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Institut für angewandte Ökologie
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Applying LCA for non-electrical products

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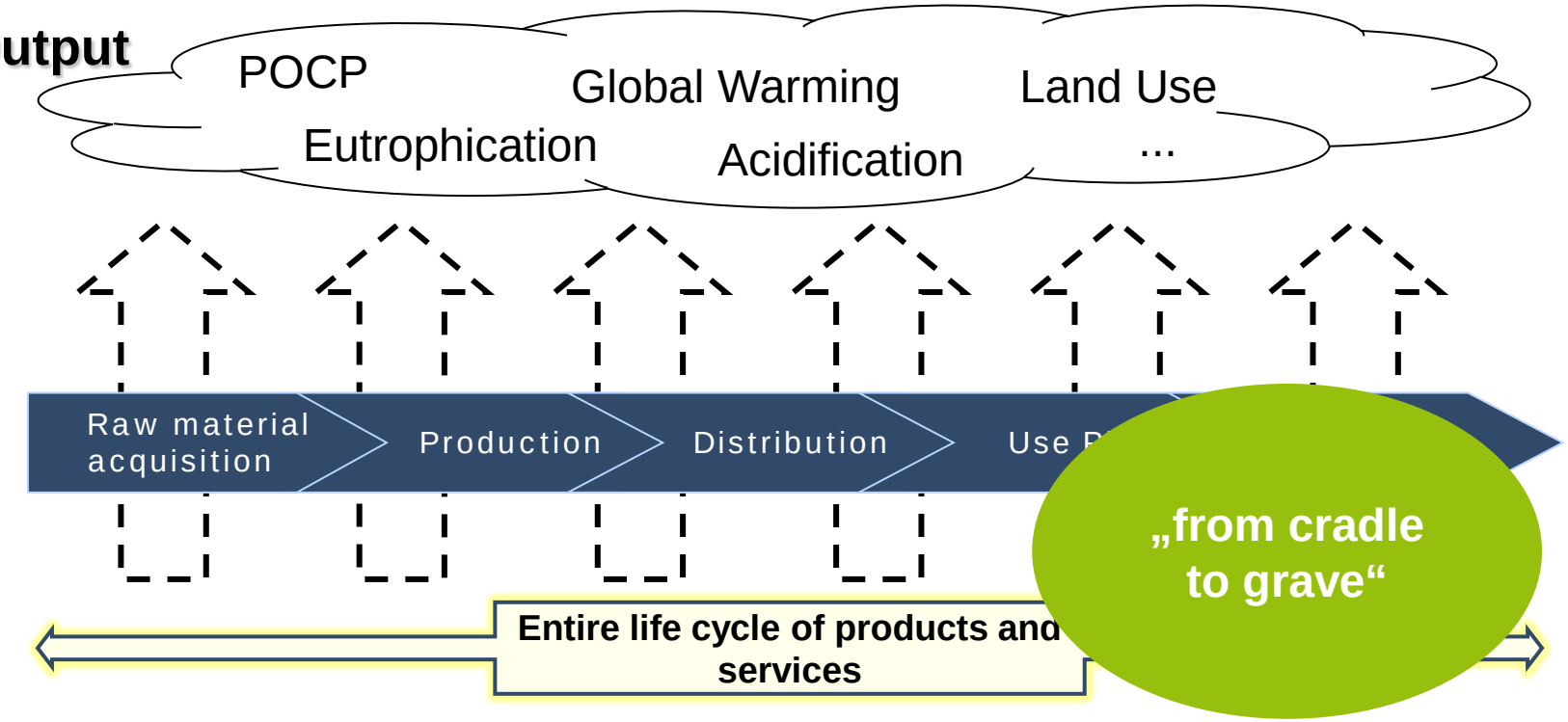
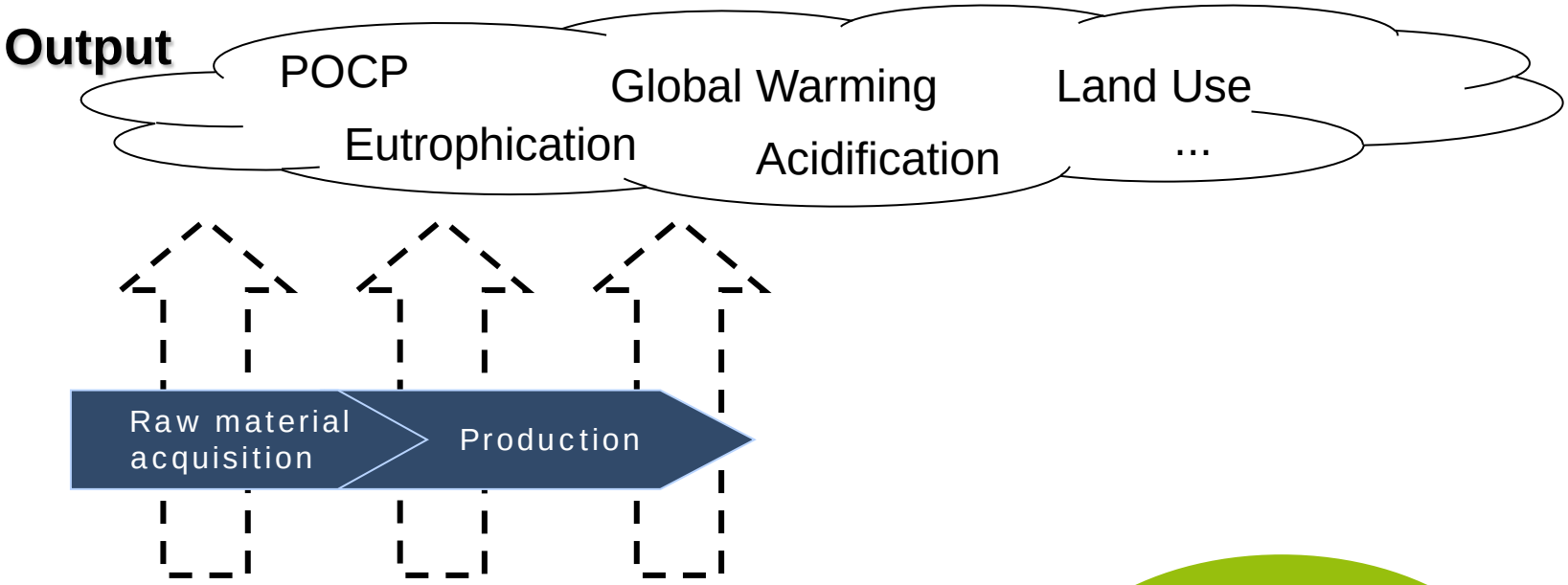
Regional Capacity Building on the application of LCA and LCC in Public Procurement, Advancing and Measuring Sustainable Consumption and Production (SCP) for a Low-Carbon Economy in Middle-Income and Newly Industrialized Countries (Advance SCP) in Southeast Asia

Port Dickson, Malaysia, 15.11.2016 – 17.11.2016

Flashback: Background of an LCA



Flashback: Background of an LCA

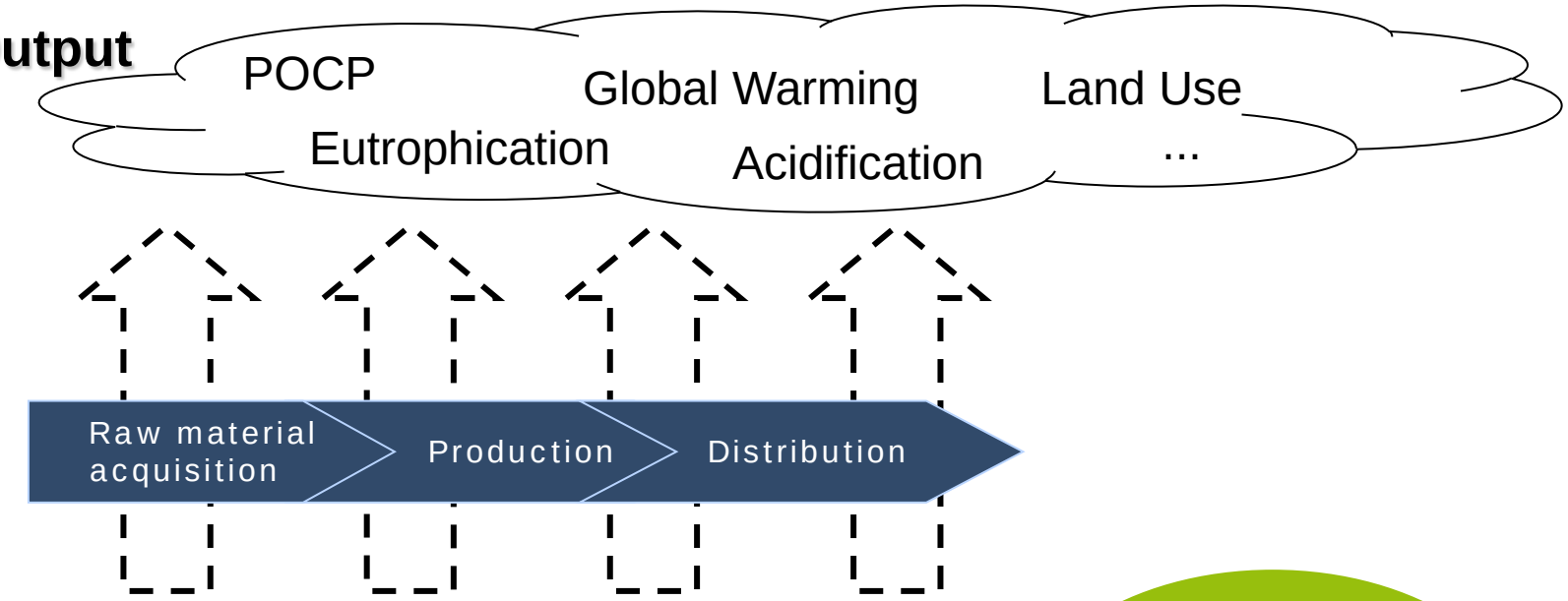


„from cradle to gate“

Input crude oil
iron ore, crops...

electricity,
petrol,

Flashback: Background of an LCA



„embedded emissions of a products“

Input crude oil
iron ore, crops...

electricity,
petrol,

Importance of single life cycle stages

- Raw material provision, production and (maybe) distribution always relevant.
- Maybe Use phase also of relevance; depends on product specific type of usage
- End-of-life treatment has actually always to be taken into account – but in some cases EoI is of only minor importance in comparison to raw material provision and production (e.g. relevant, when one of the products is recycable the other not).

LCA for public procurement departments

Life Cycle Assessments

Acquisition

- Embedded environmental burdens through production
- Environmental burdens through delivery and installation, if required

Use

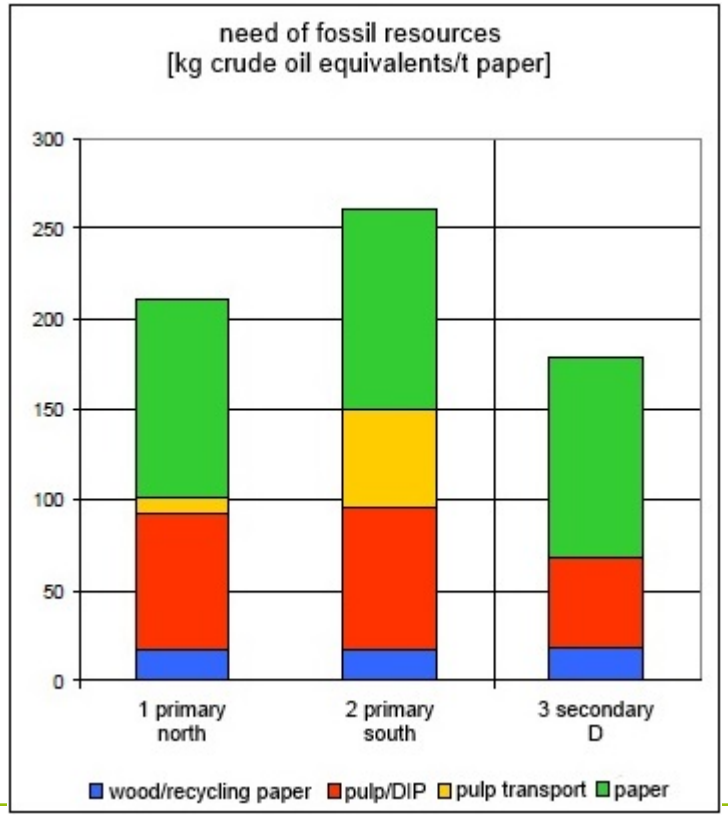
- Only if relevant:
  - Product life time
  - Water
  - ……
  - Maintenance
  - Repair
  - Etc.

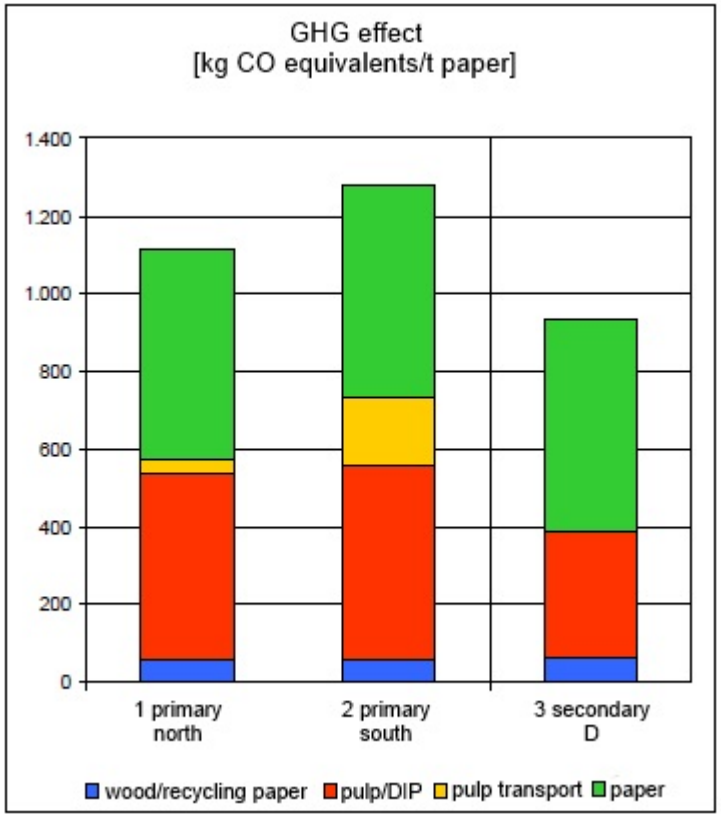
Disposal

- Environmental burdens through EoL-Treatment:
  - Collection
  - Recycling
  - Disposal

Example: LCA on copying & graphic paper

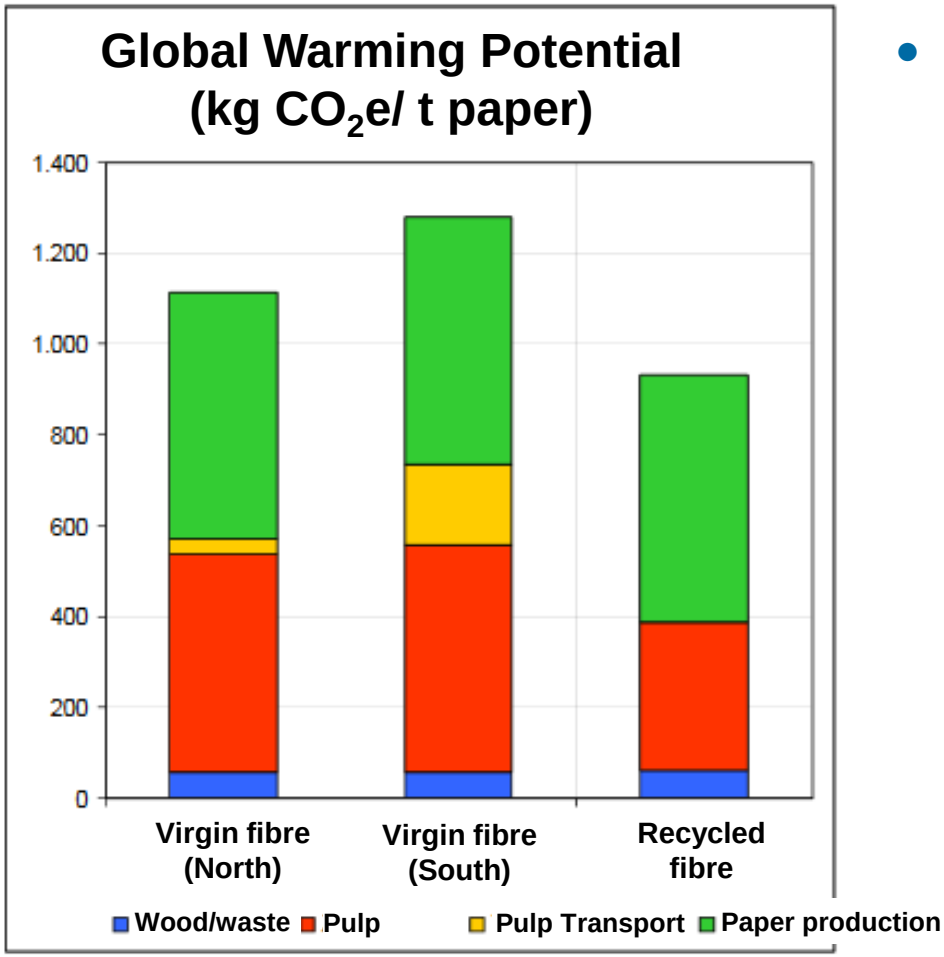
Environmental impacts during the production and processing





Source: IFEU 2006: available online: http://papiernetz.de/wp-content/uploads/IFEU-Studie_Kurzfassung.002.pdf

Example: LCA on copying & graphic paper



- LCA results show:
  - production of recycled paper is significantly better than production of fresh fibre paper
  - long transport distances of virgin fibres (e.g. overseas transport) may be of significant relevance.

Source: IFEU 2006: available online: http://papiernetz.de/wp-content/uploads/IFEU-Studie_Kurzfassung.002.pdf

Example: LCA on copying & graphic paper

- Environmental impacts during End-of-life treatment
  - Recycling of waste paper is appreciably better for the environment than incineration with energy recovery. Disposal of waste paper in landfills is the most unsatisfactory solution from an environmental perspective.
  - The poorest alternative of waste paper use, in ecological terms, is disposal to landfills.

Example: LCA on copying & graphic paper

Calculating savings in CO_2e emissions

comparison of non-recycling paper out of nordic pulp and recycling paper	resources [crude oil equivalents]	GHG effect [kg CO_2– equivalents]	process water [kg]
related to one package of copy paper (500 sheets)			
	0,08	0,5	80
related to 1 t of paper (400 packages à 500 sheets)			
	33	183	31.800
related to 800.000 t office paper (average consumption per year in Germany)			
	26.500.000	146.000.000	25.400.000.000

comparison of non-recycling paper out of southern pulp and recycling paper	resources [crude oil equivalents]	GHG effect [kg CO_2– equivalents]	process water [kg]
related to one package of copy paper (500 sheets)			
	0,21	0,9	80
related to 1 t of paper (400 packages à 500 sheets)			
	82	347	31.800
related to 800.000 t office paper (average consumption per year in Germany)			
	65.900.000	278.000.000	25.400.000.000

*Please note that „e“ stands for equivalent; Source: IFEU 2006: available online: http://papiernetz.de/wp-content/uploads/IFEU-Studie_Kurzfassung_002.pdf

Example: copying & graphic paper

Different sets of criteria are proposed for:

Paper based on recovered paper fibres, recycled paper (focus of the Blue Angel label)

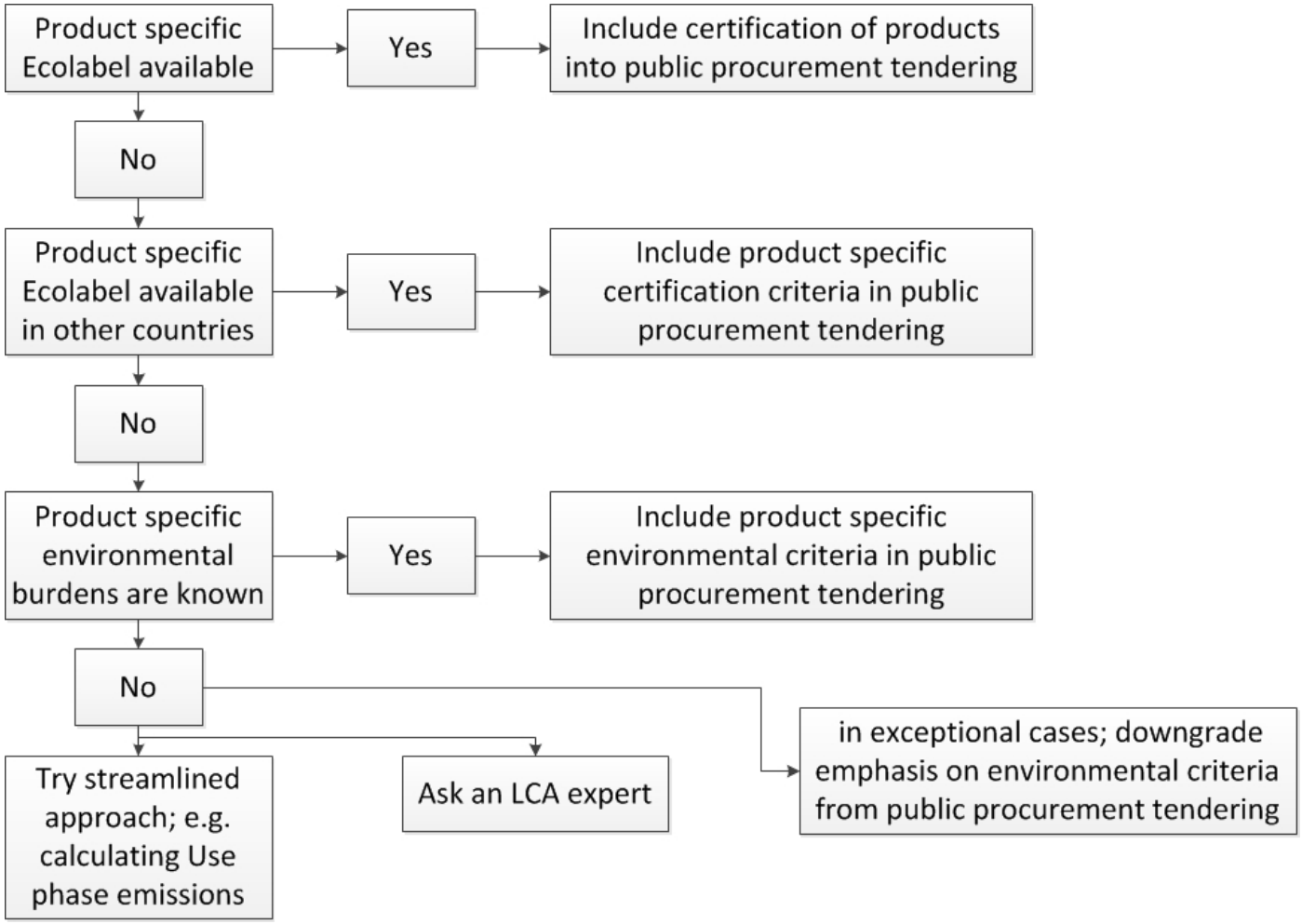
Paper based on virgin fibre (focus of the European Ecolabel and the Nordic Swan label)

Thai Green Label	Blue Angel	EU-Ecolabel	Forest Stewardship Council (FSC)	Nordic Swan
Paper made from recycling pulp and paper pulp made from agricultural wastes: - Sanitary Paper - Paper and cardboard for packaging - **Printing and writing paper** - Other Papers - Processed paper	**Recycled papers and finished products made from recycled paper:** - Recycled graphics papers - Finished products made from recycled paper, e.g. for the product lines of exercise books, writing pads, envelops etc.	**Newsprint paper, Printed paper, Copy & graphic paper and Tissue paper**	**FSC Pure: Paper products with 100% of fibres from sustainable forestry** **FSC Mix: Paper products with at least 50% of fibres from sustainable forestry** **FSC Recycling: Paper products form sustainable forestry, made of used or waste wood fibres**	**Copy and printing paper, Tissue paper, paper envelops**

Example: copying & graphic paper

- GPP Approach
  - Procurement of paper based on post-consumer recovered paper fibres (recycled paper) or paper based on legally and/or sustainably harvested virgin fibre
  - Procurement of paper produced through process characterised by low energy consumption and emissions
  - Avoidance of certain substances in paper production and bleaching

Reminder: decision tree

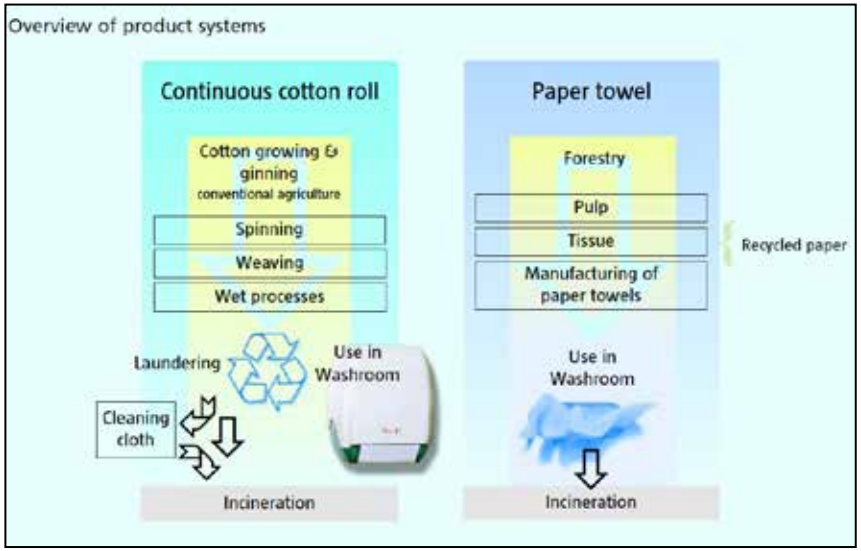


Conclusions

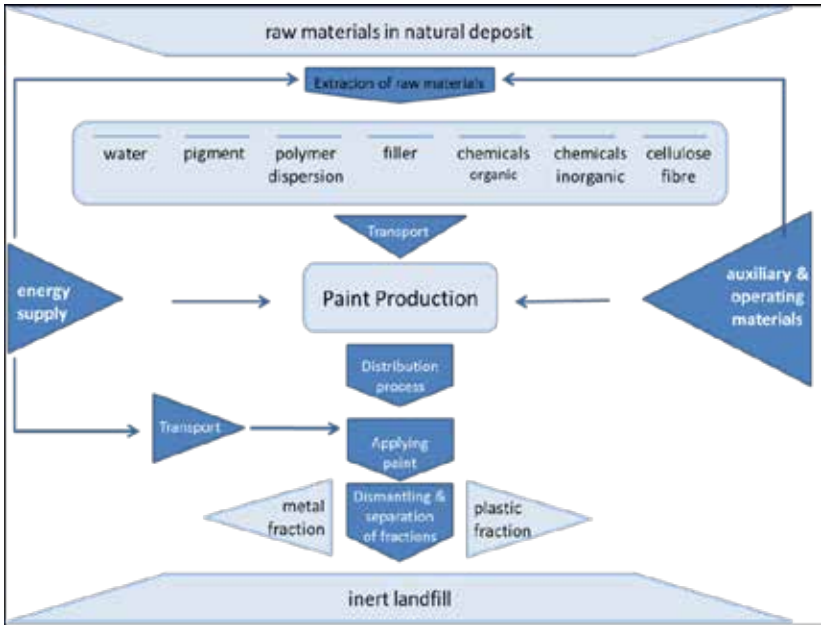
- Raw material provision, production and distribution always relevant.
- Maybe use phase also of relevance; depends on product specific type of usage
- Example: paper products:
  - Recycled paper uses only between one seventh to one third the amount of water and only about half the amount of energy that is needed for primary-fibre paper
  - For ecological reasons the use of cellulose from overseas should be avoided
  - Waste paper from regional waste paper collection should be used to make recycling paper

Training examples

Example 1: Hand towels



Example 2: Paints



Thank you for your attention!

Do you have any questions?

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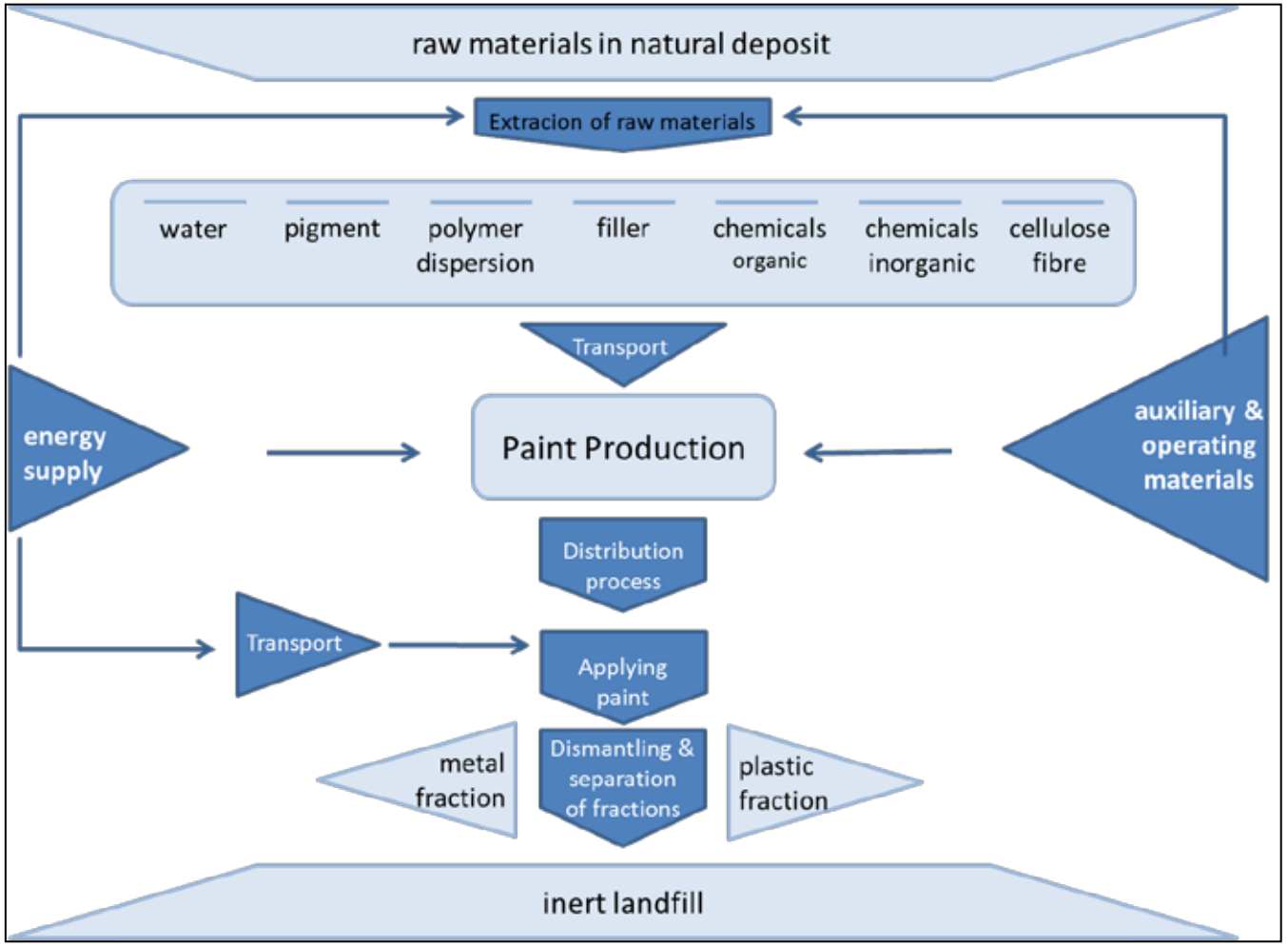
Spotlight on Use phase

- Example 1: Paints
  - Use phase maybe of relevance but not in any case

- Example 2: Hand towels (textiles vs. paper products)
  - Cotton roll towel = multi-use product
  - Paper towels = single-use product
  - Use phase of relevance for textiles and therefore for comparison

Example 1: Paints (e.g. facade paints, indoor paints)

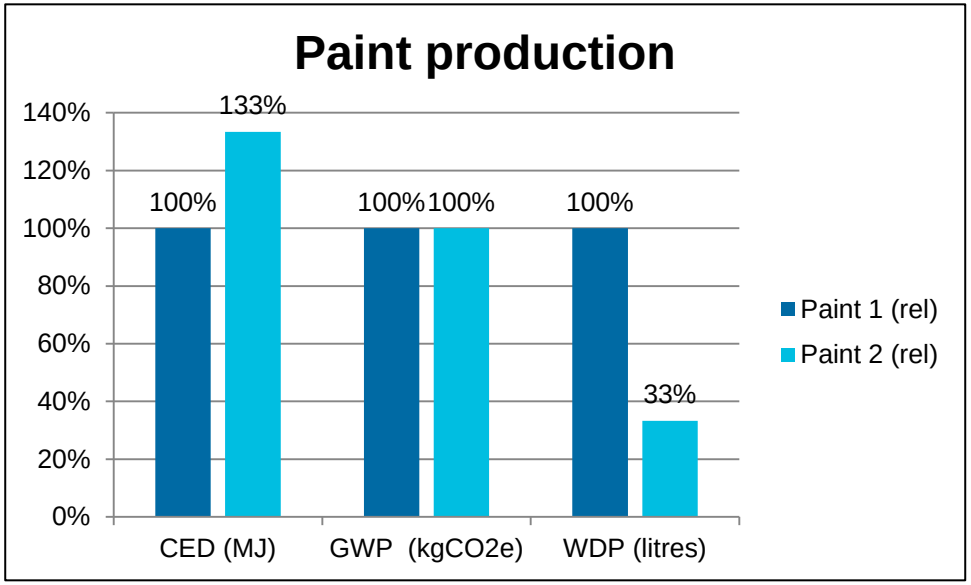


Source: Antony et al (2016) – The cleaner the greener? Product Sustainability assessment of the biomimetic façade paint Lotusan®; currently under revision of *Beilstein J. Nanotechnol.*

Example 1: Paints (e.g. facade paints, indoor paints)

- Life cycle of the building: 75 years
- Product service life time lower – requires repainting's throughout the life cycle of the building.
- Possible use phase scenarios:
  - Option 1: Both paints have the same functional properties and product service life time of 15 years
  - Option 2: Paints differ in functional properties and product service life time (Paint 1: 15 years; Paint 2: 20 years)

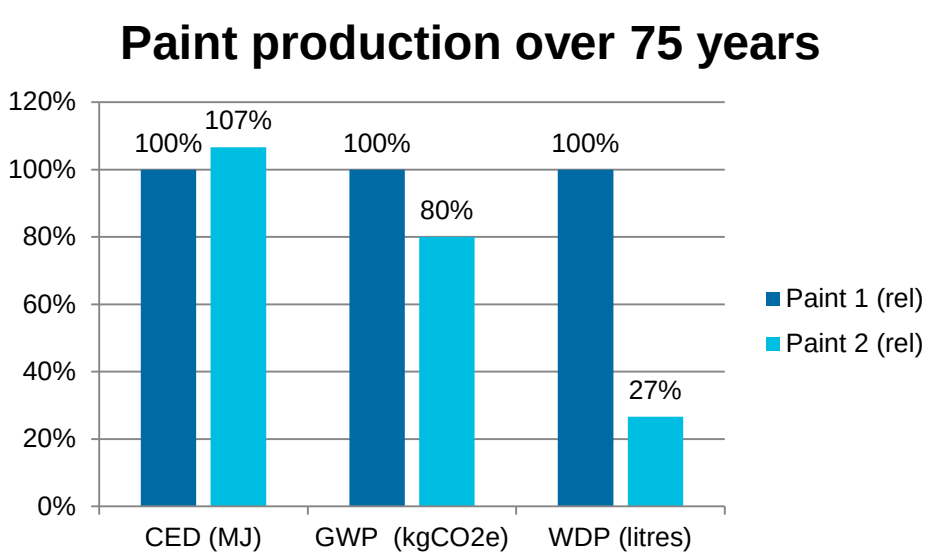
Example 1: Option 1



- Equal number of paintings (1initial, 4 repaints)
- Production phase relevant

à Use phase not relevant!

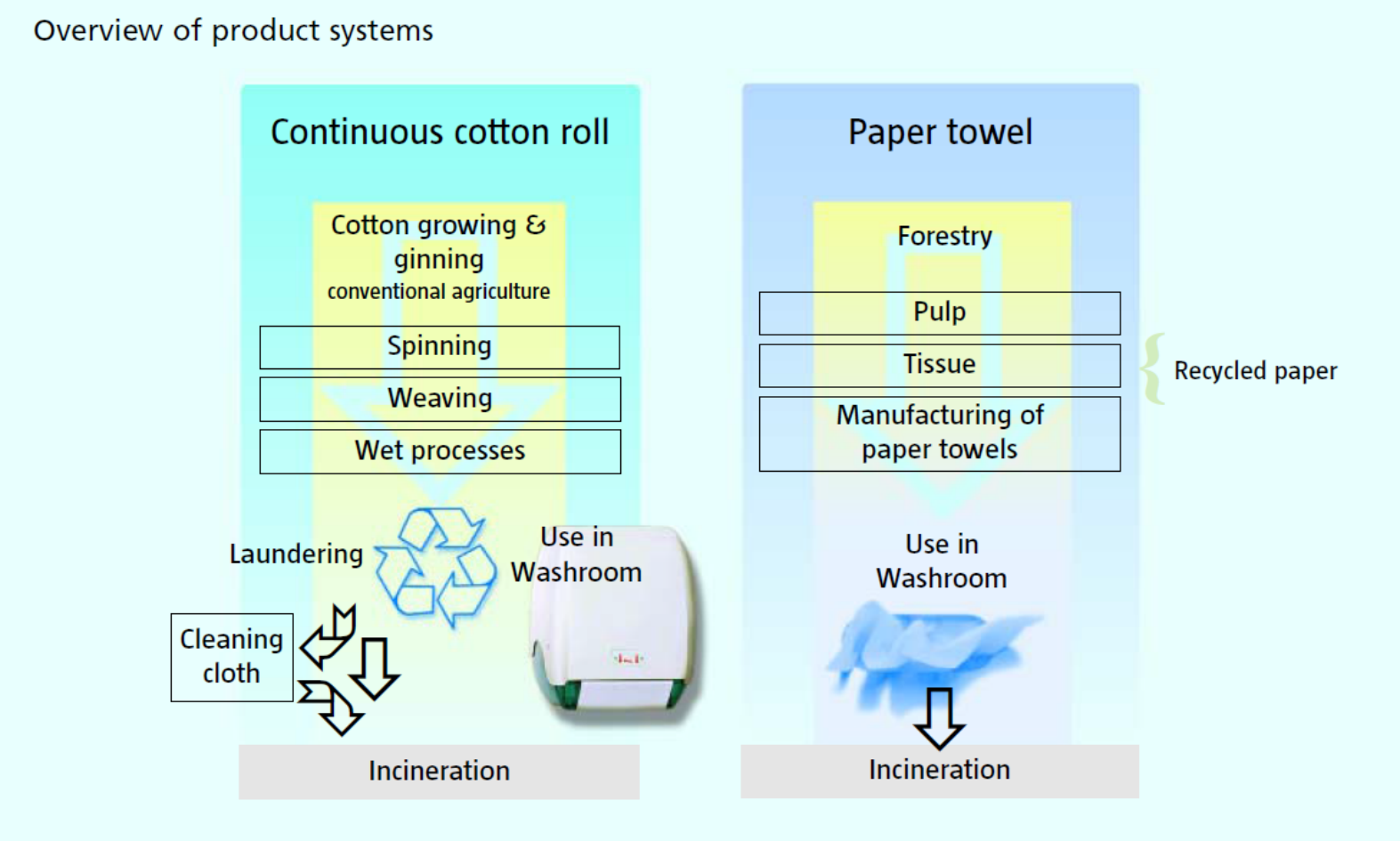
Example 1: Option 2



- Product embedded efforts stay the same as for option 1
- Number of necessary paintings:
  - Paint 1 (15a): 5 (4 repaintings)
  - Paint 2 (20a): 4 (3 repaintings)
- CED: advantage of paint 1 decreases
- GWP: paint 2 overall shows minor CO_2-emissions
- WDP: advantage of paint 2 increases

à Use phase relevant! Maybe, also with regard to Life cycle costs!

Example 2: Hand towels (textiles vs. paper products)



Source: Eberle, U., Möller, M (2006): Life Cycle Analysis of Hand-Drying Systems. A comparison of cotton towels and paper towels.