"THE VULNERABILITY OF TRANSPORT SYSTEMS TO EXTREME WEATHER EVENTS"

Weather and consequent impact on main roads

Roberto ARDITI, SINA on behalf of ASECAP

Bruxelles, September 14th 2010
THE IMPACT ON INFRASTRUCTURES

ROAD ASSET

DIRECT INDIRECT

CONTINUITY OF THE SERVICE

ROAD OPERATION

READINESS, COSTS, ORGANIZATION

SAFETY OF USERS
OUTLOOK OF THE PRESENTATION

A FEW REMARKS ABOUT ASECAP AND SINA

IMPACT ON THE ROAD ASSET

TECHNOLOGY AND PREVENTING MEASURES AN EXAMPLE: ROAD AND TERRITORY KNOWLEDGE

IMPACT ON THE OPERATION

IMPACT OF CLIMATE CHANGE
ASECAP, the European professional Association of Tolled Road Infrastructures Concessionaires

- **20** NATIONAL MEMBERS
- **16 FULL** MEMBERS OPERATE 26,226 KM
- **4 ASSOCIATE** MEMBERS HAVE 14,860 KM
- **149** TOLLED MOTORWAYS OPERATORS
- OVER **21 BILLIONS** EUROS OF REVENUES
- **15,000,000** OF ETC SUBSCRIBERS
ASECAP main agenda

at EU level…

- Financing (Tolling, Interoperability)
- Safety & Environment
- ITS

…a preferred partner of the

- European Commission
- European Parliament
- Major transport stakeholders

COPER II
COPER III
ASECAP members operate a significant part of the Trans-European network.
OUTLOOK OF THE PRESENTATION

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IMPACT ON THE ROAD ASSET

POSSIBLE MEASURES AN EXAMPLE: ROAD AND TERRITORY KNOWLEDGE

IMPACT ON THE OPERATION

IMPACT OF CLIMATE CHANGE
IMPACT ON THE ASSET
BACKGROUND PROBLEMS

CONTINUOUS PRACTICABILITY OF ROADS AND ACCESS TO THE AREA OF THE EMERGENCY
IMPACT ON THE ASSET
BACKGROUND PROBLEMS

Pont. St. Martin 2000

NORMALLY ROADS NEEDS TO OPERATE SUBSTITUTING OTHER LAND TRANSPORT SYSTEMS
Direct damage to the road structure  
(Bridge collapsed in Newcastle  
Following the flood of 1930)
IMMEDIATE ENSURING OF SAFETY

Val di Susa 2000
Flood 2000 - Autostrada Torino Milano – restoring of the motorway performed in 14 days time
IMPACT ON THE ASSET
BACKGROUND PROBLEMS

North Platte, Nebraska US – July 6th 2002
IMPACT ON THE ASSET
BACKGROUND PROBLEMS
IMPACT ON THE ASSET
BACKGROUND PROBLEMS
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TECHNOLOGY AND PREVENTING MEASURES AN EXAMPLE: ROAD AND TERRITORY KNOWLEDGE

IMPACT ON THE OPERATION

IMPACT OF CLIMATE CHANGE
Knowledge:
- Road itself
- Crossed land

Neighboring
- Built-in areas
- Infrastructures
THE CASE OF SINECO LASERTECH

Global Positioning System (GPS)

Distance Measurement Indicator (DMI)

Inertial Measurement Unit (IMU)

Light Detection and Ranging (LIDARs)
What is this for?

- Laser Measurement Rate 200 kHz
- Guarantee high accuracy even at high speed
- Able to generate a map through point cloud
Survey of a Greek Highway with Lynx
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IMPACT OF CLIMATE CHANGE
IMPACT ON THE OPERATION

BACKGROUND PROBLEMS
IMPACT ON THE OPERATION
BACKGROUND PROBLEMS
February 28, 2004
Road blocked by snow near Miranda de Ebro, Spain. 1,500 trucks stranded in France on the A63 due to snow in the Spanish Basque country.
To avoid blocks it’s necessary flow control

In case of snow carriageway maximum flow, in sage condition with operative vehicles in action, can be reduced to 300 vehicles/hour per lane from a value which is, in normal condition, about 1200 vehicles/hour.
So in very important snowfall starts to:

1) **regulate vehicles travelling towards the snowy section reducing them in a progressive way as the snowfall increases**

2) **as well to be ready for a diversion or a stop of lorries on carriageways in a section where there is not snowfall**
OUTLOOK OF THE PRESENTATION

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IMPACT ON THE ROAD ASSET

IMPACT ON THE OPERATION

IMPACT OF CLIMATE CHANGE
TEMPERATURE

Increase in very hot days and heat waves
- Impacts on pavement and concrete construction practices
- Thermal expansion on bridge expansion joints and paved surfaces

Decreases in very cold days
- Regional Changes in snow removal costs and environmental impacts from salt and chemical use
- Decreased use of unimproved roads that rely on frozen ground for passage
Increase in intense precipitation events

- Increases in **flooding** of roadways, rail lines, and subterranean tunnels
- Overloading of **drainage systems**, causing backups and street flooding
- Increases in **scouring**, **road wash out**, damages to rail bed **support structures**, and landslides and **mudslides** that damage roadways and tracks
- Impacts on soil moisture levels, affecting **structural integrity** of roads, bridges, and tunnels
- Adverse impacts of **standing water on road bases**
- Increases in **scouring** of pipeline roadbeds and damages to pipelines
Washington, USA
Thanks for your attention