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# Advanced Traffic Management Modern ITS Schemes applied in Electronic Tolling and Road Safety

5th IRF Regional Conference  
Institutional Arrangement for Reduction of Road Fatalities  
IHC, New Delhi  
25<sup>th</sup> – 26<sup>th</sup> November 2010



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# Content

1. Who is Kapsch TrafficCom ?

2. 1<sup>st</sup> Class Road Safety

3. Electronic Tolling to Support Road Safety

4. Legal Framework

5. ITS Applications for Road Safety



# Who is Kapsch?



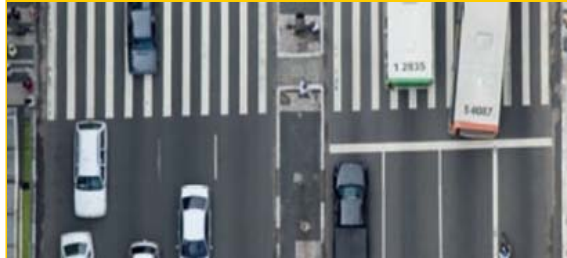
# Kapsch Solutions

## Tolling Solutions



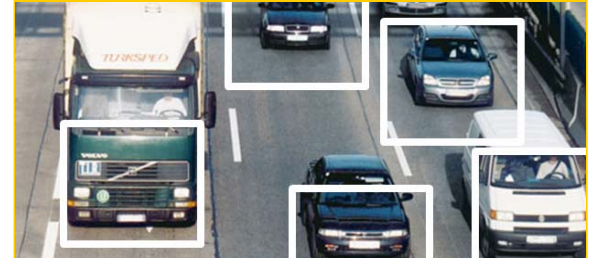
- Highway tolling
- Area tolling
- E-Vignette
- Plaza tolling

## Urban Traffic Solutions



- City tolling
- Access restriction
- Low emission zones
- Open zone parking

## Safety & Security Solutions



- Speed monitoring
- Weigh in motion
- Incident detection
- Traffic surveillance

## Add-on Applications

# Kapsch References

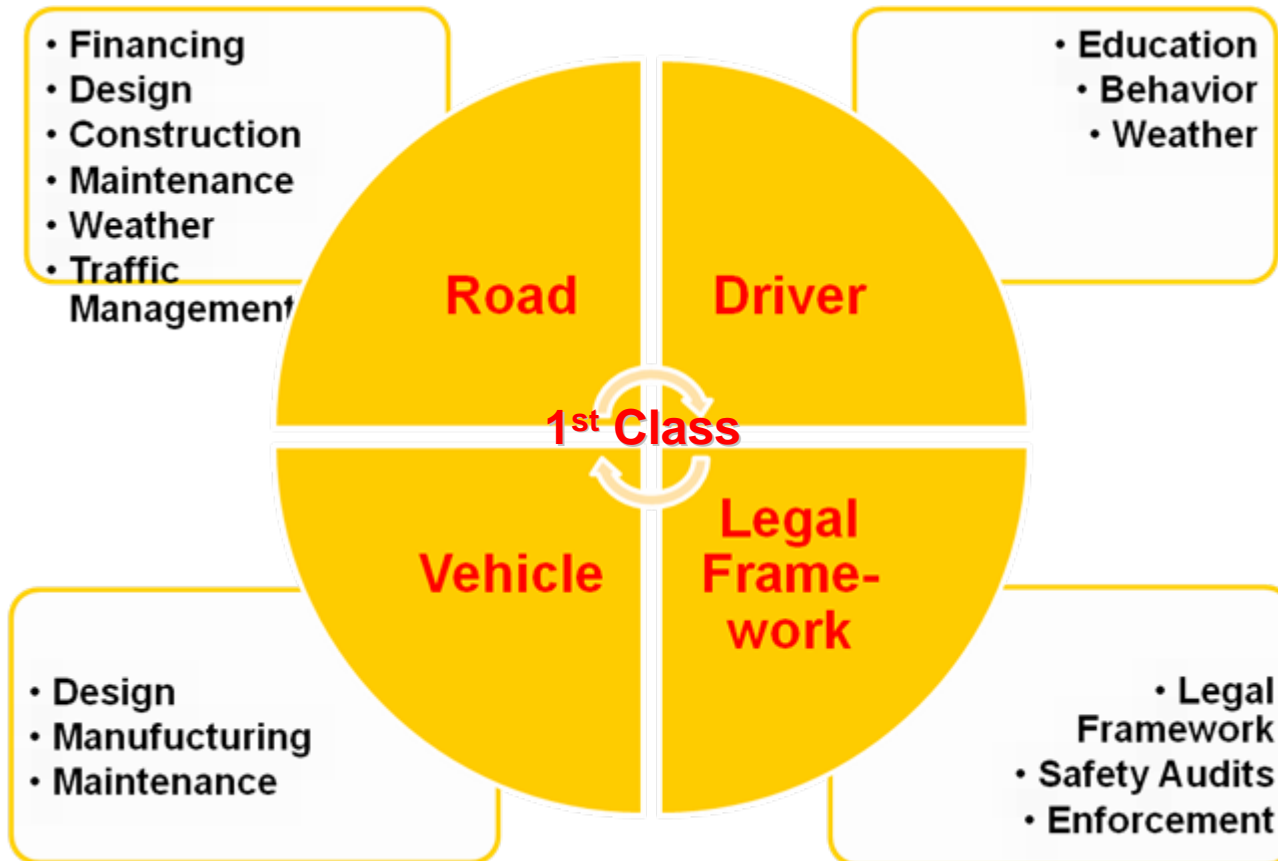
230 references – 38 countries – 5 continents – 16 million on-board units – 12.000 lanes equipped



# 1<sup>st</sup> Class Road Safety?

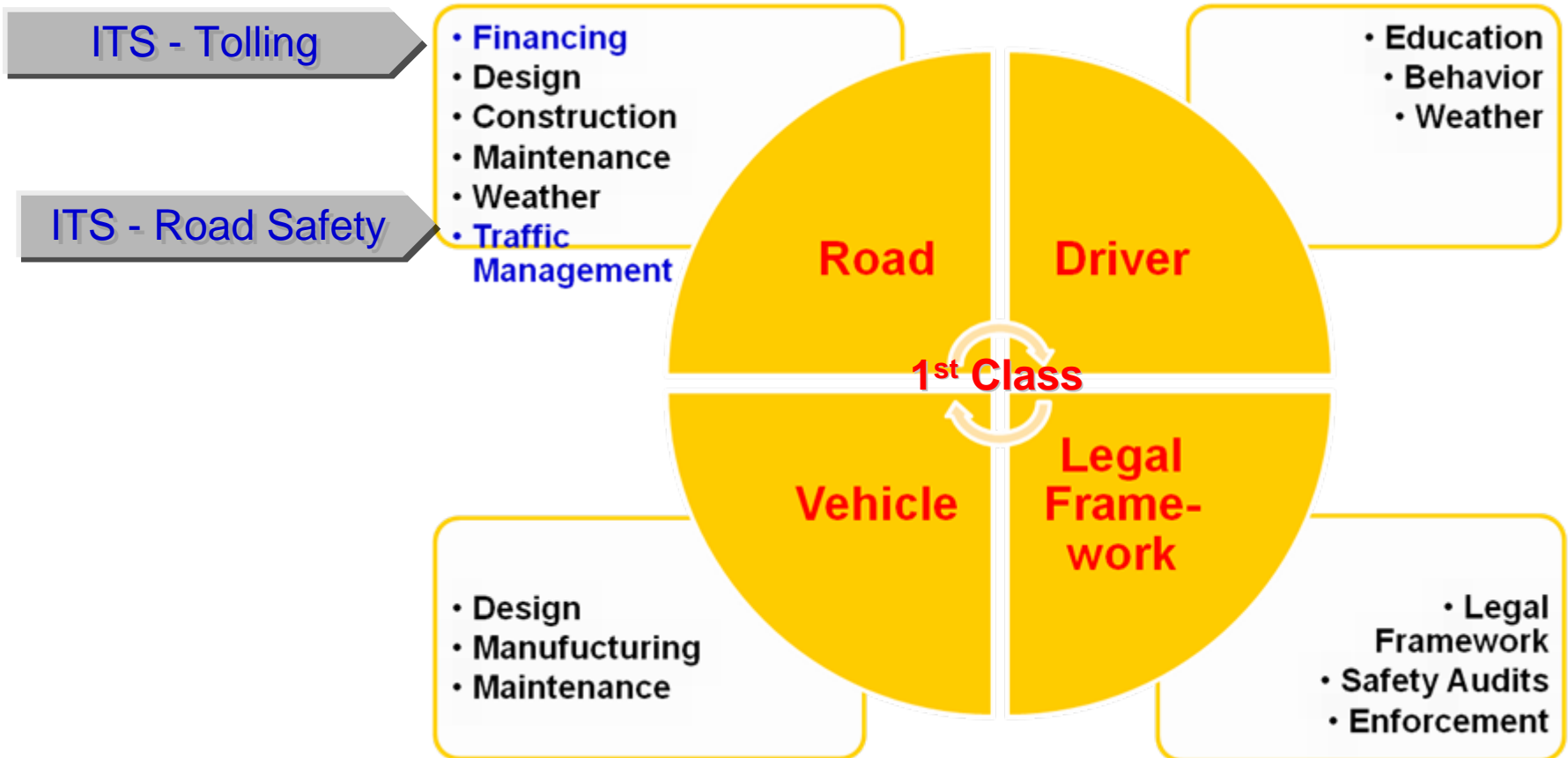


# Strategic Elements of Road Safety





# ITS to finance 1<sup>st</sup> class roads and to improve Road Safety



Positive Effects due to Telematics

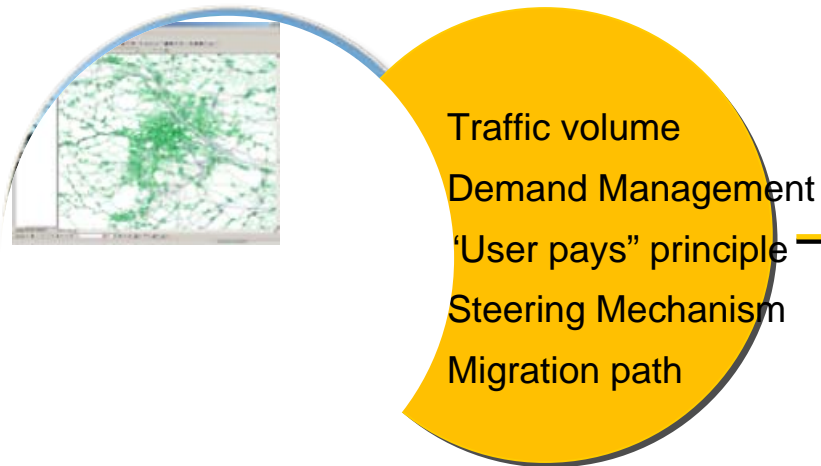
# The Haddon Matrix & Telematics

PHASE		FACTORS		
		HUMAN	VEHICLES AND EQUIPMENT	ENVIRONMENT
Pre-crash	Crash prevention	Information Attitudes Impairment Police enforcement	Roadworthiness Lighting Braking Handling Speed management	Road design and road layout Speed limits Pedestrian facilities
Crash	Injury prevention during the crash	Use of restraints Impairment	Occupant restraints Other safety devices Crash-protective design	Crash-protective roadside objects
Post-crash	Life sustaining	First-aid skill Access to medics	Ease of access Fire risk	Rescue facilities Congestion

# Electronic Tolling to Support Road Safety



## Aspects of Tolling & Road User Charging



- Growing traffic volume requires increasing capacity, better utilization of existing traffic infrastructure, and the provision of efficient transportation networks into vibrant regions
- Governments on federal and local level consider introducing road tolling to
  - Generate revenues for viable transport projects
  - reduce congestion
  - Mitigate environmental impact
  - Reduce fatalities
- Road financing as the powerful tool for road managers when forming transportation policy?
- Trend from conventional/manual toll collection to Electronic Toll Collection (ETC) allowing multi lane free flow tolling (MLFF).
  - No interference to traffic flow
  - Gathering and processing of traffic data
  - High automation rate and high enforcement rate

# 1<sup>st</sup> Class Tolling Scheme: Free Flow mode of operation

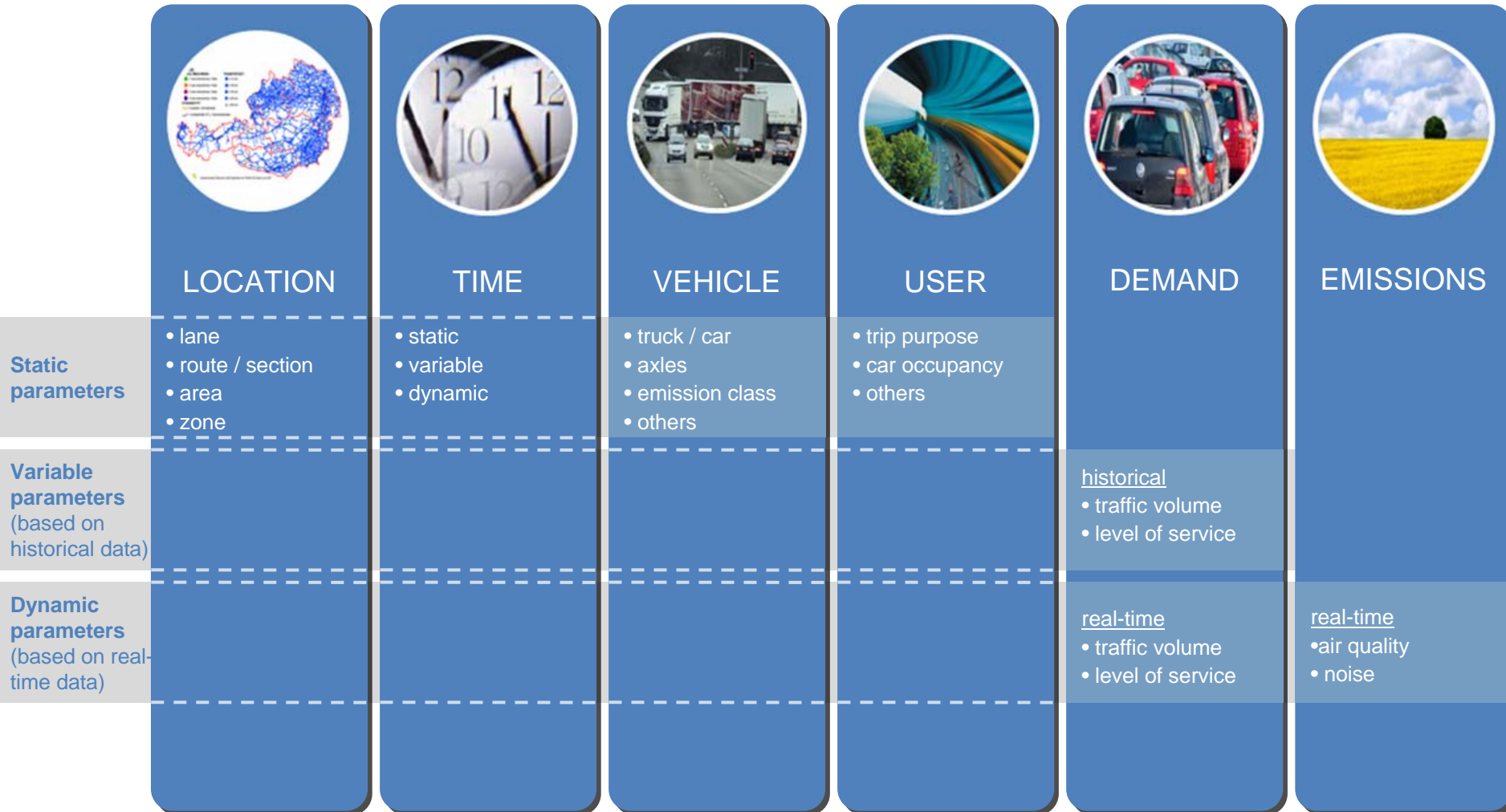
## Toll Plaza



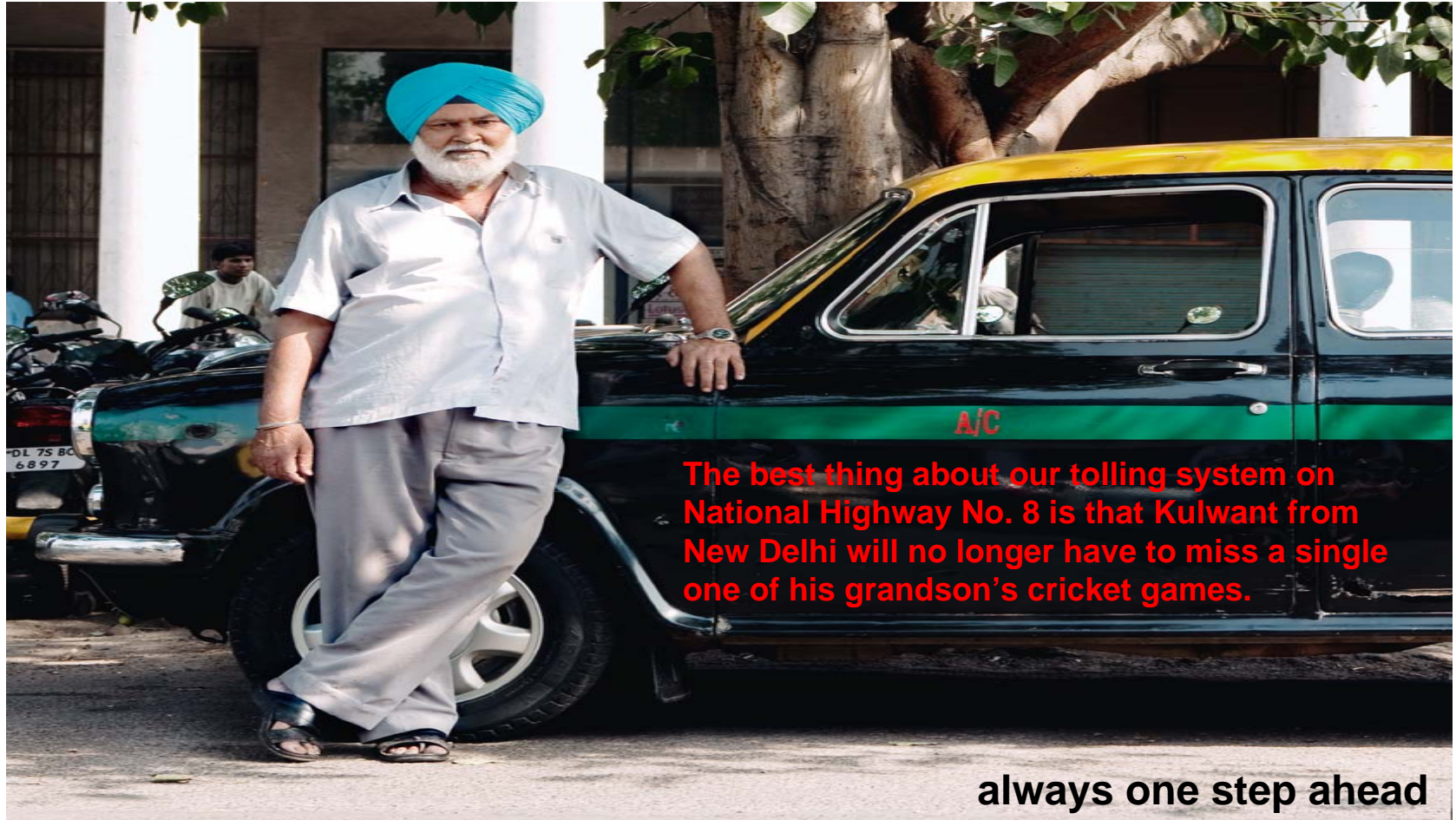
## Multi-Lane Free Flow



# Parameters to set toll tariffs



## The best thing about tolling ...

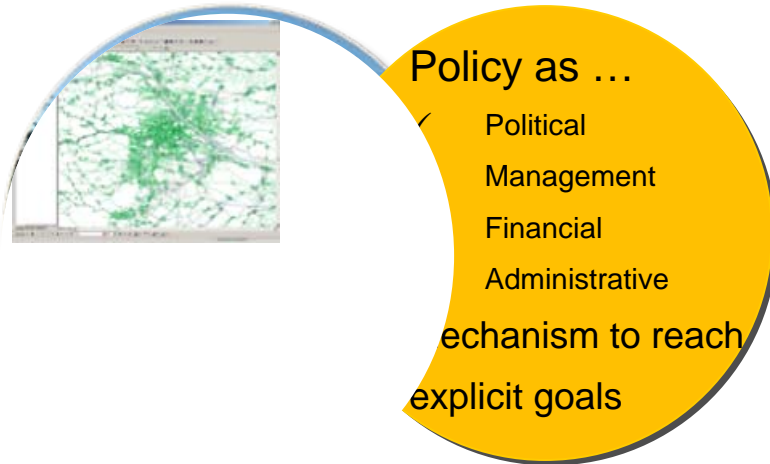


# Political & legal framework





# Political & Legal Framework for the deployment of ITS



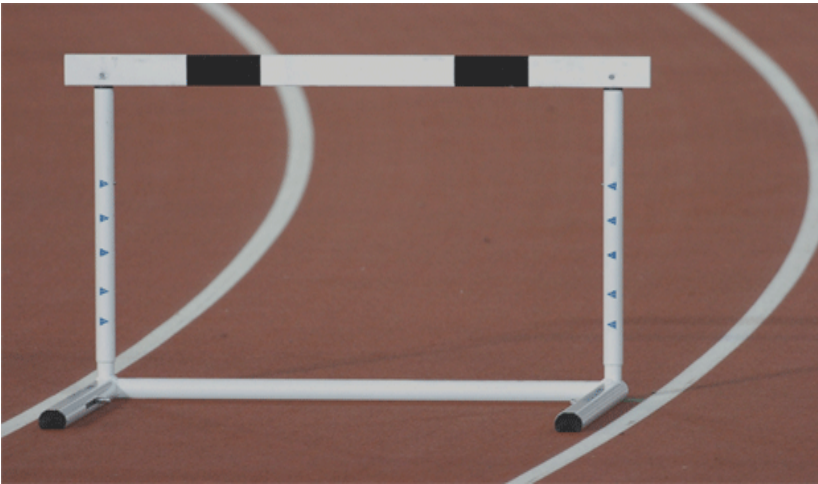
## >>> Political framework

- “Top down” approach to give direction and to set the pace of ITS deployment
- The government has to create the framework conditions for the deployment of ITS
- Political will to overcome short term thinking as well as mental and national boundaries
- Tolling (Urban & Inter-Urban) as a tool for financing and change of behaviour
- Reduce fatalities and financial consequences

## >>> Legal framework

- “Top down” approach to align Policy with national legislation and the application/deployment of ITS
- Stage of development of ITS legislation vary from country to country

## Hurdles to clear



- ✓ Isolated and fragmented applications
- ✓ Interagency disconnection at federal, regional and municipal level
- ✓ Short term thinking as well as mental and national boundaries
- ✓ Lack of national ITS standards
- ✓ Lack of systematic cooperation between ITS Nationals and International ITS community

# ITS Schemes to Support Road Safety

## Project Examples

Section Speed Control

Incident Detection

Wrong Way Driving

Intersection Safety Observation Scheme



## Positive Effects of Speed Reduction

### Rule:

### Reduction of the average speed by 1% :

- Results in 2% less slightly injured,
- 3% less seriously injured, and
- 4% less killed persons

## Examples from Europe for Positive Effects of Speed Reduction

### England (Nottingham)

Dead or seriously injured - **55%**

### Italy (Florence)

Amount of accidents - **22%**

Slightly injured - **34.75%**

Fatalities - **50.83%**

### Austria (Kaisermühlentunnel)

Slightly injured - **33.3%**

Fatalities / seriously injured - **48.8%**

# Traditional Speed Measurement

Laser based



Mobile systems based on radar



Video based speed measurement



Stationary radar systems



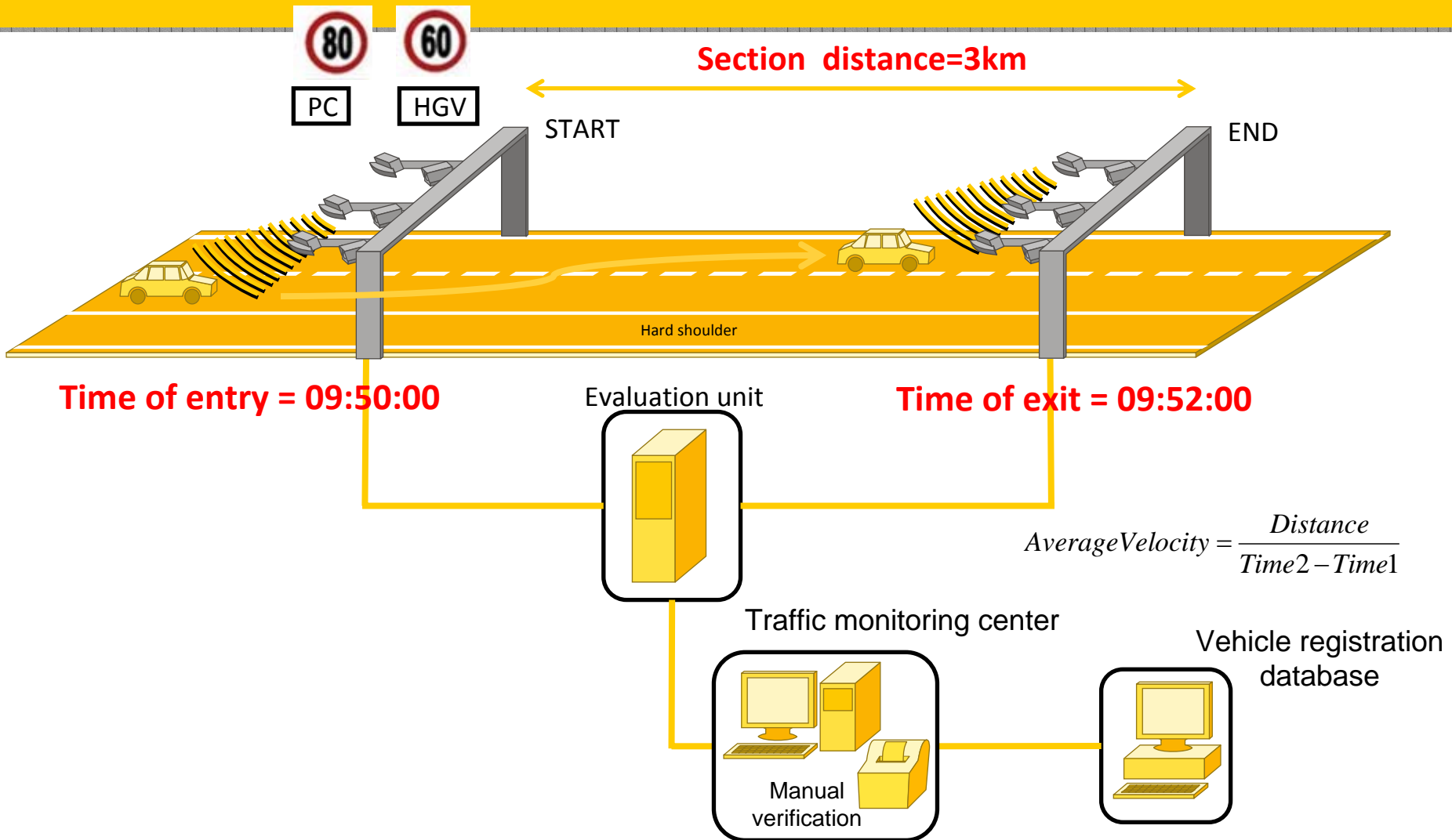
mobile systems

fixed systems

Very efficient due to the surprise effect. A disadvantage is that they are personnel-intensive and a continuous operation is not possible.

Effect of such systems is very local

# Speed Measurement by Section Speed Control



## Advantages of Section Speed Control

- Reduction accident probability and severity  
**= primary aim of speed control**
- Reduction of average velocity on a longer road section  
**= secondary aim of speed control**
- Reduce the environmental pollution (due to speed reduction)
- Reduce the noise disturbance (due to speed reduction)
- Automatic operation (24/7)
- Extendable by additional system features:
  - Distance measurement
  - Traffic statistics
  - Wrong way driver detection
  - Height check
  - Adaptive velocities
  - Weight in Motion





# Incident Detection Systems

## Digital Video Technology based Traffic Surveillance & Data Collection

Congestion and stopped car



Speed of single objects

Slow driver

Wrong way / lane drivers



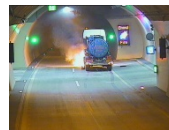
Distance of single objects

Break down by occupancy



Vehicle classification / counting

Smoke



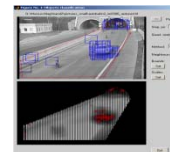
Lost Cargo / Debris

Movement



Dangerous Good (ADR), ANPR

Pedestrians, Animals



Hard shoulder lane, cont.

## Detection of Wrong Way Drivers by Digital Image Processing

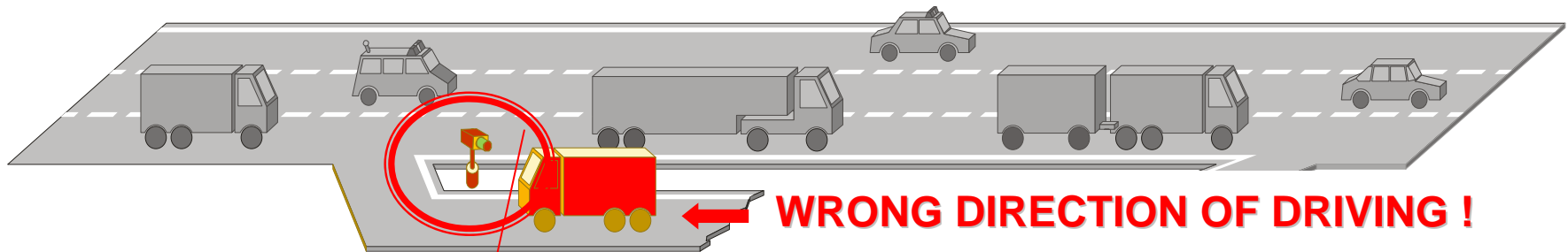
Intelligent digital video camera installed at exits

If a vehicle with wrong driving direction is detected, the following actions are started:

report to a traffic control centre

alarming police

warning of drivers on that particular stretch of the road



**Intelligent Digital  
Video Camera**

**WRONG DIRECTION OF DRIVING !**  
**NOTE:**  
**Wrong Way Driving results in severe  
accidents !!!!**

## Example: Detection of Wrong Way Driver at Strenger Tunnel in Austria

The situation is alerted immediately and the following tunnel reflex is released :

- Minimise the negative effects of traffic disturbances like accidents or congestions
- Shorten the reaction time to incidents

Automatically triggered proceedings :

- The tunnel entrance traffic light turns red
- Real-time traffic management information signs limit speed to 60 km/h
- Text signs in emergency bays and portals indicate “Attention: Wrong Way Driver”.

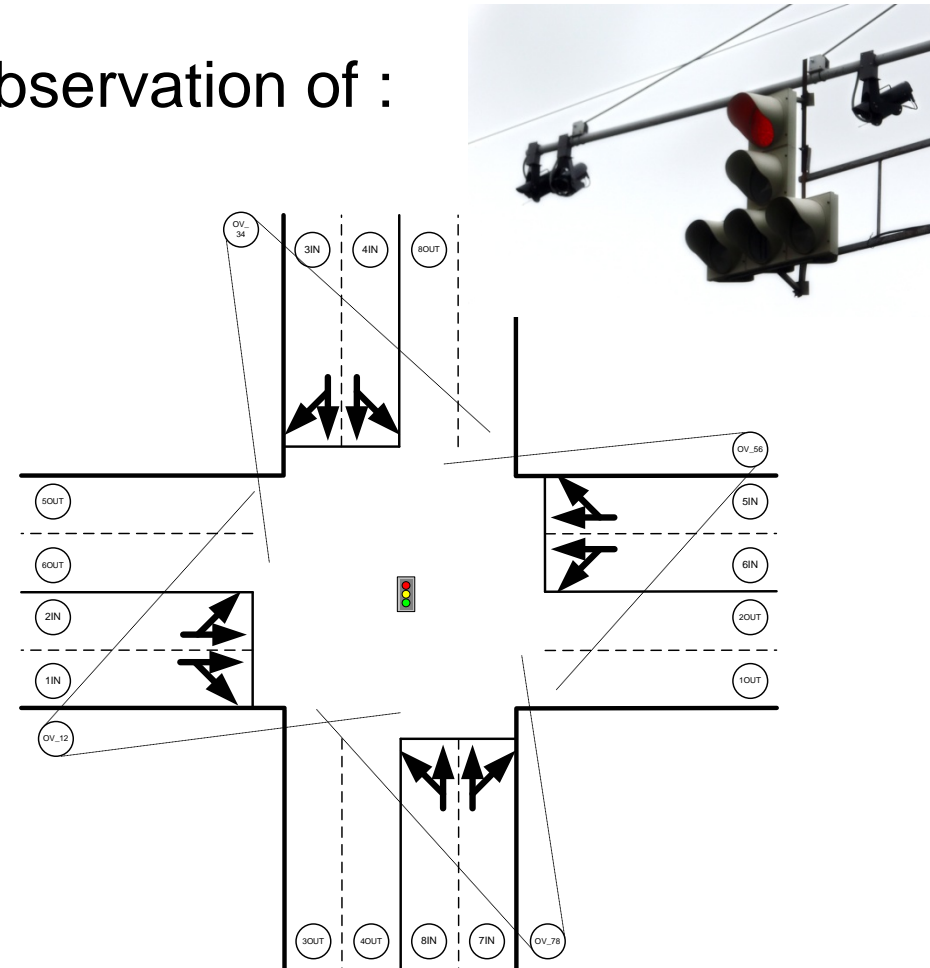


<http://oesterreich.orf.at/tirol/stories/234654>

## Intersection Safety Observation Scheme

Digital Camera Scheme for Observation of :

- Speed Detection
- Red Light Offences
- Blocking of Intersection
- Wrong Lane Usage



## Example: Intersection Safety Observation Scheme in Kazan / Russia

- No driving on red light
- No blocking of intersection
- No turns if not allowed
- No speeding



## Conclusions

- Road Safety is a shared responsibility and needs an integrated approach:
- Public awareness and education are essential
- Modern ITS Technologies support Road Safety
- (Law) Enforcement is as strong element in Road Safety
- Positive social economic benefits by :  
→ **less accidents, → less fatalities, → less congestion**



**Thank you for your attention!**



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