Cost – benefit and climate

Project direktør Sustainability Ketil Søyland
About Norconsult

Norconsult is Norway’s largest and one of the Nordic region’s leading interdisciplinary consultancy firms, with activities spanning several continents.

Through innovative and targeted advice, we contribute to a sustainable society.

Key figures

- 3,800 Employees
- 101 Offices
- 11 Business areas
- 20,000 Projects
- 5,3 Billion NOK revenues*
- 44 Countries in which we have projects

* Per. 31.12.2018
Goals and Ambitions

NOK, SEK, DK
Time
Operation and Maintenance

Safety, HSE
Architecture
Energy consumption
Politics
Flexibility
Mobility

Life on land and in water
Noise, air pollution, archeology ....
Green house gas emissions
Flight Shame or Material Shame?

- Oslo – Paris round trip 302 kg CO₂/per person (source SAS climate calculator)

- Concrete
  - 1 m³ B45 no requirements. 420 kg CO₂
  - 1 m³ B45 best lowcarbon A 240 kg CO₂
Why?
GHG budget FRE16 Ringeriksbauen

- JET-pel: 2%
- JBT: 2%
- Elektrisitet: 1%
- Asfalt: 1%
- Annet: 7%

- Plastspørt betong: 22%
- Kamstål: 17%
- Sprøytebetong: 9%
- Massetransport: 8%
- Stål-pel: 7%
- Sement: 7%
- Sprengning: 3%
- Skinnestål: 3%
- Betongelementer: 2%

Other: 13%
Goal

Large Contributors

Measures

Implement

Creative process
### Low Carbon Concrete

<table>
<thead>
<tr>
<th></th>
<th>B20 M90</th>
<th>B25 M90</th>
<th>B30 M60</th>
<th>B35 M45/MF45</th>
<th>B35 M40/MF40</th>
<th>B45 M40/MF40</th>
<th>B55 M40/MF40</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lavkarbon A</td>
<td>170</td>
<td>180</td>
<td>200</td>
<td>210</td>
<td>230</td>
<td>240</td>
<td>250</td>
</tr>
<tr>
<td>Lavkarbon B</td>
<td>200</td>
<td>220</td>
<td>240</td>
<td>270</td>
<td>300</td>
<td>310</td>
<td>320</td>
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<tr>
<td>Lavkarbon C</td>
<td>240</td>
<td>260</td>
<td>280</td>
<td>320</td>
<td>350</td>
<td>360</td>
<td>370</td>
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<tr>
<td>Bransjereferanse</td>
<td>280</td>
<td>300</td>
<td>320</td>
<td>370</td>
<td>410</td>
<td>420</td>
<td>430</td>
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</tbody>
</table>

**Maksimalt tillatt klimagassutslipp [kg CO₂-ekv. pr m³ betong]**
Resirkulated Steel

- Resirkulated steel (Rebar, Prestressing steel, guardrails and so on.)
Goal - Measures - Implement

Large Contributors - Creative process
Strategic Focus → Creative Workshop → Evaluation → Decision of what ideas to bring forward
Example – Portal Design

70% cost and greenhouse gas reduction
What does the Architect think?

What about the stream crossing the tunnel?

What happened to the trees?
….. And so on

- Increase Life Expectancy of Components and Structures
- Move less a shorter distance
- Plan for less work during winter
- Reuse materials, steel, concrete, rock
Goal: Reduce greenhouse gas emissions - 40% CO₂

Evaluate
Definitions
Weight

Find how

Evaluate
Yes/No
Score 1-6

Cost/benefit
<1500 kr/CO₂

Packet results
20% - 30% - 40%

YES
NO

Implement

Report/documentation

Cost/benefit
## Can you find your project?

<table>
<thead>
<tr>
<th>Project maturity</th>
<th>Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Project receives a climate quota + cost to govern decisions</td>
</tr>
<tr>
<td>5</td>
<td>Budget for green house gas emissions integrated in BIM, goal, creative process, evaluate, bring forward and make a statement</td>
</tr>
<tr>
<td>4</td>
<td>Budget for green house gas emissions, goal, creative process, evaluate, bring forward and make a statement</td>
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<tr>
<td>3</td>
<td>Statement and Budget for green house gas emissions, evaluate large contributors</td>
</tr>
<tr>
<td>2</td>
<td>Statement and budget for green house gas emissions</td>
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<tr>
<td>1</td>
<td>Green house gas emission statement</td>
</tr>
<tr>
<td>0</td>
<td>No measures</td>
</tr>
</tbody>
</table>
Knowledge Based Design

Goal: Reduced Carbon Emissions

- Smart and effective construction
- Use carbon effective materials
- Optimize Design

Strategy for Contracts
Thank you
Målpris/Tak på kostnad

Kostnad absolutt minimums løsning

Mål: Kr
Tid
Drift og vedlikehold
Sikkerhet
Arkitektur
Energiforbruk
Lokale forhold/politikk
Fleksibilitet i produktet
Mobilitet
Ikke prissatte konsekvenser (YM, arkeologi mm.)
Klimagassutslipp
Kostnad absolutt minimumsløsning

Målpris/Tak på kostnad

Målbilde:
Kr
Tid
Drift og vedlikehold
Sikkerhet
Arkitektur
Energiforbruk
Lokale forhold/politikk
Fleksibilitet i produktet
Mobilitet
Ikke prissatte konsekvenser (YM, arkeologi mm.)
Klimagassutslipp
Optimize Drill and Blast Process
Optimize and Use Better Design Tools

T10.5, 450mm