BIKE PAL Camp

Brussels, 20th March 2013

Infrastructure measures towards safer cycling

Maurizio TIRA, Full Professor of Town and Regional Planning
University of Brescia - http://dicata.ing.unibs.it/tira/

State of the art

- The European Union has funded several RTD projects about road safety in

  urban areas

  DUMAS : Developing Urban Management And Safety
- eSUM pdf : European Safer Urban Motorcycling
- I&I Days :Information and Initiative Days
- OSSA : Open framework for Simulation of transport Strategies and Assessment
- REVEAL : Remote Measurement of Vehicle Emissions at Low Cost
- ROSACE : Road Safety in cities: change road safety education in europe
- SAU : Urban Accident Analysis Systems (Sistemas de Análisis de Accidentalidad Urbana)
- TRAINER : System for driver Training and Assessment using Interactive Evaluation tools and Reliable Methodologies
- WATCH-OVER : Vehicle-to-Vulnerable roAd user cooperaTive communication and sensing teCHnologiesto imprOVE transpoRt safety
- YOUTH ON THE ROAD

State of the art



The ITF/OECD has recently completed the report “Cycling safety”

Why that is still an issue …

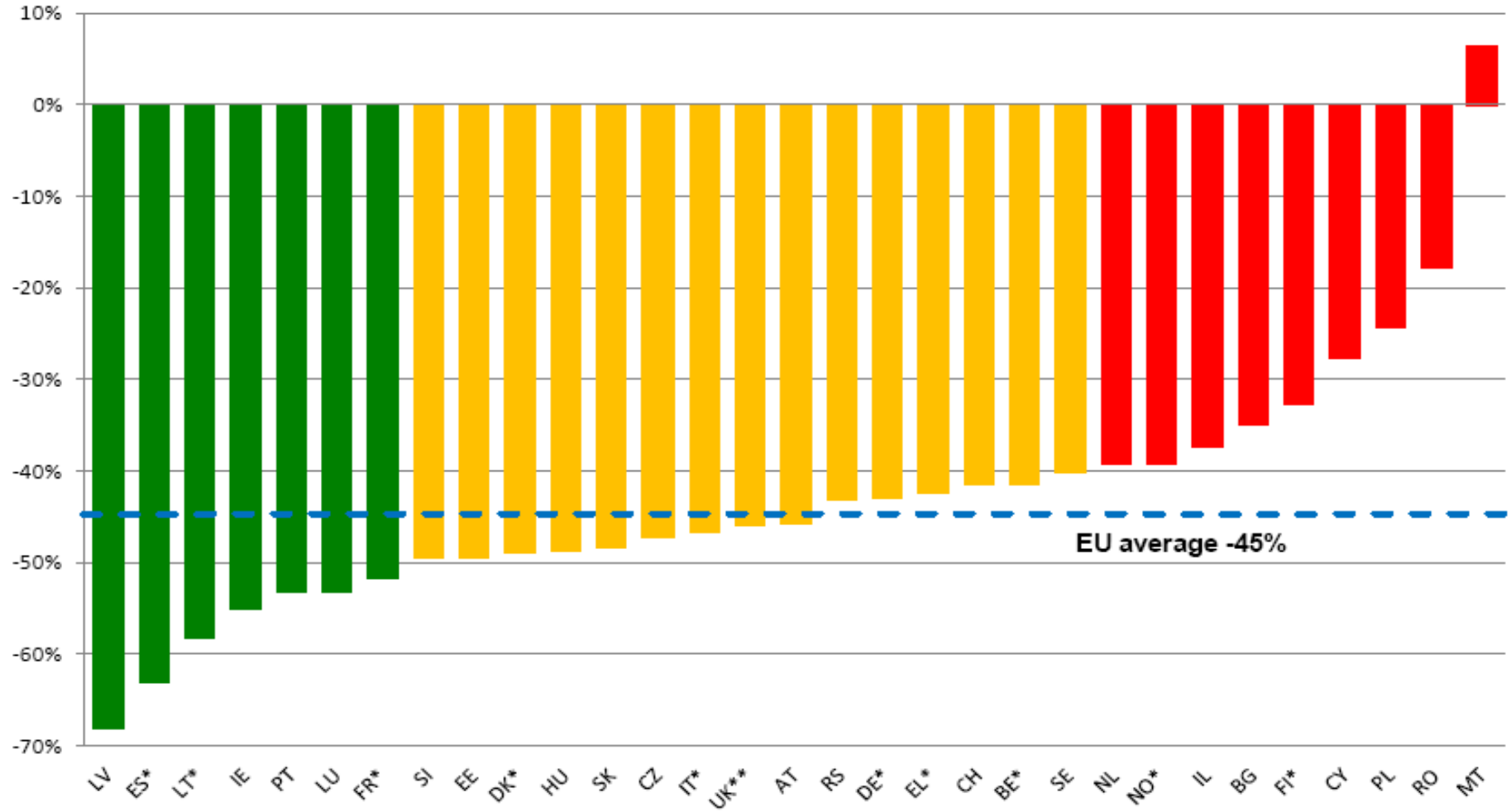
Between 2001 and 2009, some 107,700 pedestrians and cyclists were killed on EU roads, 9,250 of them in 2009 (6,900 pedestrians + 2,350 cyclists).

Within this 9-year period, deaths among this category of road users have been decreasing at a lower rate than for vehicle occupants, respectively **34%** compared with **41%.**

Pedestrian and cyclist accidents account for **26%** of all road fatalities!

What has been achieved so far …

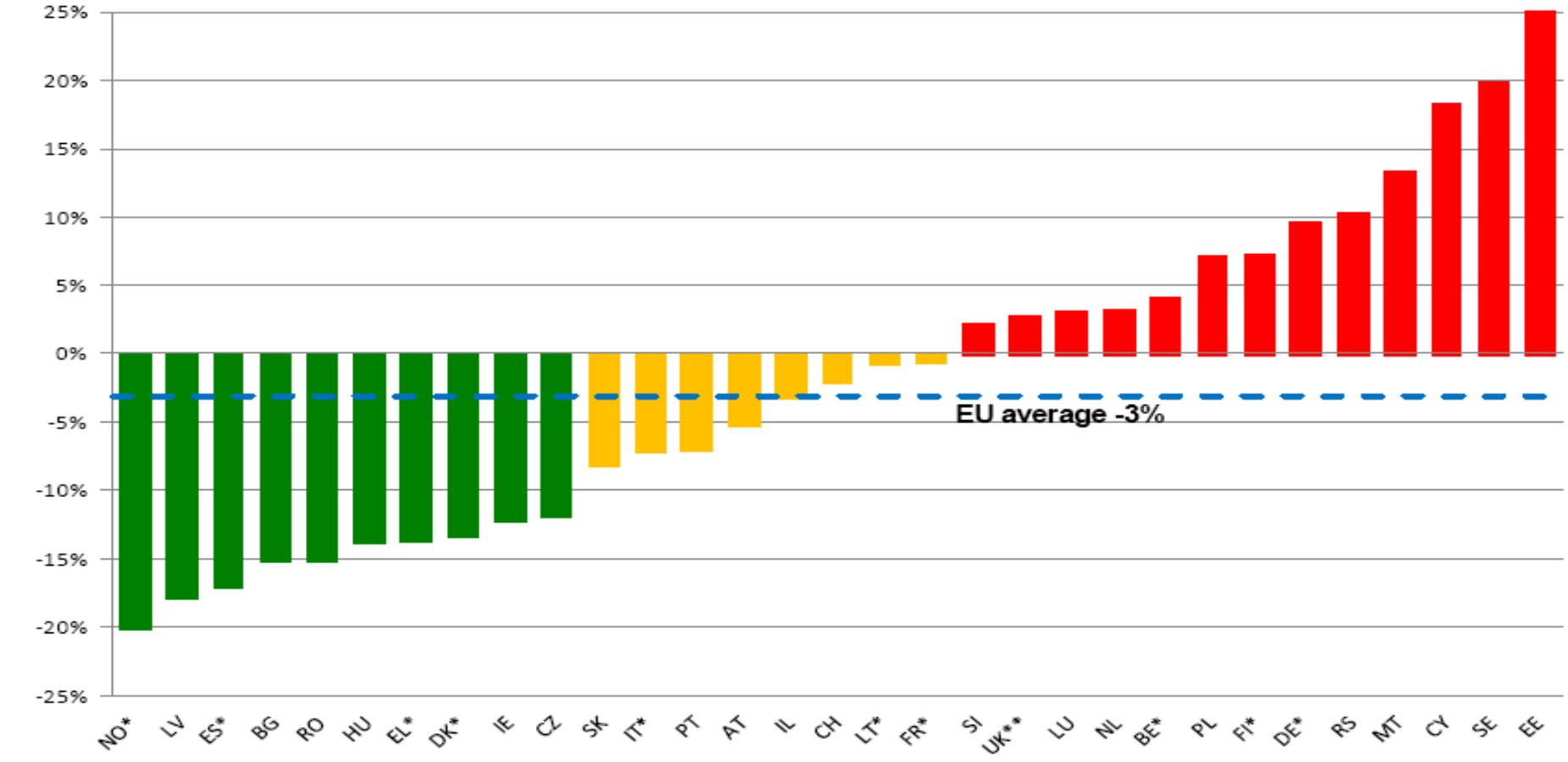
What has been achieved so far (Source ETSC)



Percentage change in road deaths between 2001 and 2011

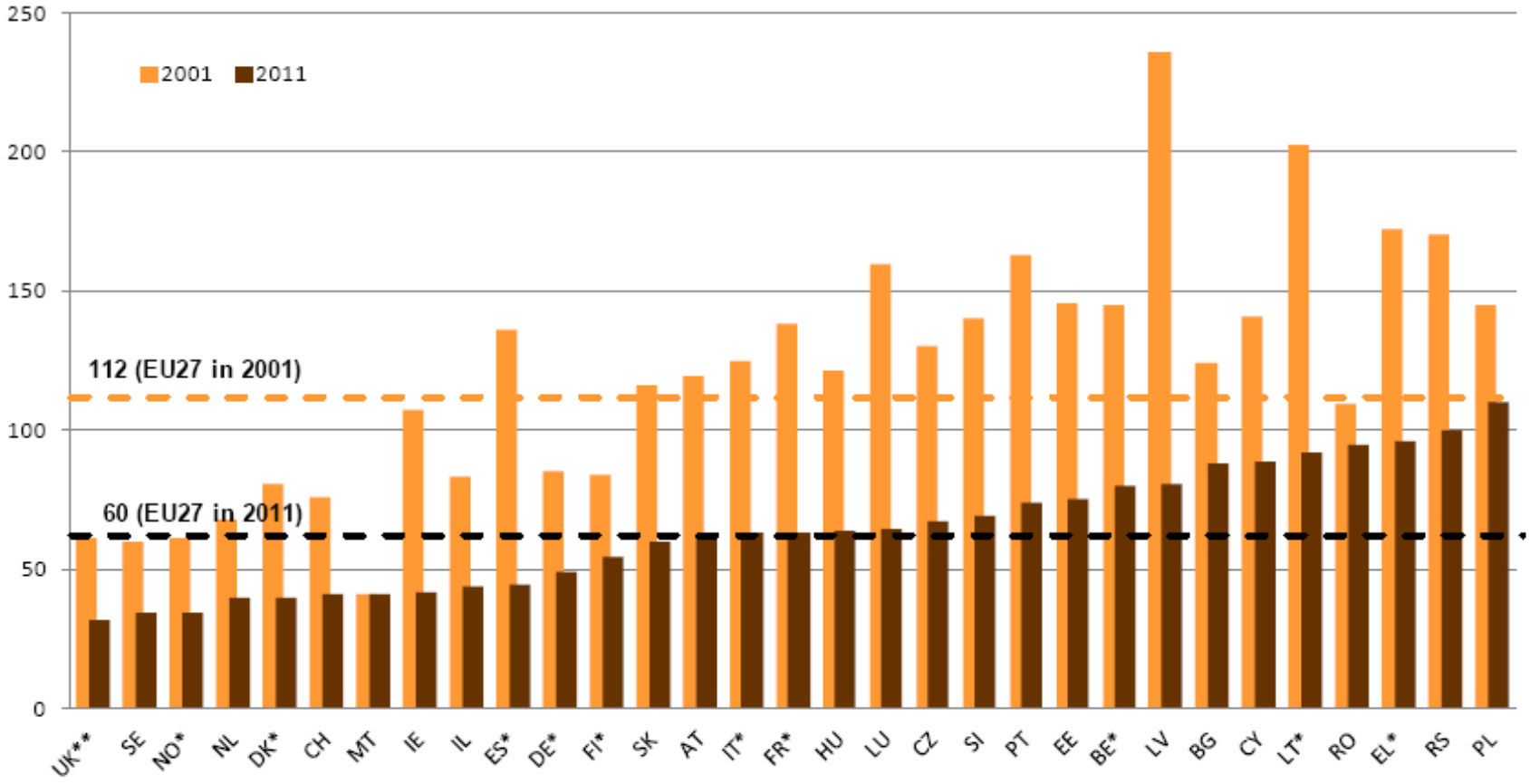
** Provisional estimates for 2011 from now on*

What has been achieved so far (Source ETSC)



Percentage change in road deaths between 2010 and 2011

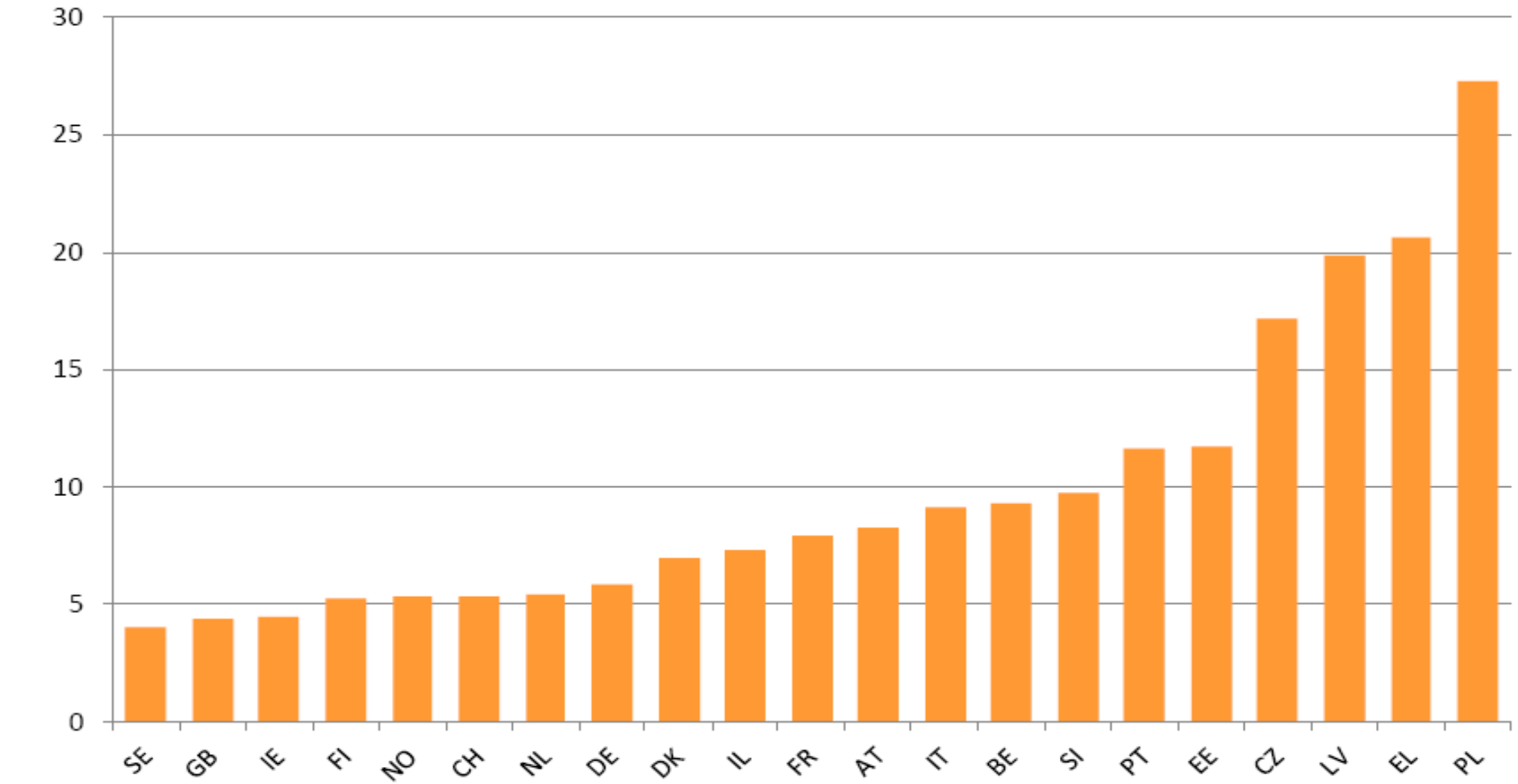
What has been achieved so far (Source ETSC)



Road deaths per million inhabitants in 2011 (with road deaths per million inhabitants in 2001 for comparison)

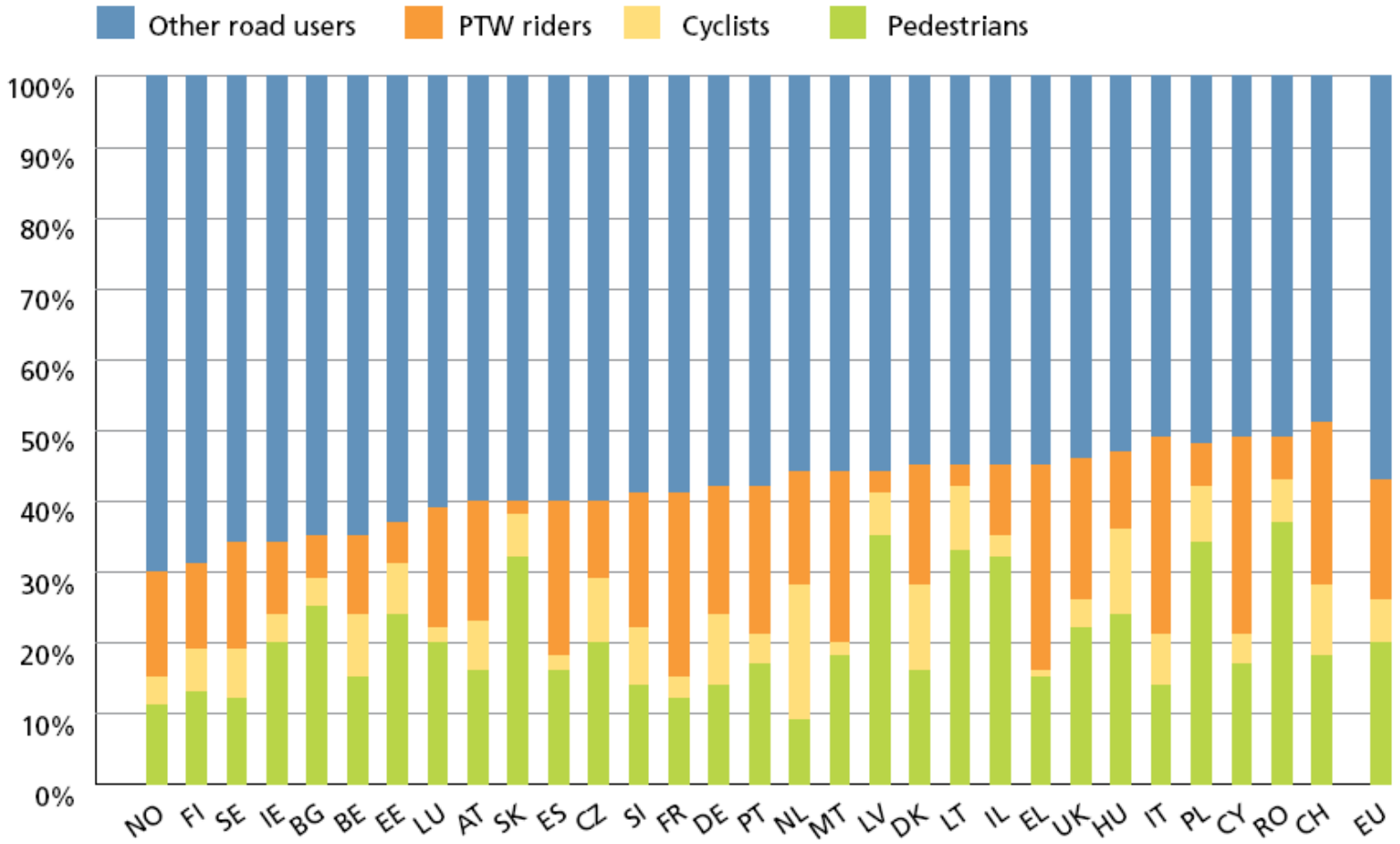
Why a stronger effort is needed …especially for pedestrians and cycle and PTW users?

Why a stronger effort is needed (Source ETSC)



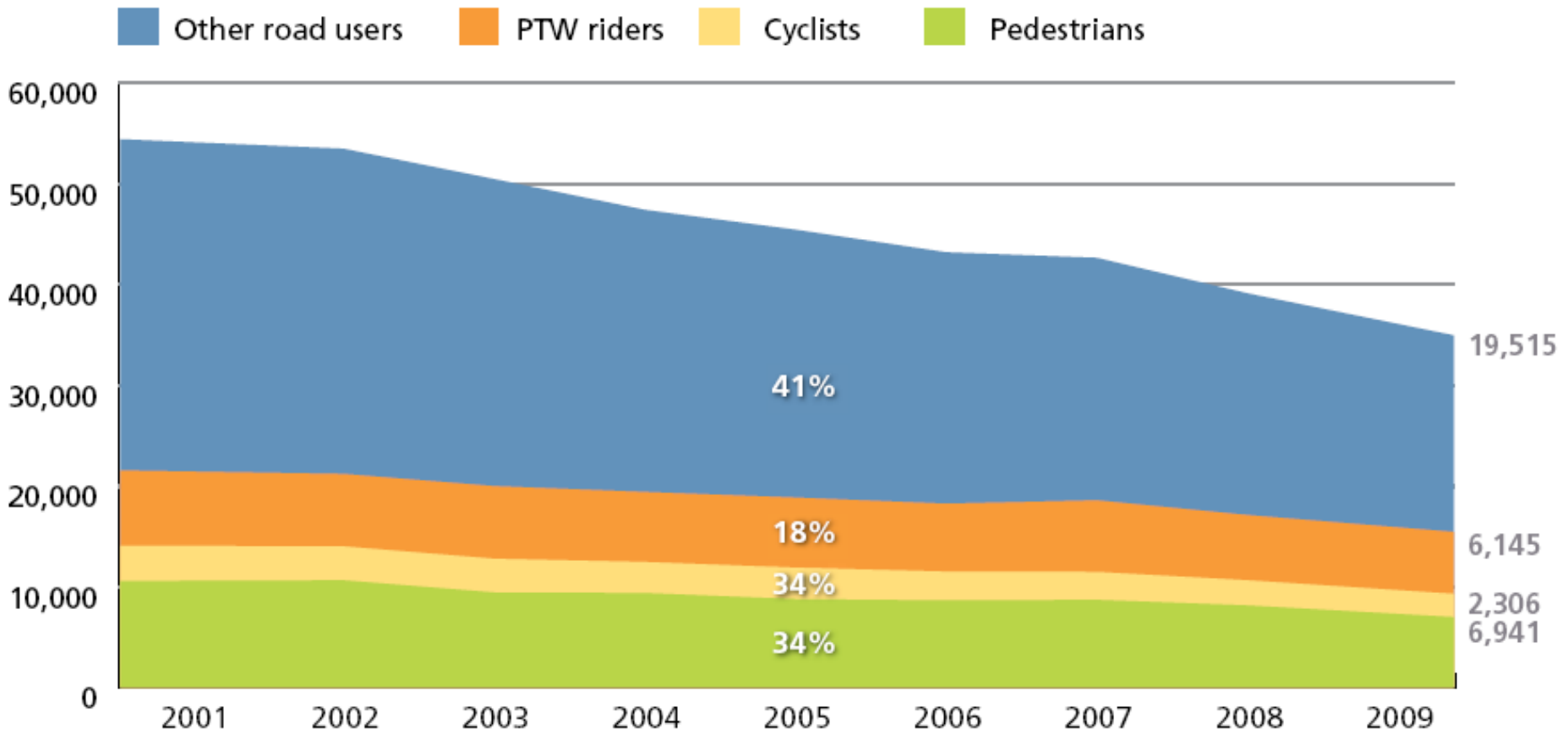
Road deaths per billion vehicle kilometres (average for the latest three years for which both the road deaths and estimated number of vehicle-km are available)

Why a stronger effort is needed (Source ETSC)



Pedestrians, cycle and PTW users' deaths as a percentage of all road deaths ranked by the share of deaths that were unprotected of all kinds taken together (2007-2009 average)

Why a stronger effort is needed (Source ETSC)



Reduction in road deaths 2001- 2009 for pedestrians, cyclists, PTW and other road users in EU-27

Why a stronger effort is needed (Source ETSC)

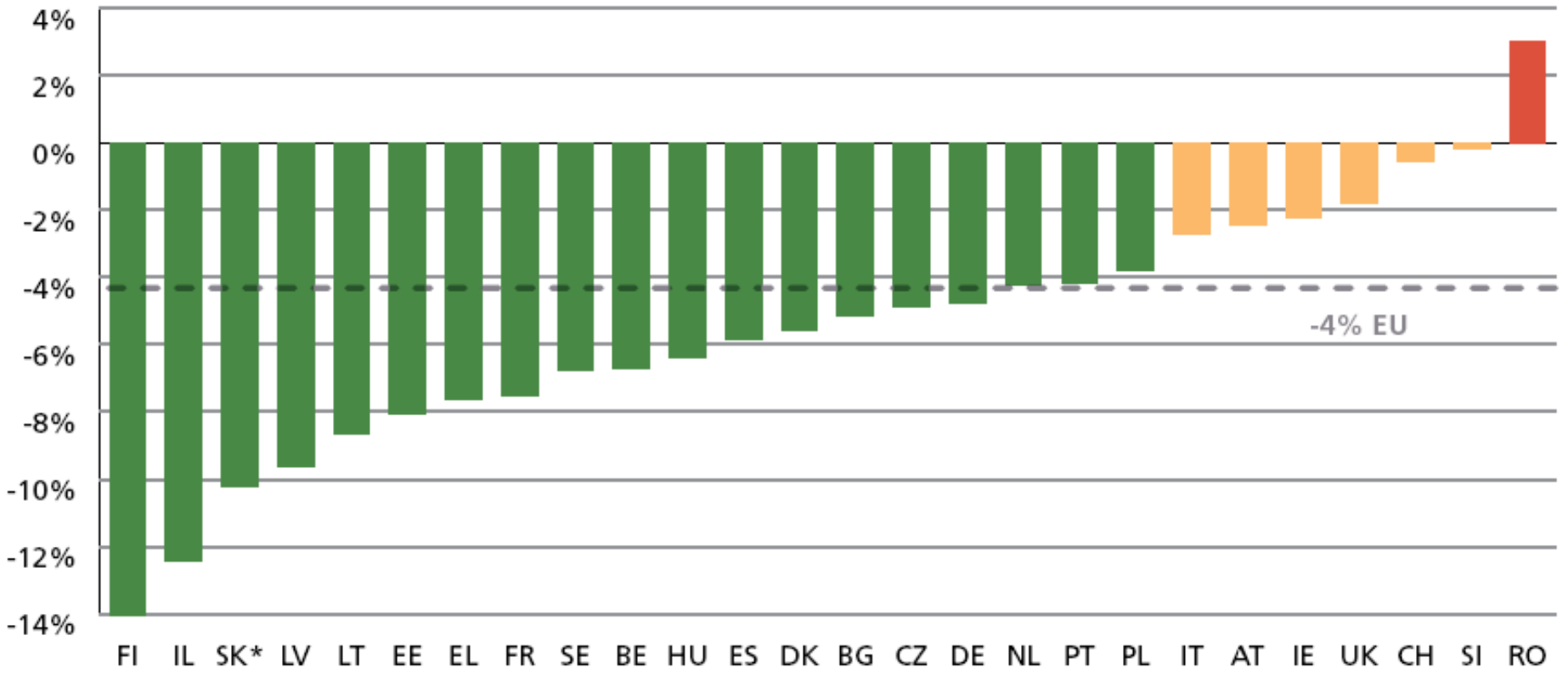
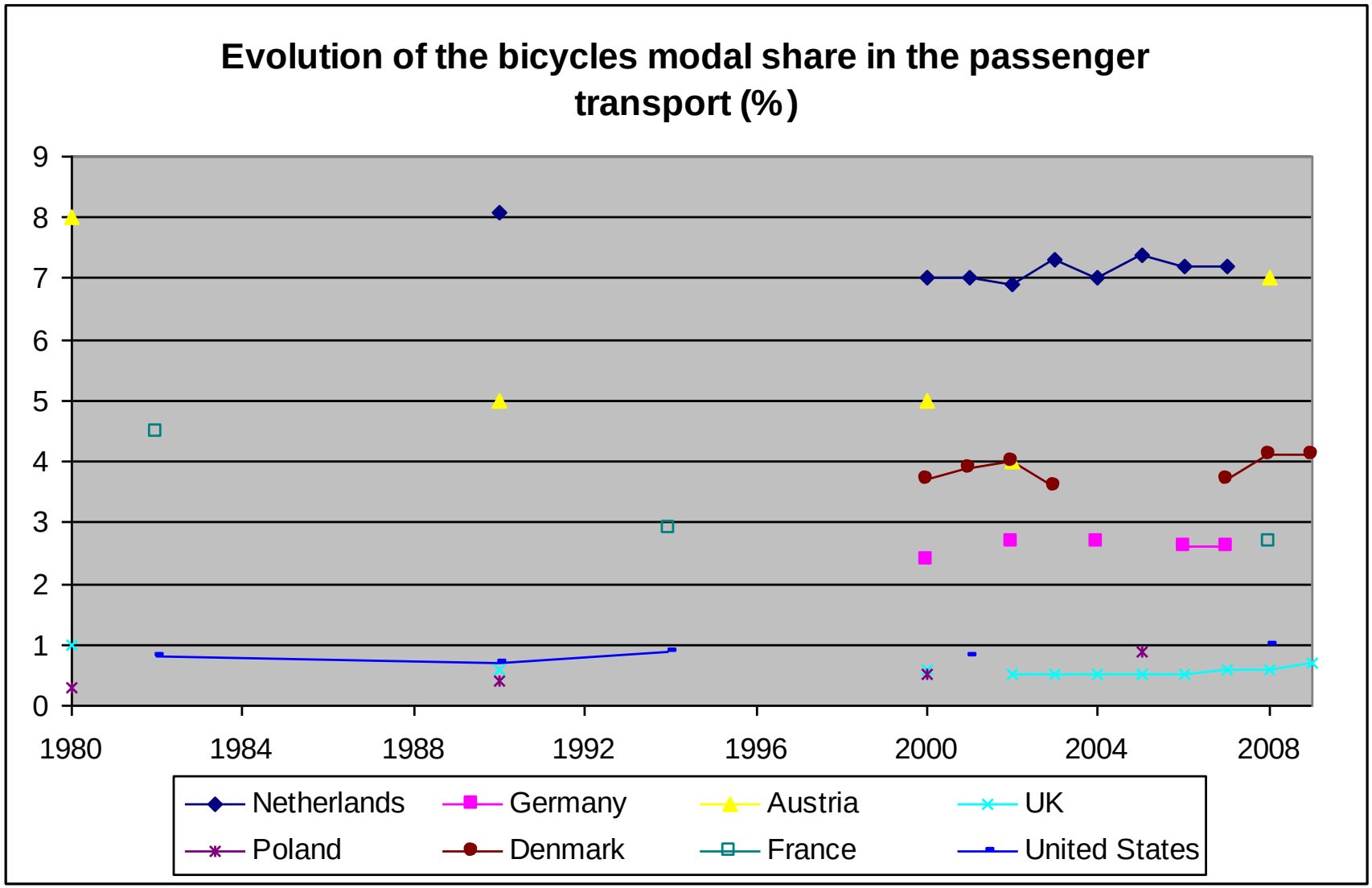


Fig. 11: Average annual percentage change in **cyclist deaths** over the period 2001-2009.

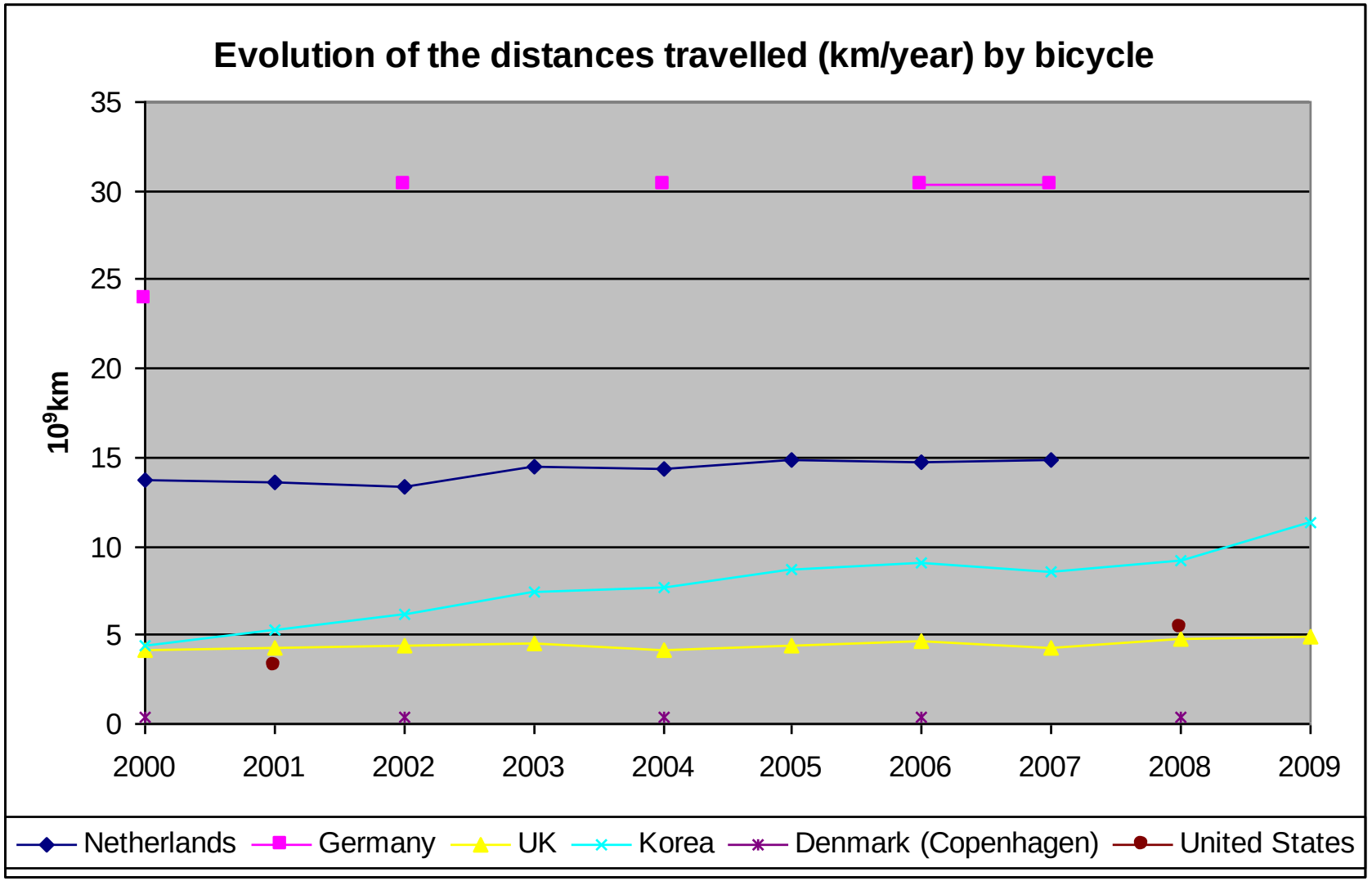
** SK 2002-2009.*

CY, LU and MT are excluded from this ranking because the numbers of cyclist deaths in those countries are so small as to be subject to substantial random fluctuation.

Bicycle modal share (Source ITF/OECD)



Bicycle modal share (Source ITF/OECD)



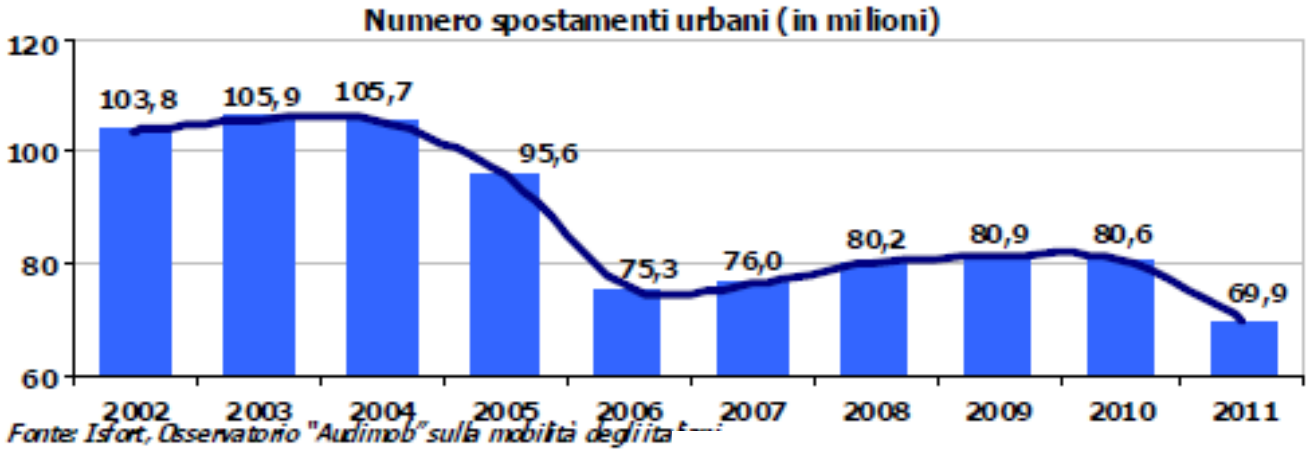
The underreporting is too important (Source: ANIA found.)

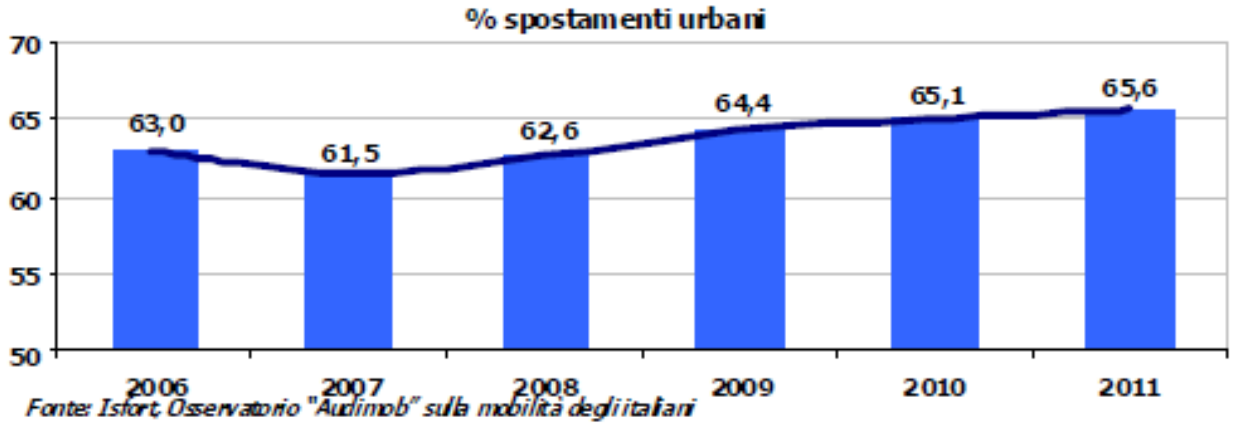
Italian ANIA Foundation for Road Safety reports **900,000** deaths + injured (serious and slight) in 2011 against the **290,000** of official statistics.

According to their data, the figure is slightly less than 2007 …

We know that underreporting is particularly high when considering pedestrian and cycle users' accidents!

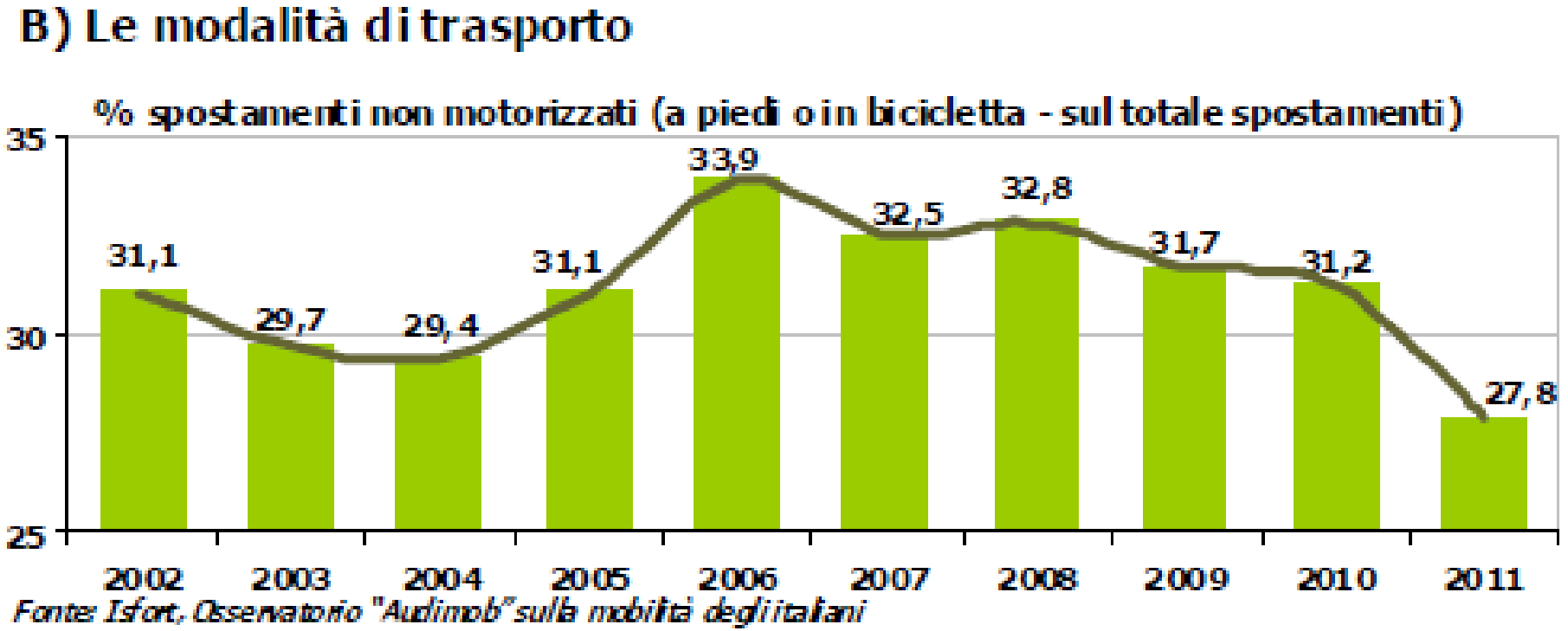
Why a stronger effort is needed (Source ISFORT - I)





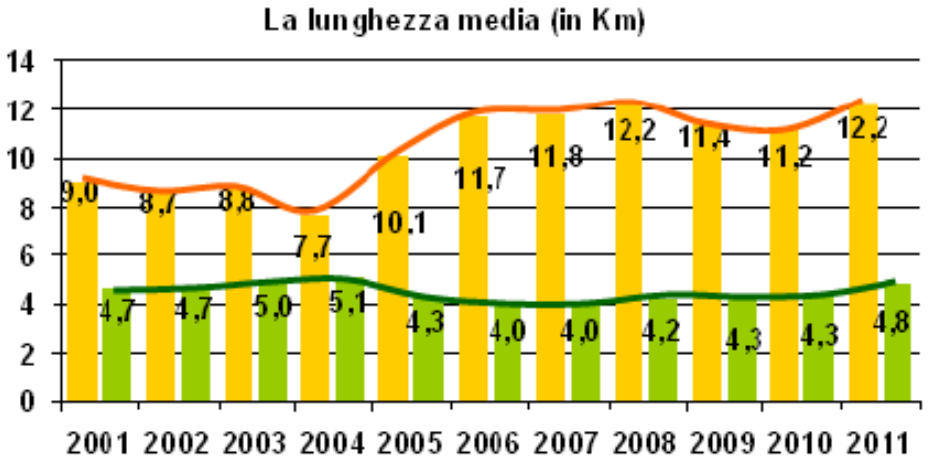
Mobility demand in a spare day in Italy
- All of trips in urban areas (up, per million) (2002-2011)
- % of trips in urban areas on the total (down) (2006-2011)

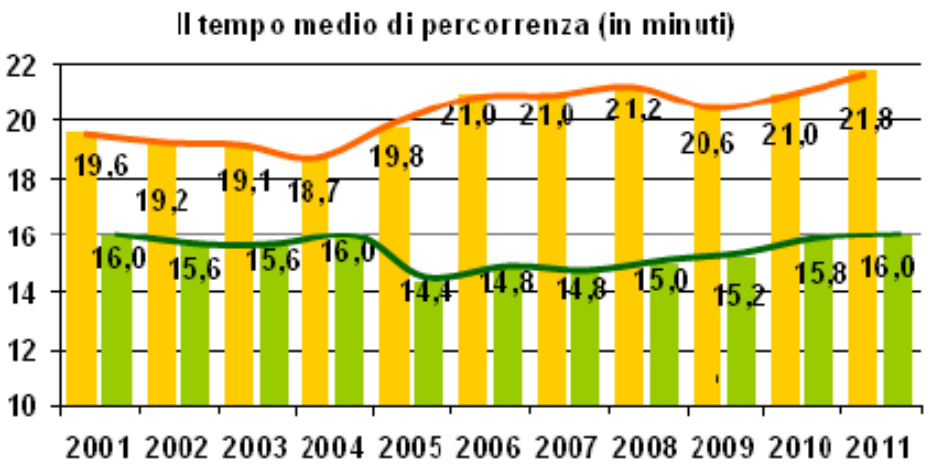
Why a stronger effort is needed (Source ISFORT - I)



Percentage of journeys made by foot and bicycle in urban areas in Italy (2002-2011)

Why a stronger effort is needed (Source ISFORT - I)



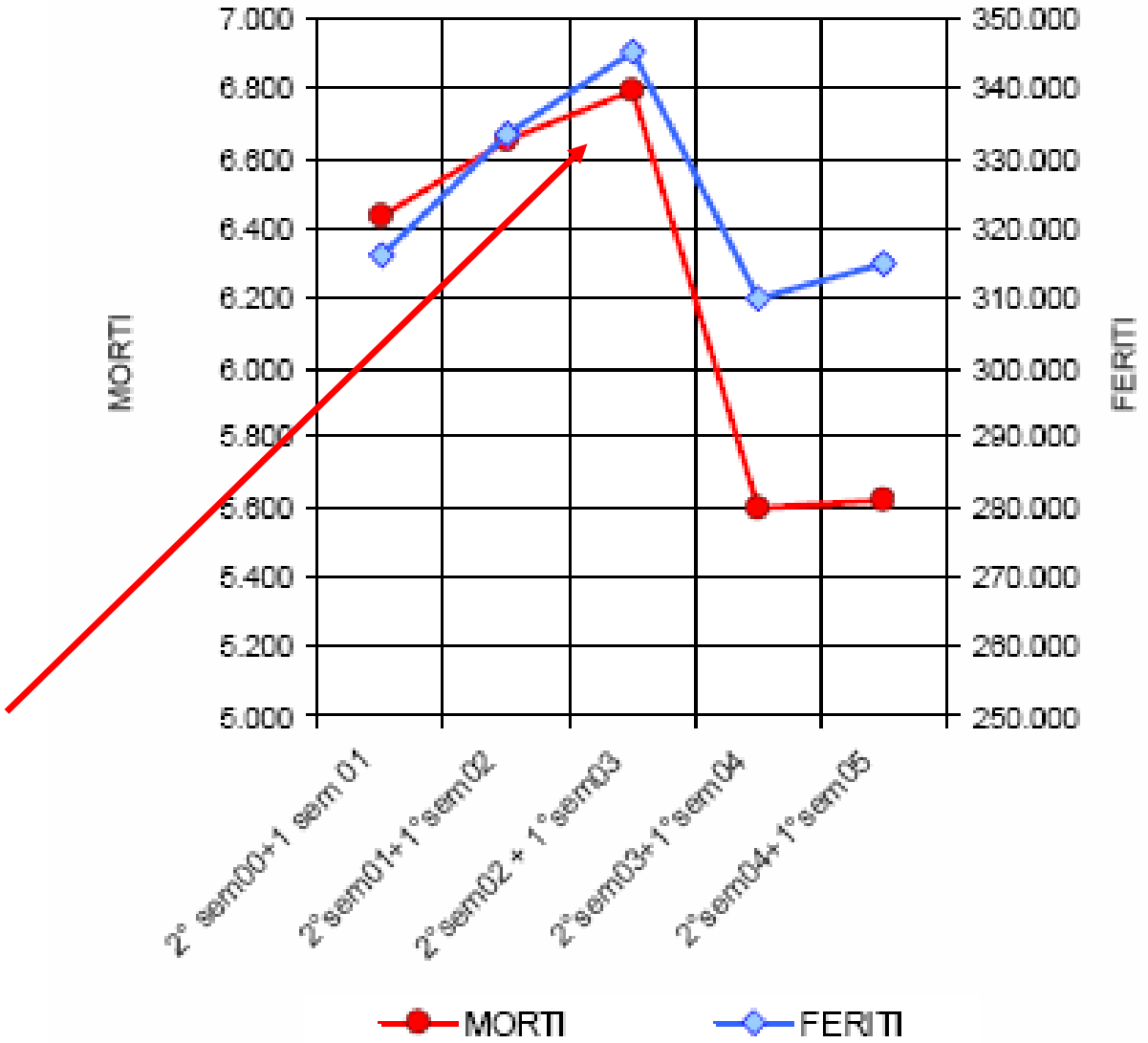


Lenght of trips with all modes in Italy (2001-2011):
total (in orange)
in urban areas (in green)
- (in green)

The effect of measures is sometimes very short

(Source: M. Coppo- RST)

Fatality rates after the introduction of the penalty point system in Italy (2003)



What is yet to come?

The forgotten modes

The aim of the presentation cannot just be a repetition of (well known) data, but the effort of identifying the main reasons why **walking and cycling** are often **forgotten in urban mobility**.

So the main features of the crucial integration between mobility and urban planning will be assessed

Proximity



Proximity in the residential units: Radburn – New Jersey

The lost proximity

The era of the private car has completely changed town design worldwide. Most urban settlements have been planned explicitly assuming the use of the private car.



Loosing proximity

So people walk and cycle less because there are no destinations within a walkable or cyclable distance:

- shopping malls can be reached only by car (for distance and for safety reasons) and parking facilities are greater and free;
- services are concentrated for economic reasons (scale economy);
- public transport have then lost customers and reduced their efficiency

Loosing proximity

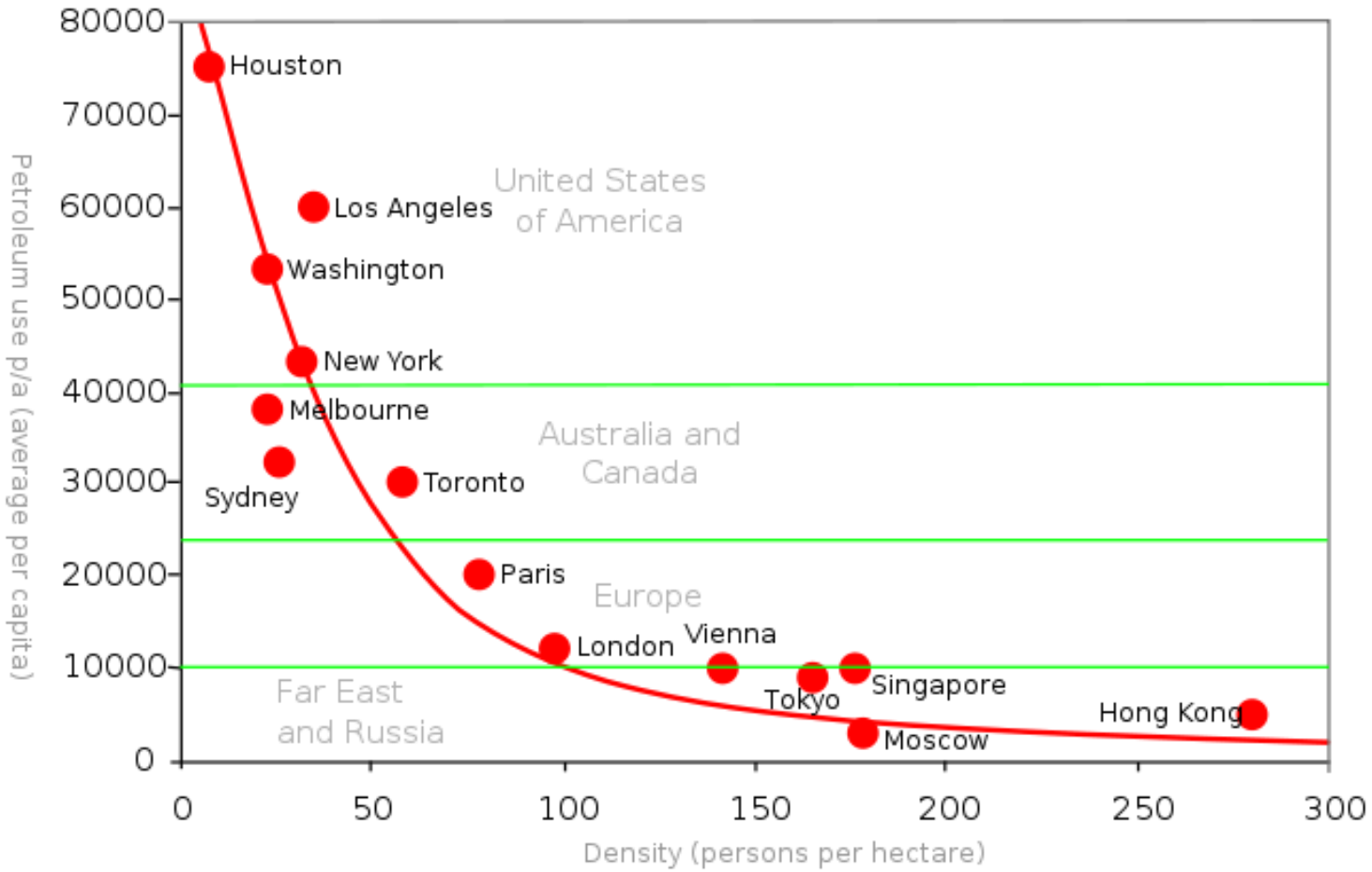
- work places are not fixed, so trips are multi-scope and they need a flexible means of transport;
- the relatively less expensive transformations in rural areas make sprawl more cost-efficient than urban renewal;
- low density is better appreciated by high income communities and sometimes defended for landscape preservation

The effect of “urban environment” as determined in urban planning

- Morphology of towns is going to be lost thus influencing the ability of people to “read” urban environment
- Road layout is given to users is an ever more intelligible way: the diffusion of GPS on cars is substituting maps, but continuing the tradition of clearing the way to car drivers.
- Pedestrians hardly know the dedicated facility network and they cannot really plan the trip: they will not know the sidewalk conditions, width, maintenance, continuity, visibility, lighting, comfort, etc..
- The lack of information can highly influence the modal choice.

Energy saving: transport and land use

A commonly used study of 32 cities by Newman & Kenworthy in 1989 concluded that there was a strong link between urban development densities and petroleum consumption.



THE NEED FOR AN INTEGRATED MOBILITY AND URBAN PLANNING

The need for an integrated mobility and urban planning

Separation of urban and mobility planning have been the general rule through most of planning attempts to include cars in cities, such as Athens' Charter

The key concept was the creation of independent zones for the four 'functions': living, working, recreation, and circulation.

The need for an integrated mobility and urban planning

Some of these concepts have been widely adopted by urban planners, but mainly that of separating urban functions, rather than the inflexible approach to road hierarchy.

The need for an integrated mobility and urban planning

When considering the development of urban areas, three main phenomena occur:

- the building of city extensions (urban sprawl), consuming new land but easier for implementing mobility networks and also pedestrian-friendly schemes;

A new (or renewed) land use development model is needed

- "New Urbanism"
- "Smart Growth"
- "Car-free cities"
- **"Transit-oriented Developments"**

  are coming to illustrate new possibilities for integration of transport and land use planning

  … and **Urban Safety Management** as a global approach to road safety

Transit Oriented Development (TOD)



European Transport Safety Council
CESCAM

Transit Oriented Development (TOD)



Transit Oriented Development (TOD)





Infrastructure measures …….....(M Tira)

Transit Oriented Development (TOD)

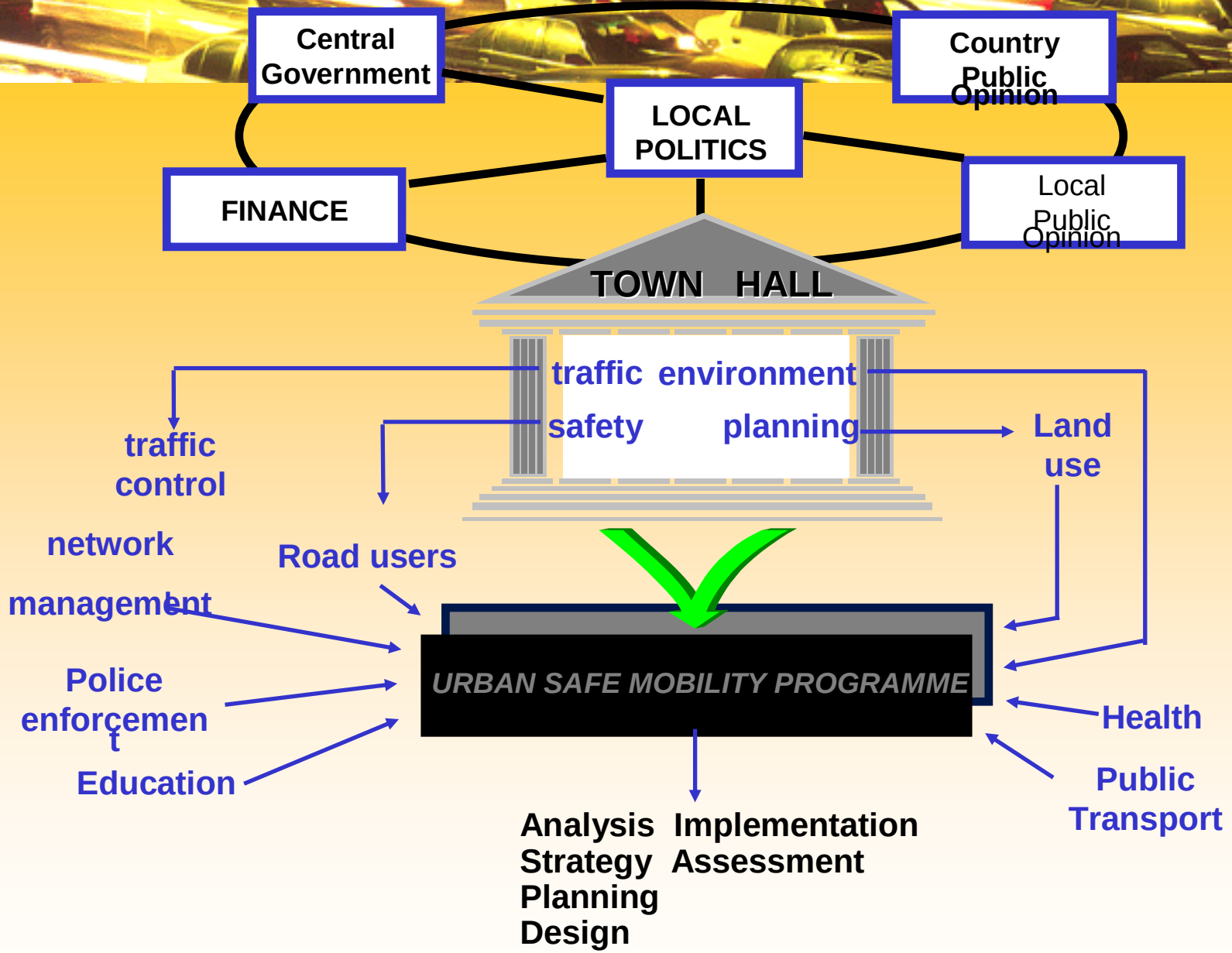


Infrastructure measures …….....(M Tira)

The USM approach (Source DUMAS Project)

Among others, the “strategy setting” and ‘sharing interests’ turned out to be successful safety policies, in those European Countries where applied. It is an approach that looks at urban environment from the point of view of global safety and comfort, pointing them as the core strategy for any action

The USM approach (Source DUMAS Project)



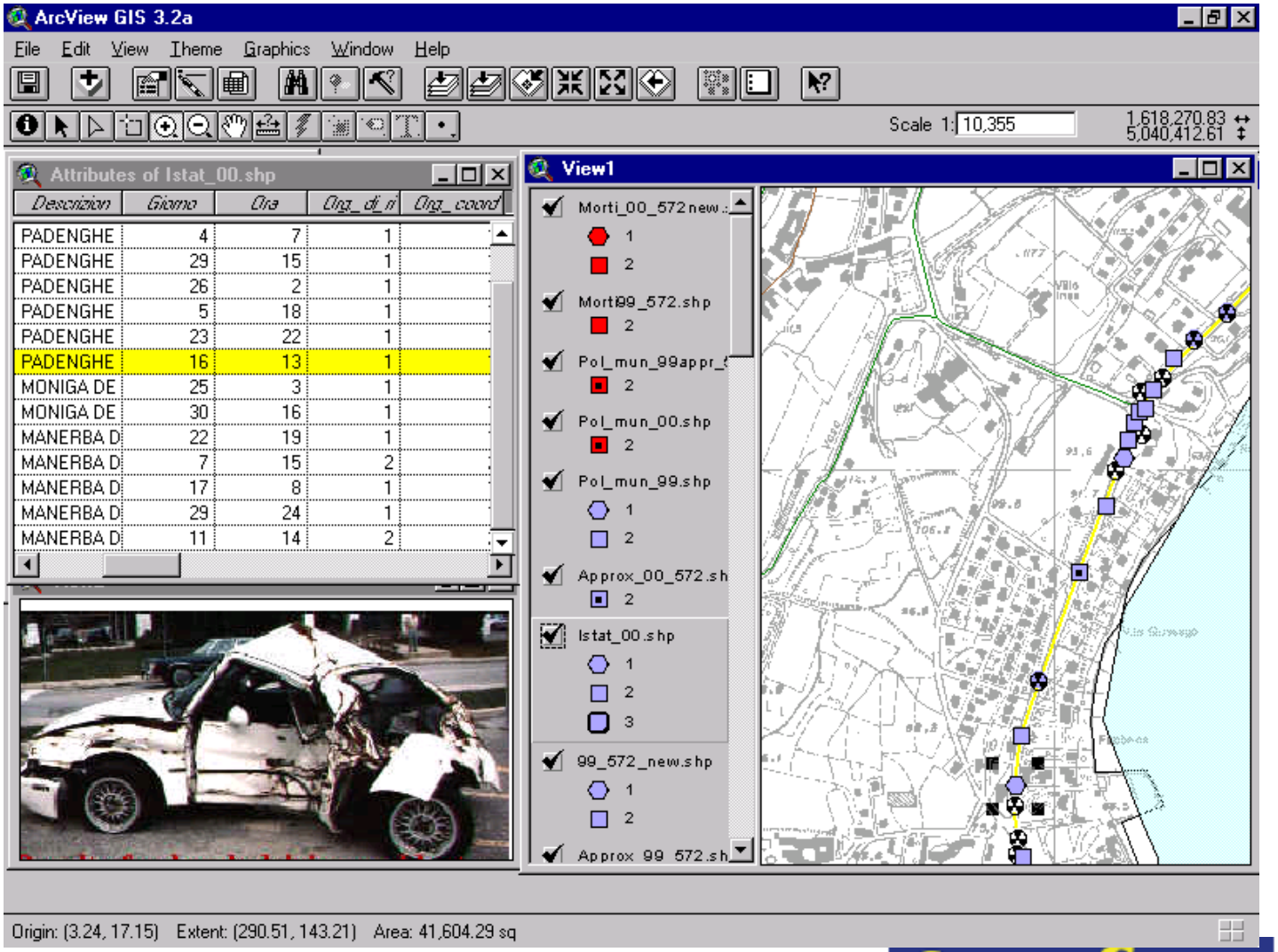
The USM approach

- A road hierarchy or classification is the essential basis for the planning process of speed management schemes
- **In-depth analysis of non-clustered accidents when assessing sustainability of plans**
- Integrating the managing offices of the cities (urban planning, public works, environment, maintenance, …)
- Monitoring procedures and information transfer
- Co-ordination with other strategies, such as the case of noise reduction or pollution control

The detailed accident analysis

Accidents

mapping

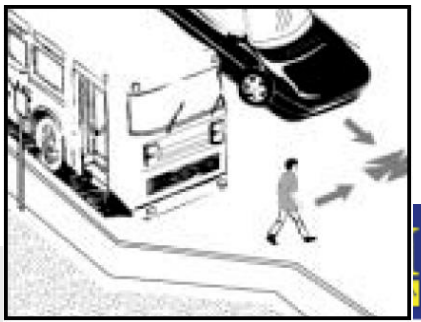


The proto-typical Accident Scenarios

Analysis of Police accident reports occurred in an area, in order to classify their temporal and casual development. Every group of accidents which have particular similarities constitutes a scenario, and for every scenario some solutions are proposed.

Driving situation	**Accidents situation**	**Emergency situation**	**Collision**
A senior citizen is going out from a bus stopped at a bus stop along an high volume street.	Initially covered by the bus, the pedestrian crosses in front of the bus.	Motorist fails to yield to pedestrian.	The pedestrian is hit by the vehicle.

An example of a typical accident scenario involving a senior citizen



The Operational (Road) Safety Review

"Operational Safety Review" (OSR) is a proactive assessment of the safety aspects of an existing road, which, in the case of a future road is called Road Safety Audit

Crosswalks (example)	
1	At the crosswalk are children visible?
2	Is motorized traffic visible by pedestrians?
3	Are there crosswalks next to bus stops?
…..	……

Existing roads - Check list 8 - Vulnerable Road Users (Italian Ministry of Infrastructure and Transportation, 2001)

The Integration between those two different techniques

- the “Accident scenario approach” (accidents database is necessary)
- the “Operational Safety Review” (proactive method)

The Integration between those two different techniques

Relevant question #1

Motorist fails to yield to pedestrian or pedestrian crosses during inadequate gap in traffic due to limited visibility distance at intersection

General Countermeasures

a. Move bus stop to far side of intersection or crosswalk.
b. Install curb extension.
c. Consider an alternative bus stop location.
d. Install pedestrian crossing islands or raised crosswalk.
e. Install or improve roadway lighting.
f. Install crosswalk markings to encourage pedestrians to cross in the crosswalk behind the bus.
g. Mark bus stop area with pedestrian warning signs.
h. Remove parking in areas that obstruct the vision of motorists and pedestrians.

The Integration between those two different techniques

Relevant question #2

Pedestrian has difficulty walking along roadway and crossing at midblock location with high vehicle speeds and/or high volumes.

General Countermeasures

a. Provide bus pull-off area.
b. Consider an alternative bus stop location.
c. Install midblock curb extensions.
d. Provide curb ramps and an accessible sidewalk.
e. Install sidewalk and/or sidewalk barriers to direct pedestrians to a nearby crossing location.
f. Provide pedestrian education/training.
g. Add bike lanes or painted shoulder.
h. Add recessed stop lines.
i. Increase police speed enforcement.
j. Install or improve roadway lighting.
k. Reduce number of roadway lanes.
l. Install traffic and pedestrian signals, if warranted.

The Integration between those two different techniques

Relevant question #3

Pedestrian has difficult time crossing,waiting, or walking in the vicinity of
school bus stop.

General Countermeasures

a. Select safer location for school bus stop.
b. Implement pedestrian/driver education programs.
c. Involve school, neighborhood groups, and PTA in promoting enforcement
and education.
d. Provide sidewalks.
e. Provide street furniture or other amenities at bus stop.
f. Install or improve roadway lighting.
g. Enforce regulations against passing stopped school bus.
h. Educate pedestrians to cross behind the bus.

The Integration between those two different techniques

Relevant question #1
Motorist fails to yield to pedestrian or pedestrian crosses during inadequate gap in traffic due to **limited sight distance at intersection**.

Relevant question #2
Pedestrian has difficulty walking along roadway and crossing at midblock location with **high vehicle speeds and/or high volumes.**

Relevant question #3
Pedestrian has difficult time crossing,waiting, or walking in the vicinity of school bus stop.

OSR Check-list

Crosswalks	
1	Is the visibility of the crosswalk by motorists satisfactory?
2	At the crosswalk are children visible?
3	Is motorized traffic visible by pedestrians?
4	Is the visibility by night satisfactory?
5	Is there vegetations which in some periods could represent an obstacle to visibility?
6	Are crosswalks and pedestrian areas well coordinated?
7	Is there the distance among crosswalks sufficient to deter crossing road at unsafe locations?
8	Is the crosswalk type adequate to road width (refuges)?
9	Is the speed road adequate to pedestrian flow crossing?
10	Are traffic calming measures necessary to slow down traffic?
11	Is there adequate space for pedestrians to wait on footway?
12	Can vulnerable road users cross within a single phase?
13	Is there special kerb height reduction for disabled at crosswalks?
14	Is there special tactile pavements for disabled at crosswalks?
15	Are there crosswalks next to bus stops?
Pedestrian paths	
16	Are there sidewalks where pedestrian flow is present?
17	Is sidewalks width adequate to pedestrian flow?
18	Are there obstacles on sidewalks?
19	Are there shops that obstacle pedestrian flow on sidewalks?
20	Are there drainage devices that obstacle pedestrian flow on sidewalks?
21	Are pedestrian paths continue?
22	Is pavements of crosswalks adequate?
23	Are restrictions to motorized traffic necessary?
24	Are traffic calming measures necessary to slow down traffic?

The Integration between those two different techniques

Relevant question #3
Pedestrian has difficult time crossing,waiting, or walking in the vicinity of school bus stop.

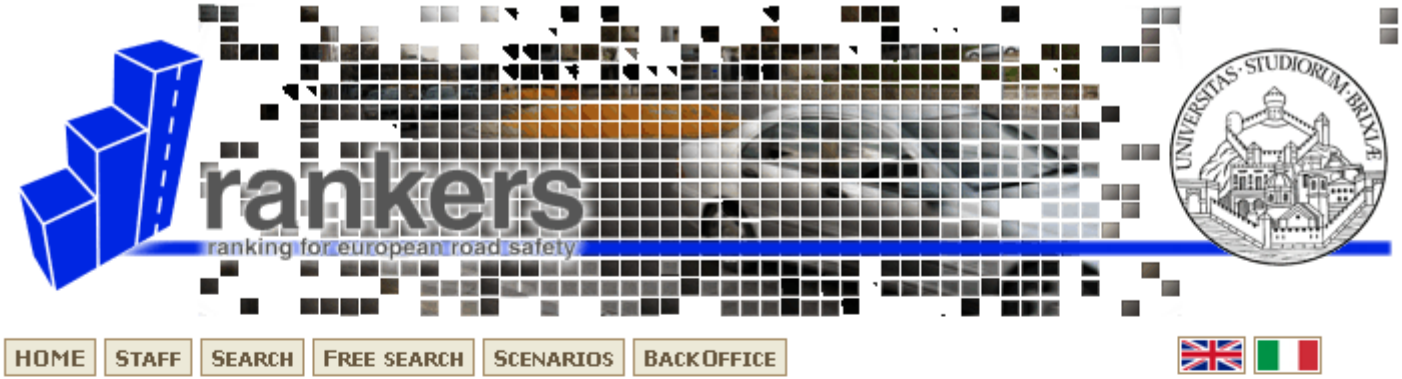
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The e-book (Source: CeSCAm - RANKERS)

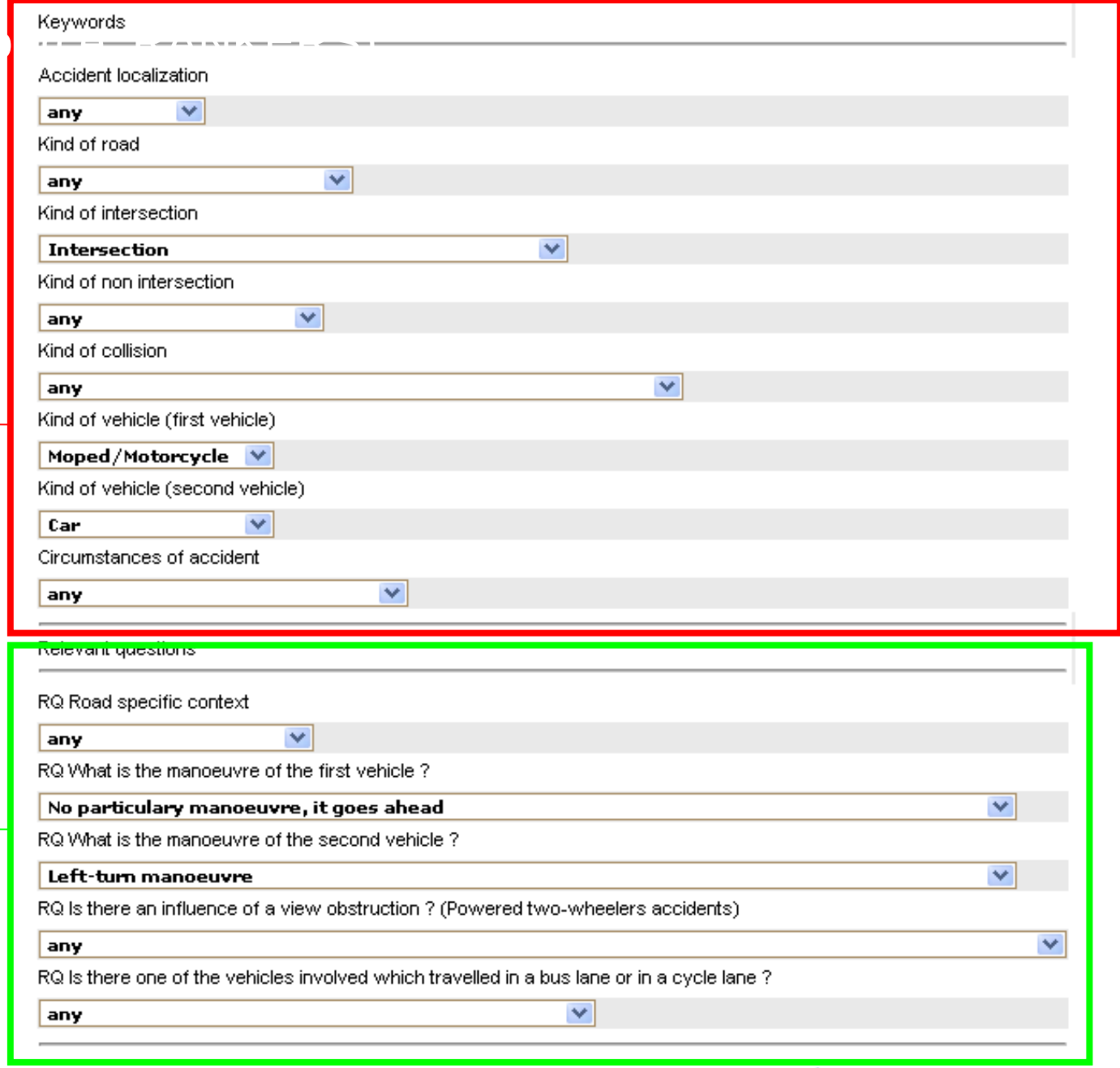
Pre-selection



The e-book (s

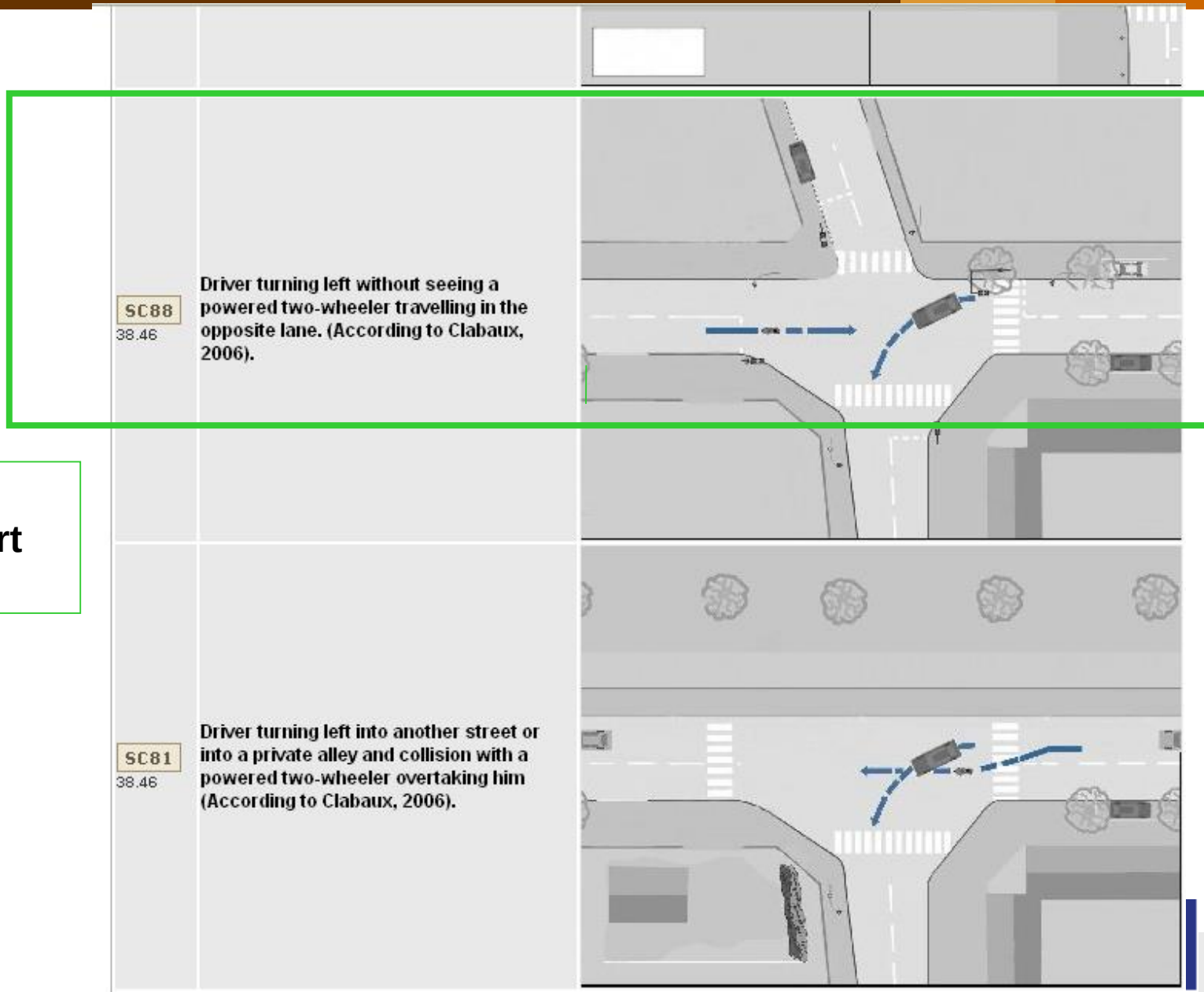
Accident statistical database fields

Relevant questions

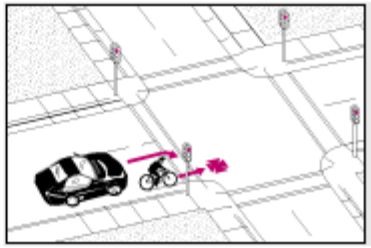
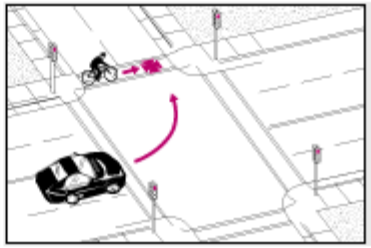
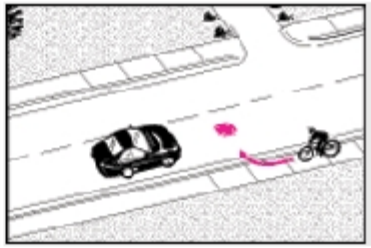
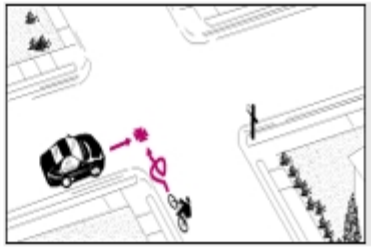
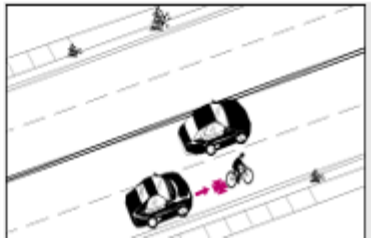


The e-book (source: RANKERS)

Accident scenario short definition



The e-book (source: RANKERS)

SC66	The motorist fails to yield to a bicyclist when making a right turn The motorist may misjudge the speed of the cyclist or belive (mistakenly) that the bicyclist should wait for them	
SC67	The motorist turning left hits a cyclist who is traveling straight ahead in the same direction as the motorist The bicyclist is riding the wrong way against traffic	
SC70	The cyclist rides off the sidewalk into the road without stopping and is hit by a motorist.	
SC72	The cyclist is swerving to avoid an obstacle (perhaps a pothole, some debris or a utility cover) and is hit by a passing motorist	
SC77	The motorist detects the bicyclist but misjudges the amount of space necessary to safely pass the bicyclist	

THE ROAD USER HIERARCHY

Road User Hierarchy

Ranks the importance of road users:

Increasing Importance

People with mobility impairments

Pedestrians

Cyclists

Public transport users

Powered two-wheelers

Commercial/business

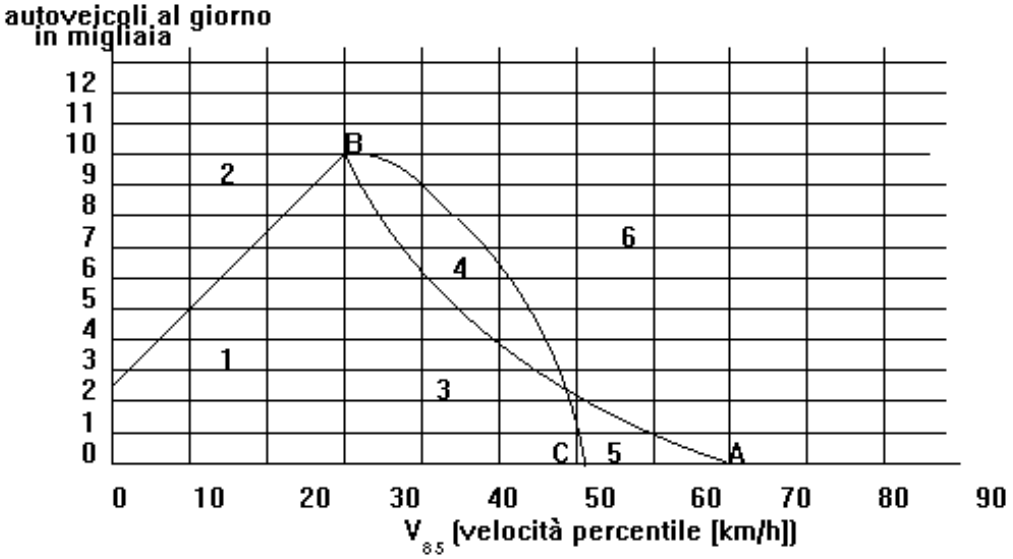
Car-borne shoppers

Car-borne visitors

Car-borne commuters



Bicycle compatibility index



Area 1: speed lower than 30 km/h no specific facility
Area 2: low speed and high traffic: need assessment
Area 3: if Vp = 60 Km/h cycle paths must be done
Area 4: cycle path or lane must be realised
Area 5: low traffic and high speeds (60 – 80 km/h). Cycle paths only
Area 6: crucial physical separation

(CROW, 1994)

Unprotected Road Users - Cyclists

- **Visibility**
  - Good quality lighting to ensure that cyclists are visible to other road users at night
  - EU vehicle regulations require pedal cycles to be fitted with lights during the hours of darkness
  - Are the lights for the cyclists to see with or are they to indicate the presence of the cyclist to other road users? - discussion

Unprotected Road Users - Cyclists

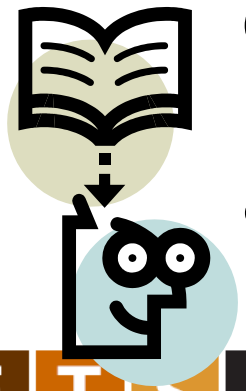
- **Vehicle design**
  - Policies and programmes for improving cycling for cyclists can have little influence the design of crash friendly car fronts as this rests primarily with vehicle manufacturers.
  - Partnership working with logistics companies to encourage retro fitting of under-run bars to their goods vehicle fleet can result in increased safety for cyclists
    - In 35-50% of the crashes between heavy goods vehicles and two-wheelers, injury severity can be limited by side under run protection

Unprotected Road Users - Cyclists

- **Protective devices**
  - Policies and programmes can be used to promote the use of protective devices for improving road safety for cyclists through partnership working with cycle retailers and product manufactures
    - Cycle helmets
    - Reflective or brightly coloured clothing
    - Retro-fit reflectors
    - Cycle lights etc.

Unprotected Road Users - Cyclists

- **Education**
  - road safety education for cyclists should be planned and progressive
  - Education should be directed at other types of road users, such as motorists as well as cyclists
  - Car driver instruction should cover characteristics of cyclists' behaviour and the necessary anticipation required by drivers to avoid conflicts with them



Road design measures

Assure a cyclist-friendly infrastructure by the introduction of measures such as;

- Area-wide speed reduction
- Safe cycling routes
- On-carriageway facilities
- Off-carriageway facilities
- Contra-flow facilities
- Crossing facilities




HOTEL
BRASSE





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Infrastructure measures ……..(M Tira)







Infrastructure measures …….(M Tira)

European Transport Safety Council


PHOTO
STUDIO


SOLDES
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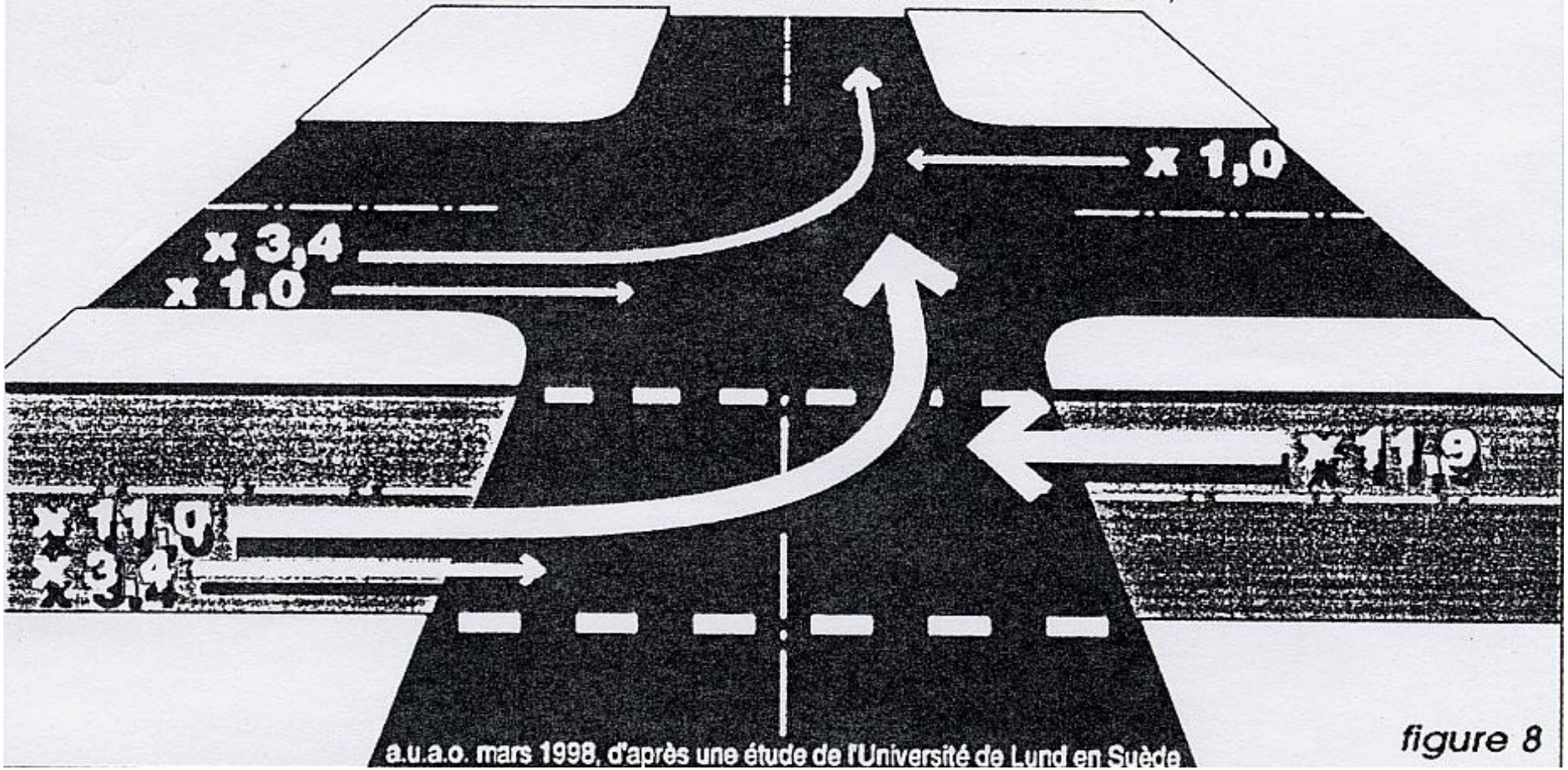



TAPIS
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TREE
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Risques relatifs d'accident aux carrefours pour des cyclistes sur chaussée et sur site propre

(base 1 pour les mouvements droits sur chaussée)



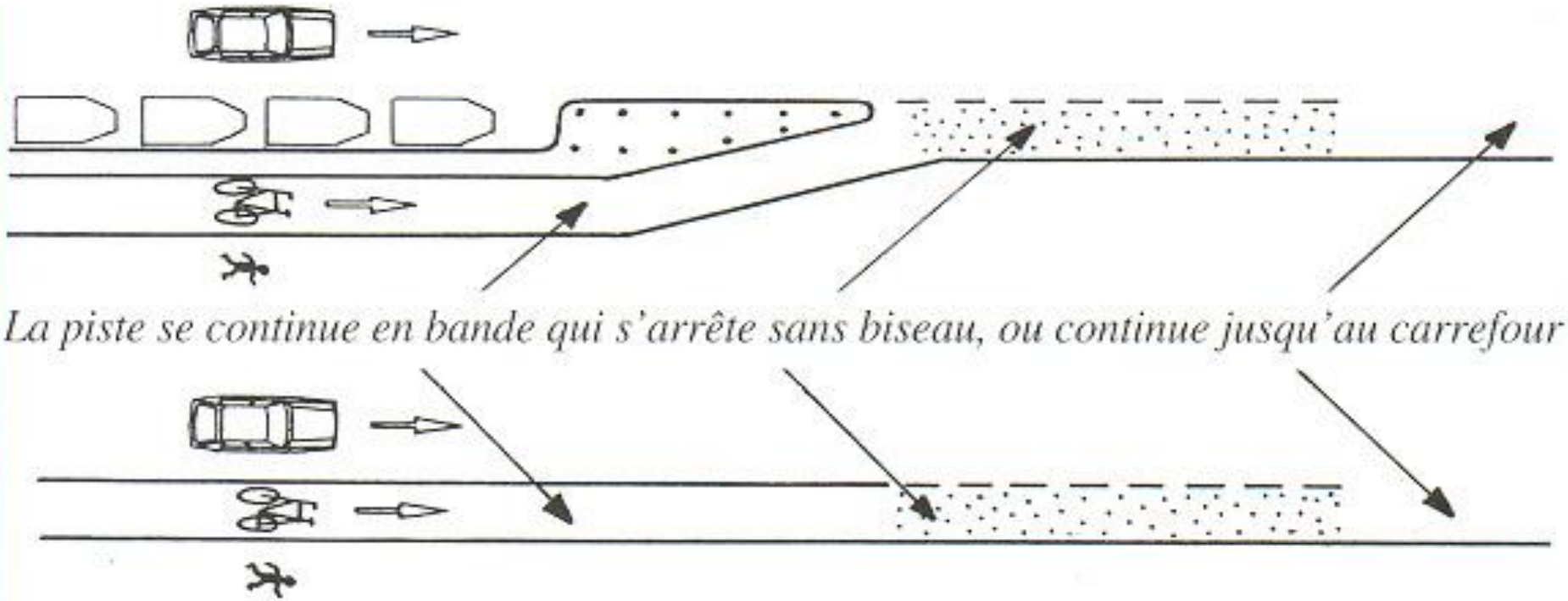
a.u.a.o. mars 1998, d'après une étude de l'Université de Lund en Suède

figure 8





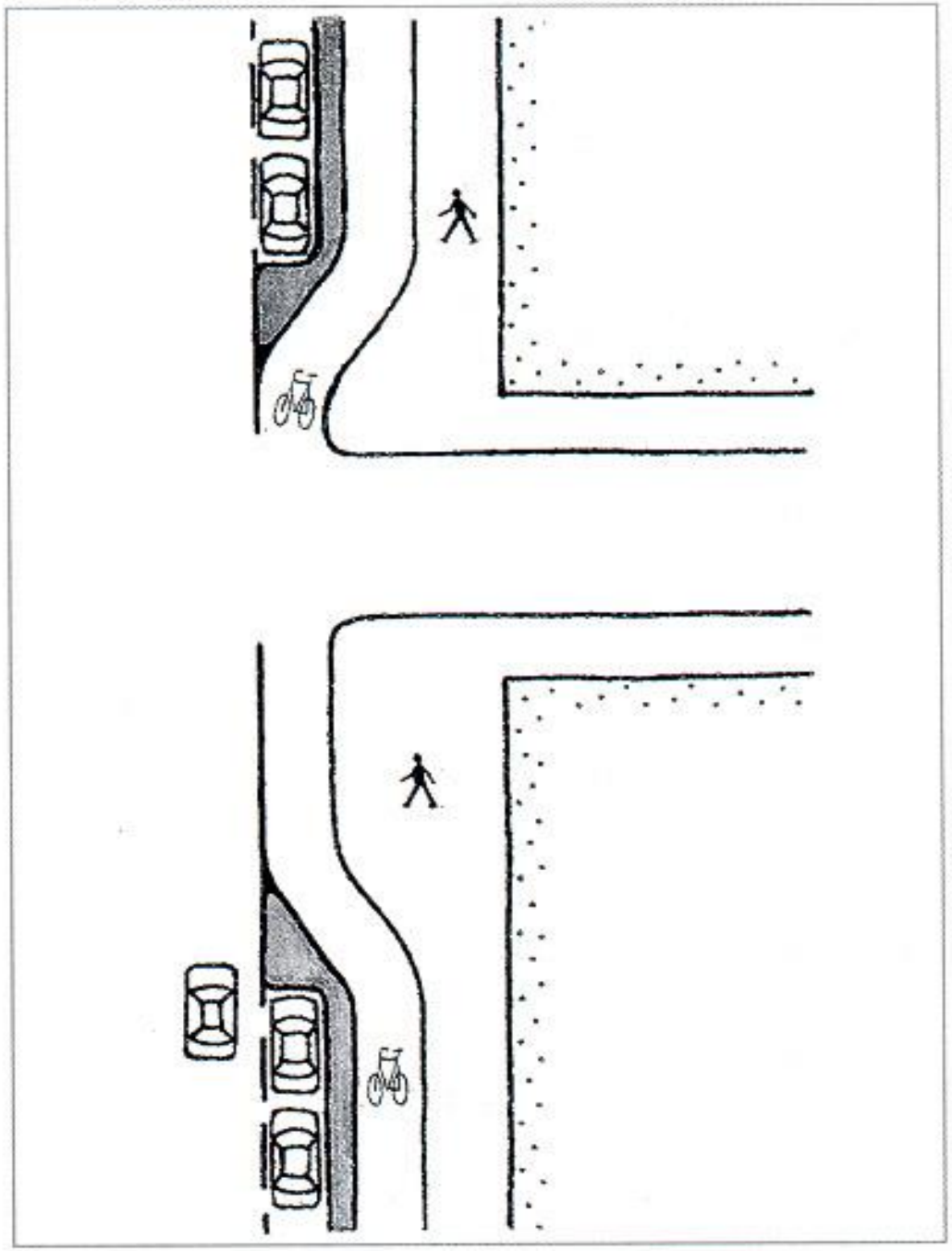

AUTRES DIRECTION



La piste se continue en bande qui s'arrête sans biseau, ou continue jusqu'au carrefour

En haut: fin d'une piste niveau trottoir, ou d'une piste écartée
En bas: fin d'une piste contiguë à mi-hauteur

Figure 2



Transformation d'une piste en bande

Residential streets





Environmental island



30km/h (20mph) zones



… Towards liveable streets



(*fonti:* www.transport2000.org.uk, www.paving.org.uk/pdf/hzone.pdf

… Towards liveable streets



Limited traffic zones

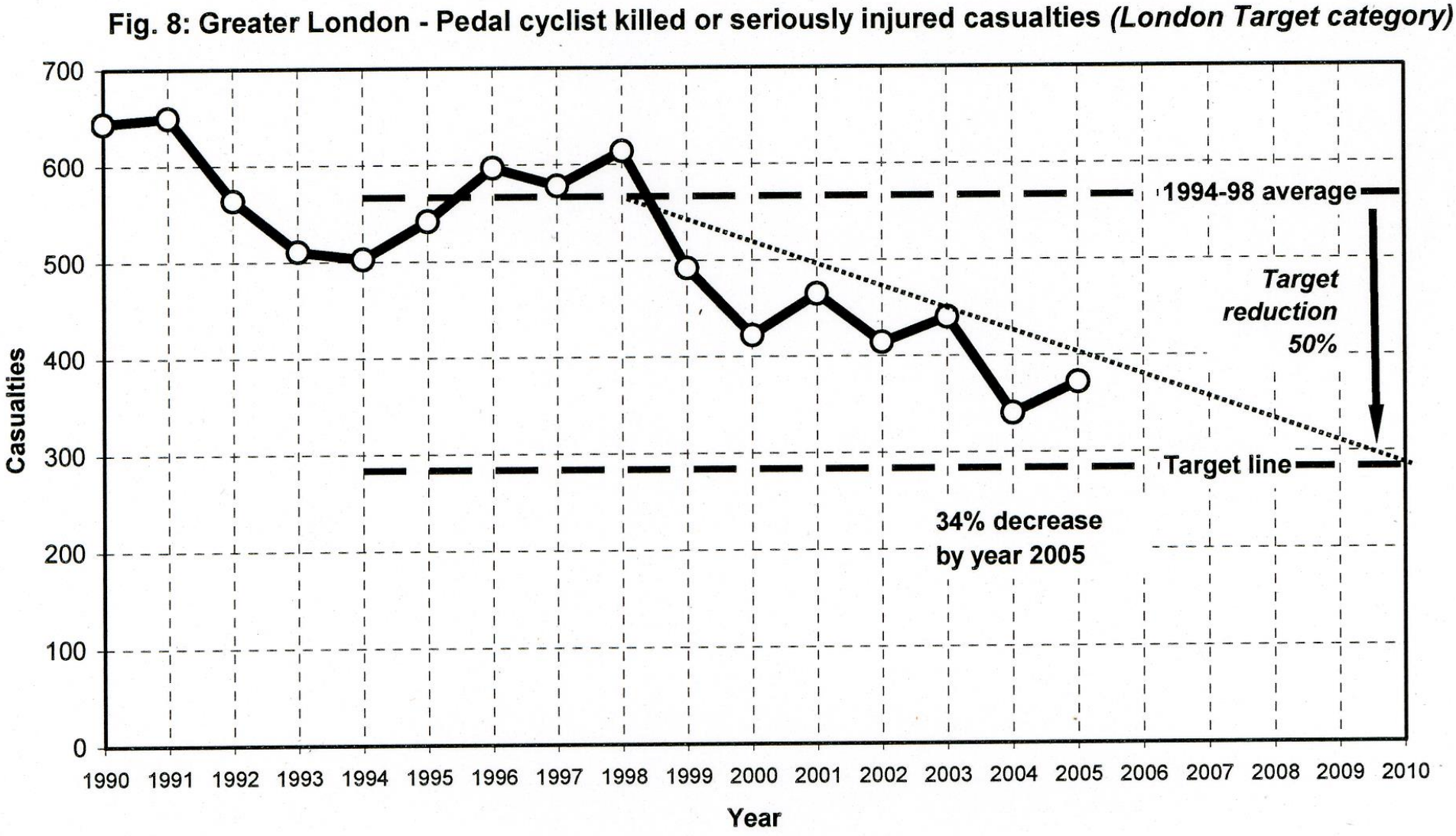








A positive experience: the London Road Safety Unit



Recommendations

Integrate mobility management and urban planning and take better account of the needs of pedestrians and cyclists from the earliest stages of urban development projects and transport investments, with the object of creating seamless, high-quality networks.

Recommendations

Establish clear administrative responsibilities among relevant government departments at all levels for co-ordinating walking and cycling programmes and initiatives. The purpose of such arrangements is to stimulate and support actions in government and private sector organisations in an integrated way. This might take the form of a national committee or an interministerial co-ordinator supported by a national observatory.

Recommendations

Improve knowledge about walking and cycling to adequately inform government policy development in relation to this fundamental aspect of mobility. This requires a standardized methodology for reporting, measuring and monitoring pedestrian and cyclists' mobility and injuries (from traffic crashes and falls).

Recommendations

Incorporate public transport services as an integrated part of the development of new urban areas and the regeneration of existing areas, through planning guidance and financial support for public services. This can support a long-term shift towards higher density, mixed-use, walking and transit-oriented urban form and a reduction in urban sprawl.

Recommendations

Encourage the responsible authorities to give higher priority and more space to non-motorised traffic and public transport in city centres. This includes a number of key actions: providing easy, safe, well-maintained and secure pedestrian access to public transport and to all city centre destinations; development of car-free areas; parking policies to discourage over-use of cars in city centres; and regulations to prevent parking on pavements and crossings, which undermines the quality of walking and, in severe cases, renders it impracticable or dangerous..

Recommendations

Develop national pedestrian and cycling planning guidance for local administrations. Plans should be required to give consideration to the impact of projects on pedestrians, and cyclists, as part of project appraisals and environmental impact assessments. Plans should also consider the development and setting of targets for future levels of walking and cycling , as well as addressing needs for financial support.

Recommendations

Encourage employers to implement a broad range of incentives for employees to include active transport in commuting trips. Government agencies should demonstrate leadership in this area.

Recommendations

Adopt a safe system approach for the design of the urban environment for pedestrians and cyclists so that it is organised in such a way that specific risk groups are not exposed to avoidable risks.

Recommendations

Implement traffic-calming policies and generalise 30 km/h zones in city centres, residential areas and other high pedestrian activity areas. This should be based on a functional classification of urban spaces, streets and road networks, supported by appropriate infrastructure design criteria to create low-risk and amenable urban environments for non-motorised road users.

Recommendations

Encourage the introduction of high-quality education programmes in schools and local community centres, to teach safe road user behaviour and promote the benefits of walking and cycling through a range of effective forms of communication. Adult retraining initiatives are also indicated. School mobility plans should be developed aiming to produce a safe and supportive environment in which children can walk or cycle to school.

Recommendations

Conduct a critical review of current traffic codes to strengthen the legal and financial protection of pedestrians and cyclists in case of a crash, and give higher priority to more vulnerable road users in order to provide safer, more equitable conditions among the different road users.

Recommendations

Develop a research strategy to better understand mobility trends in a changing society.

This should include evaluating the effectiveness of measures to reduce dependence on private car travel, achieve higher-density urban forms, protect the environment, improve health and achieve more efficient and sustainable use of energy.

Acknowledgments

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Prof. Ing. Maurizio TIRA

Università degli Studi di Brescia

Via Branze, 43

25123 BRESCIA

Tel. 030 3711 304

Fax. 030 3711 312

e.mail: tira@ing.unibs.it