

Environmental Impact from different Environmental Aspects

From Electricity generation :

It is to be understood that the energy mix in each country is essential for the average environmental impact. As an average, the following basic data is valid :

Type of energy	Environmental points/MWh					Impact categories kg/MWh				Dust ashes etc
	ECO-indicator	ET long Sweden	EDIP	EPS-2 000	Tellus	AP SO ₂	GWP100 CO ₂	NP Phosphate	POCP Ethylene	
European average Electricity	21,4	115 763	0,515	155	85,0	3,17	516,88	0,14	0,12	3,39
Hydro power Electricity	0,92	937	0,007	10	3,8	0,02	4,40	0,004	0,000	0
Lignite power Electricity	38,8	114 954	0,677	323	153,7	8,34	1 356,01	0,26	0,029	19,3
Nuclear power Electricity	0,8	38 673	0,040	40	4,8	0,09	9,24	0,01	0,007	0,003
Oil power Electricity	71,2	140 788	0,533	313	182,2	10,53	942,98	0,27	0,88	0,11
Stone coal power Electricity	38,8	364 901	1,865	251	243,1	6,08	1 098,17	0,34	0,09	19,3
Gas power Electricity	30,9	90 302	0,331	307	44,7	1,41	809,81	0,19	0,09	0
Bio fuel electricity - full regrowth	44,0	32 299		311		1,38	90	4,6	0,08	5,1
Bio fuel electricity - no regrowth	52,8	91 499		484		1,38	1690	4,6	0,08	5,1
Wind Power electricity	No calculated values			41		0,02	4,1	0,004	0	0

Here it is to be understood that 1 MWh of electricity consumption causes 1 098 kg emissions of CO₂ equivalents if a stone coal based Power Plant is used and 9,24 kg CO₂ equivalents if the electricity comes from a Nuclear Power Plant. Corresponding figures are to be found for other sources of energy. If Heat energy is consumed, instead the figures above have to be multiplied with 0,35-0,50. It is easier to get heat from a power plant instead of the purer energy electricity. Due to this the environmental impact from heat energy is less than for electricity.

The emissions of CO₂ from Bio fuel are dependent upon if the harvesting of the bio fuel is in balance of the growths of the forests. If so the forests are absorbing the CO₂ in the photosynthesis and the emissions only concerns the emissions from the harvesting and molding of wood and the fertilizing of the forests. Due to this, two different values are presented.

A summing up of the environmental impact from power generation in different countries is showed below :

Type of energy	Environmental points/MWh				Impact categories kg/MWh				
	ECO-indicator	ET long Sweden	EDIP	EPS-2 000	Tellus	AP SO ₂	GWP100 CO ₂	NP Phosphate	POCP Ethylene
Australia Electricity	35,1	300 558	1,523	233	201,2	5,18	961,63	0,30	0,10
Austria Electricity	13,2	54 239	0,252	102	42,8	1,53	309,32	0,09	0,10
Belgium Electricity	14,7	124 140	0,522	125	69,8	1,87	379,58	0,11	0,06
Britain Electricity	31,3	251 317	1,228	201	169,5	4,74	788,99	0,24	0,14
Canada Electricity	10,3	71 436	0,356	67	51,5	1,43	244,86	0,08	0,04
Denmark Electricity	39,8	349 173	1,775	254	235,4	6,12	1 084,46	0,33	0,12
Finland Electricity	12,0	89 054	0,374	100	52,6	1,46	295,12	0,09	0,05
France Electricity	5,5	58 446	0,176	61	25,8	0,77	121,98	0,04	0,03
Germany Electricity	24,1	158 825	0,760	188	113,4	3,81	691,10	0,18	0,06
Greece Electricity	43,7	113 713	0,605	301	150,7	8,31	1 179,41	0,24	0,22
Ireland Electricity	39,6	224 745	1,084	257	161,9	5,19	909,27	0,26	0,23
Italy Electricity	45,3	135 752	0,583	246	130,0	6,13	763,38	0,21	0,45
Japan Electricity	33,9	124 636	0,515	204	102,2	4,43	612,22	0,17	0,30
Luxemburg Electricity	30,3	87 549	0,324	296	45,0	1,48	780,64	0,19	0,10
Netherlands Electricity	33,5	184 438	0,857	270	117,3	3,34	865,60	0,24	0,12
New Zealand Electricity	9,8	30 711	0,122	95	18,8	0,52	241,68	0,06	0,03
Norway Electricity	1,0	1 556	0,007	10	4,2	0,03	6,26	0,004	0,004
Portugal Electricity	55,2	250 323	1,184	282	211,7	8,33	1 017,14	0,30	0,49
Spain Electricity	19,8	145 820	0,684	140	100,4	3,15	510,06	0,14	0,08
Sweden Electricity	2,8	26 613	0,065	34	11,5	0,34	45,03	0,014	0,022
Switzerland Electricity	1,7	18 154	0,025	26	6,3	0,18	17,62	0,007	0,014
Turkey Electricity	25,3	160 954	0,788	170	113,0	3,32	612,13	0,18	0,12
USA Electricity	27,9	222 832	1,084	196	145,4	3,86	737,97	0,22	0,09

EcoLab from Nordic Port and the Data Base from ABB Corporate Research are used as an information source for the data above. The values are from year 2002.

Here it is observed that each MWh electrical energy that comes from a power plant in USA creates 737 kg emissions of the equivalent global warming gas CO₂, 0,22 kg of the acid gas sulphur dioxide SO₂ and 0,09 kg of the equivalent gas ethylene that creates photochemical oxidation. These figures are average figures for USA power generation. There are better plants that create less emission utilizing more efficient cleaning of SO₂ but many are a lot worse. See for example the values from Southern Europe Greece and Portugal.

It is also to be observed that combustion of lignite without

proper cleaning the emissions to air is much higher. For sulphurous dioxide SO₂ often an emission of approx. 8,3 kg/MWh is observed, which means that the emission values for countries outside Sweden have to be modified in the same extent.

Also metals cause emissions to air during the process from mines to the steel works and further refining. The impact upon the global threats is showed below :

Environmental impact of metals from Mining to raw material

Type of energy	Environmental points/kg					Impact categories kg/kg			
	ECO-indicator	ET long Sweden	EDIP	EPS-2000	Tellus	AP SO ₂	GWP100 CO ₂	NP Phosphate	POCP Ethylene
Aluminium Profile	0,67	3 155,2	0,012	7,6	3,667	0,0793	14,0460	0,0026	0,0032
Aluminium Scrap recycled	-0,53	-2 630,8	-0,098	-6,3	-3,140	-0,0647	-11,1599	-0,0021	-0,0027
Cast Iron	0,12	701,9	0,047	1,7	0,398	0,0128	3,4933	0,0007	0,0013
Cast iron scrap recycled	-0,04	-429,8	-0,003	-1,1	-0,179	-0,0041	-1,8020	-0,0003	-0,0008
Copper Profile	1,43	573,9	0,018	214,6	1,721	0,0344	6,1270	0,0044	0,0031
Copper wire 8 mm	1,41	543,0	0,018	214,5	1,691	0,0325	5,7704	0,0041	0,0031
Copper scrap recycling	-1,30	-368,2	-0,017	-205,7	-1,503	-0,0243	-3,4059	-0,0035	-0,0026
Red Brass sand castings	2,09	748,9	0,069	262,7	1,699	0,0388	7,1456	0,0045	0,0031
Red Brass Scrap recycled	-0,86	-885,5	-0,027	-142,2	-1,254	-0,0253	-4,2904	-0,0029	-0,0018
Stainless steel	0,17	6 820,6	0,070	19,7	1,580	0,0169	3,1760	0,0010	0,0009
Stainless steel scrap recycled	-0,10	-854,0	-0,009	-18,3	-0,277	-0,0118	-1,8059	-0,0006	-0,0005
Steel bar IISI	0,04	162,2	0,028	1,4	0,151	0,0046	2,5620	0,0040	0,0012
Steel profile	0,04	182,2	0,026	1,5	0,156	0,0044	3,0248	0,0004	0,0013
Steel hot rolled SSAB	0,00	282,8	0,002	1,5	0,126	0,0053	2,8798	0,0006	0,0009
Electrical steel Sura	0,03	219,0	0,002	1,3	0,092	0,0028	1,1248	0,0003	0,0005
Steel scrap recycled	-0,02	-98,7	-0,025	-1,1	-0,093	-0,0015	-1,8016	0,0000	-0,0010

Here it is for example observed that consumption of 1 kg copper causes emissions of 6,13 kg CO₂ equivalents to air.

It also is shown that recycling of metals gives back less environmental impact than was consumed from the beginning.