Table S1. LCI-based emergy required to produce 1 kg of crude oil.

		LCI - RAW DATA			
	INPUTS	**QUANTITY**	**UEV**	**UNIT**	**EMERGY**
1	Crude oil	4.52695×10^{1}	9.45×10^{4}	sej/J	4.28×10^{12}
2	Gas/condensate	1.50526×10^{0}	6.83×10^{4}	sej/J	1.03×10^{11}
3	Coal	3.20801×10^{-1}	5.71×10^{4}	sej/J	1.83×10^{10}
5	Lignite	2.76290×10^{-8}	6.22×10^{4}	sej/J	1.72×10^{3}
6	Peat	1.30952×10^{-7}	3.19×10^{4}	sej/J	4.18×10^{3}
7	Wood	1.46879×10^{-9}	1.04×10^{4}	sej/J	1.53×10^{1}
8	Hydro	5.80197×10^{-3}	1.35×10^{5}	sej/J	7.82×10^{8}
9	Nuclear	2.22896×10^{-1}	3.14×10^{5}	sej/J	7.00×10^{10}
10	Sulphur	1.57248×10^{-7}	2.08×10^{10}	sej/g	3.57×10^{5}
11	Biomass	1.67076×10^{-2}	6.75×10^{4}	sej/J	1.13×10^{9}
12	Hydrogen	2.76997×10^{-8}	1.15×10^{5}	sej/J	3.19×10^{3}
13	Geothermal	2.53886×10^{-6}	4.52×10^{5}	sej/J	1.15×10^{6}
14	Solar	9.50301×10^{-9}	7.93×10^{4}	sej/J	7.54×10^{2}
15	Wave/tidal	8.70798×10^{-6}	2.83×10^{4}	sej/J	2.46×10^{5}
16	Wind	7.86566×10^{-4}	9.90×10^{4}	sej/J	7.78×10^{7}
17	Air	3.70152×10^{-1}	8.67×10^{7}	sej/g	3.21×10^{4}
18	Barytes	2.62998×10^{-3}	1.68×10^{9}	sej/g	4.42×10^{3}
19	Bauxite	1.81013×10^{-2}	1.44×10^{9}	sej/g	2.60×10^{4}
20	Bentonite	3.30838×10^{-3}	4.80×10^{9}	sej/g	1.59×10^{4}
21	Calcium sulphate (CaSO4)	2.45548×10^{-5}	1.68×10^{9}	sej/g	4.13×10^{1}
22	Chalk (CaCO3)	4.92569×10^{-29}	1.13×10^{7}	sej/g	5.54×10^{-25}
23	Clay	4.42704×10^{-6}	4.80×10^{9}	sej/g	2.13×10^{1}
24	Chromium (Cr)	6.84688×10^{-8}	1.50×10^{11}	sej/g	1.03×10^{1}
25	Copper (Cu)	1.84838×10^{-6}	9.80×10^{10}	sej/g	1.81×10^{2}
26	Dolomite	5.37885×10^{-2}	1.85×10^{10}	sej/g	9.95×10^{5}
27	Iron (Fe)	4.40180×10^{0}	1.20×10^{10}	sej/g	5.28×10^{7}
28	Feldspar	9.31988×10^{-34}	1.68×10^{9}	sej/g	1.57×10^{-27}
29	Ferromanganese	3.99812×10^{-3}	3.50×10^{11}	sej/g	1.40×10^{6}
30	Fluorspar	3.26753×10^{-4}	8.36×10^{8}	sej/g	2.73×10^{2}
31	Granite	3.02114×10^{-10}	8.40×10^{8}	sej/g	2.54×10^{-4}
32	Gravel	1.62408×10^{-2}	8.40×10^{8}	sej/g	1.36×10^{4}
33	Mercury (Hg)	4.24591×10^{-8}	4.20×10^{13}	sej/g	1.78×10^{3}
34	Limestone	9.20142×10^{-1}	1.68×10^{9}	sej/g	1.55×10^{6}
35	N2	3.39154×10^{-1}	1.17×10^{10}	sej/g	3.96×10^{6}
36	Nickel (Ni)	2.95168×10^{-11}	2.00×10^{11}	sej/g	5.90×10^{-3}
37	Oxygen (O2)	8.06923×10^{-2}	8.67×10^{7}	sej/g	7.00×10^{3}
38	Olivine	4.12963×10^{-2}	1.68×10^{9}	sej/g	6.94×10^{4}
39	Lead (Pb)	3.38422×10^{-2}	4.80×10^{11}	sej/g	1.62×10^{7}
40	Phosphate as P2O5	8.37819×10^{-9}	2.99×10^{10}	sej/g	2.50×10^{-1}
41	Potassium chloride (KCl)	1.36913×10^{-4}	4.97×10^{9}	sej/g	6.81×10^{2}
42	Rutile	7.07568×10^{-29}	1.68×10^{9}	sej/g	1.19×10^{-22}
43	Sulphur	1.70455×10^{-2}	2.08×10^{10}	sej/g	3.55×10^{5}
44	Sand (SiO2)	8.28356×10^{-5}	1.68×10^{9}	sej/g	1.39×10^{2}
45	Shale	6.95354×10^{-5}	1.68×10^{9}	sej/g	1.17×10^{2}
46	Sodium chloride (NaCl)	8.84022×10^{-2}	1.68×10^{9}	sej/g	1.49×10^{5}
47	Talc	5.88669×10^{-23}	2.80×10^{10}	sej/g	1.65×10^{-15}
48	Zn	1.23543×10^{-3}	7.20×10^{10}	sej/g	8.90×10^{4}
49	Water-Public supply	7.86334×10^{1}	5.51×10^{5}	sej/J	1.81×10^{5}
50	Water-River canal	2.11663×10^{-1}	3.41×10^{5}	seJ/g	7.22×10^{1}
51	Water-Sea	2.00494×10^{1}	5.36×10^{4}	seJ/J	4.50×10^{3}
52	Water-Well	2.06638×10^{-2}	6.89×10^{4}	sej/J	5.96×10^{0}
53	Water-Unspecified	1.56479×10^{4}	3.06×10^{4}	sej/J	2.00×10^{6}
			Emergy sej/kg		**4.472×10^{12}**
			UEV sej/g		**4.472×10^{9}**

Table S2. LCI-based emergy required to produce 1 kg of natural gas.

		LCI - RAW DATA			
	INPUTS	**QUANTITY**	**UEV**	**UNIT**	**EMERGY**
1	Crude oil	0.276191523	94529.02	sej/J	2.61×10^{10}
2	Gas/condensate	5.63155×10^{1}	6.83×10^{4}	sej/J	3.84×10^{12}
3	Coal	9.35411×10^{-1}	5.71×10^{4}	sej/J	5.34×10^{10}
5	Lignite	6.17164×10^{-8}	6.22×10^{4}	sej/J	3836.292
6	Peat	1.17160×10^{-7}	3.19×10^{4}	sej/J	3739.753
7	Wood	3.28091×10^{-9}	1.04×10^{4}	sej/J	34.12434
8	Hydro	1.70886×10^{-2}	1.35×10^{5}	sej/J	2.3×10^{9}
9	Nuclear	6.61175×10^{-1}	3.14×10^{5}	sej/J	2.08×10^{11}
10	Sulphur	3.51254×10^{-7}	2.08×10^{10}	sej/g	797817.6

11	Biomass	4.95686×10^{-2}	6.75×10^{4}	sej/J	3.35×10^{9}
12	Hydrogen	6.18744×10^{-8}	1.15×10^{5}	sej/J	7115.553
13	Geothermal	6.66876×10^{-6}	4.52×10^{5}	sej/J	3013746
14	Solar	2.60784×10^{-8}	7.93×10^{4}	sej/J	2068.017
15	Wave/tidal	2.58125×10^{-5}	2.83×10^{4}	sej/J	730352.3
16	Wind	2.33325×10^{-3}	9.90×10^{4}	sej/J	2.31×10^{8}
17	Air	8.26829×10^{-1}	8.67×10^{7}	sej/g	71676.17
18	Barytes	5.87473×10^{-3}	1.68×10^{9}	sej/g	9869.554
19	Bauxite	4.04340×10^{-2}	1.44×10^{9}	sej/g	58079.36
20	Bentonite	7.39012×10^{-3}	4.80×10^{9}	sej/g	35508.04
21	Calcium sulphate (CaSO4)	5.48493×10^{-5}	1.68×10^{9}	sej/g	92.14688
22	Chalk (CaCO3)	1.10028×10^{-28}	1.13×10^{7}	sej/g	1.24×10^{-24}
23	Clay	9.88892×10^{-6}	4.80×10^{9}	sej/g	47.51429
24	Chromium (Cr)	1.52943×10^{-7}	1.50×10^{11}	sej/g	22.94141
25	Copper (Cu)	4.12882×10^{-6}	9.80×10^{10}	sej/g	404.6247
26	Dolomite	1.20150×10^{-1}	1.85×10^{10}	sej/g	2222783
27	Iron (Fe)	9.83256×10^{0}	1.20×10^{10}	sej/g	1.18×10^{8}
28	Feldspar	2.08183×10^{-33}	1.68×10^{9}	sej/g	3.5×10^{-27}
29	Ferromanganese	8.93083×10^{-3}	3.50×10^{11}	sej/g	3125790
30	Fluorspar	7.29887×10^{-4}	8.36×10^{8}	sej/g	610.2491
31	Granite	6.74849×10^{-10}	8.40×10^{8}	sej/g	0.000567
32	Gravel	3.62780×10^{-2}	8.40×10^{8}	sej/g	30473.48
33	Mercury (Hg)	9.48433×10^{-8}	4.20×10^{13}	sej/g	3983.42
34	Limestone	2.05537×10^{0}	1.68×10^{9}	sej/g	3453026
35	N2	7.57587×10^{-1}	1.17×10^{10}	sej/g	8841868
36	Nickel (Ni)	6.59334×10^{-11}	2.00×10^{11}	sej/g	0.013187
37	Oxygen (O2)	1.80247×10^{-1}	8.67×10^{7}	sej/g	15625.24
38	Olivine	9.22458×10^{-2}	1.68×10^{9}	sej/g	154973
39	Lead (Pb)	7.55953×10^{-2}	4.80×10^{11}	sej/g	36285737
40	Phosphate as P2O5	1.87148×10^{-8}	2.99×10^{10}	sej/g	0.55883
41	Potassium chloride (KCl)	3.05831×10^{-4}	4.97×10^{9}	sej/g	1520.837
42	Rutile	1.58053×10^{-28}	1.68×10^{9}	sej/g	2.66×10^{-22}
43	Sulphur	3.80755×10^{-2}	2.08×10^{10}	sej/g	792613.2
44	Sand (SiO2)	1.85035×10^{-4}	1.68×10^{9}	sej/g	310.8581
45	Shale	1.55325×10^{-4}	1.68×10^{9}	sej/g	260.9462
46	Sodium chloride (NaCl)	1.97469×10^{-1}	1.68×10^{9}	sej/g	331747.9
47	Talc	4.51913×10^{-23}	2.80×10^{10}	sej/g	1.26×10^{-15}
48	Zn	2.75965×10^{-3}	7.20×10^{10}	sej/g	198694.9
49	Water-Public supply	1.75648×10^{2}	5.51×10^{5}	sej/J	181380.1
50	Water-River canal	4.72803×10^{-1}	3.41×10^{5}	seJ/g	161.2446
51	Water-Sea	4.47855×10^{1}	5.36×10^{4}	seJ/J	4497.806
52	Water-Well	4.61580×10^{-2}	6.89×10^{4}	sej/J	5.958038
53	Water-Unspecified	3.47824×10^{4}	3.06×10^{4}	sej/J	2002790
			Emergy sej/kg		**4.14×10^{12}**
			UEV sej/g		**4.14×10^{9}**

Table S3. LCI-based emergy required to produce 1 kg of naphta.

		LCI - RAW DATA			
	INPUTS	**QUANTITY**	**UEV**	**UNIT**	**EMERGY**
1	Crude oil	4.80484×10^{1}	9.45×10^{4}	sej/J	4.54×10^{12}
2	Gas/condensate	1.62489×10^{0}	6.83×10^{4}	sej/J	1.11×10^{11}
3	Coal	3.56655×10^{-1}	5.71×10^{4}	sej/J	2.04×10^{10}
5	Lignite	6.45137×10^{-8}	6.22×10^{4}	sej/J	4.01×10^{3}
6	Peat	2.55344×10^{-7}	3.19×10^{4}	sej/J	8.15×10^{3}
7	Wood	3.42962×10^{-9}	1.04×10^{4}	sej/J	3.57×10^{1}
8	Hydro	7.16451×10^{-3}	1.35×10^{5}	sej/J	9.65×10^{8}
9	Nuclear	2.35634×10^{-1}	3.14×10^{5}	sej/J	7.40×10^{10}
10	Sulphur	3.67174×10^{-7}	2.08×10^{10}	sej/g	8.34×10^{5}
11	Biomass (solid)	1.77383×10^{-2}	6.75×10^{4}	sej/J	1.20×10^{9}
12	Hydrogen	6.46788×10^{-8}	1.15×10^{5}	sej/J	7.44×10^{3}
13	Geothermal	2.07140×10^{-4}	4.52×10^{5}	sej/J	9.36×10^{7}
14	Solar	8.07139×10^{-7}	7.93×10^{4}	sej/J	6.40×10^{4}
15	Wave/tidal	9.06689×10^{-6}	2.83×10^{4}	sej/J	2.57×10^{5}
16	Wind	8.28011×10^{-4}	9.90×10^{4}	sej/J	8.19×10^{7}
17	Air	8.64305×10^{-1}	8.67×10^{7}	sej/g	7.49×10^{4}
18	Barytes	6.14101×10^{-3}	1.68×10^{9}	sej/g	1.03×10^{4}
19	Bauxite	4.22667×10^{-2}	1.44×10^{9}	sej/g	6.07×10^{4}

20	Bentonite	7.72508×10^{-3}	4.80×10^{9}	sej/g	3.71×10^{4}
21	Calcium sulphate (CaSO4)	5.73354×10^{-5}	1.68×10^{9}	sej/g	9.63×10^{1}
22	Chalk (CaCO3)	1.15015×10^{-28}	1.13×10^{7}	sej/g	1.29×10^{-24}
23	Clay	1.03371×10^{-5}	4.80×10^{9}	sej/g	4.97×10^{1}
24	Chromium (Cr)	1.59875×10^{-7}	1.50×10^{11}	sej/g	2.40×10^{1}
25	Copper (Cu)	4.31596×10^{-6}	9.80×10^{10}	sej/g	4.23×10^{2}
26	Dolomite	1.25596×10^{-1}	1.85×10^{10}	sej/g	2.32×10^{6}
27	Iron (Fe)	1.02782×10^{1}	1.20×10^{10}	sej/g	1.23×10^{8}
28	Feldspar	2.17619×10^{-33}	1.68×10^{9}	sej/g	3.66×10^{-27}
29	Ferromanganese	9.33562×10^{-3}	3.50×10^{11}	sej/g	3.27×10^{6}
30	Fluorspar	7.62969×10^{-4}	8.36×10^{8}	sej/g	6.38×10^{2}
31	Granite	7.05437×10^{-10}	8.40×10^{8}	sej/g	5.93×10^{-4}
32	Gravel	3.79223×10^{-2}	8.40×10^{8}	sej/g	3.19×10^{4}
33	Mercury (Hg)	9.91421×10^{-8}	4.20×10^{13}	sej/g	4.16×10^{3}
34	Limestone	2.14853×10^{0}	1.68×10^{9}	sej/g	3.61×10^{6}
35	N2	7.91925×10^{-1}	1.17×10^{10}	sej/g	9.24×10^{6}
36	Nickel (Ni)	6.89218×10^{-11}	2.00×10^{11}	sej/g	1.38×10^{-2}
37	Oxygen (O2)	1.88417×10^{-1}	8.67×10^{7}	sej/g	1.63×10^{4}
38	Olivine	9.64269×10^{-2}	1.68×10^{9}	sej/g	1.62×10^{5}
39	Lead (Pb)	7.90217×10^{-2}	4.80×10^{11}	sej/g	3.79×10^{7}
40	Phosphate as P2O5	1.95631×10^{-8}	2.99×10^{10}	sej/g	5.84×10^{-1}
41	Potassium chloride (KCl)	3.19693×10^{-4}	4.97×10^{9}	sej/g	1.59×10^{3}
42	Rutile	1.65217×10^{-28}	1.68×10^{9}	sej/g	2.78×10^{-22}
43	Sulphur	3.98013×10^{-2}	2.08×10^{10}	sej/g	8.29×10^{5}
44	Sand (SiO2)	1.93421×10^{-4}	1.68×10^{9}	sej/g	3.25×10^{2}
45	Shale	1.62365×10^{-4}	1.68×10^{9}	sej/g	2.73×10^{2}
46	Sodium chloride (NaCl)	2.06419×10^{-1}	1.68×10^{9}	sej/g	3.47×10^{5}
47	Talc	6.41106×10^{-23}	2.80×10^{10}	sej/g	1.79×10^{-15}
48	Zn	2.88473×10^{-3}	7.20×10^{10}	sej/g	2.08×10^{5}
49	Water-Public supply	1.83609×10^{2}	5.51×10^{5}	sej/J	4.24×10^{5}
50	Water-River canal	4.94233×10^{-1}	3.41×10^{5}	seJ/g	1.69×10^{2}
51	Water-Sea	4.68154×10^{1}	5.36×10^{4}	seJ/J	1.05×10^{4}
52	Water-Well	4.82501×10^{-2}	6.89×10^{4}	sej/J	1.39×10^{1}
53	Water-Unspecified	6.15159×10^{4}	3.06×10^{4}	sej/J	7.87×10^{6}
			Emergy sej/kg		**4.52×10^{12}**
			UEV sej/g		**4.52×10^{9}**

Table S4. LCI-based emergy required to produce 1 kg of pygas.

		LCI - RAW DATA			
	INPUTS	**QUANTITY**	**UEV**	**UNIT**	**EMERGY**
1	Energy, gross calorific value, in biomass	8.05×10^{-2}	6.75×10^{4}	seJ/J	5.44×10^{9}
3	Peat, in ground	1.98×10^{-6}	3.19×10^{4}	seJ/J	6.17×10^{5}
4	Wood, primary forest, standing	9.45×10^{-7}	1.04×10^{4}	seJ/J	1.11×10^{8}
5	Carbon dioxide, in air	2.14×10^{-2}	8.87×10^{7}	sej/g	2.51×10^{6}
6	Energy, kinetic (in wind), converted	2.53×10^{-2}	9.90×10^{4}	seJ/J	2.51×10^{9}
7	Energy, solar, converted	2.20×10^{-3}	7.93×10^{4}	seJ/J	1.74×10^{8}
8	Energy, potential (in hydropower reservoir), converted	9.83×10^{-2}	1.35×10^{5}	seJ/J	1.32×10^{10}
9	Aluminium, 24% in bauxite, 11% in crude ore, in ground	1.43×10^{-5}	5.40×10^{9}	seJ/g	7.70×10^{7}
10	Anhydrite, in ground	7.27×10^{-10}	1.68×10^{9}	seJ/g	1.22×10^{4}
11	Barite, 15% in crude ore, in ground	1.13×10^{-6}	1.68×10^{9}	seJ/g	1.89×10^{6}
12	Basalt, in ground	1.70×10^{-11}	7.56×10^{9}	seJ/g	1.29×10^{2}
13	Borax, in ground	1.45×10^{-10}	1.68×10^{9}	seJ/g	2.43×10^{2}
14	Cadmium, 0.30% in sulfide, Cd 0.18%, Pb, Zn, Ag, In, in ground	7.03×10^{-13}	3.40×10^{13}	seJ/g	2.39×10^{4}
15	Calcite, in ground	1.32×10^{-3}	1.68×10^{9}	seJ/g	2.22×10^{9}
16	Carbon, in organic matter, in soil	8.86×10^{-9}	2.77×10^{9}	seJ/g	2.45E+4
17	Cerium, 24% in bastnasite, 2.4% in crude ore, in ground	1.46×10^{-7}	1.14×10^{10}	seJ/g	1.66×10^{6}
18	Chromium, 25.5% in chromite, 11.6% in crude ore, in ground	2.14×10^{-7}	1.50×10^{11}	seJ/g	3.21×10^{7}
19	Chrysotile, in ground	1.23×10^{-8}	1.68×10^{9}	seJ/g	2.07E+4
20	Cinnabar, in ground	1.15×10^{-9}	1.68×10^{9}	seJ/g	1.93×10^{4}

21	Clay, unspecified, in ground	5.59×10^{-6}	4.80×10^{9}	seJ/g	2.68×10^{7}
22	Coal	3.40×10^{-1}	5.71×10^{4}	seJ/J	1.94×10^{10}
23	Cobalt, in ground	3.06×10^{-7}	1.30×10^{11}	seJ/g	3.98×10^{7}
24	Colemanite, in ground	4.14×10^{-9}	1.68×10^{9}	seJ/g	6.96×10^{4}
25	Copper, in ground	6.10×10^{-8}	9.80×10^{10}	seJ/g	5.98×10^{6}
26	Diatomite, in ground	1.83×10^{-13}	1.68×10^{9}	seJ/g	3.07×10^{-1}
27	Dolomite, in ground	8.61×10^{-9}	1.85×10^{10}	seJ/g	1.59×10^{5}
28	Energy, geothermal, converted	4.41×10^{-4}	4.52×10^{5}	seJ/J	1.99×10^{8}
29	Europium, 0.06% in bastnasite, 0.006% in crude ore, in ground	3.65×10^{-10}	1.68×10^{9}	seJ/g	6.13×10^{2}
30	Feldspar, in ground	1.78×10^{-15}	1.68×10^{9}	seJ/g	2.99×10^{-3}
31	Fluorine, in ground	9.40×10^{-7}	1.68×10^{9}	seJ/g	1.58×10^{6}
32	Fluorspar, 92%, in ground	1.93×10^{-5}	8.38×10^{8}	seJ/g	1.62×10^{7}
33	Gadolinium, 0.15% in bastnasite, 0.015% in crude ore, in ground	9.11×10^{-10}	1.68×10^{9}	seJ/g	1.53×10^{4}
34	Gas, natural, in ground	1.11×10^{1}	6.83×10^{4}	seJ/J	7.58×10^{11}
35	Gold, in ground	2.17×10^{-17}	5.00×10^{11}	seJ/g	1.08×10^{-2}
36	Granite, in ground	1.53×10^{-15}	8.40×10^{8}	seJ/g	1.29×10^{-3}
37	Gravel, in ground	5.88×10^{-5}	8.40×10^{8}	seJ/g	4.94×10^{7}
38	Gypsum, in ground	2.37×10^{-8}	2.85×10^{9}	seJ/g	6.75E+4
39	Indium, 0.005% in sulfide, In 0.003%, Pb, Zn, Ag, Cd, in ground	1.03×10^{-14}	4.03×10^{11}	seJ/g	4.16 × 10na
40	Iron, 46% in ore, 25% in crude ore, in ground	3.75×10^{-6}	1.20×10^{10}	seJ/g	4.49×10^{7}
41	Kaolinite, 24% in crude ore, in ground	3.30×10^{-6}	1.68×10^{9}	seJ/g	5.54×10^{6}
42	Kieserite, 25% in crude ore, in ground	1.16×10^{-10}	1.68×10^{9}	seJ/g	1.94×10^{2}
43	Lanthanum, 7.2% in bastnasite, 0.72% in crude ore, in ground	4.37×10^{-8}	1.68×10^{9}	seJ/g	7.33E+4
44	Lead, 5.0% in sulfide, Pb 3.0%, Zn, Ag, Cd, In, in ground	2.30×10^{-11}	4.80×10^{11}	seJ/g	1.10E+4
45	Lithium, 0.15% in brine, in ground	2.66×10^{-14}	9.27×10^{11}	seJ/g	2.47×10^{1}
46	Magnesite, 60% in crude ore, in ground	1.09×10^{-8}	1.68×10^{9}	seJ/g	1.83E+4
47	Manganese, 35.7% in sedimentary deposit, 14.2% in crude ore, in ground	1.02×10^{-9}	3.50×10^{11}	seJ/g	3.58×10^{5}
48	Metamorphous rock, graphite containing, in ground	2.70×10^{-8}	1.68×10^{9}	seJ/g	4.52E+4
49	Molybdenum, 0.025% in sulfide, Mo 8.2 × 10^{-3}% and Cu 0.39% in crude ore, in ground	6.01×10^{-7}	7.00×10^{11}	seJ/g	4.21×10^{8}
50	Neodymium, 4% in bastnasite, 0.4% in crude ore, in ground	2.40×10^{-8}	1.68×10^{9}	seJ/g	4.03E+4
51	Nickel, 1.13% in sulfide, Ni 0.76% and Cu 0.76% in crude ore, in ground	7.94×10^{-7}	2.00×10^{11}	seJ/g	1.59×10^{8}
52	Oil, crude, in ground	5.25×10^{1}	9.45×10^{4}	seJ/J	4.96×10^{12}
53	Olivine, in ground	2.49×10^{-10}	1.68×10^{9}	seJ/g	4.18×10^{2}
54	Pd,in ground	1.27×10^{-10}	1.20×10^{11}	seJ/g	1.53E+4
55	Phosphorus, 18% in apatite, 12% in crude ore, in ground	3.76×10^{-6}	2.07×10^{10}	seJ/g	7.77×10^{7}
56	Praseodymium, 0.42% in bastnasite, 0.042% in crude ore, in ground	2.55×10^{-9}	1.68×10^{9}	seJ/g	4.28×10^{4}
57	Pt, in ground	3.94×10^{-12}	3.70×10^{11}	seJ/g	1.46×10^{4}
58	Rh, in ground	3.53×10^{-12}	1.20×10^{12}	seJ/g	4.24×10^{4}
59	Rhenium, in crude ore, in ground	1.05×10^{-12}	8.93×10^{12}	seJ/g	9.40×10^{4}
60	Samarium, 0.3% in bastnasite, 0.03% in crude ore, in ground	1.82×10^{-9}	1.68×10^{9}	seJ/g	3.05×10^{4}
61	Sand, unspecified, in ground	1.39×10^{-8}	1.68×10^{9}	seJ/g	2.34E+4
62	Shale, in ground	2.06×10^{-9}	1.68×10^{9}	seJ/g	3.46×10^{4}
63	Silver, in ground	5.88×10^{-17}	4.50×10^{11}	seJ/g	2.65×10^{-2}
64	Sodium chloride, in ground	5.96×10^{-4}	1.68×10^{9}	seJ/g	1.00×10^{9}
65	Sodium nitrate, in ground	7.71×10^{-15}	1.68×10^{9}	seJ/g	1.29×10^{-2}
66	Sodium sulphate, various forms, in ground	5.48×10^{-6}	1.40×10^{9}	seJ/g	7.65×10^{6}
67	Stibnite, in ground	1.90×10^{-14}	1.68×10^{9}	seJ/g	3.19×10^{-2}
68	Sulfur, in ground	4.28×10^{-6}	2.08×10^{10}	seJ/g	8.92×10^{7}
69	Sylvite, 25 % in sylvinite, in ground	7.20×10^{-9}	1.68×10^{9}	seJ/g	1.21E+4
70	Talc, in ground	3.28×10^{-9}	2.80×10^{10}	seJ/g	9.19E+4
71	Tantalum, 81.9% in tantalite, 1.6×10^{-4}% in crude ore, in ground	2.14×10^{-17}	1.70×10^{11}	seJ/g	3.64×10^{-3}
72	Tellurium, 0.5ppm in sulfide, Te 0.2ppm, Cu and Ag, in crude ore, in ground	2.86×10^{-18}	5.04×10^{13}	seJ/g	1.44×10^{-1}
73	Tin, 79% in cassiterite, 0.1% in crude ore, in ground	2.57×10^{-10}	1.70×10^{12}	seJ/g	4.37×10^{5}

74	TiO2, 54% in ilmenite, 2.6% in crude ore, in ground	1.07×10^{-5}	3.82×10^{10}	seJ/g	4.10×10^{8}
75	Ulexite, in ground	1.09×10^{-17}	1.68×10^{9}	seJ/g	1.83×10^{-5}
76	Uranium, in ground	1.10×10^{-6}	1.60×10^{11}	seJ/g	1.76×10^{8}
77	Zinc, 9.0% in sulfide, Zn 5.3%, Pb, Ag, Cd, In, in ground	4.57×10^{-8}	7.20×10^{10}	seJ/g	3.29×10^{6}
78	Zirconium, 50% in zircon, 0.39% in crude ore, in ground	2.94×10^{-17}	3.18×10^{10}	seJ/g	9.36×10^{-4}
79	Magnesium, 0.13% in water	3.37×10^{-18}	1.68×10^{9}	seJ/g	5.67×10^{-6}
80	Water, cooling, unspecified natural origin	9.60×10^{-3}	2.70×10^{5}	seJ/g	2.60×10^{9}
81	Water, lake	7.77×10^{-7}	4.52×10^{5}	seJ/g	3.51×10^{5}
82	Water, process, unspecified natural origin	5.89×10^{-4}	6.74×10^{4}	seJ/J	1.66×10^{8}
83	Water, river	2.58×10^{-4}	3.41×10^{5}	seJ/g	8.78×10^{7}
84	Water, salt, ocean	4.81×10^{-4}	5.36×10^{4}	seJ/J	1.08×10^{8}
85	Water, salt, sole	9.15×10^{-4}	5.36×10^{4}	seJ/J	2.05×10^{8}
86	Water, unspecified natural origin	2.23×10^{-3}	3.06×10^{4}	seJ/J	2.86×10^{8}
87	Water, well, in ground	1.14×10^{-4}	6.89×10^{4}	seJ/J	3.28×10^{7}
			Emergy sej/kg		**5.77×10^{12}**
			UEV sej/g		**5.77×10^{9}**

Table S5. LCI-based emergy required to produce 1 kg of xylene.

1	Energy, gross calorific value, in biomass	2.53×10^{-2}	6.75×10^{4}	seJ/J	1.71×10^{9}
3	Peat, in ground	5.24×10^{-7}	3.19×10^{4}	seJ/J	1.63×10^{5}
4	Wood, primary forest, standing	8.63×10^{-7}	1.04×10^{4}	seJ/J	1.01×10^{8}
5	Carbon dioxide, in air	3.79×10^{-3}	8.87×10^{7}	sej/g	9.74×10^{5}
6	Energy, kinetic (in wind), converted	9.85×10^{-3}	9.90×10^{4}	seJ/J	9.74×10^{8}
7	Energy, solar, converted	5.70×10^{-4}	7.93×10^{4}	seJ/J	4.52×10^{7}
8	Energy, potential (in hydropower reservoir), converted	4.69×10^{-2}	1.35×10^{5}	seJ/J	6.32×10^{9}
9	Aluminium, 24% in bauxite, 11% in crude ore, in ground	1.69×10^{-5}	5.40×10^{9}	seJ/g	9.14×10^{7}
10	Anhydrite, in ground	7.29×10^{-10}	1.68×10^{9}	seJ/g	1.22×10^{3}
11	Barite, 15% in crude ore, in ground	1.21×10^{-6}	1.68×10^{9}	seJ/g	2.03×10^{6}
12	Basalt, in ground	1.64×10^{-11}	7.56×10^{9}	seJ/g	1.24×10^{2}
13	Borax, in ground	1.37×10^{-10}	1.68×10^{9}	seJ/g	2.30×10^{2}
14	Cadmium, 0.30% in sulfide, Cd 0.18%, Pb, Zn, Ag, In, in ground	7.85×10^{-13}	3.40×10^{13}	seJ/g	2.67×10^{4}
15	Calcite, in ground	1.25×10^{-3}	1.68×10^{9}	seJ/g	2.10×10^{9}
16	Carbon, in organic matter, in soil	8.49×10^{-9}	2.77×10^{9}	seJ/g	2.35×10^{4}
17	Cerium, 24% in bastnasite, 2.4% in crude ore, in ground	1.80×10^{-7}	1.14×10^{10}	seJ/g	2.05×10^{6}
18	Chromium, 25.5% in chromite, 11.6% in crude ore, in ground	2.07×10^{-7}	1.50×10^{11}	seJ/g	3.10×10^{7}
19	Chrysotile, in ground	1.33×10^{-8}	1.68×10^{9}	seJ/g	2.23×10^{4}
20	Cinnabar, in ground	1.23×10^{-9}	1.68×10^{9}	seJ/g	2.07×10^{3}
21	Clay, unspecified, in ground	5.43×10^{-6}	4.80×10^{9}	seJ/g	2.61×10^{7}
22	Coal	1.80×10^{-1}	5.71×10^{4}	seJ/J	1.03×10^{10}
23	Cobalt, in ground	3.78×10^{-7}	1.30×10^{11}	seJ/g	4.91×10^{7}
24	Colemanite, in ground	3.92×10^{-9}	1.68×10^{9}	seJ/g	6.58×10^{3}
25	Copper, in ground	1.88×10^{-8}	9.80×10^{10}	seJ/g	1.84×10^{6}
26	Diatomite, in ground	1.73×10^{-13}	1.68×10^{9}	seJ/g	2.90×10^{-1}
27	Dolomite, in ground	7.04×10^{-9}	1.85×10^{10}	seJ/g	1.30×10^{5}
28	Energy, geothermal, converted	1.04×10^{-4}	4.52×10^{5}	seJ/J	4.71×10^{7}

229		4.51×10^{-10}	1.68×10^{9}	seJ/g	7.57×10^{2}
230	Feldspar, in ground	1.71×10^{-15}	1.68×10^{9}	seJ/g	2.88×10^{-3}
231	Fluorine, in ground	8.70×10^{-7}	1.68×10^{9}	seJ/g	1.46×10^{6}
232	Fluorspar, 92%, in ground	1.79×10^{-5}	8.38×10^{8}	seJ/g	1.50×10^{7}
233	Gadolinium, 0.15% in bastnasite, 0.015% in crude ore, in ground	1.12×10^{-9}	1.68×10^{9}	seJ/g	1.89×10^{3}
234	Gas, natural, in ground	5.03×10^{0}	6.83×10^{4}	seJ/J	3.43×10^{11}
235	Gold, in ground	2.05×10^{-17}	5.00×10^{11}	seJ/g	1.03×10^{-2}
236	Granite, in ground	1.48×10^{-15}	8.40×10^{8}	seJ/g	1.24×10^{-3}
237	Gravel, in ground	6.51×10^{-5}	8.40×10^{8}	seJ/g	5.47×10^{7}
238	Gypsum, in ground	1.76×10^{-8}	2.85×10^{9}	seJ/g	5.02×10^{4}
239	Indium, 0.005% in sulfide, In 0.003%, Pb, Zn, Ag, Cd, in ground	1.16×10^{-14}	4.03×10^{11}	seJ/g	4.69×10^{0}
240	Iron, 46% in ore, 25% in crude ore, in ground	2.44×10^{-6}	1.20×10^{10}	seJ/g	2.93×10^{7}
241	Kaolinite, 24% in crude ore, in ground	4.06×10^{-6}	1.68×10^{9}	seJ/g	6.83×10^{6}
242	Kieserite, 25% in crude ore, in ground	1.11×10^{-10}	1.68×10^{9}	seJ/g	1.86×10^{2}
243	Lanthanum, 7.2% in bastnasite, 0.72% in crude ore, in ground	5.39×10^{-8}	1.68×10^{9}	seJ/g	9.06×10^{4}
244	Lead, 5.0% in sulfide, Pb 3.0%, Zn, Ag, Cd, In, in ground	2.24×10^{-11}	4.80×10^{11}	seJ/g	1.07×10^{4}
245	Lithium, 0.15% in brine, in ground	2.58×10^{-14}	9.27×10^{11}	seJ/g	2.39×10^{1}
246	Magnesite, 60% in crude ore, in ground	1.06×10^{-8}	1.68×10^{9}	seJ/g	1.79×10^{4}
247	Manganese, 35.7% in sedimentary deposit, 14.2% in crude ore, in ground	9.70×10^{-10}	3.50×10^{11}	seJ/g	3.40×10^{5}
248	Metamorphous rock, graphite containing, in ground	3.32×10^{-8}	1.68×10^{9}	seJ/g	5.56×10^{4}
249	Molybdenum, 0.025% in sulfide, Mo 8.2×10^{-3}% and Cu 0.39% in crude ore, in ground	7.18×10^{-7}	7.00×10^{11}	seJ/g	5.02×10^{8}
250	Neodymium, 4% in bastnasite, 0.4% in crude ore, in ground	2.97×10^{-8}	1.68×10^{9}	seJ/g	4.98×10^{4}
251	Nickel, 1.13% in sulfide, Ni 0.76% and Cu 0.76% in crude ore, in ground	8.43×10^{-7}	2.00×10^{11}	seJ/g	1.69×10^{8}
252	Oil, crude, in ground	5.15×10^{1}	9.45×10^{4}	seJ/J	4.87×10^{12}
253	Olivine, in ground	2.48×10^{-10}	1.68×10^{9}	seJ/g	4.17×10^{2}
254	Pd,in ground	1.22×10^{-10}	1.20×10^{11}	seJ/g	1.46×10^{4}
255	Phosphorus, 18% in apatite, 12% in crude ore, in ground	3.48×10^{-6}	2.07×10^{10}	seJ/g	7.19×10^{7}
256	Praseodymium, 0.42% in bastnasite, 0.042% in crude ore, in ground	3.15×10^{-9}	1.68×10^{9}	seJ/g	5.29×10^{3}
257	Pt, in ground	3.78×10^{-12}	3.70×10^{11}	seJ/g	1.40×10^{3}
258	Rh, in ground	3.39×10^{-12}	1.20×10^{12}	seJ/g	4.07×10^{3}
259	Rhenium, in crude ore, in ground	1.01×10^{-12}	8.93×10^{12}	seJ/g	9.01×10^{3}
260	Samarium, 0.3% in bastnasite, 0.03% in crude ore, in ground	2.25×10^{-9}	1.68×10^{9}	seJ/g	3.77×10^{3}
261	Sand, unspecified, in ground	1.21×10^{-8}	1.68×10^{9}	seJ/g	2.03×10^{4}
262	Shale, in ground	2.06×10^{-9}	1.68×10^{9}	seJ/g	3.47×10^{3}
263	Silver, in ground	5.57×10^{-17}	4.50×10^{11}	seJ/g	2.51×10^{-2}

64				seJ/g	
65	Sodium chloride, in ground	8.11×10^{-4}	1.68×10^{9}	seJ/g	1.36×10^{9}
66	Sodium nitrate, in ground	6.98×10^{-15}	1.68×10^{9}	seJ/g	1.17×10^{-2}
67	Sodium sulphate, various forms, in ground	5.07×10^{-6}	1.40×10^{9}	seJ/g	7.07×10^{6}
68	Stibnite, in ground	1.80×10^{-14}	1.68×10^{9}	seJ/g	3.02×10^{-2}
69	Sulfur, in ground	1.01×10^{-6}	2.08×10^{10}	seJ/g	2.11×10^{7}
70	Sylvite, 25 % in sylvinite, in ground	6.88×10^{-9}	1.68×10^{9}	seJ/g	1.16×10^{4}
71	Talc, in ground	3.20×10^{-9}	2.80×10^{10}	seJ/g	8.95×10^{4}
72	Tantalum, 81.9% in tantalite, 1.6×10^{-4}% in crude ore, in ground	2.03×10^{-17}	1.70×10^{11}	seJ/g	3.44×10^{-3}
73	Tellurium, 0.5ppm in sulfide, Te 0.2ppm, Cu and Ag, in crude ore, in ground	2.70×10^{-18}	5.04×10^{13}	seJ/g	1.36×10^{-1}
74	Tin, 79% in cassiterite, 0.1% in crude ore, in ground	3.17×10^{-10}	1.70×10^{12}	seJ/g	5.39×10^{5}
75	TiO2, 54% in ilmenite, 2.6% in crude ore, in ground	9.92×10^{-6}	3.82×10^{10}	seJ/g	3.79×10^{8}
76	Ulexite, in ground	1.03×10^{-17}	1.68×10^{9}	seJ/g	1.73×10^{-5}
77	Uranium, in ground	6.34×10^{-7}	1.60×10^{11}	seJ/g	1.01×10^{8}
78	Zinc, 9.0% in sulfide, Zn 5.3%, Pb, Ag, Cd, In, in ground	1.57×10^{-8}	7.20×10^{10}	seJ/g	1.13×10^{6}
79	Zirconium, 50% in zircon, 0.39% in crude ore, in ground	2.79×10^{-17}	3.18×10^{10}	seJ/g	8.87×10^{-4}
80	Magnesium, 0.13% in water	3.19×10^{-18}	1.68×10^{9}	seJ/g	5.37×10^{-6}
81	Water, cooling, unspecified natural origin	8.34×10^{-3}	2.70×10^{5}	seJ/g	2.26×10^{9}
82	Water, lake	5.89×10^{-7}	4.52×10^{5}	seJ/g	2.66×10^{5}
83	Water, process, unspecified natural origin	8.80×10^{-4}	6.74×10^{4}	seJ/J	2.48×10^{8}
84	Water, river	2.44×10^{-4}	3.41×10^{5}	seJ/g	8.31×10^{7}
85	Water, salt, ocean	6.52×10^{-4}	5.36×10^{4}	seJ/J	1.46×10^{8}
86	Water, salt, sole	8.98×10^{-4}	5.36×10^{4}	seJ/J	2.01×10^{8}
87	Water, unspecified natural origin	2.19×10^{-3}	3.06×10^{4}	seJ/J	2.81×10^{8}
88	Water, well, in ground	6.65×10^{-5}	6.89×10^{4}	seJ/J	1.92×10^{7}
			Emergia	**seJ**	**5.24×10^{12}**
			UEV	**seJ/g**	**5.24×10^{9}**

Table S6. LCI-based emergy required to produce 1 kg of ethylene.

	INPUTS	QUANTIDADE	UEV	UNIDADE	EMERGIA
1	Energy, gross calorific value, in biomass	1.30×10^{-1}	6.75×10^{4}	seJ/J	8.79×10^{9}
3	Peat, in ground	2.19×10^{-6}	3.19×10^{4}	seJ/J	6.83×10^{5}
4	Wood, primary forest, standing	1.05×10^{-6}	1.04×10^{4}	seJ/J	1.23×10^{8}
5	Carbon dioxide, in air	2.14×10^{-2}	8.87×10^{7}	sej/g	3.90×10^{6}
6	Energy, kinetic (in wind), converted	3.94×10^{-2}	9.90×10^{4}	seJ/J	3.90×10^{9}
7	Energy, solar, converted	3.66×10^{-3}	7.93×10^{4}	seJ/J	2.90×10^{8}
8	Energy, potential (in hydropower reservoir), converted	1.40×10^{-1}	1.35×10^{5}	seJ/J	1.89×10^{10}
9	Aluminium, 24% in bauxite, 11% in crude ore, in ground	1.59×10^{-5}	5.40×10^{9}	seJ/g	8.59×10^{7}
10	Anhydrite, in ground	8.03×10^{-10}	1.68×10^{9}	seJ/g	1.35×10^{3}
11	Barite, 15% in crude ore, in ground	1.60×10^{-6}	1.68×10^{9}	seJ/g	2.68×10^{6}
12	Basalt, in ground	1.89×10^{-11}	7.56×10^{9}	seJ/g	1.43×10^{2}
13	Borax, in ground	1.61×10^{-10}	1.68×10^{9}	seJ/g	2.70×10^{2}

14	Cadmium, 0.30% in sulfide, Cd 0.18%, Pb, Zn, Ag, In, in ground	8.17×10^{-13}	3.40×10^{13}	seJ/g	2.78×10^{4}
15	Calcite, in ground	1.85×10^{-3}	1.68×10^{9}	seJ/g	3.11×10^{9}
16	Carbon, in organic matter, in soil	9.78×10^{-9}	2.77×10^{9}	seJ/g	2.71×10^{4}
17	Cerium, 24% in bastnasite, 2.4% in crude ore, in ground	1.61×10^{-7}	1.14×10^{10}	seJ/g	1.83×10^{6}
18	Chromium, 25.5% in chromite, 11.6% in crude ore, in ground	2.38×10^{-7}	1.50×10^{11}	seJ/g	3.57×10^{7}
19	Chrysotile, in ground	1.75×10^{-8}	1.68×10^{9}	seJ/g	2.94×10^{4}
20	Cinnabar, in ground	1.63×10^{-9}	1.68×10^{9}	seJ/g	2.74×10^{3}
21	Clay, unspecified, in ground	6.37×10^{-6}	4.80×10^{9}	seJ/g	3.06×10^{7}
22	Coal	4.90×10^{-1}	5.71×10^{4}	seJ/J	2.80×10^{10}
23	Cobalt, in ground	3.37×10^{-7}	1.30×10^{11}	seJ/g	4.39×10^{7}
24	Colemanite, in ground	4.59×10^{-9}	1.68×10^{9}	seJ/g	7.71×10^{3}
25	Copper, in ground	9.98×10^{-8}	9.80×10^{10}	seJ/g	9.78×10^{6}
26	Diatomite, in ground	2.03×10^{-13}	1.68×10^{9}	seJ/g	3.40×10^{-1}
27	Dolomite, in ground	9.53×10^{-9}	1.85×10^{10}	seJ/g	1.76×10^{5}
28	Energy, geothermal, converted	7.42×10^{-4}	4.52×10^{5}	seJ/J	3.35×10^{8}
29	Europium, 0.06% in bastnasite, 0.006% in crude ore, in ground	4.03×10^{-10}	1.68×10^{9}	seJ/g	6.76×10^{2}
30	Feldspar, in ground	1.98×10^{-15}	1.68×10^{9}	seJ/g	3.33×10^{-3}
31	Fluorine, in ground	1.04×10^{-6}	1.68×10^{9}	seJ/g	1.75×10^{6}
32	Fluorspar, 92%, in ground	2.13×10^{-5}	8.38×10^{8}	seJ/g	1.79×10^{7}
33	Gadolinium, 0.15% in bastnasite, 0.015% in crude ore, in ground	1.00×10^{-9}	1.68×10^{9}	seJ/g	1.69×10^{3}
34	Gas, natural, in ground	1.24×10^{1}	6.83×10^{4}	seJ/J	8.46×10^{11}
35	Gold, in ground	2.40×10^{-17}	5.00×10^{11}	seJ/g	1.20×10^{-2}
36	Granite, in ground	1.70×10^{-15}	8.40×10^{8}	seJ/g	1.43×10^{-3}
37	Gravel, in ground	6.56×10^{-5}	8.40×10^{8}	seJ/g	5.51×10^{7}
38	Gypsum, in ground	2.62×10^{-8}	2.85×10^{9}	seJ/g	7.46×10^{4}
39	Indium, 0.005% in sulfide, In 0.003%, Pb, Zn, Ag, Cd, in ground	1.19×10^{-14}	4.03×10^{11}	seJ/g	4.79×10^{0}
40	Iron, 46% in ore, 25% in crude ore, in ground	4.64×10^{-6}	1.20×10^{10}	seJ/g	5.57×10^{7}
41	Kaolinite, 24% in crude ore, in ground	3.64×10^{-6}	1.68×10^{9}	seJ/g	6.11×10^{6}
42	Kieserite, 25% in crude ore, in ground	1.28×10^{-10}	1.68×10^{9}	seJ/g	2.16×10^{2}
43	Lanthanum, 7.2% in bastnasite, 0.72% in crude ore, in ground	4.82×10^{-8}	1.68×10^{9}	seJ/g	8.09×10^{4}
44	Lead, 5.0% in sulfide, Pb 3.0%, Zn, Ag, Cd, In, in ground	2.54×10^{-11}	4.80×10^{11}	seJ/g	1.22×10^{4}
45	Lithium, 0.15% in brine, in ground	2.96×10^{-14}	9.27×10^{11}	seJ/g	2.75×10^{1}
46	Magnesite, 60% in crude ore, in ground	1.23×10^{-8}	1.68×10^{9}	seJ/g	2.06×10^{4}
47	Manganese, 35.7% in sedimentary deposit, 14.2% in crude ore, in ground	1.13×10^{-9}	3.50×10^{11}	seJ/g	3.97×10^{5}
48	Metamorphous rock, graphite containing, in ground	2.97×10^{-8}	1.68×10^{9}	seJ/g	4.98×10^{4}
49	Molybdenum, 0.025% in sulfide, Mo 8.2 × 10^{-3}% and Cu 0.39% in crude ore, in ground	6.78×10^{-7}	7.00×10^{11}	seJ/g	4.75×10^{8}
50	Neodymium, 4% in bastnasite, 0.4% in crude ore, in ground	2.65×10^{-8}	1.68×10^{9}	seJ/g	4.45×10^{4}
51	Nickel, 1.13% in sulfide, Ni 0.76% and Cu 0.76% in crude ore, in ground	8.97×10^{-7}	2.00×10^{11}	seJ/g	1.79×10^{8}
52	Oil, crude, in ground	5.80×10^{1}	9.45×10^{4}	seJ/J	5.48×10^{12}
53	Olivine, in ground	2.74×10^{-10}	1.68×10^{9}	seJ/g	4.61×10^{2}
54	Pd,in ground	1.41×10^{-10}	1.20×10^{11}	seJ/g	1.69×10^{4}
55	Phosphorus, 18% in apatite, 12% in crude ore, in ground	4.15×10^{-6}	2.07×10^{10}	seJ/g	8.58×10^{7}
56	Praseodymium, 0.42% in bastnasite, 0.042% in crude ore, in ground	2.81×10^{-9}	1.68×10^{9}	seJ/g	4.72×10^{3}
57	Pt, in ground	4.36×10^{-12}	3.70×10^{11}	seJ/g	1.61×10^{3}
58	Rh, in ground	3.90×10^{-12}	1.20×10^{12}	seJ/g	4.68×10^{3}
59	Rhenium, in crude ore, in ground	1.16×10^{-12}	8.93×10^{12}	seJ/g	1.04×10^{4}
60	Samarium, 0.3% in bastnasite, 0.03% in crude ore, in ground	2.01×10^{-9}	1.68×10^{9}	seJ/g	3.37×10^{3}
61	Sand, unspecified, in ground	1.64×10^{-8}	1.68×10^{9}	seJ/g	2.76×10^{4}
62	Shale, in ground	2.27×10^{-9}	1.68×10^{9}	seJ/g	3.82×10^{3}
63	Silver, in ground	6.52×10^{-17}	4.50×10^{11}	seJ/g	2.93×10^{-2}
64	Sodium chloride, in ground	7.95×10^{-4}	1.68×10^{9}	seJ/g	1.34×10^{9}
65	Sodium nitrate, in ground	8.51×10^{-15}	1.68×10^{9}	seJ/g	1.43×10^{-2}
66	Sodium sulphate, various forms, in ground	6.04×10^{-6}	1.40×10^{9}	seJ/g	8.44×10^{6}
67	Stibnite, in ground	2.11×10^{-14}	1.68×10^{9}	seJ/g	3.54×10^{-2}
68	Sulfur, in ground	7.21×10^{-6}	2.08×10^{10}	seJ/g	1.50×10^{8}

69	Sylvite, 25 % in sylvinite, in ground	7.96×10^{-9}	1.68×10^{9}	seJ/g	1.34×10^{4}
70	Talc, in ground	3.68×10^{-9}	2.80×10^{10}	seJ/g	1.03×10^{5}
71	Tantalum, 81.9% in tantalite, 1.6×10^{-4}% in crude ore, in ground	2.37×10^{-17}	1.70×10^{11}	seJ/g	4.03×10^{-3}
72	Tellurium, 0.5ppm in sulfide, Te 0.2ppm, Cu and Ag, in crude ore, in ground	3.17×10^{-18}	5.04×10^{13}	seJ/g	1.60×10^{-1}
73	Tin, 79% in cassiterite, 0.1% in crude ore, in ground	2.84×10^{-10}	1.70×10^{12}	seJ/g	4.83×10^{5}
74	TiO2, 54% in ilmenite, 2.6% in crude ore, in ground	1.18×10^{-5}	3.82×10^{10}	seJ/g	4.52×10^{8}
75	Ulexite, in ground	1.21×10^{-17}	1.68×10^{9}	seJ/g	2.03×10^{-5}
76	Uranium, in ground	1.55×10^{-6}	1.60×10^{11}	seJ/g	2.48×10^{8}
77	Zinc, 9.0% in sulfide, Zn 5.3%, Pb, Ag, Cd, In, in ground	7.32×10^{-8}	7.20×10^{10}	seJ/g	5.27×10^{6}
78	Zirconium, 50% in zircon, 0.39% in crude ore, in ground	3.26×10^{-17}	3.18×10^{10}	seJ/g	1.04×10^{-3}
79	Magnesium, 0.13% in water	3.74×10^{-18}	1.68×10^{9}	seJ/g	6.29×10^{-6}
80	Water, cooling, unspecified natural origin	1.39×10^{-2}	2.70×10^{5}	seJ/g	3.76×10^{9}
81	Water, lake	9.85×10^{-7}	4.52×10^{5}	seJ/g	4.45×10^{5}
82	Water, process, unspecified natural origin	7.11×10^{-4}	6.74×10^{4}	seJ/J	2.00×10^{8}
83	Water, river	2.86×10^{-4}	3.41×10^{5}	seJ/g	9.74×10^{7}
84	Water, salt, ocean	5.31×10^{-4}	5.36×10^{4}	seJ/J	1.19×10^{8}
85	Water, salt, sole	1.01×10^{-3}	5.36×10^{4}	seJ/J	2.26×10^{8}
86	Water, unspecified natural origin	2.47×10^{-3}	3.06×10^{4}	seJ/J	3.16×10^{8}
87	Water, well, in ground	1.60×10^{-4}	6.89×10^{4}	seJ/J	4.60×10^{7}
			Emergia	seJ	6.40×10^{12}
			UEV	seJ/g	6.40×10^{9}

Table S7. LCI-based emergy required to produce 1 kg of p-xylene.

INPUTS	QUANTIDADE	UEV	UNIDADE	EMERGIA
Energy, gross calorific value, in biomass	5.86×10^{-2}	6.75×10^{4}	seJ/J	3.96×10^{9}
Peat, in ground	6.29×10^{-7}	3.19×10^{4}	seJ/J	1.96×10^{5}
Wood, primary forest, standing	1.01×10^{-6}	1.04×10^{4}	seJ/J	1.19×10^{8}
Carbon dioxide, in air	9.35×10^{-3}	8.87×10^{7}	sej/g	2.16×10^{6}
Energy, kinetic (in wind), converted	2.18×10^{-2}	9.90×10^{4}	seJ/J	2.16×10^{9}
Energy, solar, converted	1.71×10^{-3}	7.93×10^{4}	seJ/J	1.36×10^{8}
Energy, potential (in hydropower reservoir), converted	8.52×10^{-2}	1.35×10^{5}	seJ/J	1.15×10^{10}
Aluminium, 24% in bauxite, 11% in crude ore, in ground	2.05×10^{-5}	5.40×10^{9}	seJ/g	1.11×10^{8}
Anhydrite, in ground	8.78×10^{-10}	1.68×10^{9}	seJ/g	1.48×10^{3}
Barite, 15% in crude ore, in ground	1.68×10^{-6}	1.68×10^{9}	seJ/g	2.81×10^{6}
Basalt, in ground	1.94×10^{-11}	7.56×10^{9}	seJ/g	1.46×10^{2}
Borax, in ground	1.60×10^{-10}	1.68×10^{9}	seJ/g	2.69×10^{2}
Cadmium, 0.30% in sulfide, Cd 0.18%, Pb, Zn, Ag, In, in ground	9.47×10^{-13}	3.40×10^{13}	seJ/g	3.22×10^{4}
Calcite, in ground	1.92×10^{-3}	1.68×10^{9}	seJ/g	3.22×10^{9}
Carbon, in organic matter, in soil	9.93×10^{-9}	2.77×10^{9}	seJ/g	2.75×10^{4}
Cerium, 24% in bastnasite, 2.4% in crude ore, in ground	2.18×10^{-7}	1.14×10^{10}	seJ/g	2.48×10^{6}
Chromium, 25.5% in chromite, 11.6% in crude ore, in ground	2.43×10^{-7}	1.50×10^{11}	seJ/g	3.64×10^{7}
Chrysotile, in ground	1.84×10^{-8}	1.68×10^{9}	seJ/g	3.09×10^{4}

Cinnabar, in ground		1.71×10^{-9}	1.68×10^{9}	seJ/g	2.87×10^{3}
Clay, unspecified, in ground		6.51×10^{-6}	4.80×10^{9}	seJ/g	3.13×10^{7}
Coal		3.10×10^{-1}	5.71×10^{4}	seJ/J	1.77×10^{10}
Cobalt, in ground		4.57×10^{-7}	1.30×10^{11}	seJ/g	5.94×10^{7}
Colemanite, in ground		4.58×10^{-9}	1.68×10^{9}	seJ/g	7.70×10^{3}
Copper, in ground		2.18×10^{-8}	9.80×10^{10}	seJ/g	2.14×10^{6}
Diatomite, in ground		2.02×10^{-13}	1.68×10^{9}	seJ/g	3.39×10^{-1}
Dolomite, in ground		8.26×10^{-9}	1.85×10^{10}	seJ/g	1.53×10^{5}
Energy, geothermal, converted		4.10×10^{-4}	4.52×10^{5}	seJ/J	1.85×10^{8}
Europium, 0.06% in bastnasite, 0.006% in crude ore, in ground		5.45×10^{-10}	1.68×10^{9}	seJ/g	9.16×10^{2}
Feldspar, in ground		2.01×10^{-15}	1.68×10^{9}	seJ/g	3.38×10^{-3}
Fluorine, in ground		1.01×10^{-6}	1.68×10^{9}	seJ/g	1.71×10^{6}
Fluorspar, 92%, in ground		2.09×10^{-5}	8.38×10^{8}	seJ/g	1.75×10^{7}
Gadolinium, 0.15% in bastnasite, 0.015% in crude ore, in ground		1.36×10^{-9}	1.68×10^{9}	seJ/g	2.29×10^{3}
Gas, natural, in ground		6.11×10^{0}	6.83×10^{4}	seJ/J	4.17×10^{11}
Gold, in ground		2.40×10^{-17}	5.00×10^{11}	seJ/g	1.20×10^{-2}
Granite, in ground		1.74×10^{-15}	8.40×10^{8}	seJ/g	1.46×10^{-3}
Gravel, in ground		7.80×10^{-5}	8.40×10^{8}	seJ/g	6.55×10^{7}
Gypsum, in ground		2.07×10^{-8}	2.85×10^{9}	seJ/g	5.89×10^{4}
Indium, 0.005% in sulfide, In 0.003%, Pb, Zn, Ag, Cd, in ground	IN	1.41×10^{-14}	4.03×10^{11}	seJ/g	5.66×10^{0}
Iron, 46% in ore, 25% in crude ore, in ground		3.26×10^{-6}	1.20×10^{10}	seJ/g	3.91×10^{7}
Kaolinite, 24% in crude ore, in ground		4.91×10^{-6}	1.68×10^{9}	seJ/g	8.26×10^{6}
Kieserite, 25% in crude ore, in ground		1.30×10^{-10}	1.68×10^{9}	seJ/g	2.19×10^{2}
Lanthanum, 7.2% in bastnasite, 0.72% in crude ore, in ground		6.52×10^{-8}	1.68×10^{9}	seJ/g	1.10×10^{5}
Lead, 5.0% in sulfide, Pb 3.0%, Zn, Ag, Cd, In, in ground		2.66×10^{-11}	4.80×10^{11}	seJ/g	1.28×10^{4}
Lithium, 0.15% in brine, in ground		3.04×10^{-14}	9.27×10^{11}	seJ/g	2.82×10^{1}
Magnesite, 60% in crude ore, in ground		1.26×10^{-8}	1.68×10^{9}	seJ/g	2.12×10^{4}
Manganese, 35.7% in sedimentary deposit, 14.2% in crude ore, in ground		1.14×10^{-9}	3.50×10^{11}	seJ/g	3.98×10^{5}
Metamorphous rock, graphite containing, in ground		4.01×10^{-8}	1.68×10^{9}	seJ/g	6.73×10^{4}
Molybdenum, 0.025% in sulfide, Mo 8.2×10^{-3}% and Cu 0.39% in crude ore, in ground		8.68×10^{-7}	7.00×10^{11}	seJ/g	6.07×10^{8}
Neodymium, 4% in bastnasite, 0.4% in crude ore, in ground		3.59×10^{-8}	1.68×10^{9}	seJ/g	6.03×10^{4}
Nickel, 1.13% in sulfide, Ni 0.76% and Cu 0.76% in crude ore, in ground		1.01×10^{-6}	2.00×10^{11}	seJ/g	2.01×10^{8}
Oil, crude, in ground		6.01×10^{1}	9.45×10^{4}	seJ/J	5.68×10^{12}
Olivine, in ground		2.99×10^{-10}	1.68×10^{9}	seJ/g	5.02×10^{2}
Pd,in ground		1.42×10^{-10}	1.20×10^{11}	seJ/g	1.71×10^{4}
Phosphorus, 18% in apatite, 12% in crude ore, in ground		4.06×10^{-6}	2.07×10^{10}	seJ/g	8.38×10^{7}

Praseodymium, 0.42% in bastnasite, 0.042% in crude ore, in ground	3.81×10^{-9}	1.68×10^{9}	seJ/g	6.39×10^{3}
Pt, in ground	4.41×10^{-12}	3.70×10^{11}	seJ/g	1.63×10^{3}
Rh, in ground	3.95×10^{-12}	1.20×10^{12}	seJ/g	4.74×10^{3}
Rhenium, in crude ore, in ground	1.18×10^{-12}	8.93×10^{12}	seJ/g	1.05×10^{4}
Samarium, 0.3% in bastnasite, 0.03% in crude ore, in ground	2.72×10^{-9}	1.68×10^{9}	seJ/g	4.56×10^{3}
Sand, unspecified, in ground	1.52×10^{-8}	1.68×10^{9}	seJ/g	2.55×10^{4}
Shale, in ground	2.49×10^{-9}	1.68×10^{9}	seJ/g	4.18×10^{3}
Silver, in ground	6.51×10^{-17}	4.50×10^{11}	seJ/g	2.93×10^{-2}
Sodium chloride, in ground	1.15×10^{-3}	1.68×10^{9}	seJ/g	1.93×10^{9}
Sodium nitrate, in ground	8.16×10^{-15}	1.68×10^{9}	seJ/g	1.37×10^{-2}
Sodium sulphate, various forms, in ground	5.91×10^{-6}	1.40×10^{9}	seJ/g	8.25×10^{6}
Stibnite, in ground	2.10×10^{-14}	1.68×10^{9}	seJ/g	3.53×10^{-2}
Sulfur, in ground	2.93×10^{-6}	2.08×10^{10}	seJ/g	6.09×10^{7}
Sylvite, 25 % in sylvinite, in ground	8.06×10^{-9}	1.68×10^{9}	seJ/g	1.35×10^{4}
Talc, in ground	3.80×10^{-9}	2.80×10^{10}	seJ/g	1.06×10^{5}
Tantalum, 81.9% in tantalite, 1.6×10^{-4}% in crude ore, in ground	2.37×10^{-17}	1.70×10^{11}	seJ/g	4.03×10^{-3}
Tellurium, 0.5ppm in sulfide, Te 0.2ppm, Cu and Ag, in crude ore, in ground	3.16×10^{-18}	5.04×10^{13}	seJ/g	1.59×10^{-1}
Tin, 79% in cassiterite, 0.1% in crude ore, in ground	3.83×10^{-10}	1.70×10^{12}	seJ/g	6.52×10^{5}
TiO2, 54% in ilmenite, 2.6% in crude ore, in ground	1.16×10^{-5}	3.82×10^{10}	seJ/g	4.42×10^{8}
Ulexite, in ground	1.21×10^{-17}	1.68×10^{9}	seJ/g	2.03×10^{-5}
Uranium, in ground	9.75×10^{-7}	1.60×10^{11}	seJ/g	1.56×10^{8}
Zinc, 9.0% in sulfide, Zn 5.3%, Pb, Ag, Cd, In, in ground	1.82×10^{-8}	7.20×10^{10}	seJ/g	1.31×10^{6}
Zirconium, 50% in zircon, 0.39% in crude ore, in ground	3.26×10^{-17}	3.18×10^{10}	seJ/g	1.04×10^{-3}
Magnesium, 0.13% in water	3.74×10^{-18}	1.68×10^{9}	seJ/g	6.28×10^{-6}
Water, cooling, unspecified natural origin	1.74×10^{-2}	2.70×10^{5}	seJ/g	4.70×10^{9}
Water, lake	6.90×10^{-7}	4.52×10^{5}	seJ/g	3.12×10^{5}
Water, process, unspecified natural origin	1.30×10^{-3}	6.74×10^{4}	seJ/J	3.66×10^{8}
Water, river	2.85×10^{-4}	3.41×10^{5}	seJ/g	9.72×10^{7}
Water, salt, ocean	7.89×10^{-4}	5.36×10^{4}	seJ/J	1.77×10^{8}
Water, salt, sole	1.05×10^{-3}	5.36×10^{4}	seJ/J	2.35×10^{8}
Water, unspecified natural origin	2.56×10^{-3}	3.06×10^{4}	seJ/J	3.27×10^{8}
Water, well, in ground	1.10×10^{-4}	6.89×10^{4}	seJ/J	3.18×10^{7}
		Emergia	seJ	6.15×10^{12}
		UEV	seJ/g	6.15×10^{9}

Table S8. LCI-based emergy required to produce 1 kg of ethylene oxide.

INPUTS	QUANTIDADE	UEV	UNIDADE	EMERGIA

Energy, gross calorific value, in biomass	5.72×10^{-1}	6.75×10^{4}	seJ/J	3.86×10^{10}
Peat, in ground	1.74×10^{-6}	3.19×10^{4}	seJ/J	5.43×10^{5}
Wood, primary forest, standing	8.34×10^{-7}	1.04×10^{4}	seJ/J	9.80×10^{7}
Carbon dioxide, in air	9.63×10^{-2}	8.87×10^{7}	sej/g	1.60×10^{7}
Energy, kinetic (in wind), converted	1.61×10^{-1}	9.90×10^{4}	seJ/J	1.60×10^{10}
Energy, solar, converted	1.69×10^{-2}	7.93×10^{4}	seJ/J	1.34×10^{9}
Energy, potential (in hydropower reservoir), converted	4.66×10^{-1}	1.35×10^{5}	seJ/J	6.29×10^{10}
Aluminium, 24% in bauxite, 11% in crude ore, in ground	1.37×10^{-5}	5.40×10^{9}	seJ/g	7.39×10^{7}
Anhydrite, in ground	6.39×10^{-10}	1.68×10^{9}	seJ/g	1.07×10^{3}
Barite, 15% in crude ore, in ground	1.27×10^{-6}	1.68×10^{9}	seJ/g	2.14×10^{6}
Basalt, in ground	1.51×10^{-11}	7.56×10^{9}	seJ/g	1.14×10^{2}
Borax, in ground	1.28×10^{-10}	1.68×10^{9}	seJ/g	2.15×10^{2}
Cadmium, 0.30% in sulfide, Cd 0.18%, Pb, Zn, Ag, In, in ground	6.50×10^{-13}	3.40×10^{13}	seJ/g	2.21×10^{4}
Calcite, in ground	5.41×10^{-3}	1.68×10^{9}	seJ/g	9.08×10^{9}
Carbon, in organic matter, in soil	7.78×10^{-9}	2.77×10^{9}	seJ/g	2.16×10^{4}
Cerium, 24% in bastnasite, 2.4% in crude ore, in ground	1.28×10^{-7}	1.14×10^{10}	seJ/g	1.46×10^{6}
Chromium, 25.5% in chromite, 11.6% in crude ore, in ground	1.90×10^{-7}	1.50×10^{11}	seJ/g	2.85×10^{7}
Chrysotile, in ground	1.39×10^{-8}	1.68×10^{9}	seJ/g	2.34×10^{4}
Cinnabar, in ground	1.30×10^{-9}	1.68×10^{9}	seJ/g	2.18×10^{3}
Clay, unspecified, in ground	5.07×10^{-6}	4.80×10^{9}	seJ/g	2.44×10^{7}
Coal	1.69×10^{0}	5.71×10^{4}	seJ/J	9.65×10^{10}
Cobalt, in ground	2.69×10^{-7}	1.30×10^{11}	seJ/g	3.49×10^{7}
Colemanite, in ground	3.65×10^{-9}	1.68×10^{9}	seJ/g	6.14×10^{3}
Copper, in ground	7.94×10^{-8}	9.80×10^{10}	seJ/g	7.78×10^{6}
Diatomite, in ground	1.61×10^{-13}	1.68×10^{9}	seJ/g	2.71×10^{-1}
Dolomite, in ground	7.59×10^{-9}	1.85×10^{10}	seJ/g	1.40×10^{5}
Energy, geothermal, converted	3.49×10^{-3}	4.52×10^{5}	seJ/J	1.58×10^{9}
Europium, 0.06% in bastnasite, 0.006% in crude ore, in ground	3.20×10^{-10}	1.68×10^{9}	seJ/g	5.38×10^{2}
Feldspar, in ground	1.58×10^{-15}	1.68×10^{9}	seJ/g	2.65×10^{-3}
Fluorine, in ground	8.26×10^{-7}	1.68×10^{9}	seJ/g	1.39×10^{6}
Fluorspar, 92%, in ground	1.70×10^{-5}	8.38×10^{8}	seJ/g	1.42×10^{7}
Gadolinium, 0.15% in bastnasite, 0.015% in crude ore, in ground	8.00×10^{-10}	1.68×10^{9}	seJ/g	1.34×10^{3}
Gas, natural, in ground	1.11×10^{1}	6.83×10^{4}	seJ/J	7.54×10^{11}
Gold, in ground	1.91×10^{-17}	5.00×10^{11}	seJ/g	9.56×10^{-3}
Granite, in ground	1.36×10^{-15}	8.40×10^{8}	seJ/g	1.14×10^{-3}
Gravel, in ground	5.22×10^{-5}	8.40×10^{8}	seJ/g	4.39×10^{7}

Gypsum, in ground	2.08×10^{-8}	2.85×10^{9}	seJ/g	5.94×10^{4}
Indium, 0.005% in sulfide, In 0.003%, Pb, Zn, Ag, Cd, in ground	9.47×10^{-15}	4.03×10^{11}	seJ/g	3.82×10^{0}
Iron, 46% in ore, 25% in crude ore, in ground	9.34×10^{-6}	1.20×10^{10}	seJ/g	1.12×10^{8}
Kaolinite, 24% in crude ore, in ground	2.90×10^{-6}	1.68×10^{9}	seJ/g	4.86×10^{6}
Kieserite, 25% in crude ore, in ground	1.02×10^{-10}	1.68×10^{9}	seJ/g	1.72×10^{2}
Lanthanum, 7.2% in bastnasite, 0.72% in crude ore, in ground	3.83×10^{-8}	1.68×10^{9}	seJ/g	6.44×10^{4}
Lead, 5.0% in sulfide, Pb 3.0%, Zn, Ag, Cd, In, in ground	2.02×10^{-11}	4.80×10^{11}	seJ/g	9.70×10^{3}
Lithium, 0.15% in brine, in ground	2.36×10^{-14}	9.27×10^{11}	seJ/g	2.19×10^{1}
Magnesite, 60% in crude ore, in ground	9.75×10^{-9}	1.68×10^{9}	seJ/g	1.64×10^{4}
Manganese, 35.7% in sedimentary deposit, 14.2% in crude ore, in ground	9.03×10^{-10}	3.50×10^{11}	seJ/g	3.16×10^{5}
Metamorphous rock, graphite containing, in ground	2.37×10^{-8}	1.68×10^{9}	seJ/g	3.97×10^{4}
Molybdenum, 0.025% in sulfide, Mo 8.2×10^{-3}% and Cu 0.39% in crude ore, in ground	5.40×10^{-7}	7.00×10^{11}	seJ/g	3.78×10^{8}
Neodymium, 4% in bastnasite, 0.4% in crude ore, in ground	2.11×10^{-8}	1.68×10^{9}	seJ/g	3.54×10^{4}
Nickel, 1.13% in sulfide, Ni 0.76% and Cu 0.76% in crude ore, in ground	7.14×10^{-7}	2.00×10^{11}	seJ/g	1.43×10^{8}
Oil, crude, in ground	4.66×10^{1}	9.45×10^{4}	seJ/J	4.40×10^{12}
Olivine, in ground	2.18×10^{-10}	1.68×10^{9}	seJ/g	3.67×10^{2}
Pd,in ground	1.12×10^{-10}	1.20×10^{11}	seJ/g	1.34×10^{4}
Phosphorus, 18% in apatite, 12% in crude ore, in ground	3.30×10^{-6}	2.07×10^{10}	seJ/g	6.82×10^{7}
Praseodymium, 0.42% in bastnasite, 0.042% in crude ore, in ground	2.24×10^{-9}	1.68×10^{9}	seJ/g	3.76×10^{3}
Pt, in ground	3.47×10^{-12}	3.70×10^{11}	seJ/g	1.28×10^{3}
Rh, in ground	3.10×10^{-12}	1.20×10^{12}	seJ/g	3.73×10^{3}
Rhenium, in crude ore, in ground	9.25×10^{-13}	8.93×10^{12}	seJ/g	8.26×10^{3}
Samarium, 0.3% in bastnasite, 0.03% in crude ore, in ground	1.60×10^{-9}	1.68×10^{9}	seJ/g	2.68×10^{3}
Sand, unspecified, in ground	2.49×10^{-8}	1.68×10^{9}	seJ/g	4.18×10^{4}
Shale, in ground	1.81×10^{-9}	1.68×10^{9}	seJ/g	3.04×10^{3}
Silver, in ground	5.19×10^{-17}	4.50×10^{11}	seJ/g	2.34×10^{-2}
Sodium chloride, in ground	6.68×10^{-4}	1.68×10^{9}	seJ/g	1.12×10^{9}
Sodium nitrate, in ground	6.77×10^{-15}	1.68×10^{9}	seJ/g	1.14×10^{-2}
Sodium sulphate, various forms, in ground	4.81×10^{-6}	1.40×10^{9}	seJ/g	6.72×10^{6}
Stibnite, in ground	1.68×10^{-14}	1.68×10^{9}	seJ/g	2.82×10^{-2}
Sulfur, in ground	3.38×10^{-5}	2.08×10^{10}	seJ/g	7.04×10^{8}
Sylvite, 25 % in sylvinite, in ground	6.33×10^{-9}	1.68×10^{9}	seJ/g	1.06×10^{4}
Talc, in ground	2.93×10^{-9}	2.80×10^{10}	seJ/g	8.19×10^{4}
Tantalum, 81.9% in tantalite, 1.6×10^{-4}% in crude ore, in ground	1.89×10^{-17}	1.70×10^{11}	seJ/g	3.21×10^{-3}
Tellurium, 0.5ppm in sulfide, Te 0.2ppm, Cu and Ag, in crude ore, in ground	2.52×10^{-18}	5.04×10^{13}	seJ/g	1.27×10^{-1}
Tin, 79% in cassiterite, 0.1% in crude ore, in ground	2.26×10^{-10}	1.70×10^{12}	seJ/g	3.84×10^{5}

TiO2, 54% in ilmenite, 2.6% in crude ore, in ground	9.41×10^{-6}	3.82×10^{10}	seJ/g	3.60×10^{8}
Ulexite, in ground	9.63×10^{-18}	1.68×10^{9}	seJ/g	1.62×10^{-5}
Uranium, in ground	5.01×10^{-6}	1.60×10^{11}	seJ/g	8.02×10^{8}
Zinc, 9.0% in sulfide, Zn 5.3%, Pb, Ag, Cd, In, in ground	5.83×10^{-8}	7.20×10^{10}	seJ/g	4.20×10^{6}
Zirconium, 50% in zircon, 0.39% in crude ore, in ground	2.60×10^{-17}	3.18×10^{10}	seJ/g	8.26×10^{-4}
Magnesium, 0.13% in water	2.98×10^{-18}	1.68×10^{9}	seJ/g	5.00×10^{-6}
Water, cooling, unspecified natural origin	3.35×10^{-2}	2.70×10^{5}	seJ/g	9.07×10^{9}
Water, lake	7.84×10^{-7}	4.52×10^{5}	seJ/g	3.54×10^{5}
Water, process, unspecified natural origin	1.02×10^{-3}	6.74×10^{4}	seJ/J	2.87×10^{8}
Water, river	2.27×10^{-4}	3.41×10^{5}	seJ/g	7.76×10^{7}
Water, salt, ocean	4.23×10^{-4}	5.36×10^{4}	seJ/J	9.48×10^{7}
Water, salt, sole	8.04×10^{-4}	5.36×10^{4}	seJ/J	1.80×10^{8}
Water, unspecified natural origin	1.98×10^{-3}	3.06×10^{4}	seJ/J	2.54×10^{8}
Water, well, in ground	5.07×10^{-4}	6.89×10^{4}	seJ/J	1.46×10^{8}
		Emergia	seJ	5.40×10^{12}
		UEV	seJ/g	5.40×10^{9}

Table S9. LCI-based emergy required to produce 1 kg of ethylene glycol.

INPUTS	QUANTIDADE	UEV	UNIDADE	EMERGIA
Energy, gross calorific value, in biomass	6.16×10^{-1}	6.75×10^{4}	seJ/J	4.16×10^{10}
Peat, in ground	1.24×10^{-6}	3.19×10^{4}	seJ/J	3.88×10^{5}
Wood, primary forest, standing	5.95×10^{-7}	1.04×10^{4}	seJ/J	6.99×10^{7}
Carbon dioxide, in air	1.04×10^{-1}	8.87×10^{7}	sej/g	1.71×10^{7}
Energy, kinetic (in wind), converted	1.73×10^{-1}	9.90×10^{4}	seJ/J	1.71×10^{10}
Energy, solar, converted	1.82×10^{-2}	7.93×10^{4}	seJ/J	1.45×10^{9}
Energy, potential (in hydropower reservoir), converted	4.90×10^{-1}	1.35×10^{5}	seJ/J	6.61×10^{10}
Aluminium, 24% in bauxite, 11% in crude ore, in ground	1.02×10^{-5}	5.40×10^{9}	seJ/g	5.51×10^{7}
Anhydrite, in ground	4.56×10^{-10}	1.68×10^{9}	seJ/g	7.66×10^{2}
Barite, 15% in crude ore, in ground	9.07×10^{-7}	1.68×10^{9}	seJ/g	1.52×10^{6}
Basalt, in ground	1.07×10^{-11}	7.56×10^{9}	seJ/g	8.12×10^{1}
Borax, in ground	9.12×10^{-11}	1.68×10^{9}	seJ/g	1.53×10^{2}
Cadmium, 0.30% in sulfide, Cd 0.18%, Pb, Zn, Ag, In, in ground	4.64×10^{-13}	3.40×10^{13}	seJ/g	1.58×10^{4}
Calcite, in ground	5.61×10^{-3}	1.68×10^{9}	seJ/g	9.42×10^{9}
Carbon, in organic matter, in soil	5.55×10^{-9}	2.77×10^{9}	seJ/g	1.54×10^{4}
Cerium, 24% in bastnasite, 2.4% in crude ore, in ground	9.12×10^{-8}	1.14×10^{10}	seJ/g	1.04×10^{6}
Chromium, 25.5% in chromite, 11.6% in crude ore, in ground	1.36×10^{-7}	1.50×10^{11}	seJ/g	2.04×10^{7}
Chrysotile, in ground	9.92×10^{-9}	1.68×10^{9}	seJ/g	1.67×10^{4}
Cinnabar, in ground	9.26×10^{-10}	1.68×10^{9}	seJ/g	1.56×10^{3}
Clay, unspecified, in ground	3.62×10^{-6}	4.80×10^{9}	seJ/g	1.74×10^{7}
Coal	1.79×10^{0}	5.71×10^{4}	seJ/J	1.02×10^{11}
Cobalt, in ground	1.92×10^{-7}	1.30×10^{11}	seJ/g	2.49×10^{7}
Colemanite, in ground	2.61×10^{-9}	1.68×10^{9}	seJ/g	4.38×10^{3}
Copper, in ground	5.67×10^{-8}	9.80×10^{10}	seJ/g	5.55×10^{6}
Diatomite, in ground	1.15×10^{-13}	1.68×10^{9}	seJ/g	1.93×10^{-1}
Dolomite, in ground	5.41×10^{-9}	1.85×10^{10}	seJ/g	1.00×10^{5}
Energy, geothermal, converted	3.77×10^{-3}	4.52×10^{5}	seJ/J	1.70×10^{9}
Europium, 0.06% in bastnasite, 0.006% in crude ore, in ground	2.29×10^{-10}	1.68×10^{9}	seJ/g	3.84×10^{2}
Feldspar, in ground	1.12×10^{-15}	1.68×10^{9}	seJ/g	1.89×10^{-3}
Fluorine, in ground	5.89×10^{-7}	1.68×10^{9}	seJ/g	9.90×10^{5}

Fluorspar, 92%, in ground		1.21×10^{-5}	8.38×10^{8}	seJ/g	1.01×10^{7}
Gadolinium, 0.15% in bastnasite, 0.015% in crude ore, in ground		5.71×10^{-10}	1.68×10^{9}	seJ/g	9.59×10^{2}
Gas, natural, in ground		8.41×10^{0}	6.83×10^{4}	seJ/J	5.74×10^{11}
Gold, in ground		1.36×10^{-17}	5.00×10^{11}	seJ/g	6.82×10^{-3}
Granite, in ground		9.68×10^{-16}	8.40×10^{8}	seJ/g	8.13×10^{-4}
Gravel, in ground		3.73×10^{-5}	8.40×10^{8}	seJ/g	3.13×10^{7}
Gypsum, in ground		1.49×10^{-8}	2.85×10^{9}	seJ/g	4.24×10^{4}
Indium, 0.005% in sulfide, In 0.003%, Pb, Zn, Ag, Cd, in ground	IN	6.76×10^{-15}	4.03×10^{11}	seJ/g	2.72×10^{0}
Iron, 46% in ore, 25% in crude ore, in ground		9.17×10^{-6}	1.20×10^{10}	seJ/g	1.10×10^{8}
Kaolinite, 24% in crude ore, in ground		2.07×10^{-6}	1.68×10^{9}	seJ/g	3.47×10^{6}
Kieserite, 25% in crude ore, in ground		7.29×10^{-11}	1.68×10^{9}	seJ/g	1.22×10^{2}
Lanthanum, 7.2% in bastnasite, 0.72% in crude ore, in ground		2.74×10^{-8}	1.68×10^{9}	seJ/g	4.60×10^{4}
Lead, 5.0% in sulfide, Pb 3.0%, Zn, Ag, Cd, In, in ground		1.44×10^{-11}	4.80×10^{11}	seJ/g	6.92×10^{3}
Lithium, 0.15% in brine, in ground		1.68×10^{-14}	9.27×10^{11}	seJ/g	1.56×10^{1}
Magnesite, 60% in crude ore, in ground		6.96×10^{-9}	1.68×10^{9}	seJ/g	1.17×10^{4}
Manganese, 35.7% in sedimentary deposit, 14.2% in crude ore, in ground		6.44×10^{-10}	3.50×10^{11}	seJ/g	2.25×10^{5}
Metamorphous rock, graphite containing, in ground		1.69×10^{-8}	1.68×10^{9}	seJ/g	2.83×10^{4}
Molybdenum, 0.025% in sulfide, Mo 8.2×10^{-3}% and Cu 0.39% in crude ore, in ground		3.85×10^{-7}	7.00×10^{11}	seJ/g	2.70×10^{8}
Neodymium, 4% in bastnasite, 0.4% in crude ore, in ground		1.50×10^{-8}	1.68×10^{9}	seJ/g	2.53×10^{4}
Nickel, 1.13% in sulfide, Ni 0.76% and Cu 0.76% in crude ore, in ground		5.10×10^{-7}	2.00×10^{11}	seJ/g	1.02×10^{8}
Oil, crude, in ground		3.34×10^{1}	9.45×10^{4}	seJ/J	3.16×10^{12}
Olivine, in ground		1.56×10^{-10}	1.68×10^{9}	seJ/g	2.62×10^{2}
Pd,in ground		7.98×10^{-11}	1.20×10^{11}	seJ/g	9.58×10^{3}
Phosphorus, 18% in apatite, 12% in crude ore, in ground		2.36×10^{-6}	2.07×10^{10}	seJ/g	4.87×10^{7}
Praseodymium, 0.42% in bastnasite, 0.042% in crude ore, in ground		1.60×10^{-9}	1.68×10^{9}	seJ/g	2.68×10^{3}
Pt, in ground		2.47×10^{-12}	3.70×10^{11}	seJ/g	9.16×10^{2}
Rh, in ground		2.22×10^{-12}	1.20×10^{12}	seJ/g	2.66×10^{3}
Rhenium, in crude ore, in ground		6.60×10^{-13}	8.93×10^{12}	seJ/g	5.90×10^{3}
Samarium, 0.3% in bastnasite, 0.03% in crude ore, in ground		1.14×10^{-9}	1.68×10^{9}	seJ/g	1.91×10^{3}
Sand, unspecified, in ground		2.30×10^{-8}	1.68×10^{9}	seJ/g	3.87×10^{4}
Shale, in ground		1.29×10^{-9}	1.68×10^{9}	seJ/g	2.17×10^{3}
Silver, in ground		3.70×10^{-17}	4.50×10^{11}	seJ/g	1.67×10^{-2}
Sodium chloride, in ground		4.92×10^{-4}	1.68×10^{9}	seJ/g	8.26×10^{8}
Sodium nitrate, in ground		4.83×10^{-15}	1.68×10^{9}	seJ/g	8.12×10^{-3}
Sodium sulphate, various forms, in ground		3.43×10^{-6}	1.40×10^{9}	seJ/g	4.79×10^{6}
Stibnite, in ground		1.20×10^{-14}	1.68×10^{9}	seJ/g	2.01×10^{-2}
Sulfur, in ground		3.66×10^{-5}	2.08×10^{10}	seJ/g	7.62×10^{8}
Sylvite, 25 % in sylvinite, in ground		4.52×10^{-9}	1.68×10^{9}	seJ/g	7.59×10^{3}
Talc, in ground		2.09×10^{-9}	2.80×10^{10}	seJ/g	5.85×10^{4}
Tantalum, 81.9% in tantalite, 1.6×10^{-4}% in crude ore, in ground		1.35×10^{-17}	1.70×10^{11}	seJ/g	2.29×10^{-3}
Tellurium, 0.5ppm in sulfide, Te 0.2ppm, Cu and Ag, in crude ore, in ground		1.80×10^{-18}	5.04×10^{13}	seJ/g	9.06×10^{-2}
Tin, 79% in cassiterite, 0.1% in crude ore, in ground		1.61×10^{-10}	1.70×10^{12}	seJ/g	2.74×10^{5}
TiO2, 54% in ilmenite, 2.6% in crude ore, in ground		6.72×10^{-6}	3.82×10^{10}	seJ/g	2.57×10^{8}
Ulexite, in ground		6.87×10^{-18}	1.68×10^{9}	seJ/g	1.15×10^{-5}
Uranium, in ground		5.25×10^{-6}	1.60×10^{11}	seJ/g	8.41×10^{8}
Zinc, 9.0% in sulfide, Zn 5.3%, Pb, Ag, Cd, In, in ground		4.16×10^{-8}	7.20×10^{10}	seJ/g	2.99×10^{6}
Zirconium, 50% in zircon, 0.39% in crude ore, in ground		1.85×10^{-17}	3.18×10^{10}	seJ/g	5.89×10^{-4}
Magnesium, 0.13% in water		2.13×10^{-18}	1.68×10^{9}	seJ/g	3.57×10^{-6}

Water, cooling, unspecified natural origin	3.35×10^{-2}	2.70×10^{5}	seJ/g	9.06×10^{9}
Water, lake	5.59×10^{-7}	4.52×10^{5}	seJ/g	2.53×10^{5}
Water, process, unspecified natural origin	6.69×10^{-3}	6.74×10^{4}	seJ/J	1.89×10^{9}
Water, river	1.62×10^{-4}	3.41×10^{5}	seJ/g	5.53×10^{7}
Water, salt, ocean	3.02×10^{-4}	5.36×10^{4}	seJ/J	6.76×10^{7}
Water, salt, sole	5.74×10^{-4}	5.36×10^{4}	seJ/J	1.29×10^{8}
Water, unspecified natural origin	1.42×10^{-3}	3.06×10^{4}	seJ/J	1.82×10^{8}
Water, well, in ground	5.30×10^{-4}	6.89×10^{4}	seJ/J	1.53×10^{8}
		Emergia	seJ	3.99×10^{12}
		UEV	seJ/g	3.99×10^{9}

Table S10. LCI-based emergy required to produce 1 kg of purified terephthalic acid.

	INPUTS	QUANTIDADE	UEV	UNIDADE	EMERGIA
1	Energy, gross calorific value, in biomass	2.12×10^{-1}	6.75×10^{4}	seJ/J	1.43×10^{10}
3	Peat, in ground	5.89×10^{-6}	3.19×10^{4}	seJ/J	1.83×10^{6}
4	Wood, primary forest, standing	1.76×10^{-6}	1.04×10^{4}	seJ/J	2.07×10^{8}
5	Carbon dioxide, in air	3.48×10^{-2}	8.87×10^{7}	sej/g	1.31×10^{7}
6	Energy, kinetic (in wind), converted	1.32×10^{-1}	9.90×10^{4}	seJ/J	1.31×10^{10}
7	Energy, solar, converted	3.60×10^{-2}	7.93×10^{4}	seJ/J	2.85×10^{9}
8	Energy, potential (in hydropower reservoir), converted	2.42×10^{-1}	1.35×10^{5}	seJ/J	3.26×10^{10}
9	Aluminium, 24% in bauxite, 11% in crude ore, in ground	2.16×10^{-5}	5.40×10^{9}	seJ/g	1.17×10^{8}
10	Anhydrite, in ground	1.82×10^{-9}	1.68×10^{9}	seJ/g	3.05×10^{3}
11	Barite, 15% in crude ore, in ground	3.43×10^{-6}	1.68×10^{9}	seJ/g	5.77×10^{6}
12	Basalt, in ground	1.95×10^{-10}	7.56×10^{9}	seJ/g	1.47×10^{3}
13	Borax, in ground	2.75×10^{-10}	1.68×10^{9}	seJ/g	4.61×10^{2}
14	Cadmium, 0.30% in sulfide, Cd 0.18%, Pb, Zn, Ag, In, in ground	1.06×10^{-11}	3.40×10^{13}	seJ/g	3.62×10^{5}
15	Calcite, in ground	8.77×10^{-3}	1.68×10^{9}	seJ/g	1.47×10^{10}
16	Carbon, in organic matter, in soil	1.23×10^{-8}	2.77×10^{9}	seJ/g	3.42×10^{4}
17	Cerium, 24% in bastnasite, 2.4% in crude ore, in ground	1.43×10^{-7}	1.14×10^{10}	seJ/g	1.63×10^{6}
18	Chromium, 25.5% in chromite, 11.6% in crude ore, in ground	5.39×10^{-7}	1.50×10^{11}	seJ/g	8.09×10^{7}
19	Chrysotile, in ground	5.35×10^{-8}	1.68×10^{9}	seJ/g	8.99×10^{4}
20	Cinnabar, in ground	1.44×10^{-8}	1.68×10^{9}	seJ/g	2.43×10^{4}
21	Clay, unspecified, in ground	2.88×10^{-4}	4.80×10^{9}	seJ/g	1.39×10^{9}
22	Coal	8.20×10^{-1}	5.71×10^{4}	seJ/J	4.68×10^{10}
23	Cobalt, in ground	2.89×10^{-4}	1.30×10^{11}	seJ/g	3.75×10^{10}
24	Colemanite, in ground	7.62×10^{-9}	1.68×10^{9}	seJ/g	1.28×10^{4}
25	Copper, in ground	1.62×10^{-6}	9.80×10^{10}	seJ/g	1.59×10^{8}
26	Diatomite, in ground	3.37×10^{-13}	1.68×10^{9}	seJ/g	5.65×10^{-1}
27	Dolomite, in ground	3.91×10^{-6}	1.85×10^{10}	seJ/g	7.24×10^{7}
28	Energy, geothermal, converted	1.13×10^{-3}	4.52×10^{5}	seJ/J	5.09×10^{8}
29	Europium, 0.06% in bastnasite, 0.006% in crude ore, in ground	3.59×10^{-10}	1.68×10^{9}	seJ/g	6.03×10^{2}
30	Feldspar, in ground	1.58×10^{-14}	1.68×10^{9}	seJ/g	2.66×10^{-2}
31	Fluorine, in ground	8.34×10^{-7}	1.68×10^{9}	seJ/g	1.40×10^{6}
32	Fluorspar, 92%, in ground	1.77×10^{-5}	8.38×10^{8}	seJ/g	1.48×10^{7}
33	Gadolinium, 0.15% in bastnasite, 0.015% in crude ore, in ground	8.96×10^{-10}	1.68×10^{9}	seJ/g	1.50×10^{3}
34	Gas, natural, in ground	1.11×10^{1}	6.83×10^{4}	seJ/J	7.56×10^{11}
35	Gold, in ground	4.06×10^{-17}	5.00×10^{11}	seJ/g	2.03×10^{-2}
36	Granite, in ground	1.54×10^{-14}	8.40×10^{8}	seJ/g	1.29×10^{-2}
37	Gravel, in ground	1.05×10^{-2}	8.40×10^{8}	seJ/g	8.79×10^{9}
38	Gypsum, in ground	2.10×10^{-8}	2.85×10^{9}	seJ/g	5.99×10^{4}
39	Indium, 0.005% in sulfide, In 0.003%, Pb, Zn, Ag, Cd, in ground	1.68×10^{-13}	4.03×10^{11}	seJ/g	6.75×10^{1}
40	Iron, 46% in ore, 25% in crude ore, in ground	5.94×10^{-6}	1.20×10^{10}	seJ/g	7.13×10^{7}

41	Kaolinite, 24% in crude ore, in ground	3.57×10^{-6}	1.68×10^{9}	seJ/g	6.00×10^{6}
42	Kieserite, 25% in crude ore, in ground	9.32×10^{-10}	1.68×10^{9}	seJ/g	1.56×10^{3}
43	Lanthanum, 7.2% in bastnasite, 0.72% in crude ore, in ground	4.30×10^{-8}	1.68×10^{9}	seJ/g	7.22×10^{4}
44	Lead, 5.0% in sulfide, Pb 3.0%, Zn, Ag, Cd, In, in ground	4.60×10^{-11}	4.80×10^{11}	seJ/g	2.21×10^{4}
45	Lithium, 0.15% in brine, in ground	3.77×10^{-13}	9.27×10^{11}	seJ/g	3.49×10^{2}
46	Magnesite, 60% in crude ore, in ground	2.85×10^{-7}	1.68×10^{9}	seJ/g	4.78×10^{5}
47	Manganese, 35.7% in sedimentary deposit, 14.2% in crude ore, in ground	5.04×10^{-4}	3.50×10^{11}	seJ/g	1.76×10^{11}
48	Metamorphous rock, graphite containing, in ground	3.33×10^{-8}	1.68×10^{9}	seJ/g	5.58×10^{4}
49	Molybdenum, 0.025% in sulfide, Mo 8.2×10^{-3}% and Cu 0.39% in crude ore, in ground	1.29×10^{-6}	7.00×10^{11}	seJ/g	9.01×10^{8}
50	Neodymium, 4% in bastnasite, 0.4% in crude ore, in ground	2.36×10^{-8}	1.68×10^{9}	seJ/g	3.97×10^{4}
51	Nickel, 1.13% in sulfide, Ni 0.76% and Cu 0.76% in crude ore, in ground	2.19×10^{-6}	2.00×10^{11}	seJ/g	4.37×10^{8}
52	Oil, crude, in ground	4.08×10^{1}	9.45×10^{4}	seJ/J	3.86×10^{12}
53	Olivine, in ground	6.06×10^{-10}	1.68×10^{9}	seJ/g	1.02×10^{3}
54	Pd,in ground	1.80×10^{-10}	1.20×10^{11}	seJ/g	2.16×10^{4}
55	Phosphorus, 18% in apatite, 12% in crude ore, in ground	3.33×10^{-6}	2.07×10^{10}	seJ/g	6.89×10^{7}
56	Praseodymium, 0.42% in bastnasite, 0.042% in crude ore, in ground	2.51×10^{-9}	1.68×10^{9}	seJ/g	4.21×10^{3}
57	Pt, in ground	5.57×10^{-12}	3.70×10^{11}	seJ/g	2.06×10^{3}
58	Rh, in ground	4.99×10^{-12}	1.20×10^{12}	seJ/g	5.98×10^{3}
59	Rhenium, in crude ore, in ground	1.44×10^{-12}	8.93×10^{12}	seJ/g	1.29×10^{4}
60	Samarium, 0.3% in bastnasite, 0.03% in crude ore, in ground	1.79×10^{-9}	1.68×10^{9}	seJ/g	3.00×10^{3}
61	Sand, unspecified, in ground	3.43×10^{-8}	1.68×10^{9}	seJ/g	5.77×10^{4}
62	Shale, in ground	5.14×10^{-9}	1.68×10^{9}	seJ/g	8.64×10^{3}
63	Silver, in ground	1.09×10^{-16}	4.50×10^{11}	seJ/g	4.90×10^{-2}
64	sodium bromide	4.19×10^{-4}	1.68×10^{9}	seJ/g	7.03×10^{8}
65	Sodium chloride, in ground	1.12×10^{-2}	1.68×10^{9}	seJ/g	1.87×10^{10}
66	Sodium nitrate, in ground	9.78×10^{-15}	1.68×10^{9}	seJ/g	1.64×10^{-2}
67	Sodium sulphate, various forms, in ground	4.85×10^{-6}	1.40×10^{9}	seJ/g	6.77×10^{6}
68	Stibnite, in ground	3.50×10^{-14}	1.68×10^{9}	seJ/g	5.88×10^{-2}
69	Sulfur, in ground	2.08×10^{-5}	2.08×10^{10}	seJ/g	3.03×10^{8}
70	Sylvite, 25 % in sylvinite, in ground	1.87×10^{-8}	1.68×10^{9}	seJ/g	3.14×10^{4}
71	Talc, in ground	7.89×10^{-8}	2.80×10^{10}	seJ/g	2.21×10^{6}
72	Tantalum, 81.9% in tantalite, 1.6×10^{-4}% in crude ore, in ground	3.96×10^{-17}	1.70×10^{11}	seJ/g	6.73×10^{-3}
73	Tellurium, 0.5ppm in sulfide, Te 0.2ppm, Cu and Ag, in crude ore, in ground	5.33×10^{-18}	5.04×10^{13}	seJ/g	2.69×10^{-1}
74	Tin, 79% in cassiterite, 0.1% in crude ore, in ground	2.68×10^{-10}	1.70×10^{12}	seJ/g	4.56×10^{5}
75	TiO2, 54% in ilmenite, 2.6% in crude ore, in ground	1.02×10^{-5}	3.82×10^{10}	seJ/g	3.89×10^{8}
76	Ulexite, in ground	2.02×10^{-17}	1.68×10^{9}	seJ/g	3.39×10^{-5}
77	Uranium, in ground	2.92×10^{-6}	1.60×10^{11}	seJ/g	4.68×10^{8}
78	Zinc, 9.0% in sulfide, Zn 5.3%, Pb, Ag, Cd, In, in ground	1.18×10^{-6}	7.20×10^{10}	seJ/g	8.47×10^{7}
79	Zirconium, 50% in zircon, 0.39% in crude ore, in ground	5.44×10^{-17}	3.18×10^{10}	seJ/g	1.73×10^{-3}
80	Magnesium, 0.13% in water	6.24×10^{-18}	1.68×10^{9}	seJ/g	1.05×10^{-5}
81	Water, cooling, unspecified natural origin	3.81×10^{-2}	2.70×10^{5}	seJ/g	1.03×10^{10}
82	Water, lake	7.32×10^{-6}	4.52×10^{5}	seJ/g	3.31×10^{6}
83	Water, process, unspecified natural origin	3.56×10^{-3}	6.74×10^{4}	seJ/J	4.93×10^{5}
84	Water, river	2.57×10^{-2}	3.41×10^{5}	seJ/g	5.08×10^{9}
85	Water, salt, ocean	3.37×10^{-3}	5.36×10^{4}	seJ/J	1.37×10^{9}

86	Water, salt, sole	7.07×10^{-4}	5.36×10^{4}	seJ/J	7.56×10^{8}
87	Water, unspecified natural origin	2.05×10^{-3}	3.06×10^{4}	seJ/J	9.05×10^{7}
88	Water, well, in ground	2.86×10^{-4}	6.89×10^{4}	seJ/J	5.90×10^{8}
			Emergia	seJ	5.00×10^{12}
			UEV	seJ/g	5.00×10^{9}