Drogi zaufania

Zwiększanie Potencjału
Na Rzecz Bezpieczeństwa Ruchu Drogowego

Building Road Safety Capacity

INFRASTRUKTURA I ŚRODOWISKO
NARODOWA STRATEGIA SPÓJNOŚCI

Generalna Dyrekcja Dróg Krajowych i Autostrad

UNIA EUROPEJSKA
EUROPEJSKI FUNDUSZ ROZWOJU REGIONALNEGO

Projekt współfinansowany przez Unię Europejską ze środków Europejskiego Funduszu Rozwoju Regionalnego w ramach Programu Operacyjnego Infrastruktura i Środowisko.

Appropriate speed saves all people

First results from the ASAP project (CEDR Research program)

Lorenzo Domenichini – Francesca La Torre – Alessandro Nocentini
University of Firenze (Italy)
Department of Civil and Environmental Engineering

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Safety in Work Zones

- **New South Wales data (RTA, 2008):** 50 deaths and 750 injuries result from road traffic crashes annually in Australian roadwork zones.
- **In USA, in 2006:** 1,010 fatalities and over 40,000 injuries occurred within designated work zones.
- **UK Highways Agency in 2006:** Between 2000 and 2005 sixteen workers died and ninety were seriously injured on England's motorways and major roads alone
- **US DOT – FHWA, 2009**: 4 out of every 5 fatalities reported around work zones involves a motorist (→ **focus on regulating motorists' driving behavior in work zones**)

ASAP - Objectives

Develop harmonised best practice guidelines for work zone speed control for Europe

↓

Ensure European road workers and road users have a high level of safety, regardless of the country or region

CEDR TRANSNATIONAL ROAD RESEARCH PROGRAMME - Call 2012
Safety of road workers and interaction with road users

Project Team

VTI: Swedish National Road and Transport Research Institute: Coordinator

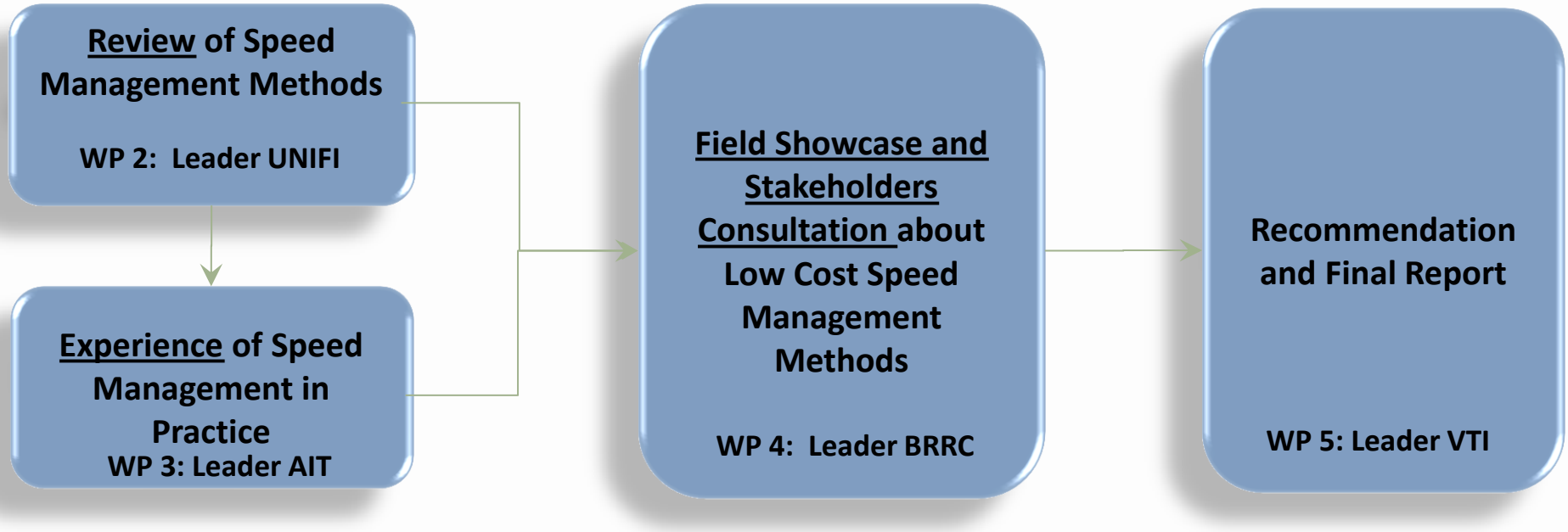
UNIFI: University of Florence

AIT: Austrian Institute of Technology

BRRC: Belgian Road Research Centre

CDV: Transport Research Centre

Project Structure



Review of Speed Management Methods

SECTION 1:

Review of Guidelines and criteria for setting the most appropriate speed in work zones

SECTION 2:

Review of available literature regarding methods used to manage and control the speed of vehicles in road work zones

Safety in Work Zones

Many studies have shown that the **safest traffic flow** occurs when all vehicles are traveling at approximately the **same speed**.

That is the **speed variance** is small.

Small speed variances are obtained if the **speed reduction is limited to 10-15% of the regular speed limit**.

% Increase Severe Crashes

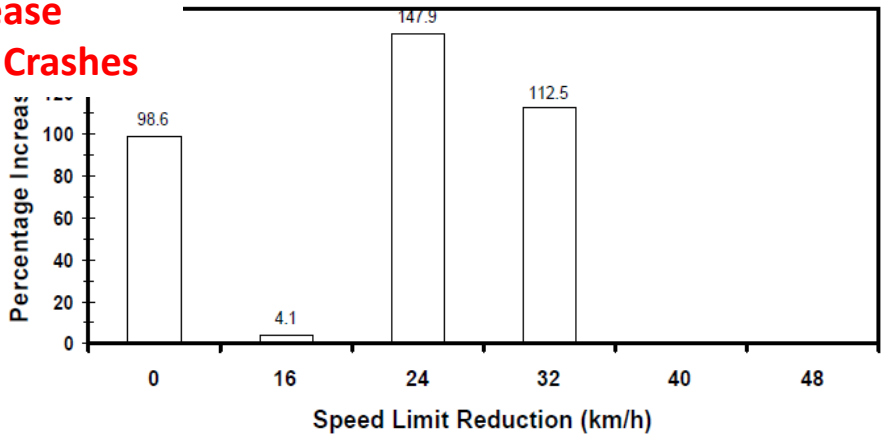


Figure 3. Percentage increase in fatal plus injury accident rate from the before to during construction periods (*Source: Migletz, Graham et al (50)*)

% Increase in Speed Variance

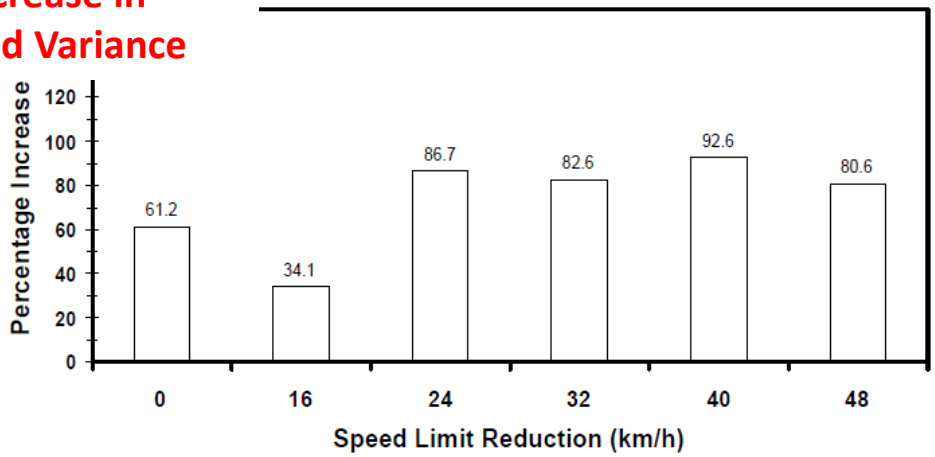


Figure 2. Percentage increase in speed variance from upstream to work zone locations for various work zone posted speed reductions (*Source: Migletz, Graham et al (50)*

1- Criteria for setting appropriate speed limits

based on road category: all countries

based on lane width:

Austria, Germany, Belgium, Luxembourg, Quebec, Switzerland, Washington DOT.

based on length and duration of the roadwork:

U.K., Sweden, Norway, Netherlands, Denmark, Ireland, U.S. (MUTCD), , Michigan, New York DOT, Australia.

based on presence of workers and safety clearances:

U.K., Sweden, Norway, Austria, Netherlands, Denmark, Ireland, Switzerland, U.S. (MUTCD), Washington DOT, Michigan, Australia, Queensland.

2- Work Zone Speed Management Techniques

Informational measures

- Regulatory speed limit signs
- Speed monitoring displays
- Changeable message signs
- Flaggers

Physical devices

- Portable Rumble Strips
- Narrowed lane width
- Optical speed bars

Enforcement measures

- Police in work zone
- Automated speed enforcements
- Radar drone
- Graduated fixed penalties

Informational measures

Regulatory Speed Limit

- *It provides the legal basis for enforcement*
- *It needs to be supported by other measures, primarily by enforcement.*

The literature state that:

- Reduced Speed limits are more likely to be respected if they are perceived to be necessary → increase **credibility** of speed limits;
- Speed reductions no lower than necessary and imposed no longer than necessary: it is **difficult to achieve an average speed reduction of more than 15 km/h**.

Informational measures

Credibility of speed limit

Speed limit sign by itself does not slow drivers down: it is the situation they see and not the reduced speed limit that cause drivers to reduce their speeds.


Source: TRL

2 factors should be taken into consideration on drivers' **speed choice**:

- **Voluntary reduction**: is lower than 15 km/h (unless the presence of enforcements) and it is **due to the presence of devices** or in general due to assertion, from authorities, to moderate speeds.

- **Involuntary reduction**: it depends from "what the driver sees", from the field of view. **The driver slows down only if he perceives the need to do so**, based on conditions in the work zone or the perception of activities.

If the speed limit is **in line with the expectations**, drivers are better inclined to comply with them.

Informational measures

Speed monitoring display

The system consists of a **self-contained trailer unit equipped with radar** to measure the speed of approaching vehicles & inform the driver

Results:

- Motorists sees their actual speed, and may infer that there is probably a police officer nearby, but a **long term effectiveness** will be **only if supported by periodic police enforcement**.
- Even without police enforcement; people are sometimes unaware of their travel speed and will **slow down when reminded of their speed by means of the display**

Source: Web

Other message signs

• In Colorado, Finland, Denmark and Sweden "particular messages" such as "**Take care of my father**" or '**My father works here**' were tested. They seem to have very beneficial effects on reducing speeds.

Physical devices

Portable Rumble Strips

Portable rumble strips (PRS) are **self-adhesive strips produce slight jolts and audible rumble effects** when motorists drive over them.


Source: Wang & al.

Results:

•The advantage of rumble strips is considered to be not so much a reduction in speed, but in raising the level of alertness of drivers;

•A study done in New Brunswick found that **portable rubber rumble strips reduced mean and 85th percentile operating speeds by 6.9 km/h and 9.5 km/h**;

• However PRS have a relatively long installation and removal times and a high safety risk of **worker exposure during installation and removal**.

Physical devices

Narrowed lane width

Using a variety of **channelizing devices**, including traffic cones, drums, and concrete barriers is possible to narrow the lane width, **to obtain moderate speed reductions throughout the entire length of the narrowed section**.

Physical devices

Narrowed lane widths

Advantage:

Relatively **inexpensive** form of speed control for long-term projects since there is usually very little on-going cost to maintain the narrowing.

Disadvantages:

• **Capacity** of the road may be reduced as a result of reducing the lane widths and certain types of crashes such as **sideswipes may increase** as a result of the narrower lane widths.

• Lane narrowing may not be very effective on **multilane highways** since the middle lanes will not be reduced in width.

• The cones were sometimes blown over or struck more frequently, making the **maintenance** of the lane width reduction significant and increasing the number of crashes in these work zones

Enforcement measures

Used to enforce speed limits by automated speed monitoring, speeding detection, imposition of violation fines, and presence of police car.

In general most part of speed reduction measures are likely to be more effective if they are supported by police enforcement.

Results:

A survey conducted by CTRE reported that: 69 percent of **agencies that include police enforcement in their work zone speed control plans, evaluate the strategy is very effective**.

A Canadian survey regarding the effectiveness of police enforcement, indicated that 55% of respondents rated their effectiveness as high, 30% as moderate, 10% as low, and 5% as not effective.

Presence of police

This strategy can involve mobile or stationary police cars.

In general a **police officer stationed at one point** significantly increases the speed limit compliance at that location.

A **circulating police car** covers a larger area but is less effective at speed reduction.

The U.S. Federal Highways Administration (FHWA) has noted that the most **effective way** of controlling speed in the work zone is to have a **staffed police car with flashing lights at the beginning of the work zone**.

Enforcement measures

Automated speed enforcement

- Enforcement of speed limits by utilising speed cameras **has been found to be generally effective**.
- Joerger (2010) found speed cameras resulted in a 27% reduction in speeds in a 64 km/h zone in Oregon.

However **the effects can be temporary and localised**

Source: TRL

Source: www.securoad.be

Enforcement measures

Graduated fixed penalties

Common practice especially in U.S. and Canada.

In USA 42 states have implemented legislation increasing fines for moving violations that occur in work zones; slightly more than half have specified that the fines should be doubled for these infractions.

Half of the states **requires that workers actually be present** for the higher fines to kick in**.**

Texas Transportation Institute at Texas A & M University concludes that **doubling fines for speeding in work zones has no consistently measurable effect** upon fatal accident frequency.

The ineffectiveness of the higher penalties could be due to problems with enforcement, as the **law requires workers to be present** at site when a higher penalty can be issued.

Some first conclusions about Work Zone Speed Management Techniques

Work Zone Speed Management Techniques

Most effective techniques:

- Reduced regulatory speed limits together with police enforcement
- Portable variable message signs on the approach to the work zone
- Radar speed measurement and speed display

Police enforcement or presence enhanced the effectiveness of these measures, because they tend to lose long-term efficacy.

Techniques that were found to be less effective were:

- Advisory speed limits
- Variable speed limits
- Increased fines for work zone speeding (effectiveness depends on enforcement)

Notable areas that need further investigation

- Managing **variability in driving speeds**
- **Car-following behaviour** within work zones
- **Taper design** and its effect on traffic regulation
- Effect of **distance of signs** from the work zone on driving behaviour and driver attentiveness
- Effect of different **devices** and their **combinations** on driving behaviour
- Effect of **lateral buffer** distance
- **Perceptual countermeasures**

http://asap.fehrl.org/

Point of Contact:
alessandro.nocentini@dicea.unifi.it

Changeable message signs

Changeable message signs (CMSs) are used primarily to provide real time, dynamic information about current road conditions. Often a changeable message sign is equipped with radar (CMR) has the capability to determine the speeds of approaching vehicles.

Results:

•CMS effectiveness on reducing speeds is strictly connected to the procedure of placing a message on the sign only when there is a specific activity or condition which would warrant a message is recommended.

•CMS should only be used for short periods. If they are used for longterm applications, they tend to lose some effectiveness.

•Users should always make sure that messages are up-to-date and reliable.