

SPENS Final seminar
27 – 28 August 2009

Task 2.2 – Non-destructive testing of Pavement conditions

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Tasks in WT2.2

- Inventory of non-destructive measurement techniques in European new member states
- Carry out harmonisation test for
 - skid resistance
 - longitudinal evenness
 - bearing capacity
- Recommendations for road operators/road authorities on non-destructive measurement techniques

Non-destructive pavement testing

- Tests are performed in-situ
- Tests are normally done in fluent traffic
- No influence on the pavement itself
- Quality assurance (new work approval, ...)
- Input for Pavement management systems
- A lot of different measurement techniques in use today

Inventory

- Skid resistance
 - Pendulum [the only one internationally standardized]
 - SCRIM
 - TRT
 - BV11
 - Griptester
 - RoadSTAR

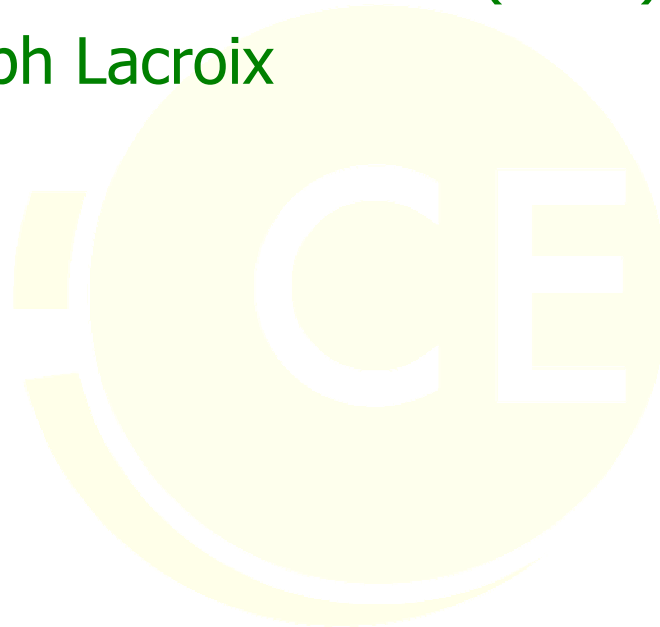


Inventory

- Evenness
 - 4 m straight edge
 - Profilograph
 - Different kinds of profilometers (i.e. contactless, laser sensor/accelerometer based)

Inventory

- Bearing capacity
 - Falling weight deflectometer (FWD)
 - Deflectograph Lacroix

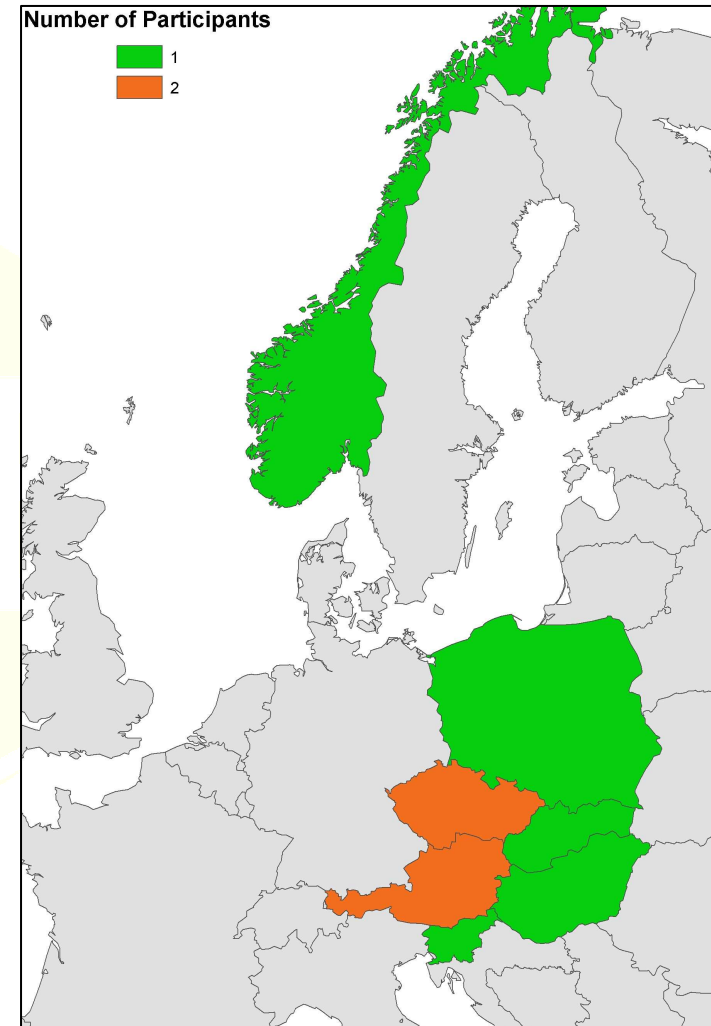


Harmonisation test

	Time	Action
Preparation	Autumn 2007 – Spring 2008	Test design
	January 2008	Addresses of device owners collected
	February 2008	Invitation letters sent out
	March – April 2008	Preparation for harmonisation test <ul style="list-style-type: none"> • Selection of test sites • Measurements • Organisation
Test	May 5 th 2008	Briefing for participants at AIT
	May 6 th – May 8 th 2008	Parallel harmonisation test for skid resistance, longitudinal evenness and bearing capacity devices
	May 12 th – May 15 th 2008	Reference measurements longitudinal evenness
Analysis	August 8 th 2008	Received last measurement result from participants
	August 2008	Analysis started
	February 2009	Analysis finished

Harmonisation Test

- Skid resistance
 - Methodology: CEN/TS 13036-2:2009
 - 9 participants
 - 6 surfaces with varying skid resistance and texture
 - 3 speeds (30-60-90 km/h)
 - Macro texture measured
 - Calculation of SRI



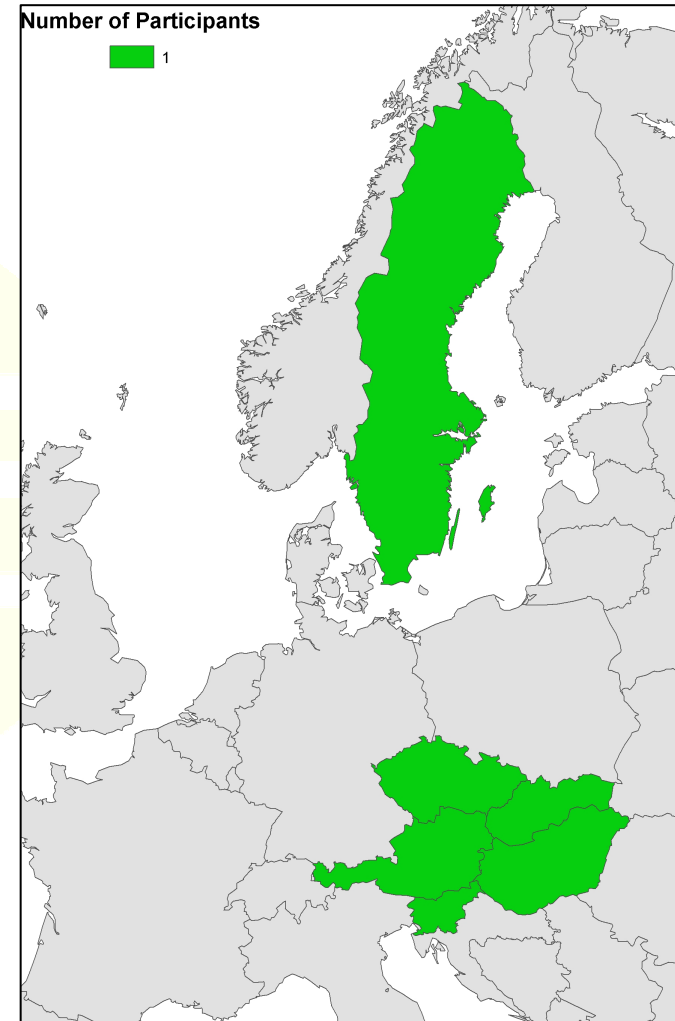
Harmonisation Test

- Skid resistance - devices



Harmonisation Test

- Longitudinal Evenness
 - Methodology: similar to FILTER
 - 6 participants
 - Reference: VTI Primal
 - 6 sections of 500 m lengths
 - IRI from 0.8 up to 10
 - Comparison of IRI, Profile, PSD



Harmonisation Test

- Longitudinal Evenness - devices



Harmonisation Test

- Bearing capacity
 - Methodology: COST 336 Protocol C5
“In situ FWD harmonisation procedure”
 - 7 participants
 - 6 sections with varying stiffness
 - Comparison of measured deflection bowls
 - No comparison of calculated E-Moduli



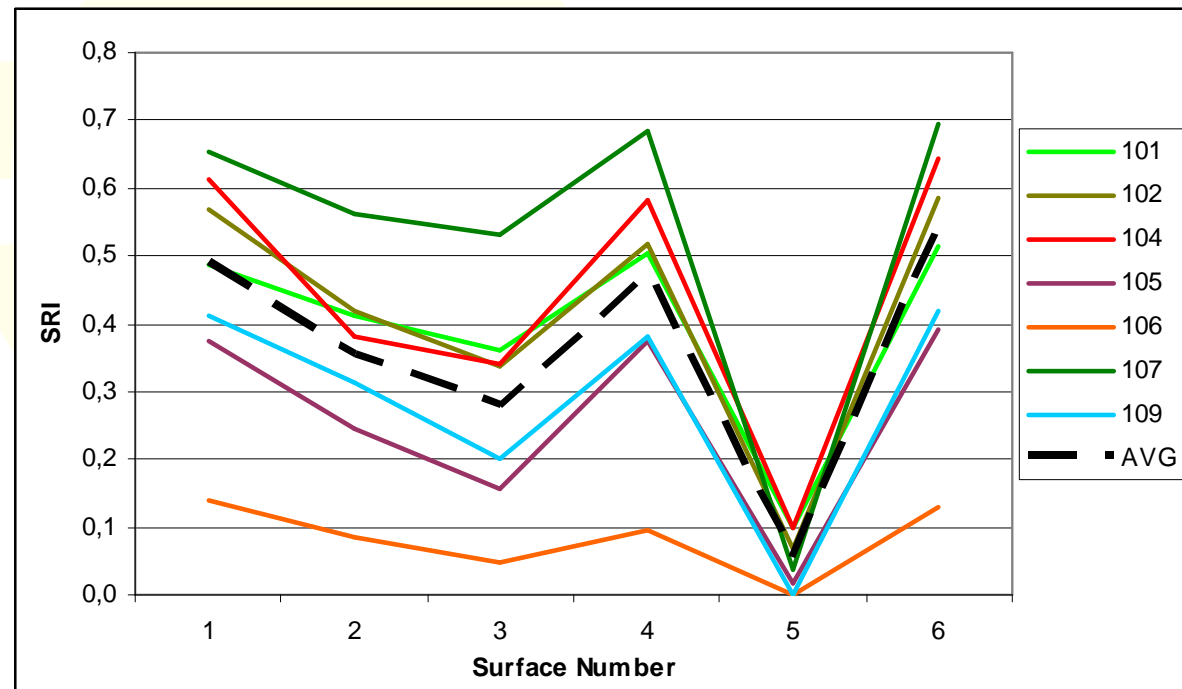
Harmonisation Test

- Bearing capacity - devices



Results – Skid resistance

- Good speed independence [0.01 ... 0.053]; avg=0.016
- Repeatability limit **r=0.05** [slightly high]
- Reproducibility limit **R=0.24** [very high]
- Trueness of Result? → no accepted reference value available



Results – Longitudinal Evenness

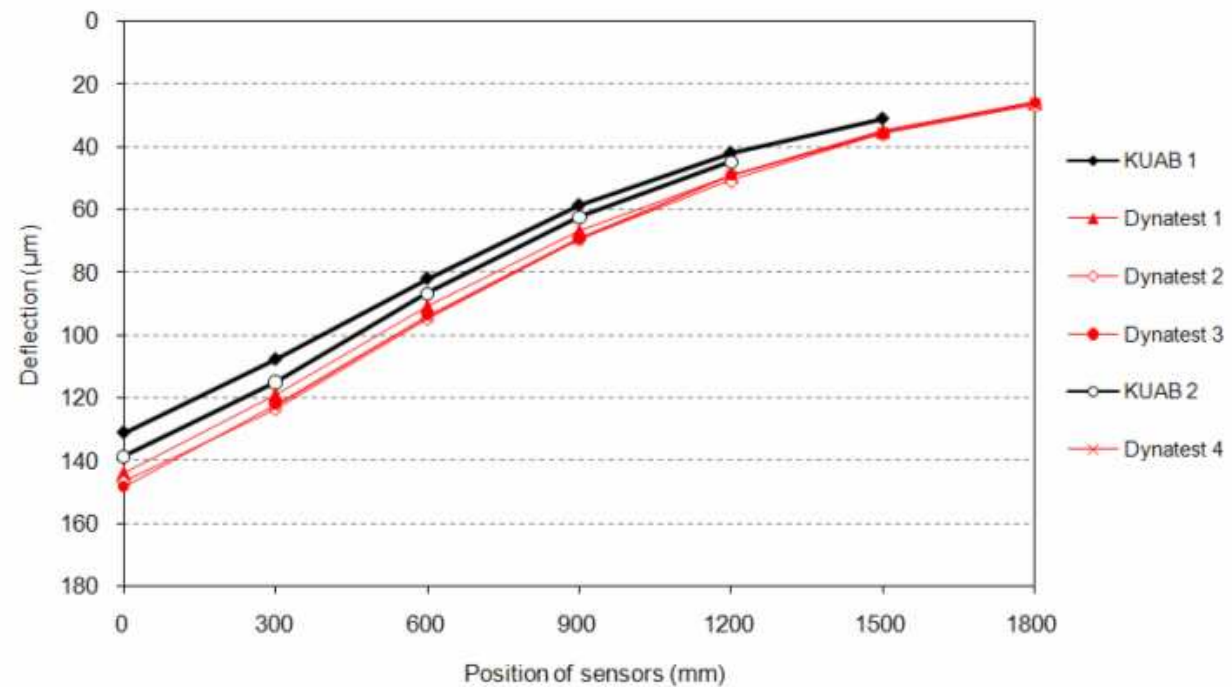
- IRI – one outlier, rest has a rather good compliance with reference

Correlation Primal/Vehicle	Standard deviation [mm/m]
r=0.89	0.73
r=0.95	0.17
r=0.97	0.45
r=0.90	0.60
r=0.80	0.41
r=0.93	0.27

- Typical value from procurement tests in Sweden: std < 0.12 mm/m
- PSD-Analysis: good compliance for wavelengths < 5 m
- Devices are technically very similar – main source of error lies in the hand of the human factor. Quality assurance is essential.

Results – Bearing Capacity

- Apparent differences between the two types “KUAB” and “Dynatest”
- All FWD fulfilled reproducibility requirements.
- Short-time repeatability – all FWD passed.



Conclusions

- Advantages of harmonised measurement techniques are quite obvious – for road operator as well as for device operators
- Harmonisation needs agreed reference devices
 - there is none for skid resistance
 - there are static/quasi static devices for longitudinal evenness
 - FWDs are constructed very similar, average can be used
- Harmonisation methodology
 - needs improvement for skid resistance
 - works quite well for longitudinal evenness
 - works well for bearing capacity
- Quality assurance and trained personnel is essential for good results

Acknowledgements

- László Gáspár and Zsolt Bence for helping me with the skid resistance analysis
- Josef Stryk and Slavoljub Erjavec for carrying out the bearing capacity analysis
- Thomas Lundberg, Leif Sjögren and Peter Andrén for carrying out the Longitudinal evenness analysis
- and all SPENS people I had the pleasure to get to know.