Correction of Eco-indicator'99 Normalisation values

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In January 2007 Patrick Hofstetter detected errors in the normalisation values for resource use in the Eco-indicator'99 LCIA method. The source of these errors were faulty data for the energy consumption for Western Europe, which were too low by a factor of approximately two. The consequence of this is that all resource consumptions – energy and mineral – were overestimated by a factor two. The corrections in the characterisation factors were heeded in this study and are documented below.

Correct energy consumption data for Western Europe[1] was taken from (BP 2007). The reference year was left unchanged: the consumption figures relate to the year 1995, identical to the reference year used in the original Eco-indicator'99 annex report. The split of the total coal consumption into underground hard coal, open-pit hard coal, and brown coal was left unchanged (32%, 32%, 36% respectively). Nuclear energy is not included, as in the original report.

Tab. 1 Original and corrected figures for Energy consumption in Western Europe 1995 in Petajoules (1 Petajoule = 1'000'000'000 Megajoule)

	Energy consumption in Western Europe 1995 in PJ/yr	
	Faulty	Correct
Natural gas	8938	11'259
Oil	12185	29'628
Open-pit hardcoal	1832	3'118
Underground hardcoal	1832	3'118
Brown coal	2061	3'507
Total	26'848	50'630

The new data changes the normalisation values for resource use, which are given in units of 'MJ surplus energy per year per captia'. The original figure for Western European population of 386 million was adopted. The Normalisation value for the Individualist perspective is unaffected (apart from rounding mistakes), as he does not value energy resources at all.

[1] The Western European Countries in the Eco-indicator'99 reports are the EU15 plus Norway, Iceland, and Switzerland.

Tab. 2 Original and corrected figures for resource use normalisation values for the three archetypical perspectives of Eco-indicator'99

	Resource use normalisation value in MJ surplus energy per year per captia	
	Faulty	Correct
Egalitarian	5'940	11'025
Hierarchist	8'410	16'025
Individualist	150	148

In this report only the default perspective Hierarchist is applied. For the affected resource exchanges in the ecoinvent database following characterisation factors are calculated[2].

Tab. 3 Original and corrected figures for characterisation factors for resource uses in the Hierarchist perspective.

Exchange name		Unit	Characterisation factors for resource extractions for the Hierarchist perspective	
			Points/unit	Points/unit
			Faulty	Correct
Oil, crude, in ground		kg	0.144	0.0755
Gas, natural, in ground		Nm3	0.125	0.0655
Gas, mine, off-gas, process, coal mining		Nm3	0.125	0.0655
Coal, brown, in ground		kg	0	0
Coal, hard, unspecified, in ground		kg	0.00369	0.00193
Aluminium, 24% in bauxite, 11% in crude ore, in ground		kg	0.0566	0.0297
Chromium, 25.5 in chromite, 11.6% in crude ore, in ground		kg	0.0218	0.0114
Copper, 0.99% in sulfide, Cu 0.36% and Mo 8.2E-3% in crude ore, in ground	[1]	kg	0.873	0.458
Iron, 46% in ore, 25% in crude ore, in ground		kg	0.00121	0.000637
Manganese, 35.7% in sedimentary deposit, 14.2% in crude ore, in ground		kg	0.00744	0.00391
Molybdenum, 0.11% in sulfide, Mo 0.41% and Cu 0.36% in crude ore, in ground	[1]	kg	0.975	0.512
Nickel, 1.13% in sulfides, 0.76% in crude ore, in ground	[1]	kg	0.388	0.204
Pyrolusite, in ground		kg	0.00744	0.00391
Tin, 79% in cassiterite, 0.1% in crude ore, in ground		kg	14.3	7.49
Zinc 9%, Lead 5%, in sulfide, in ground		kg	0.0912	0.0479

1 Other resource exchanges for copper, molybdenum or nickel have identical characterisation factors per metal, respectively.

2 Characterisation factors are calculated from surplus energy figures for single resources (e.g. 6.05 MJ/ kg crude oil given in the Eco-indicator'99 methodology report (Goedkoop et al. 2001)) by dividing by the normalisation value (16'025 MJ/yr*cap for Hierarchist) and multiplying with the weighting factor for resources (20% for Hierarchist given in the Eco-indicator'99 methodology report) and multiplying with a customary factor of 1000; i.e. for 1 kg crude oil 6.05/16025 * 20% * 1000 = 0.0755.

References

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