

Incursion Reduction to Increase Safety in road work zones



# Welcome to the IRIS workshop

# The consortium partners

- KfV (Austrian Road Safety Board), Austria
- Lund University, Sweden
- Vias institute, Belgium

IRIS is financed by the CEDR – Conference of European Directors of Roads

# The aim and objectives of the project

The main aim of IRIS is to improve the knowledge on Traffic Management at Work Zones for increasing safety for both Road Workers and Road Users.

## Objectives

- To give an overview of the best-practices in temporary traffic management.
- To give an overview of the best-practices in Road Safety Audit and Inspection of road works.
- To present recommendations and share information about best-practices in temporary traffic management for short, medium and long term.
- To provide information and tools for NRAs and enhance their practice so they will be able to improve their Strategy, Guidelines, Standards, and Procedures.

# What have we done until now?

## Information collection and analyses:

- Data analysis of accidents related to work zones
- Review of problems and best practices in inspection and audit requirement for road works
- Inventory of best practices to prevent incursions into work zones
- Analysis of psychological trends and attitudes of road user to improve safety in work zones

## Preliminary outputs:

- Draft version of Guidance document on temporary traffic management (TTM) layouts
- Draft version of Tools for Road Safety Audits and Road Safety Inspections at Work Zones

# Aim of the workshop

- to present interim results of the project
- to get feedback to build/improve guidelines and recommendations  
(how they would fit in with current practices, potential barriers and chances for implementation)

# Today's program

- 10:00 - 10:10: Welcome and introduction to the IRIS project  
(András Várhelyi – Lund University, Sweden)
- 10:10 - 10:25: Knowledge and current practices on traffic management at work zones  
(Stijn Daniels – Vias institute, Belgium)
- 10:25 - 10:35: Human factors (Ludo Kluppels – Vias institute, Belgium)
- 10:35 - 10:55: Measures to improve work zone safety  
(Bernd Strnad - Kuratorium für Verkehrssicherheit, Austria)
- 10:55 - 11:00: Introduction to themes group discussion (András Várhelyi)
- 11:00 - 12:00: Group discussions
- 12:00 - 12:15: Coffee break
- 12:15 - 12:25: Results of the group discussions
- 12:25 - 12:35: Opinion poll
- 12:35 - 12:45: Conclusions (András Várhelyi)
- 12:45 - 14:00: Sandwich lunch

# Wifi

- VIAS\_Guest
- No credentials needed

**Wish you a successful workshop!**



**I**ncursion **R**eduction to **I**ncrease **S**afety in road work zones



# IRIS workshop

11 Oct 2018, Brussels

Knowledge and current practices on traffic management at work zones

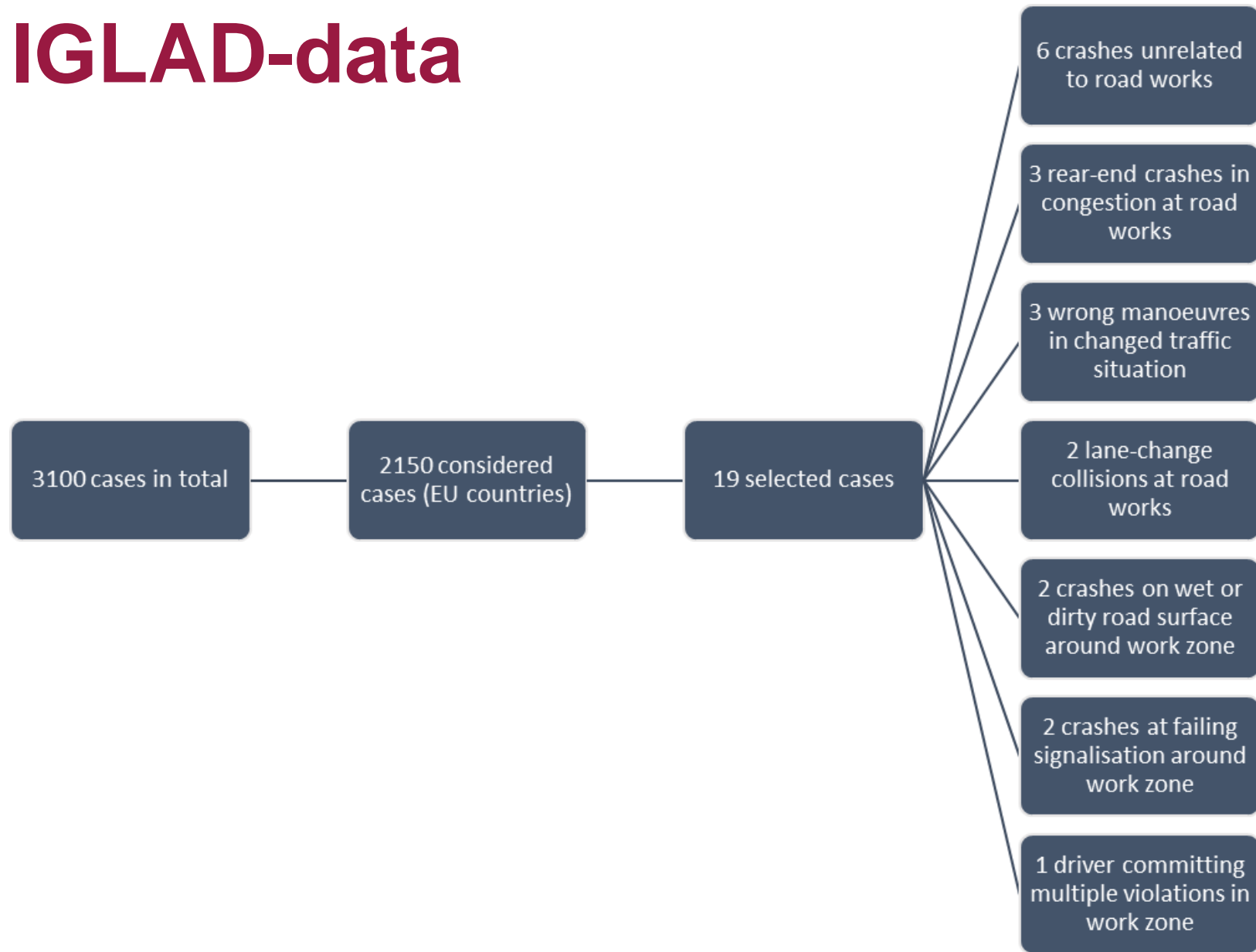
Stijn Daniels, Vias institute

# Content

- What do we know about work zone accidents and incursions?
- Current work zone management practices in selected CEDR countries

# Work zone accidents and incursions

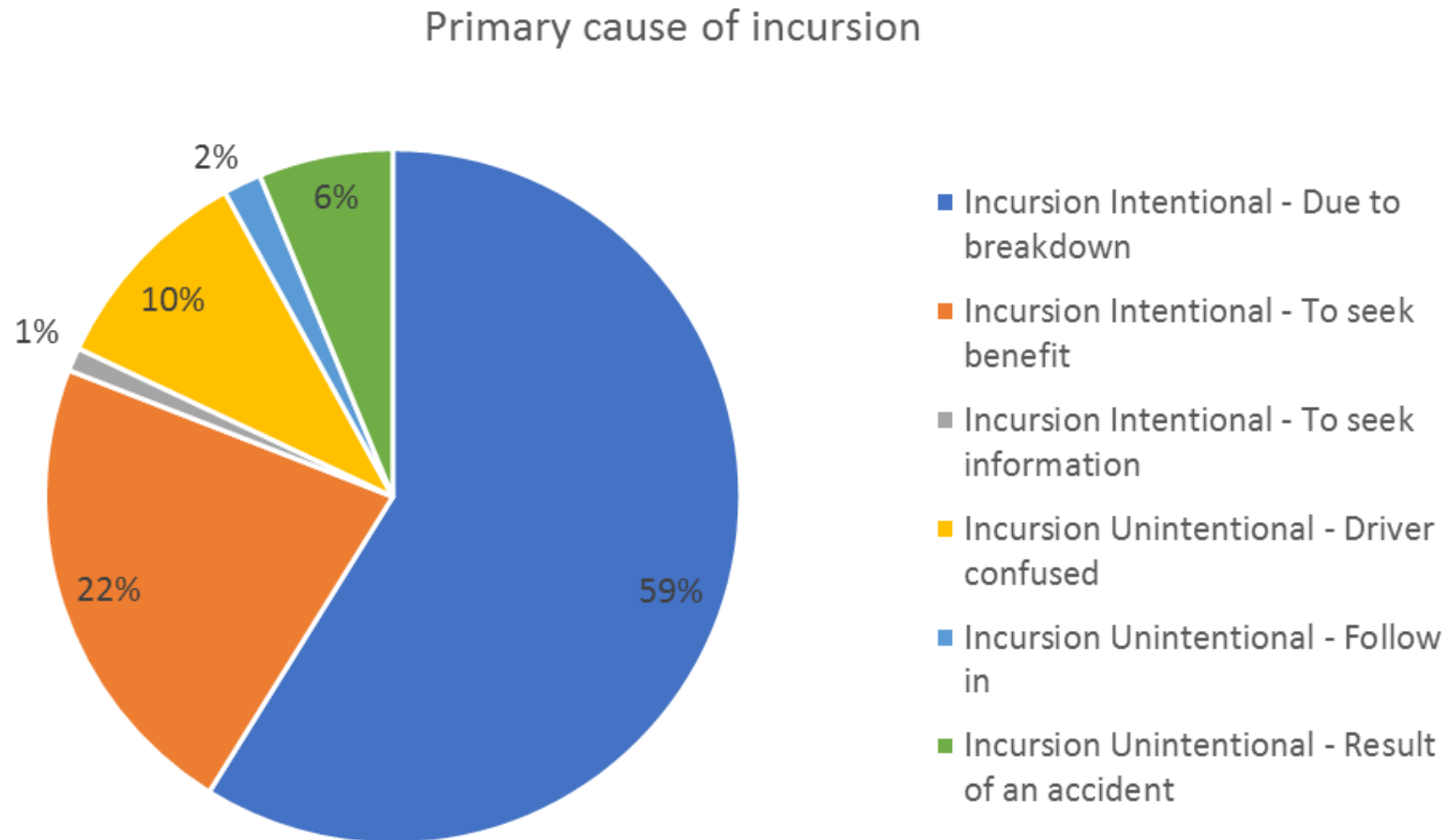
# IGLAD-data



# Collected accident information

Country	Source	Nr. of cases	Years	Roads	Research area	Severity
<b>Belgium</b>	Vias institute	158	2014 - 2015	Motorways	Entire country	Fatal
<b>France</b>	Association des Sociétés Françaises d'Autoroutes (ASFA)	349	2014 - 2016	Motorways	Entire country	All
<b>Ireland</b>	Transport Infrastructure Ireland	96	2016 - 2017	All roads	Entire country	All
<b>Netherlands</b>	Rijkswaterstaat	37	2018	Motorways	Entire country	All
<b>Norway</b>	Norwegian Public Roads Administration	23	2005 - 2009	All roads	Entire country	Fatal
<b>Sweden</b>	Swedish Transport Administration	3958	2003 - 2015	All roads	Entire country	Injury
<b>United Kingdom</b>	Highways England -> Highways Safety Hub	2542	2016 - 2017	Motorways	England	All
<b>United Kingdom</b>	Highways England -> CEDR	125 (subset of the above)	2016 - 2017	Motorways	England	All

# Incursions in work zones (UK 2016-2017)



Source: Highways England, [www.highwayssafetyhub.com](http://www.highwayssafetyhub.com)

# Conclusions from accident and incursion data

---

- **Most fatal accidents:**
  - At static road works
  - Single vehicle accidents or rear-end collisions
  - On busy/congested roads
  - In daylight and normal weather conditions
- **BUT, large variety of accident types**
- **Accidents are rare events**
- **Perspective of road workers: work zone incursions**
- **Human factors to be considered: attention and expectation**

11/10/2018



# Current work zone management practices in selected CEDR countries



# Interviews

---

- 14 interviews (SE, UK, IE, SI, NL, BE-FL, AT, DE)
- Open questions on TTM practices at work zones
  - Before road works start
  - During road works
  - New developments

11/10/2018



# Categories of road works



**Common denominator**

Short-term: < 1 day (IE: 12h)

Long-term:  $\geq 1$  day

Medium-term not used



**Also distinction (e.g. SE, IE) according to**

Static (works during a certain period at the same location)

Semi-static (e.g. road marking, mowing)

Mobile/moving (e.g. salting, snow ploughing)



**Sometimes additional conditions (e.g. FL (weather/visibility, traffic volume))**

# Road Safety Auditing procedures for TTM

- No compulsory RSA procedures in most countries
- Compulsory RSA for long-term work zones (IE)
- Some other examples of RSA:
  - RSA is done for long-term road works, not for the work **zones** as such (e.g. SI)
  - Voluntary audits by external auditors (e.g. ASFINAG in AT)
  - RSA can be part of the construction contract (e.g. NL)

# Road Safety Inspections

- Each country has procedures for regular checks of work zone locations
- Checks are usually not formally called RSI
- Checks may include:
  - Check whether work zone is implemented in accordance with regulations
  - Inspection of the employed material,
  - Control of documentation of the contractor about its performance of the prescribed daily checks of the work zone,
  - Inspection on workers' health and safety
- Frequency depends on size and duration of the road works
- Checks done by contracting authority, by contractors or by dedicated persons (or a mix)

# Experienced safety problems

- **Identified problems:**
  - Lack of awareness, distraction
  - Collisions with safety vehicles
  - Speeding
  - Attitudes and behaviour in traffic
  - Deficiencies in work zone signage/organisation
- **Problems generally occur in the beginning of work zones**
- **Problems are bigger at short-term work zones**



# Thank you for your attention




**I**ncursion **R**eduction to **I**ncrease **S**afety in road work zones



# IRIS workshop

Work zone RSA & RSI

Psychological perspectives from road users and workers to improve  
safety in work zones



Road user

Road worker



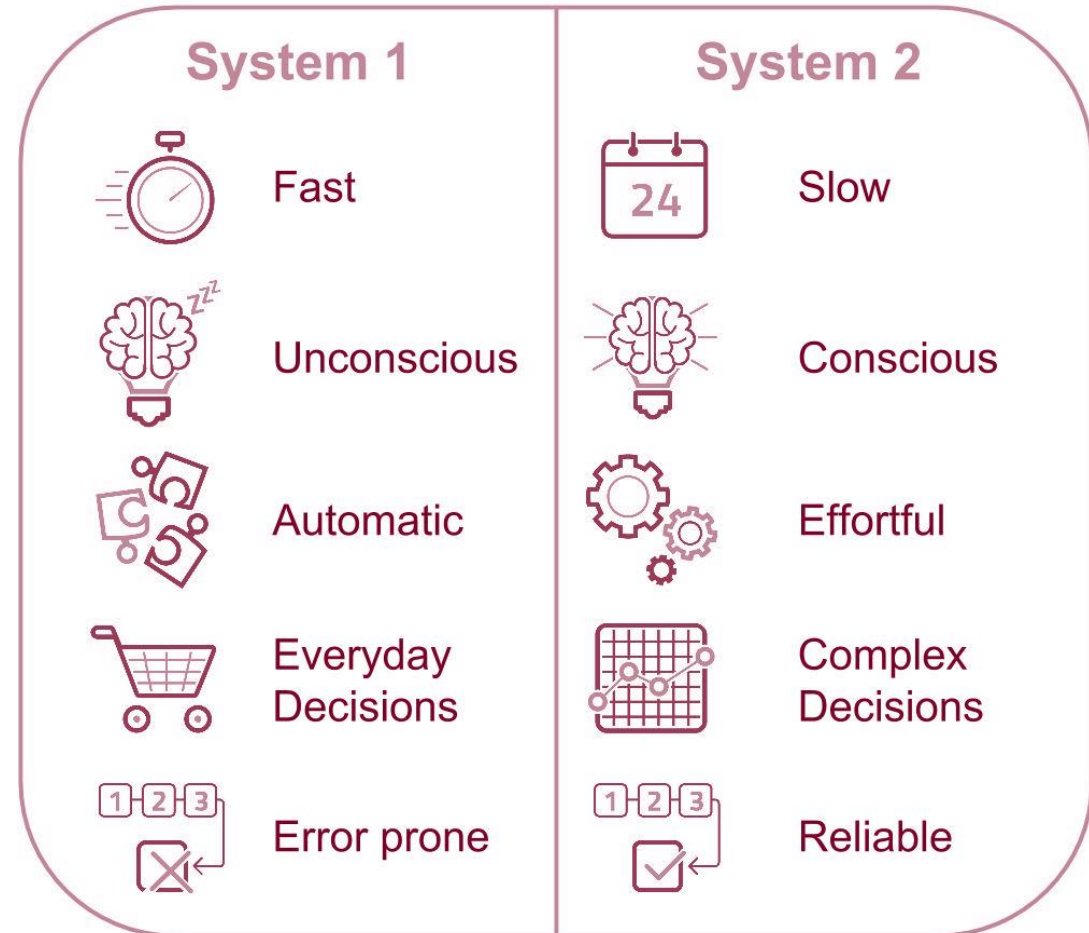


# **1. Road user's behaviour : possibilities & limitations**

# 1. Driving a vehicle ... an automatic behaviour ?

*“A bottom-up mode of behaviour composed of well-rehearsed reception-action units that enable experienced drivers to maintain their speed, lane position, following distances and negotiate traffic with little or no conscious attention or efforts”.*

Summala, 2000



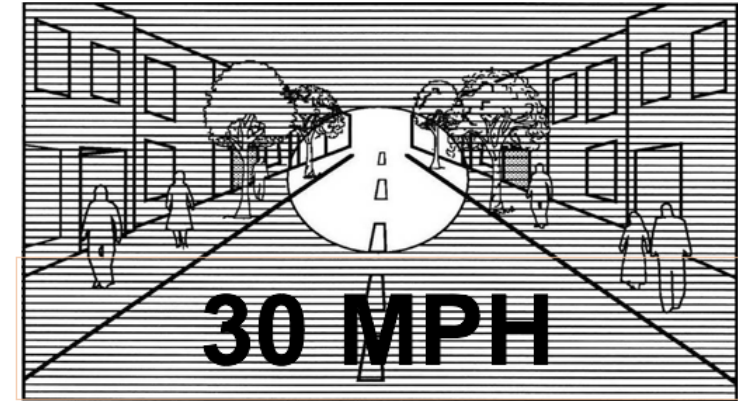
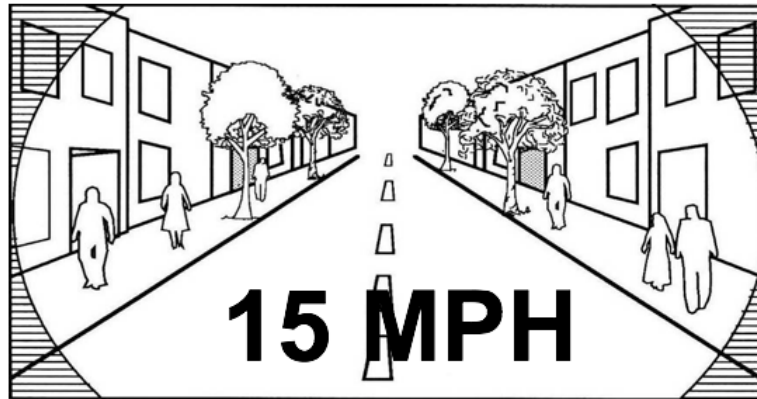
Kahneman, 2012



## 2. Workload, attention and distraction



### 3. Visual perception



Useful field of view

### 3.

# Visual perception



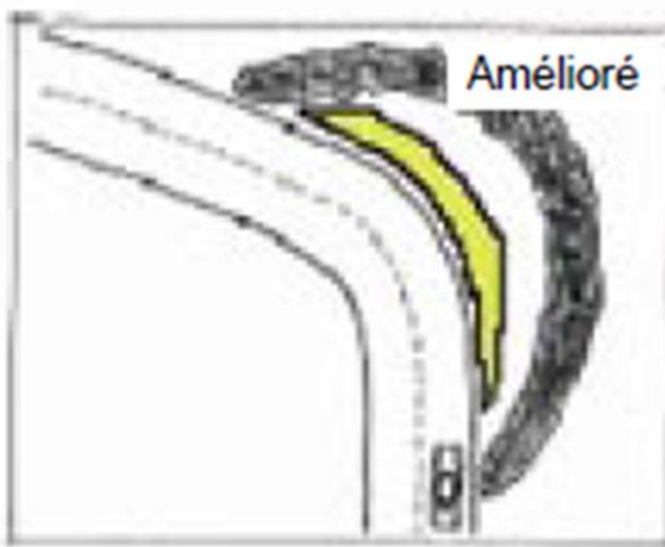
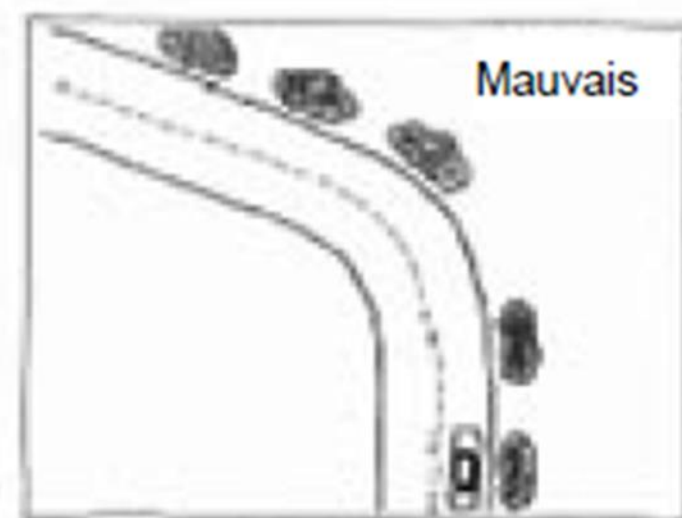
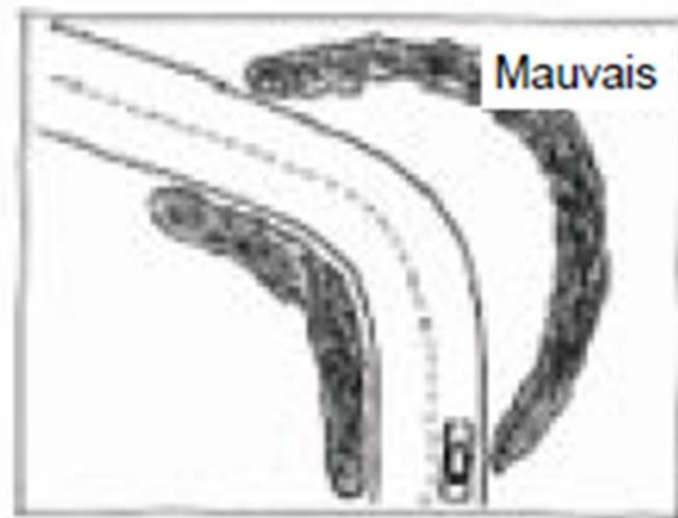
Camouflage (Helman et al., 2000)



Driving

## 4. perception errors

“



Example from PIARC



# 5. Emotions & illusions

*Levelt (2003) has conducted research on professional drivers. In his study he found a relationship between the frequency and the intensity of emotions, such as anger and irritation and the number of violations and accidents.*



Speeding on work zone:

- Common problem
- Especially when the work activity is low

More than signs and radars

- Rubble zones
- Lane changing



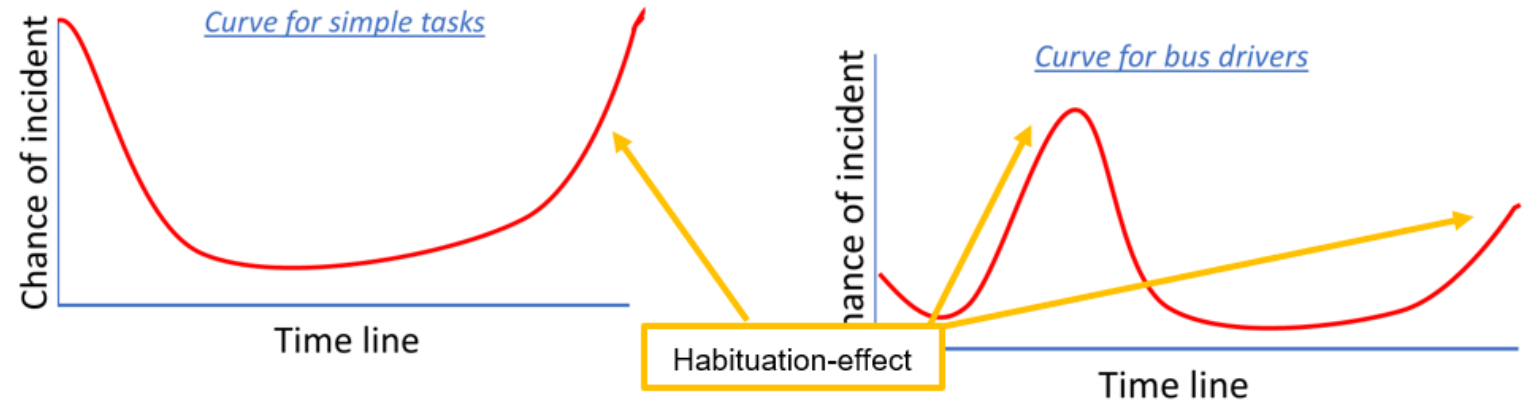
## 2. Road workers and their perception of safety



# 1. Risk sensitivity & habituation

**“Bathub”**

Daalmans, 2014



**Fig. 5.1: examples of the habituation-process for simple and complex tasks (Daalmans, 2014).**

“Newcomers as well as workers with new procedures or materials encounter many minor accidents (“childhood diseases”). After a while, the volume of incidents decrease based on knowledge and experience. However, at a certain time, habituation will increase volume of incidents. ”

## 2. Risk understanding, illusions & emotions

- Surprisingly, people share a realistic view on the (in)security of others whereas they develop a too optimistic view on their own risk-related activities (Baumeister, 2003)
- On the other side, workers can over-respond to risk-related (Baumeister, 2003)
- Workers want to be performant : working faster can be perceived as success in work



- If we can avoid lose something (time, money, friendship, ...), we are prepared to take more risks (Kahneman, 2012)

# Conclusions

- 1. Multiple types of work zones with multiple possible reactions of users depending on their**
  - Perception
  - Comprehension
  - Capability
  - Motivation
- 2. 3 concepts of major importance to secure workzones :**
  - Credibility of the information
  - Predictability of the workzone
  - Density and complexity of the traffic situation
- 3. Some inspirational rules**
  - Put the driver in the center of the work zone safety
  - A driver can't do many things at the same time
  - A driver always comes back to what he knows and what he expects
  - A driver gets easily confused
  - Expect the unexpected
- 4. Because intrusion accidents are one of the causes of work accidents, preventing traffic from entering the work zone can increase safety for both road users & workers**

# Thank you for your attention

**I**ncursion **R**eduction to **I**ncrease **S**afety in road work zones



# IRIS workshop

Work zone RSA & RSI

Measures to improve work zone safety

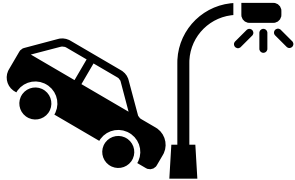
# Work zone safety...



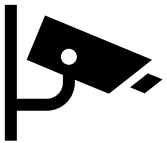
Human factors, psychological rules



Segregation of work zones and road users



Forgiving roadside



Speed control



Design principles

# Work zone safety...

Conspicuous  
Clear  
Consistent  
Credible



Source: Work on and along roads, Statens vegvesen, Handbook N301E



Source: KfV



Source: KfV



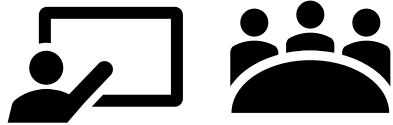
Source: Lund University



Source: KfV



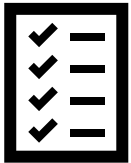
# General, possible measures to improve work zone safety



Raising safety awareness – all parties involved in work zone



Standardization of design layout and work sequence

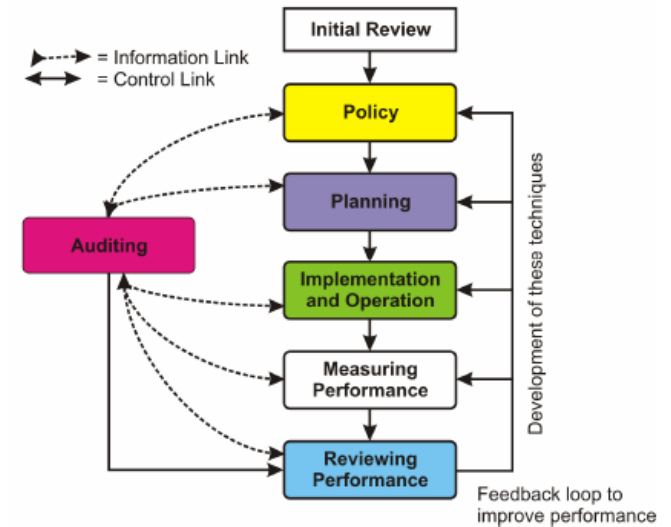


Road Safety Audits / Road Safety Inspections



Feedback processes, reviews, lessons learned on different levels – administration, designers,...

Source: American Traffic Safety Services Association



Source: Guidance for the Control and Management of Traffic at Road Works, , Department of Transport



# Measures indicated being of interest

## Establishment of work zones – critical phase

- Stopping all traffic during establishment of work zone
- Protection measures

Temporary speed reduction / use of truck mounted attenuators (TMAs) or impact protection vehicles / rolling road blocks / facilitating work

- Automation of works



Source: <http://www.worldhighways.com/categories/road-markings-barriers-workzone-protection/features/safer-cone-collection-with-x-cone-among-the-latest-safety-innovations/>



Source: KfV

# Measures indicated being of interest

## Information, warning & guiding of road users

- Use of mobile gantry cranes
- Use of Intelligent Transportation Systems (ITS) and Variable Message Signs (VMS)



Source: Traffic Service Nederland,  
<https://tsned.nl/producten/mrs/>

improving information for drivers; real time information (travel duration, adaptation of speed limit, incidents)



Source:  
<https://www.wegenforum.nl/viewtopic.php?t=18231>



Source: <http://www.superiortelegram.com/business/transportation/2322021-construction-set-begin-interstate-35-digital-signs-display-travel>

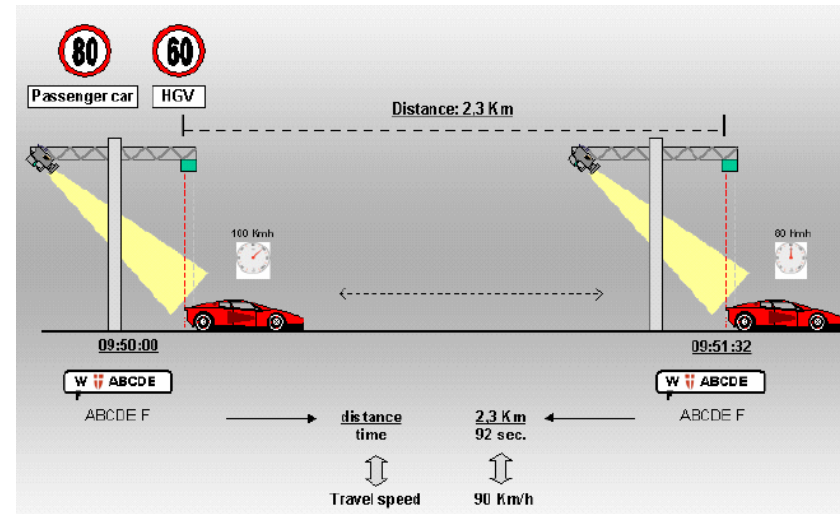


Source: Wikimedia

# Measures indicated being of interest

## Speed control

- Average speed control, speed cameras
- Use of dynamic speed display signs
- Temporary speed limits

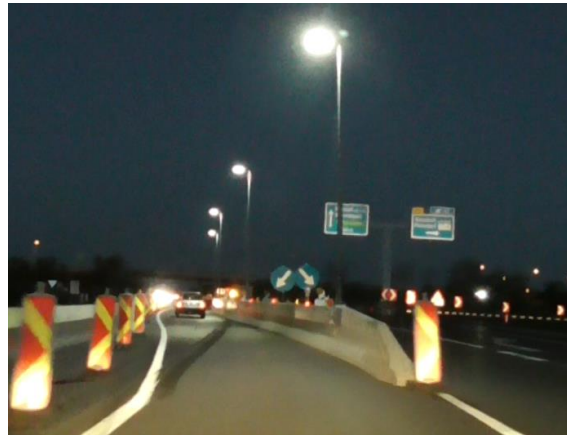


Source: Vienna Municipal Department 34 / Stefan, C.

# Measures indicated being of interest

## Protection & lighting

- Barriers
- Equipment of TMAs to measure impact
- Illumination of critical zones



Source: KfV



Source: KfV



Source: KfV

# Workshop

- Major problems, important issues, possible measures to enhance work zone safety...
- To be discussed!



# Group discussion topics

- Topic A – Issues concerning work zone safety

What are the main problems concerning work zone safety?

How could the situation be improved? Promising measures?

Hindrances for introduction of promising measures?

- Topic B – RSA and RSI at work zones

What are the main obstacles for implementing these tools?

Can more duties be put on the contractor?

How to handle deviations from the road work design?

# Whish you a successful workshop!