Table S1. Stages and resources taken into account when assessing the life cycle of complex technical devices

Object	Source	Production					Installation			Operation		Waste management after end-of-life operation
		Number of materials used, units	Types of processing	Auxiliary structures	Electricity	Other resources*	Transporta-tion of materials and components	Land acquisition, site preparation, road	Transporta tion of structures	Technical service	Repair	
Offshore wind turbine (Brazil, 2022)	**[20]**	Total – 5 Gandola – 4 Hub and blades – 2 Tower – 3 Platform – 2 Mooring system - 1	were not considered	were not considered	+	were not considered	Freight transport	were not considered	Sea transport	Technical service - 2 times / year, Lubricating oil -1 time / 3 years	In case of breakdown	Recycling
Offshore wind turbine (USA, 2014)	**[21]**	Total – 6 Gandola – 5 Blades – 4 Tower - 1	were not considered	were not considered	-	Lubricatin g oil	were not considered	were not considered	Sea transport	were not considered	were not considered	Recycling, incineration, disposal
Onshore wind turbine (USA, 2014)	**[22]**	Total – 7 Gandola – 5 Rotor – 4 Tower - 1	were not considered	Foundation	-	Lubricatin g oil	were not considered	were not considered	Freight transport	Changing oils and lubricants - 1 time / 3 years, rotor blades, reducer and generator 1 time / 20 years	were not considered	Recycling, incineration, disposal
Onshore wind turbine (USA, 2019)	**[23]**	Total – 12 Gandola – 9 Rotor – 9 Tower - 2	were not considered	Foundation, electrical wiring, substation	+	Lubricatin g oil, varnish, glue, electronic component s	no data	Site and access road preparation	Sea and freight transport	Lubricating oil -1 time / 2 years, brake system – 1 time / 5 years, control system - 1 time / 10 years	In case of breakdown	Recycling, incineration, disposal
Onshore wind turbine (USA, 2022)	**[24]**	Total – 9 Gandola – 5 Blades – 2 Tower - 1	were not considered	Foundation	+	were not considered	were not considered	were not considered	Sea and freight transport	were not considered	were not considered	were not considered

Object	Source	Number of materials used, units	Production				Installation			Operation		Waste management after end-of-life operation
			Types of processing	Auxiliary structures	Electricity	Other resources*	Transporta-tion of materials and components	Land acquisition, site preparation, road	Transporta tion of structures	Technical service	Repair	
Wind power plant (Jordan, 2019)	**[25]**	Total – 15	no data	Foundation, electrical wiring, substation	+	Varnish, glue, sealant, electronic component s	were not considered	Site and access road preparation	Sea and freight transport	Lubricating oil -1 time / 5 years	In case of breakdown	Recycling, incineration, disposal
Onshore wind turbine (Iran, 2018)	**[26]**	Total – 8	no data	Foundation	+	were not considered	were not considered	were not considered	were not considered	Changing the oil in the gearbox and cooling system, lubrication of mechanical parts	were not considered	Recycling, incineration, disposal
Onshore wind turbine (Germany, 2010)	**[13]**	Total – 13	Injection casting, rolling, wire drawing	Foundation, electrical wiring, substation	+	were not considered	were not considered	Site and access road preparation	were not considered	were not considered	were not considered	Recycling, disposal
Onshore wind turbine (France, 2003)	**[13]**	Total – 13	Injection molding, rolling, wire drawing, polymeriza tion	Foundation, electronics	+	Paint (alkyd)	were not considered	Land acquisition, site and access road preparation	were not considered	were not considered	were not considered	Recycling, disposal
Onshore wind turbine (Denmark, 2004)	**[13]**	Total – 12	Injection casting, rolling, welding, wire drawing	Foundation, electronics	+	Zinc coating	were not considered	Land acquisition, site and access road preparation	were not considered	were not considered	were not considered	Recycling, disposal
Onshore wind turbine (World, 2014)	**[27]**	Total – 7 Blades – 2 Tower - 1	were not considered	Electronics	-	Water, lubricating oil	were not considered	were not considered	Sea, railway,	Replacement of consumables	In case of breakdown	Recycling, incineration, disposal

Object	Source	Number of materials used, units	Types of processing	Auxiliary structures	Electricity	Other resources*	Transporta-tion of materials and components	Land acquisition, site preparation, road	Transporta tion of structures	Technical service	Repair	Waste management after end-of-life operation
			Production				Installation			Operation		
									freight transport			
Onshore wind turbine (EU, 2020)	**[28]**	Total – 12 Gandola – 7 Generator – 5 Gearbox - 5 Tower – 7 Blades - 1	were not considered	Foundation, submarine cable	+	were not considered	were not considered	were not considered	were not considered	were not considered	were not considered	were not considered
Electric motor for electric vehicle (Switzerland, 2015)	**[13]**	Total – 10	Rolling, wire drawing, coating	Electronics	+	Heat supply, nickel coating	were not considered	were not considered	were not considered	were not considered	were not considered	were not considered
Electric vehicle (Canada, 2018)	**[29]**	Total – 11	were not considered	were not considered	+	Paints, coatings	Sea and freight transport	were not considered	were not considered	were not considered	were not considered	Recycling
Electric vehicle (EU, 2022)	**[30]**	Total – 11	were not considered	Electronics	+	Textile	were not considered	Road construction	were not considered	Replacement of tires, brake pads	were not considered	Recycling, disposal
Hydrogen fuel cell power plant for a bus (Russian Federation, 2021)	**[31]**	Total – 6	no data	Fuel cell	+	were not considered	were not considered	were not considered	were not considered	Replacement of consumables	In case of breakdown	Recycling, disposal
Hydrogen fuel cell propulsion system for bus (Russian Federation, 2021)	**[31]**	Total – 5	no data	Accumulator	+	were not considered	were not considered	were not considered	were not considered	Replacement of consumables	In case of breakdown	Recycling, disposal
Passenger plane (World, 2019)	**[13]**	Total – 5	Injection molding	were not considered	+	Water, heat supply	were not considered	were not considered	were not considered	were not considered	were not considered	Recycling

Object	Source	Number of materials used, units	Production				Installation			Operation		Waste management after end-of-life operation
			Types of processing	Auxiliary structures	Electricity	Other resources*	Transporta-tion of materials and components	Land acquisition, site preparation, road	Transporta tion of structures	Technical service	Repair	
Passenger plane (Switzerland, 2015)	**[32]**	Total – 5	were not considered	were not considered	-	were not considered	were not considered	were not considered	were not considered	were not considered	were not considered	Recycling, disposal
Passenger plane (UK, 2013)	**[33]**	Total (without aircraft engine) – 5	no data	no data	+	no data	Air and road transport	were not considered	Air and road transport	were not considered	were not considered	Recycling, incineration, disposal
Aircraft engine (USA, 2015)	**[34]**	Total – 5	were not considered	were not considered	-	were not considered	were not considered	were not considered	were not considered	were not considered	were not considered	were not considered
Marine engine (Peru,2018)	**[13]**	Total – 5	Metalwork ing (steel)	were not considered	-	were not considered	were not considered	were not considered	were not considered	were not considered	were not considered	Recycling
Bus (Germany, 2004)	**[13]**	Total – 13	Rolling (steel), tempering (glass), wire drawing (copper)	Manufacture building	+	Heat supply, diesel, lubricating oil, acetic, hydrochlor ic, nitric, sulfuric acid, paint (alkyd), refrigerant, sodium hydroxide, etc.	were not considered	were not considered	were not considered	were not considered	were not considered	Recycling
Gas turbine power plant (Brazil, 2003)	**[14]**	Total – 4	no data	Foundation	+	were not considered	Freight transport	were not considered	Freight transport	Replacement of consumables (oil, spare parts, etc.)	were not considered	Recycling, disposal
Gas turbine installation (EU, 2007)	**[13]**	Total – 5	were not considered	Foundation	+	Heat supply	were not considered	Land acquisition	were not considered	were not considered	were not considered	were not considered

Object	Source	Number of materials used, units	Production				Installation			Operation		Waste management after end-of-life operation
			Types of processing	Auxiliary structures	Electricity	Other resources*	Transporta-tion of materials and components	Land acquisition, site preparation, road	Transporta tion of structures	Technical service	Repair	
Gas turbine installation (Norway, 2021)	**[13]**	Total – 8	Rolled sheets, metalworking (steel), injection molding (polymers))	were not considered	-	Organic chemicals	were not considered	were not considered	were not considered	were not considered	were not considered	Incineration, disposal
Micro gas turbine installation (EU, 2007)	**[13]**	Total – 7	Rolled sheets, welding, polymerization, construction work	Manufacture building	+	Heat supply, water	were not considered	Land acquisition	Road transport	were not considered	were not considered	were not considered
Combined cycle steam power plant (EU, 2007)	**[13]**	Total – 12	were not considered	were not considered	+	Heat supply, diesel	were not considered	Land acquisition	were not considered	were not considered	were not considered	were not considered
Combined cycle steam power plant (Indonesia, 2021)	**[15]**	no data	were not considered	were not considered	+	Water, reagents, lubricating oil	were not considered	were not considered	were not considered	were not considered	were not considered	were not considered
Combined cycle steam power plant (Indonesia, 2022)	**[16]**	no data	were not considered	no data	+	Water, reagents, lubricating oil, chemicals	no data	Land acquisition, site preparation	no data	Replacement of consumables	no data	Recycling, incineration, disposal
Combined cycle steam power plant (China, 2023)	**[17]**	Total – 2	were not considered	were not considered	+	were not considered	were not considered	were not considered	were not considered	were not considered	were not considered	were not considered
Combined cycle power	**[18]**	Total – 15	were not considered	were not considered	+	Water (salty, fresh)	were not considered	Land acquisition,	no data	Replacement of consumables	were not considered	Recycling, incineration, disposal

Object	Source	Number of materials used, units	Types of processing	Auxiliary structures	Electricity	Other resources*	Transporta-tion of materials and components	Land acquisition, site preparation, road	Transporta tion of structures	Technical service	Repair	Waste management after end-of-life operation
		Production					Installation			Operation		
plant (Italy, 2019)								site preparation				
Thermal power plant (Russian Federation, 2021)	**[19]**	Total - 4 Engine – 3 Generator – 2 Container - 1	were not considered	were not considered	+	Water	were not considered	were not considered	were not considered	were not considered	were not considered	Recycling

* Water consumption, heat supply, fuel for construction machines, paint, lubricating oils, etc.