PROJECT DRAFFT
REPORT

01.09. – 18.12.2020

RAMBØLL Bright ideas. Sustainable change.

REPORT SECTIONS

1. Intermediate results

2. Final results

PROJECT DRAFFT

1 INTERMEDIATE RESULTS

16.11.2020

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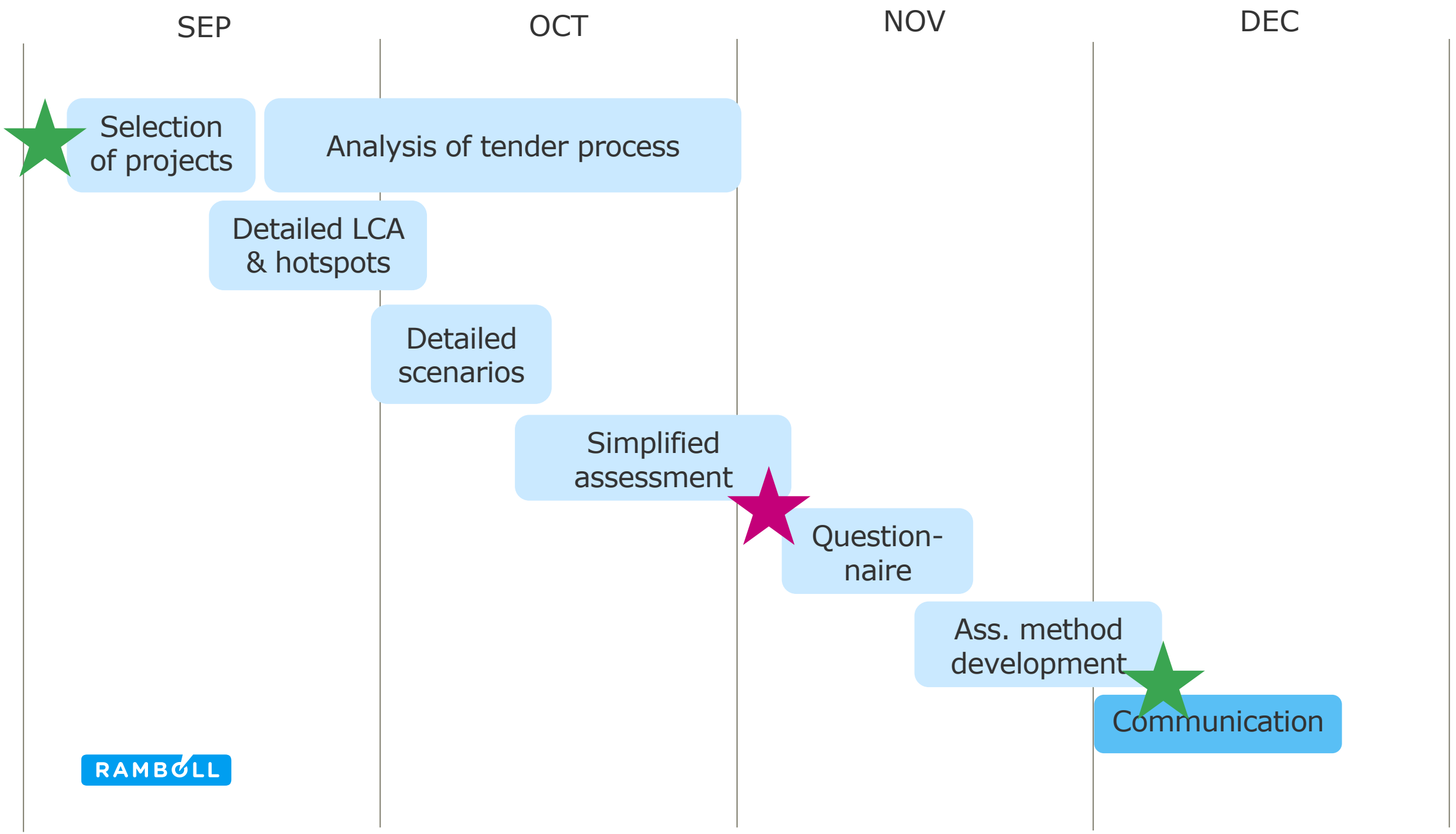
SEP
OCT
NOV
DEC
Selection of projects
Analysis of tender process
Detailed LCA & hotspots
Detailed scenarios
Simplified assessment
Question-naire
Ass. method development
Communication
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AGENDA

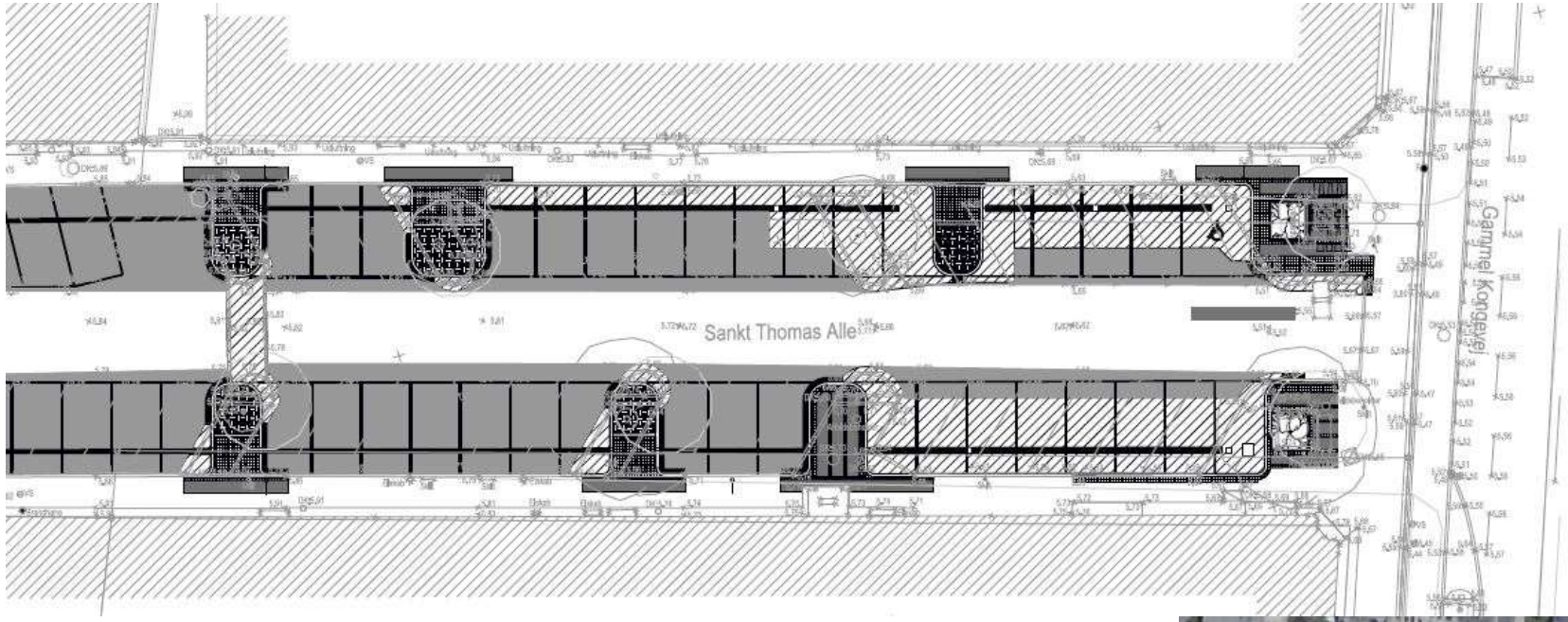
1. LCA & HOTSPOT ANALYSIS RESULTS
2. TENDER OVERVIEW
3. STRATEGY FOR SUSTAINABLE TENDERS
4. CONCLUSION & POSSIBLE NEXT STEPS
5. QUESTIONS & DISCUSSION

Sustainable procurement is not about “burdening” the market with extra requirements; rather it is a well-defined strategy that gradually phases in sustainable requirements in tenders and bids, promotes dialogue and open communication between the suppliers and procurers.

United Nations Global Marketplace: **What is sustainable procurement?**

LCA & HOTSPOT ANALYSIS RESULTS

GREEN SOLUTION: SANKT THOMAS ALLÉ



NOTE:

Eksisterende forhold vist nedtonet

SIGNATURER:

- Projekteret ny kørebane
- Projekteret chaussesten
- Projekteret 30 x 30 betonfliser
- Projekteret slidlag
- Projekteret fortovsfliser
- Projekteret plantebed
- Projekteret cykelstativer (Nørrebro Bike Stand)

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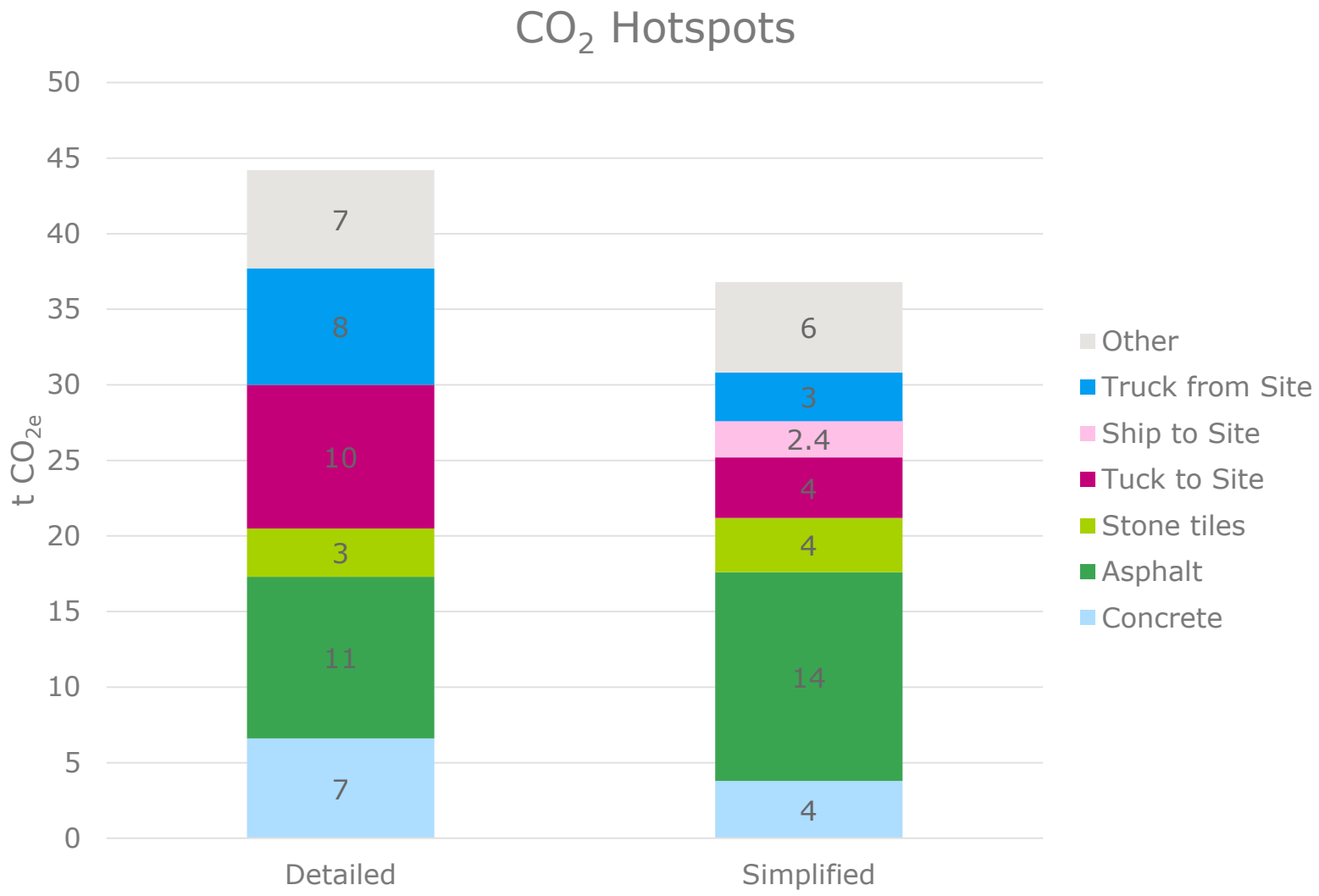
GREEN SOLUTION: SANKT THOMAS ALLÉ



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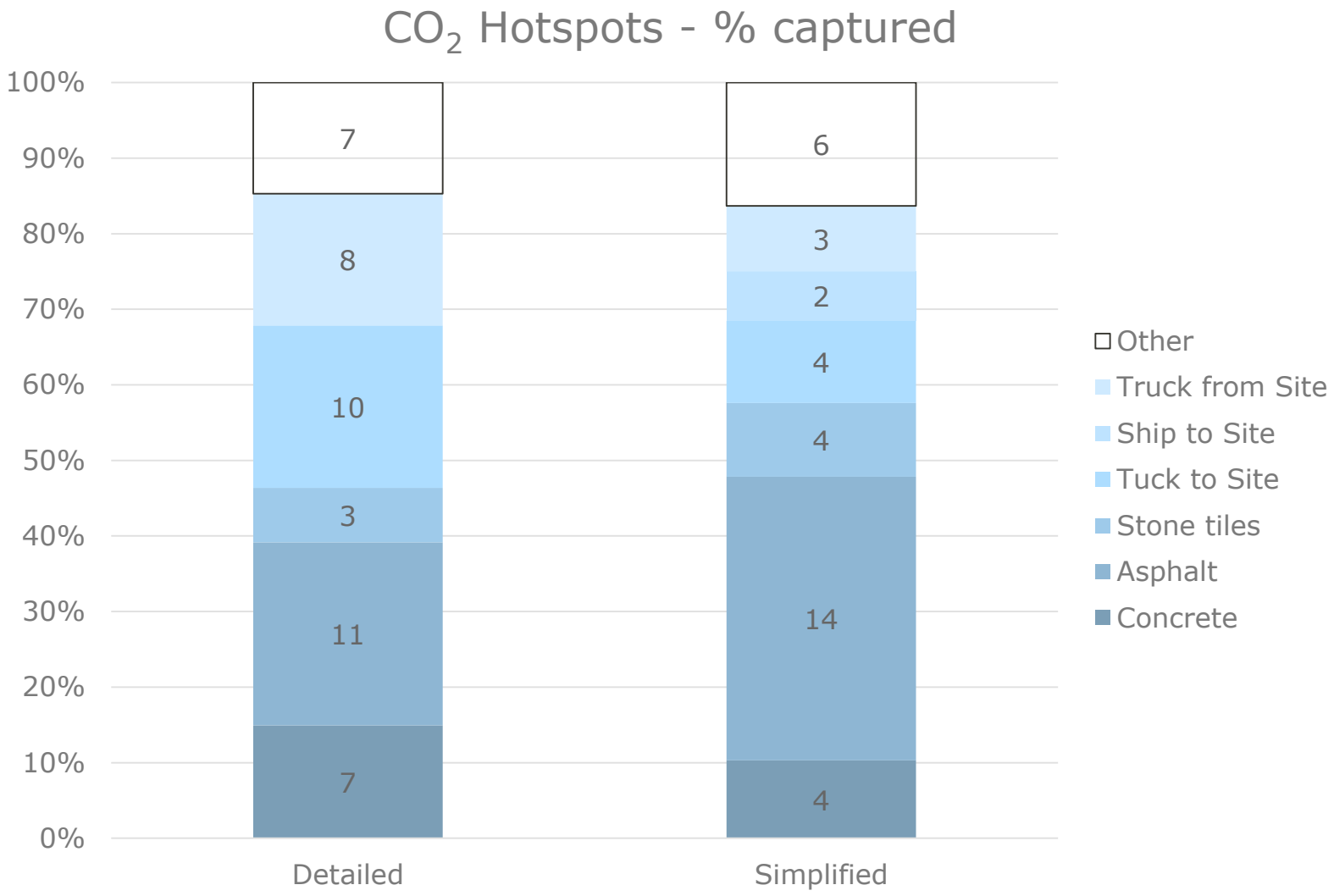
GREEN SOLUTION: SANKT THOMAS ALLÉ



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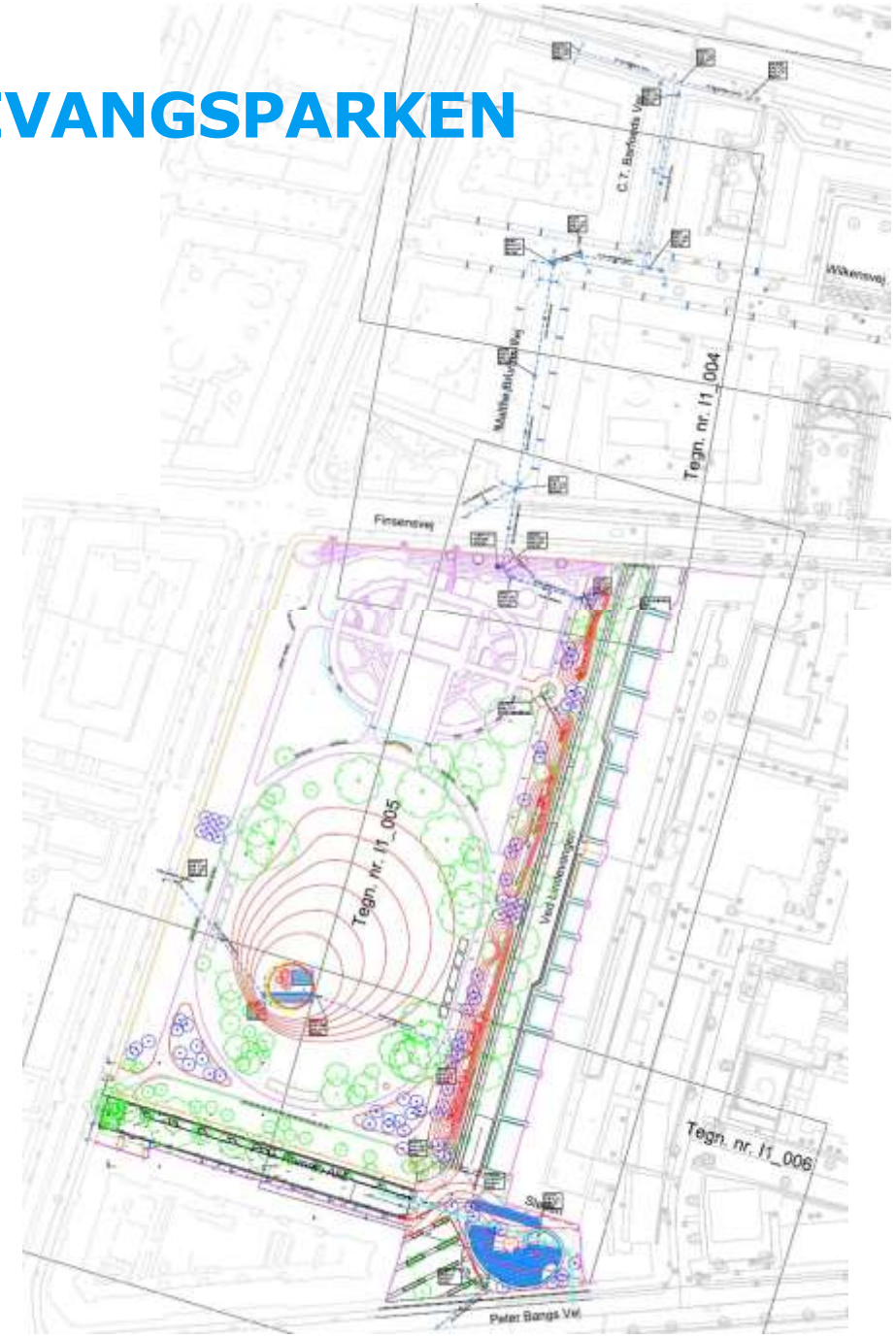
SUBSURFACE SOLUTION: LINDEVANGSPARKEN



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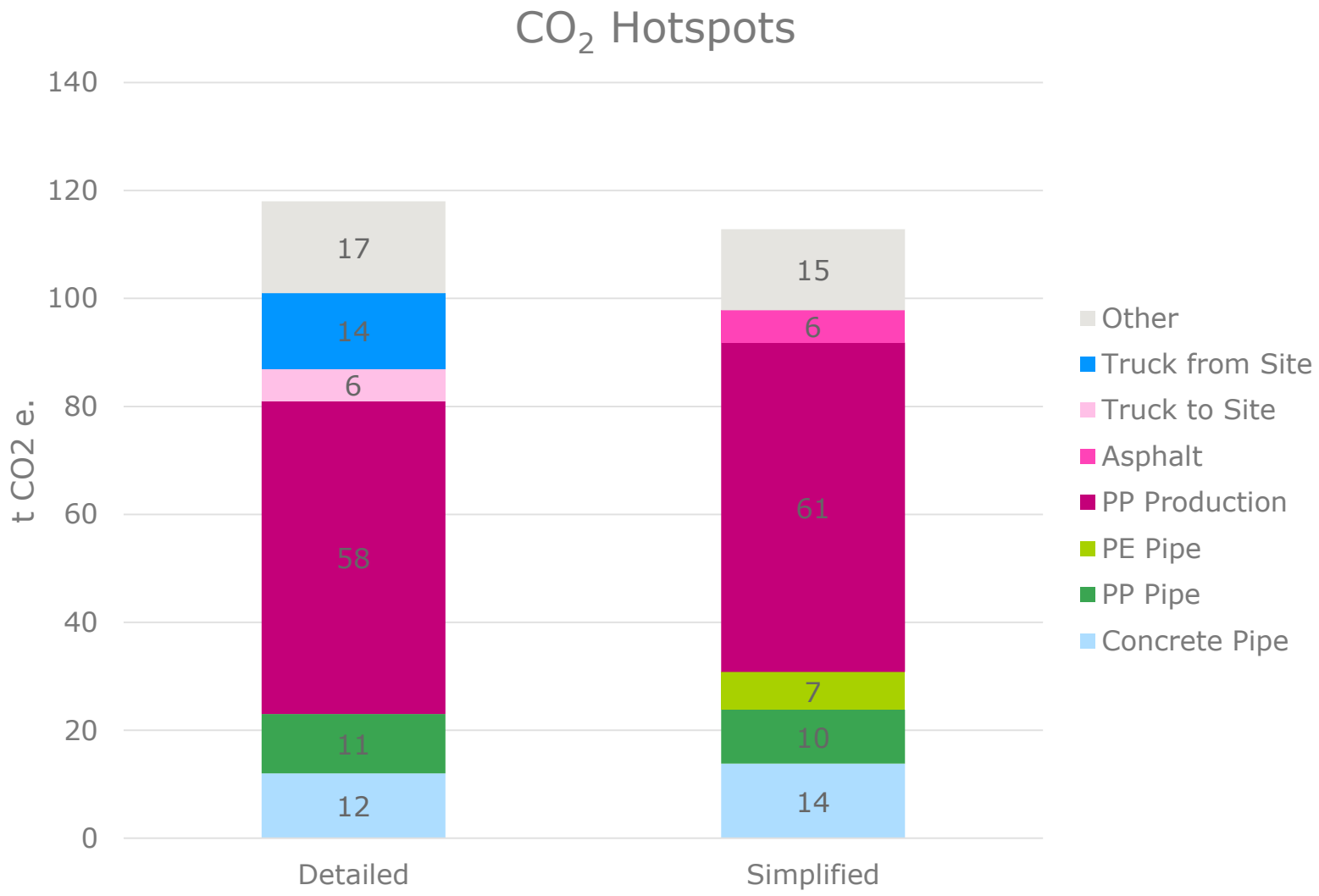
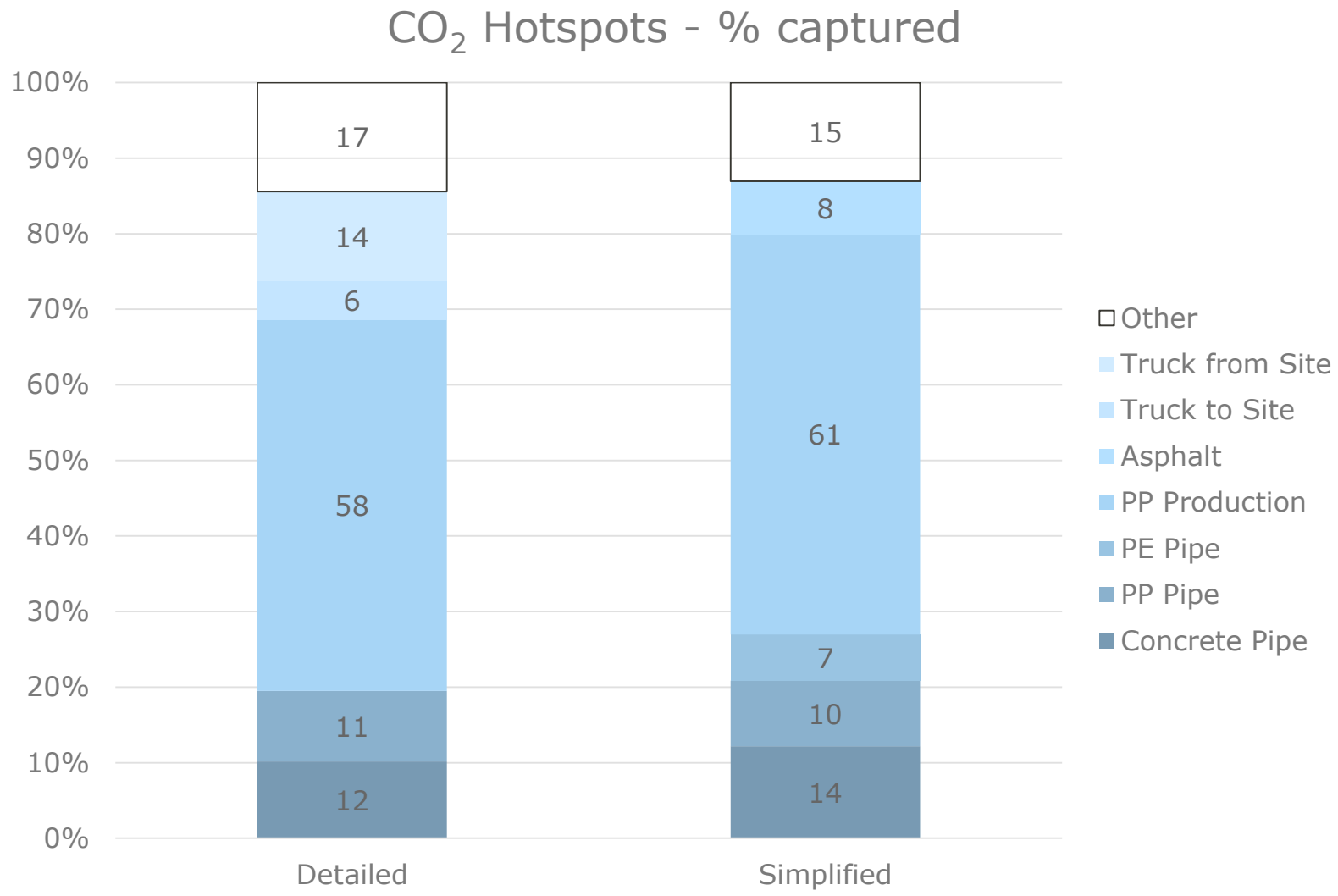


SUBSURFACE SOLUTION: LINDEVANGSPARKEN



OPEN SOURCE DATA

EPD – Environmental Product Declaration

- ISO 14025 "type III environmental declarations"
- Voluntary declaration of the life cycle impact of a product
- Subject to Product Category Rules (PCR)
  - Provide rules, requirements, and guidelines for developing an EPD for a specific product category

  → Enable transparency and comparability

! Problem: Different PCR exist for same product type → limit comparability

The International EPD System

- Present a collection of comparable information

→ EPDs declarations are based on ISO 14025 and EN 15804 (PCR for European construction sector)

EPD®
THE INTERNATIONAL EPD® SYSTEM

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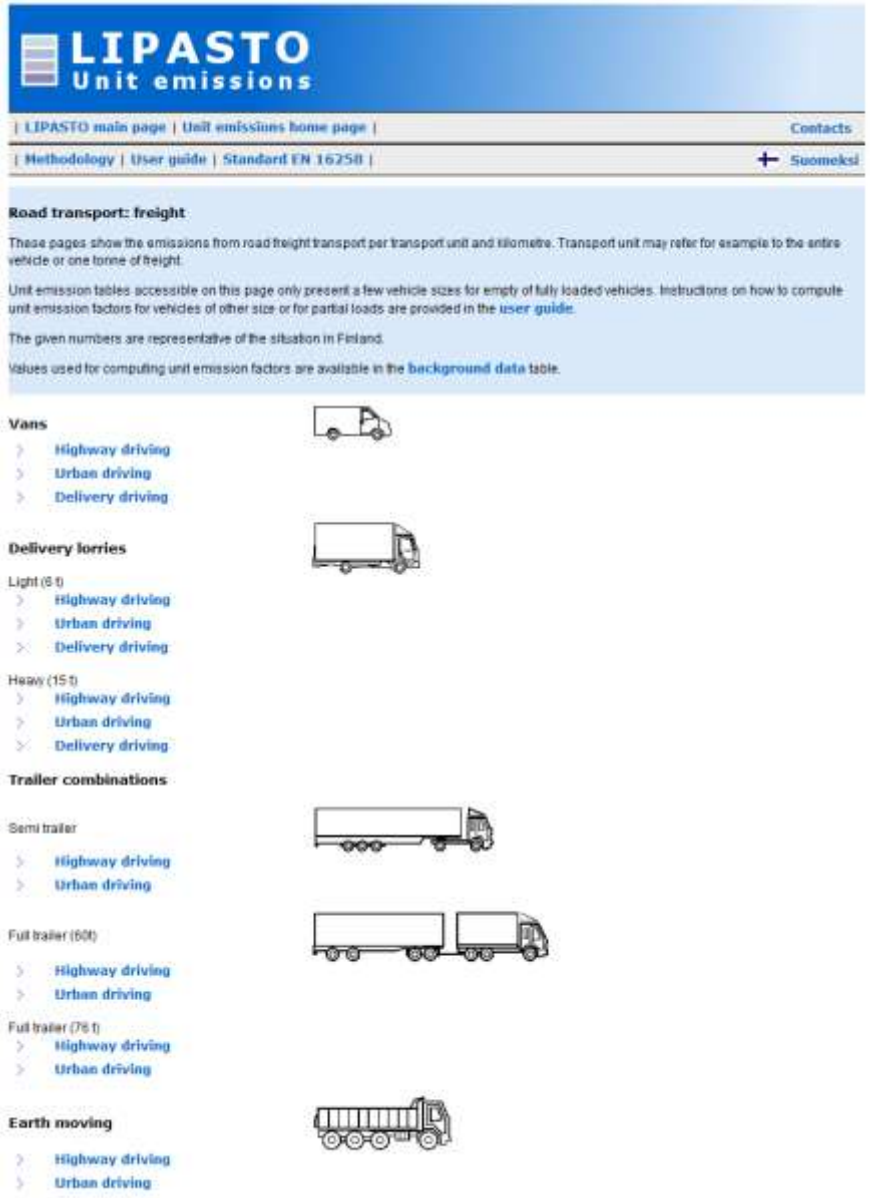
OPEN SOURCE DATA

ELCD – European Life Cycle Database

- Collection of high quality proven datasets

Lipasto

- A webpage that shows the emissions from road freight transport
- Representative of the situation in Finland



EXAMPLE EPD: 1M2 BETONFLISER

Deklareret produkt
1 m² betonflise.

EPD'en er udarbejdet på baggrund af vægtede gennemsnitsdata fra flere producenter (average product, Industry level). Producenterne som leverer data til EPD'en dækker ca. 86% af den samlede danske produktion af betonfliser.

Antal deklarerede datasæt/produktvariationer: 3
Betonflise med tykkelse 5 cm
Betonflise med tykkelse 7 cm
Betonflise med tykkelse 10 cm

epddanmark

LCA resultater

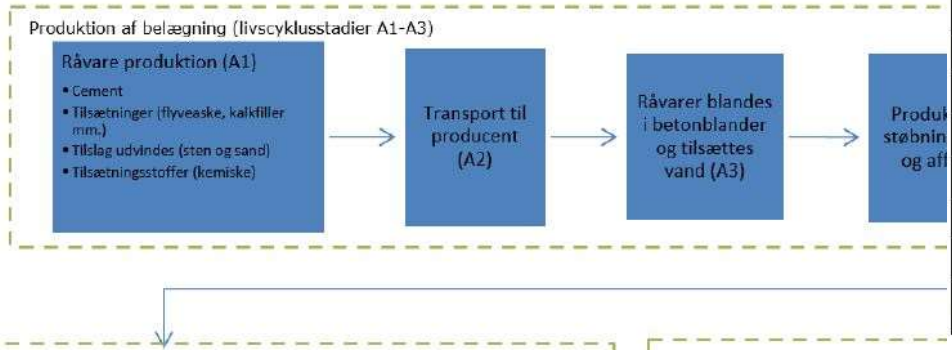
Til beregning af LCIA resultater er karakteriseringsmodellen CML 2001 anvendt sammen med GaBi 8.7 til klassificering og karakterisering af input- og output flows. Dette jf. EN 15804 6.5 samt Annex C.
Livscyklusfaserne A4-D er baseret på de samme processer og scenarier, men da massen per m² flise varierer mellem de enkelte produkttyper, varierer resultaterne. Karbonatisering i B1, varierer desuden afhængigt af brugsscenariet.

Flise, 5 cm

Parameter	Enhed	Miljøpåvirkninger per m2, Flise, 5 cm									
		A1-A3	A4	A5	B1	B2-B7	C1	C2	C3	C4	D
GWP	[kg CO_2 ækv.]	1,24E+01*	6,29E-01	MND	-1,10E+00	MNR	6,20E-01	3,36E-01	3,44E-01	2,55E-01	-2,36E-01
ODP	[kg CFC11 ækv.]	1,58E-07	1,04E-16	MND	0,00E+00	MNR	7,91E-17	5,54E-17	2,77E-17	3,31E-16	-2,85E-15
AP	[kg SO_2 ækv.]	1,80E-02	1,46E-03	MND	0,00E+00	MNR	2,21E-03	7,80E-04	1,20E-03	7,77E-04	-1,29E-03
EP	[kg $(PO_4)^{3-}$ ækv.]	5,77E-03	3,53E-04	MND	0,00E+00	MNR	5,30E-04	1,88E-04	2,91E-04	1,48E-04	-2,41E-04
POCP	[kg Ethen ækv.]	5,16E-04	-4,89E-04	MND	0,00E+00	MNR	2,15E-04	-2,61E-04	1,12E-04	-1,35E-04	-1,17E-04
ADPE	[kg Sb ækv.]	1,02E-05	4,47E-08	MND	0,00E+00	MNR	3,40E-08	2,38E-08	1,19E-08	1,95E-08	-4,24E-08
ADPF	[MJ]	6,34E+01	8,52E+00	MND	0,00E+00	MNR	6,49E+00	4,54E+00	2,28E+00	3,47E+00	-3,01E+00
Caption	GWP = Global opvarmning; ODP = Nedbrydning af ozonlaget; AP = Forsuring a fjord og vand; EP = Eutrofiering; POCP = Fotokemisk ozondannelse; ADPE = Udtynding af abiotiske ikke-fossile ressourcer; ADPF = Udtynding af abiotiske fossile ressourcer										

* Det vægtede gennemsnit dækker et spænd af producenter, GWP kan variere med op til 29%, afhængigt af producent.

Flowdiagram
Nedenfor er angivet et overordnet flowdiagram for livscyklus (A-D) for fliser. Se nær de enkelte faser på de efterfølgende sider



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TENDER OVERVIEW

CURRENT TENDER APPROACH FOR CLIMATE ADAPTATION PROJECTS

- Well-established, reliable and efficient procedure
- Standard tender materials send out for tender
  - TBL – Tilbudsliste
  - TAG – Tilbuds og Afregningsgrundlag
  - SAB – Særlige Arbejdsbeskrivelser

STANDARD TENDER MATERIAL

TBL

03			**AFVANDING**				
			Al afgravning og tilbagefyld hører under ledningsarbejder				
	01		Levering og lægning af dræn ø160 mm	lbm.	153	128,00	19.584,00
	02		Levering og sætning af nedløbsbrønde inkl. 70 l. sandfang, karm og rist	stk.	8	4.973,00	39.784,00
	03		Levering og sætning af sideløbsbrønde inkl. 70 l. sandfang, karm og rist	stk.			
	04		Levering og sætning af ø315 snydebrønde inkl. karm og rist; d < 2,5 m	stk.			
	05		Levering og sætning af ø315 spulebrønde inkl. karm og dæksel; d < 2,5 m	stk.			
	06		Levering og sætning af ø1000 reguleringsbygværk med sandfang inkl. kegle, karm og ø600 kuppelrist:				

Post	Betegnelse		I alt
01	ARBEJDSPLADS MV.	kr.	447.937,00
02	JORDARBEJDER	kr.	2.350.363,00
03	AFVANDING	kr.	1.777.125,70
04	BUNDSIKRINGSLAG AF SAND OG GRUS	kr.	114.950,00
05	UBUNDNE BÆRELAG AF STABILTGRUS	kr.	80.880,00
06	RODVENLIGE BÆRELAG	kr.	10.319,00
07	VARMBLANDET ASFALT	kr.	807.079,00
08	BROLÆGNING	kr.	748.037,00
09	KØREBANEAFMÆRKNING	kr.	84.123,00
10	AFMÆRKNINGSMATERIEL	kr.	27.016,00
11	INVENTAR	kr.	16.785,00
12	BEPLANTNING	kr.	423.320,00
13	DIVERSE ARBEJDER	kr.	226.235,00
14	SIGNALANLÆG	kr.	14.190,00
15	BELYSNING	kr.	77.030,00
16	EVENTUELLE TILLÆGSARBEJDER	kr.	713.700,00
Tilbudssum i alt ekskl.. moms		**kr.**	7.919.089,70

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STANDARD TENDER MATERIAL

TAG

3.3.5 *Justering af eksisterende riste og dæksler*

Posten omfatter højdejustering af ALLE eksisterende brøndriste og brønddæksler inden for entrepriseområdet, hvor de tilstødende belægninger er ændret iht. nye projektkoter.

3.4 Regnvandskassetter

Regnvandskassetterne skal være af typen ENREGIS/X-BOX type 60 med et magasinkoefficient på 95%.

3.4.1 *Levering og installering af faskine under Scenen*

Ydelsen omfatter alle leverancer og arbejder i forbindelse med levering, udgravning, og installation af regnvandskassetter inkl. indpakning i fiberdug samt alle nødvendige formstykker-/overgange.

STANDARD TENDER MATERIAL

SAB

0.1 ALMENT

SAB Styring og samarbejde indeholder bestemmelser for entreprenørens ind
ring af entreprisen og samarbejde med bygherre/tilsyn i relation til:

- Tid
- Kontrol og dokumentation
- Kvalitet
- Miljø
- Arbejdsmiljø
- Trafiksikkerhed og – afvikling
- Beredskabsforhold
- Kontakt til myndigheder, herunder ledningsejere

Vedrørende begreber henvises til Vejteknisk Ordbog i gældende udgave, DS/
samt afsnit 12. Ordliste.

0.6 KVALITETS- OG MILJØLEDELSE

0.6.1 Alment

Entreprenøren skal udarbejde, implementere og vedligeholde en entreprisespecifik kvalitets- og miljøplan, der opfylder kravene i efterfølgende afsnit.

Planen kan i relevant omfang kombineres med eksisterende kvalitetsstyrings- eller miljøledelsessystemer.

0.6.2 Krav til entreprenørens kvalitets- og miljøplan

0.6.2.1 Procedurer og arbejdsprocedurer

Procedurer og arbejdsprocedurer fra eksisterende kvalitetsstyrings- og/eller miljøledelsessystemer kan anvendes i det omfang, de opfylder de stillede krav.

Entreprenøren skal som minimum udarbejde følgende arbejdsprocedurer:

- Forebyggelse af støjgener
- Forebyggelse af støvgener
- Forebyggelse af lugtgener
- Bekæmpelse af forurening af tilstødende veje
- Afværgeforanstaltninger til forhindring af forurening
- Affaldshåndtering og bortskaffelse
- Opsætning/nedtagning af midlertidig afmærkning

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CURRENT TENDER APPROACH

- Well-established, reliable and efficient procedure
- Standard tender materials send out for tender:

- The material provides a very detailed description of the work and construction materials

  → set in stone and leave no space nor motivation to eco-innovate
- Evaluation is based on price and quality
- Some mandatory environmental requirements are included, but non that aim at reducing the carbon footprint

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OPEN TENDER MATERIAL

TAG

Conventional way

3.3.5 *Justering af eksisterende riste og dæksler*

Posten omfatter højdejustering af ALLE eksisterende brøndriste og brønddæksler inden for entrepriseområdet, hvor de tilstødende belægninger er ændret iht. nye projektkoter.

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Udbudsbetingelser

1.2.3 Særlige fokuspunkter

Opgaven rummer en række tekniske og procesmæssige udfordringer/fokuspunkter, som det er væsentligt at entreprenøren kan håndtere. De væsentligste er listet og kort beskrevet nedenfor. De tekniske fokuspunkter omhandler såvel etableringen af pumpestationen som ledningsarbejder i oplandet.

- Ledningsarbejder skal udføres i konkrete boligveje, hvor både støj, støv, vibrationer og adgangsforhold er særligt vigtige. Der er desuden to skoler indenfor projektområdet, hvor sikker skolevej skal opretholdes. Ligeledes skal den store pumpestation etableres i nærheden af boliger mod syd. Frederiksberg Kommunes grænseværdier for støj o.l. skal som minimum overholdes, men det er væsentligt at der på alle fronter arbejdes for at minimere gener for beboere og trafik under udførelsen. Derfor anses det som en fælles opgave at sikre dette, hvor ikke mindst entreprenørens tilgang og kultur spiller en væsentlig rolle for projektets succes.

- Projektet skal udføres inden for de i hovedtidsplanen i byggesagsbeskrivelsen angivne milepæle. Det vurderes at kræve en god plan og en intensiv indsats med flere udførende sjak på samme tid at tilrettelægge og koordinere arbejdet således at anlægget kan være færdiganlagt til denne deadline. Ikke mindst i forhold til trafikomlægninger og opretholdelse af busdrift på Jens Jessens Vej. Samtidig vil det kræve fleksibilitet og kreativitet at sikre fremdriften, hvis der skulle opstå uforudsete problemer og være behov for projektændringer.

- Der er vedlagt principtegninger af brønde og knudepunkter. Udformninger, vinkler på tilslutninger mv. afviger flere steder fra almindelig praksis, men er projekteret således på baggrund af de hydrauliske beregninger, der sikrer, at systemet kan leve op til de dimensioneringskrav, som bygherre har stillet (håndtering af 100-årsregn). Bygherre er dog åben overfor andre løsninger end de projekterede, men såfremt der benyttes anden udformning eller andre materialer end det beskrevne, skal de hydrauliske dimensionskriterier overholdes. Samtidig skal det godtgøres, at der er plads i ledningstracéet til at benytte andre materialer eller anden udformning. Bygherre kan til enhver tid afvise en metode, hvis ovenfor anførte krav ikke er opfyldt.

- Det er beskrevet i bilag 3.2 *Geoteknisk undersøgelse og projektering af bygværk*, hvordan midlertidig grundvandssænkning af det primære grundvand ved konstruktion af pumpestationen tænkes udført ved pumpning i eksisterende 10" filterboringer. Det vurderes at der vil skulle oppumpes mellem 15 og 25

Progressive open tender approach

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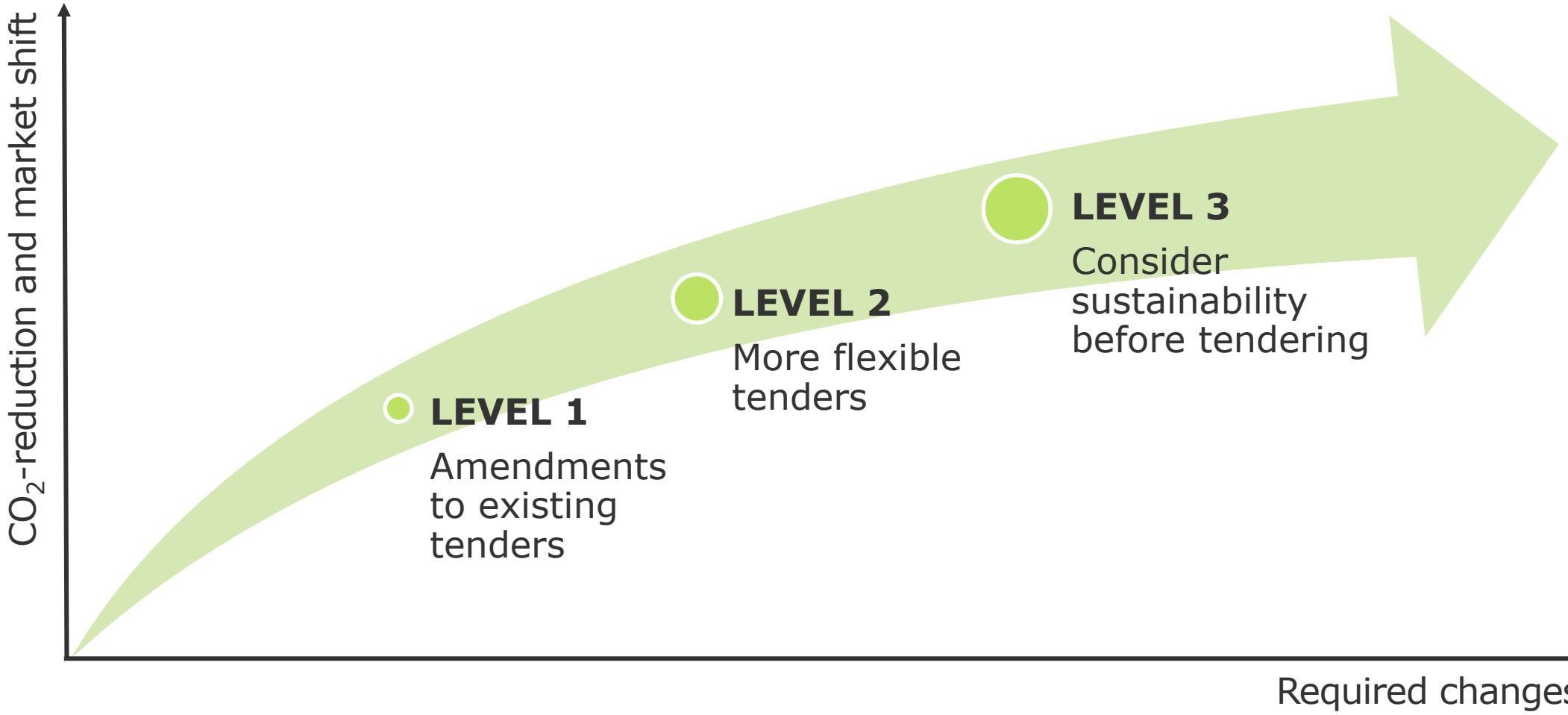
HOW CAN WE USE THESE FINDINGS IN THE TENDER PROCESS?

SUSTAINABILITY IN THE TENDER PROCESS



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LEVEL 1
AMENDMENTS TO EXISTING TENDERS

1

Post	Betegnelse	Enhed	Antal Enheder	Enheds-pris	Kr.
02.	**JORDARBEJDER**				
02.01	**Rydning**				
02.01.01	Rydning af træer med stød	stk.	9		
02.01.02	Tavler inkl. standere/galger at optage og lægge i depot for senere gensætning	stk.	7		
03.	**AFVANDINGSARBEJDER**				
03.01	**Plastrør at levere og lægge**				
03.01.01	110 mm, SN8, dybde < 1,0 m, inkl. alle muffe, fittings etc. for arbejds udførelse	m	60		
03.01.02	160 mm, SN8, dybde 1,0-2,0 m, inkl. alle muffe, fittings etc. for arbejds udførelse	m	75		

? Do all items on the TBL cause relevant emissions?

? Who provides emission factors?

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1

Do all items on the TBL cause relevant emissions?

A prior hotspot analysis identifies the relevant items

Who provides emission factors?

Could be on a ”reward basis” to start with

Option 1: Bidders report emission factors (open source data)

Framework agreements can increase incentive and the positive impact!

Option 2: The producers provide emission factors

Option 3: Bidders report parameters that determine the CO_2 footprint

Especially important for standard items, e.g. transport

R

MAIN CHALLENGES

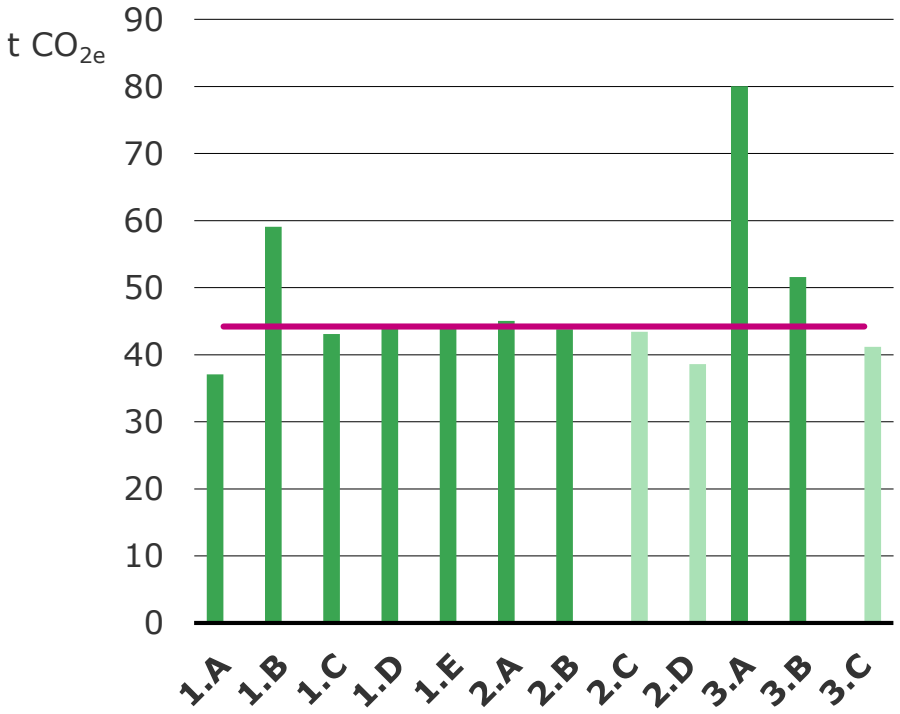
- Requires knowledge of system and life cycle assessment
- Bidders lack access to / understanding of data
- Data has to be checked to ensure comparability
- Producers of water technologies do not yet report their emissions
- Open source data has to be found
- CO_2-footprint is calculated during evaluation

RESOURCES

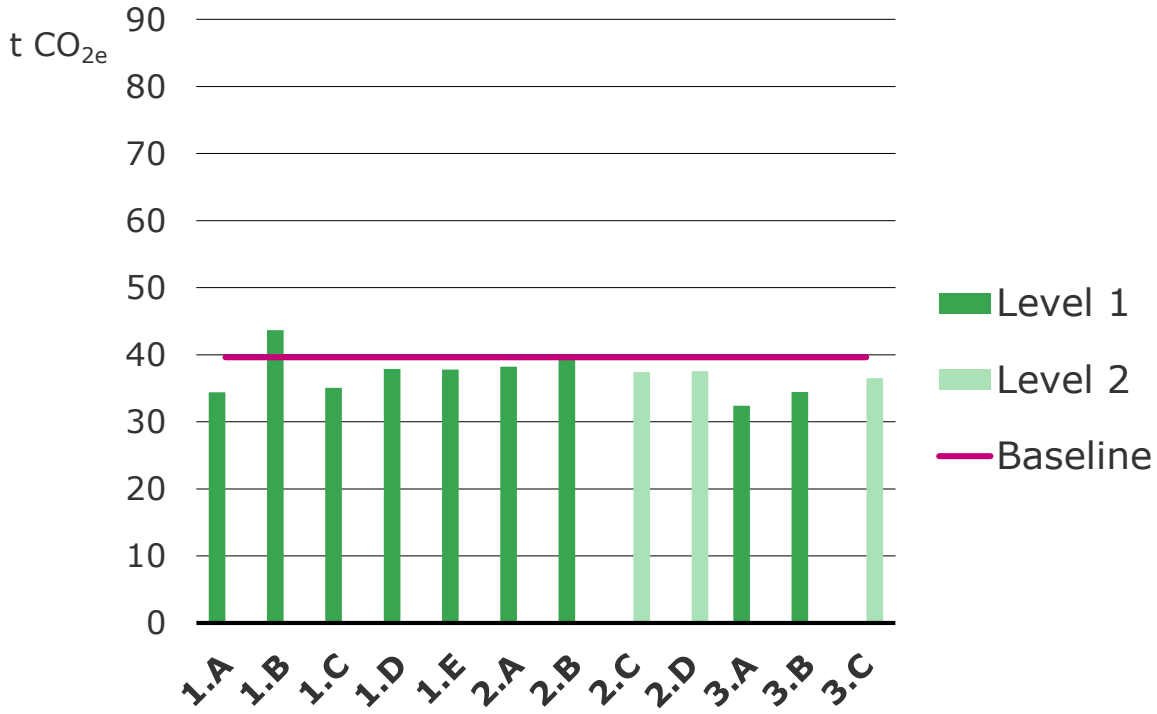
POTENTIAL

LEVEL 1 SCENARIO ANALYSIS: SANKT THOMAS ALLÉ

DETAILED LCA



OPEN SOURCE



1.A Short transport

1.B Long transport

1.C No ship transport

1.D Euro 3

1.E Euro 6

2.A Different concrete tile production process

2.B Different concrete production process

2.C Different drain

2.D Green strip

3.A Different asphalt production

3.B Different stone production

3.B Replacing 50% asphalt

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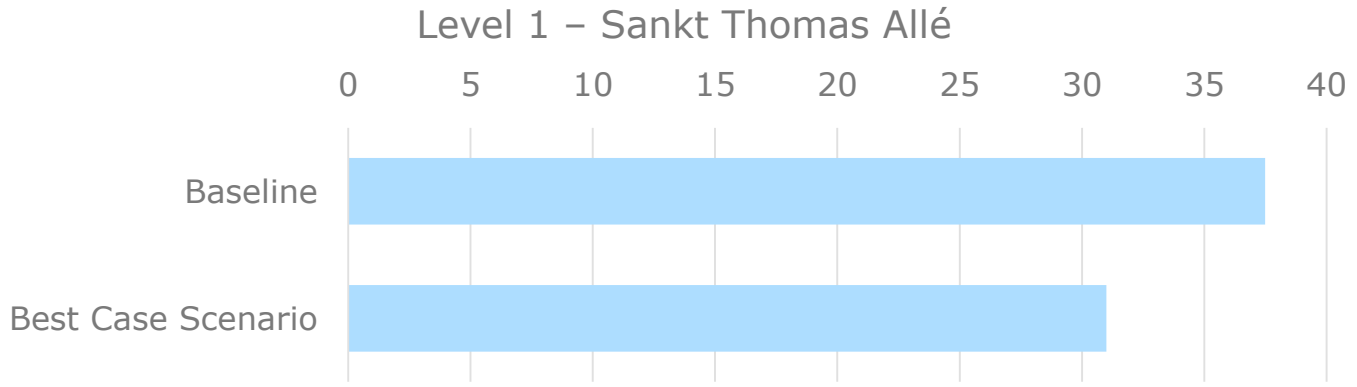
LEVEL 1: BEST CASE SCENARIO



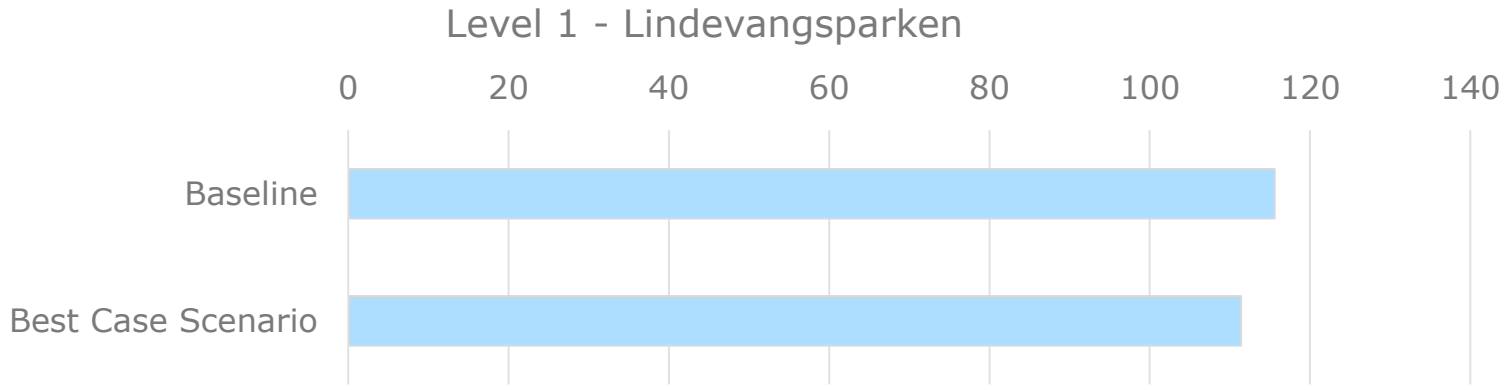
-16%

6 tCO2 captured

Shorter transport distances

No shipment of materials

Euro 6



-4%

4,2 tCO2 captured

Shorter transport distances

Shorter disposal distances

Euro 6

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EXAMPLE: TRANSPORT IN SUSTAINABLE PROCUREMENT
CLEANING PRODUCTS IN BELGIUM

Objective: greening municipal cleaning services and achieve the use of 100% environmental sound products in Ghent

The city incorporated multiple measures aiming at system-wide circularity:

- Cleaning products are delivered using vehicles meeting the emission standard EURO 6.
- Packaging uses 85% recycled cardboard; plastic bottles made from polyethylene high-density (PEHD) are 100% recyclable and include 10% recycled material; bottles made of polyethylene terephthalate (PET) are 100% recyclable and new bottles are made of 81% recycled materials.
- A fully automatic smart dosage system is provided; the device tracks different parameters to ensure savings of energy, water use and waste.
- Dosage bottle with an anti-spilling system are supplied. Such innovative products meet the criteria of the Cradle-to-Cradle gold label.[27]
- The supplier is responsible (at its own expense) to take back all packaging.
- Training on the use of the products is provided to all cleaning staff of the City of Ghent.

> "The City of Ghent communicated its needs and sustainability goals to its suppliers. This has positively influenced the availability of new ecological products and methods on the market"

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2 LEVEL 2
MORE FLEXIBLE TENDERS

2

Post	Betegnelse	Enhed	Antal Enheder	Enheds-pris	Kr.	Emission	kg CO_{2e}
02.	**JORDARBEJDER**						
02.01	**Rydning**						
02.01.01	Rydning af træer med stød	stk.	9			-	-
02.01.02	Tavler inkl. standere/galger at optage og lægge i depot for senere gensætning	stk.	7			-	-
03.	**AFVANDINGSARBEJDER**						
03.01	**Plastrør at levere og lægge**						
03.01.01	110 mm, SN8, dybde < 1,0 m, inkl. alle muffe, fittings etc. for arbejds udførelse	m	60			11,39	
03.01.02	160 mm, SN8, dybde 1,0-2,0 m, inkl. alle muffe, fittings etc. for arbejds udførelse	m	75			12,94	

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2

Post	Betegnelse	Enhed	Antal Enheder	Enheds-pris	Kr.	Emission	kg CO_{2e}
02.	**JORDARBEJDER**						
02.01	**Rydning**						
02.01.01	Rydning af træer med stød	stk.	9			-	-
02.01.02	Tavler inkl. standere/galger at optage og lægge i depot for senere gensætning	stk.	7			-	-
03.	**AFVANDINGSARBEJDER**						
03.01	**Rør at levere og lægge**						
03.01.01	110 mm, SN8, dybde < 1,0 m, inkl. alle muffe, fittings etc. for arbejds udførelse	m	60				
03.01.02	160 mm, SN8, dybde 1,0-2,0 m, inkl. alle muffe, fittings etc. for arbejds udførelse	m	75				

? Which solutions are possible?

? Who provides emission factors?

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2

Who is most capable of developing sustainable solutions of the future?

		MA	RESOURCES	POTENTIAL
Which solutions are possible?	Option 1: Bidders are given a choice between different elements	Requires development of different solutions in parallel		
Innovation tender could be a more feasible approach	Option 2: Bidders develop solutions based on open formulation (TBL, TAG, SAB)	Bidders lack access to / understanding of data		
		Solutions have to be checked to ensure feasability		
Who provides emission factors?	Option 1: Emission factors are given in the tender (open source)	Possible solutions are limited by the available emission factors		
	Option 2: The producers provide emission factors			
	Option 3: Bidders report emission factors	Data has to be checked to ensure comparability		

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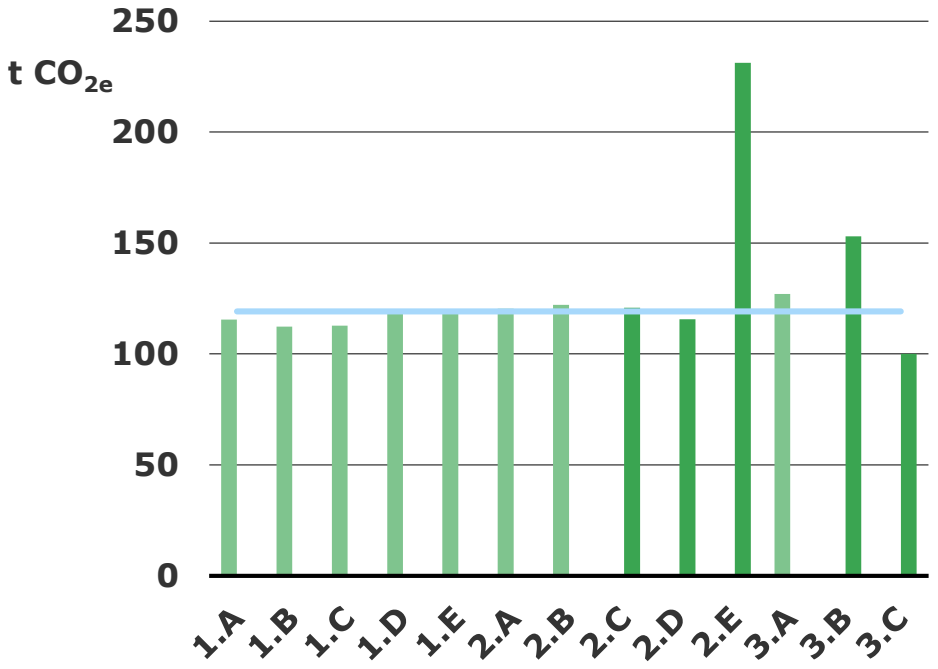
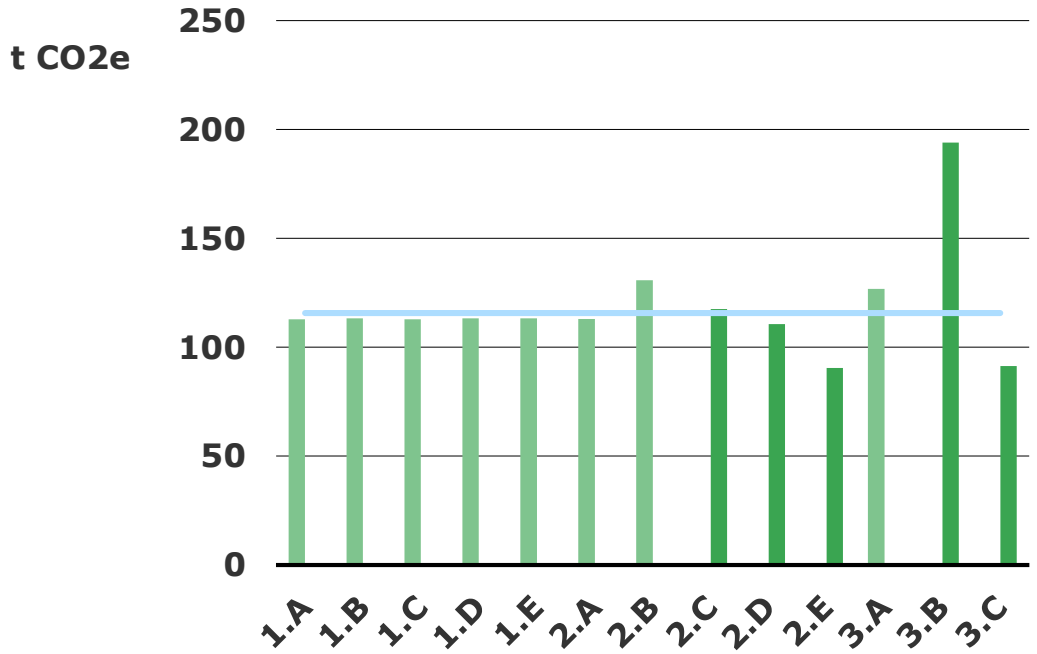
LEVEL 2 SCENARIO ANALYSIS: LINDEVANGSPARKEN

DETAILED LCA



OPEN SOURCE



1.A	1.B	1.C	1.D	1.E	2.A	2.B	2.C	2.D	2.E	3.A	3.B	3.C
Short transport	Shorter disposal transport	No ship transport	Euro 3	Euro 6	Different concrete production process	Different PP granulate production process	Only concrete pipes	Only plastic pipes	Only glass fibre reinforced plastic pipes	Different cassette production	Rock-wool volume	Gravel volume

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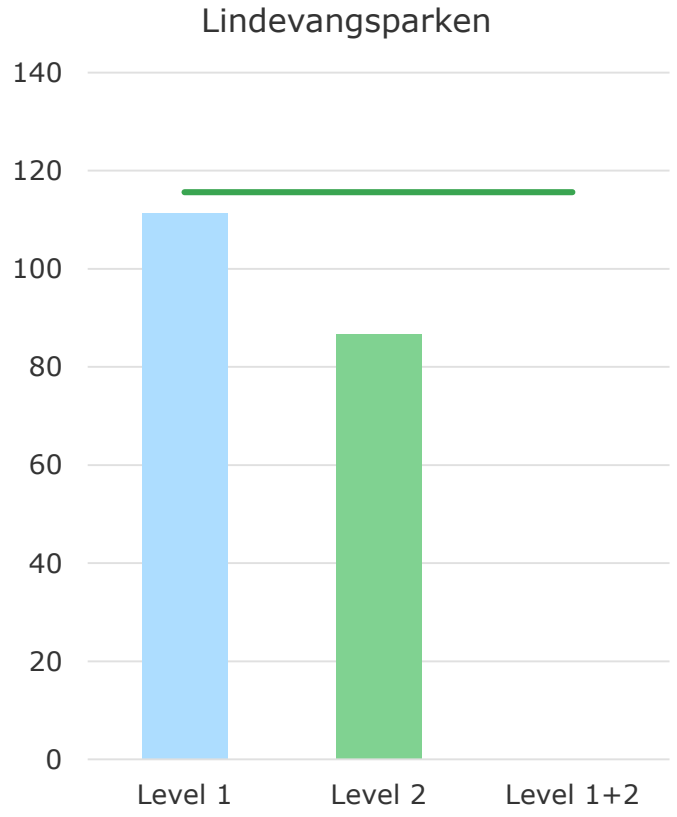
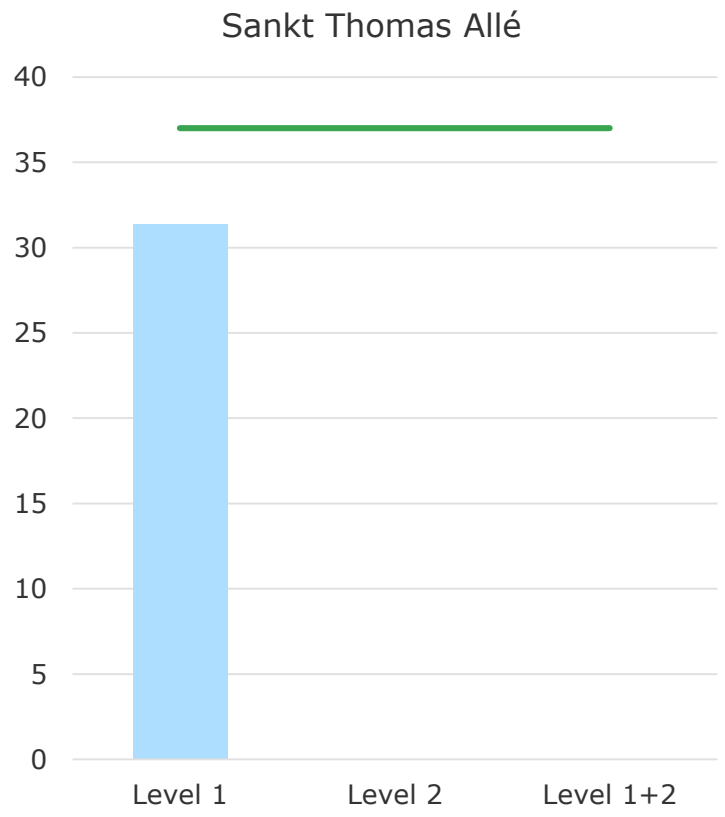
LEVEL 2: BEST CASE SCENARIO



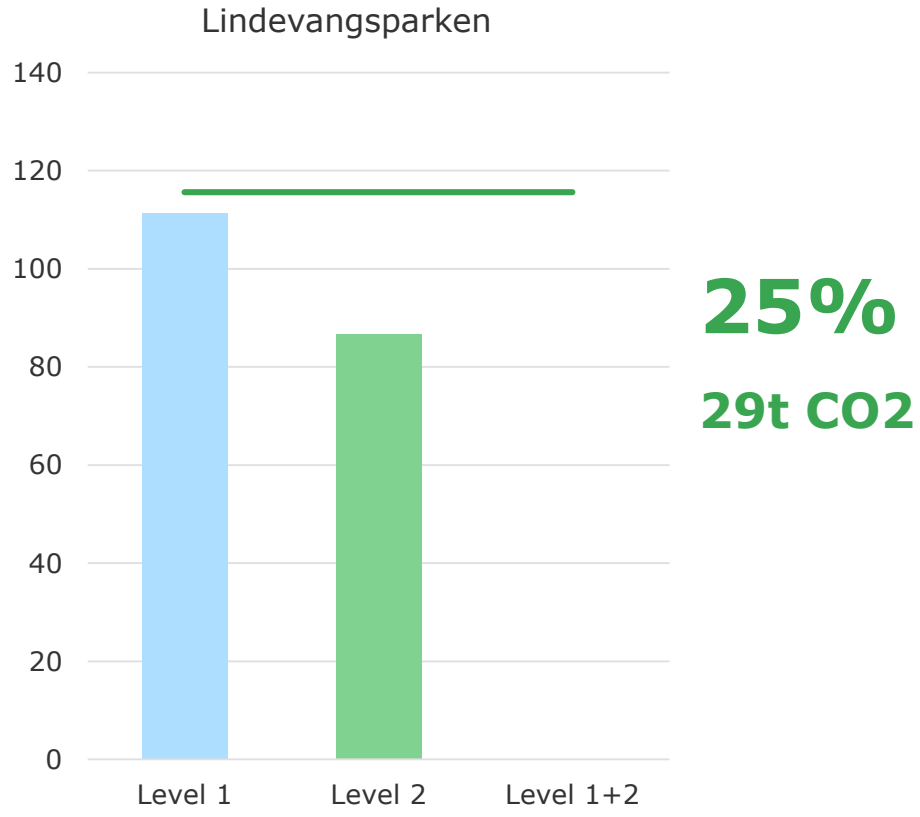
25%

29t CO2



Only plastic pipes
& Gravel volume

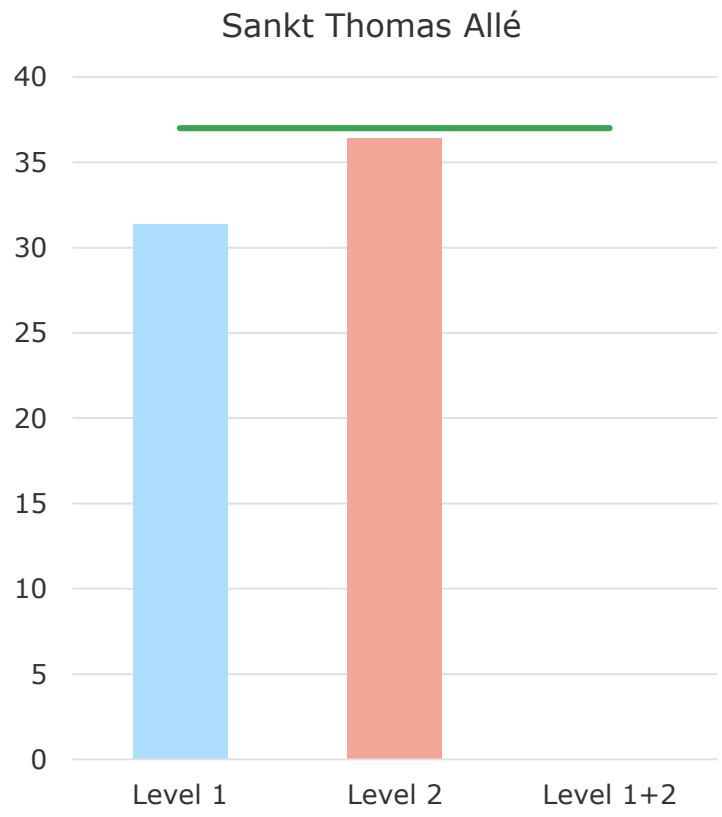
LEVEL 2: BEST CASE SCENARIO



25%

29t CO2

Only plastic pipes
& Gravel volume



4%

1t CO2

Different Drain
& Lawn grid stones

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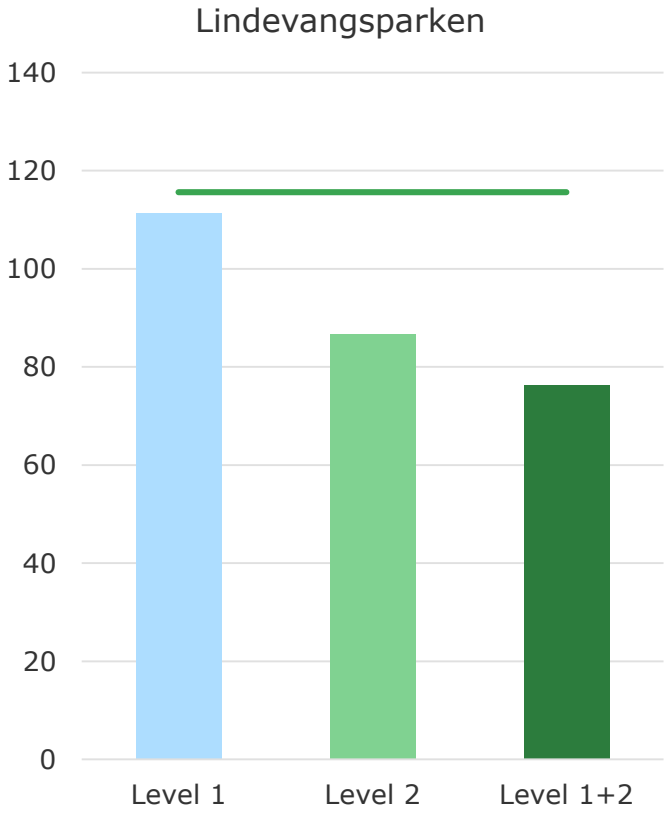
LEVEL 1+2: BEST CASE SCENARIO

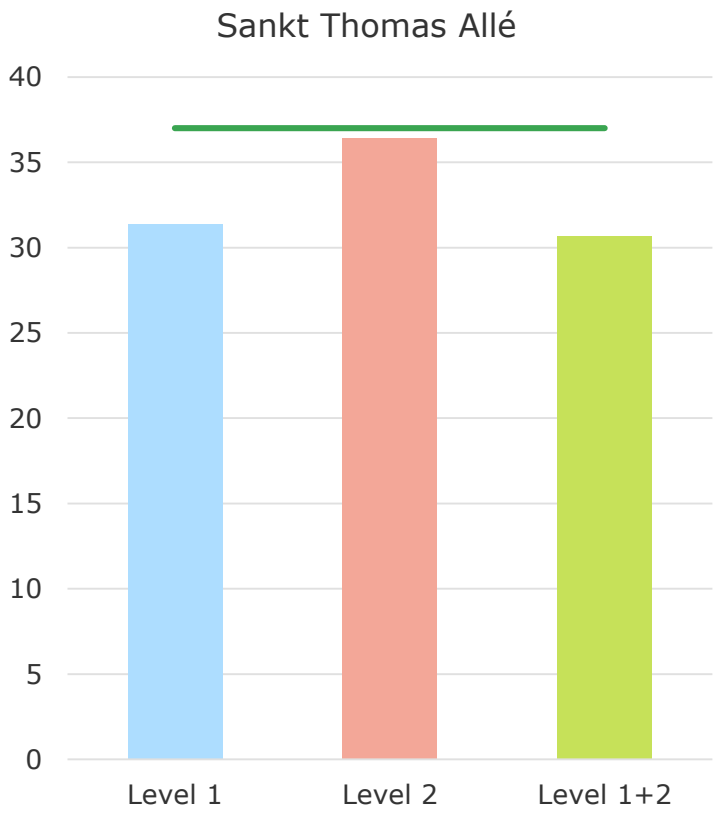


34%

39t CO2

Only plastic pipes & Gravel volume

Short transport distances



18%

7t CO2

Different Drain & Lawn grid stones

Shorter transport distances No Shipment

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3

LEVEL 3
CONSIDER SUSTAINABILITY BEFORE TENDERING

3

Post	Betegnelse	Enhed	Antal Enheder	Enheds-pris	Kr.
02.	**JORDARBEJDER**				
02.01	**Rydning**				
02.01.01	Rydning af træer med stød	stk.	9		
02.01.02	Tavler inkl. standere/galger at optage og lægge i depot for senere gensætning	stk.	7		
03.	**AFVANDINGSARBEJDER**				
03.01	**Plastrør at levere og lægge**				
03.01.01	110 mm, SN8, dybde < 1,0 m, inkl. alle muffe, fittings etc. for arbejds udførelse	m	60		
03.01.02	160 mm, SN8, dybde 1,0-2,0 m, inkl. alle muffe, fittings etc. for arbejds udførelse	m	75		

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3

Post	Betegnelse	Enhed	Antal Enheder	Enheds-pris	Kr.
02.	**JORDARBEJDER**				
02.01	**Rydning**				
02.01.01	Rydning af træer og genburg som inventar på lejeplads	stk.	9		
02.01.02	Tavler inkl. standere/galger at optage og lægge i depot for senere gensætning	stk.	7		
03.	**AFVANDINGSARBEJDER**				
03.01	**Grønne render**				
03.01.01	Grønne render, 1 m bredde, 0,1 m dybde	m	60		
03.01.02	Dræn, 110 mm, SN8, dybde < 1,0 m, inkl. alle muffe, fittings etc. for arbejds udførelse	m	75		

? How do we know which solutions are sustainable?

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3

How do we know which solutions are sustainable

Sustainability assesments throughout the planning process guarantee that the most suastainable solution is selected

MAIN CHALLENGES

Requires change in planning process and mindset

Resources within organisation often limited

RESOURCES

POTENTIAL

This approach can bring the largest savings, especially when applied on large scale

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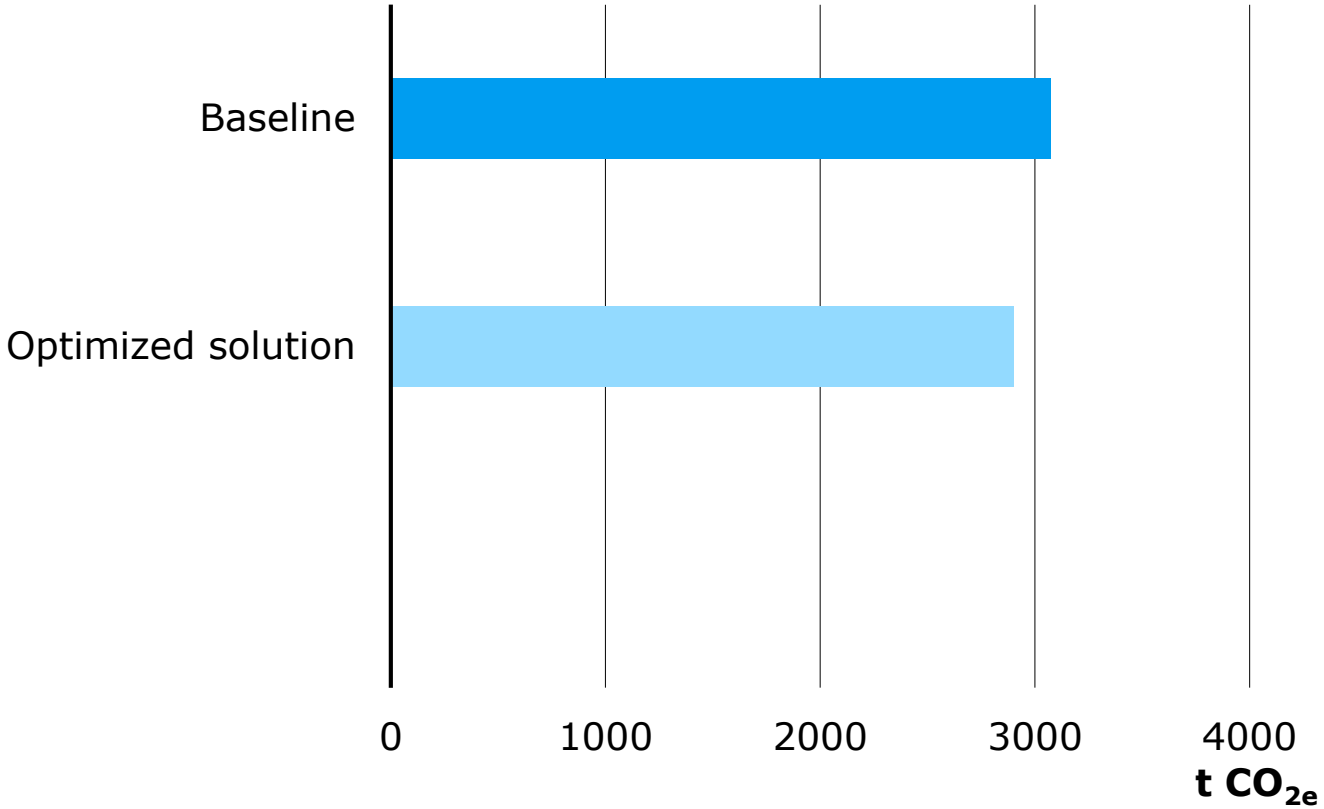
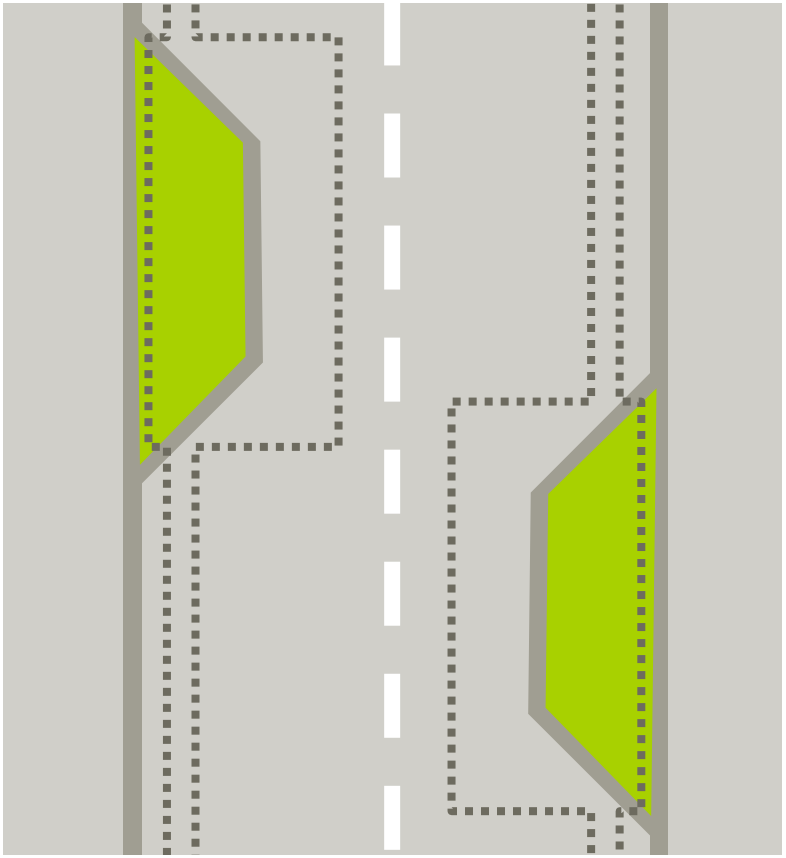
EXAMPLE: CLIMATE CHANGE ADAPTATION PROJECT





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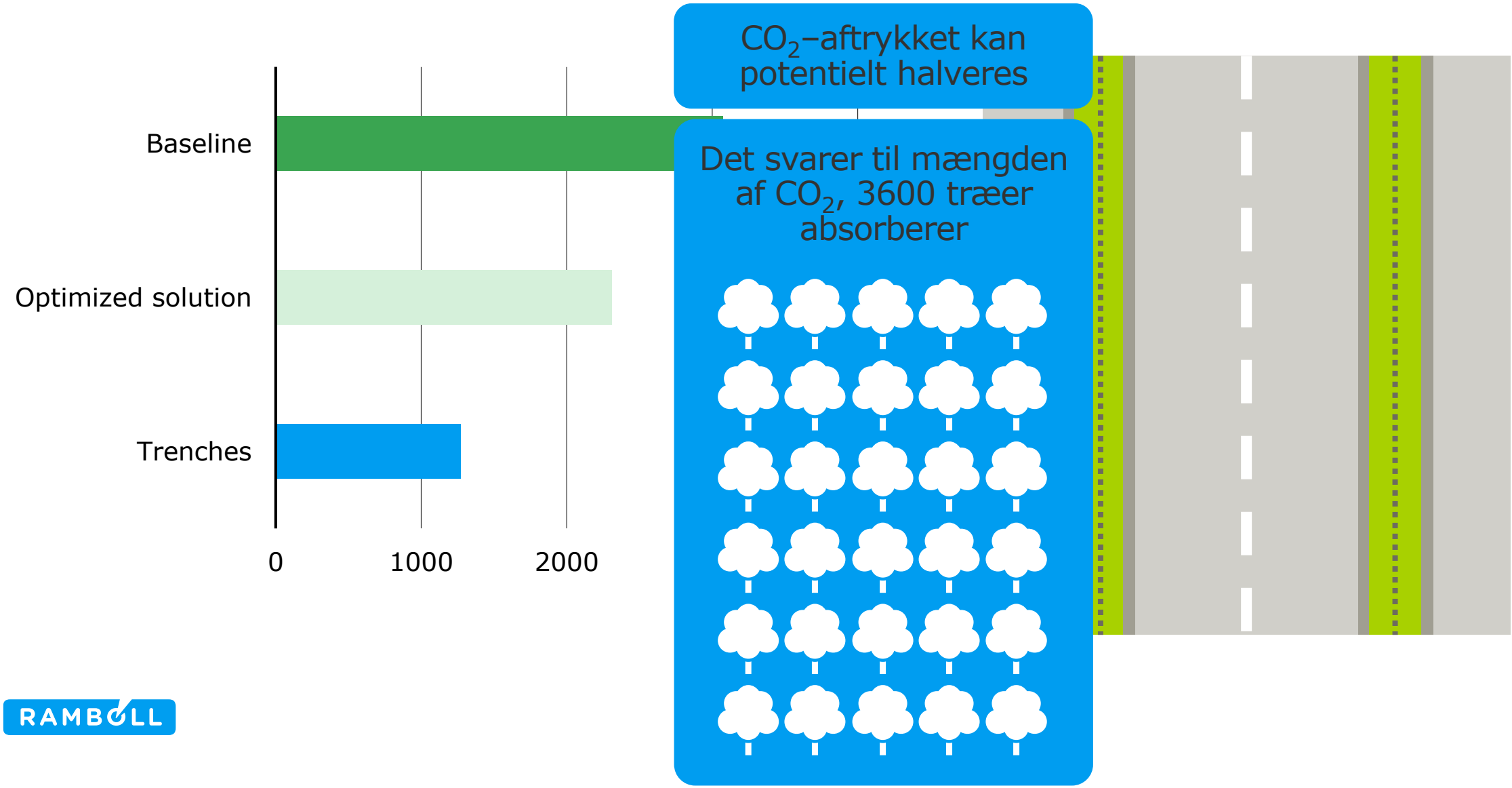
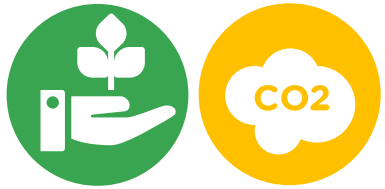
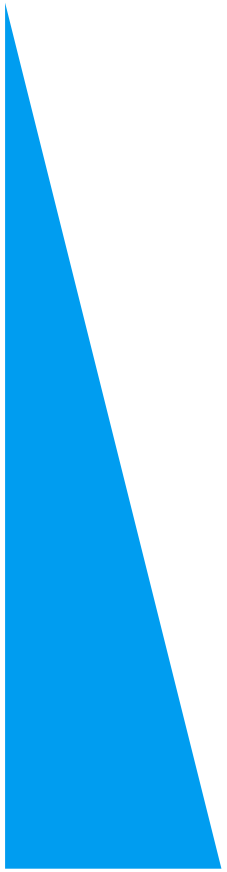
EKSEMPEL: KLIMATILPASNINGSPROJEKT



CONCLUSIONS AND POSSIBLE NEXT STEPS

	MAIN CHALLENGE	POTENTIAL	PROJECT SIZE	COMPLEXITY	FIRST STEPS
1	Missing availability of emission data				Hotspot analysis of standard projects Evaluation of available open source data Assessment of transport parameters
2	Resources within organisation often limited				Framework agreement with producers More flexible tenders for standard elements like pipes
3	Requires change in planning process and mindset				Integration of sustainility as a parameter in the planning of large scale and non-standard projects

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PROJECT DRAFFT
2 FINAL RESULTS

18.12.2020

RAMBØLL Bright ideas. Sustainable change.

NEXT STEPS

INCLUDING SUSTAINABILITY EVALUATION OF TRANSPORT (LEVEL 1)

OPEN QUESTIONS

- ✓ Which transport processes are most important (e.g. delivery of concrete, transport to soil depot)
- ✓ Which transport processes are possible (e.g. diesel, biodiesel, hybrid) → Caroline
- ✓ Do we ask for input data (e.g. transport distance) or for the footprint? → Sarah
- ✓ Which emission factors can be used? → Caroline, Sarah
- ❑ How could we ask for the relevant information → Caroline, Sarah, Steen
- ❑ How do we evaluate tender?

→ Show exemplarily for Sankt Thomas Allé → can be used for future green roads

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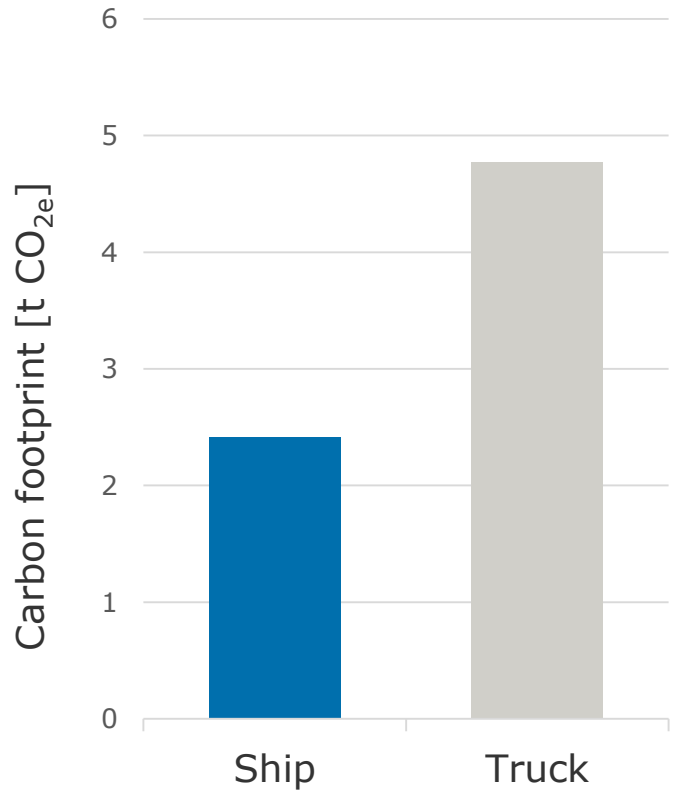
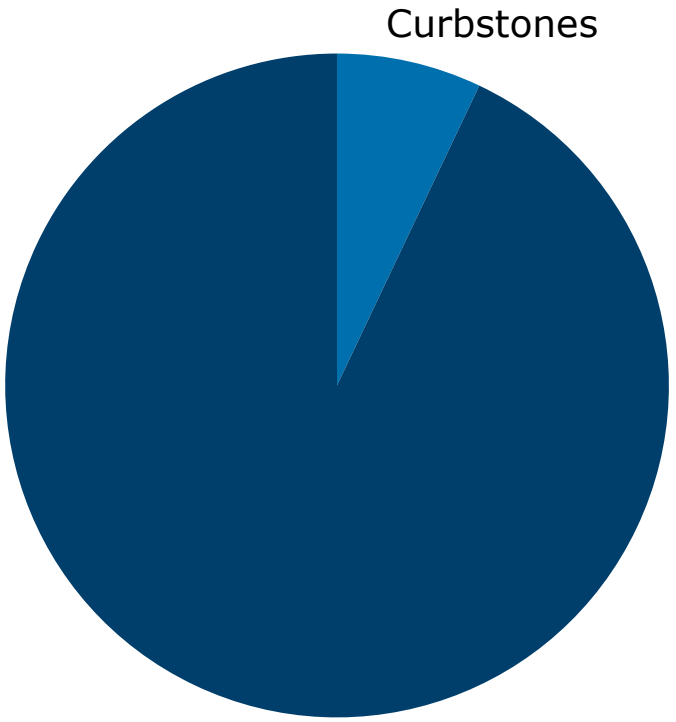
WHICH TRANSPORT PROCESSES ARE MOST IMPORTANT?
SANKT THOMAS ALLÉ (GREEN ROAD)

TRANSPORT TYPES



SHIP TRANSPORT



Where are cobblestones delivered from?

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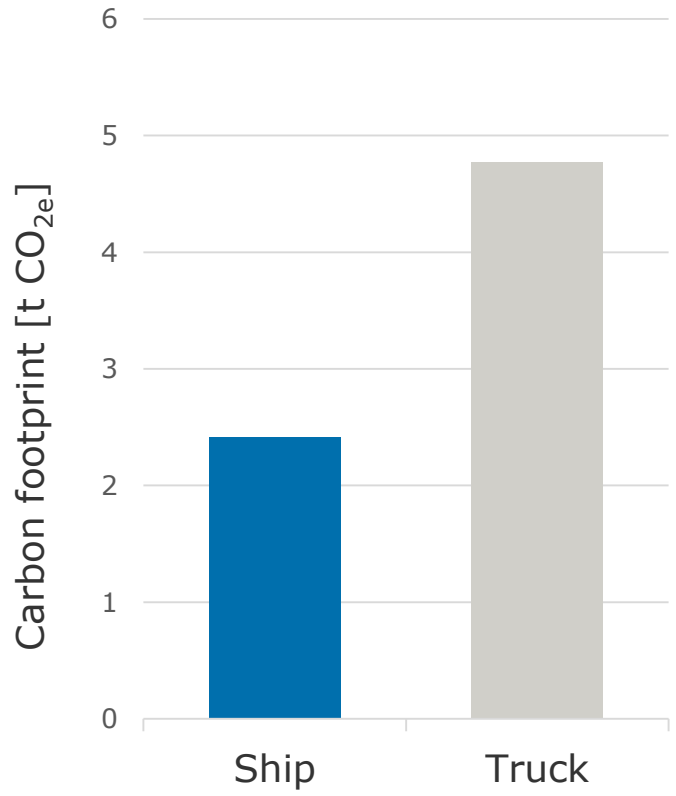
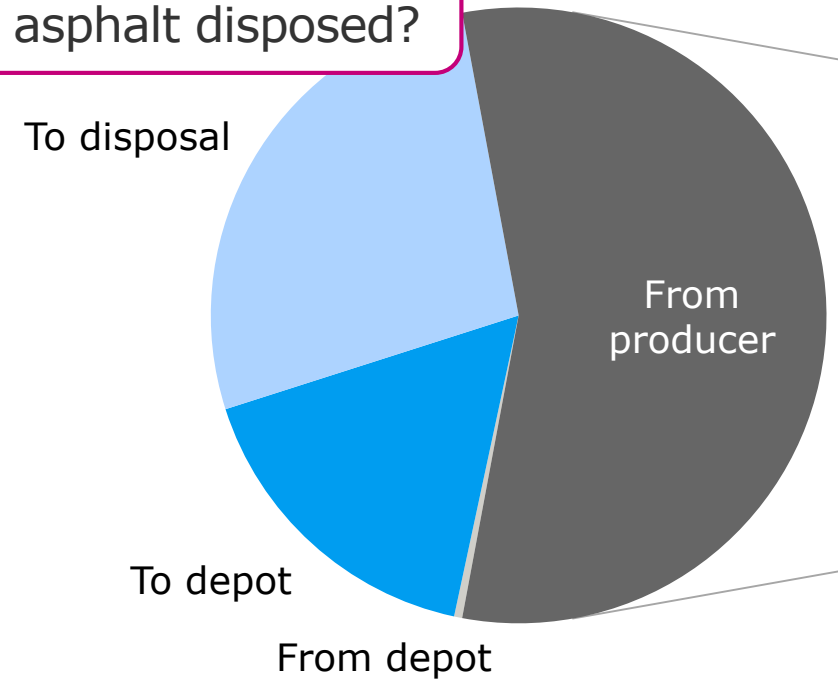
WHICH TRANSPORT PROCESSES ARE MOST IMPORTANT?
SANKT THOMAS ALLÉ (GREEN ROAD)

TRANSPORT TYPES

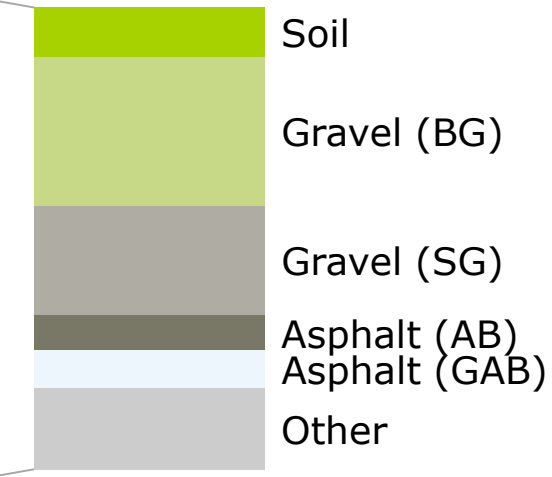


TRUCK TRANSPORT

Where are soil and asphalt disposed?



Where is gravel delivered from?



Where is the soil and material depot?

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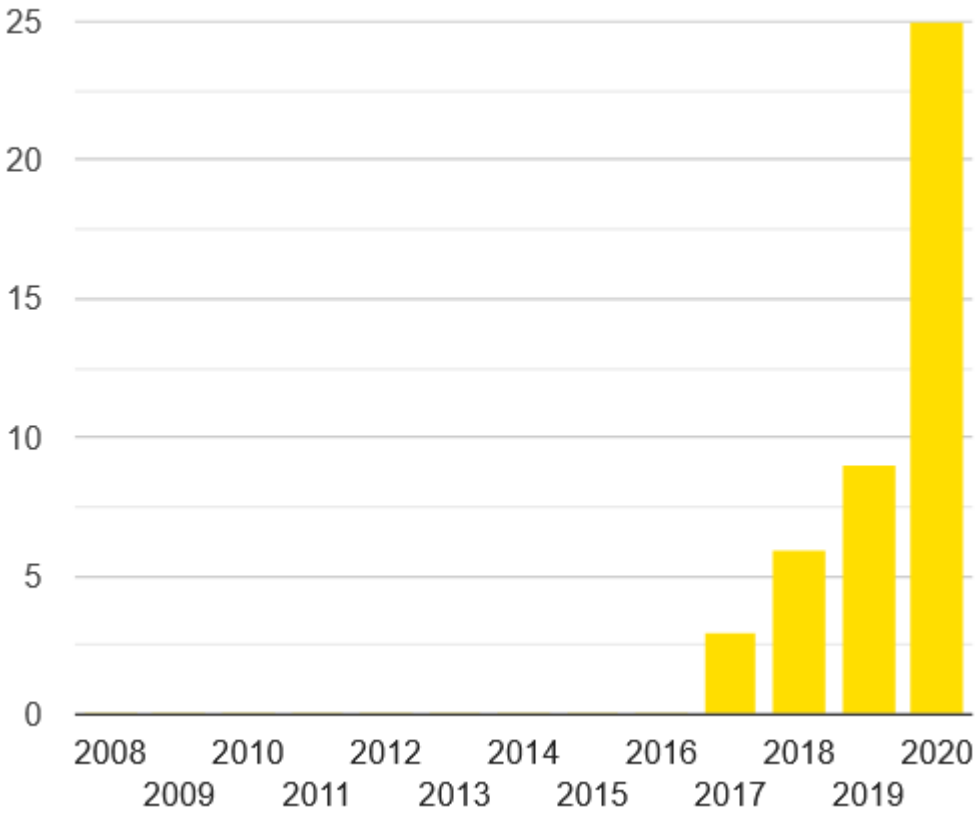
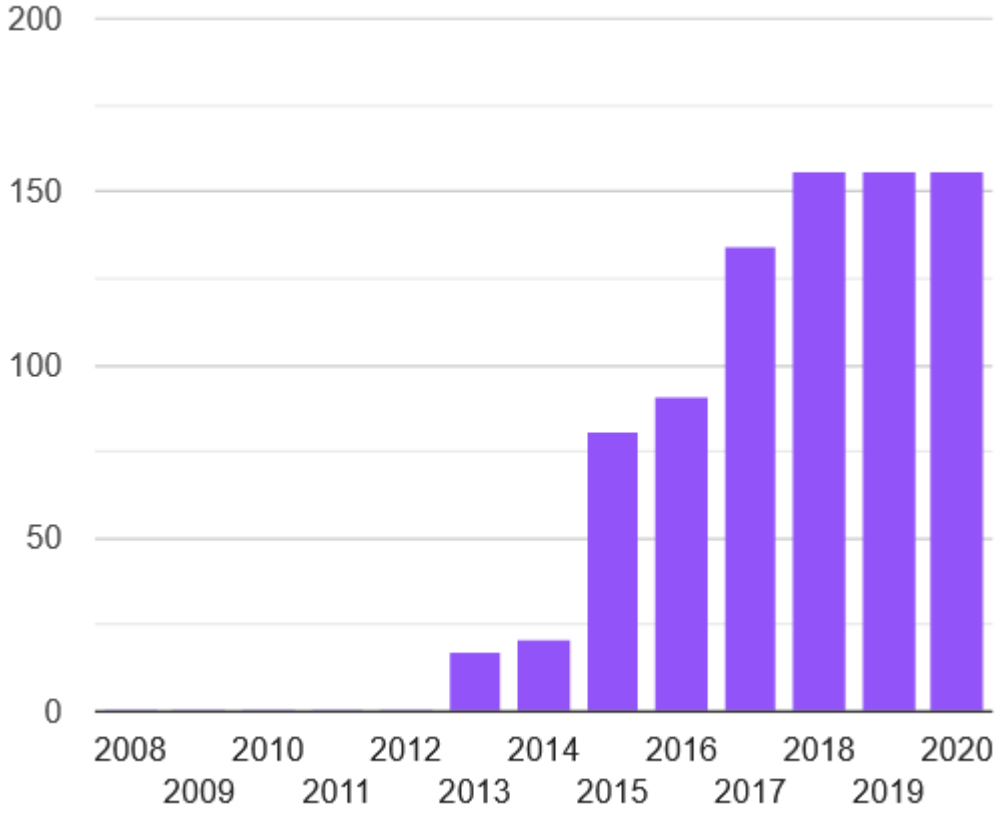
WHICH TRANSPORT PROCESSES ARE POSSIBLE?
ALTERNATIVE FUEL HEAVY DUTY VEHICLES DENMARK

BATTERY ELECTRIC VEHICLES (BEV)



COMPRESSED NATURAL GAS (CNG)



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H2, PHEV (Plug in Hybrid Electric Vehicle), LNG: No Infrastructure, No Fleet

Dec 11, 2019 - 04:16 pm

Volvo electric heavy-duty and regional use trucks

BEV | ELECTRIC TRUCKS | EUROPE | VOLVO TRUCKS

After Volvo Trucks recently started selling electric trucks for urban traffic, the manufacturer now plans to introduce heavy electric vehicles for construction and regional distribution and has developed two concept trucks.

These are a four-axle tip truck and a semi-trailer tractor. Volvo Trucks has not yet mentioned any technical details. The company plans to initially deliver the vehicles in small quantities to selected customers in Europe and says that a more comprehensive market launch will take place at a later date.

Although some experts and companies prefer fuel cell solutions for heavy trucks, Volvo Trucks also believes in battery-electric models in this class. Only in November did the Swedes start selling the FL Electric and FE Electric electric models in selected European markets. https://www.electrive.com/2019/12/11/volvo-trucks-concepts-electric-heavy-duty-and-regional-use/

Nov 27, 2020 - 12:29 pm

Scania launches BEV & PHEV truck series

BEV | ELECTRIC TRUCKS | PHEV | SCANIA | VOLKSWAGEN

Truck manufacturer Scania says it has reached a milestone in electrification: the first commercial electric truck series from the Swedish VW subsidiary has now been launched on the market. Like the fully electric truck, the plug-in hybrid is also being delivered now and is similarly intended for urban distribution traffic.

Scania started selling the two vehicle models in mid-September. Scania's BEV truck has an output of 230 kW and is offered with battery capacities of 165 and 300 kWh for ranges of up to 250 km. The PHEV truck can cover 60 kilometres on pure electric power.

https://www.electrive.com/2020/11/27/scania-announces-market-launch-of-bev-phev-trucks/

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WHICH TRANSPORT PROCESSES ARE POSSIBLE?
AVAILABLE ALTERNATIVE FUELS

	Green alternatives 2019-2021	Green alternatives 2022-2025
Trucks	• Biogas trucks for distribution are available today. • It is possible to use synthetic fossil-free diesel (HVO) at an additional cost of 20/30%. • Hybrid trucks are available on the market and can contribute to significant reductions in diesel consumption.	• Some electric trucks will come on to the market, but still too early for a major intrusion. • Electric hybrid trucks will also find greater penetration. • Biogas will continue to be a relevant alternative.

Analysis on making requirements for supplier transport to Copenhagen's Kommune representing the possibilities for conversion to green vehicle alternatives in the short and medium term (COWI)

Grøn transport i værdikæden - Inspiration og gode råd til indkøbere og leverandører af transport (POGI)

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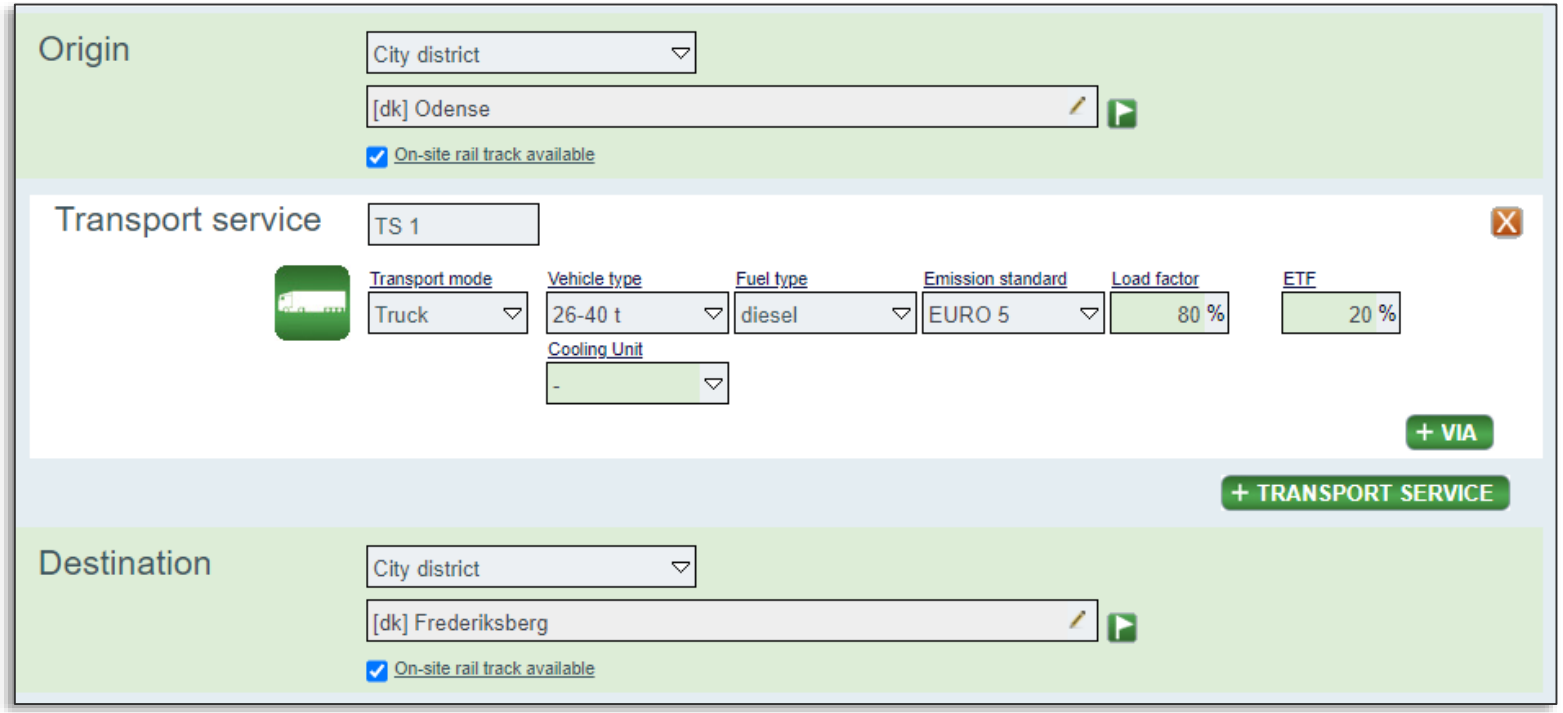
WHAT INFORMATION DO WE ASK FOR?
OPTION 1: WE ASK FOR THE CO2 FOOTPRINT

- We define the calculation method / tool in the tender to ensure transparency
- This can e.g. done with the ecotransit website (www.ecotransit.org)

  - Standard values could be given as a baseline
  - If bidders deviate from standard values, they have to provide documentation (e.g. different fuel type)

→ Very difficult to control and verify the detailed inputs

→ Requires time and resources from bidder



WHAT INFORMATION DO WE ASK FOR?
OPTION 2: WE ASK FOR INPUT DATA

- We ask for input data to calculate the CO_2-footprint, not the CO_2-footprint itself to
  - Ensure comparability
  - Limit the time and resource requirements for the bidders
  - Ensure transparency
- Emission factors have to be provided to allow bidders to optimize regarding sustainability

→ **Numerous databases exist providing different emission factors**

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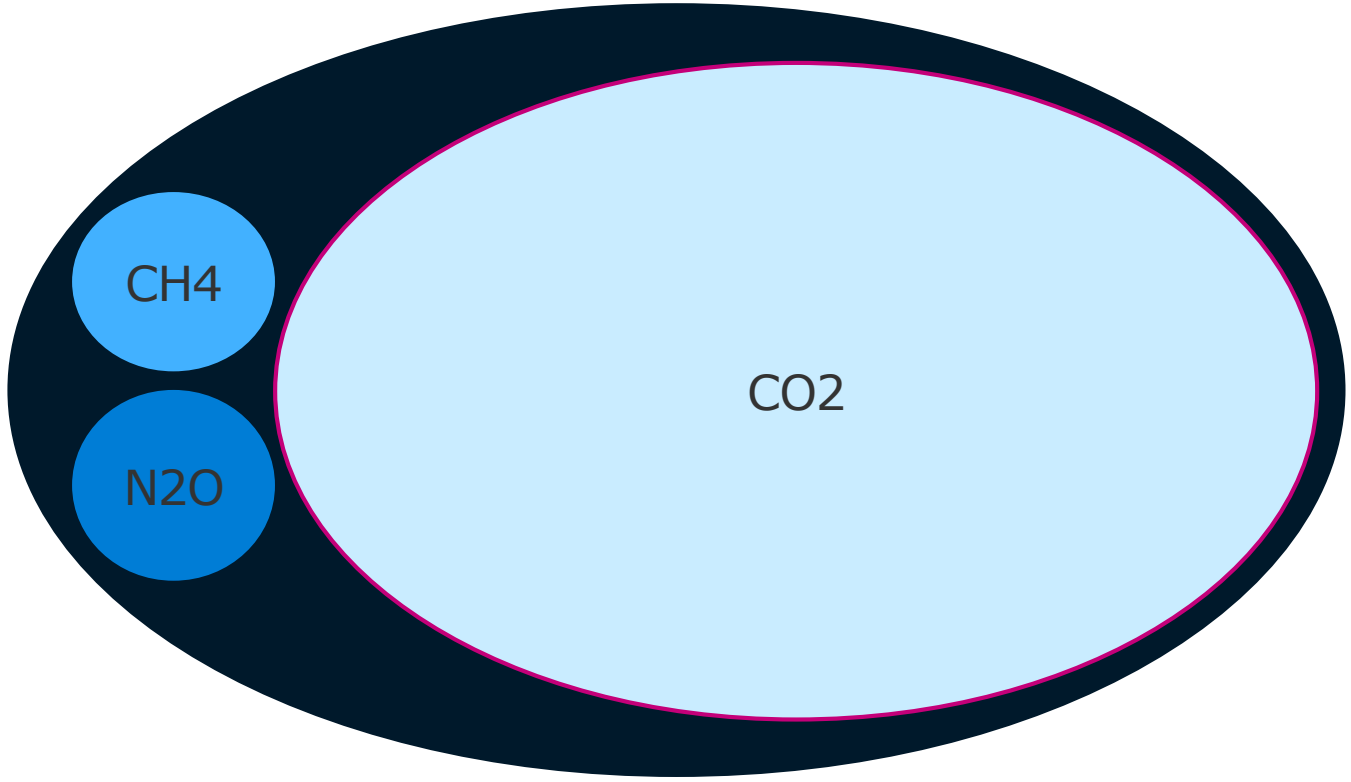
WHICH EMISSION FACTORS CAN BE USED?
WHICH GREENHOUSE GAS EMISSIONS ARE IMPORTANT?

Vehicle	Standard	CH4	N2O	CO2	CO2e
Earth moving Lorry 32t	EURO VI	0.00%	1.70%	98.1%	100%

→ We can compare the emissions by only looking at CO2 parameter



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WHICH EMISSION FACTORS CAN BE USED?
WHAT EMISSION DATABASES CAN WE USE?

EMSA THETIS-MRV | EU MRV | CO_2 EMISSION REPORT | REGISTER | FAQ | Login

Publication of information in accordance with Article 21 of Regulation (EU) 2015/757 on the monitoring, reporting and verification of CO_2 emissions from maritime transport. Information is accessible through the search tool or can be exported in a spreadsheet for further analysis. Since 30 June 2020, all the verified information submitted by companies to the European Commission for the reporting year 2019 is accessible.

IMO Number | Ship Name | Reporting Period | Ship type

Search | Reset

	IMO	Name	Ship Type	Technical efficiency		Reporting Period	Total CO_2 emissions [m tonnes]	CO_2 emiss. per distance [kg CO_2 / n mile]	CO_2 emiss. per transp. work
				Type	(gCO_2/t·nm)				
Actions	5383304	ASTORIA	Passenger ship	EIV	169.16	2019	24512.83	502.27	2115.78 g CO_2 / pax · n miles
Actions	5383304	ASTORIA	Passenger ship	Not ...		2018	20080.25	442.71	993.14 g CO_2 / pax · n miles
Actions	6417097	MARCO POLO	Passenger ship	EIV	68.95	2019	26799.64	474.29	652.52 g CO_2 / pax · n miles
Actions	6417097	MARCO POLO	Passenger ship	Not ...		2018	25689.03	454.65	639.96 g CO_2 / pax · n miles
Actions	6511128	RED STAR 1	Ro-pax ship	EIV	23	2019	4909.30		

Some databases provide information, that is too detailed

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WHICH EMISSION FACTORS CAN BE USED?
WHAT EMISSION DATABASES CAN WE USE?

	EEA	Lipasto	Lipasto	Ökobaut	ELCD	HBFEA	DK epd adapted
EURO 5							
General	Rural Driving	Urban driving	Urban driving			Germany	
Gross vehicle mass	32t	40t	40t	20-26t		Heavy Duty Vehicle	28-3
Payload capacity		25t	25t	17.3t			22t
Payload		Fully loaded	70%	85%			61%
CO2e kg/tkm		0.08	0.07	0.09	0.06		0.07
CO2e kg/km	0.68	0.95				0.79*	
CO2 kg/tkm		0.08	0.07		0.06	0.05*	

Different vehicles

Different units

Different calculation method

Different loads

Databases are not comparable and should not be combined

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WHICH EMISSION FACTORS CAN BE USED?
WHAT EMISSION DATABASES CAN WE USE?

	CO_{2e} [g/km]		CO_{2e} [g/tkm]	
Emission standard	Empty	fully loaded (25t load)	partially loaded (e.g. 70%)	fully loaded (25t load
--> 1992	657	946	49	38
EURO I (1993 - 1996)	637	926	48	37
EURO II (1997 - 1998)	628	974	50	39
EURO III (1999 - 2003)	630	976	50	39
EURO IV (2004 - 2007)	625	960	49	38
EURO V (2008 - 2013)	636	971	50	39
EURO VI (2014 -->	628	880	46	35
Average in 2016	**630**	**962**	**49**	**38**

Freight ships

- Container ships
- Roro and ropax ships
- Carcarriers
- Bulk carriers
- General cargo ships
- Pusher barges
- Tankers
- Chemical ships

There are no databases, that have factors for all relevant fuel types

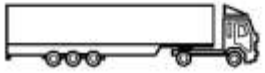
Delivery lorries

Light (6 t)
- Highway driving
- Urban driving
- Delivery driving

Heavy (15 t)
- Highway driving
- Urban driving
- Delivery driving

Trailer combinations

Semi trailer



- Highway driving
- Urban driving

Full trailer (60t)

- Highway driving
- Urban driving

Full trailer (76 t)
- Highway driving
- Urban driving

Earth moving

- Highway driving
- Urban driving

WHICH EMISSION FACTORS CAN BE USED?
ONE DATABASE & REDUCTION FACTORS

- Theoretically biofuels are carbon neutral, however the cultivation phase and conversion of land lead to increased CO2 emissions
- To ensure the negative effects of biofuels are minimized in their production phase the European Commission defined sustainability criteria in the Renewable Energy Directive II

"Greenhouse gas emissions from biofuels must be lower - at least 50%"

Greenhouse gas savings threshold in RED II	
Plant operation start date	Transport biofuels
Before October 2015	50%
After October 2015	60%
After January 2021	65%

Reduction factor

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HOW CAN WE INCLUDE THIS IN THE TENDER?
OPTION 1: WE INCLUDE ADDITIONAL COLUMNS IN THE TBL

Post	Betegnelse	Enhed	Antal Enheder	Enheds-pris	Kr.	Post I alt kr.	Transport distance (in km)	Origin/destination	Fuel	Technology
06.02	Asfaltbeton (AB) at levere og udlægge									
06.02.01	25 mm AB type 8t på kørebane	m²	1450							
06.03	Grusasfaltbeton (GAB) at levere og udlægge									
06.03.01	85 mm GAB I på kørebane	m²	550							

- We colorcode the fields that are to be specified
- Mandatory to fill in transport distance and origin/ destination while the fuel and transport is optional
- Additional document for more detailed information on the origin/ destination (and fuel/ technology)
- More detailed information: Truck size, payload are difficulte to ask for…

  → We can‘t say whether the specified truck is available on the day it is needed

  → The payload is assumed to be maximized for economic efficieny

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→ Contract conditions need to be aligned

HOW CAN WE INCLUDE THIS IN THE TENDER?
OPTION 2: WE PROVIDE A SEPARATE QUESTIONNAIRE

Example Skt Thomas Allé

Additional Questionnaire: Transport and Logistics

Part A

1) Suppliers

Please fill in the following information on the supplier of the indicated materials

Post	Material	Supplier information		
		Country	Name	Addres
02.03.01	Vækstmedie			
04.01.01	Bundsikring			
05.01.01	SG II			
05.01.02	SG			
06.02.01	AB			
06.06.01	AB			
06.03.01	GAB			
07.03.02	Grus foundation			
07.04.01	Grus foundation			
07.04.02	Grus foundation			
07.01.02	Fasgranitkantsten			
07.03.02	Chaussesten			

2) Deposit

Please fill in the following information for the depot of the indicated materials

Post	Material	Location information		
		Country	Name	Addr
02.04.02	Grus			

Ask for detailed information on pavement materials

Ask for the origin of granite

Part B

4) Alternative fuelled vehicles

4.1. Do you make use of alternative fuelled vehicles for transportation of materials for instance biodiesel?

- ☐ Yes, please specify the biodiesel
- ☐ No
- ☐ Other, please specify the type of alternative fuel and vehicle type

…e vehicles for material transport that run on alternative fuels in percentage of …al fleet

- ☐ All vehicles – 100%
- ☐ Partially, please specify ____%
- ☐ None – 0%

… and for machinery

5) Additional Notes/ Comments

→ procurement laws need to be examined for each case

HOW CAN WE INCLUDE THIS IN THE TENDER?
ADAPTATION OF THE TENDER MATERIAL AND PROCESS

Both option 1 and 2 further require

→ Decide whether to set minimum requirements for the use biodiesel

→ Define the awarding criteria correspoding to sustainability goal

e.g we could use „best price/ quality ratio" with sustainability as sub catergory and transport as sub-sub category

→ Inform the bidder on the method and weighting of criteria (e.g. 60% price, 20% quality, 20% sustainability)

→ Set the documents as mandatory to be filled and handed in to participate

→ Provide a description for the documents

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HOW DO WE EVALUATE OFFERS?

With the right awarding criteria in place we need to decide on how to evaluate the offer

1) **Converte input data from bidders**

   *distance*fuel factor* CO2 factor = CO2 Emissions from transport*

2) **Evaluate by e.g. assigning points for significant performance in "CO2 Emissions from transport"**

3) **Sum-up points across categories with corresponding weights**

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INTERVIEWS WITH GREEN ROAD ENTREPRENØRS

Could you fill out specific information on the type and size of truck before hand?

"Yes, in theory that would be possible. But the specifications would not be absolutely perfect because we don't know if the truck will actually be available on that day."

Do you use biodiesel? Would it be possible to transport everything with biodiesel?

"Yes, it would be possible, and it is already done, but Biodiesel is by far not the usual case. The costs are higher, and the fuel consumption is higher (requires about 10-20% more fuel)."

Where is the depot setup?

"Copenhagen Kommune has set up the biggest depot in the harbor area (Nordhavn). There they get sorted in terms of size and reuse. […] It would be best if the materials were deposited and processed on site instead of driving 500 trucks through the whole city. But norms are restrictive due to the noise and pollution the local residents would be exposed to."

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INTERVIEWS WITH GREEN ROAD ENTREPRENØRS

When purchasing granite curbs or other products made of natural stone, do you choose a local or a producer from overseas?

"Come from China, the origin is very important for the visuals/ aesthetics. We would always prefer Nordic stones. But Nordic stones are 3-4x more expensive due to less supply and smaller scale mining. Portugisisk stones are also used quite often."

How do you judge the possibility to decrease transport distances and make use of alternative fueled vehicles?

Alternative fueled vehicles *"2 possibilities in Copenhagen -Biodiesel and EV. Biodiesel works of course associated with a bit higher costs. Electric vehicles are on the move. Currently they have a transportation capacity of two and a half tones. Smaller construction machines –diggers - exist for small jobs such as loading trucks. The out phasing of fossil fueled diesel engines will probably take 5-10 years, but biodiesel is a good solution for this transition time."*

Decreasing transport distances *"We have made some sketches on how to process asphalt and concrete direct on site. To do this changes of norms are required. Is it worse to have some noise in one location and better to drive trough the whole city with trucks?"*

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OUTLOOK: PLANNING PHASE

Could we use less materials?

→ Material amounts are determined witihn current road construction standards

„Are really 25cm gravel needed, 10cm might be enough"

Could we use more recycled materials?

→ Entrepreneurs see a high potential to incorporate a higher amount of reused and recycled materials when addressed within planning phase

„Right now approx. 20-30% are secondary materials, we could achieve 50%"

Could depots be set up closer to construction site?

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LEVEL 1 IN SUMMARY

1 Relevant transport processes

2 Emission factors	ECO Transit	LIPASTO
	+ Specific Fuel Reduction Factors	
3 What information to ask for?	Ask bidder for CO2 footprint	Ask bidder to provide input data: km, fuel
4 How to ask for information in tenders?		Additional TBL Columns; Questionnaire
Characteristics	Difficulte to check Time intense for bidder	Transparency Comparability

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→ **Alignment with legal requirements, tender documents & process**

NEXT STEPS

FRAMEWORK AGREEMENTS WITH PRODUCERS (LEVEL 2)

Important to remember:
material production processes account for 60% of the impacts

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SUSTAINABLE FRAMEWORK AGREEMENTS
PROCUREMENT PROCESS

Hotspot analysis of the product	Dialogue with producers	Formulation of tender material	Evaluation of the bids	Translation into a score
Which processes in the production processes cause the highest CO_2-footprint?	How can hotspots be documentet, e.g. consumption of raw materials or electricity?	What parameters have to be reported and how? What open source data can be provided to calculate the CO_2-footprint?	How do we weigh the single parameters relative to each other? How do we take into account that the producer can not influence all parameters?	How do we communicate the outcomes of the sustainability evaluation? How can we create an incentive for producers to develop more sustainable practices?

The process is complex and requires careful planning, but has a large potential for creating change within the sector

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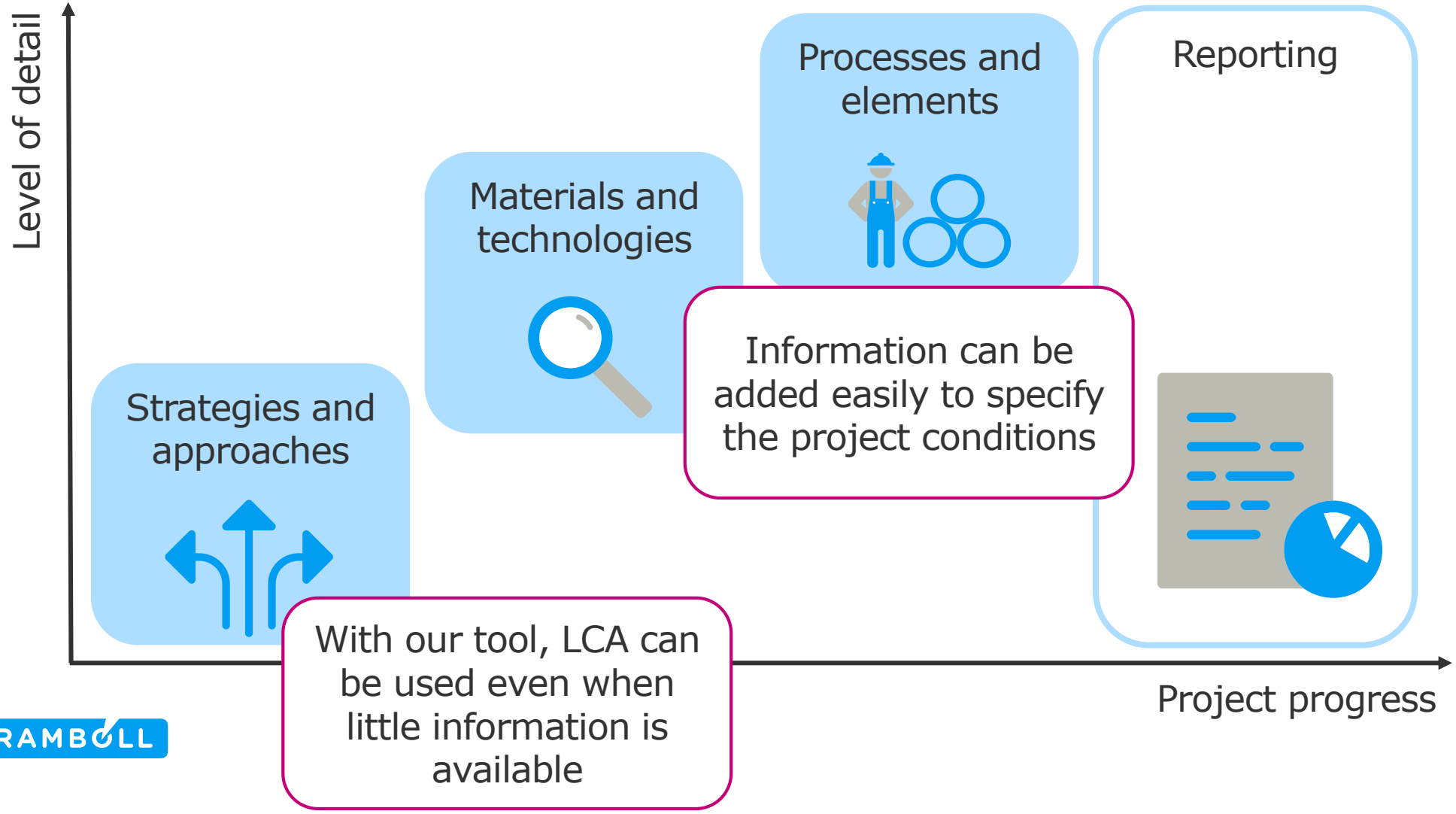
NEXT STEPS

INTEGRATION OF SUSTAINABILITY IN THE PLANNING (LEVEL 3)

SUSTAINABILITY THROUGHOUT PROJECTS

LCA IS USED TO SUPPORT DECISIONS ON DIFFERENT LEVELS



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THANK YOU!

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