UNIVERSITETET I AGDER

Emnekode : BYG 404

Kandidatnr. : 316

Dato : 12.12.2017

Ark nr. : 9 av 9

6c) The difference is that the market accounts for a weighted average for for example electricity while transformatin gives you the opportunities to transform the electricityproduction to your marked. (1)

7a) 2017 X

b) Gro Harlem Brundtland (2)

c) 37 X

(3)

5b. continued ...
based on the singel score weighing on the previous page we can estimate how this affects the human health.

This can be done by: Calculating (disability adjusted life years) DALY.

DALY = YLL + YLD

YLL = years of life lost

YLD = wD

w = between 0 (healty) and 1 (dead)

D = duration of disability

6a) EPDs might underestimate emissions because this is a product declaration that all product producers are required to do. Therefor there are "competition" between the companies for how low their emissions are. The amount of emissions becomes a sellingpoint for the company. Therefor all the companies wants to show their best numbers which is not nessecarely accurate.

b) The documentation tab includes how the data was collected, when, and what assumptions that where made.

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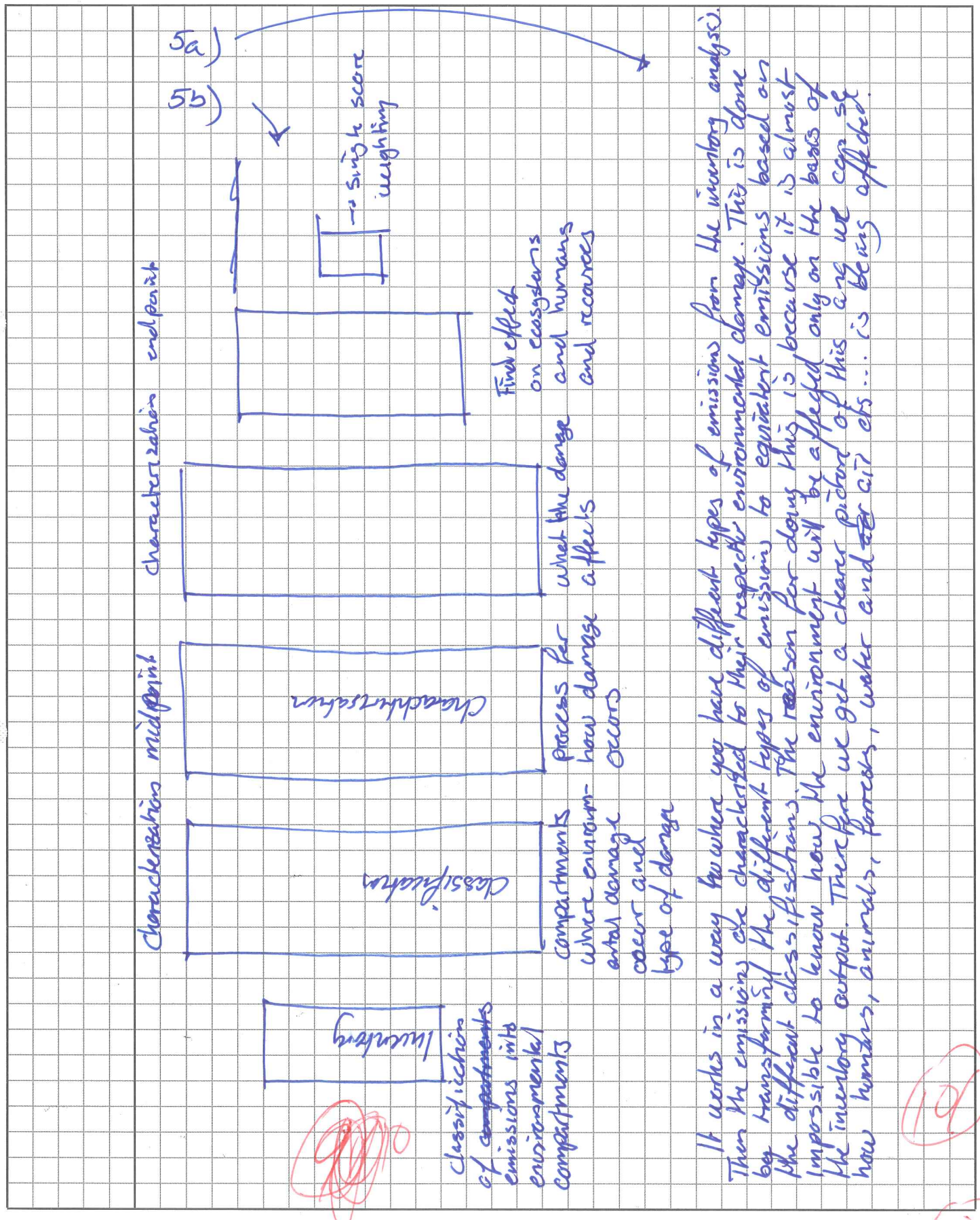


If works in a way how we have different types of emissions from the inventory analysis. Then the emissions are characterized to their respective environmental damage. This is done by transforming the different types of emissions to equivalent emissions based on the different classifications. The reason for doing this is because it is almost impossible to know how the environment will be affected only on the basis of the inventory output. Therefor we get a clear picture of this and can see how humans, animals, forests, water and air etc... is being affected.

10

10

d) Energy for transport + welding + bitumen

Welding: $2000\ kWh \cdot 3.6\ MJ/kWh = 7200\ MJ$

Transport:

$0.02\ l/Item \cdot 1024344.573\ Item \cdot 44\ MJ/l = 901423.2242\ MJ$

Bitumen: $36\ MJ/kg \cdot 22906.8\ kg = 824644.8\ MJ$

No ocean transport

Total: $7200 + 901.423\,2242 + 824644.8 = 1733268.024\ MJ$

+ earthwork: $0.2\ l/m^3 \cdot 2000\ m^3 = 400\ l \cdot 44\ MJ/l = 17600\ MJ$

Therefor: $1733268.024 + 17600 = 1750868.024\ MJ$

4,5/6

4,5

c) tkm?

No ocean transport

- Steel arch: 2130.03t · 65km = 138.451,95tkm
  Beams: 360.64t · 65km = 23441.6 tkm
- Hangers: 23.662t · 65km = 1538.355tkm
  Bolts: 0.0672t · 65km = 4.368tkm
- Concrete deck: 3299.47t · 110km = 362941.7tkm
  Rebar: 1356.264t · 65km = 88157.16tkm
- Foundations: 2820t · ~~68~~ 110km = 310200tkm (concrete)
  Rebar: 1159.26 · 65km = 75348tkm
- Asphalt: 662.904t · 20km = 13258.08tkm (gravel)
  Bitumen: 22.9068t · 200km = 4581.36tkm
- Guardrails: 43.44t · 450km = 19548tkm

Total: $\sum$ = ~~1024344.573tkm~~ 1024941.5 tkm

+ earthwork: $2000m^3 \cdot 2.2 \frac{kg}{m^3} = 4400t \cdot 20km = 88tkm$

I assumed that the earth could be moved 20 km away from the construction site.

b.) Material requirements:

- Steel arch: (140m · 0.9m · 1.05m) · 2 = 264.6m³ 3
  Beams: ~~20~~ 32 (20m · 0.35m · 0.20m) · 32 = 44.8m³ 3
  Weld: 2000kWh
  Arch: 264.6m³ · 8.05 t/m³ = 2130.03t
  Beams: 44.8m³ · 8.05 t/m³ = 360.64t
- Steel hangers: 0.07m³/steel hanger : 42 steel hanger = 2.94m³ · 8.05 = 23.667t 2,5
  Bolts: 4 · 42 · 0.4kg = 67.8kg = 0.0672t needs x 2
- Concrete deck: 0.65m · 18m · 120m = ~~60~~ 1404m³ · 2.25 t/m³ = 3299.4t 2
  Rebar: 1404m³ · 0.12 = 168.48m³ · 8.00 t/m³ = 1356.264t 3
- Foundations: 1200m³ · 2.35 t/m³ = 2820t 2 3
  Rebar: ~~2820~~ 1200m³ · 0.12 = 144m³ · 8.05 t/m³ = 1159.2t
- Asphalt: 0.15m · 18m · 120m = 324m³
  gravel 324m³ · 0.93 = 301.32m³ · 2.2 t/m³ = 662.904t 3
  bitumen: 324m³ · 0.07 = 22.68m³ · 1.01 t/m³ = 22.9068t 3
- Guardrails: 18 kg/m · 120m · 2 = 43.44t 3

Total: 11878.589t

26,5/30

26,5

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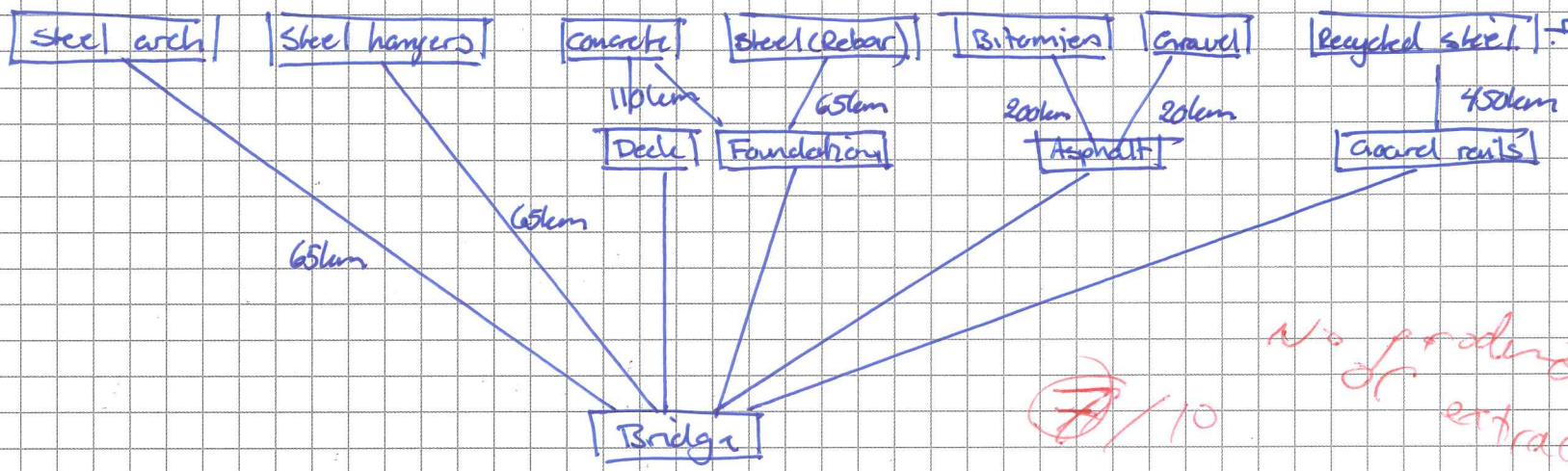
# Flow chart bridge




No of gradations of extraction

8/10

Assumptions: I assume that there is no extra distances other than the ones on the flowchart.

I assume that the earthwork that requires earth to be removed, not as a material requirement, but as a transportation that needs to be done.

I assume that none of the constructions processes uses any energy other than what is given. I assume that the transportation distances for the bolts are the same as for the hangers. I assume that the bridge has no given lifetime and that there is not used energy for the storageprosses on the construction sight.

11

3a. Tot. $CO_2$ = 15 t

Fly ash: $\frac{1200\,kr}{t} \cdot 85.00\,t = 102000\,kr$

Electricity: $\frac{200\,kr}{1000\,MJ} \cdot 750.000\,MJ = 150.000\,kr$

Heat: $\frac{111\,kr}{1000\,MJ} \cdot 350.000\,MJ = 38.850\,kr$

Tot. kr: 290.850 kr

per unit in kr. Sing

$\frac{15\,t\,CO_2}{290.850\,kr} \cdot 102.000\,kr = 5860.44\,kg\,CO_2$ -> Fly ash

$\frac{15\,t\,CO_2}{290.850\,kr} \cdot 150.000\,kr = 7735.95\,kg\,CO_2$ -> Electricity

+1 for 3b (10/12)

$\frac{15\,t\,CO_2}{290.850\,kr} \cdot 38.850\,kr = 2003.61\,kg\,CO_2$ -> Heat

b) Not necessarily now since the output is expressed in profits per unit but if they you do not consider that it could have been expressed with physical or energy allocation. (3)

c) $80.000\,kg\,CO_2 + 700.000\,kg\,CO_2 + 70.000\,kg\,CO_2 = \frac{850.000\,kg\,CO_2}{100.000\,kg}$ 100 kg

$= 850\,\frac{kg\,CO_2}{t}$ std. Portland

Fly ash: $\frac{5260.44\,kg\,CO_2 \cdot 1000\,kg}{150000\,kg} = 350.7\,\frac{kg\,CO_2}{t}$ +1 for 3c

$\Rightarrow 850\,\frac{kg\,CO_2}{t} \cdot 0.915\,t + 350.7\,kg\,\frac{CO_2}{t} \cdot 0.085\,t = 807.5\,\frac{kg\,CO_2}{t}$ -> With Fly ash (5)

(18)

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1a) kg, $m^3$ 3

b) $m^2$, number of apartments per building 3

c) kg, $m^3$, kg recycled per day or per year 3

d) person kilometer 3

e) kWh produced per year 3 (15)

2a) The purchasing manager should consider a lots of things that has to do with geography. Which is:

The type of energy productions in the different countries, source of energy. Environmental response to pollution (system impacts)
transportation of the material. The type of method being used for manufacturing (process impact). And maby also laws and regulations in that country (System impact). I think that the ~~one~~ electricity source and transportation will influence the most (10)

b) The environmental impact of a t-shirts lifetime in Norway is completely different to, lets say, Kenya. This is because if you use a t-shirt with a functional unit of: number of times used. Then this will be much less for Norways average person than Kenyas average person (most likely).

More discussion needed (4/10)

(29)