Contents

• Consortium
• Objectives
• Project plan & achievements:
  1. Survey & interviews
  2. Tool assessment
  3. Functional requirements
  4. Tool development
  5. Dissemination
• To-do list
Project consortium

Three parties with a long history in research, development and consultancy on roads and road building materials:

**Royal HaskoningDHV (NL)** – Project coordinator, experience in development of predictive tools (LCA and CO2 foot printing)

**KOAC-NPC (NL)** – Knowledge partner on pavement behaviour and performance over life time and maintenance and rehabilitation strategies.

**DRD (DK)** – Specialist in research, development and testing to provide reliable data on road related issues. DRD developed the LCA model for materials ROAD-RES.

Website [www.cereal.dk](http://www.cereal.dk)
Objectives

1. A **decision tool** for NRA’s and contractors which is **harmonized** on the European level

2. Development of a prototype software tool for computation of the CO2 emission of pavement **construction and maintenance** works.

3. Proper use of the tool by providing **training courses** and tutorial material.
Achievements so far (1)

International **online survey & interviews** with NRA’s of the funding countries to:

- Identify the general level of experience
- Inventory of existing tools.
- Identify the potential user group & the desired results
- Verification of the scope of the tool.
- Identify the functional requirements
Achievements so far (2)

Results of the survey and interviews:
- Many tools but very limited use.
- Current tools are too complex, not user friendly, not transparent and have too high requirements for input data.
- Data quality & availability
- Scope
- Use in the design phase of the decision making process.
- Most of the tools are not embedded (yet) in national policies.
- International expert panel has been formed (20 experts).
Achievements so far (3)

Assessment of existing tools:

- Identify structure, calculation rules and data that can be used for CEREAL
- Long list of about 50 tools (also US)
- First selection of tools: energy/CO$_2$ and infrastructure
- Shortlist 16 tools
- Assessment protocol:
  1. Background information (name, purpose, language)
  2. Technical questions (software, data accessibility etc.)
  3. User related questions (a.o. target group)
Achievements so far (3)

Conclusions on the tool assessment:

- Different purpose
- Closed and not transparent
- Require a lot of data and/or are complex in structure
- Focus on new construction
- American (US) models are more user-friendly
- European models provide useful components and material data.
Achievements so far (4)

Functional requirements for the new tool:
- Data requirements are low
- Open structure
- Best available engineering knowledge & data
- Reliable results
- Predefined maintenance scenario’s
- Full life cycle of roads, but focus on maintenance
- includes the main road objects
- uses existing databases
- For projects in North-Western Europe,
- Does not include calculations on use phase
Achievements so far (5)

Tool development:

• Started in July based on the preliminary functional requirements.
• Building of the structure.
• Development of the content (Data collection & recalculation)
• Development of a testing protocol & procedure.
• ßeta version ready November/December 2012
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Carbon Road Map

‘Carbon Calculator for road projects’

- **Easy to use** in default mode
- Adjustment of most defaults in the **expert mode**
- **Sophisticated engineering** calculations
- **Makes use of existing tools** and databases

Screenshot of project definition (beta version)

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Carbon Road Map

<table>
<thead>
<tr>
<th>Construction data</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Design life (years):</td>
<td>10</td>
</tr>
<tr>
<td>Truck traffic (%):</td>
<td>10</td>
</tr>
<tr>
<td>Annual growth rate (%):</td>
<td>2</td>
</tr>
<tr>
<td>Maximum speed limit for truck traffic (km/h):</td>
<td>80</td>
</tr>
<tr>
<td>Type of subgrade:</td>
<td>Klei</td>
</tr>
<tr>
<td>Type of pavement:</td>
<td>AC</td>
</tr>
<tr>
<td>Type of Road foundation:</td>
<td>Hoogvenslakken</td>
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<tr>
<td>Thickness of Road foundation (mm):</td>
<td>300</td>
</tr>
<tr>
<td>Average daily traffic per direction</td>
<td>37000</td>
</tr>
</tbody>
</table>

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Simple to use but with detail in expert mode

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### Maintenance Scenario Details

<table>
<thead>
<tr>
<th>Year</th>
<th>Treatment</th>
<th>Lane</th>
<th>Cycle</th>
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<tbody>
<tr>
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<td>Top layer of 2L porous wearing course</td>
<td>Slow</td>
<td>12</td>
</tr>
<tr>
<td>12</td>
<td>Porous wearing course</td>
<td>Fast</td>
<td>12</td>
</tr>
<tr>
<td>12</td>
<td>Partial depth patch porous wearing course</td>
<td>Slow</td>
<td>15</td>
</tr>
<tr>
<td>17</td>
<td>Porous wearing course</td>
<td>All lanes</td>
<td>17</td>
</tr>
<tr>
<td>17</td>
<td>Porous wearing course</td>
<td>All lanes</td>
<td>17</td>
</tr>
<tr>
<td>24</td>
<td>Top layer of 2L porous wearing course</td>
<td>Slow</td>
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<tr>
<td>27</td>
<td>Partial depth patch porous wearing course</td>
<td>Slow</td>
<td>17</td>
</tr>
<tr>
<td>29</td>
<td>Porous wearing course</td>
<td>Slow</td>
<td>12</td>
</tr>
<tr>
<td>34</td>
<td>Binder + 2L porous wearing course</td>
<td>All lanes</td>
<td>34</td>
</tr>
<tr>
<td>36</td>
<td>Top layer of 2L porous wearing course</td>
<td>Slow</td>
<td>12</td>
</tr>
<tr>
<td>42</td>
<td>Partial depth patch porous wearing course</td>
<td>Slow</td>
<td>15</td>
</tr>
<tr>
<td>46</td>
<td>Porous wearing course</td>
<td>Fast</td>
<td>17</td>
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<tr>
<td>48</td>
<td>Top layer of 2L porous wearing course</td>
<td>Slow</td>
<td>12</td>
</tr>
</tbody>
</table>

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Carbon Road Map

Screenshot of results
(beta version)
To-do list

1. Finishing bèta version structure and databases.
2. Inclusion of end-of-life and road objects.
3. Testing of the bèta version (expert panel).
4. Preparation of the final version.
5. Development of user guide and courses for users.