

# Road safety in urban areas: a place of myths

La sicurezza stradale nelle aree urbane: la  
necessità di un approccio razionale

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## 0. Premise (1)

Remarkable advancements in research have been carried out in the latest years.

**Nevertheless several myths (beliefs and prejudices) people road safety field, as regards particularly the applications in urban areas**

- ❑ **They prevent a rational approach for managing road safety (and just a reasonable one) and compromise success for actions undertaken in this regard by Local Administrations**
- ❑ **They introduce into road safety practices warped and misleading vision of accident phenomenon**
- ❑ **They can disorientate final stakeholders and researchers (particularly younger ones)**



## 0. Premise (2)

Focusing the attention on beliefs and prejudices is the necessary preamble in order to frame from a realist perspective the road safety theme, considering this matter involves first of all the Society and then Administrations and researchers



1. **The main beliefs to be removed**
2. **Main features of crash phenomenon in urban areas**
3. **Lessons from experiences and researches of the latest years**
4. **The real obstacles with which it is necessary to correspond, particularly technical and conceptual ones**



# 1. The main beliefs to be removed

Wrong prejudices derive to a great degree from a mistaken knowledge of the accident phenomenon and/or from a poor consideration of its intrinsic characteristics

They express the trust in personal valuation (or conjecture, too) rather in the knowledge based on prominent facts

In particular, three prejudices directly regard technical reasons and thwart the development of the road safety culture:

**1.1 Urban roads are safer than extra-urban ones**

**1.2 Roads built (or designed) by standards are safe**

**1.3 The responsibility of accidents is imputable to users and (hardly ever) to infrastructure**



The main beliefs to be removed

## 1.1 **Urban Roads** are safer than extra-urban ones (1)

- ❖ This assertion is unconfutable if referred to crash consequences
- ❖ The urban spaces features assigned to road traffic, the quick lineage of junctions and the same traffic conditions in urban areas operate well on limiting vehicular speed and reduce strongly crash danger
- ❖ This turns out in an unequivocal way on rates usually applied to highlight the danger of the crash phenomenon



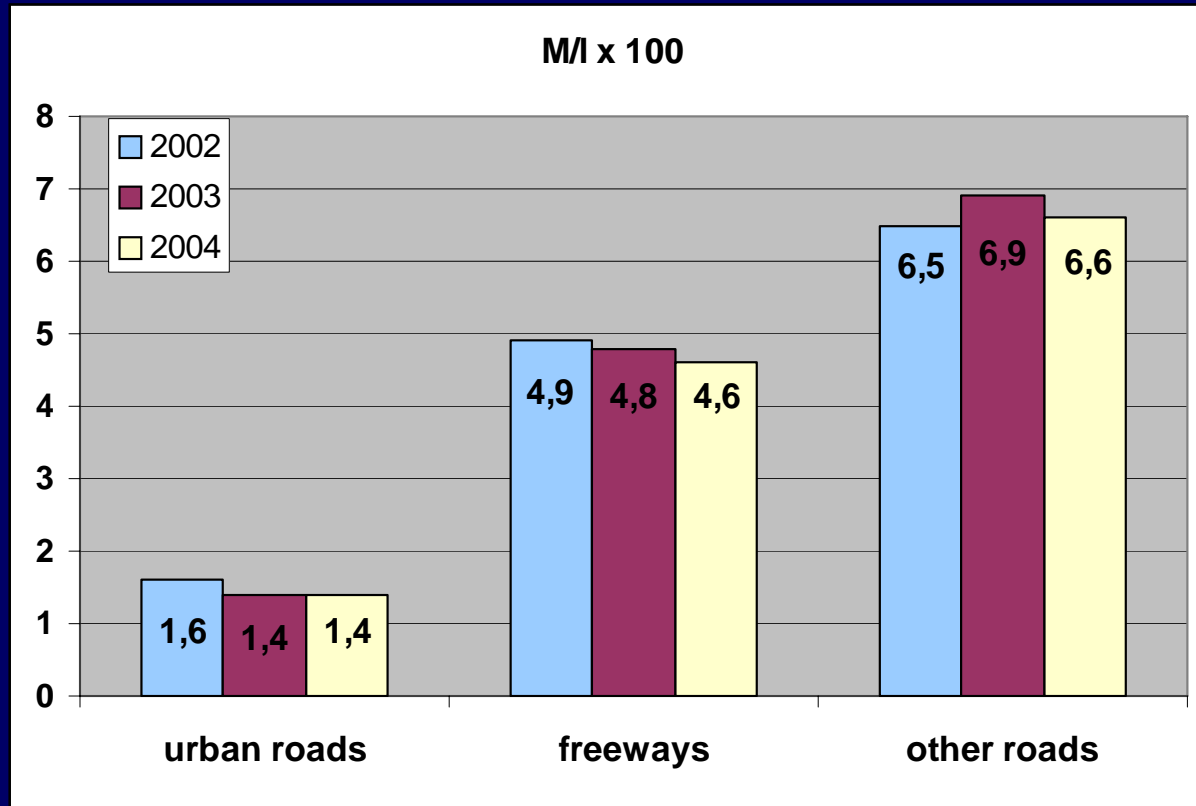
The main beliefs to be removed

## 1.1 Urban Roads are safer than extra-urban ones (2)

- The likelihood of an urban crash having fatal consequences is about three times lower than freeways, **about five times lower than other extra-urban roads**
- The likelihood of user being injured in an urban crash, even if comparable to that one of extra-urban roads, is in all cases lower both further to freeways and further to other roads

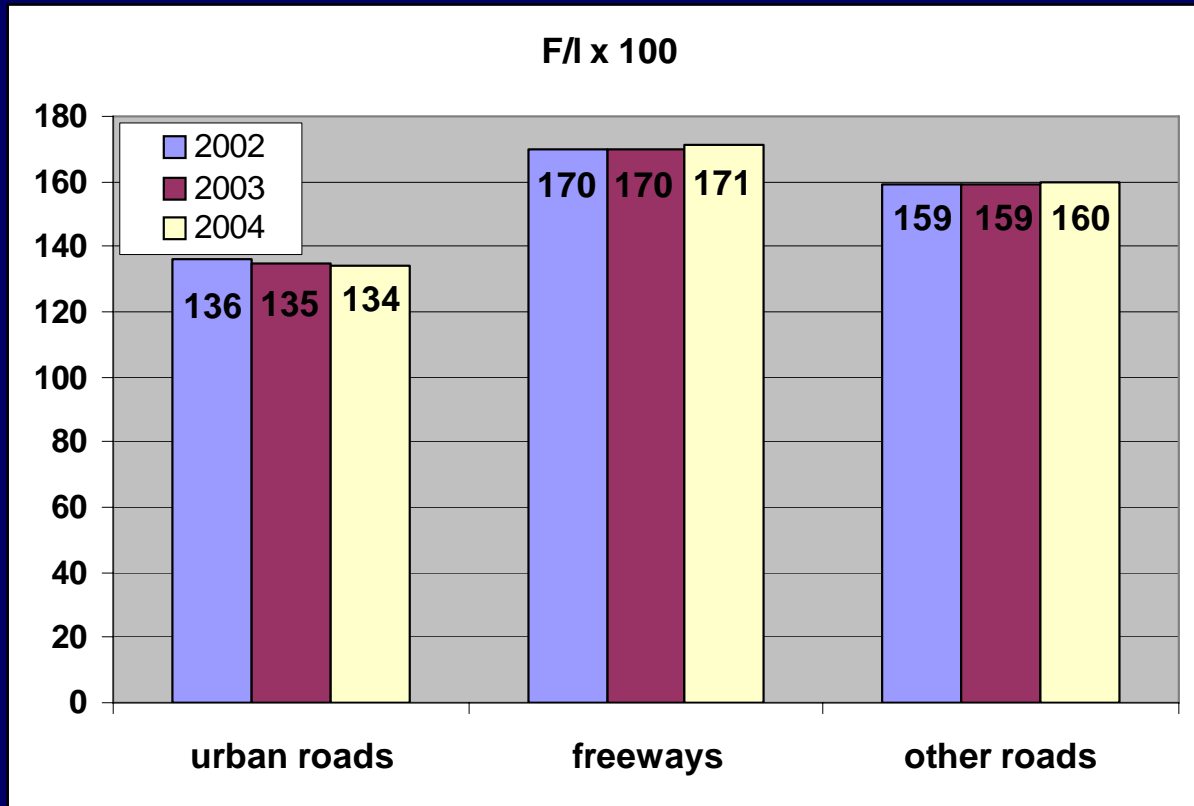
The main beliefs to be removed

## 1.1 Urban Roads are safer than extra-urban ones (3)



The main beliefs to be removed

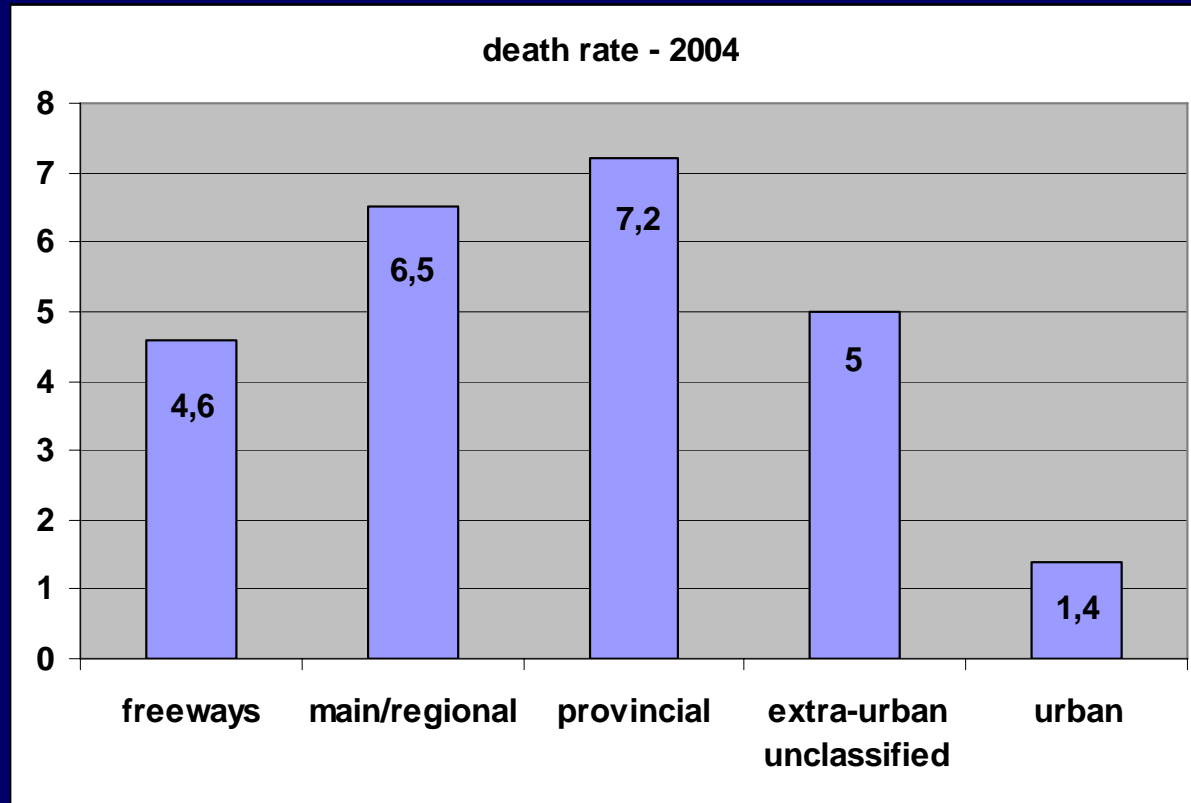
## 1.1 Urban Roads are safer than extra-urban ones (4)





The main beliefs to be removed

## 1.1 Urban Roads are safer than extra-urban ones (5)



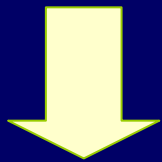


The main beliefs to be removed

## 1.1 **Urban Roads** are safer than extra-urban ones (6)

Nevertheless the perspective is very different if the impact of urban crashes on Society Safety is considered, i.e. the extent and consequences of the phenomenon are examined

Few data can be useful for this purpose:



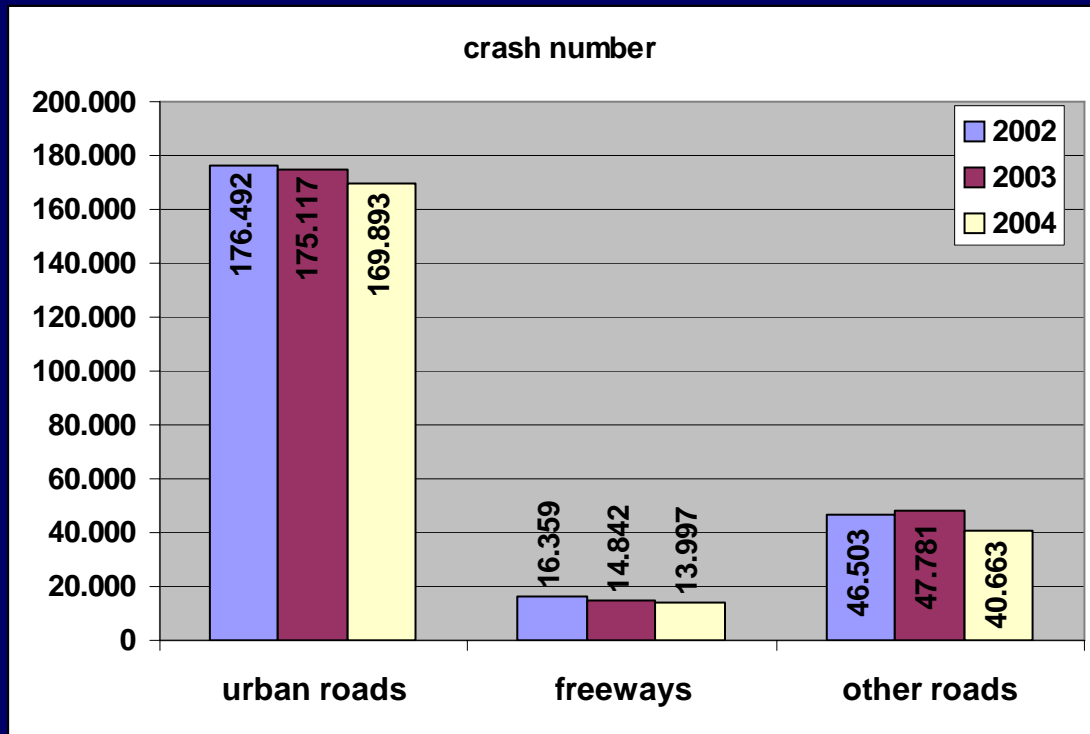
**1.1.1 The extent of the crash phenomenon**

**1.1.2 The consequences of the crash phenomenon**

## The main beliefs to be removed

Urban Roads are safer than extra-urban ones

### 1.1.1 The extent of the crash phenomenon (1)

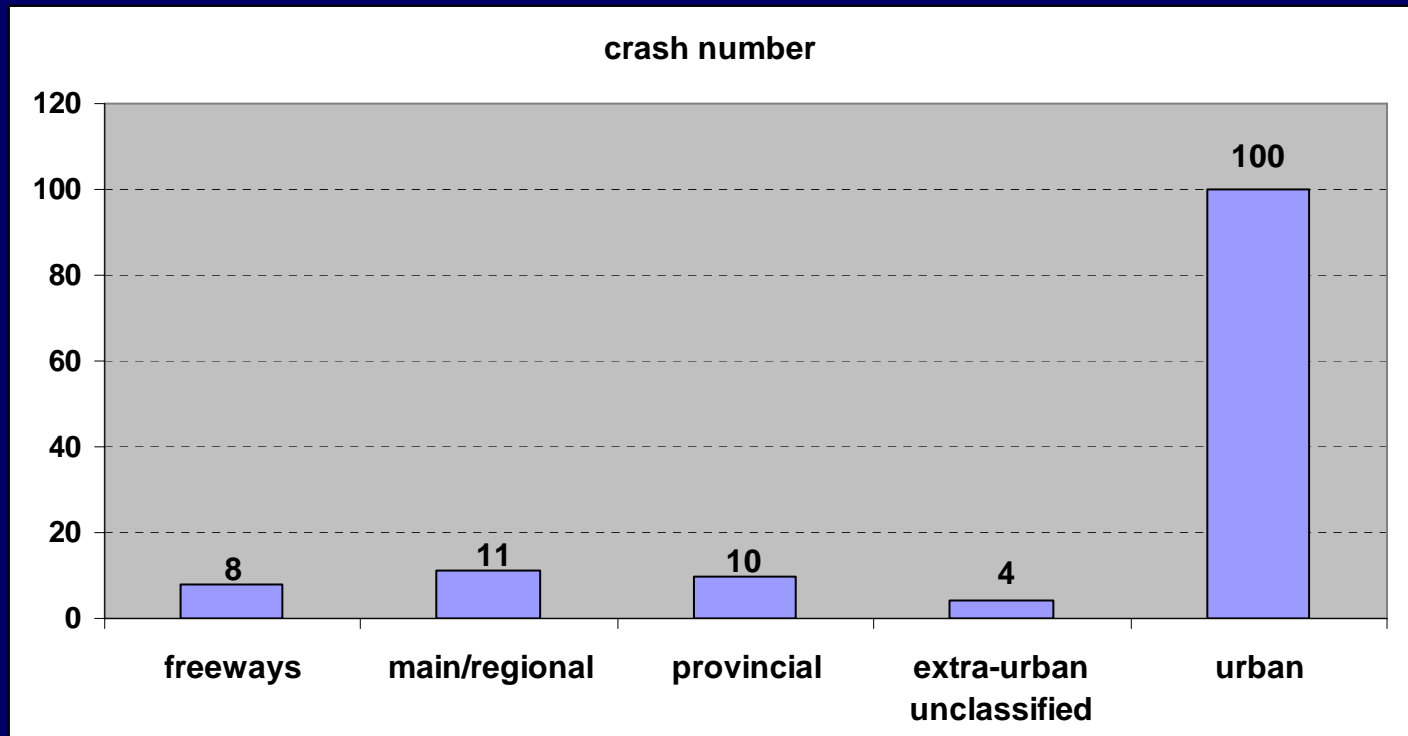


The accident number in urban areas is more than  $\frac{3}{4}$  of all crashes; they are 3 times and over 10 times greater than those on freeways and other extraurban road, respectively

The main beliefs to be removed

Urban Roads are safer than extra-urban ones

## 1.1.1 The extent of the crash phenomenon (2)

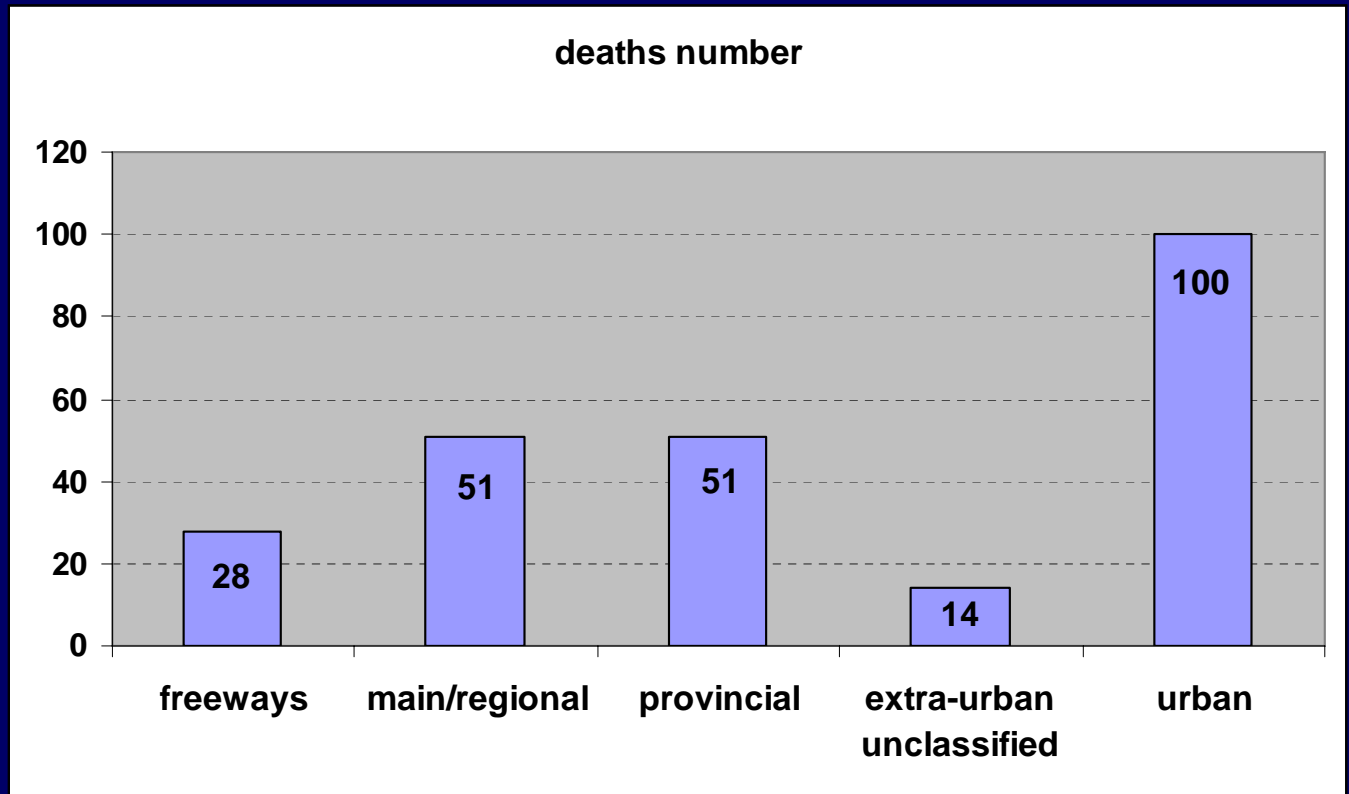


The accident number in urban areas is three times higher than crashes occurred in other roads (ten times higher than freeways)

The main beliefs to be removed

Urban Roads are safer than extra-urban ones

## 1.1.2 Consequences of the accident phenomenon



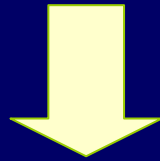
The number of deads caused by road crashes are in urban areas about the half of deaths following up road crashes



The main beliefs to be removed

## 1.2 Roads built (or designed) by standard are safe (1)

- road safety concept is, always and anyway, of marginal kind



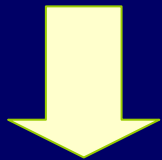
**A road cannot be defined “safe”, but on the contrary it can result safer or less safe than one other**



The main beliefs to be removed

## 1.2 Roads built (or designed) by standard are safe (2)

- Ordinary standards used in geometric design, in Italy and in other countries, are largely deduced by mechanistic considerations and presuppose a predominantly perceptive interaction between the driver and the road environment



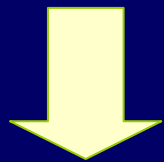
From that we know on crash mechanism, especially in built areas, road situations bring to accidents are much more constructed, involve different users (not only motorized ones) and escape the simplifications implicitly introduced by standards



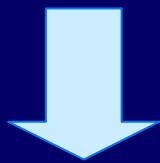
The main beliefs to be removed

## 1.2 Roads built (or designed) by standard are safe (3)

- **The relation between safety and geometric features of single elements of the road (to which standards are linked), when it exists, is very complex**



At all events, how much is known relating to these relations, it is possible to say safety doesn't reduce suddenly when road features change slightly



The contrary is the same as, whenever the standard is reviewed toward the high, all roads previously built become suddenly unsafe

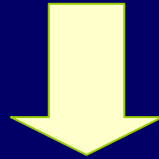




The main beliefs to be removed

## 1.2 Roads built (or designed) by standard are safe (4)

- **Many road features relevant for road safety are not definable by standards**



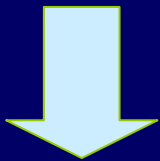
As well as in general, this is particularly true for urban roads where the density and (the kind) of intersections and the activities at sides have a fundamental role for safety.



The main beliefs to be removed

### 1.3 The responsibility of accidents is imputable to users and (hardly ever) to infrastructure (1)

- **Police records confirm this common way of thinking; moreover the assertion is confirmed considering that human mistakes play an important part in a lot of accidents**



**If users do not perform mistakes, almost all accidents could be prevented**

- **The obvious consequence is that actions really effective in road safety are those ones linked to education and repression, while actions related to the infrastructure and the equipment are quite marginal and without an economic return**



The main beliefs to be removed

### 1.3 The responsibility of accidents is imputable to users and (hardly ever) to infrastructure (2)

- It is a common opinion that the disposition to make errors can be unlikely corrected by repressive countermeasures and/or by a better user education
  
- on the contrary, the main task of geometric design inspired by road safety principles is:
  - to reduce the likelihood of human error (or, at least, that the latter will be to crash)
  - to mitigate, in every case, the consequences of accident caused by human errors



The main beliefs to be removed

### 1.3 The responsibility of accidents is imputable to users and (hardly ever) to infrastructure (3)

- ❑ It's amply proved by documents that roads with specific features are safer than others (i.e. crashes occur with lower proportion and less seriousness)
- ❑ Inversely, it's possible to foresee the number and the gravity of accidents starting from road features



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## 2. Main features of crash phenomenon in urban areas (1)

**2.1 Dispersion of accidents on the network**

**2.2 Crash types and users classes**

**2.3 Night crashes**

## Main features of crash phenomenon in urban areas

### 2.1 Dispersion of accident on the network (1)

#### Crash phenomenon groups at junctions

|                    | crashes<br>% | deaths<br>% | injured<br>% |
|--------------------|--------------|-------------|--------------|
| Urban roads        | 52,65        | 35,76       | 53,88        |
| Extra-urban roads* | 39,34        | 30,30       | 41,64        |

\* Excluded freeways

#### Similarly to extra-urban areas, crashes at junctions aren't more hazardous situations; this is much more unmistakable in the urban case where the death rate halves

|                    | Dead rate |           | Injured rate |           |
|--------------------|-----------|-----------|--------------|-----------|
|                    | Junctions | Elsewhere | Junctions    | Elsewhere |
| Urban roads        | 0,92      | 1,85      | 137          | 130       |
| Extra-urban roads* | 5,05      | 7,54      | 170          | 154       |

\* Excluded freeways

## 2.1 Dispersion of accident on the network (2)

- *In extra-urban roads crashes out of junctions tend to group in few sections; this doesn't happen in urban roads (out of junctions crashes are scattered)*

## 2.2 Crash types and users classes

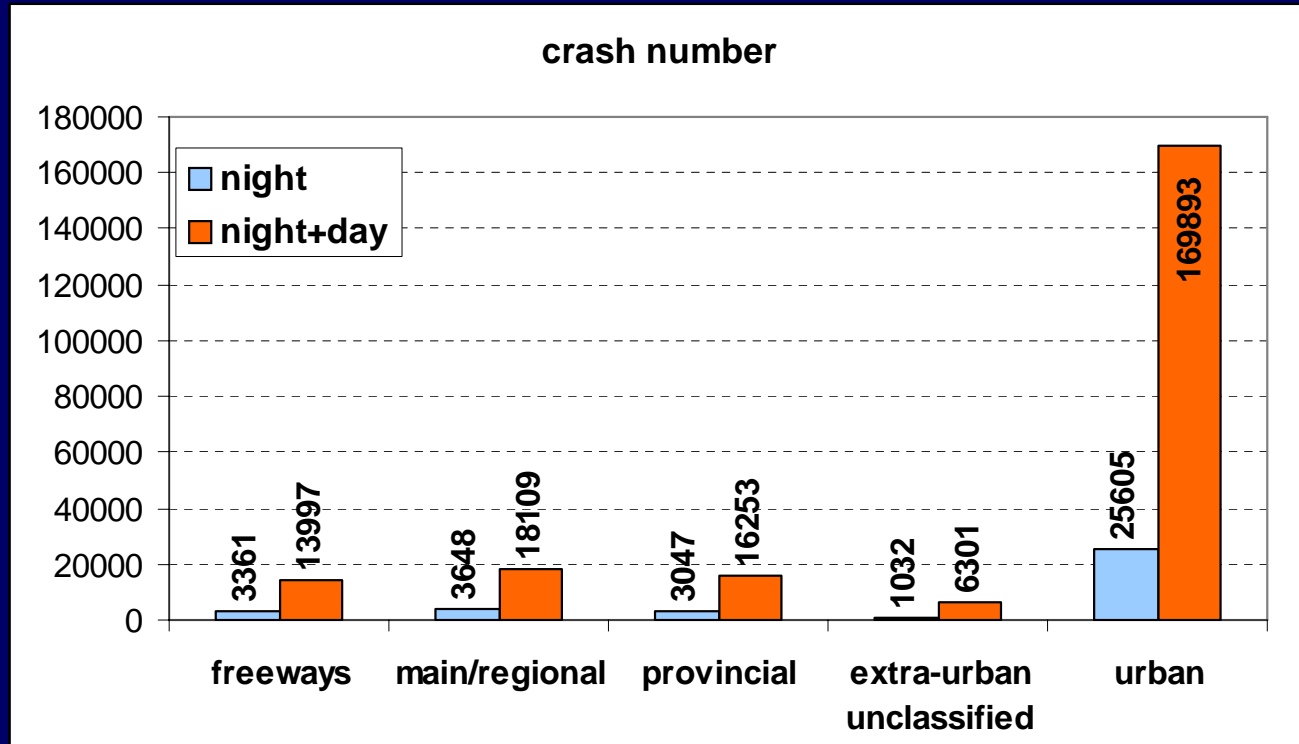
### From 2004 data - Urban areas:

- ❑ **About 24 per cent are single crashes**
  - ❑ **About 42 per cent are pedestrian crashes (equal to 10 per cent on all crashes)**
  - ❑ **About 24 per cent are loss of control crashes (equal to 6 per cent on all crashes)**
- ❑ **About 76 per cent are moving vehicle crashes**
  - ❑ **About 51 per cent are side on/ head on collisions (equal to 35,5 per cent on all crashes)**
  - ❑ **About 21,34 per cent are bumping crashes (equal to 16,22 per cent on all crashes)**
  - ❑ **About 18,25 per cent are side on collisions (equal to 14 per cent on all crashes)**
  - ❑ **About 30-40 per cent are estimated to be moped crashes**



## Main features of crash phenomenon in urban areas

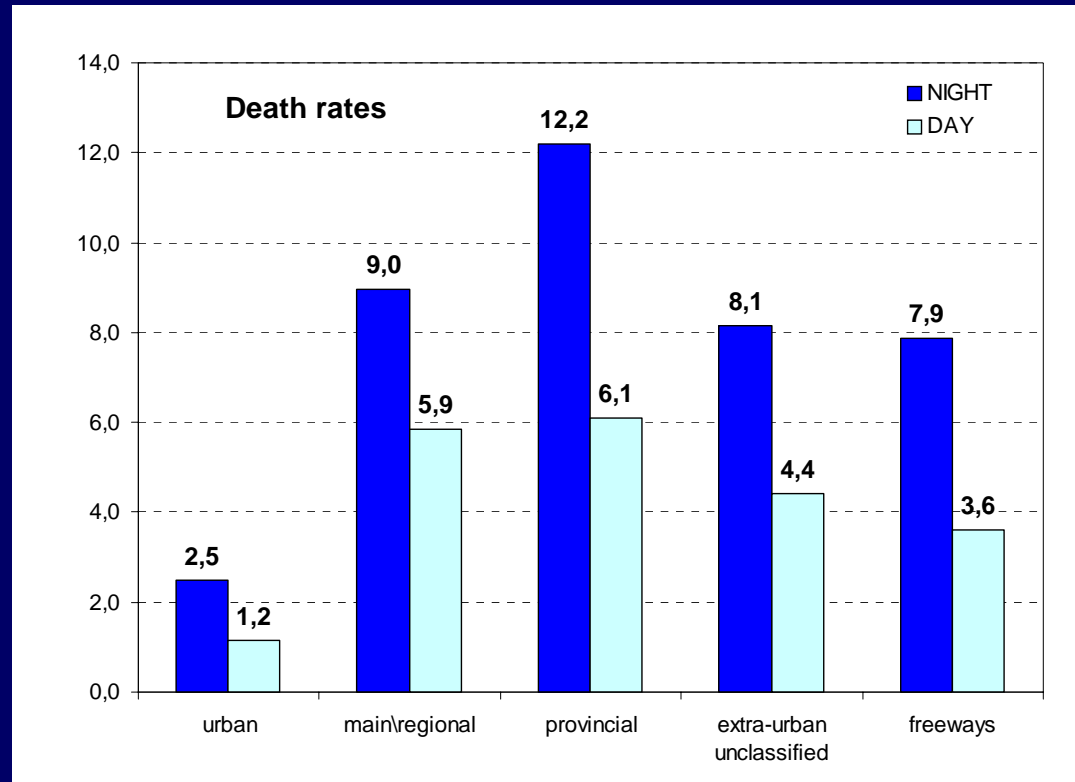
### 2.3 Night crashes (1)



Night crashes are considerable both in absolute terms and in relation to other road classes

## Main features of crash phenomenon in urban areas

### 2.3 Night crashes (2)



Data related to urban roads highlight a higher relative dangerousness of night crashes, compared with daily ones, more than in other road classes (death rate doubles in the night)



### 3. Lessons from experiences and researches of the latest years (1)

Review of road safety practices in urban areas emphasizes two main ways for reducing the occurrence of accidents and casualties:

- crash reduction addresses to locations where crashes occur on a regular and explainable basis; it is the preferential field of engineering measures, such as blackspot programs and traffic calming treatments
- crash prevention targets problem groups of road users and uses systematic approach in order to remove causes of accidents, both in existing roads and in designing and planning, such as introducing a formal road safety procedure into the design process.

Crash prevention cannot be achieved only by means of engineering measures; it requires a more comprehensive approach across several sectors including planning, traffic law enforcement, education and communication.



### 3. Lessons from experiences and researches of the latest years (2)

The main findings can be summarized as follows:

- **Overall, road crashes and rates have been reducing over a number of years, due to the cumulative effect of a range of interventions.** This reduction comprises a large decrease in vulnerable road user casualties, coupled with a decrease in vehicle occupant casualties
- **There is a strong relationship between traffic speeds, crashes and injury severity.** Thus speed enforcement and area-wide speed limits are effective in reducing crashes. For zones with a speed limit lower than the standard, the casualty savings are even greater, particularly for pedestrians.





### 3. Lessons from experiences and researches of the latest years (3)

- **Site specific remedial treatment is effective in dealing with clusters of vehicle/vehicle crashes and some crashes involving pedestrians.**

Pedestrian and two wheels crashes tend to be more dispersed and so require an area-wide approach for effective treatment.

- **Traffic calming schemes, which reduce traffic speeds and generally provide facilities for pedestrians and other vulnerable road users, have been proven effective in reducing crashes.**



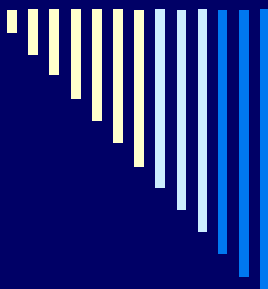


### 3. Lessons from experiences and researches of the latest years (4)

- **A comprehensive approach, based on a road safety plan for the town or municipal area, is needed.**

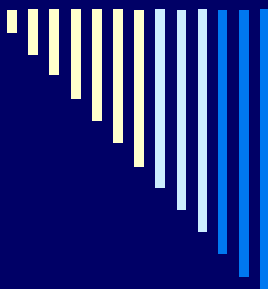
The need for a more comprehensive approach has grown as successful blackspot programmes have reduced the proportion of crashes concentrated at single locations.

The comprehensive approach involves the various authorities with responsibilities for the different aspects of road safety activity: highway and traffic engineers; traffic police; education and publicity; health authorities and emergency services; etc.



## 4. The real obstacles with which it's necessary to correspond (1)

- **“Real” obstacles depending on state of things and actual knowledge**
  - ❖ **troubles concerning structural (general) conditions**  
*It could be a matter of financial and political actions*
  - ❖ **troubles of a technical or practical nature**  
*Care must be put in application*
  - ❖ **conceptual or scientific troubles**  
*Outlining needs in research*



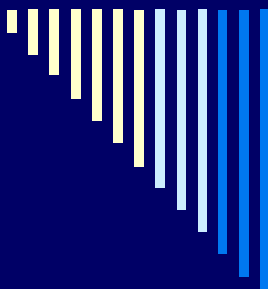
## 4. The real obstacles with which it's necessary to correspond (2)

### **Objective troubles concerning structural conditions:**

- The territorial spreading of phenomenon and its different characterization as regards the size of the city
- The apportionment of the competences into a multitude of subjects: from Administrations and Agencies of big cities to those ones of small cities







## 4. The real obstacles with which it's necessary to correspond (3)

- **The limited availability of (human and material) resources specifically intended for the safety management**
- **The need, more than elsewhere, to combine together engineering, educational and enforcement measures**





## 4. The real obstacles with which it's necessary to correspond (4)

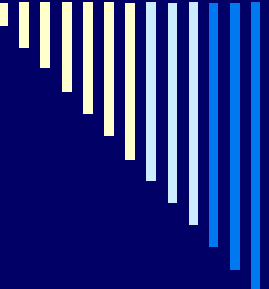
- The need of permanent and large scale actions both for monitoring and effectiveness evaluation of corrective measures and for progressive improvement in knowledge of phenomenon
- The tendency of politicians to privilege an approach based on people agreement (**pragmatic approach**) rather than a rational approach based on knowledge of phenomenon (**rational approach**)





## 4. The real obstacles with which it's necessary to correspond (5)

- **Political and financial reasons limit the implementation of area-wide or strategic approaches based on application of (USM (IHT; DUMAS) principles**



## 4. The real obstacles with which it's necessary to correspond (6)

### Objective Troubles of technical nature:

- The coexistence of accident phenomenologies with very different characteristics demands suitable analysis tools and proper engineering countermeasures
- The poor quality of the available data compromises the applicability of **reactive safety tools** largely experimented in extra-urban areas, but requiring a good knowledge of previous occurred accidents





## 4. The real obstacles with which it's necessary to correspond (7)

- ❑ The large scale presence of atypical infrastructural installations can also considerably reduce **proactive safety tools** (i.e. RSAR), even if they are a particularly promising option as regards rapidity of implementation and contained costs
- ❑ The inapplicability of traditional analysis tools (both reactive and proactive ones) in order to comprise crashes scattered over the network



## 4. The real obstacles with which it's necessary to correspond (8)

### Objective Troubles of conceptual nature:

- ❑ The accident phenomenon in urban areas is very complex and its understanding requires an *authentically interdisciplinary approach*, able to consider the needs of different users
- ❑ The transferability of acquired knowledge isn't always possible and has to be valued in relation to the peculiarity of the context in which we're working





## 4. The real obstacles with which it's necessary to correspond (9)

- ❑ **The traditional approach of the engineer, based on a mechanistic conception, is entirely unsuited in comparison with problems in which the user behaviour and its interaction with the surrounding context have a fundamental role**
- ❑ **Differently from extra-urban areas, safety problems derive greatly from the heterogeneity of road situations and users, both in terms of user behaviour and in terms of mass, speed and acceleration**





## 4. The real obstacles with which it's necessary to correspond (10)

- **The user behaviour feels not much or nothing the conditioning exercised by geometric characteristics of infrastructure (curvature, slope, etc.); differently from extra-urban areas, it is strongly influenced by the activities at sides, by the way of intersections follow one another and by their functional organization**

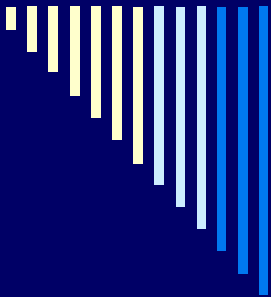






## 4. The real obstacles with which it's necessary to correspond (11)

- **The risk of accident, particularly at intersections, is strongly influenced by the directional distribution of traffic streams and by operational conditions, variable during the day and the months of the year**
- **The presence of vulnerable users (pedestrians, moped) and/or users with reduced mobility cause specific problems of protection that come into conflict to general objectives of urban transport efficiency**



.....to be continued (?)