Newspaper waste management – a combined assessment of ecological and economic aspects

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Background

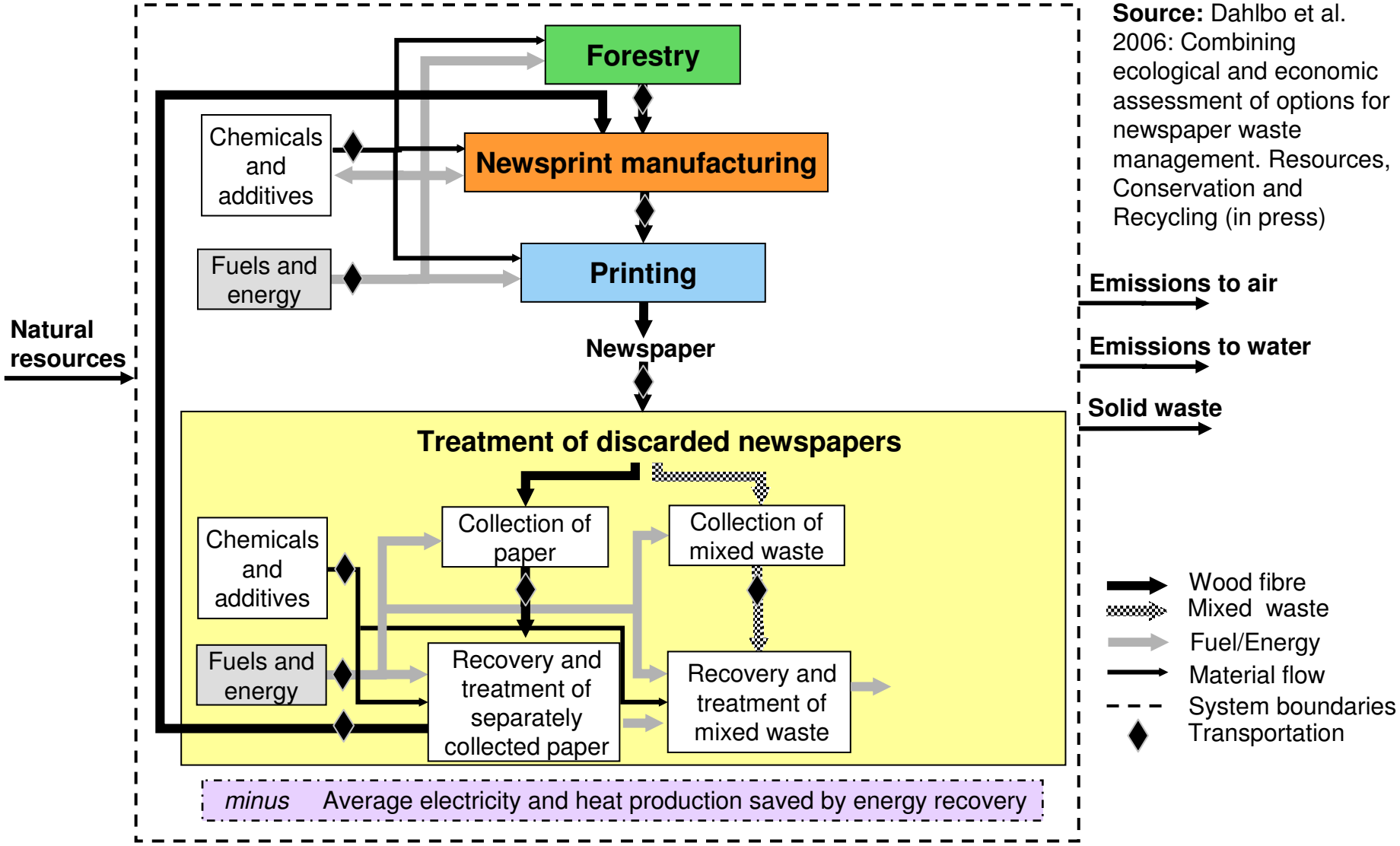
- LCA-WASTE-study
  - Case: Helsinki Metropolitan Area, newspaper
- Objectives:
  - a methodology for simultaneous assessment of life cycle environmental and economic impacts of waste management
  - information on the impacts of different paper waste management strategies
- Implementation:
  - SYKE, Research Programme for Production and Consumption
  - University of Helsinki, Environmental and Resource Economics

Background

- Ecological dimensions: Life cycle assessment (LCA)
  - Life cycle impact assessment (LCIA)
  - DAIA, Eco-indicator 99, EPS 2000
- Where to find logics for a cost calculation identical to LCA?
  - social life cycle costs (SLCC)
  - all conventional and external social costs associated with the entire life cycle of newspaper within the system boundaries of the LCA
  - waste management alternatives belong to the sphere of public policy ➔ social life cycle costs (SLCC) are applicable

Source: Dahlbo et al. 2006: Combining ecological and economic assessment of options for newspaper waste management. Resources, Conservation and Recycling (in press)

Boundaries of the product systems



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Functional unit = 1 tonne of newspaper delivered to consumers

The waste management alternatives studied

	■	▲	●	+	◆
	REC + LF	**REC + SRF**	**REC+COMB+SRF**	**REC+INC**	**REC+INC+INC**
Separately collected paper:	Recycling	Recycling	50% Recycling 50% Comb.	Recycling	50% Recycling 50% Inc.
Mixed waste:	Landfill	SRF gasification + combustion with coal	SRF gasification + combustion with coal	Incineration	Incineration

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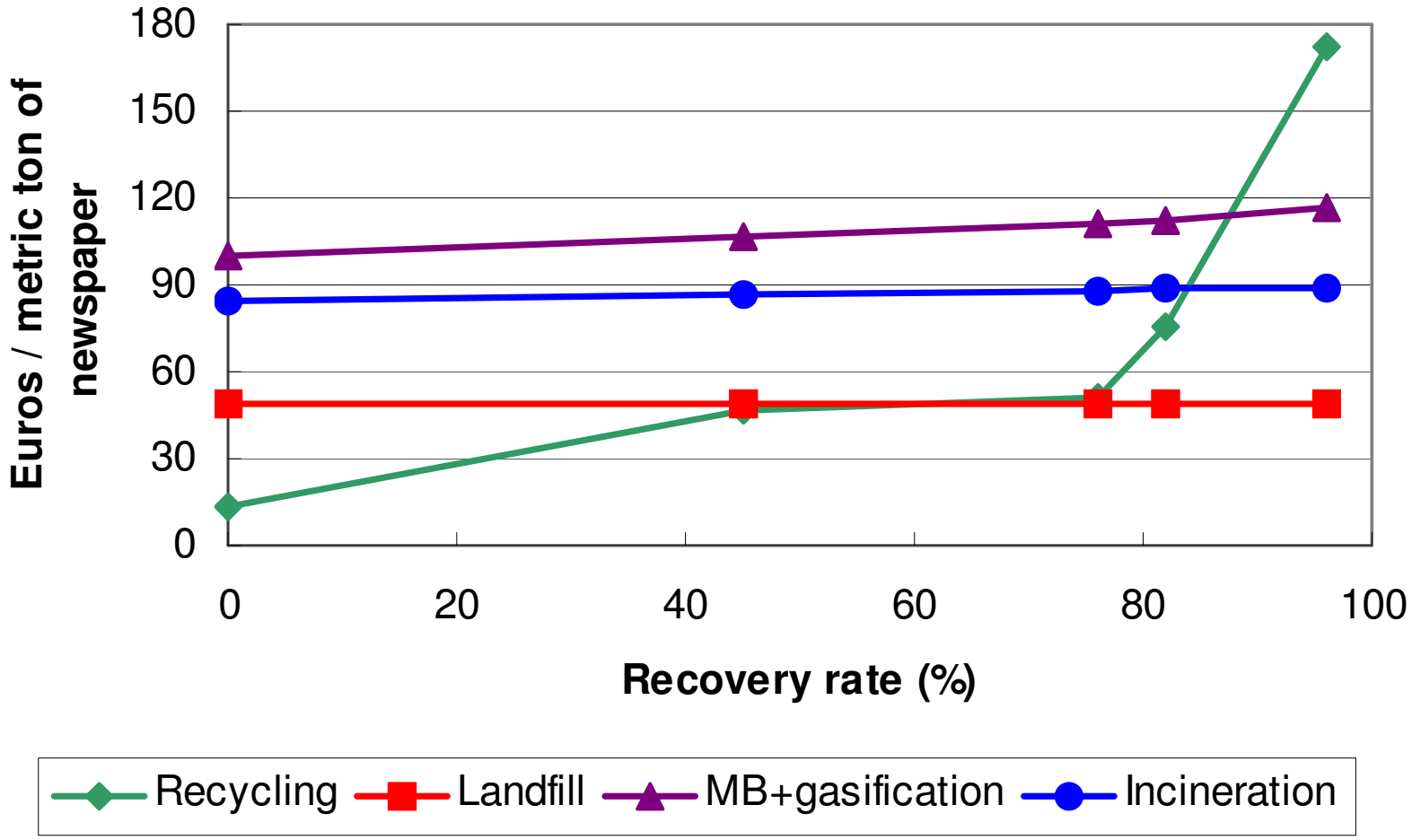
Proceeding step by step

- Step 1
  - Finding the ecologically best solution
- Step 2
  - Finding the cost minimizing solution
- Step 3
  - Comparing the ecological impacts with costs
- Step 4
  - Seeking for a compromise between the ecological and economic impacts?
    - Moving towards higher environmental quality with minimum costs

LCIA results with Eco-indicator 99

Impact category	REC + LF	REC + SRF	REC+COMB +SRF	REC+INC	REC+INC+INC
Damage to human health					
Carcinogenic effects	0.11	0.06	0.06	0.06	0.06
Respiratory effects from organic substances	0.01	0.01	0.01	0.01	0.01
Respiratory effects from inorganic substances	10.9	10.7	7.34	11.2	9.06
Climate change	5.87	4.48	2.18	5.02	3.75
Damage to ecosystem quality					
By ecotoxic emissions	1.41	1.35	1.71	1.36	1.76
By acidification and eutrophication	1.47	1.36	0.91	1.48	1.25
By land occupation and conversion	0.84	0.84	1.39	0.84	1.39
Damage to resources					
By extraction of minerals	0.15	0.15	0.15	0.15	0.15
By extraction of fossil fuels	15.3	14.8	14.2	15.3	15.7

Marginal costs of methods



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The cost minimizing solution

Cost minimizing alternative	Life cycle impact assessment results (ranking)*		
	DAIA impact value	Eco-indicator 99 ecopoints	EPS 2000 ELUs
80% recycling & 16% landfill	7.4 (V)	34.5 (V)	295 (V)
86% recycling & 10% incineration	7.2 (IV)	35.5 (IV)	265 (III)

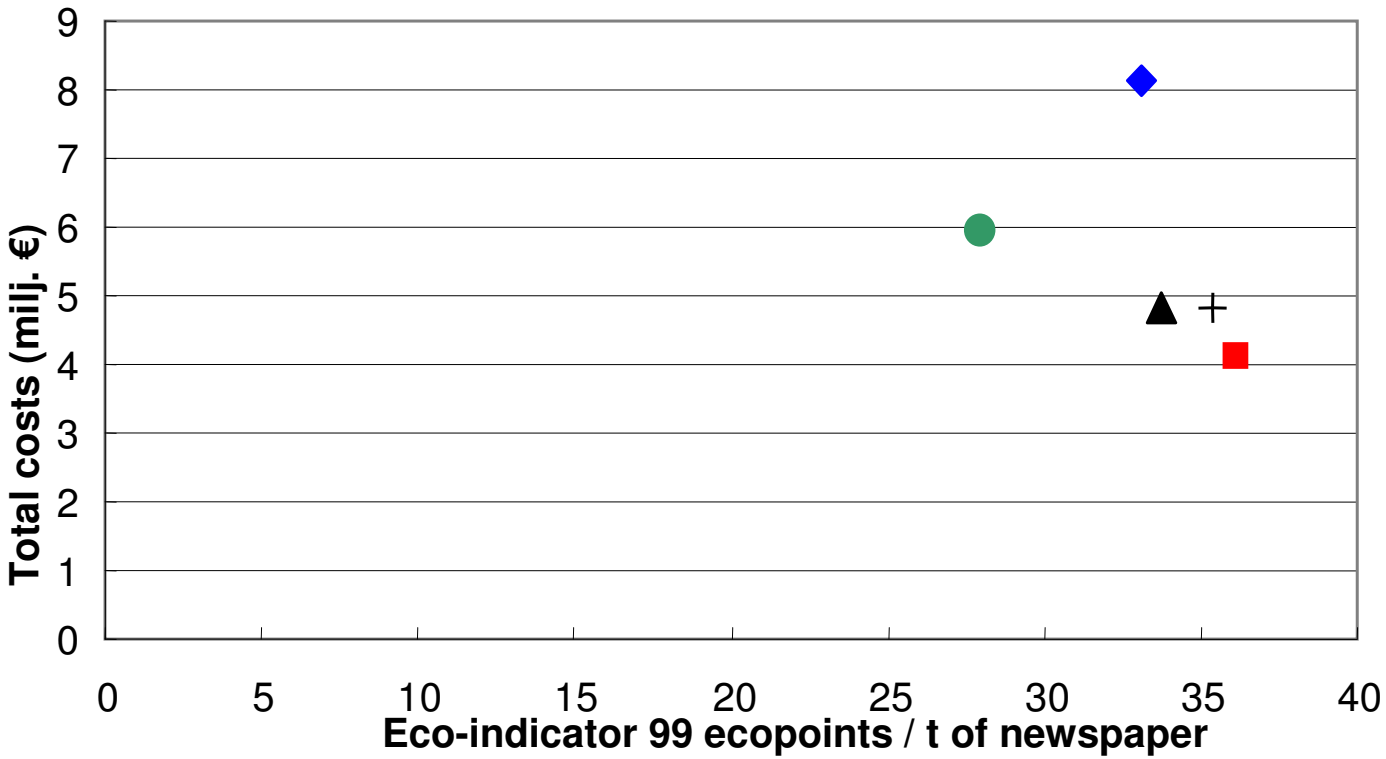
* I = lowest environmental impacts, V = highest environmental impacts

Environmental and economic aspects

Waste management alternative	Costs (ranking)*	Life cycle impact assessment result ranking*		
		DAIA	Eco-indicator 99	EPS 2000
REC + LF	4.15 (I)	V	V	V
REC + SRF	4.81 (II)	III	III	II
REC+COMB+SRF	5.95 (IV)	I	I	I
REC+INC	4.81 (II)	IV	IV	III
REC+INC+INC	8.15 (V)	II	II	IV

* I = lowest cost or lowest environmental impacts, V = highest costs or highest environmental impacts

Looking for a compromise



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Conclusions

- Energy recovery of separately collected paper
  - performs environmentally well,
    - if waste substitutes coal and
    - If energy recovery processes are efficient
  - increases the cuttings of forests
    - increased impacts on e.g. biodiversity
    - these impacts are not included in the assessment satisfactorily
    - increased demand of wood increases the price of wood
  - Is more expensive than material recovery
- Of the two energy recovery technologies incineration performed environmentally worse

Conclusions

- Material recovery of separately collected paper
  - Performs quite well environmentally
  - Is cheaper than energy recovery
- Landfilling is environmentally worst, but cheapest
  - No longer a feasible option for biodegradable wastes

Final remarks

- Including both the environmental and economic dimensions in the assessment of waste management alternatives is crucial for making sustainable decisions.
- The results of the two assessments rank the alternatives somewhat differently.

  ➔ Social decision-making problem: the ecological and economic aspects have to be weighed against each other.
- When performing trade-offing between the two aspects, transparency is important.
- Striving towards better environmental quality requires economic investments.