EUROPEAN COMMISSION
DIRECTORATE-GENERAL
Joint Research Centre
Institute for Environment and Sustainability
Soil and Waste Unit

Joint Research Centre

Taking sustainable use of resources forward: Life cycle thinking and waste management

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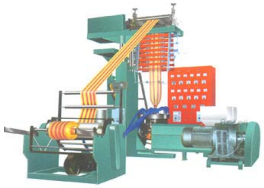


Extraction/Processing

Use



Recycling to other plastic products (of lower quality)


Incineration for heat and electricity

Landfill

Life cycle illustration: Plastic bags

Life cycle considerations: e.g. Trade-offs & Credits

Recycling: e.g. recycling to replace virgin material

-avoids environmental pressures of extraction & processing virgin materials

- pressures from recycling

Fuel substitution: e.g. waste substitutes fossil fuel, …

- fuel extratction processing, …

- emissions from waste incineration, transport, …

Product substitution: e.g. waste substitute other composts/soil improver

Towards Sustainability: Life Cycle Thinking in EU Policy

- Strategy for Prevention and Recycling of Waste (2006)
- Strategy for Sustainable Use of Natural Resources (2006)
- Integrated Product Policy Communication (2003)
- Waste Framework Directive – Need for change
- Strategic Environmental Assessment Directive – *plans/programs (2001)*

Growing Examples in Specific EU Policies

- **Packaging waste Directive** – Life cycle based cost-benefit analysis
- **Waste oils Directive** – Stakeholder consultation inputs based on LCA studies/ EIA
- **Eco-design requirements for energy using products Directive** - "Eco-design of EuP methodology" study, study on eco-design of television devices, EPIC-ICT project.
- **Construction products Directive (CPD)** – LCA of PVC and principle competing materials, LCA tools workshop (2002), CEN Mandate M350 – int. env. performance for buildings (EPDs)

Taking sustainable use of resources forward
Thematic Strategy on the prevention and recycling of waste

preventing waste and promoting re-use, recycling and recovery so as to reduce negative environmental impacts and promote sustainable resource consumption

Looking at the Life Cycle Thinking Elements

Streamling and extending legislation: life cycle thinking in Waste Framework Directive (no environmental objectives in current WFD)

Waste hierarchy not a rigid prescription – guidance

Need to ensure easily useable tools, with agreed approaches, to support policy at local to EU scale.

Consider trade-offs from broader picture – upstream/downstream, across impacts, …

(minimum quality standards for recycling, compost criteria, energy efficiency thresholds for municipal waste incinerators, …)

COMPLIMENT EXISTING TOOLS

Example of use of LCA: Review of Waste Oils Directive

-Recycling of waste fuel oils? – or environmentally better to burn it?

- Trade-offs: replace virgin oils through recycling, or replace e.g. fossil fuels through waste incineration + energy recovery

-can be technology specific, depends on fuel being replaced, …

-Lower carcinogenic pressures, climate change contributions, …, from energy recovery, but higher resource consumption, …

Promoting Life Cycle Thinking in Europe and European Policy

Integrated Product Policy (IPP) Communication (COM(2003)302)

not specific policy nor tool – **promote life cycle thinking** for greener products

- strengthen sustainable policies/remove barriers
- Various tools: taxes, subsidies, public/corporate procurement, …
- voluntary agreements, standards, targets, EMAS, labeling, EPDs, …
- **Support: awareness, agreement, info. availability, …**

European Platform on Life Cycle Assessment

Needs: consensus, quality assured LCA data sets, methods, efficiency, ...

- Deliverable: EU Reference LCA Database System
- Deliverable: Handbook of EU Recommended Technical Guidelines on LCA
- Kick-off meetings (Nov. 2005): cross-DG, 100 industry assoc., IPP Formal committee
- Coordination & implementation: DGs JRC & Env

Pilot Studies, Workshops & Reference Methods

LCA in Waste Management Planning

Sustainable management of wastes, sustainable use of resources, SEA Implementation, ...

Need for a European Platform on Life Cycle Assessment

Commission, Member States, and European Industry Associations

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e.g. from Integrated Product Policy (IPP) Communication (COM 2003:302):

*"**LCAs** provide the **best framework for assessing the potential environmental impacts of products** currently available. They are therefore an **important support tool for IPP**. However, the **debate is ongoing about good practice** in LCA use and interpretation. **Through a series of studies and workshops**, the Commission will further this discussion, **with the aim of producing a handbook** within two years on best practice, based on the **best possible consensus** attainable among **stakeholders**."*

Example Core LCA data from prototype

Sector	Process	Region	Source	Remark
Plastics	ABS (Acrylonitrile-butadiene-styrene copolymer)	RER	PlasicsEurope	
	Nylon 6 and Nylon 6 glass filled	RER	PlasicsEurope	
	Nylon 66	RER	PlasicsEurope	
	Nylon 66 glass filled	RER	PlasicsEurope	
	PET resin (amorphous)	RER	PlasicsEurope	
	PET resin (bottle grade)	RER	PlasicsEurope	
	PET resin (terephthalic acid)	RER	PlasicsEurope	
	Polybutadiene	RER	PlasicsEurope	
	Polycarbonate	RER	PlasicsEurope	
	Polyethylene (HD)	RER	PlasicsEurope	
	Polyethylene (LD)	RER	PlasicsEurope	
	Polyethylene (LLD)	RER	PlasicsEurope	
	Polymethyl methacrylate beads (PMMA)	RER	PlasicsEurope	
	Polypropylene	RER	PlasicsEurope	
	Polystyrene (expandable)	RER	PlasicsEurope	
	Polystyrene (general purpose)	RER	PlasicsEurope	
	Polystyrene (high impact)	RER	PlasicsEurope	
	PVC (bulk polymerised)	RER	PlasicsEurope	
	PVC (emulsion polymerised)	RER	PlasicsEurope	
	PVC (suspension polymerised)	RER	PlasicsEurope	
	MDI (Diphenylmethane-diisocyanate)	*RER*	*PlasicsEurope*	*?*
	TDI (Toluene-diisocyanate)	*RER*	*PlasicsEurope*	*?*
	Polyols	*RER*	*PlasicsEurope*	*?*
	Liquid epoxy resins	*RER*	*PlasicsEurope*	*?*
Chemicals	Sodium chloride	RER or DE	PlasicsEurope or GaBi	
	Sulpheric acid	RER or DE	PlasicsEurope or GaBi	
	Caustic Soda	RER or DE	PlasicsEurope or GaBi	
	HCl	RER or DE	PlasicsEurope or GaBi	
Packaging materials	corrugated board 1	RER	FEFCO	
	corrugated board 2	RER	FEFCO	
	corrugated board 3	RER	FEFCO	
	glas	*RER*	*IFEU*	*?*
	paper	*RER*	*KCL*	*?*
Construction materials	timber	DE	BFH (Bundesanstalt für Forst- und Holzwirtschaft)	
	particle board	DE	BFH (Bundesanstalt für Forst- und Holzwirtschaft)	
	concrete	*RER*	*CEMBUREAU*	*?*
Waste treatment	waste incineration of mixed household waste	DE	GaBi	if regional differences are too large, we will split up into different datasets
	landfill of mixed household waste	DE	GaBi	if regional differences are too large, we will split up into different datasets

Transport	small lorry (7,5t)	RER	TREMOD (Transport Emission Estimation Model)	
	lorry (22t)	RER	TREMOD (Transport Emission Estimation Model)	
	articulated lorry (40t)	RER	TREMOD (Transport Emission Estimation Model)	
	rail transport	RER	TREMOD (Transport Emission Estimation Model)	
	barge	RER	TREMOD (Transport Emission Estimation Model)	
	container ship ozean	RER	GaBi	
	bulk carrier ozean	RER	GaBi	
	plane	RER	TREMOD (Transport Emission Estimation Model)	
	small lorry (7,5t) incl. fuel	RER	TREMOD (Transport Emission Estimation Model)	
	lorry (22t) incl. fuel	RER	TREMOD (Transport Emission Estimation Model)	
	articulated lorry (40t) incl. fuel	RER	TREMOD (Transport Emission Estimation Model)	
	rail transport incl. fuel	RER	TREMOD (Transport Emission Estimation Model)	
	barge incl. fuel	RER	TREMOD (Transport Emission Estimation Model)	
	container ship ozean incl. fuel	RER	GaBi	
	bulk carrier ozean incl. fuel	RER	GaBi	
	plane incl. Fuel	RER	TREMOD (Transport Emission Estimation Model)	
Metals	aluminium foil	RER	EAA	
	aluminum sheet	RER	EAA	
	aluminium profile	RER	EAA	
	steel slab	RER	IISI	
	steel profile hot rolled	RER	IISI	
	steel sheet cold rolled	RER	IISI	
	steel wire	RER	IISI	
	stainless steel slab	*RER*	*IISI*	*?*
	copper cathode	RER	ECI	
	zinc billet	*RER*	*IZA*	*?*

Sector	Process	Region	Source	Remark
Energy				
Electricity production	electricity production	AT	GaBi	
	electricity production	BE	GaBi	
	electricity production	CH	GaBi	
	electricity production	CZ	GaBi	
	electricity production	DE	GaBi	
	electricity production	DK	GaBi	
	electricity production	EE	GaBi	
	electricity production	FI	GaBi	
	electricity production	FR	GaBi	
	electricity production	GB	GaBi	
	electricity production	GR	GaBi	
	electricity production	HU	GaBi	
	electricity production	IS	GaBi	
	electricity production	IT	GaBi	
	electricity production	LU	GaBi	
	electricity production	LT	GaBi	
	electricity production	LV	GaBi	
	electricity production	NL	GaBi	
	electricity production	NO	GaBi	
	electricity production	ES	GaBi	
	electricity production	PL	GaBi	
	electricity production	PT	GaBi	
	electricity production	SE	GaBi	
	electricity production	SI	GaBi	
	electricity production	SK	GaBi	
	electricity production	UCPTE	GaBi	
Fuels	regular fuel	RER	GaBi	
	diesel	RER	GaBi	
	light fuel oil	RER	GaBi	
	heavy fuel oil	RER	GaBi	
	kerosene	RER	GaBi	
	natural gas	RER	GaBi	
	hard coal	RER	GaBi	
	lignite	RER	GaBi	
Thermal energy	thermal energy from natural gas	RER	GaBi	
	thermal energy from light fuel oil	RER	GaBi	
	thermal energy from heavy fuel oil	RER	GaBi	

EU Municipal Waste Management Life Cycle Pilot Studies

- JRC Enlargement Action: Exchange with New member states and candidate countries

- Implementation of new waste management systems/planning

- Focus on life cycle thinking, exchange information, needs in EU, …

- Prague 2004 LCA Workshop & Conference (http://viso.ei.jrc.it/iwmlca/index.html)

- Pilot studies for specific regions in new member state, acceding countries, associated, …

- Interactions with International Expert Group on LCA for Integrated Waste Management

EU Municipal Waste Management Life Cycle Pilot Studies

- **Phase 1**: IWM2 for 13 pilot regions in new Member States and Candidate Countries

- **Scenarios:** Current situation, Directive compliant, Ambitious.

- **Phase 2:** More detailed studies for Krakow + Malta

- **Demonstrate options:** – 1) conventional LCA, 2) hybrid LCA, 3) externalities

Pilot Studies (13 regions phase 1)

Recycling, Composting, Incineration, Refuse Derived Fuels

Packaging Waste Directive compliance:

Recycling: 55% overall, 60% paper, 60% glass, …

Landfill Directive compliance:

Ultimately 65% relative to 1995 levels

Ambitious:

Higher recycling, higher incineration, …

(EU25 extreme: 10% landfill, 25% energy recovery and 65% recycling)

Life Cycle Thinking in Environmental Policies of the European Union

References

1. IPP = http://europa.eu.int/comm/environment/ipp
2. EuP Directive = http://europa.eu.int/comm/enterprise/eco_design
3. EPD see IPP; Product Performance Targets see ETAP; Environmental Technology Verification see ETAP; Eco-Label = http://europa.eu.int/comm/environment/ecolabel
4. RTD funding = http://europa.eu.int/comm/environment/research ; ETAP = http://europa.eu.int/comm/environment/etap
5. EMAS = http://europa.eu.int/comm/environment/emas ; BATs = http://europa.eu.int/comm/environment/ippc
6. Public Procurement = http://europa.eu.int/comm/environment/gpp
7. eLCA project = http://www.ecosmes.net
8. Resources Strategy = http://europa.eu.int/comm/environment/natres
9. Waste Framework Directive = http://europa.eu.int/comm/environment/waste/legislation
10. Waste Strategy = http://europa.eu.int/comm/environment/waste/strategy