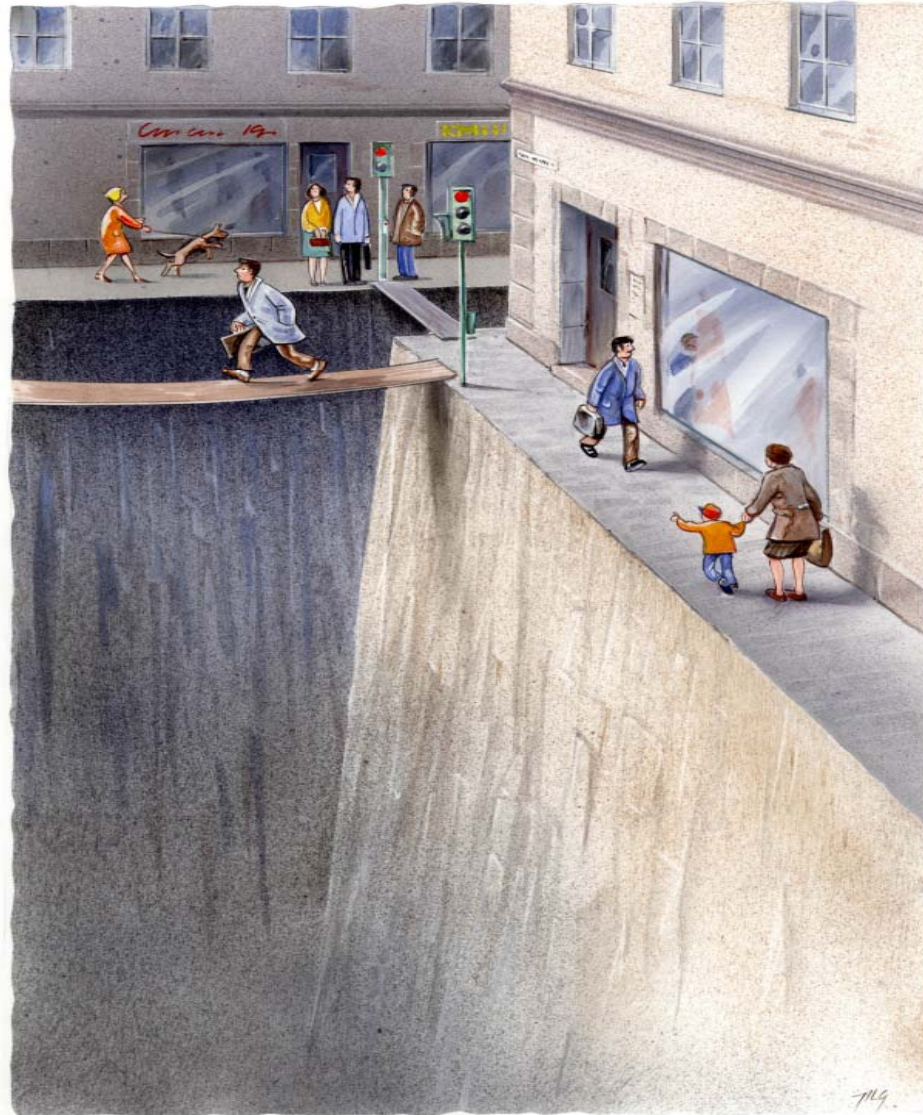










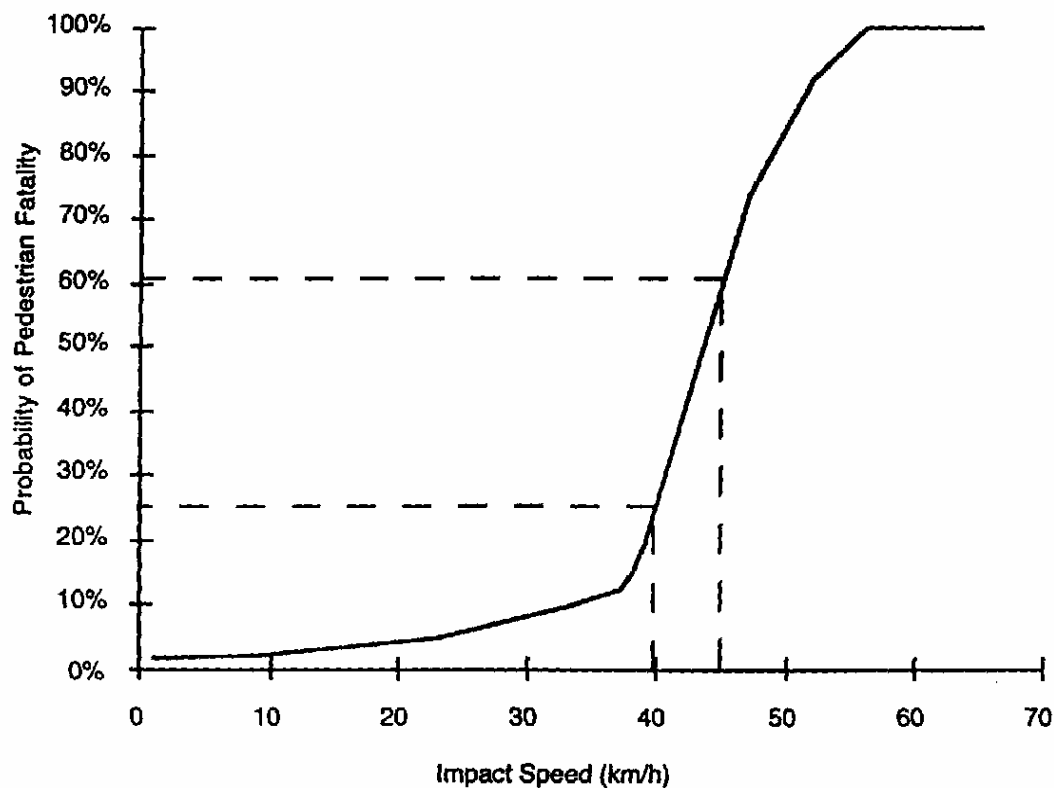


‘The Biomechanics of the Human’

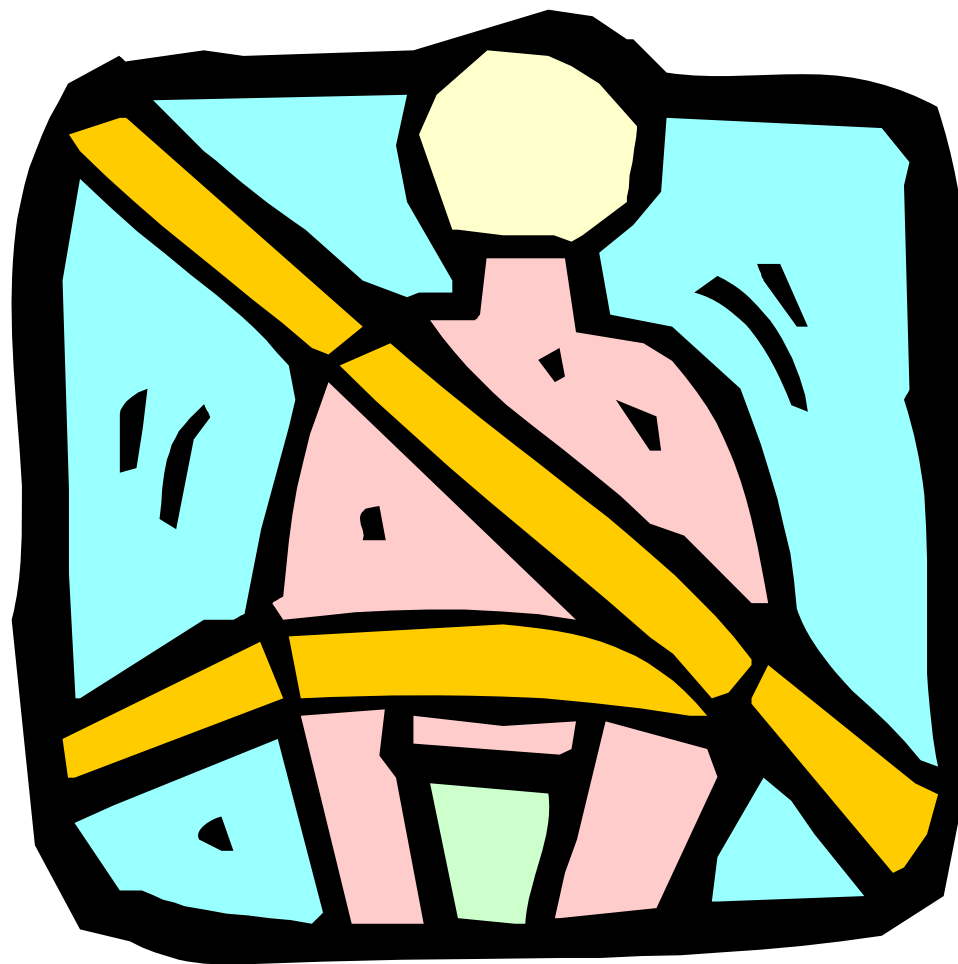


Probab. of pedestrian fatality as a function of impact speed

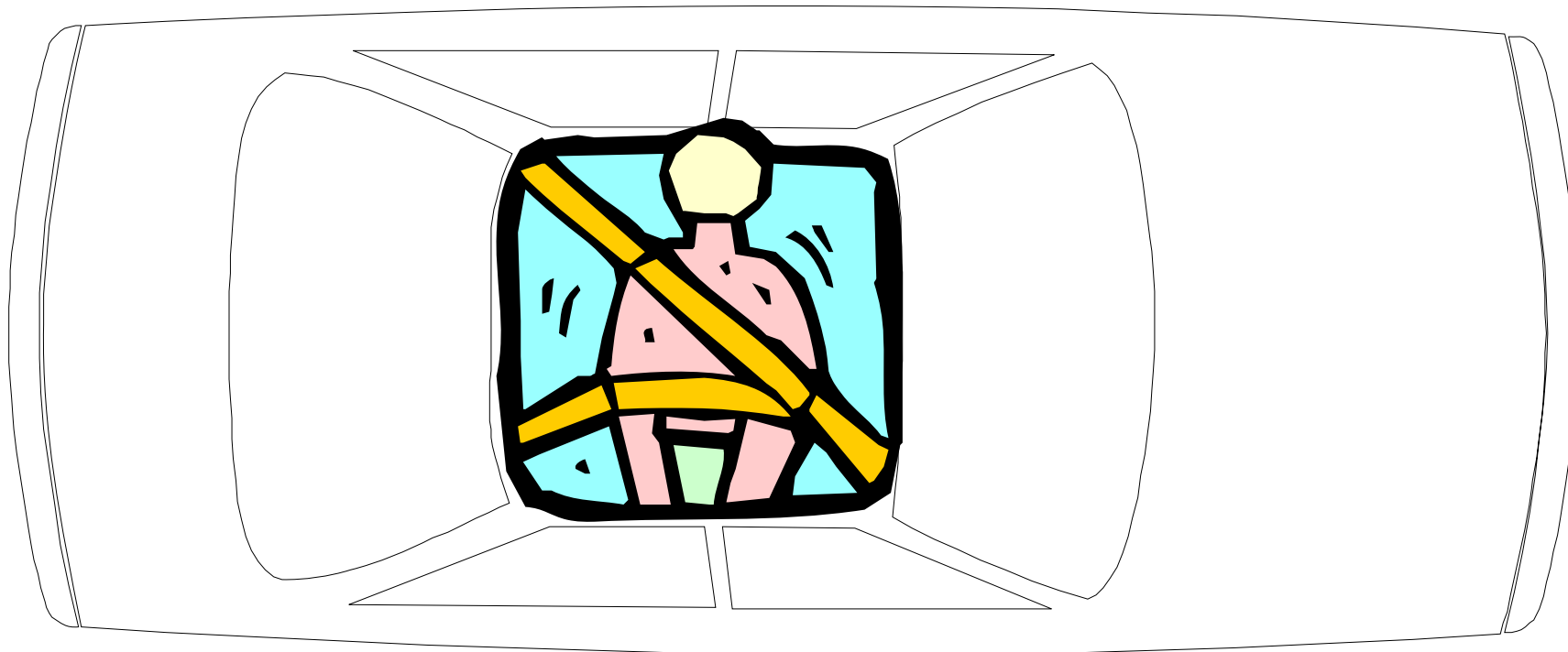
Figure 2: Probability of Pedestrian Fatality by Impact Speed.
Derived from the Interdisciplinary Working Group for Accident Mechanics (1986) and Walz, Hoefliger and Fehrmann (1983)



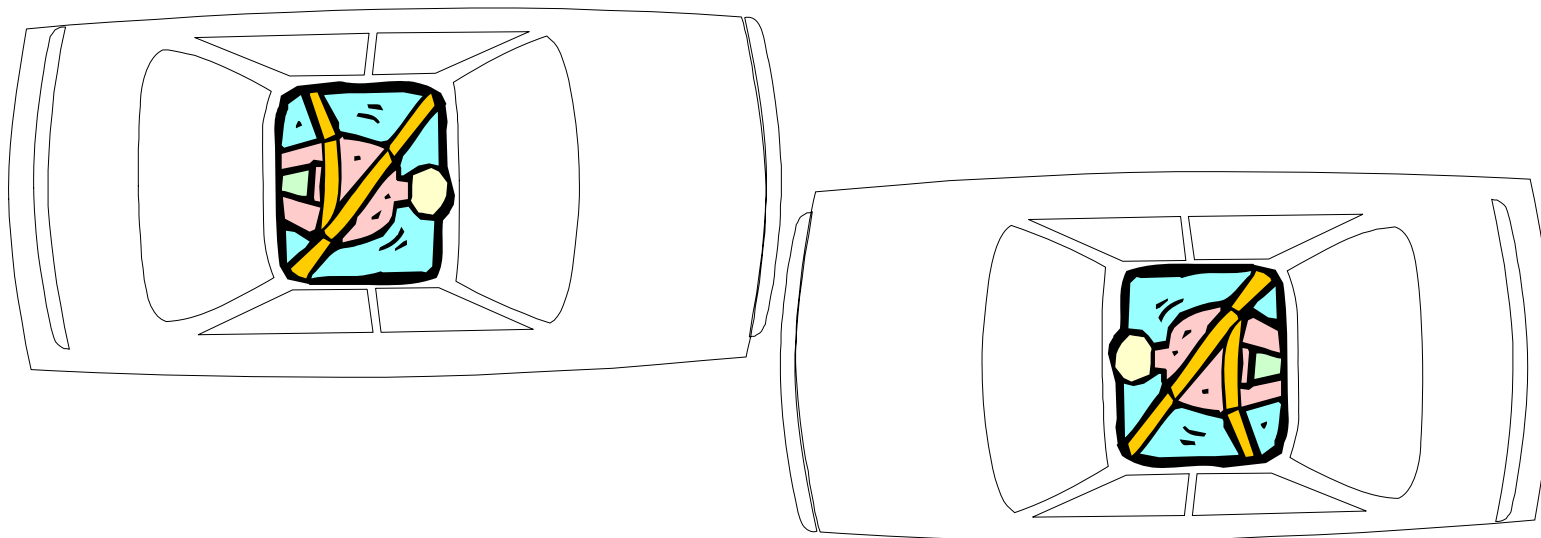
'The Restrained Occupant'



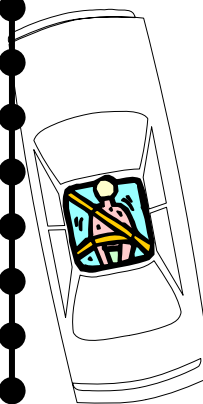
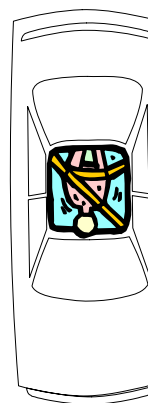
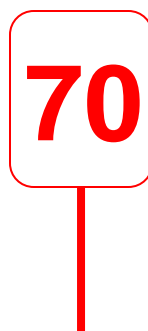
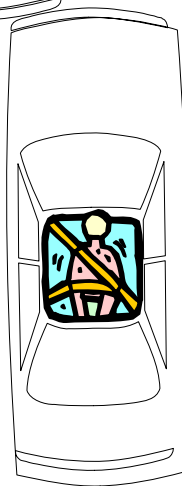
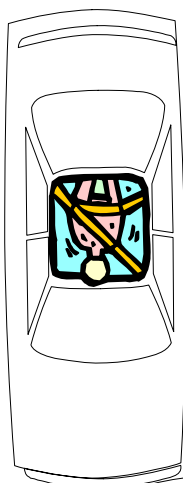
'The Crashworthy Vehicle'



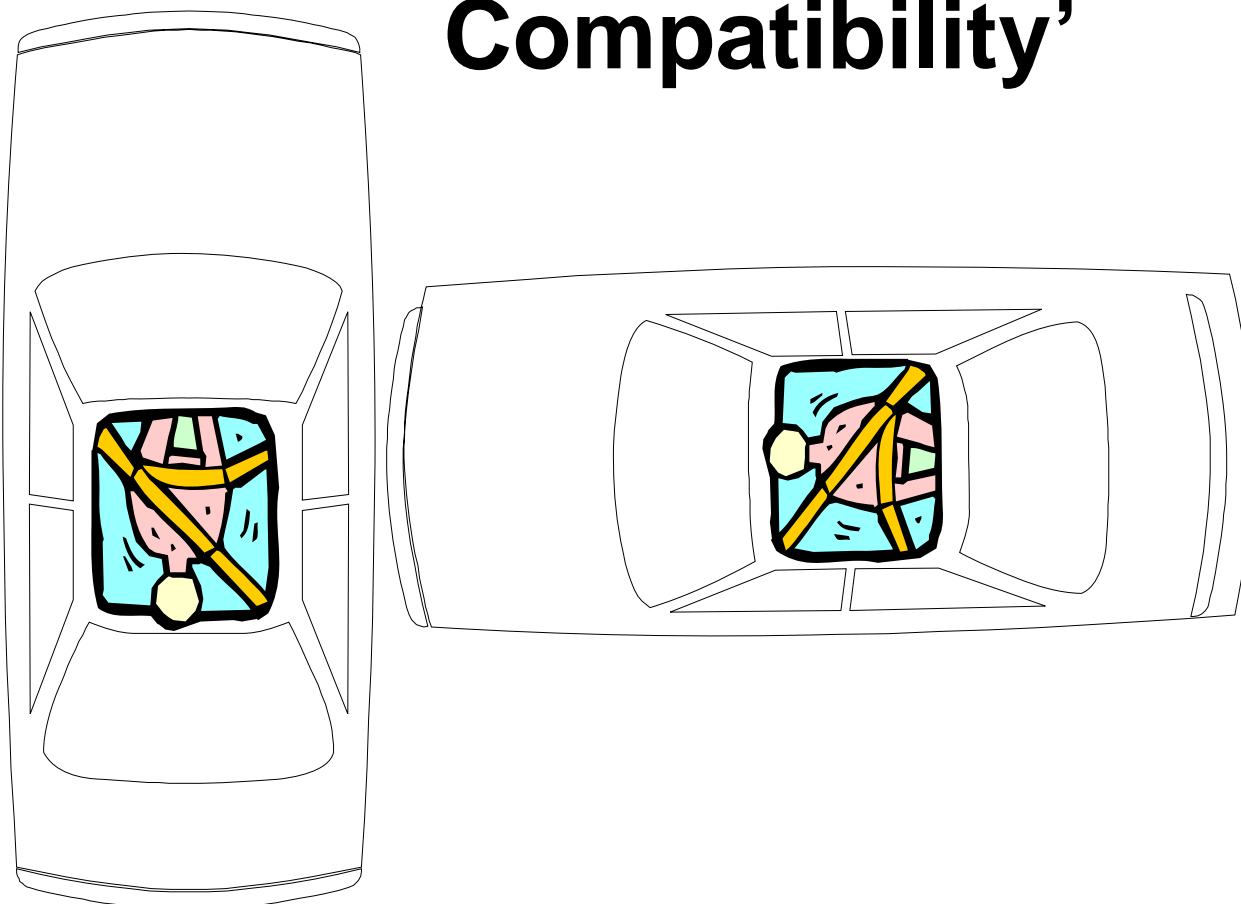
Compatibility



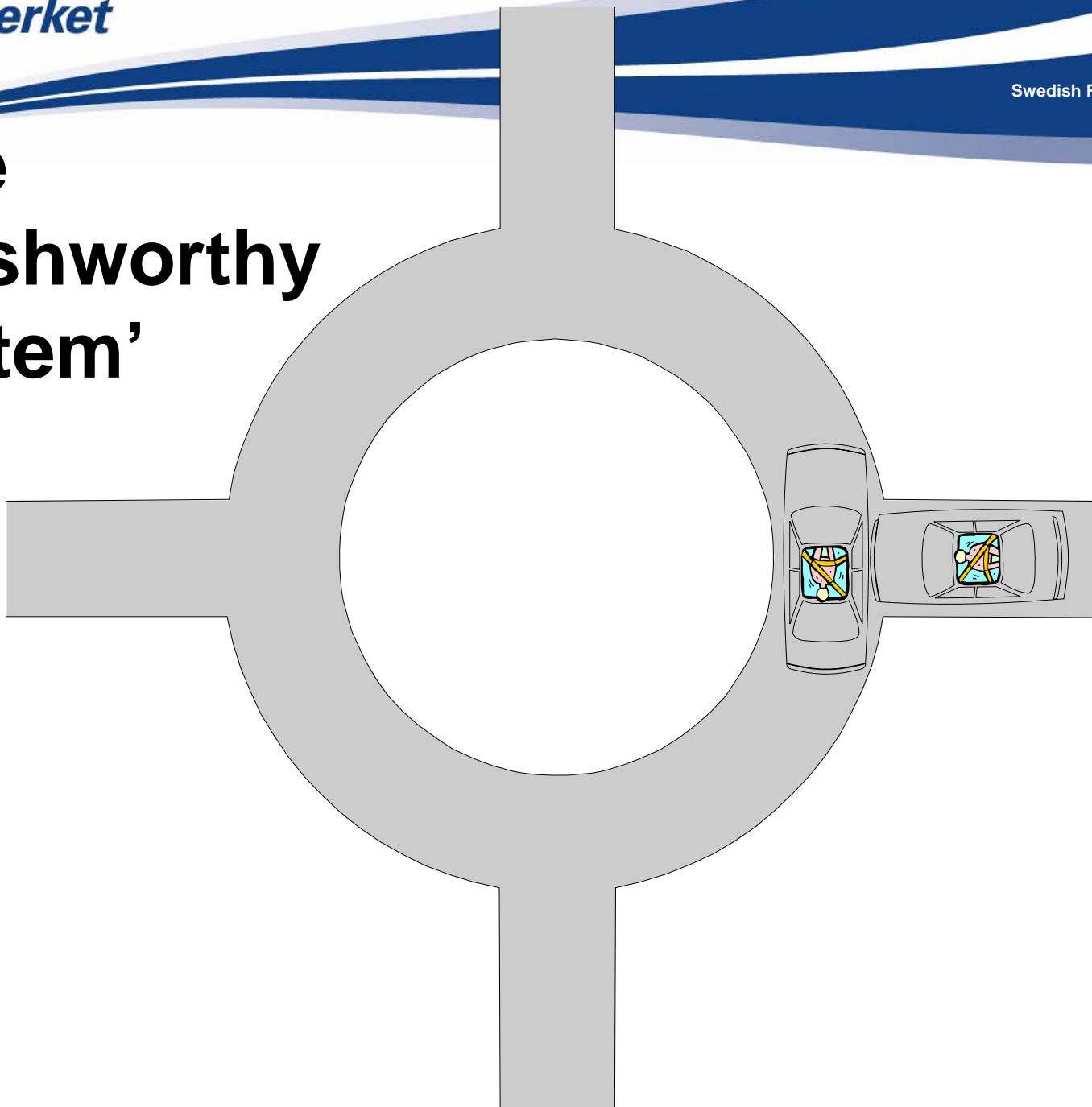
The Crashworthy System



‘Vehicle-to-vehicle Compatibility’



'The Crashworthy System'



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

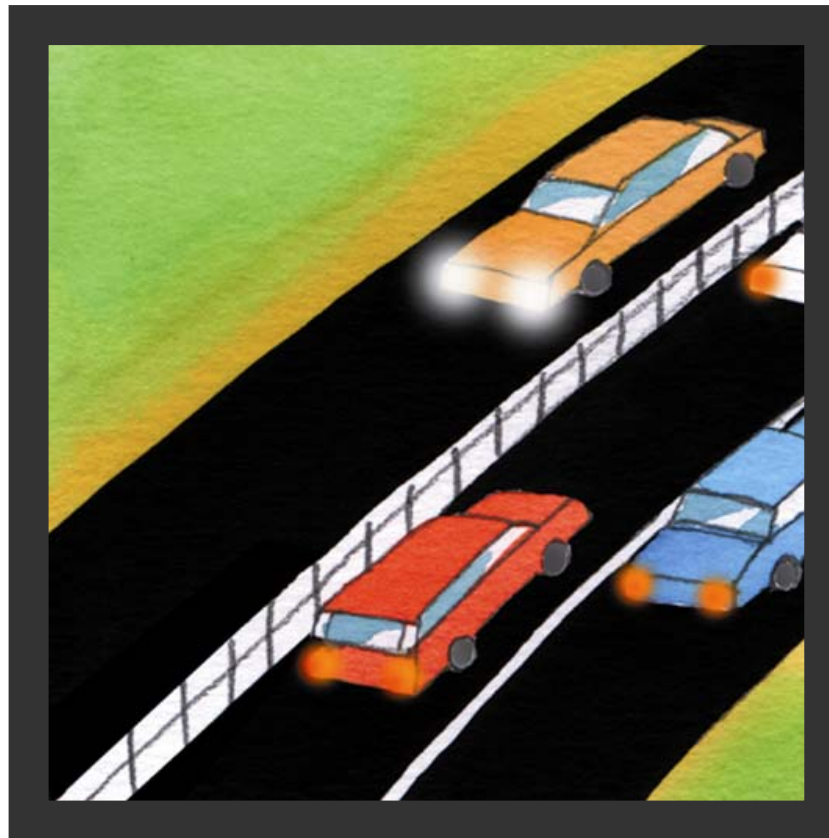
Integration and Separation (cont).

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

Use of the principles of Integration and Separation

- To create an *error-tolerant* transport system, e.g. a system where accidents can happen without severe human injury
- Widespread use of these principles in built-up areas in Sweden
- Some use of principles on rural roads e.g. 2+1 roads
- Full implementation of these principles would give a new 5-star rating in EuroRAP

CENTRE GUARD RAILS



On existing 13m wide roads

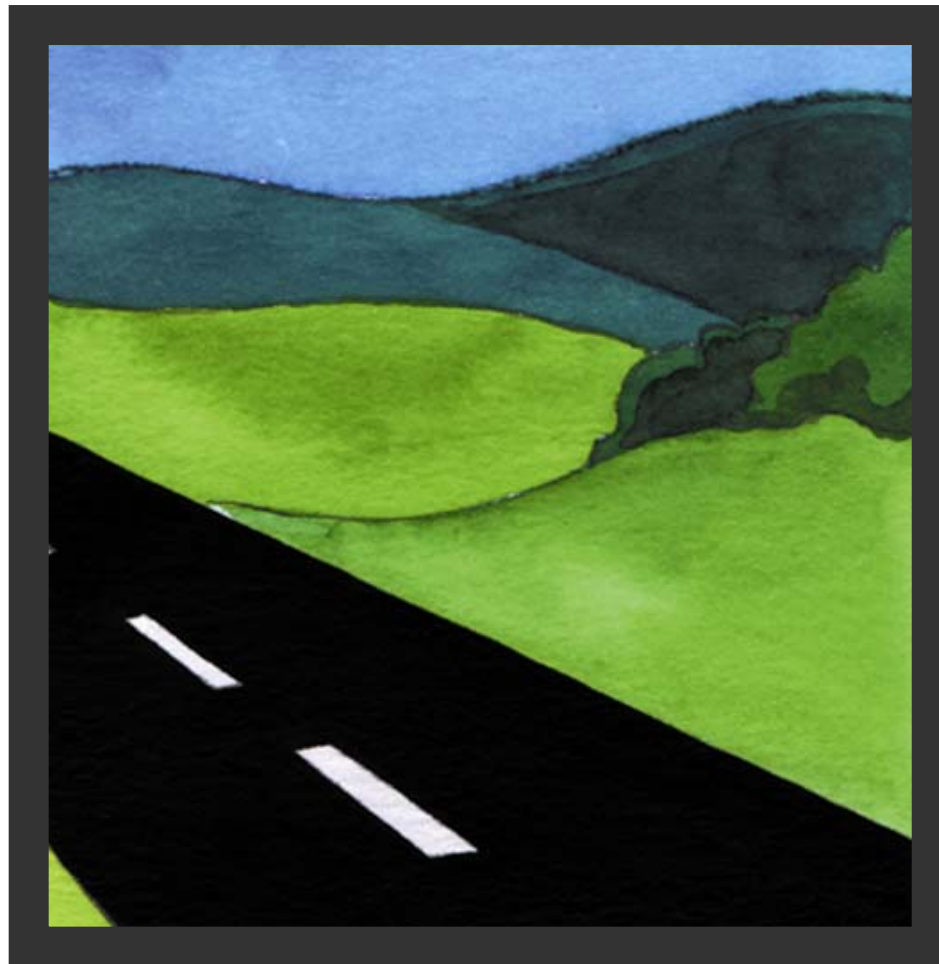




Results of mid barrier programme

- From 22% of the traffic flow in 1998 to 38% in 2007
- On the 38% of the traffic flow 35 fatalities, on the 62% 280 fatalities - factor 5
- 10-20 times more cost effective than earlier, in fact a marginal decrease of the cost of saving lives.

SAFE ROAD AREAS



Design for people leaving the road



Results of improved side areas

- Euro - RAP shows a 50% reduction of serious and fatal injuries for 4-star side areas than 2-star areas
- Treatment with barriers is highly cost effective

ROUNABOUTS



Intersection with problems
Focus on crashes results in signals
Focus on injuries results in roundabouts



Results of roundabouts

- 80-90% reduction of fatal injuries compared to traditional intersections
- Generally well accepted by citizens

RIGHT SPEED



Vehicles, roads and speeds must match







Gothenburg a good example

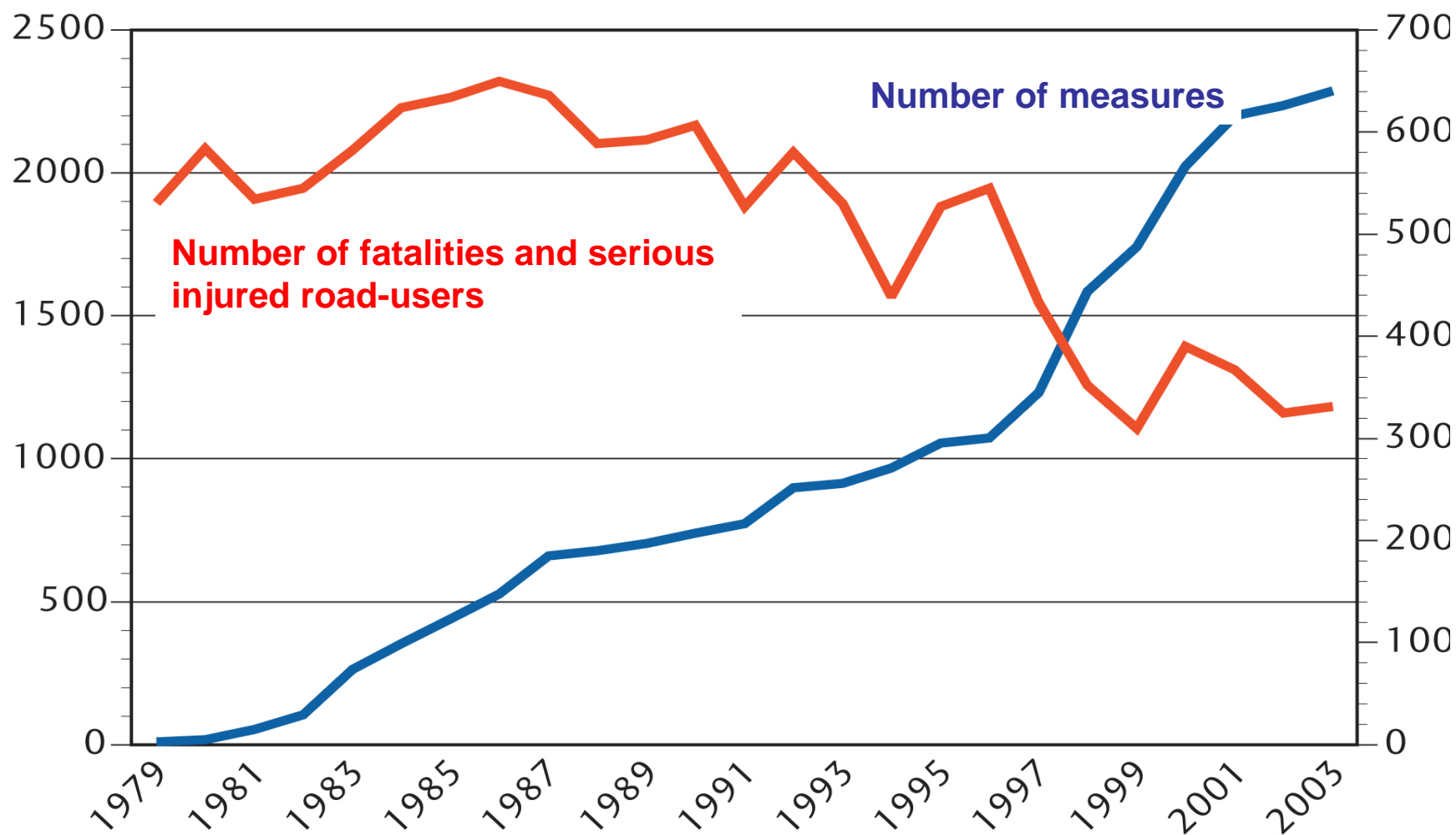




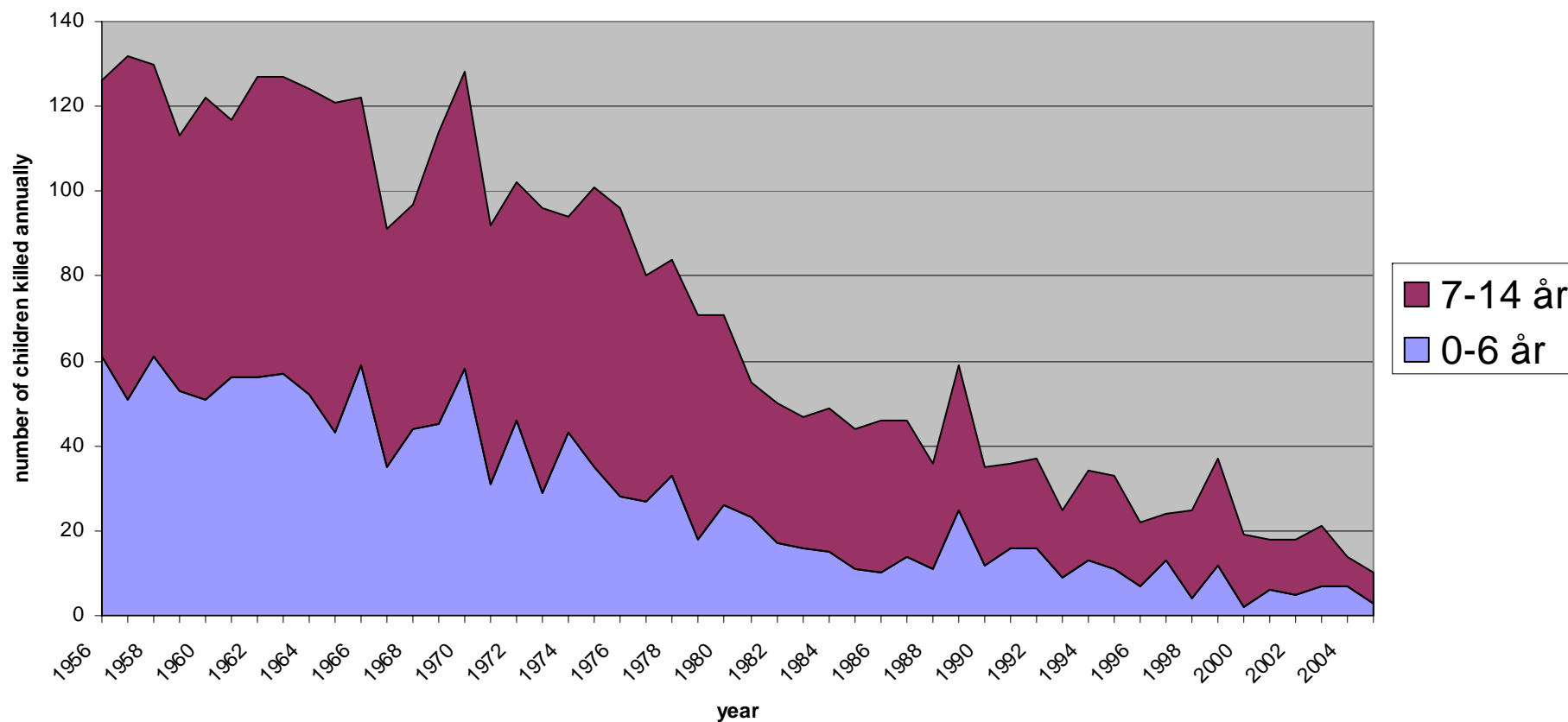




Traffic safety countermeasures and effects in Gothenburg



Children killed in traffic in Sweden 1956-2005



Is safety in conflict with environment?

- Energy consumption is the key to both safety and environmental issues like global warming
- Safety can be combined with the liveable city

Is safety affordable?

- The eradication principle is cheaper long term than gradual improvement
- The new safety principle, to control kinetic energy, is by itself cheaper than accident prevention
- The new safety principle is not based on all other “traditional” safety countermeasures to same extent

Typical costs

- if made right from the beginning

	Current costs in EURO	Costs for highest safety	Increase	Effectiveness
Road	1500	1,515 (barriers)	1%	90%
Vehicle	20,000	20,002 (SBR)	0.01%	20%
Vehicle	20,000	20,020 (alcohol)	0.1%	20%
Vehicle	20,000	20,200 (speed)	1%	20%

Is safety in conflict with mobility?

- Mobility is poorly defined - the question is complicated to answer
- If mobility is accessibility, safety would never be in conflict
- If mobility must be affordable, safety would never be in conflict
- If mobility is reliability, safety is seldom in conflict
- If mobility is less time on the road, safety costs more!

Summary

- Safety is a key element of sustainable mobility
- Using sound principles, safety could be achieved at low costs without conflict with environment and mobility
- “Eradication” principle is more effective
- Infrastructure is the key to safe mobility!