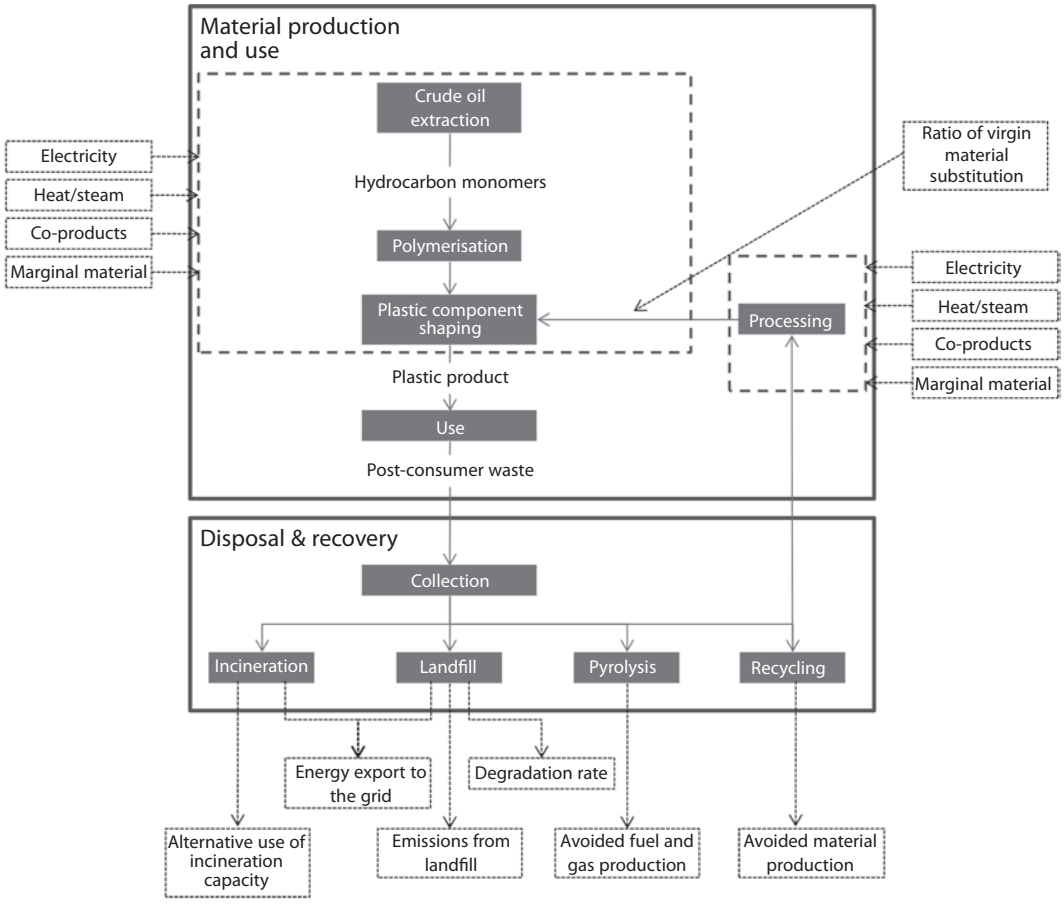
Annex E

Lifecycle analysis

System boundary for plastics

Figure E.1. **System flow and boundaries for plastics value chain**



Source: Michaud, Farrant and Jan (2010[19]), *Environmental benefits of recycling*, http://bit.ly/2uricL6.

Lifecycle inventory data

Table E.1. **Carbon factors (kg CO_2/tonne savings versus landfill)**

Plastic type	kg CO_2/tonne saved by recycling compared to landfill
PET	1 705
PS	1 240
Mixed plastics	1 215
Mixed Plastic Bottles	1 156
HDPE	1 161
LDPE	1 098
PP	948
PVC	888
Other plastics	688

Note: ranked by highest impact from recycling.

Source: Defra (2012[84]), *England Carbon Metric*, http://bit.ly/2vm94o3

Table E.2. **Environmental inventories of PET production using virgin and recycled materials**

Input and output	1 kg virgin plastic (PET)	1 kg recycled plastic (R-PET)
Input		
Energy (& petroleum)	84 MJ	7.97 MJ
Waterborne	17.5 kg	2.96 kg
Other input materials	0.01 kg	0.024 kg
Output		
Atmospheric emission	6 kg	3.5 kg
Solid waste	45.13 kg	0.31 kg
Waterborne emission	21.46 kg	12.82 kg

Source: Wong (2009[88]), *A Study of Plastic recycling supply chain*, http://bit.ly/2vtHK7L.

Table E.3. **Relative difference between the impacts from the different end-of-life options vs. recycling for climate change for different plastic types**

	Recycling versus other alternatives										
No. case	1[PE]	1[PET]	2[MIX1]	2[MIX2]	2[MIX3]	2[MIX4]	3[PE]	3[PP]	3[PS]	3[PET]	3[PVC]
Incineration + energy rec.	310%	200%	390%	710%	390%	710%	990%	50%	100%	210%	0%
Landfill	100%	100%	130%	150%	130%	150%	1 080%	60%	130%	220%	10%
Pyrolysis			100%	110%	90%	80%					

	Recycling versus other alternatives										
No. case	4[MIX]	5[MIX]	6[HDPE]	6[LDPE]	6[PET]	7[PET]	7[PE]	7[PVC]	8[PS1]*	8[PS2]	8[PS3]
Incineration with energy rec.	430%	40%	170%	150%	170%				10%*	60%	100%
Landfill	290%		100%	100%	100%	130%	160%	110%			
Pyrolysis	30%										

*Feedstock recycling scenario.

Note: A positive value means that recycling is preferable to the other end-of-life option. A negative value means that recycling causes more environmental impact than the other end-of-life option.

Source: Michaud, Farrant and Jan (2010[19]), *Environmental benefits of recycling*, http://bit.ly/2uricL6.

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