I-T-G Engineers for Environmental Technology

Sustainability Benchmarking – the carbon footprint of upholstery materials for car seats

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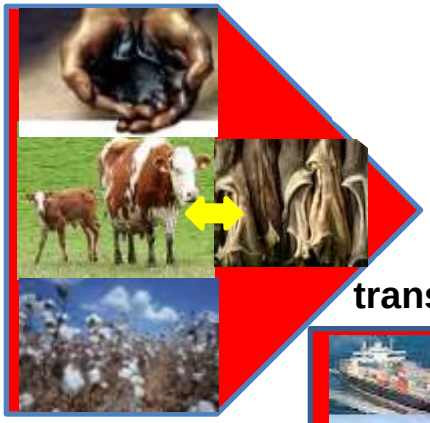
The product carbon footprint (CO_2-e) assessment of

- Artificial Leather
- Textile
- Leather

Production of rawmaterials



transportations

Production of upholstery matrial

life cycle

final disposal

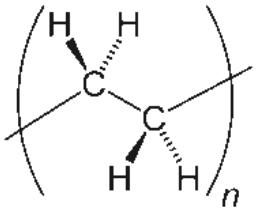
Production of chemicals

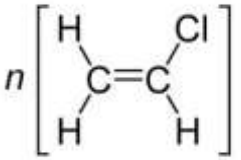
Waste from production
Wastewater from production

System boundaries «cradle to grave»

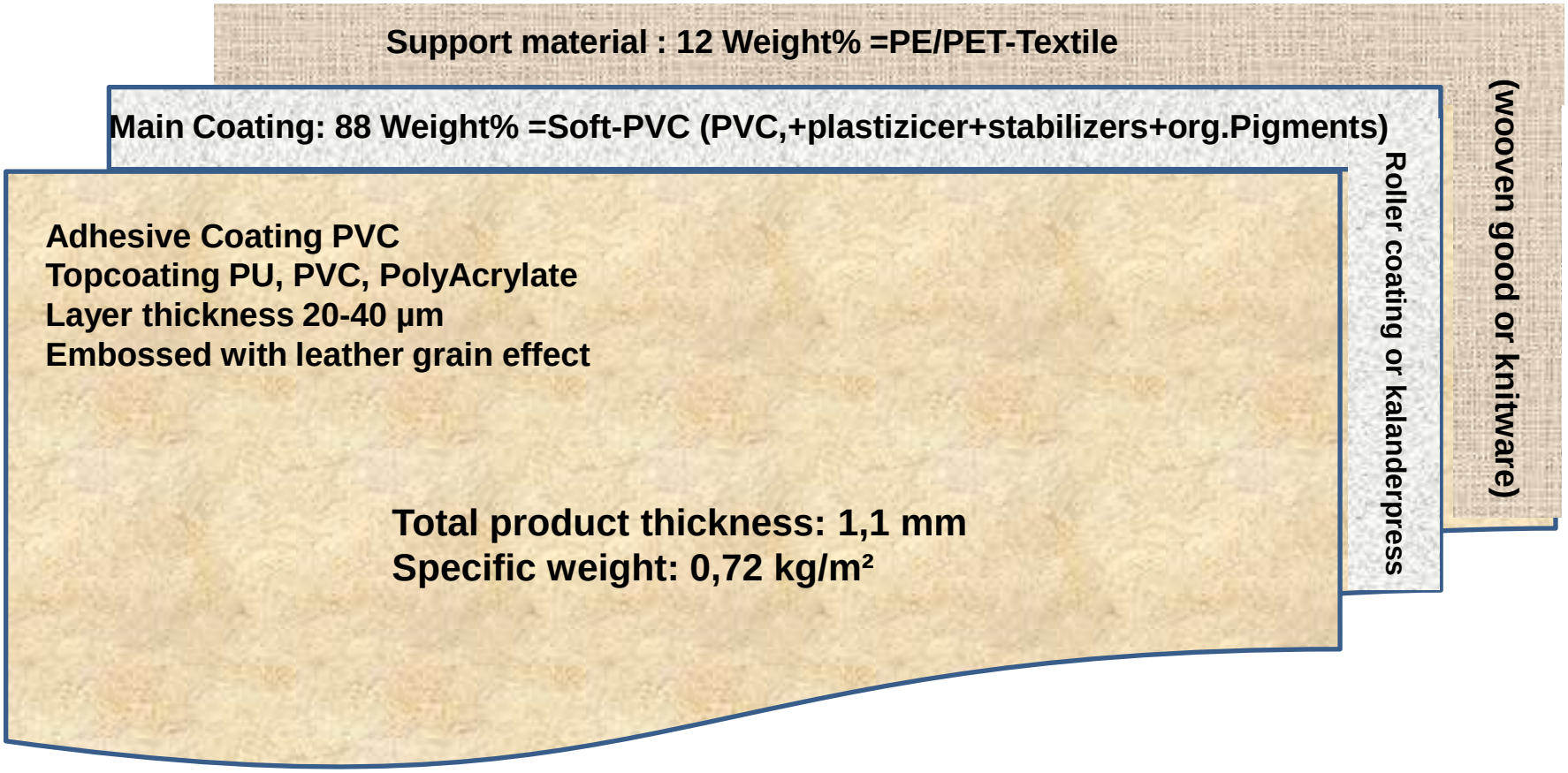
Artificial Leather

Fossil rawmaterial „oil“





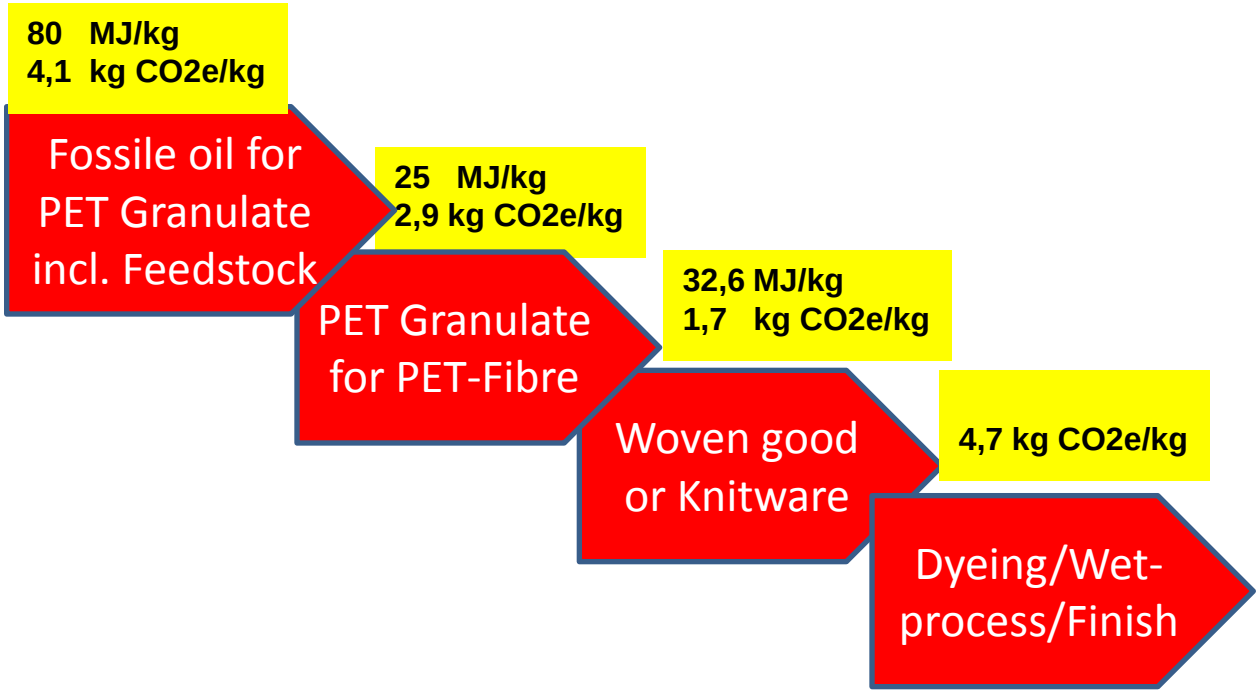
Composition of artifical leather for car upholstery



Appr. 70-80% of artifical leather used for car upholstery is produced from textile supportmaterial PE/PET with PVC/PU coating

Product Carbon Footprint (PCF) for artifical leather:

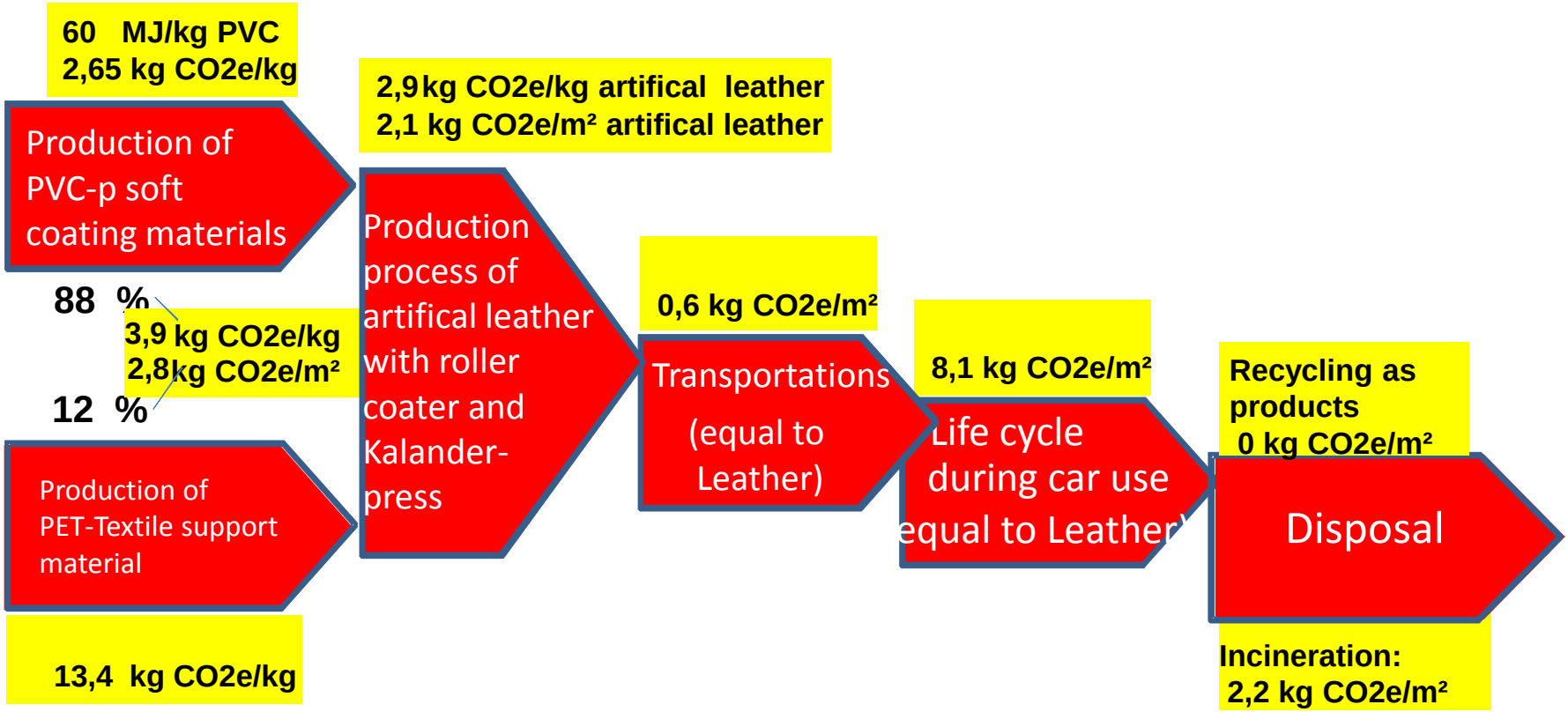
Step 1: Production of 1 kg = 0,72 m² Textile Support (sheet textiles); Polyester as woven good



Sum (Average): 13,4 kg CO_2e/kg or 9,6 kg CO_2/m² Textile as PET-woven goods

Product Carbon Footprint (PCF) for artifical leather:

Step 2: Complete productionprocess of artifical leather and CO2-e emission from graddle to grave



SUM: 15,8 kg CO2e/m² artifical leather (with incineration)

TEXTILE

Cotton (renewable)

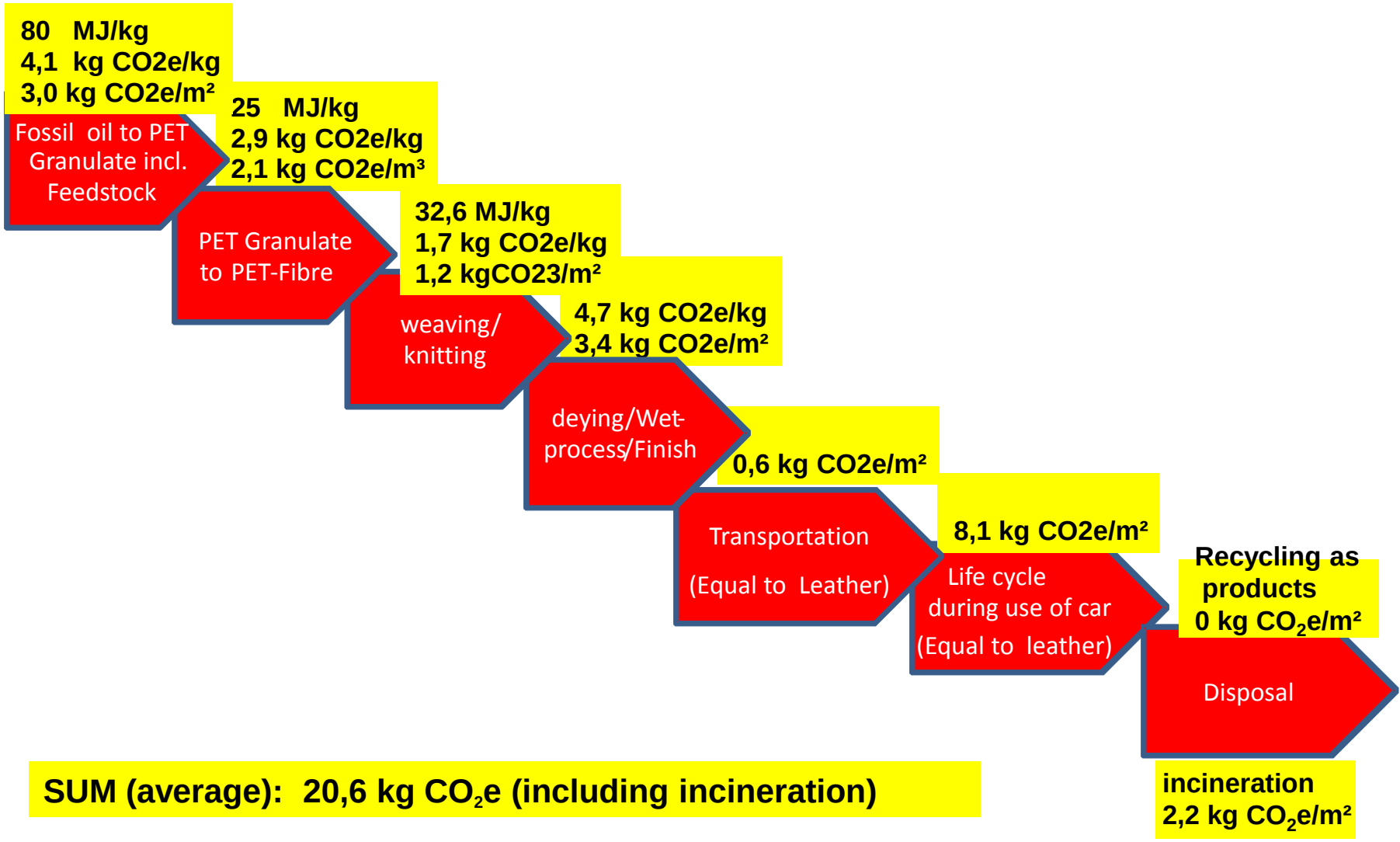
Polyester knitware (fossile)

Polyester woven goods (fossile)

COTTON: Product Carbon Footprint (PCF):

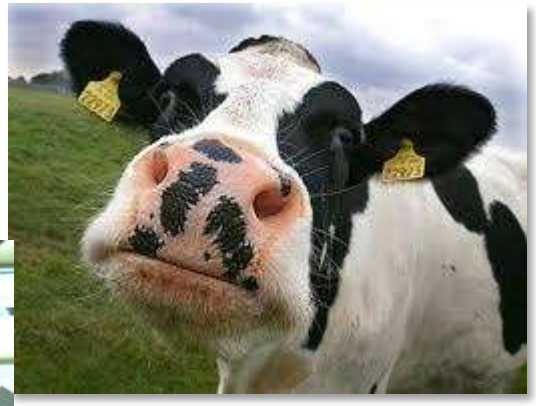
Name of process	Kg CO2/kg or m² cotton
Cotton plantage (0,7-3,3 kg CO2/kg)	2,0 kg CO2/kg
Production:Spinning, knitting/weaving (3,5-7,0 kg/kg)	4,3 kg CO2/kg
Transportation	0,2 kg CO2/kg
subtotal -per kg textile (0,72 kg/m²)	**6,5 kg CO2/kg Textil**
subtotal -per m² textile	**4,7 kg CO2/m² Textil**
Chemicalproduction (equal to leather)*	5,9 kg CO2/m²
Wastewater/waste (equal to leather)*	0,3 kg CO2/m²
Life cycle Automobile (equal to leather)*	8,1 kg CO2/m²
Thermal recycling of renewables (equal to leather)*	-0,2 kg CO2/m²
SUM (average) **Range**	**18,8 kg CO2/m²** 18-22 kg CO2/m²

Textile (Polyester): Product carbon footprint for Car upholstery



SUM (average): 20,6 kg CO_2e (including incineration)

LEATHER



The cattle – a producer of rawhide or The rawhide – a forcing resulting product of the meat- and milkindustry?

Basic Statements

No leatherproduction /no tannerys → same amount of cattles

Reduced meat- or milkproducion → reduced amount of cattles

Results

- No cattle is living because of leatherproduction

- The hide is a forcing resulting product of the meat- and milkindustry

CAUSATIVE PRINCIPLE:

The emissons from cattle-farming belongs to the meat- and milkindustry

„Cradle to Gate“ – CO2-e emissions of beef-/milk production on the farm (extensive year round field farming in Germany)

Production of beef „Cradle to Gate“ (without methan by fermentation):	Kg CO2-e/ kg beef
Pasture fence maintanance	0,036
Install waterpipelines on the pasture area	0,036
Provide animal feed	0,142
Look after the cattles	0,034
Auxiliary processes (energy, gas….)	0,275
Water usage	0,003
Solids disposal and reuse	0,061
Total CO_2-e emissions:	**0,587**

Source: Institut für angewandte Forschung der Hochschule für Forstwirtschaft Rottenburg ,Germany „Ökobilanz der Rindfleischproduktion aus extensiver Ganzjahresbeweidung“; 2008

CO_2-e/m²rawhide including methan-digestion

Different bovine species with conventional farming methodes „Cradle to Slaughterhouse“

Bovine species	Kg CO_2-e/ Kg beef*	Rawhide ratio (kg hide/ kg total weight	Kg CO_2-e/ animal (beef) (45% slaughter-weight	Kg CO_2e/ Rawhide	Kg CO_2e/ m² hide *	% of species
Milk cow for milk-production	15,3 (10,8-36,4)	5 %	4475	224	90	65
Bovine for meet-production	19,7 (16,0-20,2)	5 %	8865	443	98	25
Small Beefcow/calf	15,9 (6,0-25,5)	5 %	1216	61	61	10

Average: 93 kg CO_2-e / m² rawhide

Range: 36 kg- 350 kg CO_2-e/m² rawhide

CO2e-/m² in the tanning process „Rawhide to Finish Leather“ incl. By-processes

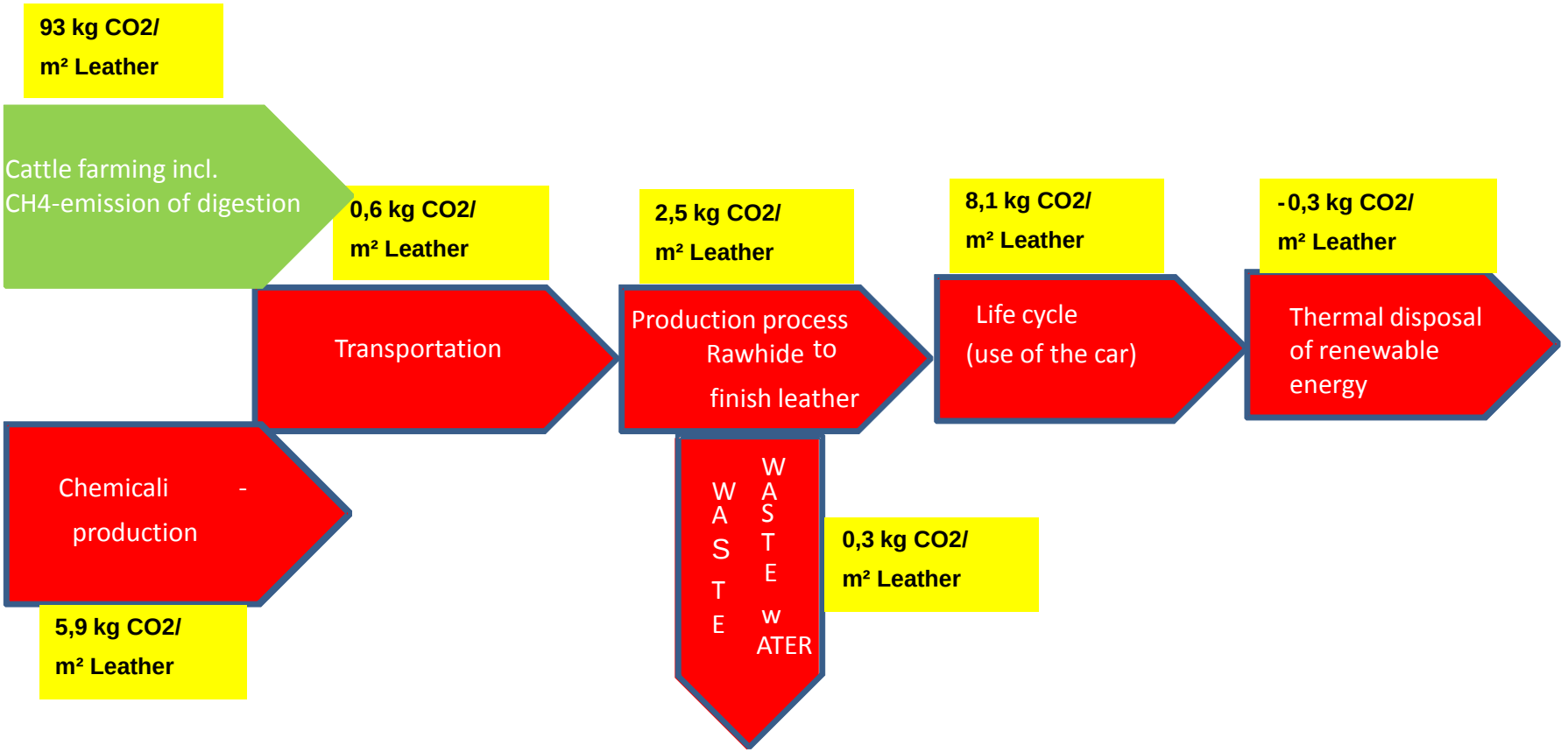
Transportations (Rawware and Chemicals) to the tannery	**0,6**	**kg CO2/m² Leather**
Productionsprocess from rawhide-finish leather	**2,5**	**kg CO2/m² Leather**
Wastewater- and wastetreatment incl. transportations	**0,3**	**kg CO2/m² Leather**

Source: Study to „ECO2L“;-Energy Controlled Leather- VDL Frankfurt, 2011

CO_2-e Emission as PCF for leather production „Cradle to Grave“ with/without cattlefarming

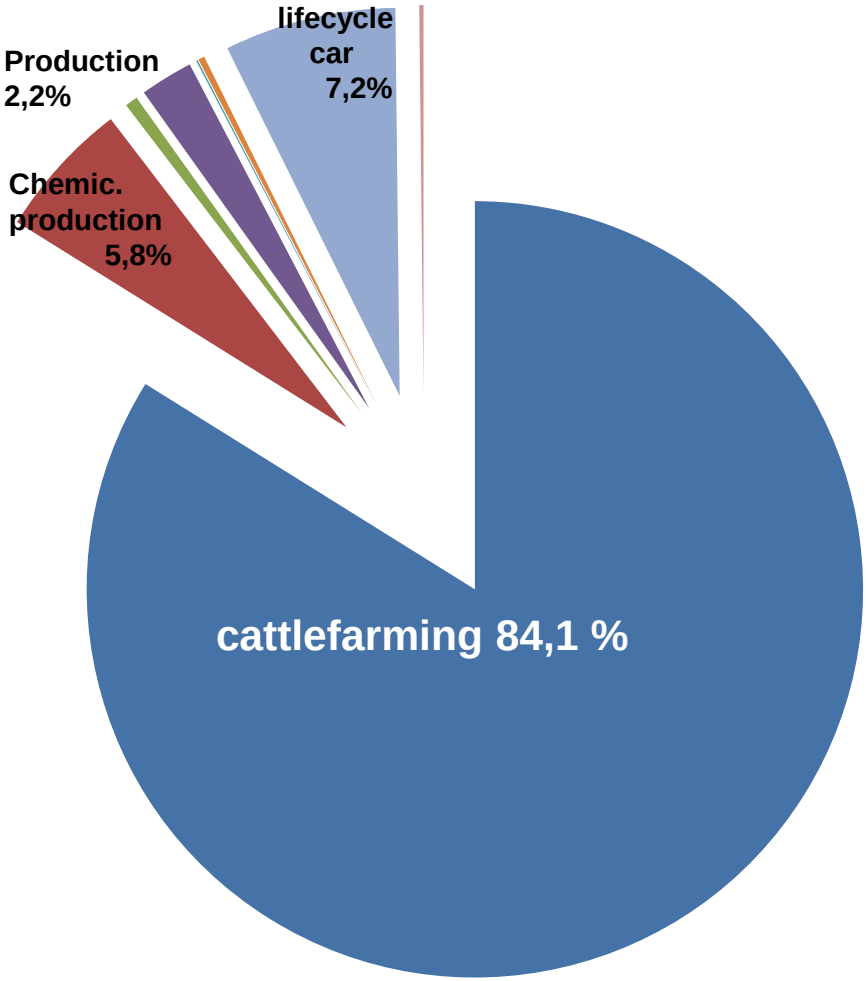
Cattlefarming incl. Digestion with 5% share	93	kg CO2/m² Hide
Chemical production	5,9	kg CO2/m² Leather
Transportation rawmaterial + chemicals to tannery	0,6	kg CO2/m² Leather
Productionsprocess: Rawhide to finish leather	2,5	kg CO2/m² Leather
Waste and wastewatertreatment incl. transport	0,3	kg CO2/m² Leather
employees accessroute	0,07	kg CO2/m² Leather
Lifecycle during use of the car	8,1	kg CO2/m² Leather
Thermal disposal of renewable sources	-0,3	kg CO2/m² Leather
SUM incl. cattle farming and digestion	110,2	kg CO2/m² Leather
SUM: start after slaughterhouse	17,2	kg CO2/m² Leather

CO_2-e emission of leatherproduction
„Cradle to Grave“ including and excluding cattlefarming

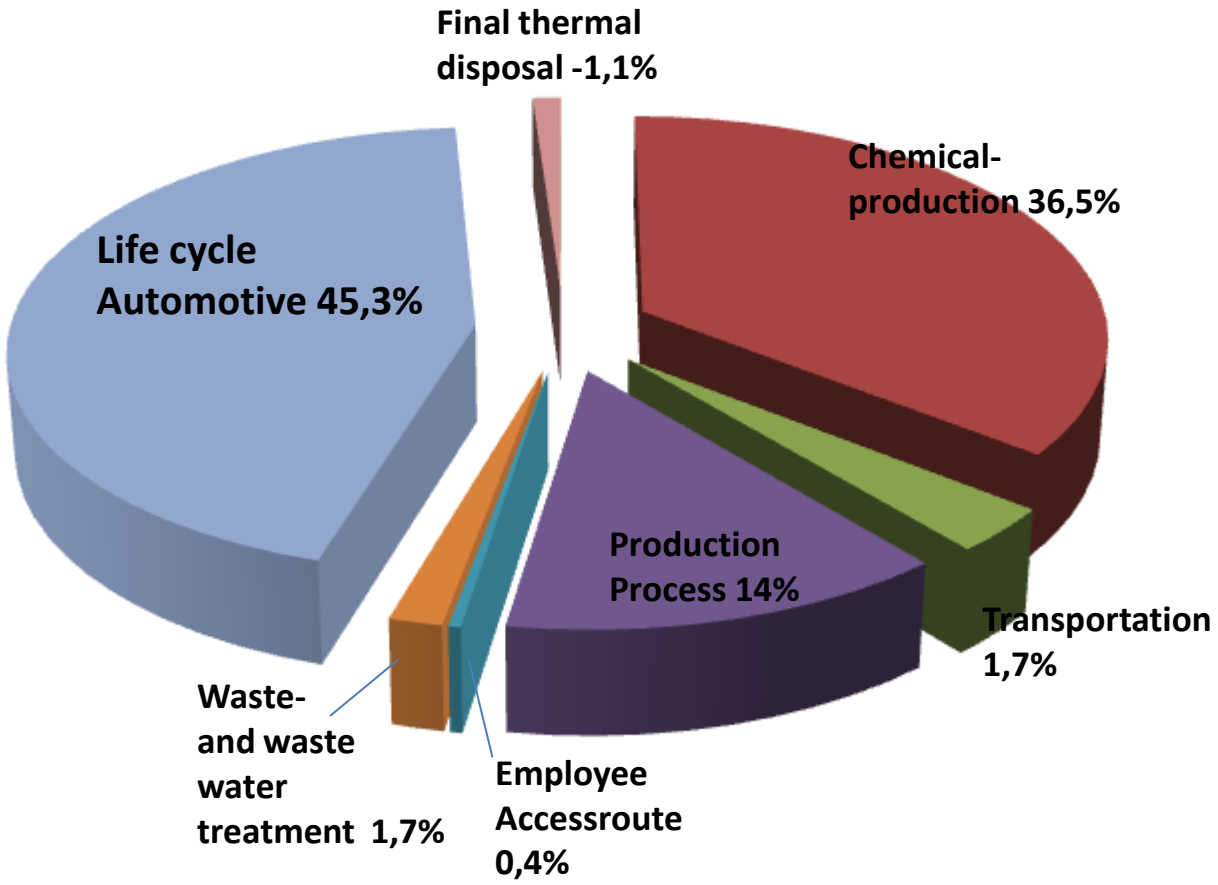


CO2-e-emission incl. cattle farming: 110 kg CO2-e/m² leather
CO2-e-emission after slaughterhouse: 17 kg CO2-e/m² leather

CO_2-e Emission and PCF of leather for car upholstery „Craddle to Grave“ including cattlefarming

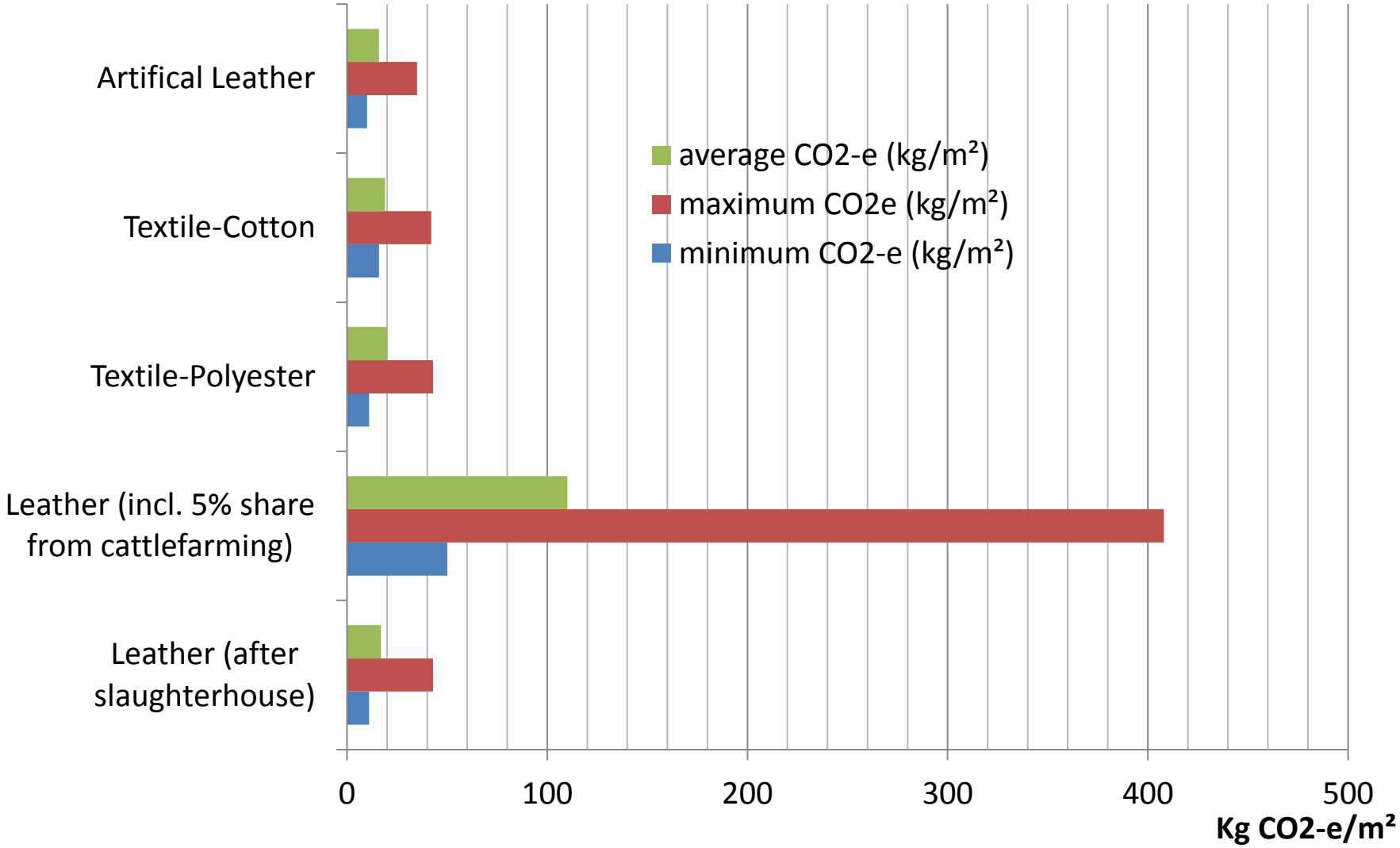


CO_2-e Emission (PCF) : From slaughterhouse to grave without cattlefarming



Sustainability Benchmarking – The Carbon Footprint of Upholstery Materials for Car seats

Name	kg CO2 e/m² (Min - Max) Incl. emission range of 5,6-28 kg/m² during lifecycle of the car	kg CO_2 e/m² (Min - Max) Incl. average emission of 8,1 kg/m² during lifecycle of the car	kg CO_2 e/m² (average)
Leather (start after slaughterhouse)	11 -43	13 - 23	17
Leather (incl. cattlefarming with 5% share)	50 -408	52 - 388	110
Textile: Polyester	11 -43	13 - 23	20
Textile: Cotton	16 -42	18 - 22	19
Artifical Leather	10 -35	12 - 15	16


Artifical Leather
Textile-Cotton
Textile-Polyester
Leather (incl. 5% share from cattlefarming)
Leather (after slaughterhouse)
average CO2-e (kg/m²)
maximum CO2e (kg/m²)
minimum CO2-e (kg/m²)
0
100
200
300
400
500
Kg CO2-e/m²

UNIDO (Shanghai 9-2012)
System Bounderies to handle Co-products of sustainable materials

3 pre-condidtion need to be fullfilled:

- the material (rawhide) needs to be based fully on a re-newable raw materials
- should at least partly replace a non-renewable substrate in its final application
- the demand for the product is not influencing the upstream processes

If all these three parameters are fullfilled, the boundary for the co-products (leather) should exclude upstream processes, because it is a SUSTAINABLE MATERIAL.

- IULTCS draft-document
- than discuss it in the CEN leather panel end of September

Thank you for your attention!