SPENS Final seminar
27 – 28 August 2009

Sustainable Pavements for European New member States

Mojca Ravnikar Turk - ZAG Ljubljana
project coordinator

Ljubljana, Slovenija
Summary

• Objectives
• Consortium
• Scope of the work and Deliverables
• Conclusions
• Dissemination
Objectives

The standard of the road infrastructure differs throughout the European Union member states. The present volume of heavy road transport requires a sustainable road infrastructure immediately. There is a constant need for new resistant pavement materials, that should comply with the EU regulations.
Objectives

The objective of the SPENS research project was to develop appropriate tools and procedures for the rapid and cost-effective rehabilitation and maintenance of roads especially in the EU New Member States.

Priority: Sustainable Surface Transport 1.6.2
Objectives

During the three years (September 2006 – August 2009) we were searching for materials and technologies for road pavement construction and rehabilitation that would:
- behave satisfactorily in a typical climate,
- have an acceptable environmental impact,
- be easy to incorporate within existing technologies,
- be cost-effective and easy to maintain,

taking into account the availability of materials and traditional construction techniques.
Consortium

Project start:
09/2006

Duration:
3 years

Partners:
10, majority from NMS

Budget:
~ 2.47 mio€ (total cost)

Coordinator:
ZAG (Slovenia),
Mrs. Mojca Ravnikar Turk

Website:
http://spens.fehrl.org
## Consortium

<table>
<thead>
<tr>
<th>WP No.</th>
<th>WP Leader</th>
<th>Affiliation</th>
<th>Deputy</th>
<th>Affiliation</th>
<th>Task</th>
<th>Task leader</th>
<th>Affiliation</th>
</tr>
</thead>
<tbody>
<tr>
<td>WP 1</td>
<td>Mojca Ravnikar Turk</td>
<td>ZAG</td>
<td>Aleš Žnidarič</td>
<td>ZAG</td>
<td></td>
<td>Mojca Ravnikar Turk</td>
<td>ZAG</td>
</tr>
<tr>
<td>WP 2</td>
<td>László Gáspár</td>
<td>KTI</td>
<td>Josef Stryk</td>
<td>CDV</td>
<td></td>
<td>Darko Kokot</td>
<td>ZAG</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2.1</td>
<td>Roland Spielhofer</td>
<td>AIT</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2.2</td>
<td>Slovenko Henigman</td>
<td>DDC</td>
</tr>
<tr>
<td>WP 3</td>
<td>Safwat Said</td>
<td>VTI</td>
<td>Ana Mladenovič</td>
<td>ZAG</td>
<td></td>
<td>Safwat Said</td>
<td>VTI</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3.1</td>
<td>Ana Mladenovič</td>
<td>ZAG</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3.2</td>
<td>Imre Pap</td>
<td>FEHRL (IP)</td>
</tr>
<tr>
<td>WP 4</td>
<td>Marjan Tušar</td>
<td>ZAG</td>
<td>Wojciech Bańkowski</td>
<td>IBDiM</td>
<td></td>
<td>Bjorn Kalman</td>
<td>VTI</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4.1</td>
<td>Wojciech Bańkowski</td>
<td>IBDiM</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4.2</td>
<td>Leif G Wiman</td>
<td>VTI</td>
</tr>
<tr>
<td>WP 5</td>
<td>Manfred Haider</td>
<td>AIT</td>
<td>Lennart Folkesson</td>
<td>VTI</td>
<td></td>
<td>Lennart Folkeson</td>
<td>VTI</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5.1</td>
<td>Manfred Haider</td>
<td>AIT</td>
</tr>
<tr>
<td>WP 6</td>
<td>Steve Phillips</td>
<td>FEHRL</td>
<td>Adewole Adesiyun</td>
<td>FEHRL</td>
<td></td>
<td>Mojca Ravnikar Turk</td>
<td>ZAG</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6.1</td>
<td>Steve Phillips</td>
<td>FEHRL</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6.2</td>
<td>Adewole Adesiyun</td>
<td>FEHRL</td>
</tr>
</tbody>
</table>
Scope of the work and deliverables

WP2  Road assessment and monitoring

D12 Recommendations for traffic equivalency factors

D13 Guidelines of a complex methodology for non-destructive pavement measuring techniques

D11 Guidelines on systematic decision making methodology on the pavement rehabilitation of low volume road
In EU member states there is a variety of apparatus in use today for non-destructive pavement measuring techniques. There are five surface parameters that are of major importance for pavement management systems:

- longitudinal evenness
- bearing capacity
- skid resistance (in combination with macro texture)
- surface defects
- transversal evenness (not covered in SPENS report)
Harmonisation tests – Vienna, May 2008

For skid resistance measuring exercise, six test pavements were selected with various skid resistance. The 9 devices coming from 7 countries run the 100-m long test sections at 30-60-90 km/h measuring speeds.
Harmonisation tests – Vienna, May 2008

For longitudinal unevenness measuring test, the device Primal (VTI) was selected as reference instrument for the harmonisation exercise. Six test pavements were chosen with various unevenness. The 7 devices coming from 6 countries run the 500 m-long test sections at 30-60-90 km/h measuring speeds.
For bearing capacity measuring devices, the methodology developed in COST 336 action for calibration and harmonisation was applied. 7 Falling Weight Deflectometers (FWDs) from 6 countries participated in the exercise. The maximum surface deflection values were compared to each other.
Scope of the work and deliverables

WP3 Improvement of pavement structures

D9 Long-term performance of reinforced pavements

D18 A methodology for testing and implementing selected recycled materials and industrial by-products in road construction

D10 Practical mix design model for asphalt mixture
test fields in Slovenia
long-term behavior (skid resistance) of
the wearing course with slag
aggregate in typical climate

On one lane
conventional natural aggregate
(silicate 4/8 and 8/11 + carbonate
aggregate 0/2 mm)

On the other lane
slag aggregate
(0/4, and 4/8 and 8/11 +
carbonate aggregate 0/2 mm).

**D18 A methodology for testing and implementing selected recycled materials and industrial by-products in road construction**

**Test field in Slovenia**

Long-term behaviour of **building rubble in unbound layer**

Determination of long term behaviour (bearing capacity, deterioration) of the unbound layer

Spreading of building rubble crushed concrete
Scope of the work and deliverables

WP4 Evaluation of materials for road upgrading

D8 Laboratory and field implementation of high modulus asphalt concrete. Requirements for HMAC mix design and pavement design.

D15 Recommendations for modified binder usage in pavement

D16 Guidelines for selection the most convenient upgrading systems based on results of heavy vehicle simulator tests and cost-benefit analyses of field trials
Preparation of initial recommendations
Laboratory implementation and tests
**Construction of full scale trial sections in Poland**
Accelerated loading tests
**Requirements for HMAC mix design and pavement design.**
test fields in Slovenia
6 typical pavement structures - accelerated loading tests
D16 Guidelines for selection the most convenient upgrading systems based on results of heavy vehicle simulator tests and cost-benefit analyses of field trials
D16 Guidelines for selection the most convenient upgrading systems based on results of heavy vehicle simulator tests and cost-benefit analyses of field trials

test fields in Slovenia
6 typical pavement structures - accelerated loading tests
D16 Guidelines for selection the most convenient upgrading systems based on results of heavy vehicle simulator tests and cost-benefit analyses of field trials

test fields in Dragučova
6 typical pavement structures - accelerated loading tests
Scope of the work and deliverables

WP5  Impact assessment of roads on the environment

17 Guidelines for the environmental assessment of various pavement types including recommendations to road authorities in New Member States

Activities were oriented towards two sources of road impact on the environment:
- emission of particles,
- noise emissions of typical pavements

Various types of pavement were assessed in laboratories and in-situ with regard to their influence on noise emission by the pavement / tire interaction.
Various types of pavement commonly used in the EU New Member states were assessed in laboratories and in-situ with regard to their influence on traffic-generated \textbf{surface wear of pavements and generation (and characterization) of pavement-wear particles}.
Conclusions

rehabilitation and maintenance of roads in the EU New Member States
✓ The NMS issues have been addressed, typical (local) materials were used for testing.

Diversity of partners
✓ Language was not an obstacle in communication

Little experience in EU projects
✓ We learned fast

😊 Close contacts, informal, day-to-day, quick exchange of experience
😊 Comparison of laboratory test results (round robin test)
Conclusions

Scope of the work
✓ SPENS provides research into road assessment, materials for pavements and environmental impact
😊 Research results are interesting also for experts from other states (Ukraine, EU-15)
😊 The research has raised new issues, additional testing as well as post constructional (long-term monitoring) are needed

Clustering with other EU project
✓ Past EU projects have been implemented,

! It is very important to share the experience gained not only within SPENS but also within other (national etc) research projects.
Dissemination

http://spens.fehrl.org/

SPENS partners and CERTAIN will disseminate the results especially within the NMS countries September 2009 to June 2010

TRA, Transport Research Arena 2010
Brussels, 07-10 June 2010
## Program of the SPENS Final Seminar
### August 27 and 28, 2009

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Presenter(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12:00</td>
<td>Registration and coffee</td>
<td></td>
</tr>
<tr>
<td>12:30</td>
<td>Welcome and introduction General Session</td>
<td>Aleš Žnidarič, Andraž Legat, Wiliam Bird, Mojca Ravnikar, Tomasz Wierzbicki, CERTAIN Coordinator, ZAG Director, EC Project Officer</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mojca Ravnikar, Turk, ARCHES Coordinator</td>
</tr>
<tr>
<td>13:45</td>
<td>“Road assessment and monitoring” Chairman Manfred Haider</td>
<td>László Gáspár, Roland Spielhofer, Slovenko Henigman, Road assessment and monitoring, Guidelines of a complex methodology for non-destructive pavement measuring techniques, Guidelines on systematic decision making methodology on the pavement rehabilitation of low volume road, Guidelines for the environmental assessment of various pavement types including recommendations to road authorities in New Member States, Discussion</td>
</tr>
<tr>
<td>15:15</td>
<td>Lunch</td>
<td>Wojciech Bankowski, Leif Wiman, Evaluation of materials for road upgrading, Laboratory and field implementation of high modulus asphalt concrete, Guidelines for selection the most convenient upgrading systems based on results of heavy vehicle simulator tests, Recommendations for modified binder usage in pavement, Discussion</td>
</tr>
<tr>
<td>18:00</td>
<td>The end of day 1</td>
<td></td>
</tr>
<tr>
<td>19:00</td>
<td>Sightseeing tour - Ljubljana</td>
<td></td>
</tr>
</tbody>
</table>
## Program of the SPENS Final Seminar
### August 27 and 28, 2009

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Speaker(s)</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:00</td>
<td>&quot;Improvement of pavement structure&quot;</td>
<td>Safwat Said</td>
<td>Improvement of pavement structure</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ana Mladenović</td>
<td>Long-term performance of reinforced pavements</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Primož Pavšič</td>
<td>A methodology for testing and implementing steel slag in road construction</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Imre Pap</td>
<td>A methodology for testing and implementing crushed concrete in road construction</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Practical mix design model for asphalt mixture Discussion</td>
</tr>
<tr>
<td>10:30</td>
<td>Coffee break</td>
<td>Anita Ihs, Stefan Deix</td>
<td>Heavyroute Coordinator</td>
</tr>
<tr>
<td>11:00</td>
<td>Closing Session</td>
<td>Steve Philips</td>
<td>FEHRL General Secretary</td>
</tr>
<tr>
<td></td>
<td>General Session</td>
<td>William Bird</td>
<td>EC Project Officer</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Andraž Legat</td>
<td>ZAG Director</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Aleš Žnidarič</td>
<td>CERTAIN Coordinator</td>
</tr>
<tr>
<td>12:30</td>
<td>Lunch</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>