MEMO

To	:	The Program Executive Board of Era-Net Road
From	:	Renilde Spriensma, DHV
Copies to	:	Project team CEREAL
File	:	BA5030
Project	:	CEREAL
Subject	:	Preliminary results of the survey
Our ref	:	MD-AF20120759
Date	:	25 April 2012
Classification	:	Client confidential

Dear members of the PEB,

Included you will find the preliminary results of the international survey for CEREAL. Fortunately, the results meet our expectations and we will be able to put them to good use.

We have decided to postpone the interviews until the survey results have been processed and discussed within the project team. In this way we can use the interviews to gather additional information in the most optimal manner. This means the results of the interviews will follow in May. We have already started the interviews with the NRA's of all Era-Net Road funding countries. We have also started to evaluate the existing tools to make sure all available information is used to develop the new tool.

All this information hopefully, will lead up to a well-founded set of functional requirements and a smart structure for the CEREAL tool.

Looking forward to your reactions,

Kind regards,

On behalf of the CEREAL project team
Renilde Spriensma

DHV Group is an international consultancy and engineering group and is active worldwide. It has offices in Europe, Africa, Asia and North America.
DHV BV is part of DHV Group. Its head office is in the Netherlands. Dutch Trade Register nr. 31034767.
The quality management system of DHV B.V. has been approved against ISO 9001.

1 PRELIMINARY RESULTS OF THE SURVEY

1.1 Survey goals and working method

Goals

Within the overall goal of the CEREAL project the goal for the survey was to identify characteristics of the future CEREAL tool in a sense that the tool will be applicable over European countries. Furthermore, the identification of the potential user group in Europe in public and private organizations was a main challenge.

More specifically the goals of the survey are:
- Identify the general level of experience with CO_2 related tools in road projects
- Inventory of existing tools
- Identify the potential user group, the desired results and the use of specific protocols
- Verification of the scope of the tool
- Identify the requirements for effective and long term use

Target group

The target was to get at least 40 complete filled out surveys by people over Europe. Special focus was to get to all NRA's of the funding countries, since these organizations will be the key-stakeholders in the development and implementation of the tool. The following selection criteria were applicable to the responders: knowledge of the road sector, working for a road authority, contractor or consultancy firm in Europe, and experience with or special interest in CO_2 calculations for road constructions.

Invitations and pre-announcements were made by using personal networks of all team members, the PEB and the project coordinators of the other Era-Net Road projects, several associations (EAPA, IRF, CEDR) and by using several groups on sustainability and pavement or building discussion groups in social networks such as LinkedIN. Some of these LinkedIN discussion groups: Pavement Engineer, Pavement Materials, National asphalt pavement association users group (all English) and Road Builders, Duurzaam GWW, CO2 prestatieladder, CO2 reductie GWW sector (all Dutch)

The actual survey was online at 'Surveymonkey'[1] for about 6 weeks in February and March 2012. Also the survey was available through the project website www.cereal.dk. The main results of the survey are available at the website as well, excluding any personal information on the responders.

---

[1] Specific address; https://www.surveymonkey.com/s/WGKPVX3.

1.2   Survey results

1.2.1 General results and conclusions

- 47 completed survey's have been acquired, of which 18 from relevant stakeholders within NRA's (all NRA's of contributing countries included).
- The responders represent a good distribution over different countries, with different backgrounds working in different organizations.
- The current experience with CO_2 (tools) includes many different (specific) tools but very limited use. Only few responders use tools on a regular basis.
- The opinion on existing CO_2 tools varied, most tools were regarded as too complex, not transparent, too much of a black box, not user friendly software, too high requirements for input data.
- A few (national) tools were regarded as very useful and adequate.
- The quality and availability of input data is a key issue among the responders as well as the use of a wide scope.
- The intended use and purpose according to the responders is mainly optimizing design and calculation of scenario's, thus use in the design phase of the decision making process.
- Based on the answers we can make a preliminary conclusion that the new CEREAL tool needs to be simple but complete, including relevant country specific differences.
- Most of the tools are not embedded (yet) in national policies. It seems that only the use of Dubocalc in the Netherlands is obligatory in national design and contracting processes.

The results of the survey are used as a basis to conduct a series of in-depth interviews with NRA's of the funding countries. The results of the survey and interviews are the basis for the formulation of the functional requirements of CEREAL in the next phase of the project.

### 1.2.2 Background of the responders

Functions of responders:
– 20 of the 48 responders identified themselves as 'specialist / researcher'
– 4 identified themselves as 'policy maker'
– 12 identified themselves as 'consultant'
– 12 identified themselves as 'other' (for example: road engineer, technical manager, environmental expert, purchaser, HSE manager, marketing specialist, etc.)

Operational level of the organization:
– 6 of the 48 responders were working within an organization on a 'local level'
– 5 were working within an organization on a 'regional' level
– 30 were working within an organization on a 'national' level
– 14 were working within an organization on a 'multinational' level

Type of organization:
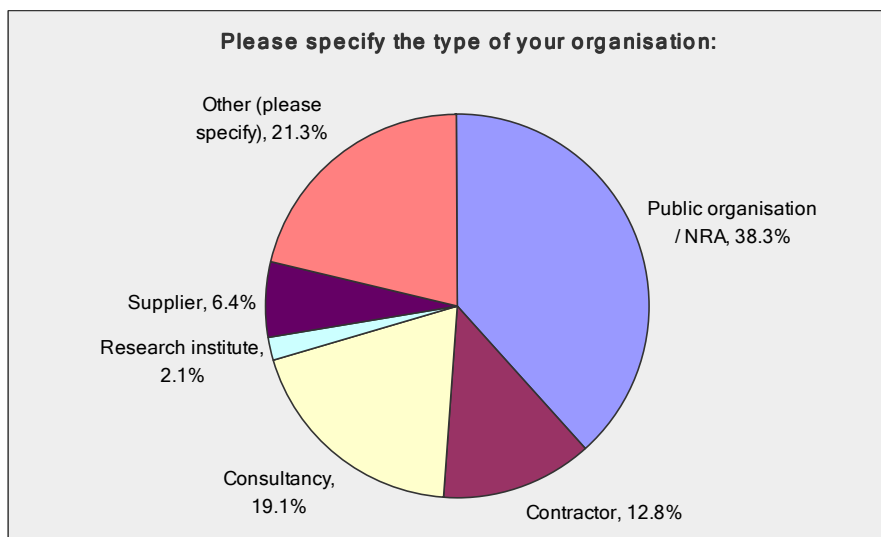
Others are specified as universities and associations related to infrastructure.

**Field of expertise of the responders:**
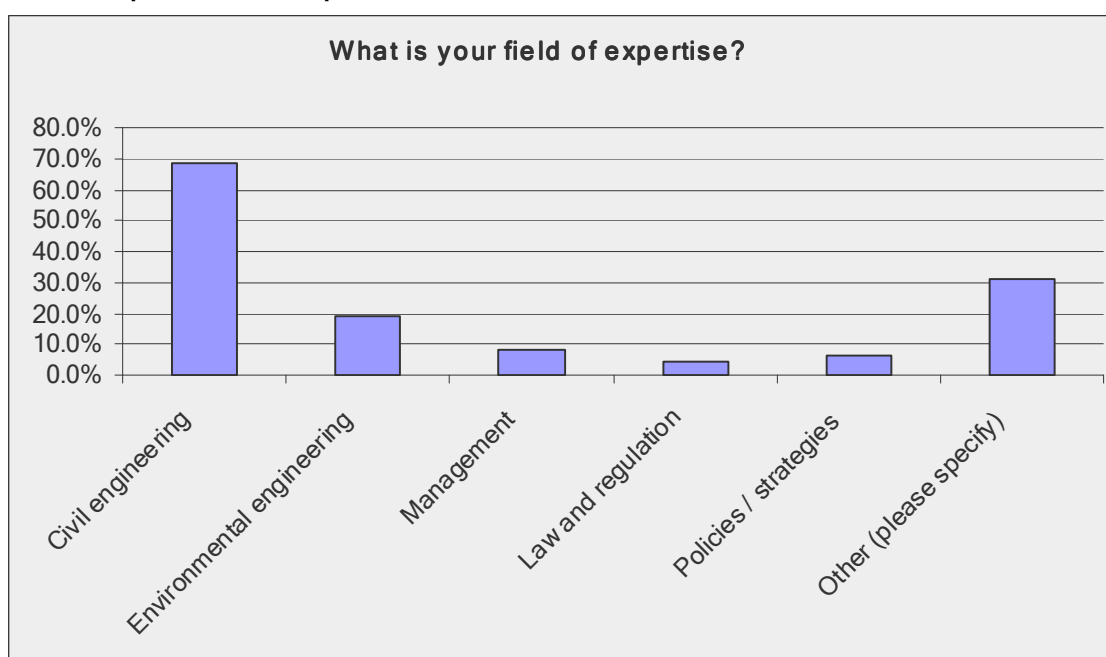
The responders are mainly engineers, representing the potential user group quite well. Others are specified as chemical engineering, waste management, sustainability, climate change, software development, etc.

Home country of the organization:

What is the country of your organisation?:
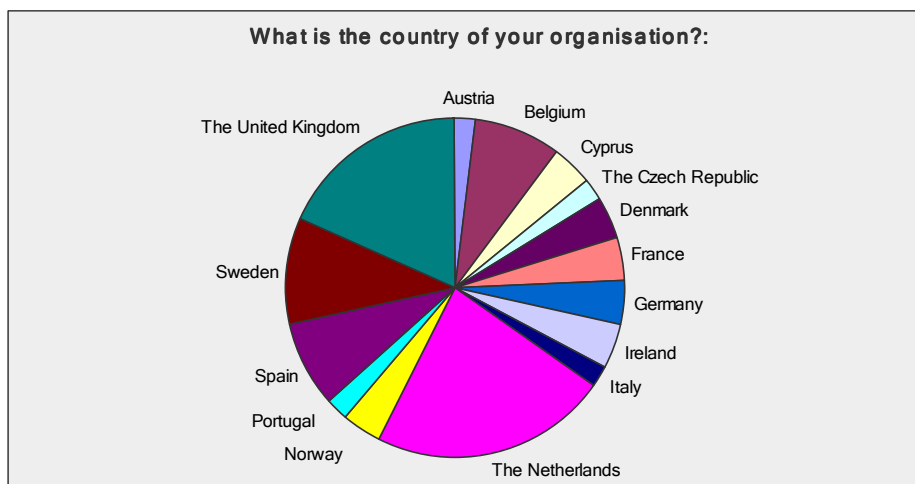
A lot of responses came from the UK and the Netherlands. This is coherent with the relative high level of development and implementation of CO_2 tools in these countries.

1.2.3 Knowledge and experience with CO_2 in road projects

Please identify the tools you know and specify the frequency of use:
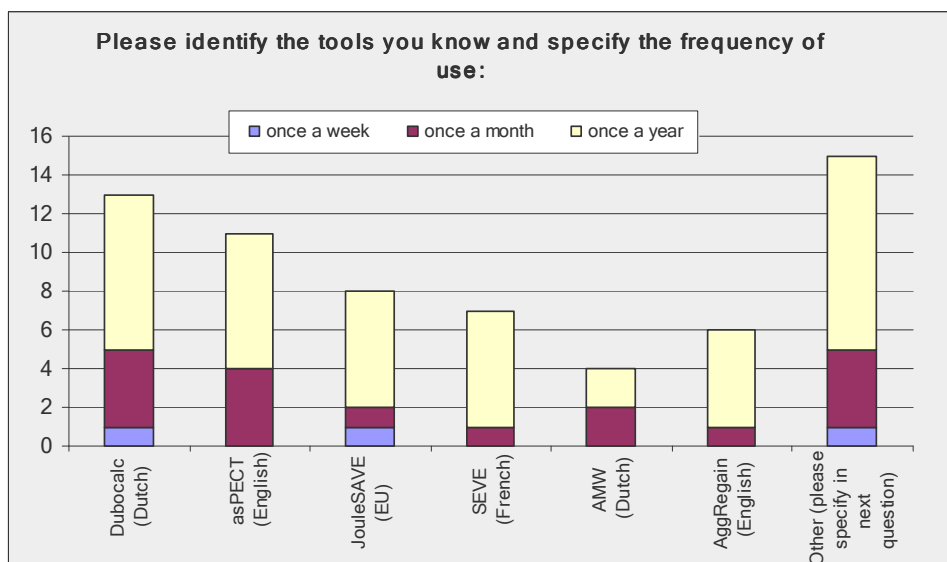
Only a few tools, Dubocalc and Aspect, are used on a regular basis by a few responders. The majority of the tools is country specific and used in one country only.

Other tools mentioned were a.o.: GHG calculator for infrastructure, Highways Agency Carbon Calculation tool (UK), CO_2 ladder (Netherlands), Transport Scotland toolkit, ECORCE (French), GreenDOT and GreenRoads. All tools mentioned are subject to evaluation in the next phase of the project.

The Opinion on existing tools

The opinions on the existing tools differ a lot:

- The NRA's in France, the UK, Netherlands and Denmark are positive on their own national tools.
- JouleSAVE is seen as not user friendly and very complex. It is developed for a very specialist user group in combination with MX software.
- Users of Aspect and AMW are positive.
- Highways Agency Carbon Calculator is used for footprinting of organizations and is not applicable for scenario analysis in road projects.
- Many of the tools are not transparent and too much a black box.
- Tools are too complex and require too much input data.
- Data quality and availability are very important.

Motivation of interest in a (new) CO_2 tool

According to the responders there is a purpose for a (new) CO_2 tool mainly in policy-making, implementation in contracts and for research objectives. Other identified reasons to use CO_2 tools are monitoring and communication on CO_2 emissions in organizations.
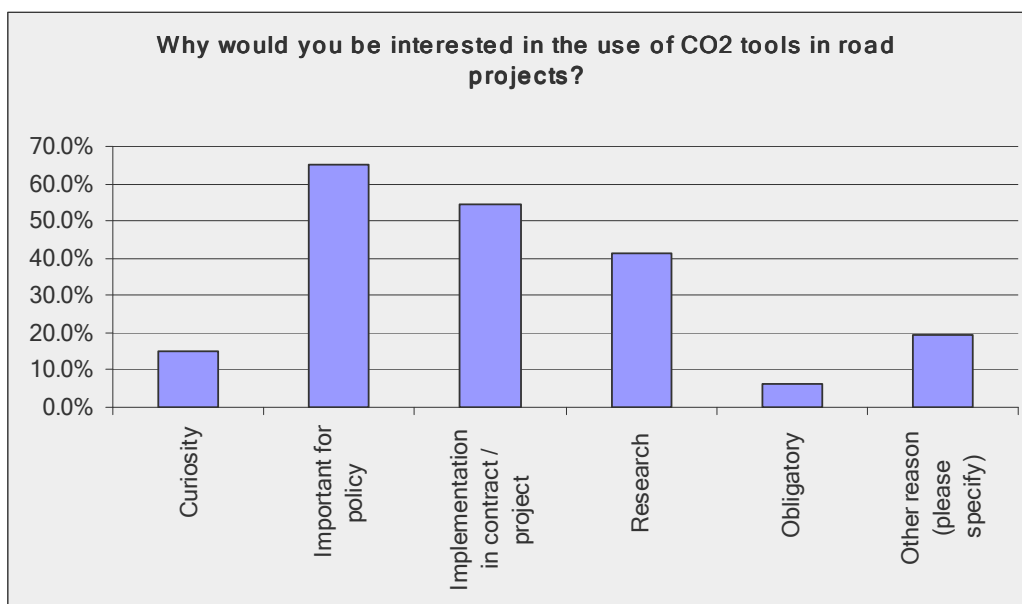
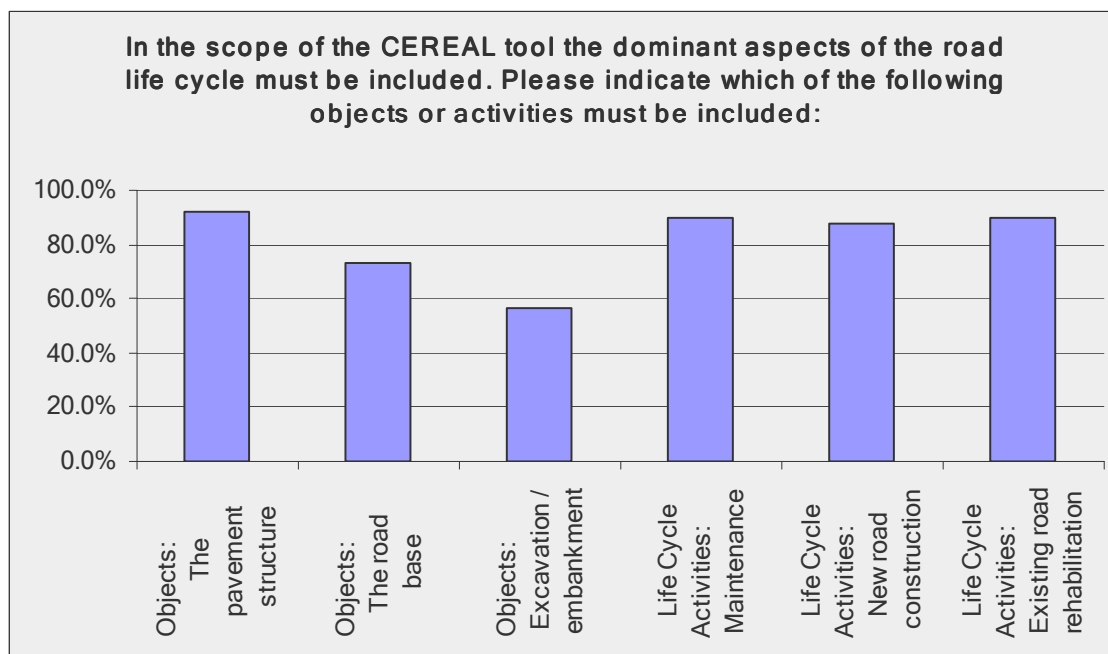**Examples of CO_2 in road projects**

Some good examples in the UK, the Netherlands and Sweden were reported. If possible, these examples will be used in the testing phase of the CEREAL tool.

For JouleSAVE some specific 'pilots' were done: N25 Waterford to Glenmore (Ireland) M20 Cork to Limerick (Ireland) N11 Gorey Bypass (Ireland) A29 (Portugal) IC-6 (Portugal) Expressway R43 (Czech Rep) RD921 (France) Route 50 and 32 (Sweden)

1.2.4 Functional requirements (scope, requirements and implementation)

Scope
According to the responders all aspects mentioned are important and must be included in the CEREAL tool. Example: nearly 60% of the responders states that excavation and embankment should be included.

In the scope of the CEREAL tool the dominant aspects of the road life cycle must be included. Please indicate which of the following objects or activities must be included:

The responders were asked what other objects and activities should be included in the CEREAL tool. This resulted in the following statements.

Objects considered to be included in the CEREAL model, other than in the graph above are: bridges, drainage, road marking and signs and safety objects. These objects may be included in the tool in a simple way.

Other CO_2 generating activities to be considered are: winter maintenance, demolition at the end of structural life, production and transport of constituent materials, routine maintenance, recycling of existing pavement materials. These activities are included in the life cycle if the relevance is evident.

Beside these activities a lot of responders mentioned the importance of the effect of *road use* for CO_2 emissions. CO_2 emissions as a result of the use of the road are influenced by the vehicles (traffic intensity, speed zone and motor technology) and the road construction itself (slope, alignment and smoothness of the pavement).

Methodologies and protocols
The responders considered to use the following methodologies and protocols to help backbone the CEREAL tool: ISO 14040, ISO 14064 (and 14067 draft), NEN 8006 EN 15804, GHG Protocol including recent Scope 3 protocol, PAS 2050, Bath ICE, CESSM3 Carbon and Price Book, Proprietary Materials, EU requirements for GHG reporting and bitumen LCI (Eurobitume).

Most of the protocols are strongly related and include similar starting points, guidelines and working methods for LCA, which makes it possible to use most of the common protocols for the development of the tool.

Intended use

All possible application areas for a CO_2 tool are interesting for the responders. A majority of the responders wants to use such a tool for optimizing design and calculation of scenario's.
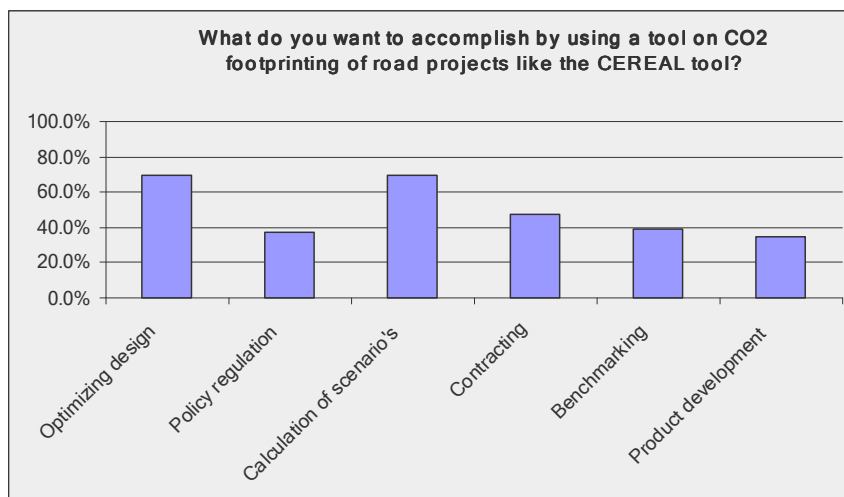
Contribution of the new CO_2 tool to the intended use

Many different answers were obtained on this issue. The expected added value of the new CO_2 tool can be summarized as:

- Assessment of alternative constructions for a given alignment and support of the decision making
- Stimulation of contractors to provide sustainable solutions
- Uniform calculation and benchmarking of CO_2 emissions across countries/EU
- Monitoring and reporting of CO_2 emissions

Contribution of CO_2 tools to the (policy of) the organization

How will the use contribute to the policy of the organization?

- Various responders mention that there organization has goals on sustainability, decreasing environmental impact and also CO_2.
- The most important identified contribution is the influence on the design, evaluation of different construction or rehabilitation options, and procurement. There may be an indirect contribution in the choice of applied materials.
- The use of the tool may lead to more dedicated marketing of the policy, demonstration of carbon savings (as non direct cost benefits) by providing numbers and improvement of knowledge and awareness of the organization.
- Not all responders believe that a CO_2 tool like CEREAL will effectively change the way decisions are made by the organization.

In which phase of the decision making process a CO_2 tool like CEREAL be used?

The responders see the applicability of the tool mainly in the design and contracting phase.
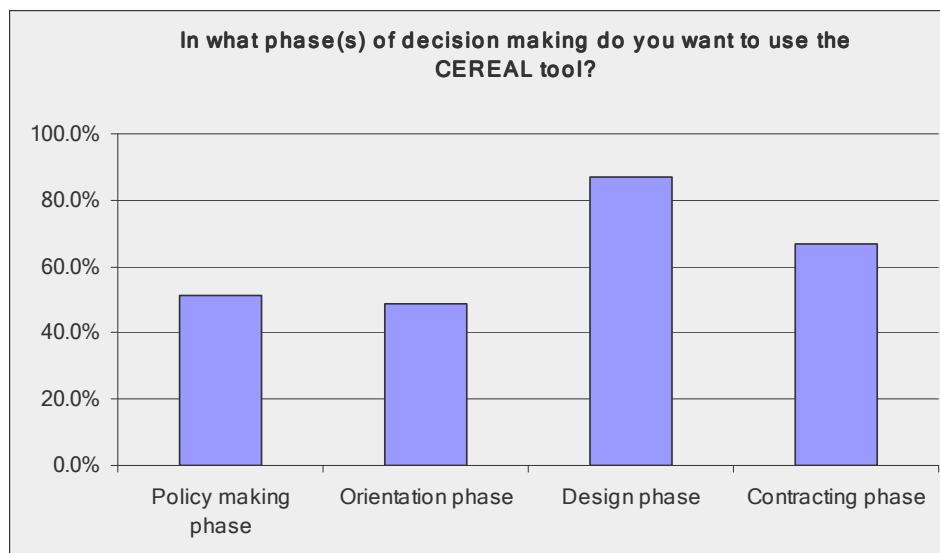
Connection with existing management systems

The majority of the responders (66%) expect that that the CEREAL tool will fit into an existing management system mostly in order to work on continuous improvement of quality. They identified most organization specific management systems but also guidelines as ISO 9001 and 14001.

1.2.5 Data availability & project structures (Q21 – Q26)

Data availability

In general responders have most detailed data available on the amount of building materials used in road projects. Also data on operational maintenance activities is available on a high level of detail. Most general data is available on building logistics and energy use in road projects. A significant group of 12 (out of 47) states that no data is available on building logistics and 15 states that no data is available on the amount of energy used.

In road management projects, do you or does your organization have information on:	no data	general data	detailed data
Amount of building materials (such as ton asphalt, ton sand, etc)	5	15	28
Building logistics (such as types of trucks, km's, frequency)	12	22	13
Operational maintenance (such as type of maintenance activities, frequency, etc)	8	19	19
Energy use (by use of generators, electricity, etc.)	15	21	11

Is data on road management country specific?

The answers to this question are very diverse. Apparently many responders want to include specific data for materials. They mentioned they would like to have the focus on the development phase and maintenance phase of

road projects, as new roads are rarely built in their countries. Also the need to have maintenance and construction activities for asphalt as well as concrete roads has been mentioned. Specific asphalt mixtures used as wearing coarse have been mentioned such as noise reducing mixture and porous asphalt.

Beside the general materials used in road constructions (bitumen, modifiers, fillers, aggregates, etc), the responders also mentioned the need for specific road construction materials in their countries. Examples are the recycling of (sub)base materials like used concrete and masonry applied in some countries in the EU. Further specific needs are inclusion of data on modified bitumen and light colour aggregate. Some responders said they would like to have general data about transport distances in the program.

The responders mentioned some maintenance strategies as being country specific such as reinforcing, milling (planning) and paving. Some responders also said they would like to see in the new software specific activities related to weather and winter conditions (damage due to weather conditions).

Road classes
According tot the responders, they are mostly involved in projects on motorways, dual/multilane carriageway or single carriage way. Urban collector, low-volume roads and residential area's are less frequently subject of their work.
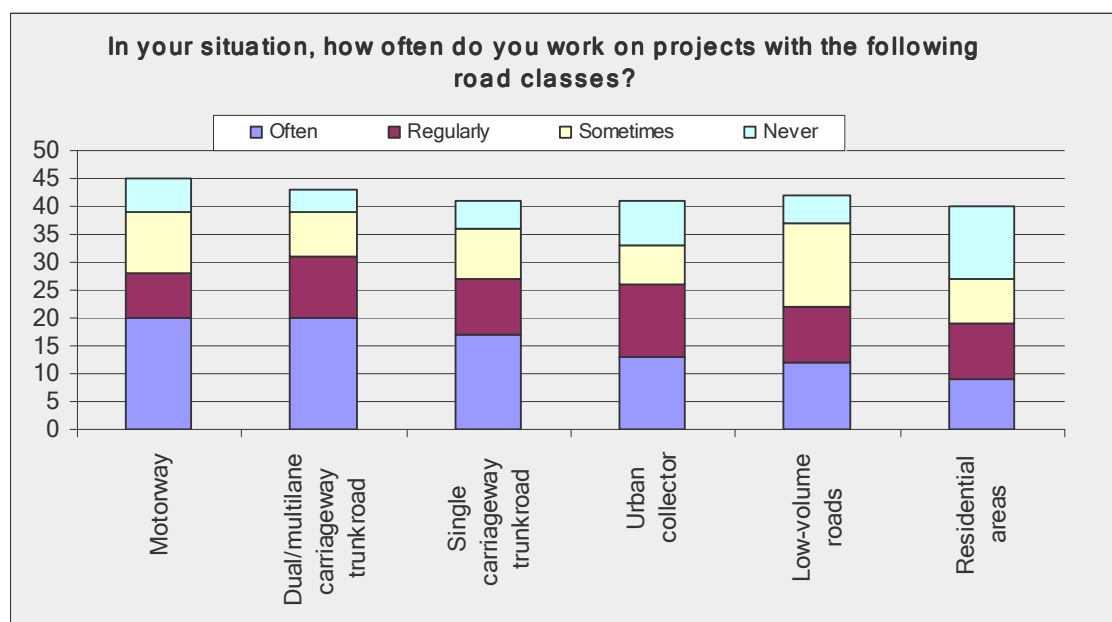
Pavement types
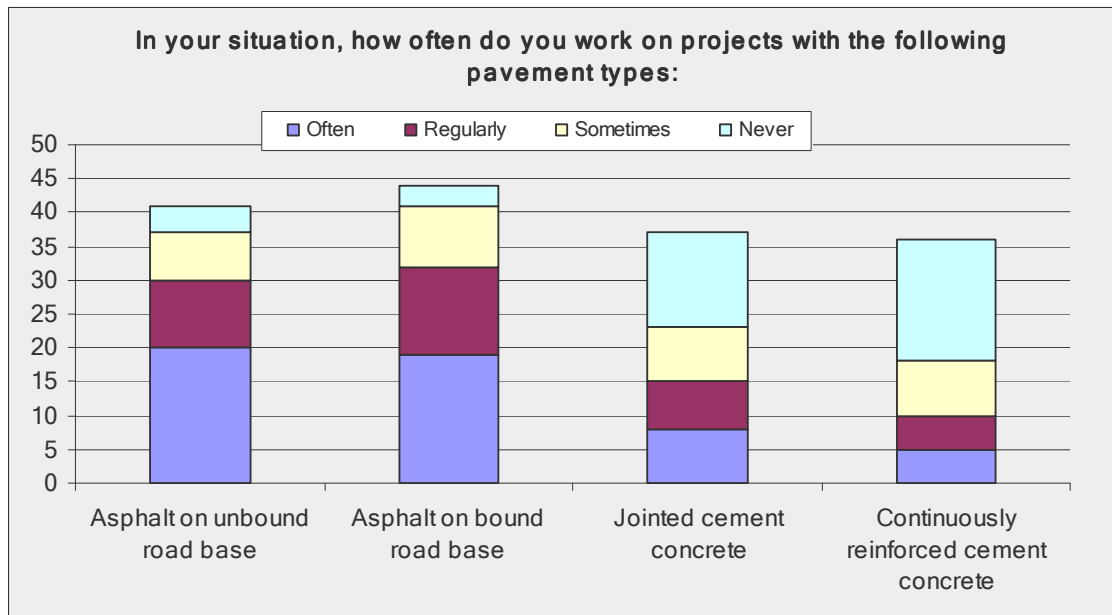
The most used pavement type is asphalt. According to the responders the most used base on asphalt pavement is the unbound base, followed very close by the bound base. Those types of base are widely used. Unbound base is more suited for areas with weak soils (peat and clay). In case some vertical settlement would occur, the unbound material is able to 'follow' this displacement without introducing cracks in the road structure. The bound base has higher modulus of elasticity if compared with unbound materials due to the introduced cementing material (bitumen, lime, Portland cement, etc). Due to this, the material is also more brittle and can hardly settle without cracking. That's the reason it is mostly applied on areas with solid subsoil.

Cement concrete pavements are less applied according to the responders. Jointed cement concrete is more used than the continuously reinforced cement concrete. Concrete pavement has still a higher initial investment and is mostly indicated for areas with solid subsoil.

Annual Average Daily Traffic intensity per road class
The reported intensities are quite high. The AADT differs very much per country or even per road. The intensities are a good match to the most mentioned road classes, such as motorways, dual multilane carriageway or single carriage ways. The AADT together with the available subsoil are the main input needed to determine the structure of the road and the maintenance strategies.

Maintenance measures

The four main maintenance measures mentioned by the responders are patching, asphalt overlay (reinforcing), milling (planning) in combination with asphalt overlay and total reconstruction of asphalt or cement concrete road. Again, the mentioned strategies match well with the type of strategies applied on the main road classes chosen by the responders. Their application on the road maintenance extends the life span considerably. Coating and rejuvenators are not indicated as maintenance for a long term measures. They are mainly used as a short term life span extension measure.

To what extent do you use the following maintenance measures?

Legend: Often, Regularly, Sometimes, Never

Measure	Often	Regularly	Sometimes	Never
Seal coat	3	6	14	8
Patching and local crack sealing	9	11	10	3
Rejuvenator seals	2	2	16	11
Joint sealing in cement concrete	3	5	14	10
Asphalt overlay	18	3	10	2
Milling (planing) and asphalt overlay	19	4	6	2
Cement concrete overlay	1	2	7	21
Reconstruction of asphalt or cement concrete	9	13	10	2