



## 2011 RWM STAKEHOLDERS MEETING

# MDSS PILOT PROJECT Sector M-1. Madrid, Spain

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## Network maintained by the Spanish Ministry of Public Works and Transport (Ministerio de Fomento)

### STATE ROAD NETWORK

- **High capacity network: 11096 km**
  - ✓ toll motorways: 2493 km
  - ✓ toll-free motorways: 8603 km
- **Single road: 14537 km**
- **Total network: 25633 km**
- **Number of maintenance sectors: 160**

Ministry maintains 15% of the country's roads. These roads, though, account for 51% of the total traffic, and 64% of heavy traffic.



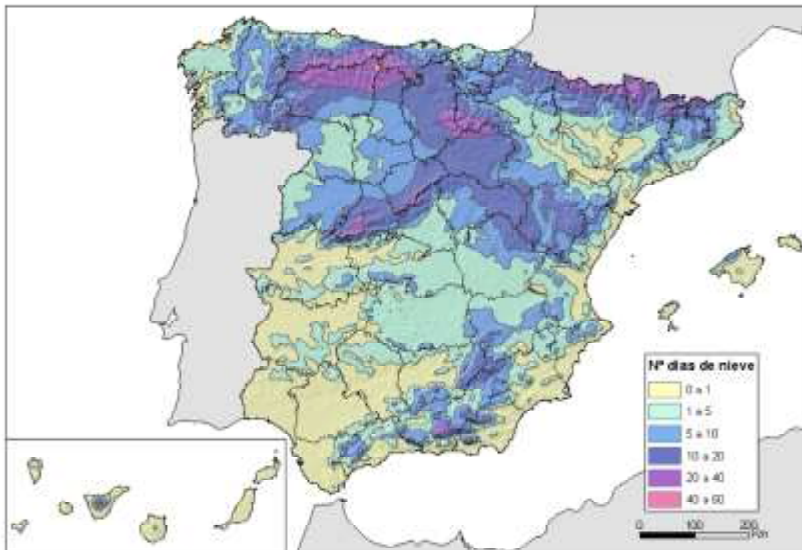
## Spain: Geographic Description

- 2nd most mountainous country in Europe.
- Average altitude: 660m (2165 ft).
- 37% of the network is at +700 m (+2300ft).
- Conclusion: despite generally temperate weather, many areas present snow problems due to altitude.

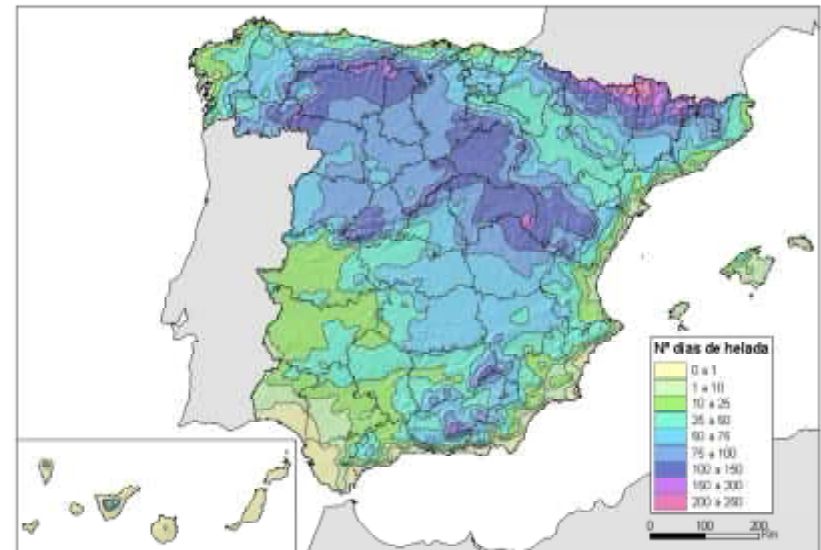


## Spain: Winter weather

Average days of snowfall (1971-2000)



Average days of freezing temperatures (1971-2000)



- Winter presents some areas in Spain with abundant below freezing temperatures and snowy days.
- Mountainous areas in northern, central and southern Spain present an average of as many as 50 days of snow per year.
- Central and Northern Spain:  
high average elevation + continental climate= 150 days per year (on average) of below - freezing temperatures.

## Public-private partnership in Spanish road maintenance

- The Ministry outsources road maintenance to private contractors, manages, supervises and enforces maintenance standards.
- Total BUDGET for road maintenance and routine maintenance 2010: €350 million (\$503m).
- Winter Maintenance: €60 million (\$86m) (15% of total).
- Capacity for improvement through further deployment of means is very limited: increased *efficacy* is only viable option.



## MDSS Test Site: the A-1 motorway



- 70 km: start at 600 m (1968 ft), highest point, 1200 m (3937 ft).
- Pronounced slopes: up to 5%.
- 27 km with 6 lanes (+ 4 auxiliary lanes). Rest: 4 lanes.
- Average daily traffic between 30,000 and 100,000
- Beyond test site (30 km after the end) is Europe's highest stretch of motorway (1440 m- 4725 ft).

## MDSS Test Site: Weather



- **Extreme changes in temp.**  
Range from -7 to 40+°C (19 to +100 °F)
- **Days of snow: 15**
- **Days of -0°: 100**
- **Very low visibility during storms (fog+snow).**

## MDSS Test Site: available means in M1 Sector

**For M1 Sector (70 km):**

- **Snow plows: 19**
- **Brine plants: 2**
- **Brine storage units: 4**
- **Total brine capacity: 100,000 L**
- **Salt silos: 7**
- **Salt storage barn: 1**
- **Total salt capacity: 2,500 T**





## Why MDSS?

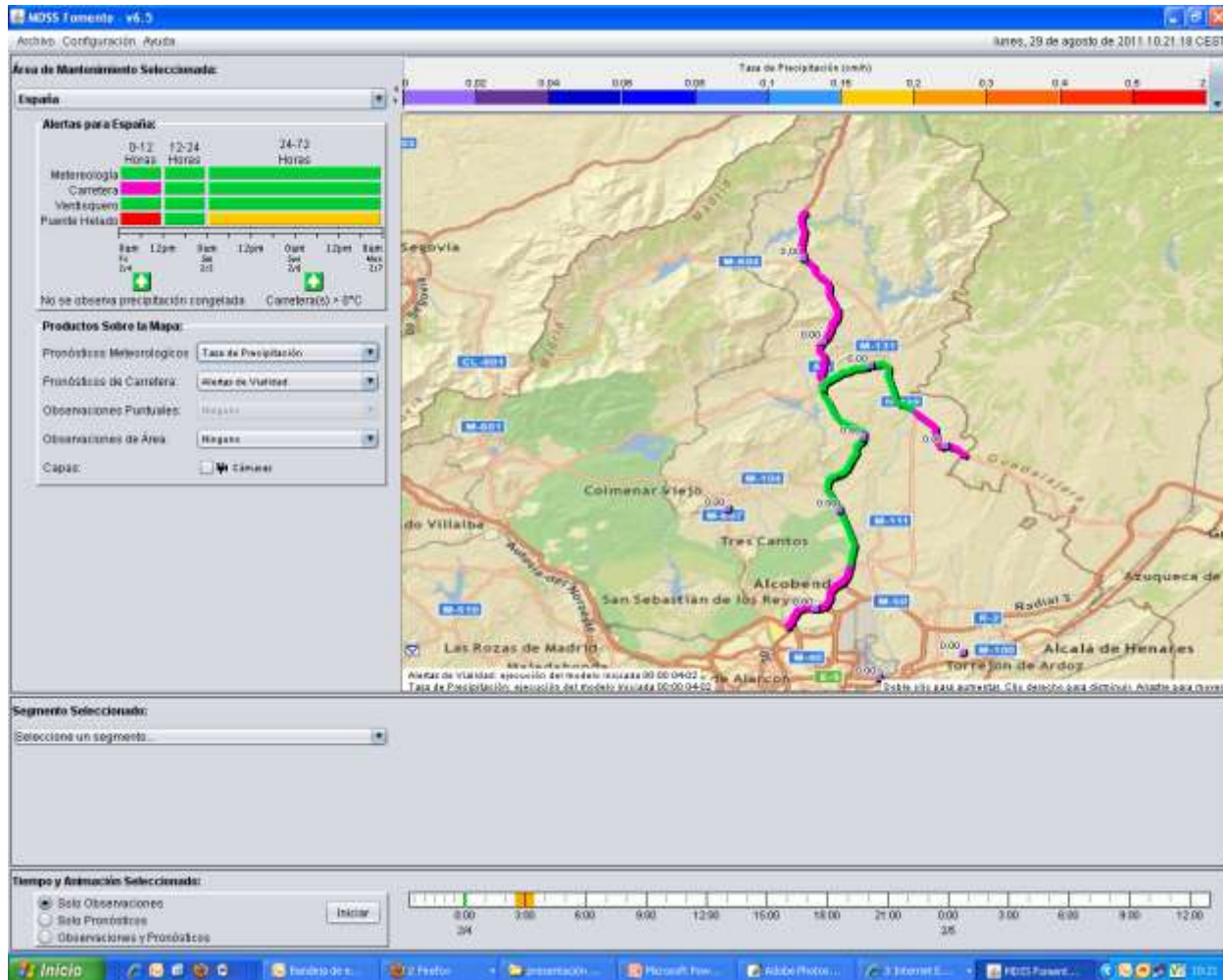
### Ministry Objectives in Winter Maintenance:

- Reduce to smallest expression any risks & disturbances to traffic due to weather.
- Impede ice formation on road.
- Inform stakeholders of conditions in advance.

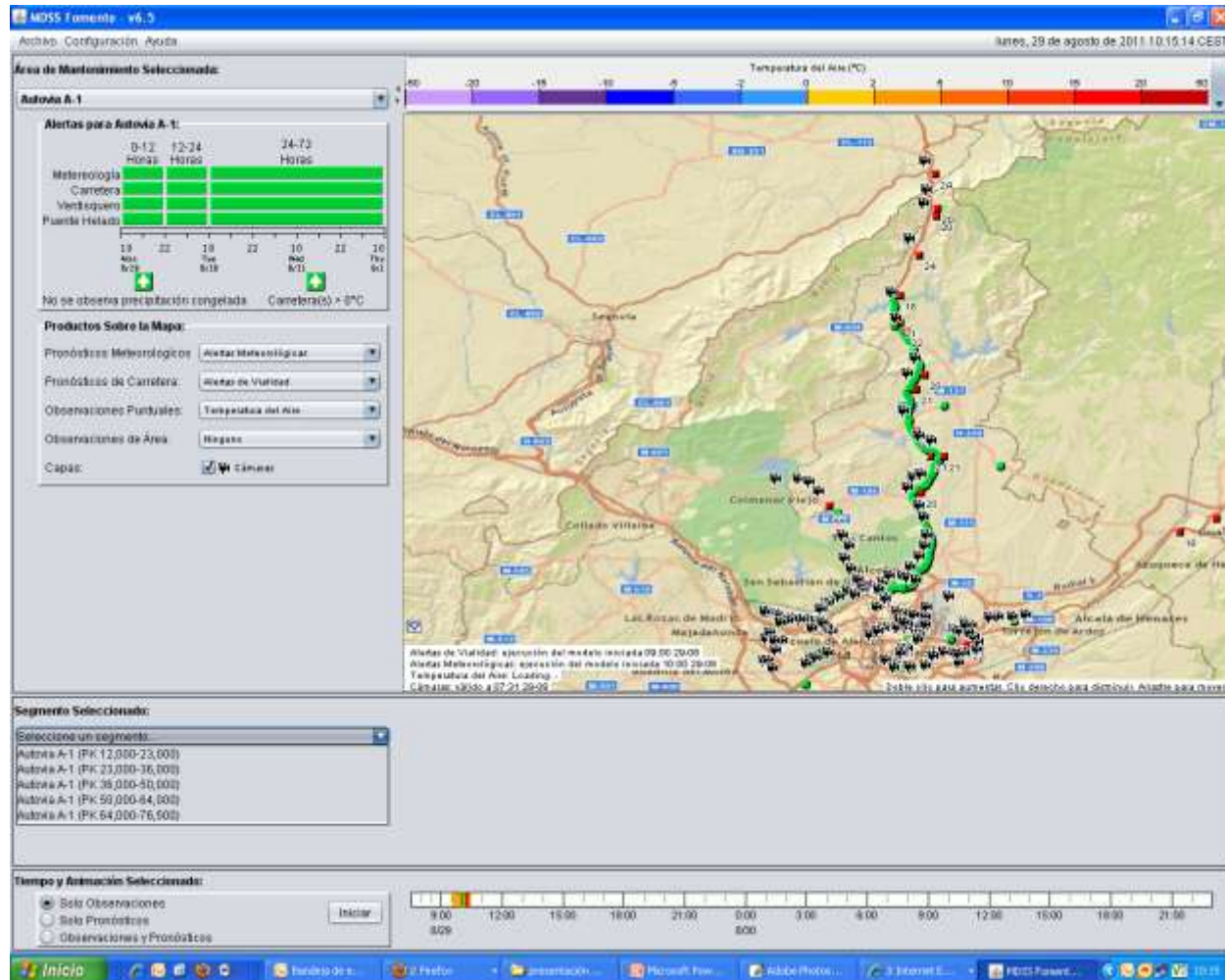
### MDSS Pilot Objectives:

- Improvement of service through more means can only be marginal: only possible through better use of available means.
- To this day, reduction in cost is not objective: improve our efficiency as a way to improve our efficacy.

## A1 Motorway MDSS



## A1 Motorway MDSS



## Lessons learnt and future challenges

### Objectives achieved:

- Improved weather predictions.
- Characterization of road segments. Segmented predictions.
- Improved response planification for preventive treatments.
- Concentrated all information flows into 1 interface (forecast, cameras, weather stations, radar).

### Future challenges:

- To test over full season.
- Integrate other information flows, especially AVL.
- To be able to actually follow MDSS recommendations.
- To use results of these recommendations to improve general procedures (operation plan).

**Thank you!**