



# **CEREAL CO<sub>2</sub> Emission Reduction in roAd Lifecycles**

20 November 2012  
PEB meeting Delft

- 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<sub>2</sub> 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.
- Bèta version ready November/December 2012



CEREAL falls under the authority of ERA-NET ROAD  
(funded by the European Commission under FP7)

road **ERA**net





# Carbon Road Map

## 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

Project definition	
Country:	The Netherlands
Type of project:	Building new road
Length (in km):	50
No. of lanes	2x3 lanes
No. of sliproads	6
Project life (years):	50
Name of project:	Project A34-1

*Screenshot of project definition (beta version)*



# Carbon Road Map

Start


Project Definition

Construction Data

Maintenance

Overview

Results



### Project definition

Country:	The Netherlands	...	?
Type of project:	Building new road	...	?
Length (in km):	50	...	?
No. of lanes	2x3 lanes	...	?
No. of sliproads	6	...	?
Project life (years):	50	...	?
Name of project:	Project A34-1	...	?

Previous

Dashboard item

Please select value:

2x1 lanes

2x2 lanes


2x3 lanes

Cancel

OK

Next

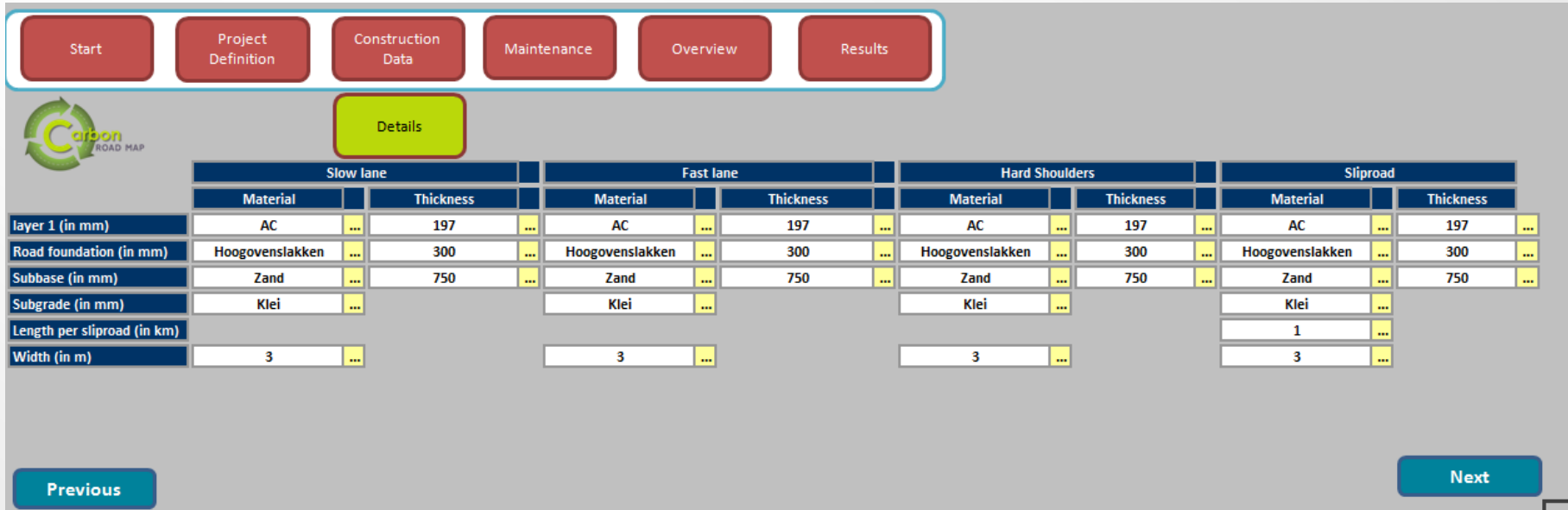
Start
Project Definition
Construction Data
Maintenance
Overview
Results


Details

Construction data				
Design life (years):	10	...	<input type="checkbox"/>	?
Truck traffic (%):	10	...		?
Annual growth rate (%):	2	...		?
Maximum speed limit for truck traffic (km/h)	80	...		?
Type of subgrade:	Klei	...		?
Type of pavement:	AC	...		?
Type of Road foundation:	Hoogovenslakken	...		?
Thickness of Road foundation (mm):	300	...		?
Average daily traffic per direction	37000	...		?

Previous
Next

*Screenshot of construction details (beta version)*



The screenshot shows the 'Carbon Road Map' software interface. At the top, there is a navigation bar with buttons: Start, Project Definition, Construction Data, Maintenance, Overview, and Results. Below this, a 'Details' button is highlighted. The main area displays a table with construction details for four road components: Slow lane, Fast lane, Hard Shoulders, and Sliproad. Each component has a table with columns for Material and Thickness. The data is as follows:

	Slow lane		Fast lane		Hard Shoulders		Sliproad	
	Material	Thickness	Material	Thickness	Material	Thickness	Material	Thickness
layer 1 (in mm)	AC	197	AC	197	AC	197	AC	197
Road foundation (in mm)	Hoogovenslakken	300	Hoogovenslakken	300	Hoogovenslakken	300	Hoogovenslakken	300
Subbase (in mm)	Zand	750	Zand	750	Zand	750	Zand	750
Subgrade (in mm)	Klei		Klei		Klei		Klei	
Length per sliproad (in km)							1	
Width (in m)	3		3		3		3	

At the bottom, there are 'Previous' and 'Next' buttons.

✓ Simple to use but with **detail in expert mode**



# Carbon Road Map

Start


Project Definition

Construction Data

Maintenance

Overview

Results



Details

	Slow lane		Fast lane	
	Material	Thickness	Material	Thickness
layer 1 (in mm)	AC	197	AC	...
Road foundation (in mm)	Hoogovenslakken	300	Hoogovenslakken	...
Subbase (in mm)	Zand	750	Zand	...
Subgrade (in mm)	Klei	...	Klei	...
Length per sliproad (in km)				
Width (in m)	3	...	3	...

Previous

Calculation of amount in m3

Calculation of volume (in m3) of: Hoogovenslakken

Lane	Layer	Length (km)	Width (m)	Height (mm)	Volume (m3)
Slow lane	Road foundation (in m)	50	3	300	45.000
Fast lane	Road foundation (in m)	100	3	300	90.000
Hard Shoulders	Road foundation (in m)	50	3	300	45.000
Sliproad	Road foundation (in m)	06	3	300	5.400

To equipment onsite

To transport details

Calculation of volume in ton

Calculation of volume (in ton) of: Hoogovenslakken

Volume (in m3): 185.400 ?

Density (in kg/m3): 2.000 ?

Volume (in ton): 370.800

Distance to factory (in km): 20

Transport vehicle: Heavy\_truck\_2

Ok

Cancel

*Screenshot of maintenance (beta version)*

Start


Project Definition

Construction Data

Maintenance

Overview

Results



Details

Maintenance scenario's

Strategy: Maintenance scenario porous wearing course and top layer 2L porous wearing course ...

Year:	Treatment:	Lane	Cycle:
12	top layer of 2L porous wearing course	Slow lane	12
12	porous wearing course	Fast lane	17
12	partial depth patch porous wearing course	Slow lane	15
34	binder + 2L porous wearing course	All lanes	34

Previous

Next



# Carbon Road Map

*Screenshot of maintenance details (beta version)*

Start


Project Definition

Construction Data

Maintenance

Overview

Results



Details

Maintenance scenario's

Strategy:

Maintenance scenario porous wearing course and top layer 2L porous wearing course

Year:	Treatment:	Lane	Cycle:
12	top layer of 2L porous wearing course	Slow lane	12 ...
12	porous wearing course	Fast lane	17 ...
12	partial depth patch porous wearing course	Slow lane	15 ...
17	porous wearing course	All lanes	17 ...
17	porous wearing course	Slow lane	17 ...
24	top layer of 2L porous wearing course	Slow lane	12 ...
27	partial depth patch porous wearing course	Slow lane	15 ...
29	porous wearing course	Fast lane	17 ...
34	binder + 2L porous wearing course	All lanes	34 ...
36	top layer of 2L porous wearing course	Slow lane	12 ...
42	partial depth patch porous wearing course	Slow lane	15 ...
46	porous wearing course	Fast lane	17 ...
48	top layer of 2L porous wearing course	Slow lane	12 ...

Previous

Next

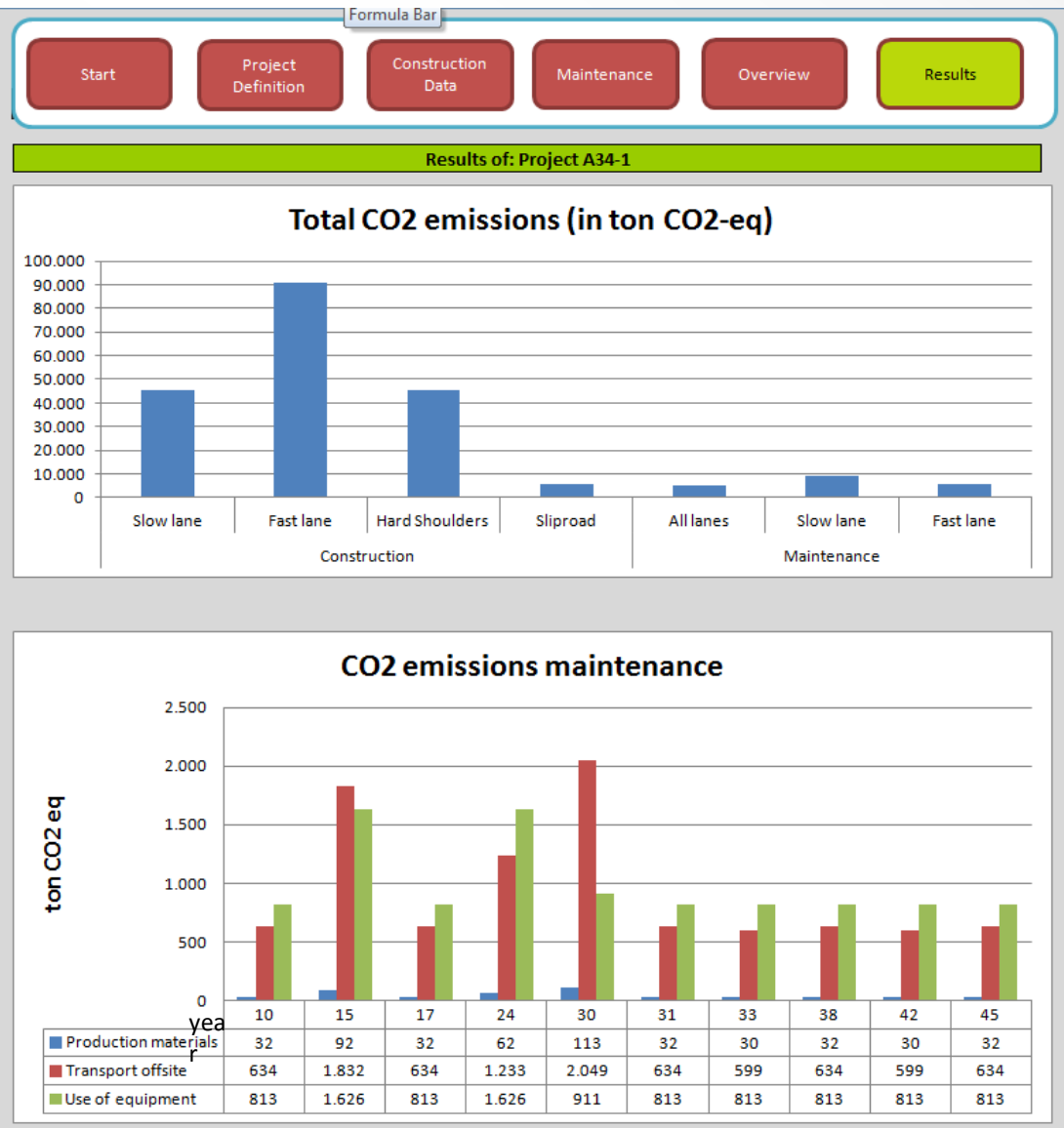
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# Carbon Road Map



*Screenshot of results  
(beta version)*

road **ERA** net





# 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.
6. Communication/presentation of the tool.