



SUMMER SCHOOL SIIV 2012 - ROAD SAFETY MANAGEMENT
Theoretical principles and practical application in the framework of the European Directive 2008/96/CE
Catania 24-28 September 2012



Società Italiana Infrastrutture Viarie

dept. Civil Environmental Engineering

Summer School SIIV 2012

European Directive 2008/96/CE

Road Infrastructures Safety Management

Session C

Safety ranking and management of the road network in operation

Wednesday 26 sept. 2012



Safety ranking and management of the road network in operation

Wednesday 26 Sept. 2012 - Session C

- 09:00 - 09:15 Introduction (Chair S. Cafiso)
- 09:15 - 10:45 Modulo C1 – Network Safety Screening – Basics and North American Perspectives (B. Persaud)
- 10:45 - 11:15 Coffee Break
- 11:15 - 12:30 Modulo C2 – Network safety screening and the identification of hazardous road locations – State of the Art and European Practice (R. Elvik)
- 12:30 - 14:00 Lunch
- 14:00 - 15:30 Modulo C3 – Evaluation of Safety Effects of Design Decisions and Countermeasures (B. Persaud)
- 15:30 - 16:00 Discussion

SPEAKERS



Bhagwant Persaud
Professor of Civil
Engineering at Ryerson
University,
Toronto, Canada

BHAGWANT PERSAUD, a professor of Civil Engineering at Ryerson University, has become well recognized, in Canada, the United States, and around the world, as an expert in the area of statistical methods in collision data analysis.

Dr. Persaud has been, and is currently involved in several safety related research projects for the Ministry of Transportation, Ontario, the Transportation Research Board (TRB), the US Federal Highway Administration (FHWA), the Insurance Institute for Highway Safety, Transport Canada, and the Transportation Association of Canada.

He has authored or co-authored a substantial number of peer-reviewed papers, three of which won awards for the Transportation Research Board's Annual Meeting outstanding paper in the field of operation, safety and maintenance of transportation facilities.

In Canada, he is a member of the Transportation Association of Canada's Standing Committees on Road Safety and Geometric Design.



Rune Elvik
Chief Research Officer
Professor of road safety
studies at Lund university,
Sweden

RUNE ELVIK is a political scientist from the University of Oslo. He attained the degree of doctor of political science in 1993 and the degree of doctor of philosophy in 1999. In 2007, he attained the ph D degree at Aalborg University in Denmark.

His main areas of research include evaluation of the effects of road safety measures, research synthesis by means of meta-analysis, and cost-benefit analysis.

Rune Elvik has taken part in several international research projects organised by the European Commission, the OECD, the European Transport Safety Council and the US Transportation Research Board. During the years 1997-2004 he was associate editor of Accident Analysis and Prevention. From 2005, he has been one of the editors-in-chief of the journal. From 1999, Elvik has been a member the committee for Safety data, analysis and evaluation of the TRB. Elvik is professor of road safety studies at Aalborg university in Denmark. From 2009, he is professor of road safety studies at Lund university in Sweden. He has authored or co-authored a substantial number of peer-reviewed papers.

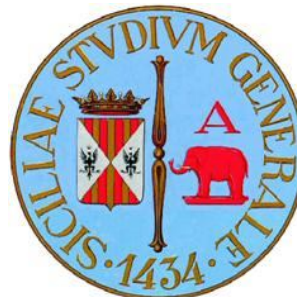
Safety ranking and management of the road network in operation

An Introduction

by

Damiano Cafiso

University of Catania



DIRECTIVE 2008/96/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 19 November 2008 on road infrastructure safety management

Article 1

Subject matter and scope

1. This Directive requires the establishment and implementation of procedures relating to road safety impact assessments, road safety audits, the management of road network safety and safety inspections by the Member States.
2. This Directive shall apply to roads which are part of the trans-European road network, whether they are at the **design** stage, under **construction** or **in operation**.
3. Member States may also apply the provisions of this Directive, as a set of good practices, to national road transport infrastructure, not included in the trans-European road network, that was constructed using Community funding in whole or in part.

Article 5

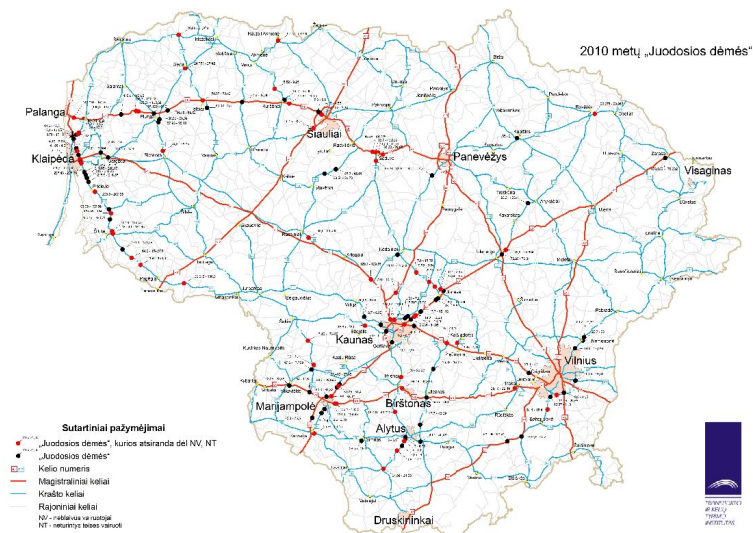
Safety ranking and management of the road network in operation

1. Member States shall ensure that the **ranking of high accident concentration sections** and the **network safety ranking** are carried out on the basis of reviews, at least every three years, of the operation of the road network.
2. Member States shall ensure that **road sections** showing higher priority according to the results of the ranking of high accident concentration sections and from network safety ranking **are evaluated by expert teams** by means of **site visits** guided by the elements referred to in point 3 of Annex III. At least one member of the expert team shall meet the requirements set out in Article 9 (appointment, training).
3. Member States shall ensure that **remedial treatment** is targeted at the road sections referred to in paragraph 2. Priority shall be given to those measures referred to in point 3(e) of Annex III paying attention to those presenting the **highest benefit-cost ratio**.

Road Network in Operation

Article 5

Management of the road network



Article 6

Safety Inspection



Identify road safety features to prevent accidents (6.1)

Inspections of road network & road works (6.2)

Sufficiently frequent to safeguard safety levels (6.3)

Ranking of road section with high accident concentration (5.1)

Site visit (5.2)

Treatments (5.3)

Directive EU 2008/96/CE
was transposed by Italian
Legislative decree n. 35
November 2011

Italian Guidelines for
Safety Audit, Safety
Inspection and Road
Network Safety
Management

September 2012



The cover features the Italian coat of arms at the top center. Below it, the name of the Ministry is written in a cursive script. The main title is in a bold, sans-serif font, and the subtitle is in a smaller, italicized font. The year '2012' is prominently displayed at the bottom right.

Ministero delle Infrastrutture e dei Trasporti

Allegato al D.M. previsto dall'art. 8 del
Decreto Legislativo
n. 35/11

LINEE GUIDA
PER LA GESTIONE DELLA SICUREZZA
DELLE INFRASTRUTTURE STRADALI

*Criteria e modalità per l'effettuazione dei controlli della sicurezza stradale sui progetti,
delle ispezioni di sicurezza sulle infrastrutture esistenti e
per l'attuazione del processo per la classificazione della sicurezza della rete stradale*

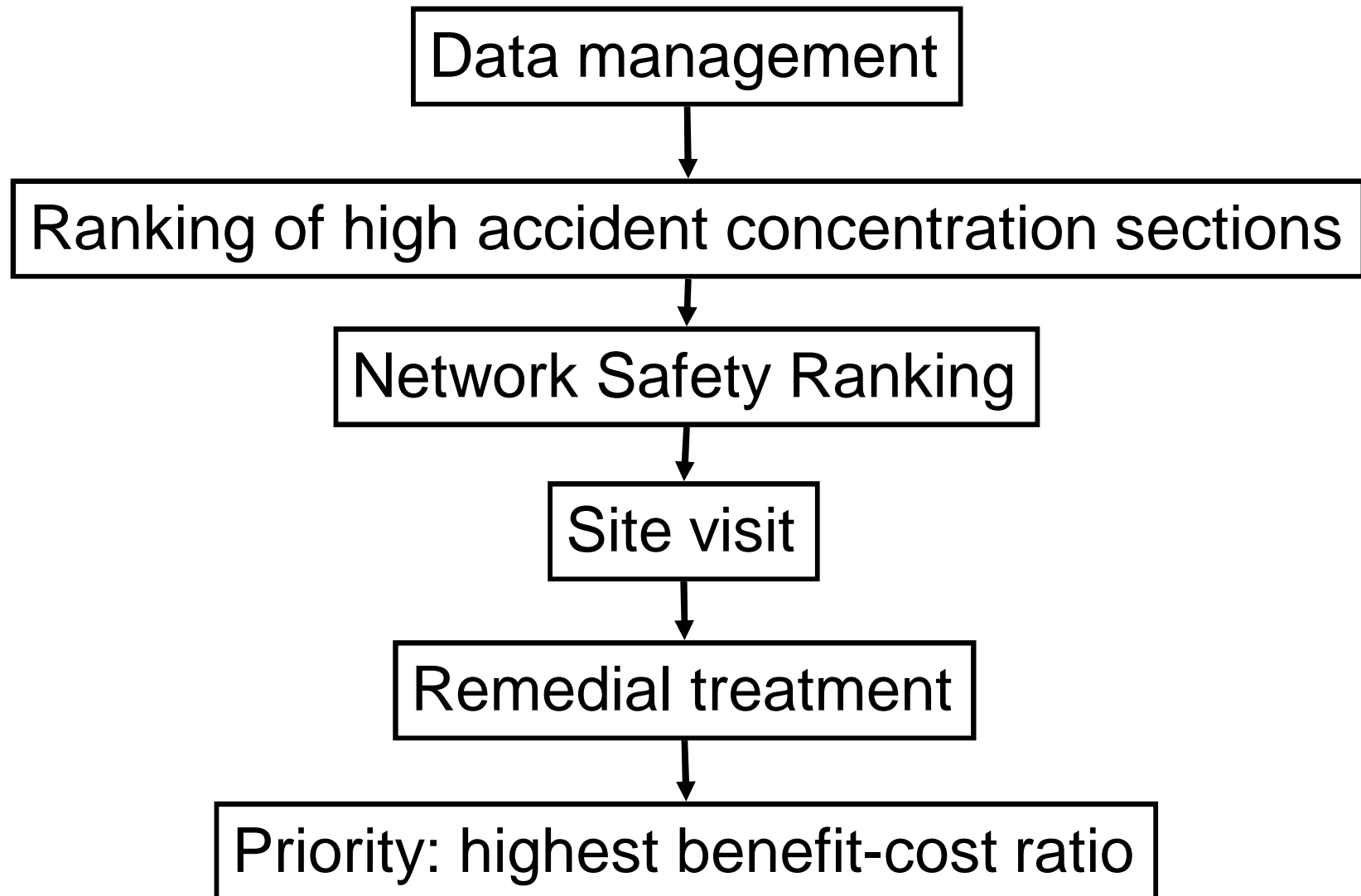
2012

Article 7

Data management

1. Member States shall ensure that for each **fatal accident** occurring on a road referred to in Article 1(TERN) an accident report is drawn up by the competent entity. Member States shall endeavour to include in that report each of the elements listed in Annex IV.
2. Member States shall calculate the average **social cost of a fatal accident** and the average **social cost of a severe accident** occurring in its territory. Member States may choose to further differentiate the cost rates, which shall be updated at least every five years.

Safety ranking & Management



Data (*ANNEX III*)

- At least fatal accidents;
- Traffic Volume and Typology;
- Accident costs;
- Road sections shall be classified into categories



Highlights:

Fatal accidents account for about 2% (Motorway, Italy) of the total number of serious crashes. Serious crashes account for about 30% of total number of crashes;

Identification of high accident concentration sections (*ANNEX III*)

The identification of road sections with a high accident concentration takes into account at least the number of fatal accidents that have occurred in previous years per **unit of road length** in relation to the **volume of traffic** and, in case of intersections, the number of such accidents per location of intersections



Highlights:

- Crash Rate [fatal accidents/(length × traffic volume)] Vs. Crash Frequency Vs. Crash Cost
- Assumption of a linear Relationship between Collision Frequency and AADT ?
- Reference to the recorded number of accidents instead of the expected number of accidents (regression to the mean);

Ranking of high accident concentration sections

Italian Guidelines 2012

Priority	Crash measures	Dimensions
1	Fatal crash rate	N. Fatal crashes/vehic. × km
	Injury crash rate	N. injury crashes/vehic. × km
	Crash rate	N. crashes/vehic. × km
	Fatality rate	N. Fatalities/vehic. × km
	Severity rate	N.(Fatalities+Injured)/vehic. × km
	Injury rate	N. injured peoples/vehic. × km
2	Fatal crash frequency	N. Fatal crashes/ km
	Injury crash frequency	N. injury crashes/ km
	Crash frequency	N. crashes/ km
	Fatality frequency	N. Fatalities/ km
	Injury frequency	N. injured peoples/ km
3	Fatality rate	N. Fatalities/N. crashes
	Severity rate	(N. Fatalities+ N. injured)/N. crashes
	Injury rate	N. Injured people/N. Crashes
	Fatalities	N. Fatalities
	Injured people	N. Injured people
	Crashes	N. Crashes

Network Safety Ranking (*ANNEX III*)

For each road category, network safety ranking shall result in a priority list of road sections where an **improvement** of the infrastructure is expected to be **highly effective**.



Highlights:

- highly effective: maximum “expected” reduction, maximum “expected” cost reduction;
- Improvement: CMF (availability, reliability and transferability);

Network Safety Ranking

Italian Guidelines 2012

SAFETY POTENTIAL: SAPO

Excess of crash cost for site i

$$\text{SAPO}_i = (\text{Crash cost})_i - (\text{reference Crash cost})$$

Crash cost: site_i costs of (fatalities+severe injured+injured) per unit length per year;

Reference crash cost: average cost rate (€/vehic×km) × (365 AADT_i);

7.6 €/(1000 vehic km) motorways ÷ 24 €/(1000 vehic km) 2lane rural roads

Site visit (*ANNEX III*)

Elements of evaluation for expert teams' site visit:

....

- d) the number of accidents, of fatalities and of severely injured persons in the three previous years;
- e) a set of potential remedial measures for realisation within different timescales



Highlights:

- Training and Certification: curricula, certification of trainers, EU recognition, refreshment
- Accident: blind visit, use of different typology of accidents;
- Remedial measures: identification (low, medium, long term), benefit-cost ratio; budget optimization at network level

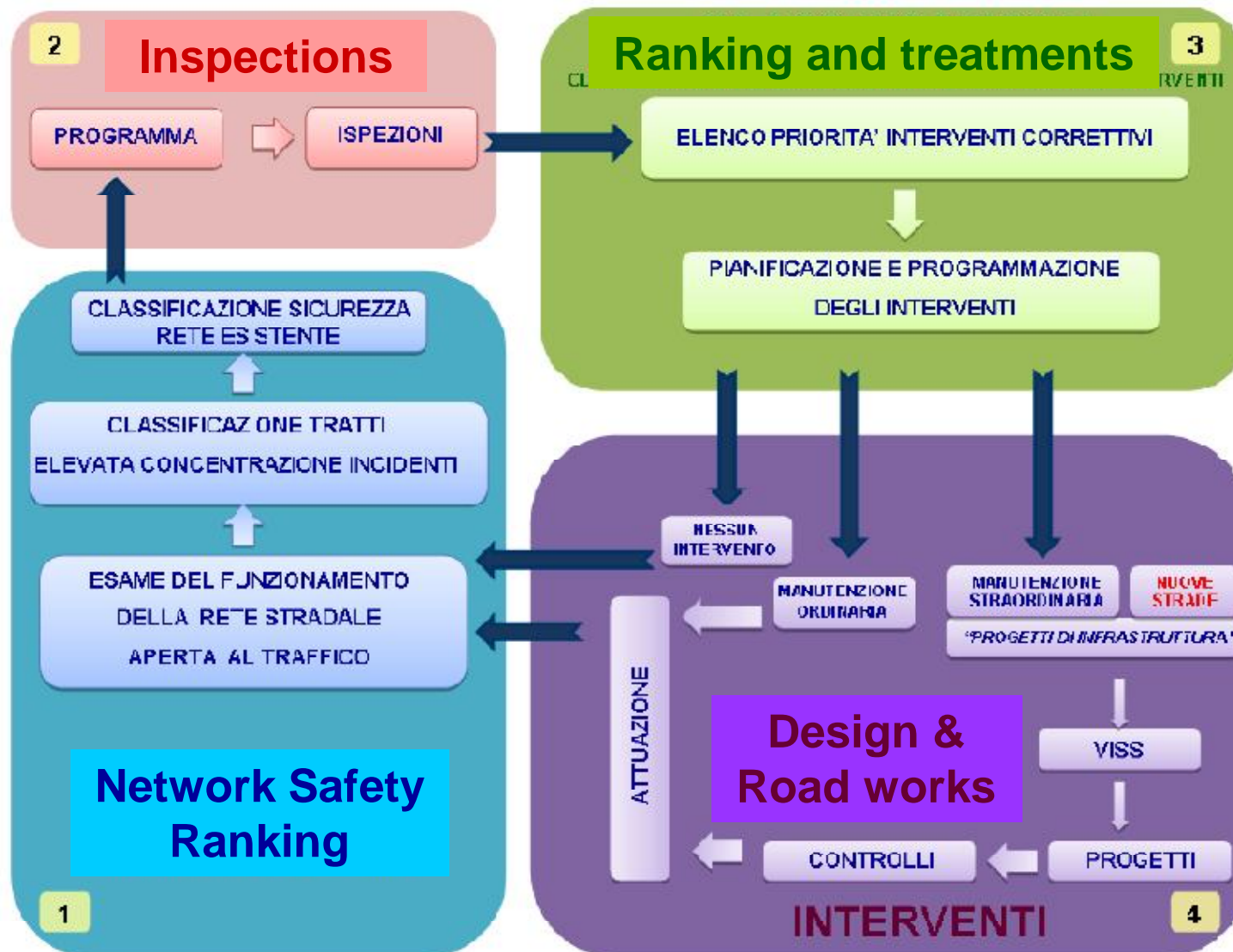
Example of Ranking

Table 4. Italian Guidelines 2012

Crash Measure								
Homogenous Section	Length	Fatality rate	Fatality frequency	Fatalities	Injury rate	Injury frequency	Injured people	Ranking
	Km	N.Fatalities /vehic.xkm	N.Fatalities / km	N.	N.Injuries/ vehic.xkm	N. injured peoples/km	N.	
A	5	1/15	1/5	1	3/15	3/5	3	2
B	3	1/18	1/3	1	3/18	3/3	3	3
	2		1/2	1	3/8	3/2	3	

Safety Management Cycle

Italian Guidelines, 2012



The EU Directive gives a framework, but requires the establishment and implementation of procedures by the Member States (art. 1)



Can we find references in the state of the art of knowledge ?

Are there still some gaps to be filled ?

Can the international state of the art be transferred in different EU countries ?

Is the state of the art the reference in the practice ?

