FEDERATION OF PILING SPECIALISTS

EFFC / DFI Carbon Calculator

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Context

- Climate change is increasingly seen as a key issue by authorities and private companies
- The capability to evaluate carbon footprints is becoming more important and could become a potential differentiating factor in tenders and evaluating project performance and system / process improvements

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Why should the EFFC / FPS Members account for Carbon Emission ?

- Understand the impact of deep foundations activities on climate change
- Reduce dependence on energy (Direct and Embodied)
- To quantify innovative technique / materials impacts
- To foster innovation regarding existing process and flows
- To demonstrate to customers the environmental (and normally commercial) advantage of some techniques / schemes compared to others

Why a Carbon Calculator ?

- In 2010 when this was first discussed there was no carbon calculator tool at European or International level for Deep Foundation and Ground Improvement Works
- Several National, European & International carbon standards and databases existed
- The need for a unique standard was identified
- Several carbon calculation tools had been developed by European companies but without any coordination

Why a Carbon Calculator

- Quantifying impacts is a key starting point in all improvement strategies

- A sector specific method and tool to improve the credibility of the calculations and confidence of customers

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Aims & Objectives of Building the Calculator

- Provide all EFFC members with a carbon calculator for Deep Foundation and Ground Improvement Works, allowing for absolute calculation and project comparison

- Tool should be simple & open, though comprehensive

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  methodologically sound & usable by non-carbon specialists

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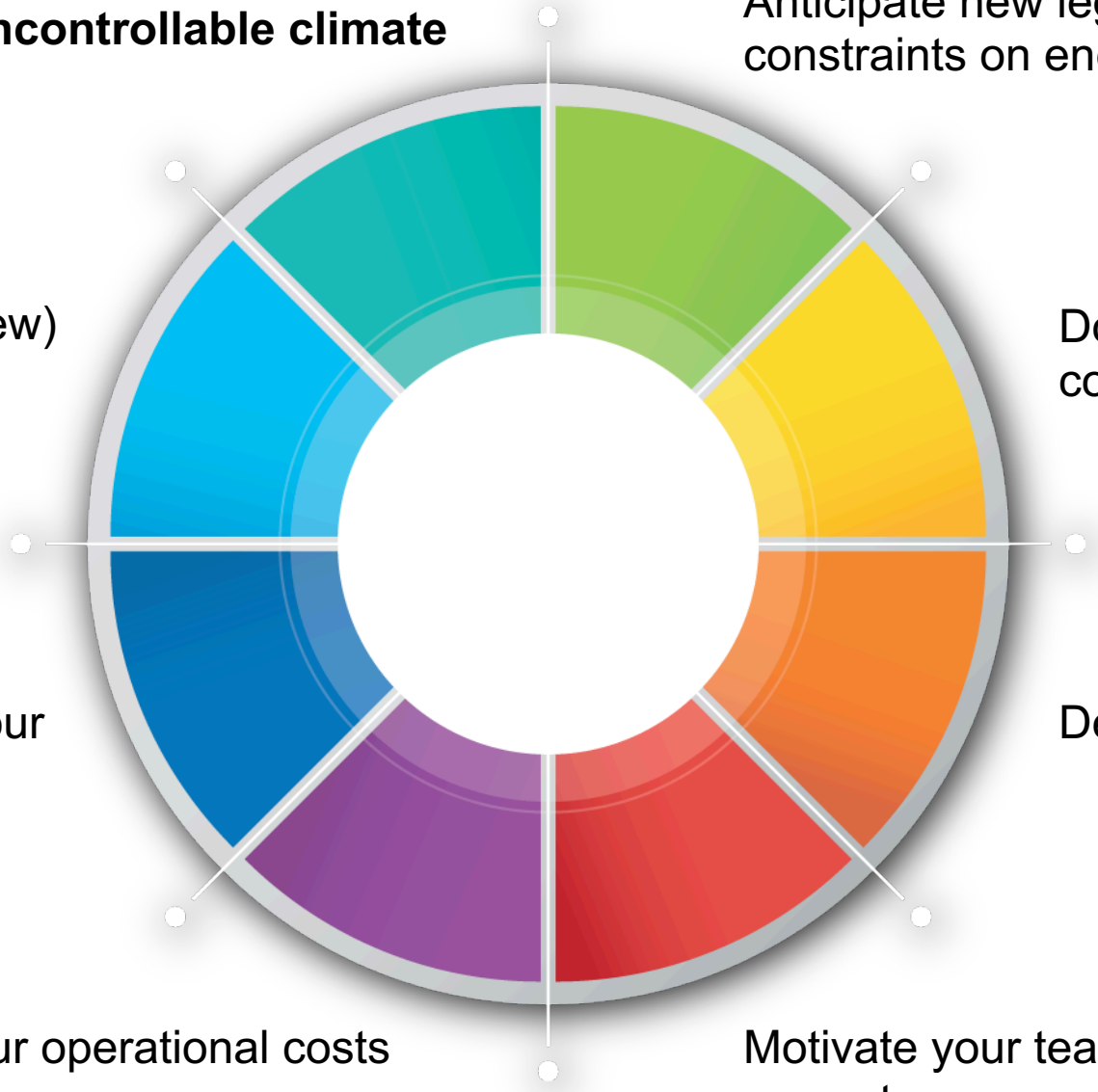

Prevent uncontrollable climate change
Anticipate new legislative constraints on energy / emissions
Do like (or better than) your competitors
Develop marketing arguments
Motivate your teams working on customer service
Reduce your operational costs
Improve your image
Answer (or initiate new) customers needs

Development Process

- Tender for support of carbon accounting specialist launched by EFFC / DFI
- Involvement of European wide team drawn from majority of EFFC/DFI member federations
- Strong UK involvement from Bachy Soletanche, BBGE, Cementation Skanska and Keller

FPS

WHAT WE DO

ASSESS your footprint, your strength & weaknesses in the fight against climate change

ANTICIPATE the transition of our climate and economic system

ACT! Seize the opportunities and reduce associated risks

PROMOTE your actions, progress and carbon strategy

+30 countries in which we have carried out studies

10 years old!

150 clients

+200 talks for top managements

+800 missions worldwide

+30 dynamic colleagues

+50% of the CAC40 are our clients

A MULTI-SECTOR APPROACH

BUILDINGS

ENERGY

FINANCE

TRANSPORT

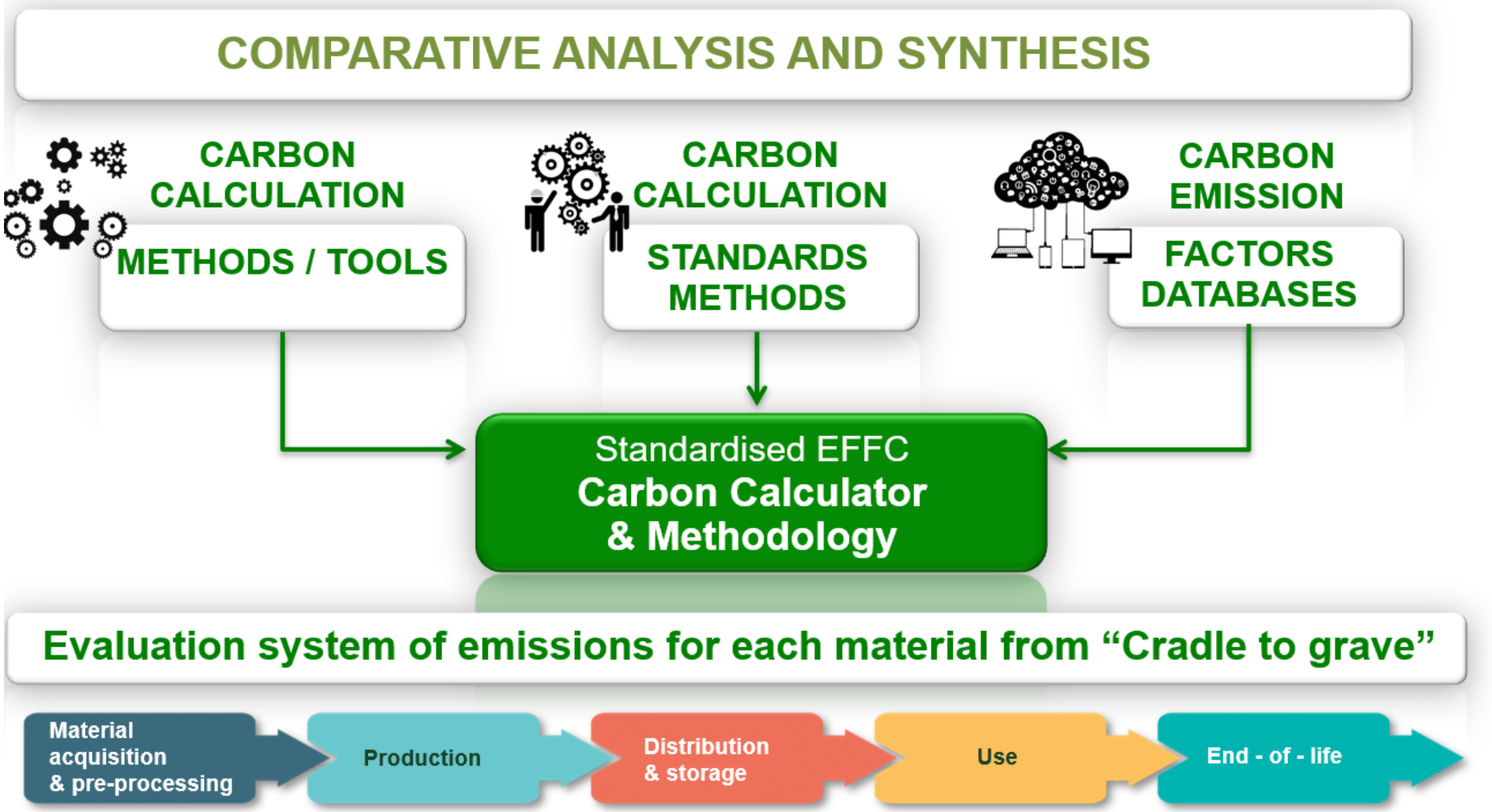
PUBLIC SECTOR

INDUSTRY

MEDIA & SERVICES

carbone 4

Methodological Summary



Methodology : Calculating GHG Emissions: No carbon sensors – Emission Factors

Basic equation for assessing GHG emissions is as follows :

Activity data x **Emissions factors** = **GHG emissions**

Physical or monetary indicator reflecting the activity

Available in database

Examples :

1,000 Liters consumed by vehicles	**3.16** $kgCO_2e$ / litre	**3.16** Tons of CO_2e
2 Transformers 36 MVA	**150,400** $kgCO_2e$ / transformer	**300.8** Tons of CO_2e

Secondary emission sources estimation

- Primary and secondary emission sources are estimated with different approaches

- Primary emission sources :

Direct calculation based on activity data and specific emission factors

- Secondary emission sources :

Possibility to use generic ratio or to bypass them with your own activity data

1. Additional percentage

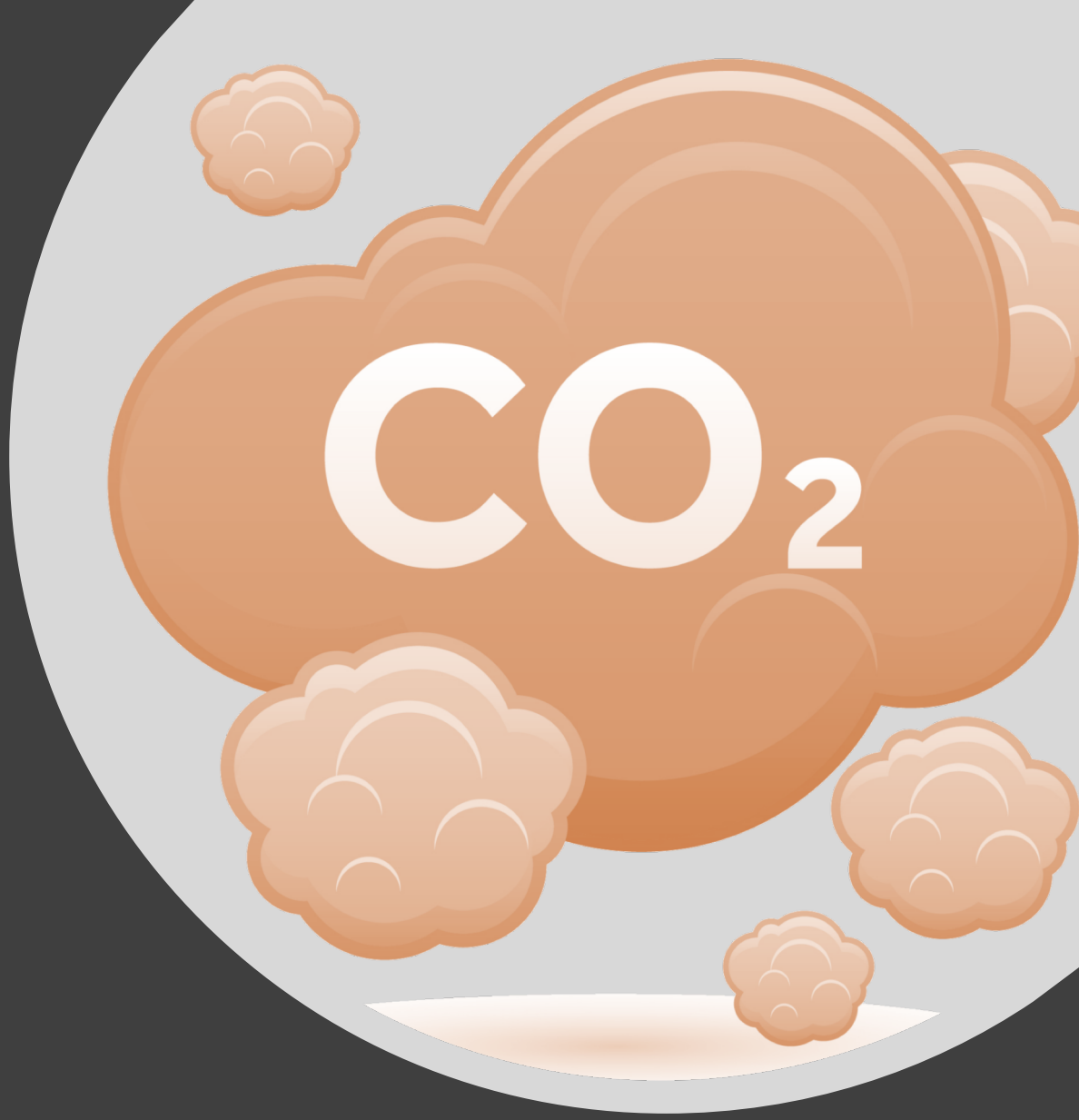
Secondary emission source Y	=	Primary emission sources	X	$\%_Y$
Ex : Machines depreciation	=	(Materials + Energy emissions)	x	0,6%

1. Standard activity data

Secondary emission source Z	=	Activity data needed otherwise	X	Standard activity data/ratio	X	Emission factor
Ex : Steel freight emissions	=	Quantity of steel	x	Truck used to transport steel Average distance Average load factor	x	Emission factor per vehicule.km

Emission Sources

- **Material Manufacturing** (Cement, Bentonite, Steel etc etc.
- **Material Transportation** from factory to construction site
- **Energy Consumed** on the construction site
- **People's Transport** to the construction site
- **Equipment Transportation** machines etc
- **Equipment Manufacturing**
- **Waste Transportation** from construction site to treatment site & **Waste Treatment**



Materials manufacturing
(Cement, steel, bentonite…)

Materials transportation

Waste transportation

Waste treatment and re-use

Equipment manufacturing
(Cranes…)

Equipment transportation

People transportation

TRANSPORT FOR LONDON
EVERY JOURNEY MATTERS

Legend:
UPSTREAM ACTIVITIES
TRANSPORTATION
ON-SITE ACTIVITIES
DOWNSTREAM ACTIVITIES (except transportation)

Global Warming Potential

- The Global Warming Potential (GWP) measures a gas's contribution to warming the atmosphere over a period of time, usually 100 years, compared with CO2.
- It allows us to measure all types of GHGs with a single unit: CO2 equivalent (in kg, tons…).
- These GWP values are published regularly by the IPCC*.

GHG*	GWP over 100 years
Carbon dioxide (CO_2)	1
Fossil methane (CH_{4f})	30
Biogenic methane (CH_{4b})	28
Nitrous oxide (N_2O)	265
SF_6	23 500

Source : AR5 – IPCC 5th report

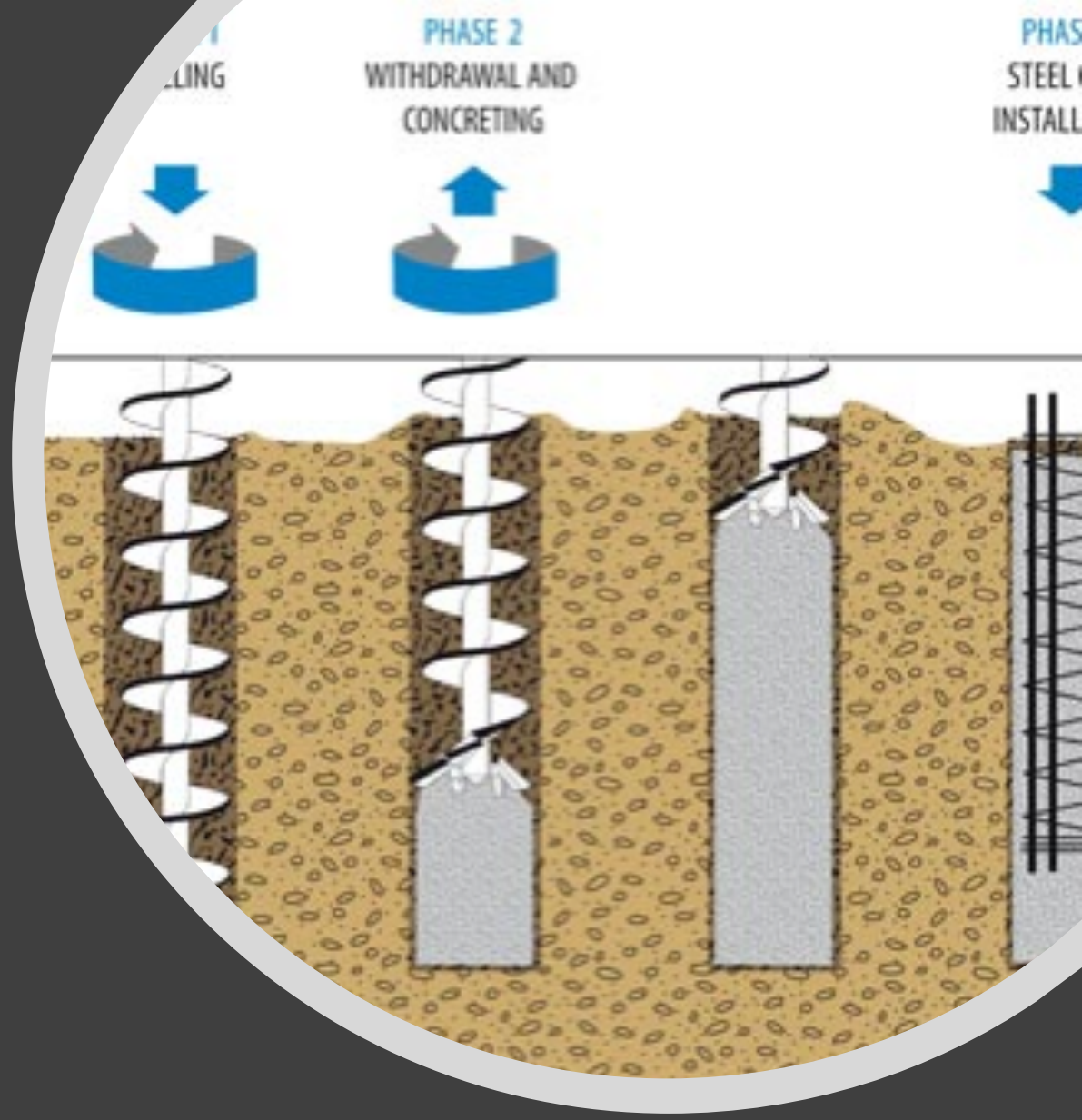
What are the emission factors database used?

- A specific EFFC-DFI recommended database has been built from different databases

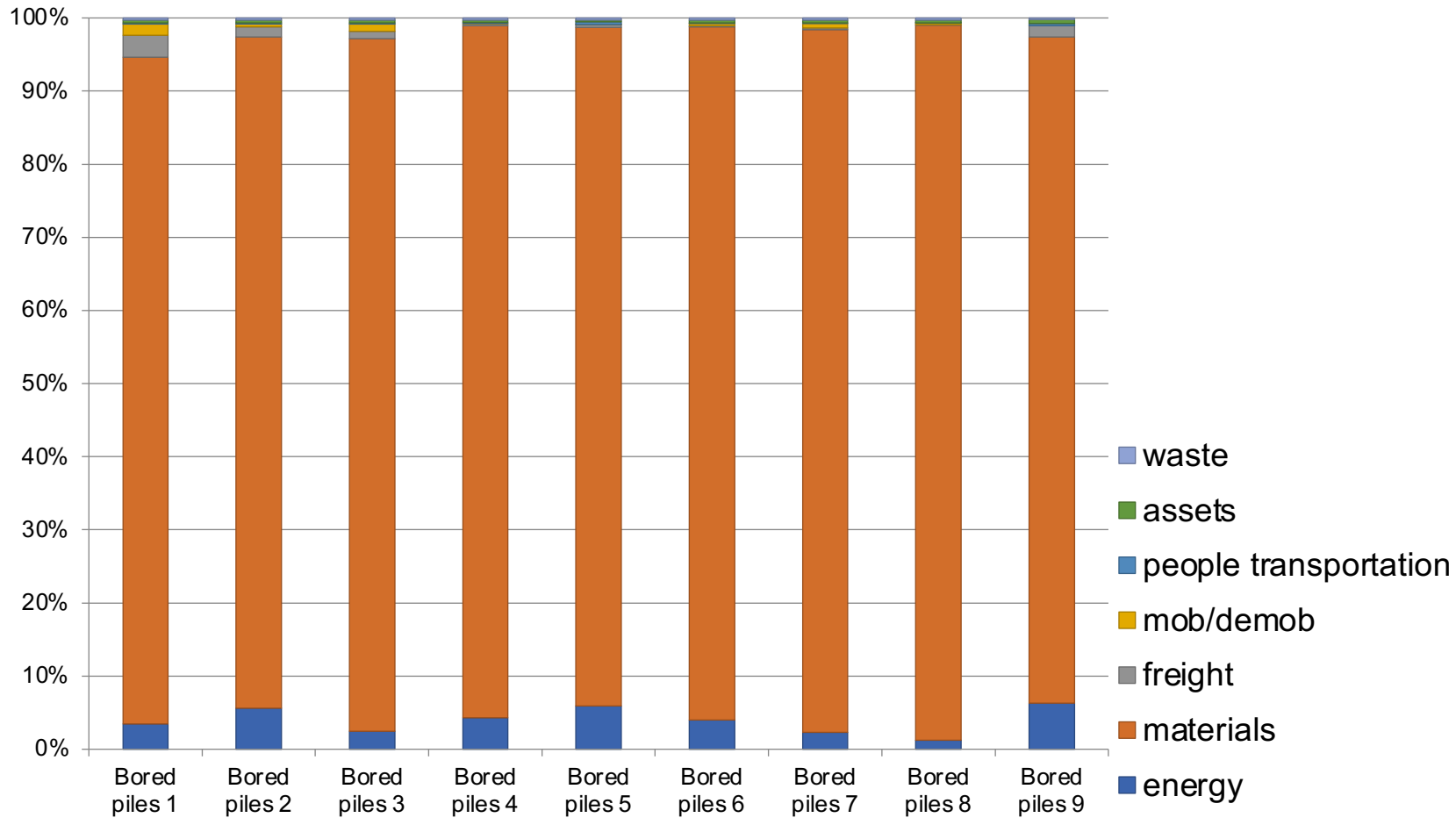
	EFFC-DFI Recommended database
Materials	▪ Ecoinvent ▪ Bian Carbone ▪ Sustainableconcrete ▪ ICE Uni of Bath ▪ DEFRA
Energy	▪ DEFRA ▪ IEA
Transportation	▪ DEFRA ▪ EcoTransit
Assets	▪ Bilan Carbone

Techniques Covered

- Bored piles
- Displacement piles
- Micropiles
- Diaphragm & Slurry Walls
- Sheet Pile Walls
- Soil Mixing
- Grouting
- Bored Pile Walls
- Anchors
- Soil Nails
- Dynamic Compaction
- Vibro Compaction
- Jet Grouting
- Stone Columns
- Vertical Drains
- Dewatering
- Underpinning
- Horizontal Drilling



Sampling: Bored Pile Example



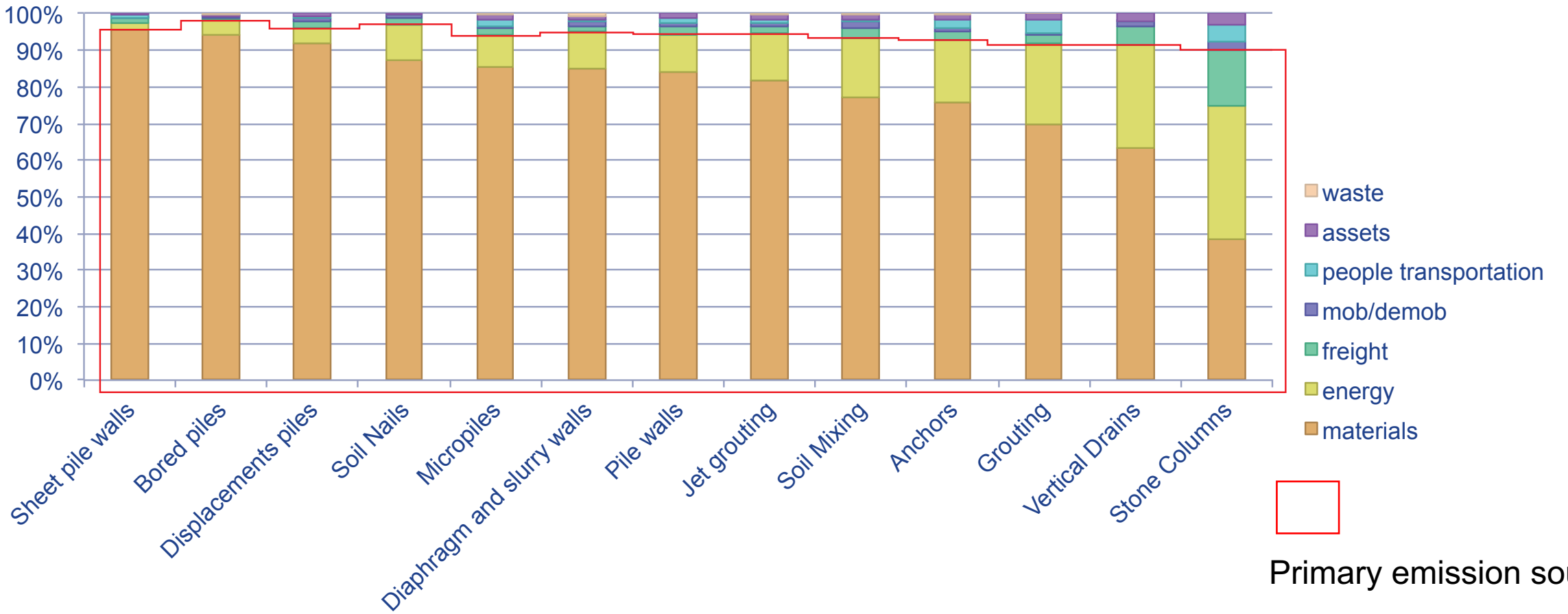
2 main primary sources :

- Materials (94%)
- Energy (4%)

Secondary sources (2%) :

- Freight
- Mob/Demob
- People Transportation
- Assets
- Waste

Prioritisation of emission sources



Primary emission sources

Secondary emission sources are estimated with techniques specific ratios that can be replaced by real field data

General Principles of the EFFC method

Relevance

- By using a project-based carbon calculator, companies are able to compare the carbon footprints of their different techniques and promote low-carbon offers to their customers. The tool calculates the carbon footprint of projects based on real activity data, ensuring the relevance of the calculation made.

Completeness

- The tool always considers the same perimeter. The emission sources that are not calculated using activity data are estimated based on statistical data obtained from various relevant projects and made publicly available.

Consistency

- Emission factor databases will have to be updated regularly by the EFFC to keep the tool up to date and to ensure comparability of the calculation made with other similar approaches.

General Principles of the EFFC method

Transparency

- A Microsoft Excel based tool has the advantage that all the calculations are visible. All the values already in the tool are sourced with no “black box” approach. The methodology discloses all the assumptions and the tool is transparent (all emission factors are documented with complete references and from public sources).
- As a consequence of this principle, all emission factors integrated by the user must also be transparently sourced. (Supply Chain Help……)

Accuracy

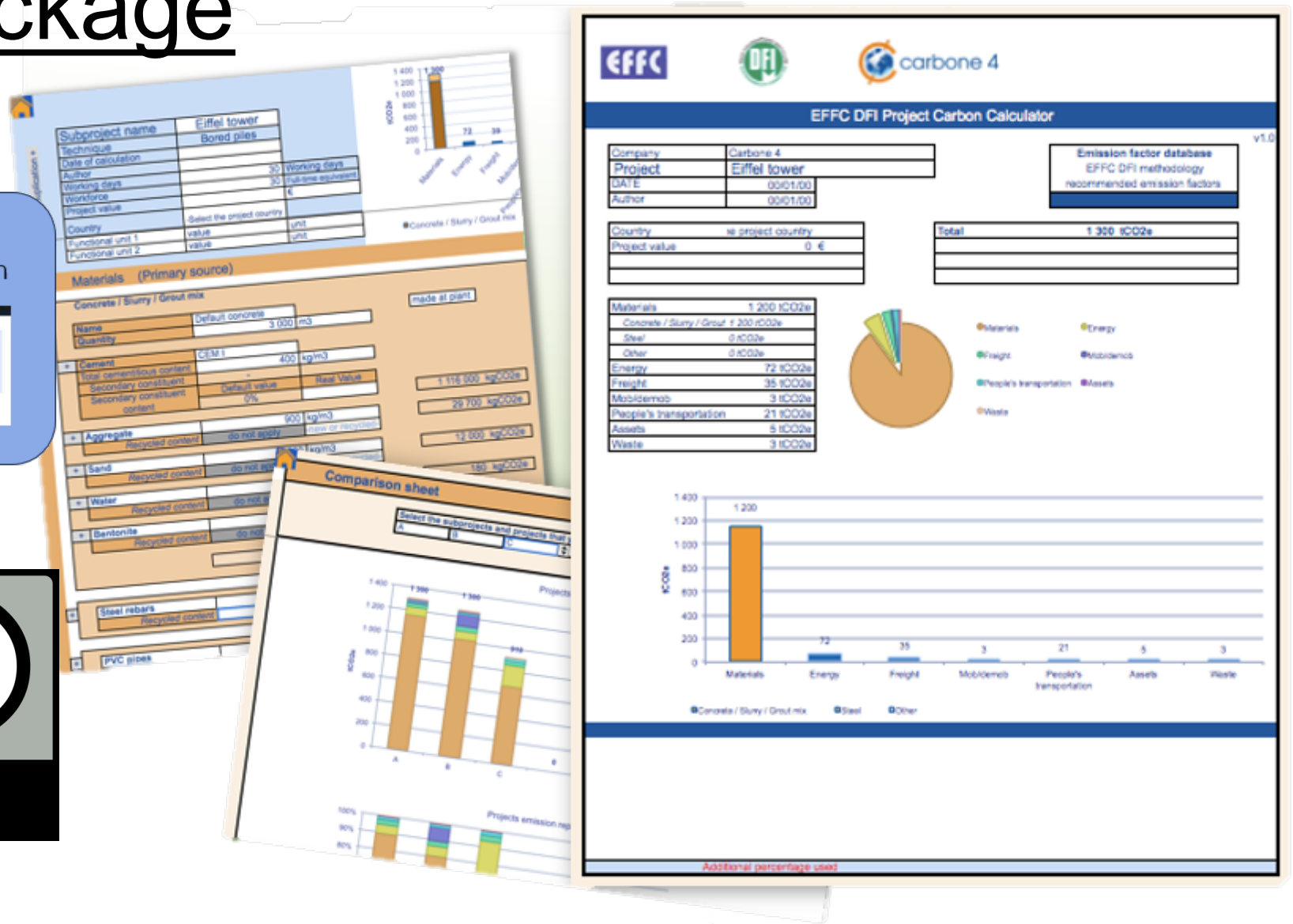
- This principle is integrated by evaluating an emission source’s importance for the covered techniques. The uncertainty is evaluated and simple ratios proposed for secondary emission sources.

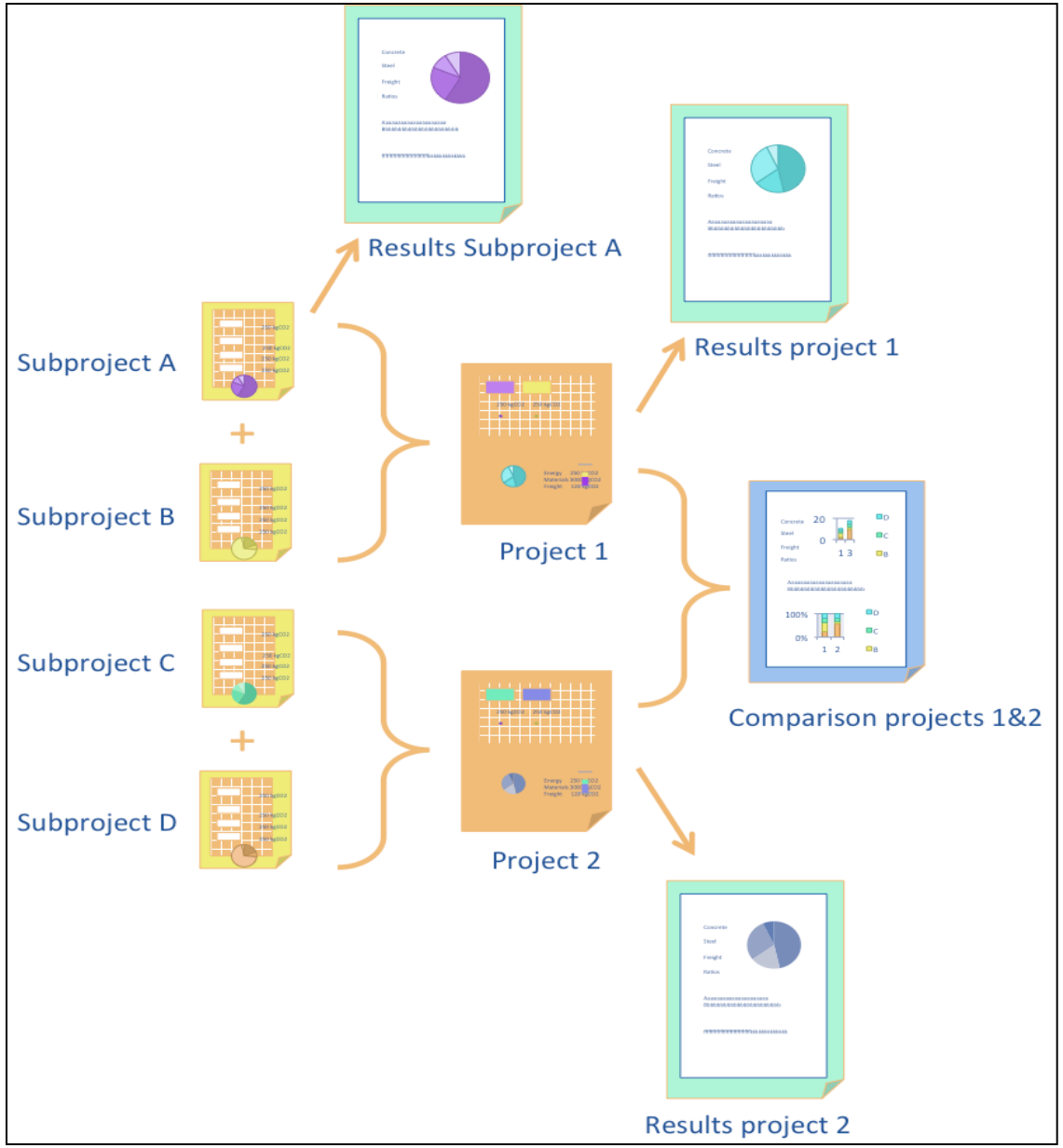
Calculator Package

Carbon Calculator Tool

Methodology and user guide

Project presentation





Tool Structure

The tool aims to calculate the carbon footprint of a deep foundation or ground improvement project.

A project can be subdivided into different subprojects.

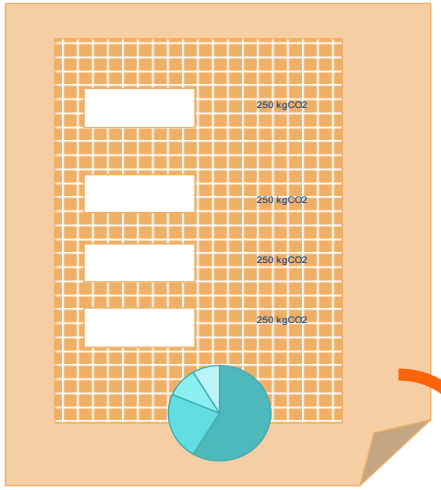
Each of these subprojects corresponds to the use of one of the deep foundation techniques.

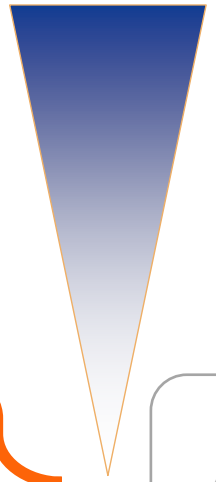
Projects are created simply by adding as many subproject worksheets as required for each technique used in the project.

The tool allows comparisons at all levels, enabling the user to select the techniques with the lowest associated emissions and to compare the performance of different solutions for the same customer need

Tool Structure

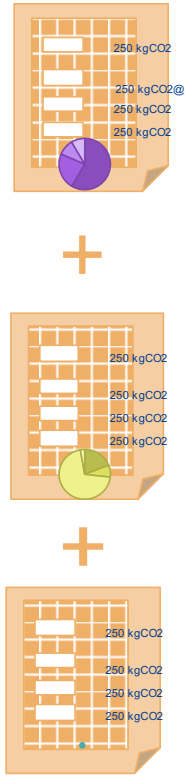
One technique on one sheet



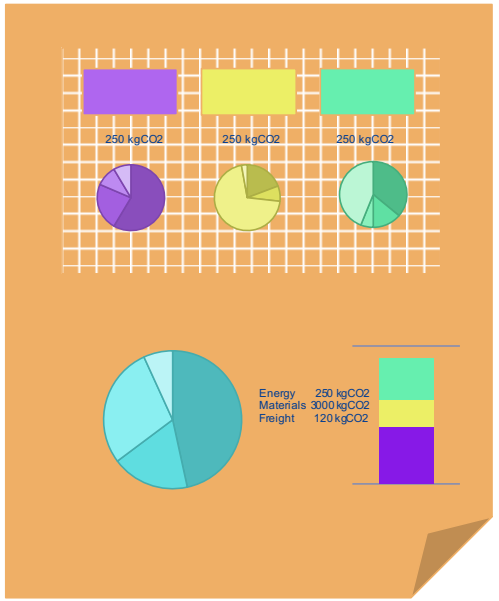


Emission sources by decreasing order of importance

Secondary sources with default ratios that can be replaced by real values



Totalisation sheet



Tool Demonstration

List all the physical inputs to the (sub)project, for the primary emission sources:

- **Materials:** types of materials.
- **Energy**: energy sources.
- **Freight and mobilization/demobilization and waste:** vehicles.
- **People transportation:** transportation modes.
- **Assets:** machines.

Select the category corresponding to the activity data *(this step will set up the corresponding emission factor for the calculation).*

Enter the activity data corresponding to the unit proposed: if relevant specify options.

The results of the calculation appear automatically

Repeat this for all the activity data of the primary emission sources. The results are displayed on the top of the worksheet.

If activities data of the secondary emission sources are known, these may be entered in the same way.

The Benefits…..

- Once you measure the footprint of your projects / techniques / materials you can target reducing it
- You can use the tool to drive innovation and find alternatives materials and techniques and measure tangible benefits
- The comparison sheet allows promotion of alternative, lower-carbon schemes
- Ultimately carbon costs money, either via material usage, energy costs or potentially increasing taxes/levies on pollution / waste etc
- We all have a civic duty to protect the future.