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Schmidt, Jannick; Appelqvist, Björn; Carlsen, Iben; Petersen, Kennet; Jensen, Heidi

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Results and Experiences from Combined LCA and Economical Assessment of New Collection Scheme in the City of Copenhagen

Jannick Schmidt(1), Björn Appelqvist(2), Iben Carlsen(2), Kennet Petersen(2), Heidi Jensen(3)

(1) Department of Development and Planning, Aalborg University, Aalborg, Denmark,

(2) R98, Copenhagen, Denmark,

(3) Environmental Protection Agency, City of Copenhagen, Copenhagen, Denmark



The experiment

- Collection of single use beverage containers of plastic and metal
- Collected together with glass in publicly placed bottle banks
- Manually sorted at treatment facility
- Carried out during 2004
- 31 bottle banks covering 12,000 households

Experiment results

Material	Amount of material pr. household pr. annum (g)	Fraction of potential	Results scaled up to the City of Copenhagen (tons pr. annum)
Plastics	92	~ 4 %	26
Metal	58	~ 4 %	15
Total	150	~ 4 %	41

- 14 % of the inhabitants claim to have used the scheme



Evaluation of the experiment Background

According to the new waste management strategies of the European Union and the Danish government:

- The Waste Hierarchy of the European Union is considered to be a blunt tool for prioritizing waste management initiatives
- An evaluation approach shall consider both environmental impacts and economical costs

Therefore:

- New decision support tools are needed



Our approach

$$\begin{aligned}
 &\text{Life cycle assessment (LCA)} \\
 &+ \\
 &\text{Economical Assessment (EA)} \\
 &= \\
 &\text{Combined Environmental and} \\
 &\text{Economical Assessment (CEEA)}
 \end{aligned}$$

- Results presented as cost per environmental impact (for example € per ton saved CO₂-eq)



Methodology - Scope

Functional unit:

Disposal of:

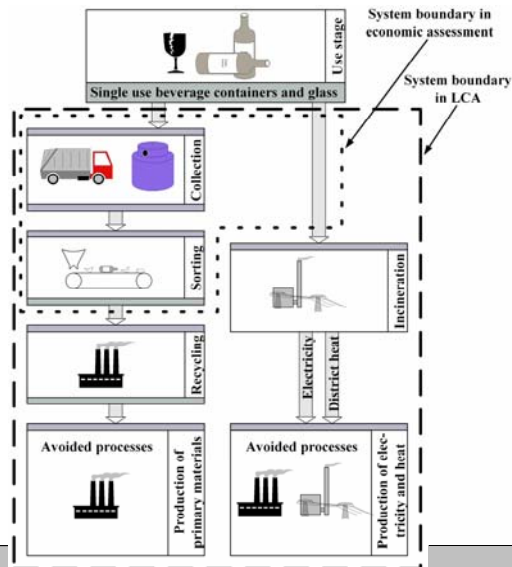
- the potential of glass waste from households in the City of Copenhagen
- the potential of beverage packaging waste of plastics and metal

What is assessed in LCA?







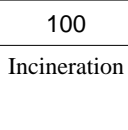
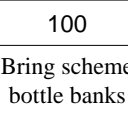
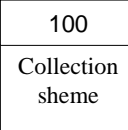
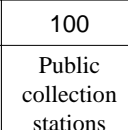
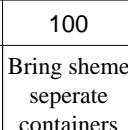

















- Global warming
- Acidification

What is assessed in the EA?

- Direct economical costs for the City of Copenhagen (R98)

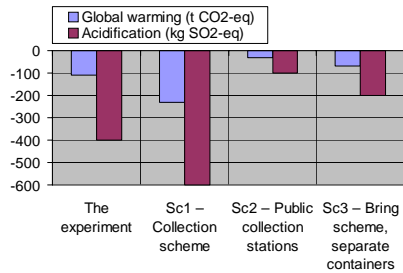


Methodology - Scenarios

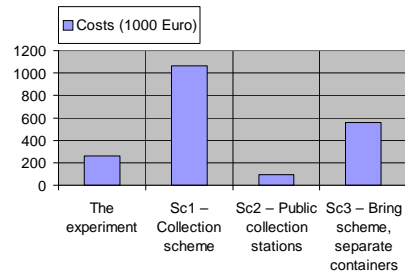
		Reference	Experiment	Sc1	Sc2	Sc3
	Glass bottles					
	Broken glass					
Index		100	100	100	100	100
	PET plastics	Incineration	Bring scheme bottle banks	Collection scheme	Public collection stations	Bring scheme separate containers
	PE-HD plastics					
	Steel cans					
	Alu cans					
Index		0	100	300	22	75

Results

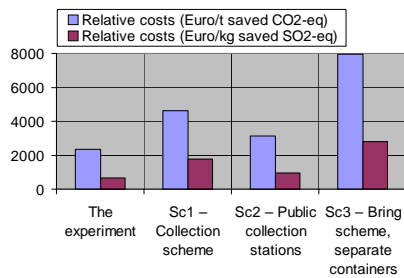
Life cycle assessment (LCA)



Economic Assessment (EA)



Combined environmental and economic assessment (CEEA)



Methodological experiences

- System boundaries: Differences between LCA and EA
 - LCA: included processes = those which are actually affected
 - EA: included processes dependant on purpose and “costs for whom?”
- Uncertainties going from LCA and EA to CEEA
 - Uncertainties are adding
 - Results are simplified



Methodological experiences CEEA vs. CBA

- CBA
 - Hard to verify results in real world budgets
 - Valuation of environmental impacts is controversial
- CEEA
 - Overcomes these main problems with cost-benefit
 - Many parameters may cause difficult interpretation



Practical experiences The process

- Iterative process
- Need for coordinated analysis
- Project management is resource demanding
- The process produces additional knowledge and insights



Practical experiences Decision support

- Reports are not read by politicians
- It's a long way from policy making in Brussels to implementation in my backyard
- Sensitivity analysis crucial to report credibility
- "Killer" assumptions can override the assessment conclusions



Conclusions

- The experiment scheme has been introduced in Copenhagen
- CEEA has been shown to be a useful tool - more transparent and less infected with subjective choices than CBA
- Uncertainties adds up in a combined analysis
- The process is resource demanding
- “Killer” assumptions has to be identified and assessed
- Sensitivity analysis is crucial to report credibility

