



EUROPEAN
RENTAL
ASSOCIATION

The Carbon Footprint of Construction Equipment

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Construction equipment and its carbon footprint

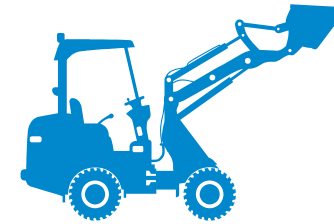




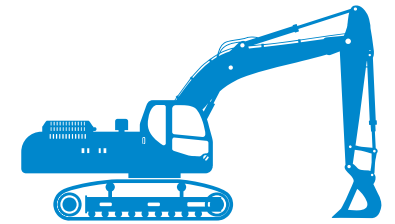
Project goal

To compare efficient and inefficient use of equipment

To demonstrate possible reductions in CO₂-emissions.



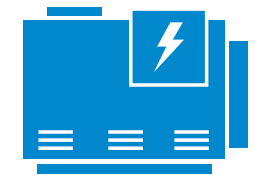
Mini-excavator



Excavator



Wheel loader



Generator



Telehandler



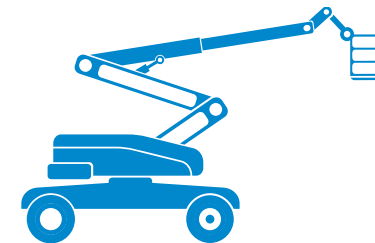
Scissor lift



Breaker



Battery drill



Electric articulating boom lift



Mast boom lift



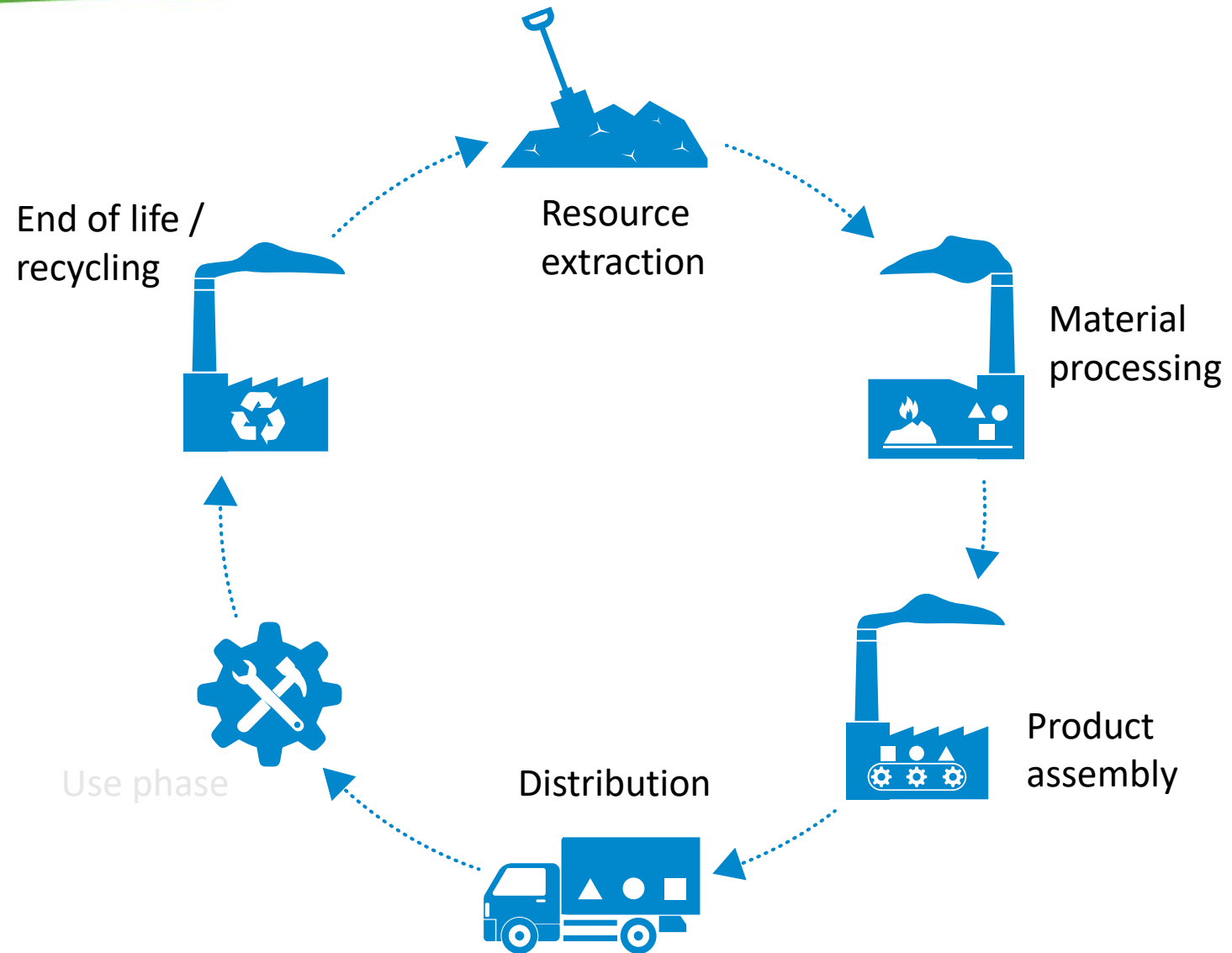
Approach

Phase 1:

- Carbon Life Cycle Assessment, ISO 14040 & 14044 LCA standard

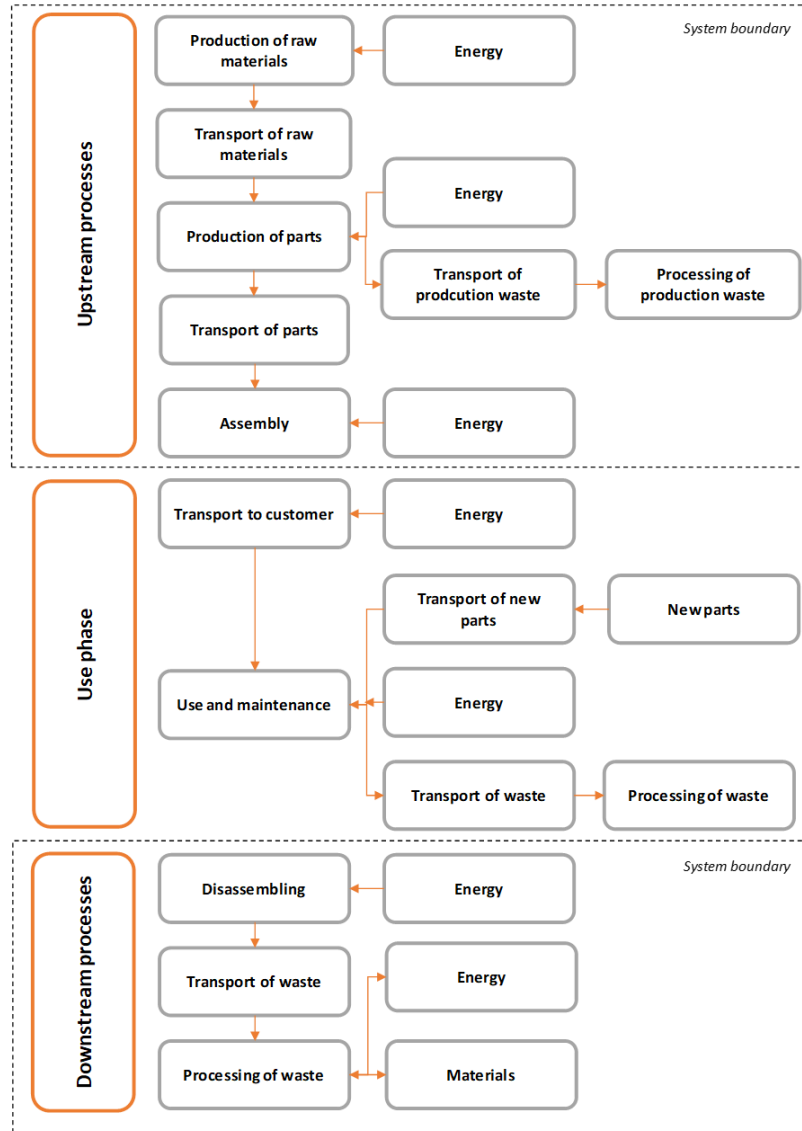
Phase 2:

- Definition of parameters
- Comparative analysis of parameters effects on selected products
- Use case scenarios and calculator





Scope LCA





Materials & Ecoinvent databases

Part of equipment	Material	Amount	Unit	Reference
Steel	Reinforcing steel	173	kg	Reinforcing steel {GLO} market for Cut-off, U
Steel	Stainless steel	56	kg	Steel, chromium steel 18/8 {GLO} market for Cut-off, U
Steel	Stainless steel, hot rolled	1	kg	Steel, chromium steel 18/8, hot rolled {GLO} market for Cut-off, U
Steel	Steel low-alloyed	2830	kg	Steel, low-alloyed {GLO} market for Cut-off, U
Steel	Steel low-alloyed, hot rolled	0	kg	Steel, low-alloyed, hot rolled {GLO} market for Cut-off, U
Steel	Steel unalloyed	6249	kg	Steel, unalloyed {GLO} market for Cut-off, U
Iron	Cast iron	13694	kg	Cast iron {GLO} market for Cut-off, U
Iron	Sinter iron	93	kg	Sinter, iron {GLO} market for Cut-off, U
Aluminium	Aluminium cast alloy	112	kg	Aluminium, cast alloy {GLO} market for Cut-off, U
Chromium	Chromium	3	kg	Chromium {GLO} market for Cut-off, U
Lead	Lead	30.6	kg	Lead {GLO} market for Cut-off, U
Copper	Copper	0.15	kg	Electronics, for control units {GLO} market for Cut-off, U
Plastic	Polyamide glass reinforced	18	kg	Glass fibre reinforced plastic, polyamide, injection moulded {GLO} market for Cut-off, U
Plastic	Polyester glass reinforced	61	kg	Glass fibre reinforced plastic, polyester resin, hand lay-up {GLO} market for Cut-off, U
Plastic	Nylon 6	16	kg	Nylon 6 {GLO} market for Cut-off, U

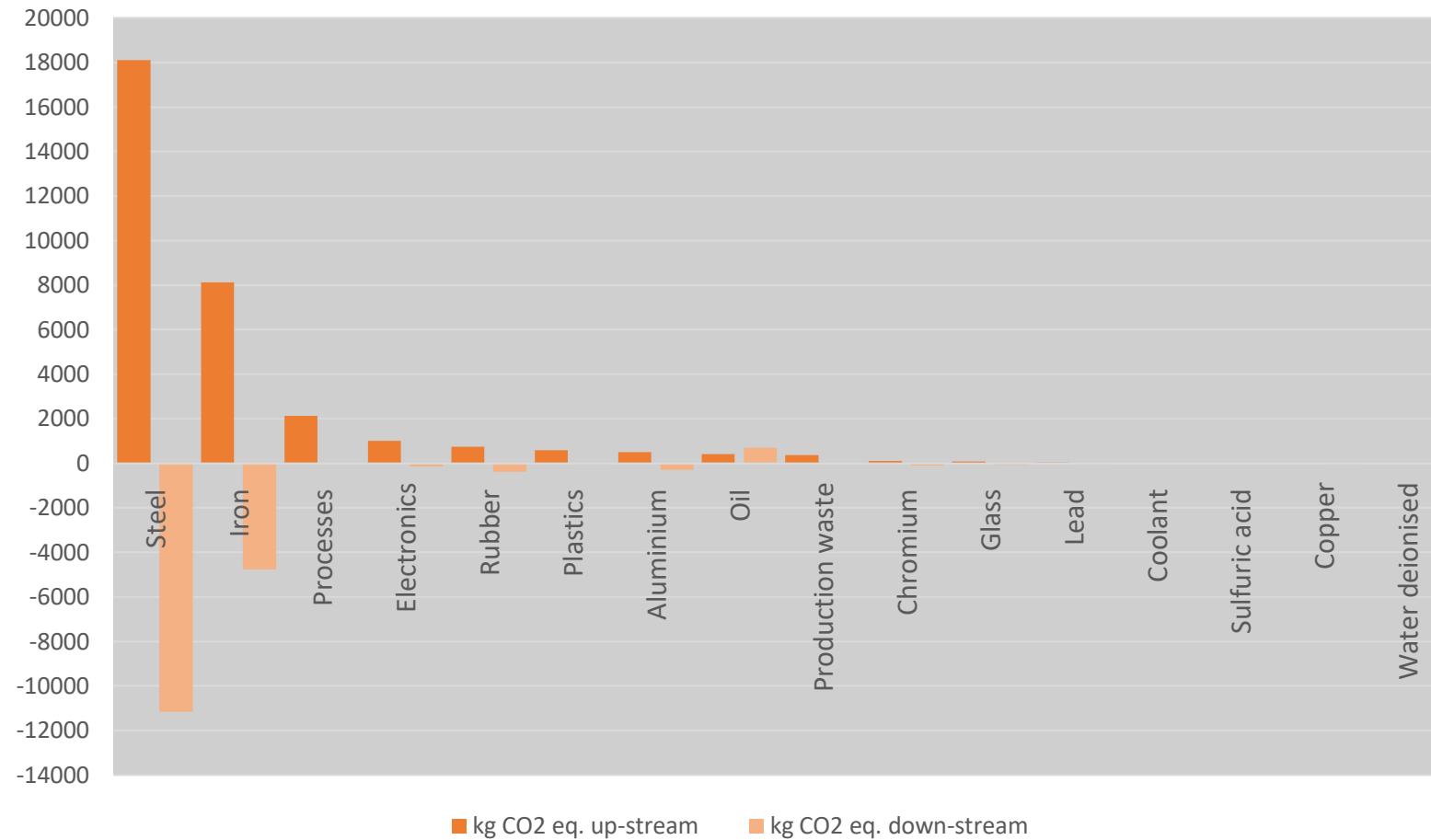


End of life assumptions

Product	Recycle	Incineration	Landfill	Reference
Plastics**	95%	3.5%	1.5%	Eurostat ELV
Tyres	57.5%	42%	0.5%	Eurostat ELV
Metal	99%	0%	1%	Eurostat ELV
Glass	99%	0%	1%	Eurostat ELV
Electronics	83%	9.5%	7.5%	Eurostat WEEE
Battery (metal)	95%	0%*	5%*	Eurostat battery
Battery (plastic)	47.5%*	47.5%*	5%*	Eurostat battery



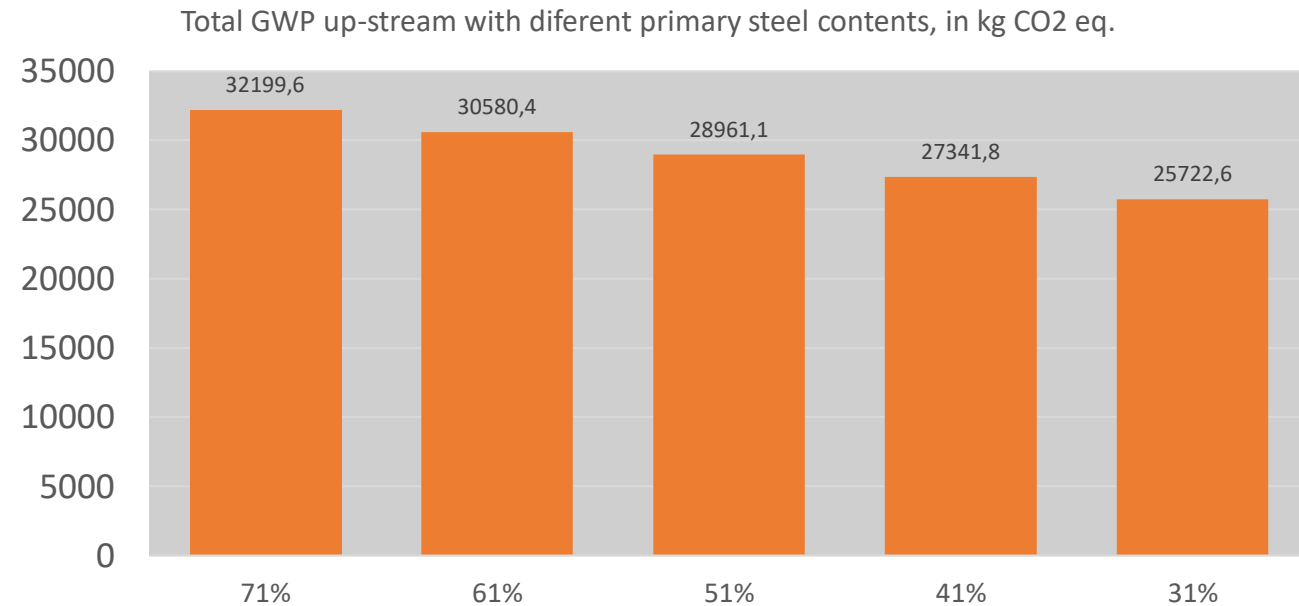
Example- GWP of up- and down-stream processes





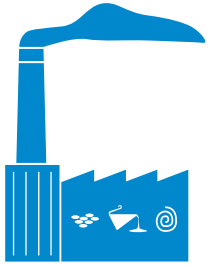
Sensitivity analysis for primary material content

Primary steel content	Total GWP up-stream	% difference up- stream
71%	32199.6	0%
61%	30580.4	5%
51%	28961.1	10%
41%	27341.8	15%
31%	25722.6	20%

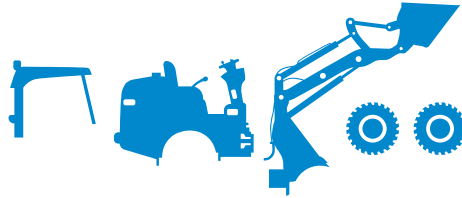




**PRODUCTION
of materials**



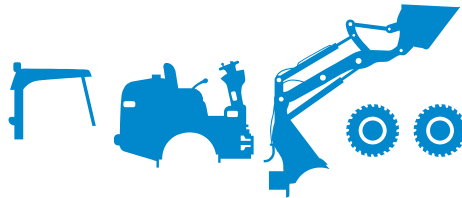
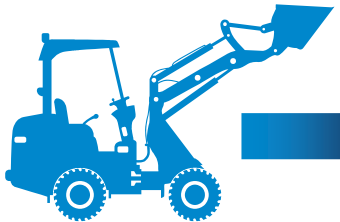
**PRODUCTION
of components**



ASSEMBLY



11.870 kg CO₂-eq



DISASSEMBLY

**RECYCLING
(average)**

-4.720 kg CO₂-eq

7.150 kg CO₂-eq





Potential of disassembly and recycling

	Batery drill	Breaker	Generator	Mast boom lift	Articulating boom lift	Scissor lift	Telehandler	Mini-excavator	Wheel loader	Crawling excavator
Carbon footprint kg CO2e	26	136	3546	7049	7935	3691	24908	5059	11872	32200
End of life	-6	-38	-1101	-3832	-3338	-1435	-10439	-1798	-4716	-15909
Net carbon footprint kg CO2e	20	98	2445	3217	4597	2256	14469	3261	7156	16291
% change if properly recycled	-21%	-28%	-31%	-54%	-42%	-39%	-42%	-36%	-40%	-49%



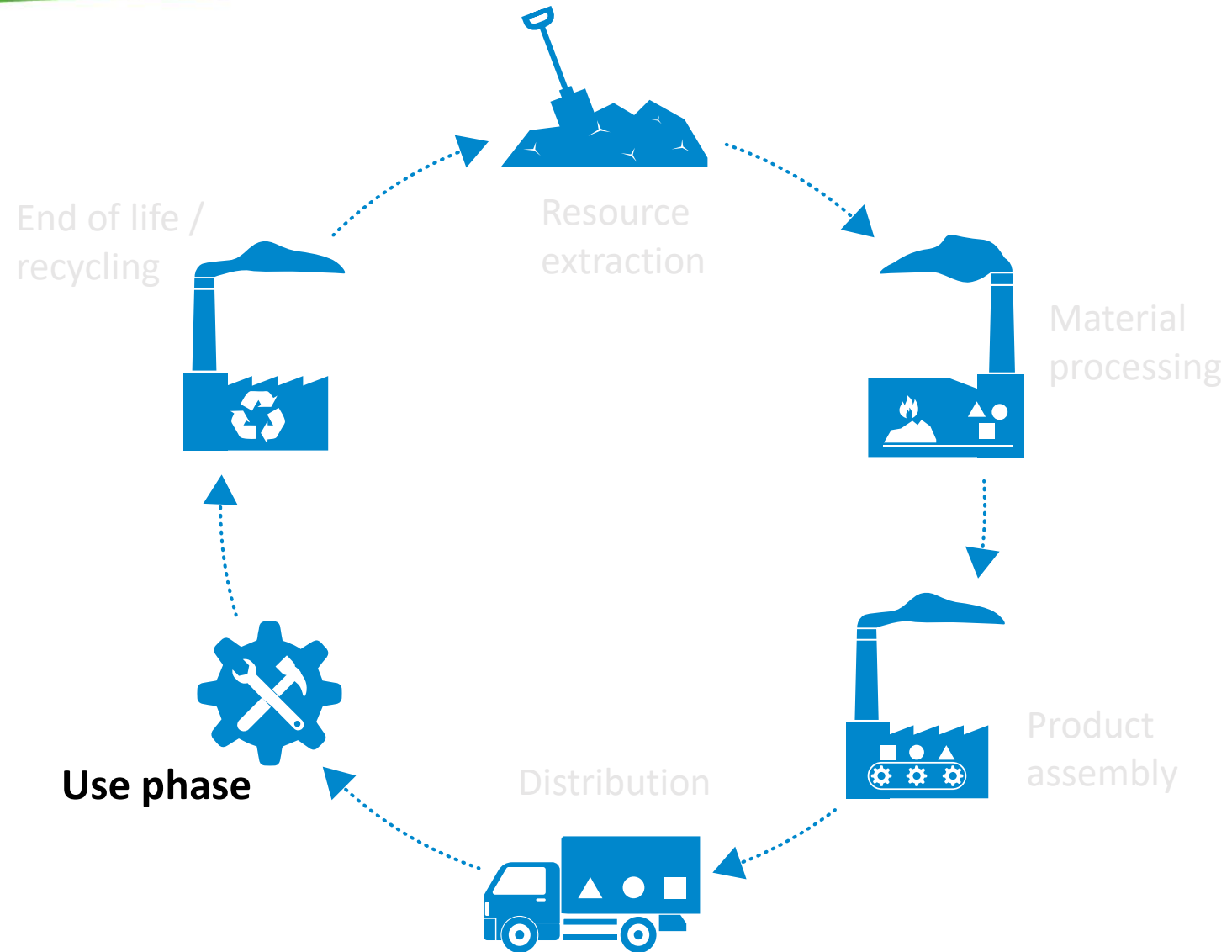
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Various parameters determine the impact of use

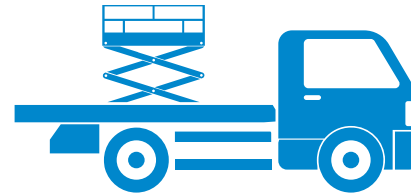


Intensity of use

- Lifetime
- Low vs high (h/yr)
- Wrong vs good



Energy consumption Biofuel



Transportation:

- Distance,
- Vehicle type
- Load factor



Recycling (yes/no)



Enables innovation

- Efficiency improvement over time

