



## **Innovative measures to reduce non-motorised transport fatalities**

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# Scope of presentation

- Terminology and examples of NMT innovations.
- Need for an innovative approach to reduce non-motorised transport fatalities:
  - Focus on Decade of Action for Road Safety 2011 – 2020
  - Flag areas that need innovative thinking.
  - Also cover other areas that would assist traffic officers.
- Innovative measures to improve non-motorised safety:
  - Road safety management
  - Safer roads and mobility
  - Safer vehicles
  - Safer road users.
- Conclusions.

# Terminology



- **Innovation:** “Introduce a new process or way of doing things” (Oxford Dictionary).
- **Intervention:** “The systematic process of assessment and planning employed to remediate or prevent a social, educational or developmental problem” (The Free Dictionary).
- **Non-motorised transport** (NMT Facility Guidelines 2014):

Pedestrians	Cyclists	ADT
Child	Neighbourhood	Passengers
Adult	Commuter	Goods
Disabled	Recreational (and tourism)	

# Classical example of an innovation: Cycle lanes in The Netherlands, 1930



# Innovations to NMT Challenges (Haddon 1973)



1. Prevent aggregation of a particular energy form – encourage alternative travel modes, e.g. **greening of transport.**
2. Reduce the amount of energy aggregated – reducing opportunity for speeding, e.g. **traffic calming.**
3. Prevent the inappropriate release of energy – better brakes e.g. **anti-skid braking systems** (ABS).
4. Alter the rate or spatial distribution of release of the energy from its source – e.g. **rounded surfaces** reduce stresses on the human body.
5. Separate susceptible structures from the energy being released by means of space or time – e.g. **vertical separation of bicycles and pedestrians.**



# Innovations to NMT Challenges (Haddon 1973)



6. Interpose material barrier to separate the released energy from susceptible structures, e.g. ***bollards and fences*** between pedestrian paths and roads.
7. Modify contact surfaces or basic structures that can be impacted, e.g. ***softer car and bus fronts, cycle helmets***.
8. Support human beings who are susceptible to damage by the energy transfer, e.g. older road user ***crossing devices***.
9. Quickly detect and damage, and prevent its continuation or extension, e.g. extraction of crash victims – ***jaws of life***.
10. Carry out all necessary measures between the emergency period immediately following damage and ultimate stabilization of the process, e.g. ***Golden hour principle***.

# Decade of Action for Road Safety: 2011-2020

- DOA: Reduce fatalities by 50% by 2020. NMT fatalities more than 40% - major focus area for innovative action.
- Millennium Development Goals in Africa: 40% fatality reduction.
- Identify NMT innovations within Pillars of DOC:
  - **Pillar 1: Road safety management**
    - Strategy, Funding
  - **Pillar 2: Safer roads and mobility**
    - Improved road design for all users, road infrastructure
  - **Pillar 3: Safer vehicles**
    - Harmonization of vehicle standards, Intelligent "vehicles", R&D for Vulnerable Road Users
  - **Pillar 4: Safer road users**
    - Jaywalking, Social media, pedestrian BAC laws
  - **Pillar 5: Post-crash response.**
    - Golden hour

# Road safety management

**Dutch Sustainable Safety** - Five principles for sustainable safe road traffic:

1. Functionality (of roads).
2. Homogeneity (of masses and/or speed & direction).
3. Predictability (of road and road user behaviour by a recognizable road design).
4. Forgivingness: environment and road users.
5. State of awareness (road user).

## Sustainable funding for NMT

- Dutch funding model.
- RSA Public Transport Fund.

[What about a NMT Fund ?](#)



## Access roads

- These are typically residential streets
- They are not through roads and therefore carry very low volumes of traffic
- They are designed to slow down traffic





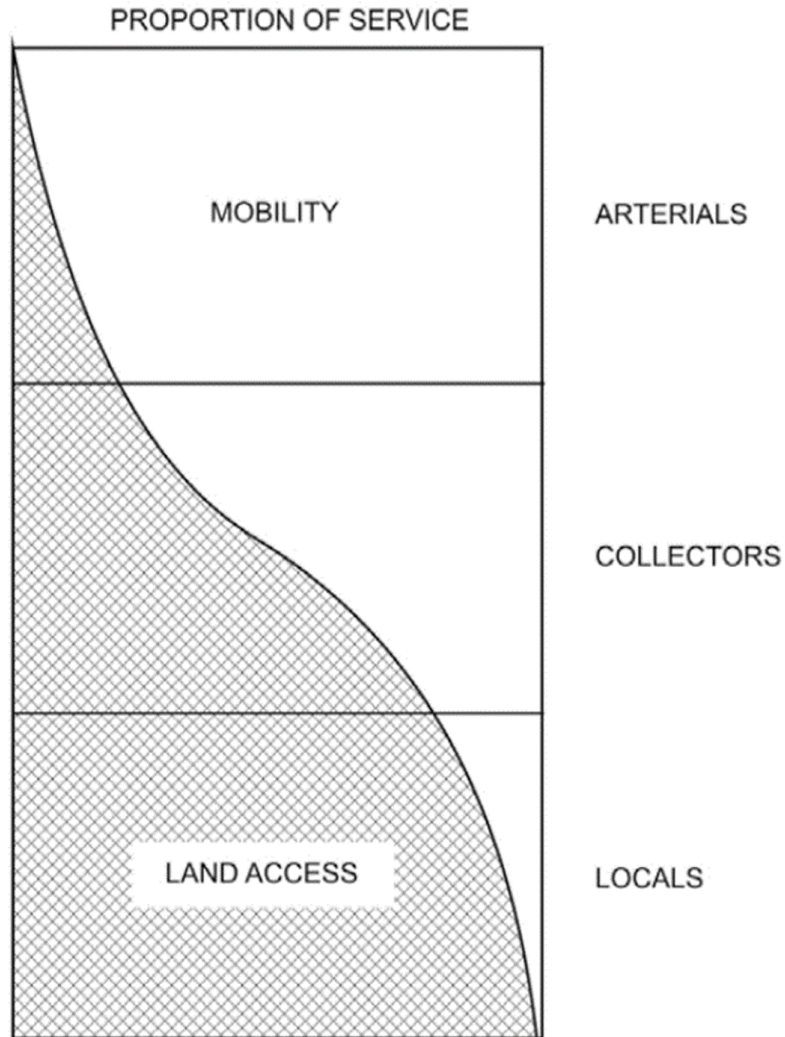
# Road safety management

## ***Safe Systems Approach - Guiding principles***

- *People make mistakes.* Humans will continue to make mistakes, and the transport system must accommodate these.
- *Human physical frailty.* There are known physical limits to the amount of force the body can take before we are injured.
- *A 'forgiving' road transport system.* A Safe System ensures that the forces in collisions do not exceed the limits of human tolerance. Speeds must be managed so that humans are not exposed to impact forces beyond their physical tolerance. System designers and operators need to take into account the limits of the human body in designing and maintaining roads, vehicles and speeds.

# Safer roads and mobility

RELATIONSHIP OF FUNCTIONALLY CLASSIFIED SYSTEMS IN SERVING TRAFFIC MOBILITY AND LAND ACCESS



## RIFSA/COTO (2012 classification of roads)

- Class 1: Freeways with Controlled Access
- Class 2: High Speed Highways
- Class 3: Kerbed Arterials
- Class 4: Urban Distributors & Collectors
- Class 5: Access Roads
- Class 6: NMT routes

**Prioritised retrofitting of NMT facilities?**

# Safer roads and mobility - NMT as job creation opportunity?

## Find innovative ways to create jobs and promote safety

- Construction/maintenance of cycle routes and pedestrian walkways.
- Security at footbridges and subways, NMT routes through public open spaces and bicycle parking at stations.
- Upgrading and maintenance of green corridors.
- Bike share schemes.
- Bicycle storage and support centres at public transport terminals.
- Local production of bicycles for service provision, e.g. custom-built bicycles to assist people collecting recyclable items in communities.





# Safer roads and mobility

## ITS applications for NMT users

Five areas of ITS treatment:

- Increased motorist awareness - in-pavement lighting.
- Feedback to waiting pedestrian that activation of the button has been recognized.
- Feedback to the crossing pedestrian - animated eyes display and pedestrian countdown displays.
- Pedestrian detection - microwave and infrared systems, pedestrian mats.
- Visual impairment issues - audible pedestrian signals.





# Safer roads and mobility

## DoT NMT Facility

## Guidelines 2014 (new)

- NMT and public transport
- NMT along rural roads
- Animal drawn transport
- Maintenance
- Pavement design
- Operations



# **Safer roads and mobility**

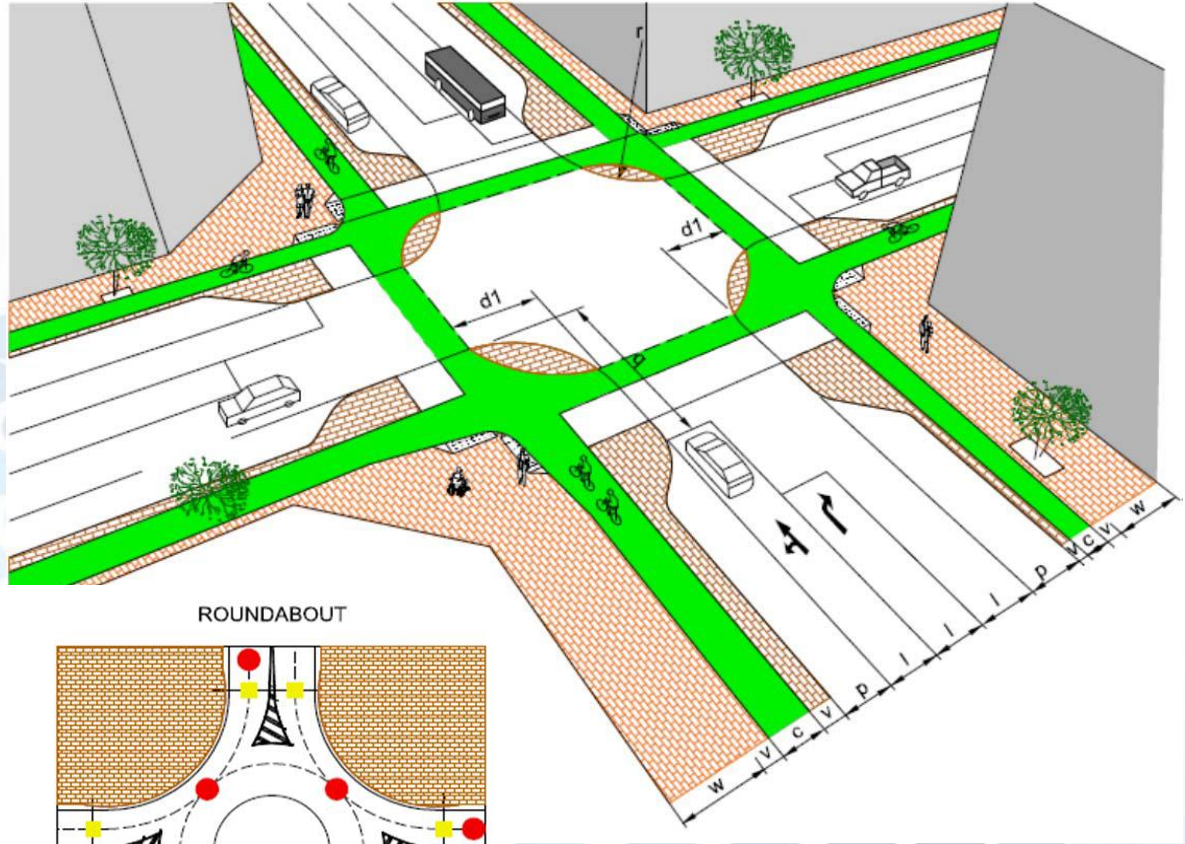
## **Guidelines to improve mainstreaming of NMT - Dept. of Environmental Affairs: Green Cities NMT Best Practice Manual (2015)**

- Introduction
- Benefits of walking and cycling
- NMT-friendly policy and legislation
- Developing a cycle master plan
- Developing pedestrian master plans
- Designing NMT infrastructure
- Procuring the services of consultants and contractors
- Monitoring and evaluation
- Communication and awareness raising
- Conclusion
- References

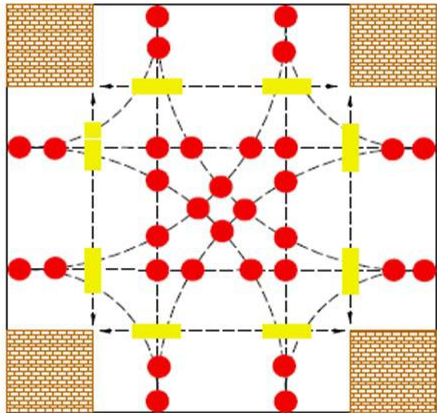


# Safer roads and mobility

- Application of innovative concepts - horizontal separation of vehicular and bicycle traffic at intersections - DoT NMT Facility Guidelines, 2014.



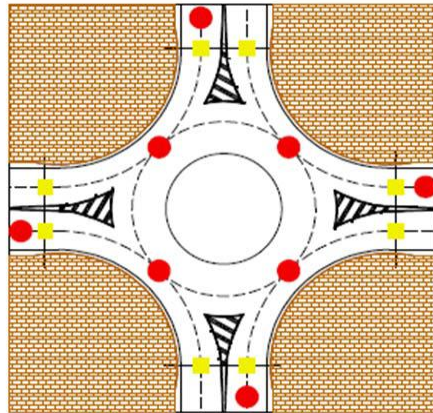
JUNCTION



● 32 Vehicle conflicts

■ 24 Pedestrian Conflicts

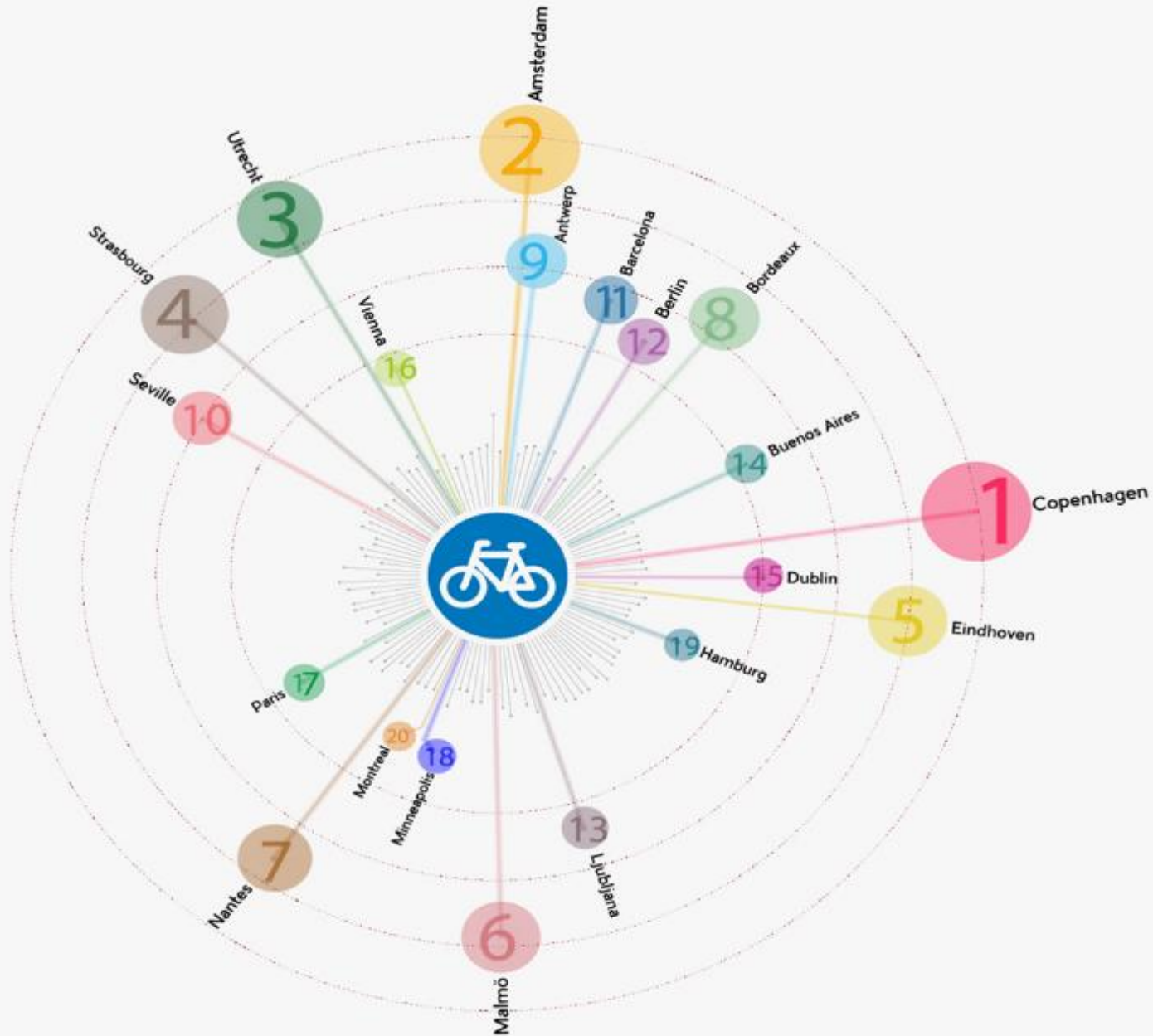
ROUNDABOUT



● 8 Vehicle conflicts

■ 8 Pedestrian Conflicts

# 20 Most cycle friendly cities: Bicycle innovations





# Safer roads and mobility - Bicycle innovations

- The 'forgiving curb' with 45 degree angle.
- Less dangerous than the older curbs with a more common 90 degree angle.
- A cyclist accidentally hitting this new type of curb is less likely to fall.



# Safer roads and mobility - Bicycle innovations

Priority for cyclists during inclement weather in Rotterdam.





# Safer roads and mobility - Bicycle innovations

## Turn-signalling gloves

- To let motorists know where the cyclist is heading on the road, it helps to use hand signals.
- Back of each glove contains a waterproof array of high-intensity LEDs arranged to form a blinking directional arrow.
- Lights are activated by touching a pair of metal contacts together – one on the inside of the glove's thumb, and one on the inside of its index finger.



# Safer roads and mobility - Bicycle innovations

## Cycle tag

As cyclists approach a junction, the tag sends a signal to a nearby reader, which in turn switches the light to green.





# Safer roads and mobility - Bicycle innovations



## Passing distance

- Western Cape Safety of Cyclists Regulations, 2013 Provincial Gazette 7119, dated 18 April 2013
- Regulations covers a number of critical safety issues to promote cyclists safety:
  - Duties of drivers of motor vehicles when passing cyclists - maintain 1m distance between vehicle and cyclist until safely clear of the cyclist.
  - Duties of cyclists.
  - Lamps on pedal cycles.
  - Offences and penalty.



# Safer roads and mobility

Compulsory stopping places for all public transport vehicles?

- Minibus taxi passengers embark/disembark anywhere, causing major traffic risk and pedestrian casualties.
- Need for innovative solution to combat taxi related and other forms of jaywalking?

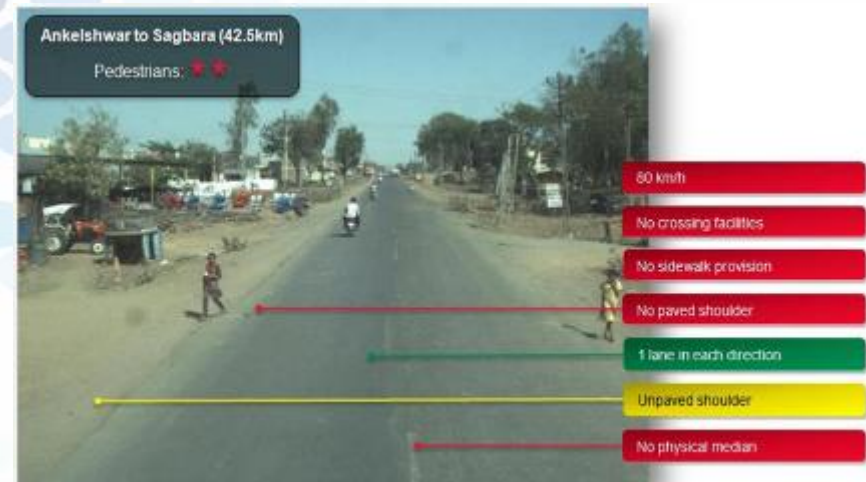




# Safer roads and mobility

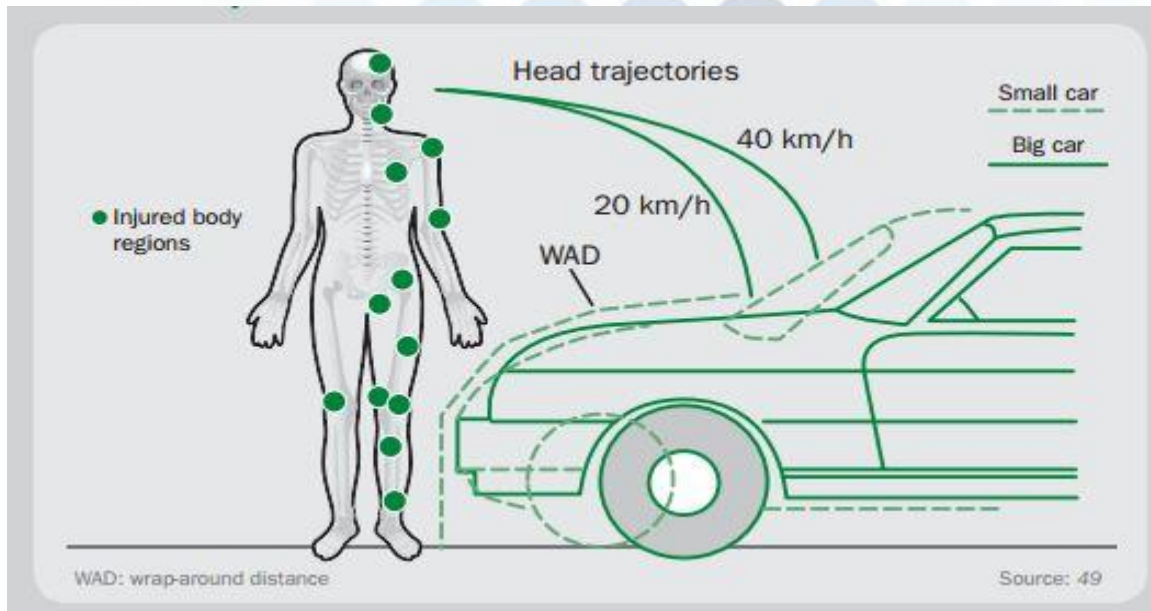
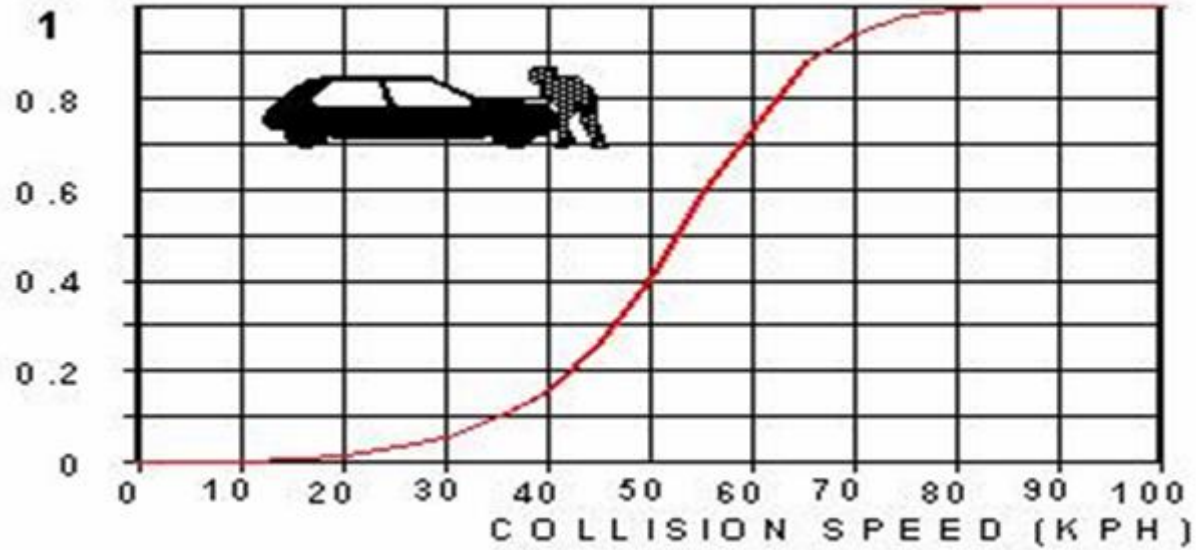
## Star Rating Assessment Method

- Between 1 and 5-Stars are awarded to road segments (typically five kilometres in length) depending on the level of safety which is 'built in' to the road.
- A 5-Star rating represents the safest road infrastructure design for the prevailing speed environment.
- A 1-Star rating represents a road with poor infrastructure design for the prevailing speed environment.



# Safer vehicles

PROBABILITY OF DEATH





## Safer vehicles

- One approach reduce pedestrian deaths and injuries is to modify the fronts of vehicles to make them "softer" if they contact a pedestrian.
- New vehicles with sensors in the front bumper - detect when a pedestrian has been hit. Trigger a giant U-shaped airbag that inflates near the bottom of the windscreen.
- Automated vehicles – a vehicle that is capable of sensing its environment and navigating without human input, e.g. Tesla, VW, Volvo, others.
- Heavy vehicle blind spot detection systems?



# Safer vehicles - Heavy vehicle blind spot detection systems

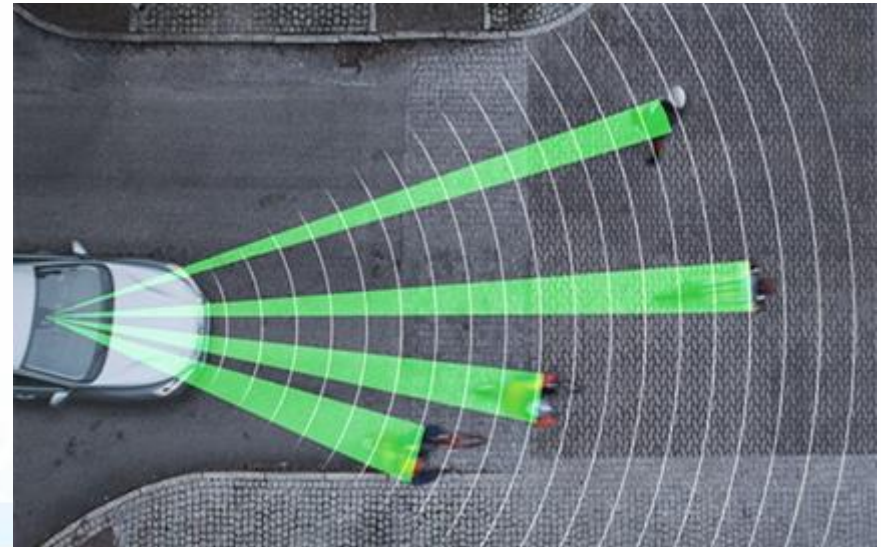
- Most heavy vehicles have significant blind zones where the driver cannot see other road users - vehicles, cyclists and pedestrians.
- Contributes to road casualties, during cornering, lane change, reversing manoeuvres.
- Trials of commercial and prototype collision warning systems, e.g. cameras, sensors.





# Safer vehicles

- Pedestrian detection systems could reduce pedestrian deaths/injuries.
- Active pedestrian-detection systems — which can automatically slow the vehicle to reduce the impact speed or even avoid the collision — therefore help to significantly improve the pedestrian's chance of survival.
- By adding a radar device via sensor fusion, the enhanced performance allows full braking at higher speeds.'





# Animal drawn vehicles (ADV)

## DoT: NMT Facility Guidelines: 2014

- Design controls for ADV
- Geometric design
- Service roads in settlements.
- Maximum grade of roads.
- Horizontal/vertical curves.



## SABS: SANS 1025 Animal Drawn Vehicles

- Standard covers requirements for construction/performance of ADV:
  - Brakes
  - Roadworthiness
  - Visibility.



# Safer road users – Jaywalking enforcement

- Jaywalking: poor pedestrian behaviour leading to injuries and fatalities.
- Several types of jaywalking:
  - Walking against a walk signal.
  - Crossing street where there is no crosswalk.
  - Crossing street outside of a marked crosswalk where present.
  - Walking on a street (ignoring sidewalks).
  - Minibus taxi jaywalking.
- Many international examples of effective law enforcement campaigns.
- **Jaywalking & minibus taxi operations?**



# Safer road users – Distracted walking and driving

## Distracted walking

- The role of cell phones in distracted driving injuries and deaths.
- Also need to consider the danger cell phone/IPOD use poses to pedestrians.
- Study in Ohio, USA found that young people aged 16 to 25 were most likely to be injured as distracted pedestrians, and most were hurt while talking rather than texting.

## Distracted driving

- Number of pedestrians and bicyclists who have been killed by distracted drivers has risen significantly in the past several years.
- **Need for innovative solutions?**

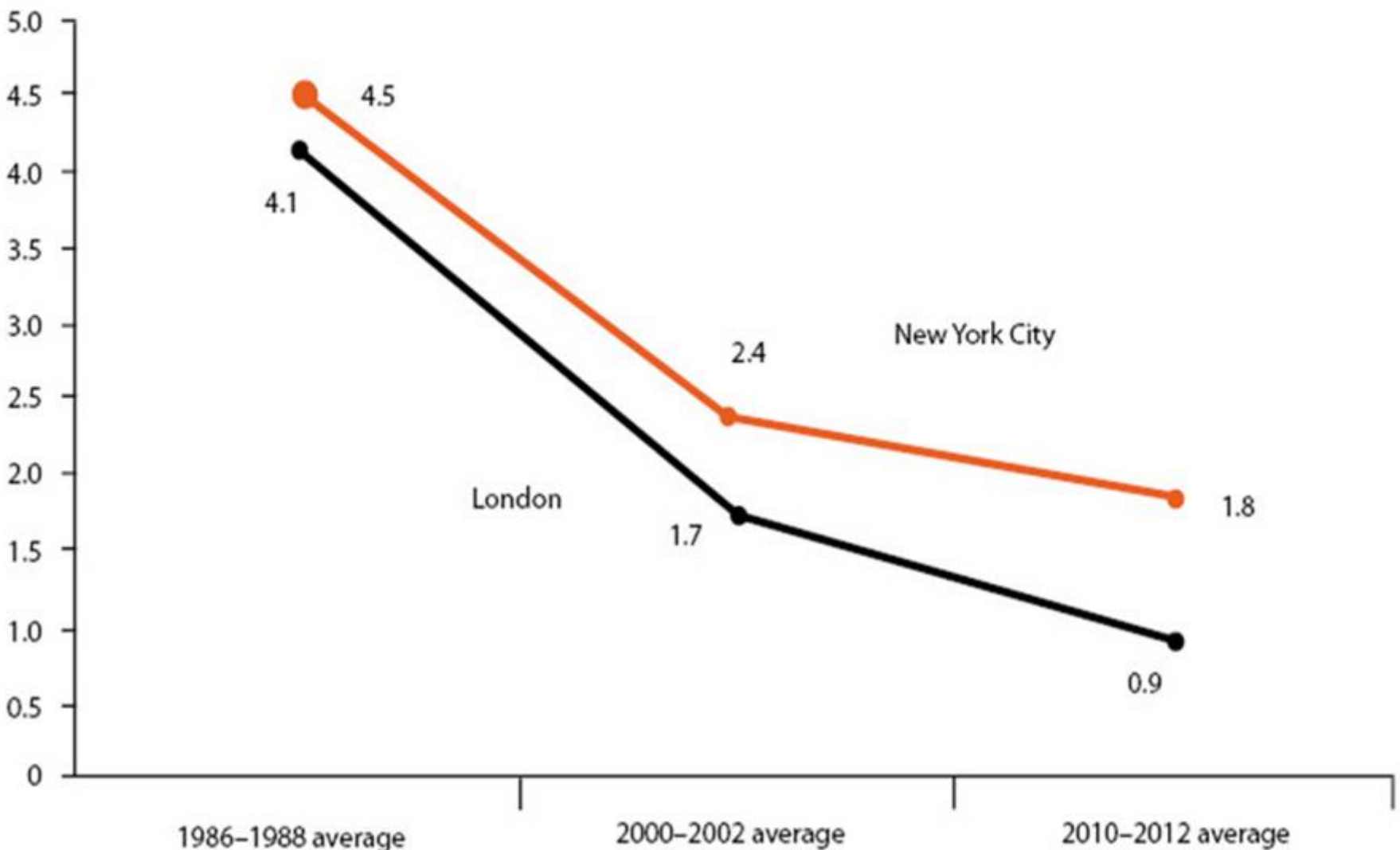




# Safer road users: Impact of Law enforcement



PEDESTRIAN FATALITY RATE PER 100,000 PEOPLE



# Safer road users: Impact of Law enforcement



- In Greater London, pedestrian fatalities dropped by over 75% since the late 1980s.
- Intervention: This substantial improvement follows the institution of stronger traffic laws and prosecution.
- Recent study found that drivers were convicted of one or more crimes in 35% of studied pedestrian fatality cases:
  - Most common conviction was careless driving.
  - Next most common being dangerous driving.
  - Penalties for causing death by dangerous driving range from 2 to 14 years jail time, with revocation of the driver's license for a minimum of two years.

# Safer road users

- **BAC limit enforcement**
  - South Africa 0.5 mg/ml drivers and 0.2 mg/ml for professional drivers.
- Need for a pedestrian BAC legal limit?
- Need for legislation? Maybe lower BAC level than for drivers because of physical activity?
- Poly drug use – Need for drug recognition experts?
- Using social media to educate road users:
  - Facebook/Twitter, etc. to raise awareness about pedestrian and bicycle safety.





## Conclusions

- NMT road user fatality reduction – a focal area to achieve DOA and Millennium Development Goals.
- Several innovations/interventions have been identified in the field of NMT to assist authorities in achieving the relevant goals.
- Sustainable funding required for NMT road network improvements and other initiatives.
- DoT/RTMC/RAF/C-BRTA, provinces and local authorities should do an assessment of the potential to customise/ implement NMT innovations/interventions that fall within their respective mandates.