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Supplementary table 1: Data entry changes for Scenario 1 with adjusted lognormal distribution

Product	Lognormal		Unit
	From (EU)	To (SA)	
Fresh water	0.0027	0.0029	L
Electricity	0.0007	0.0008	kWh
Natural gas	0.0007	0.0008	MJ
Diesel	0.0013	0.0014	MJ
Coal	0.0013	0.0014	kg
Transport by ship	0.21	0.22	kg.km
Transport to mill	0.21	0.22	kg.km
Transport from mill	0.21	0.22	kg.km
Effluent	0.056	0.061	L

Supplementary table 2: Data entry, value and lognormal distribution adjustments for Scenario 2

Product	Value	Lognormal	Value	Lognormal	Unit
	From (EU)		To (SA)		
Fresh water	18.1	0.0027	8.8	0.22	L
Electricity	0.57	0.0007	0.96	0.0046	kWh
Natural gas	6.1	0.0007	0.76	0.0062	MJ
Diesel	8.2×10^{-5}	0.0013	0.13	0.011	MJ
Coal	0.051	0.0013	0.36	0.0038	kg
Transport by ship	26.3	0.21	849	0.0028	kg.km
Transport to mill	58.1	0.21	290	0.015	kg.km
Transport from mill	199	0.21	420	0.031	kg.km
Screened waste (landfill)	0.05	0.0027	0.076	0.01	kg
Effluent	16	0.056	5.7	0.012	L
Sludge	0.012	-	0.048	0.027	kg
Stone groundwood pulp, bleached	-	-	0.06	0.0017	kg
Sulfate pulp, bleached	-	-	0.19	0.0052	kg
Recycled paper + board	-	-	0.85	0.0096	kg
Ash	0.0004	-	0.085	0.039	kg
Chemical oxygen demand	0.000783	0.042	0.00173	0.00036	kg
Dissolved organic carbon	0.000304	0.042	0.00641	0.13	kg
Total organic carbon	0.000304	0.042	0.00641	0.13	kg
Biological oxygen demand	0.000117	0.042	0.00865	0.13	kg
Carbon dioxide - fossil	0.5	0.0007	0.6	0.043	kg
Carbon monoxide - fossil	1.8×10^{-4}	0.71	0.0015	0.66	kg
Nitrogen oxides	2.9×10^{-4}	0.041	0.0012	0.062	kg
Particulate matter	5.1×10^{-5}	0.37	0.001	0.22	kg
Sulfur dioxide	1.4×10^{-4}	0.0013	0.0019	0.041	kg

Supplementary table 3: Data entries and value changes made to the EU[a] dataset in Scenario 2

Entry	Action	Data entry region	Data value
Thermo-mechanical pulp	Changed	GLO	ZA
Light fuel oil	Removed		
Aluminium sulfate, powder	Unchanged	RER	EU
Clay	Unchanged	CH	EU
Printing ink, offset, without solvent,	Unchanged	RER	EU
Transport, freight, inland waterways, barge	Removed		
Sulfate pulp, bleached	Changed	GLO	ZA
Latex	Unchanged	RER	EU
Sulfur	Unchanged	GLO	EU
Sodium hydroxide, without water, in 50% solution state	Unchanged	GLO	EU
Paper mill, integrated	Unchanged	RER	EU
Electricity, medium voltage	Changed	ZA	ZA
Packaging film, low density polyethylene	Unchanged	GLO	EU
Hard coal	Changed	ZA	ZA
Tap water	Changed	ZA	ZA
Transport, freight, lorry, unspecified	Changed	ZA	ZA
Rosin size, for paper production	Unchanged	RER	EU
Sodium chlorate, powder	Unchanged	RER	EU
Chemical, organic	Unchanged	GLO	EU
Acrylic varnish, with water, in 53% solution state	Unchanged	RER	EU
Ethylene vinyl acetate copolymer	Unchanged	RER	EU
Transport, freight train	Removed		
Waste paper, sorted	Changed	GLO	ZA
Sulfate pulp, unbleached	Removed		
Sodium sulfate, anhydrite	Unchanged	RER	EU
Maize starch	Unchanged	GLO	EU
Potato starch	Unchanged	GLO	EU
Diesel, low-sulfur	Changed	ZA	ZA
Waste paperboard, sorted	Changed	GLO	ZA
Pulpwood, softwood, measured as solid wood under bark	Removed		
Sulfuric acid	Unchanged	RER	EU
Aluminium, primary, ingot	Unchanged	IAI Area, EU27 & EFTA	EU
Natural gas, high-pressure	Changed	ROW	ZA
Sheet rolling, aluminium	Unchanged	GLO	EU
Hydrogen peroxide, without water, in 50% solution state	Unchanged	RER	EU

Entry	Action	Data entry region	Data value
Chemi-thermomechanical pulp	Removed		
Calcium carbonate, precipitated	Unchanged	RER	EU
Wood chips, wet, measured as dry mass	Removed		
Water, well, in ground	Removed		
Water, lake	Removed		
Sodium I	Unchanged	NA	EU
Silicon	Unchanged	NA	EU
Barium II	Unchanged	NA	EU
Lead II	Unchanged	NA	EU
Dinitrogen monoxide	Unchanged	NA	EU
Dioxins, measured as 2,3,7,8-tetrachlorodibenzo-p-dioxin	Unchanged	NA	EU
Ethylene	Unchanged	NA	EU
Benzene	Unchanged	NA	EU
Toluene	Unchanged	NA	EU
Iodine	Unchanged	NA	EU
Selenium IV	Unchanged	NA	EU
Aluminium III	Unchanged	NA	EU
Acetic acid	Unchanged	NA	EU
Lead-210	Unchanged	NA	EU
DOC, dissolved organic carbon	Changed	NA	ZA
Ethane	Unchanged	NA	EU
NMVOC, non-methane volatile organic compounds	Unchanged	NA	EU
Butane	Unchanged	NA	EU
Mercury II	Unchanged	NA	EU
Carbon dioxide, fossil	Changed	NA	ZA
Bromine	Unchanged	NA	EU
Nickel II	Unchanged	NA	EU
Titanium ion	Unchanged	NA	EU
AOX, adsorbable organic halides	Changed	NA	ZA
Radon-220	Unchanged	NA	EU
Iron ion	Unchanged	NA	EU
Propionic acid	Unchanged	NA	EU
Nitrogen	Unchanged	NA	EU
Ammonia	Unchanged	NA	EU
Methane, fossil	Unchanged	NA	EU
Hydrocarbons, aliphatic, alkanes, unspecified	Unchanged	NA	EU

Entry	Action	Data entry region	Data value
Copper ion	Unchanged	NA	EU
Arsenic ion	Unchanged	NA	EU
Particulate matter, > 2.5 um and < 10um	Changed	NA	ZA
Particulate matter, < 2.5 um	Changed	NA	ZA
Suspended solids, unspecified	Changed	NA	ZA
Carbon dioxide, non-fossil	Unchanged	NA	EU
Manganese II	Unchanged	NA	EU
Boron	Unchanged	NA	EU
Phosphorus	Unchanged	NA	EU
Formaldehyde	Unchanged	NA	EU
Chromium III	Unchanged	NA	EU
Acetaldehyde	Unchanged	NA	EU
Propane	Unchanged	NA	EU
Scandium	Unchanged	NA	EU
Thorium	Unchanged	NA	EU
Particulate matter, > 10 um	Changed	NA	ZA
BOD5, biological oxygen demand	Changed	NA	ZA
Nitrogen oxides	Changed	NA	ZA
TOC, total organic carbon	Changed	NA	ZA
Hydrocarbons, aromatic	Unchanged	NA	EU
Water (out)	Changed	ZA	ZA
Sulfur dioxide	Changed	NA	ZA
Calcium II	Unchanged	NA	EU
Uranium-238	Unchanged	NA	EU
Thorium-228	Unchanged	NA	EU
Phosphorus	Unchanged	NA	EU
Radon-222	Unchanged	NA	EU
Water (in)	Changed	ZA	ZA
Zinc II	Unchanged	NA	EU
Hydrogen fluoride	Unchanged	NA	EU
Uranium	Unchanged	NA	EU
Radium-226	Unchanged	NA	EU
Strontium II	Unchanged	NA	EU
Propylene	Unchanged	NA	EU
Polonium-210	Unchanged	NA	EU
Hydrocarbons, aliphatic, unsaturated	Unchanged	NA	EU
Potassium-40	Unchanged	NA	EU

Entry	Action	Data entry region	Data value
Xylenes, unspecified	Unchanged	NA	EU
Acetylene	Unchanged	NA	EU
Tin ion	Unchanged	NA	EU
Potassium I	Unchanged	NA	EU
Beryllium II	Unchanged	NA	EU
Cobalt II	Unchanged	NA	EU
Magnesium	Unchanged	NA	EU
Molybdenum VI	Unchanged	NA	EU
Thallium I	Unchanged	NA	EU
Antimony ion	Unchanged	NA	EU
Radium-228	Unchanged	NA	EU
Cadmium II	Unchanged	NA	EU
PAH, polycyclic aromatic hydrocarbons	Unchanged	NA	EU
Hydrochloric acid	Unchanged	NA	EU
Chromium VI	Unchanged	NA	EU
Benzo(a)pyrene	Unchanged	NA	EU
Thorium-232	Unchanged	NA	EU
Pentane	Unchanged	NA	EU
Vanadium V	Unchanged	NA	EU
COD, chemical oxygen demand	Changed	NA	ZA
Carbon monoxide, fossil	Changed	NA	ZA
Biowaste	Removed		
Waste mineral oil	Removed		
Biowaste	Removed		
Municipal solid waste	Changed	RER	ZA
Sludge from pulp and paper production	Changed	Europe without Switzerland	ZA
Ash from paper production sludge	Changed	Europe without Switzerland	ZA
Hazardous waste, for incineration	Removed		
Aluminium scrap, post-consumer, prepared for melting	Removed		

Region abbreviations: RER – Europe, ZA -South Africa, GLO – global, RoW – Rest of world, IAI Area – Aluminium producing area, EU27 – European Union representing 27 counties, EFTA - European Free Trade Association.

[a]Sturges M., white lined chipboard carton production, RER, Allocation, cut-off by classification, Ecoinvent database version 3.9