



THE EVOLUTION OF ROAD-VEHICLE INTERACTION: A VISION TO 30 YEARS

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ACKNOWLEDGMENTS

The activities reported in this presentation have been carried out by WGA members in the period 2004-2007.

The key results of WGA work are described in the paper “THE EVOLUTION OF ROAD-VEHICLE INTERACTION: EXPECTED TRENDS AND MONITORING TECHNIQUES” included in the CD by:

- F. La Torre – UNIFI – ITALY
- L. Poulikakos – EMPA – SWITZERLAND
- S. Brown – VicRoads - AUSTRALIA

THE ISSUE

**“Having a 20 to 30-year vision of developments in vehicle and road pavement characteristics”
(PIARC STRATEGIC PLAN 2004-2007)**

How “THINGS” are changing in road vehicle interaction and in which direction are we going?

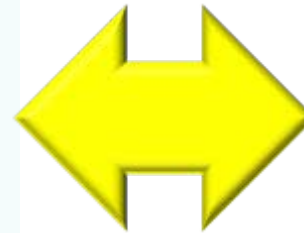
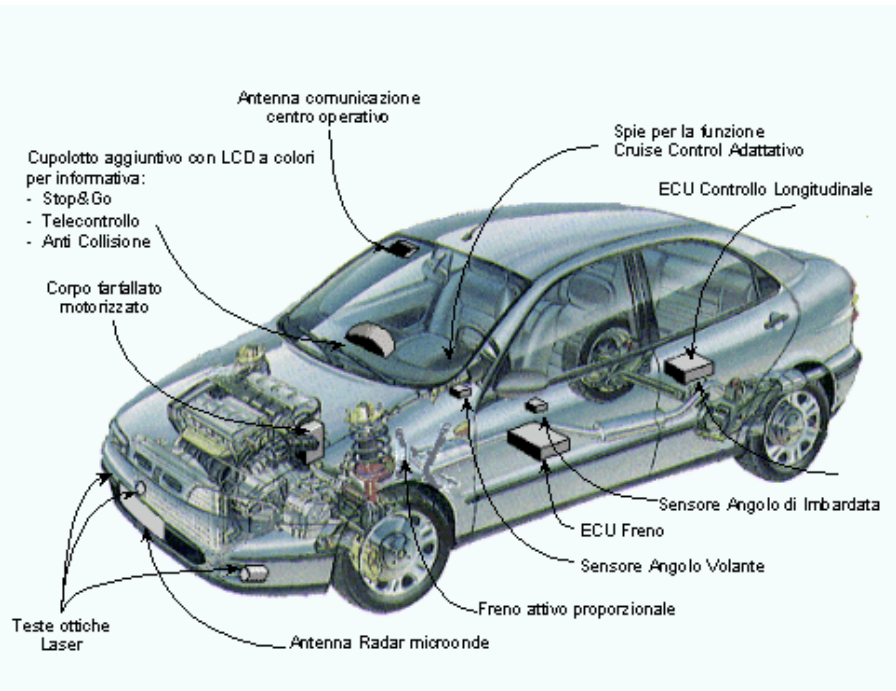
How can we keep track of these changes in infrastructure design and managements (with special attention to pavements but not only)?

How can we keep track of these changes?



**ESALS
&
TOTAL
HGV
COUNTS**

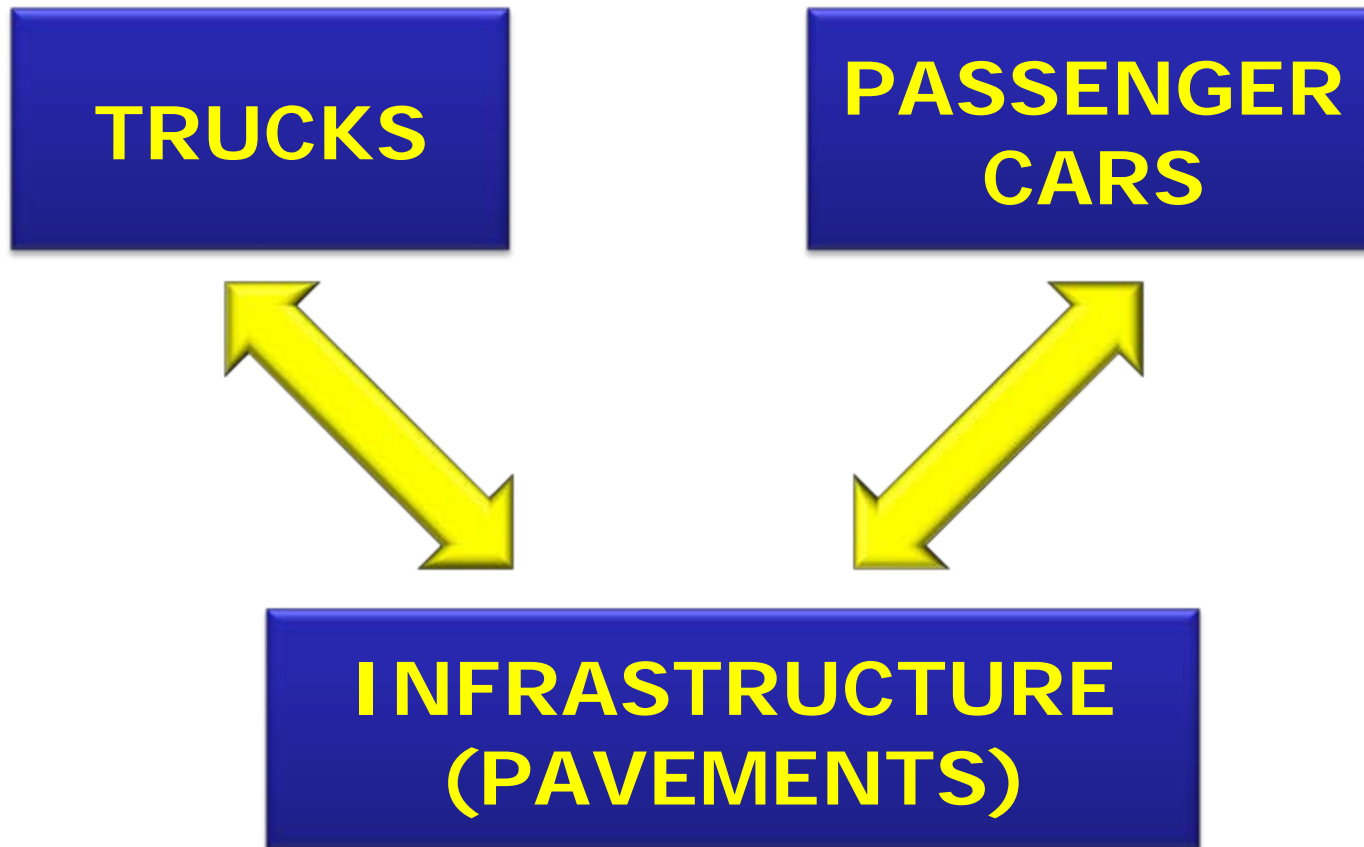
How can we keep track of these changes?



**EQUILIBRIUM
OF A SINGLE
POINT MASS
&
LOCKED
WHEEL
FRICTION**

How “THINGS” are changing?

3 major areas of interest



How “THINGS” are changing?

TO TACKLE THIS ISSUE

- ✓ A **Workshop** has been organized to be held during this WRC to share the views of the different stakeholders (vehicle and tyre manufacturers, infrastructures designers and managers, ITS technologists etc);
- ✓ An **Inquiry** has been conducted to identify the actual use of new monitoring techniques

WGA WORKSHOP - Paris 20 Sept. 2007

STRUCTURE OF THE WS:

MORNING: BY INVITATION ONLY

- 45 experts from 19 countries have been invited for a ½ day “brain storming” on the different issues that have been raised from the different perspectives;
- All the different stakeholders will be represented in the discussion

WGA WORKSHOP - Paris 20 Sept. 2007

STRUCTURE OF THE WS (part by invitation only) :

3 ROUND TABLES DEALING WITH:

- Effects on design and loading;
- Effects on safety and road/vehicle communication;
- Effects on pavement management and monitoring.

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16 experts from different areas of expertise (roads – management, design, materials -, passenger cars and passenger car tyres, trucks and truck tyres, ITS, WIM expert etc) and key research projects (INTRO, HeavyRoute, Safespot etc), have produced in advance a “Vision note” including:

- **examples;**
- **provocations;**
- **questions to be discussed in the workshop;**
- **implementation issues**

These notes have been sent in advance to all the experts invited for the Round Tables

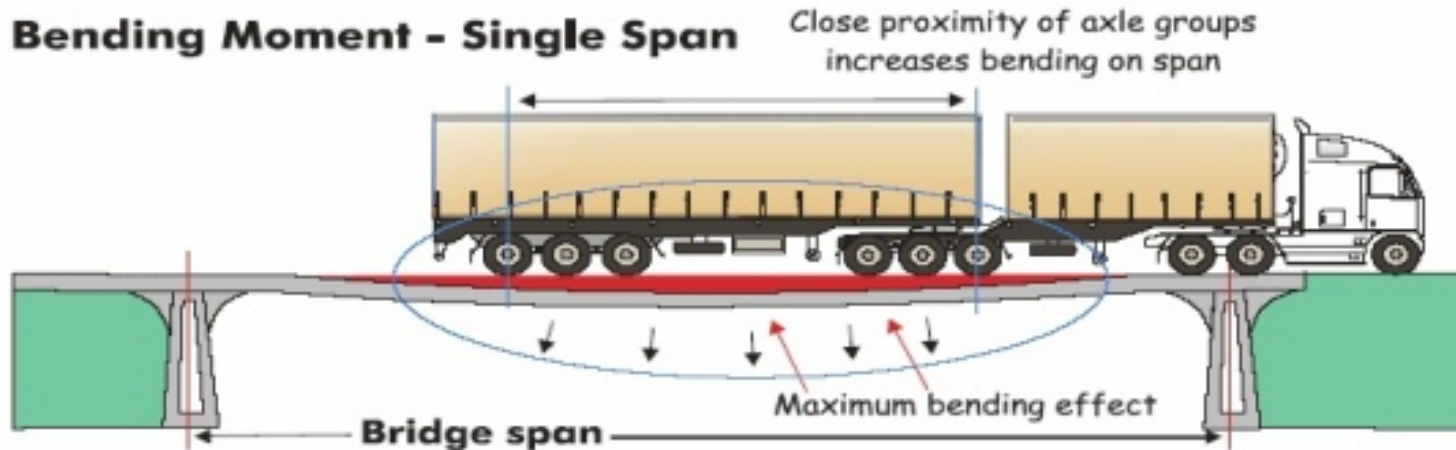
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**AFTERNOON: OPEN TO ALL THE WRC
ATTENDEES – ROOM 343 (2:00 – 5:30 pm)**

- **Synthesis of the conclusions of each Round Table to the plenary group (by the moderator)**
- **Selected interventions from the experts**
- **Open floor for the discussion**

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Effects on design and loading ... moving towards performance related specs for trucks?

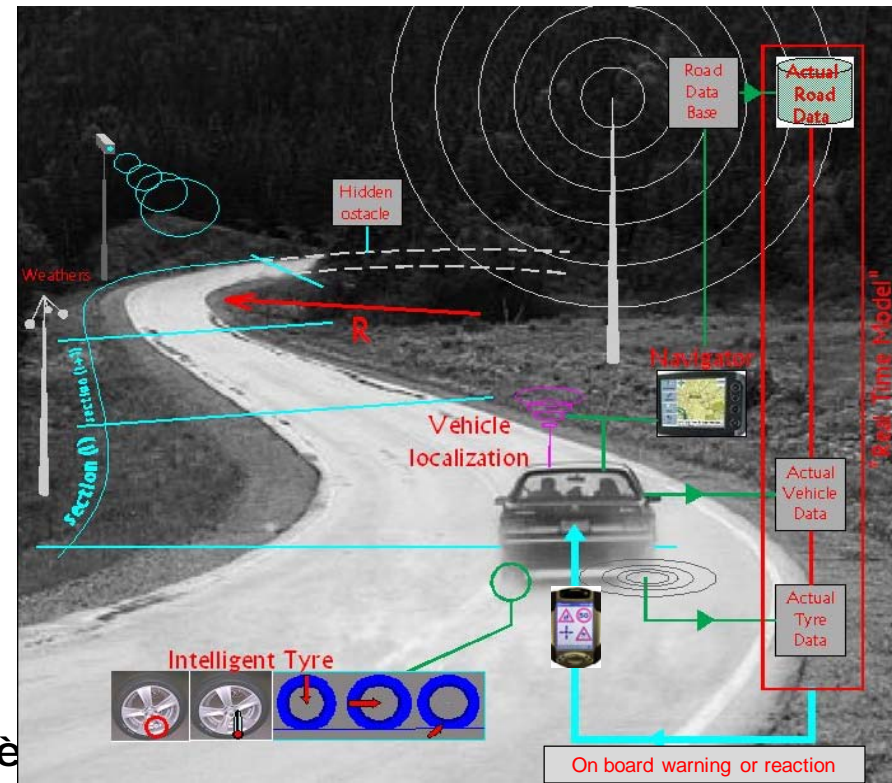


New materials for pavements and infrastructure construction issues will also be addressed

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Effects on safety and road/vehicle communication ... moving towards an “intelligent” infrastructure-vehicle-tyre-driver system?

Everybody is looking for the solution but are we even close to find it?

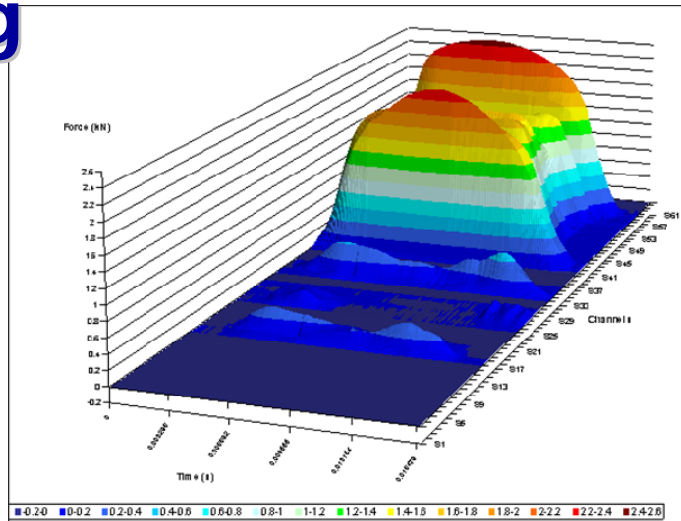


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Effects on pavement management and monitoring ... moving towards a self monitoring infrastructure?

How spread are these new technologies?

What role can the vehicles themselves play in the monitoring effort? (V2I)



How spread are these new technologies

RESULTS OF THE C4.2 INQUIRY

	COUNTRIES	RESPONSES
	Australia	7 (*)
	Belgium	2
	Canada-Quebec	1
	Czech Republic	6
	Denmark	1
	Italy	2
	France	1
	Portugal	- (**)
	Slovakia	1
	Slovenia	1
	Spain	1
	Switzerland	2
	UK	2
TOTAL	12+1 (***)	27

NOTES

(*) responses on friction and evenness monitoring devices are not included

(**) Portugal has sent 3 responses but all referred to functional or structural pavement monitoring

(***) 13 including Portugal not considered in the analysis

RESPONDER'S DETAILS

AFFILIATION	Università di Firenze		
COUNTRY	Italy		
TYPE OF INSTITUTION	University		
POINT OF CONTACT	Name	Francesca La Torre	
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	Website	roads.dicea.unifi.it	

MONITORING TECHNIQUE DETAILS

MONITORING TYPE	Laser Vehicle Counter		
OPERATING INFORMATION	Accuracy of the Monitoring Techniques for the required purpose	Medium	
	Average passes missed in a survey	<5%	
COSTS FOR TESTING	Costs for installation	<1000 euro	
	Costs for data acquisition (1 day monitoring)	<1000 euro	
	Costs for post processing (1 day monitoring)	<1000 euro	
POST PROCESSING	<input type="checkbox"/> Real time post processing	<input checked="" type="checkbox"/> Desktop post processing	
	Time (in hours) per day of testing		
	<input checked="" type="checkbox"/> In House post processing	<input type="checkbox"/> Outsourced post processing	

TYPE OF DATA COLLECTED

Vehicle Type	<input checked="" type="checkbox"/>	VEHICLE TYPE DEFINITION	
Number of Vehicles	<input checked="" type="checkbox"/>	Classification of the vehicles by mass	
Lateral Vehicle Distribution		Classification of the vehicle by length	<input checked="" type="checkbox"/>
Vehicle Speed	<input checked="" type="checkbox"/>	Mass of each vehicle	
Pressure Distribution Under the Wheel		Length of each vehicle	<input checked="" type="checkbox"/>
Subsurface Strain/Stress		VEHICLE SPEED DISTRIBUTION	
Automatic Vehicle ID		Number of passes in a speed class	<input checked="" type="checkbox"/>
Average Daily Traffic	<input checked="" type="checkbox"/>	Speed of each vehicle	<input checked="" type="checkbox"/>
Percentage of HGV	<input checked="" type="checkbox"/>		
ESALs			
Other			

DEVICE INFORMATION

MANUFACTURER	Sodi Scientifica		
MODEL	KVLaser	COST	5000 to 10000 euro (US\$)
NUMBER OF UNITS AVAILABLE	1		
OPERATING CAPABILITIES IN THE SECTION	Multilane (not distinguish the lane of the passage)	MAX. NUMBER OF LANES	2
THE DEVICE CAN BE RELOCATED	FULLY		

DEVICE PICTURE**DATA COLLECTION**

PURPOSE FOR TESTING	
Infrastructure Management	<input checked="" type="checkbox"/>
Pavement Management	
Pavement Design	
Vibration Control	
Noise Control	
Speed Enforcement	
Safety Assessment	<input checked="" type="checkbox"/>
Accident Reconstruction	
Vehicle Dynamics	<input checked="" type="checkbox"/>
Research	<input checked="" type="checkbox"/>
Road User Charging	
Pavement Maintenance	

FREQUENCY OF TESTING

Occasionally

DATA STORAGE

Raw Data is Stored

COMMENTS AND REFERENCES**KEY ADVANTAGES IN USING THIS MONITORING TECHNIQUE**

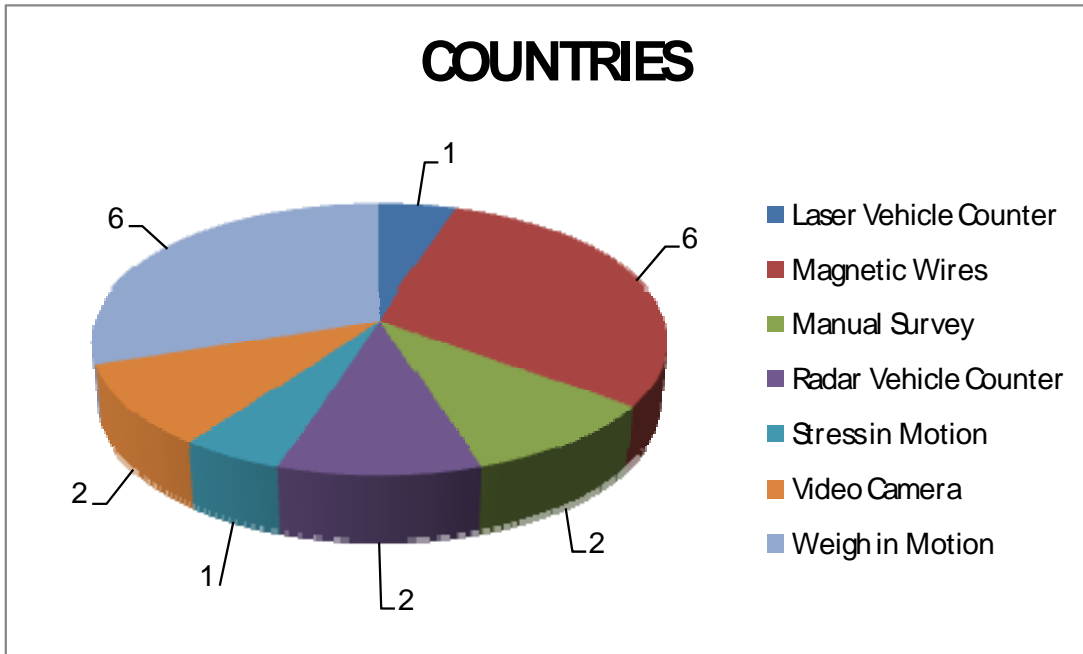
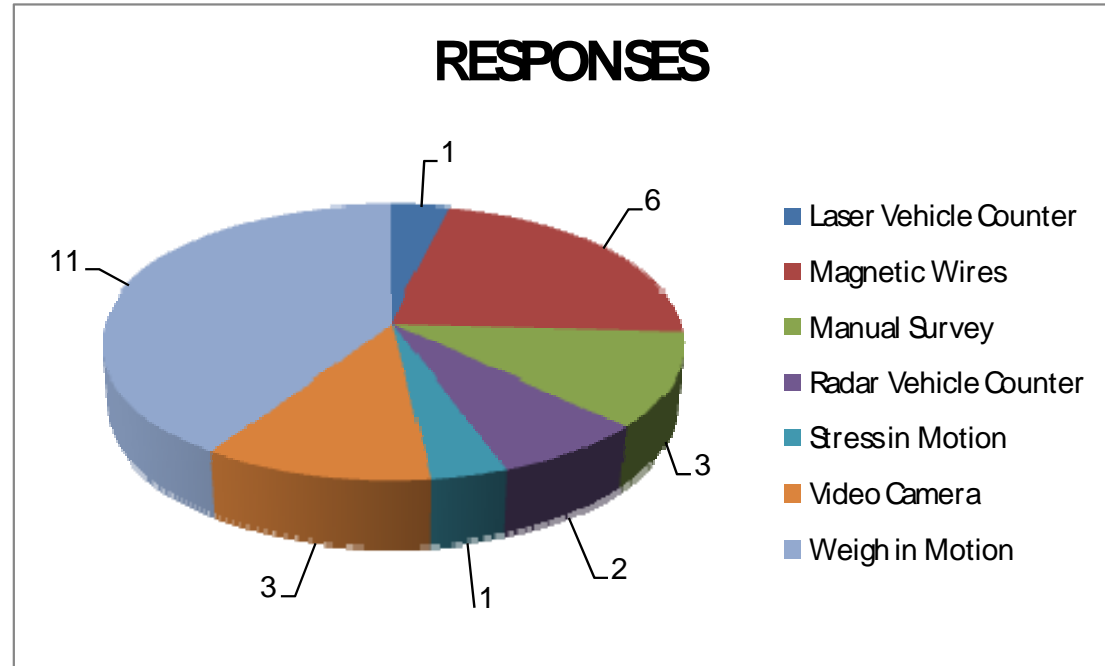
The cost for the device is rather limited and it is easy to install without the need for specialized personnel. The speed and time for each vehicle can be determined allowing to correctly evaluate the speed percentiles.

MAJOR DISADVANTAGES OF THIS MONITORING TECHNIQUE

- It has to be located in a hidden site if the purpose is speed testing
- it doesn't distinguish between the passes in the two lanes for multiline highways
- For more than two lanes is highly unreliable
- it cannot operate under rainy conditions

TECHNICAL REFERENCES

Distribution of monitoring techniques among the single responses



.... and countries

Area of application of traffic and loading monitoring by technique

MONITORING TECHNIQUE	Infrastructure Management	Pavement Management	Pavement Design	Vibration Control	Noise Control	Speed Enforcement	Safety Assessment	Accident Reconstruction	Vehicle Dynamics	Research	Road User Charging	Pavement Maintenance
Manual Survey	X				X	X	X		X	X	X	
Laser Vehicle Counter	X						X		X	X		
Radar Vehicle Counter	X		X			X	X		X	X		
Video Camera	X					X	X		X	X	X	
Magnetic Wires	X	X	X		X	X	X		X	X	X	X
Weigh in Motion	X	X	X	X	X	X	X		X	X	X	X
Stress in Motion	X	X	X							X		X
TOTALS	7	3	4	1	3	5	6	0	6	7	4	3

cost for the installation and use of each monitoring technique

Monitoring type	Device cost [euro]	Costs for installation [euro]	Costs for data acquisition [euro] (1 day monitoring)	Costs for post processing [euro] (1 day monitoring)
Manual Survey	-	<1000 ^(*)	<1000	1000 to 3000
Laser Vehicle Counter	5000 to 10000	<1000	<1000	<1000
Radar Vehicle Counter	< 5000	<1000	<1000	<1000
Video Camera	< 5000	<1000	<1000	1000 to 3000
Magnetic Wires	5000 to 10000	<1000	<1000	<1000
Weigh in Motion_1	> 25000	>5000	<1000	<1000
Weigh in Motion_2	5000 to 10000	>5000	<1000	<1000
Stress in Motion	> 25000	1000 to 3000	3000 to 5000	<1000
(*) Cost for setting up the survey				





**SEE YOU ALL ON THURSDAY AT
THE WORKSHOP!!!!!!!!!!!!!!
(2:00 – 5:30 pm ROOM 343)**

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