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APPENDICES

Appendix A Development of LCI Calculation Function

Table A1 LCI results from LCI calculation of acetic acid, 98 % in H₂O, at plant – RER, ecoinvent data v2.0

Elementary Flow	LCSoft	SimaPro7.1	Unit	Ratio
1,4-Butanediol[air_high population density]	1.83642E-11	1.83642E-11	kg	0.999999977
1,4-Butanediol[water_river]	7.34575E-12	7.34575E-12	kg	0.999999998
2,4-D[soil_agricultural]	1.19372E-10	1.19372E-10	kg	0.999999938
2-Propanol[air_high population density]	3.43014E-07	3.43014E-07	kg	0.999999962
4-Methyl-2-pentanone[water_unspecified]	3.28774E-13	3.28774E-13	kg	0.999999945
Acenaphthene[air_high population density]	1.81092E-12	1.81092E-12	kg	0.999999998
Acenaphthene[air_low population density]	5.02534E-14	5.02534E-14	kg	1
Acenaphthene[air_unspecified]	7.54339E-16	7.54339E-16	kg	0.999999936
Acenaphthene[water_ocean]	5.10534E-11	5.10534E-11	kg	1.000000004
Acenaphthene[water_river]	1.02054E-10	1.02054E-10	kg	1
Acenaphthylene[water_ocean]	3.19289E-12	3.19289E-12	kg	0.999999989
Acenaphthylene[water_river]	6.38245E-12	6.38245E-12	kg	1.000000002
Acetaldehyde[air_high population density]	1.85791E-07	1.85791E-07	kg	1.000000009
Acetaldehyde[air_low population density]	1.27851E-09	1.27851E-09	kg	0.999999976
Acetaldehyde[air_unspecified]	1.46813E-07	1.46813E-07	kg	0.999999994
Acetaldehyde[water_river]	1.0552E-08	1.0552E-08	kg	0.999999999
Acetic acid[air_high population density]	1.77062E-06	1.77062E-06	kg	0.999999969
Acetic acid[air_low population density]	8.39883E-09	8.39883E-09	kg	0.999999939
Acetic acid[air_unspecified]	0.005000142	0.005000142	kg	0.999999994
Acetic acid[water_river]	3.49339E-08	3.49339E-08	kg	0.999999961
Acetone[air_high population density]	5.84919E-07	5.84919E-07	kg	0.999999976
Acetone[air_low population density]	6.61268E-08	6.61268E-08	kg	0.999999994
Acetone[water_unspecified]	7.83619E-13	7.83619E-13	kg	0.999999932
Acetonitrile[air_low population density]	3.51444E-10	3.51444E-10	kg	0.999999952
Acidity, unspecified[water_river]	8.45252E-09	8.45252E-09	kg	0.999999931
Acidity, unspecified[water_unspecified]	1.64881E-11	1.64881E-11	kg	0.999999926
Aclonifen[soil_agricultural]	8.10428E-11	8.10428E-11	kg	0.999999954
Acrolein[air_high population density]	4.74227E-11	4.74227E-11	kg	1.000000006
Acrolein[air_low population density]	1.08524E-10	1.08524E-10	kg	0.999999996
Acrolein[air_unspecified]	4.36677E-13	4.36677E-13	kg	0.999999928
Acrylate, ion[water_river]	2.10042E-09	2.10042E-09	kg	0.999999989
Acrylic acid[air_high population density]	8.87469E-10	8.87469E-10	kg	0.999999977
Actinides, radioactive, unspecified[air_low population density]	2.04179E-07	2.04179E-07	kBq	1.000000013
Actinides, radioactive, unspecified[water_ocean]	3.13988E-05	3.13988E-05	kBq	0.999999996
Aerosols, radioactive, unspecified[air_low population density]	4.67419E-06	4.67419E-06	kBq	1.000000003
Aldehydes, unspecified[air_high population density]	3.1513E-09	3.1513E-09	kg	0.999999957

Table A1 LCI results from LCI calculation of acetic acid, 98 % in H₂O, at plant – RER, ecoinvent data v2.0 (cont'd)

Elementary Flow	LCSoft	SimaPro7.1	Unit	Ratio
Aldehydes, unspecified[air_low population density]	8.637E-09	8.637E-09	kg	0.99999997
Aldehydes, unspecified[air_unspecified]	3.21086E-12	3.21086E-12	kg	0.999999948
Aldrin[soil_agricultural]	2.28251E-11	2.28251E-11	kg	0.999999973
Aluminium, 24% in bauxite, 11% in crude ore, in ground[resource_in ground]	-0.000926966	-0.000926966	kg	0.999999947
Aluminium[air_high population density]	3.6615E-06	3.6615E-06	kg	0.999999983
Aluminum[air_low population density]	2.10364E-07	2.10364E-07	kg	0.999999939
Aluminum[air_unspecified]	3.74284E-05	3.74284E-05	kg	0.999999909
Aluminum[soil_agricultural]	4.85598E-07	4.85598E-07	kg	1.000000002
Aluminum[soil_industrial]	1.46695E-05	1.46695E-05	kg	1.000000013
Aluminum[water_ground-, long-term]	0.000928711	0.000928711	kg	0.999999995
Aluminum[water_ground-]	9.52744E-07	9.52744E-07	kg	1.000000001
Aluminum[water_ocean]	2.59351E-06	2.59351E-06	kg	0.999999951
Aluminum[water_river]	4.99339E-06	4.99339E-06	kg	1
Aluminum[water_unspecified]	1.14862E-08	1.14862E-08	kg	0.999999957
Ammonia[air_high population density]	1.49206E-06	1.49206E-06	kg	0.999999968
Ammonia[air_low population density]	3.87895E-06	3.87895E-06	kg	0.999999966
Ammonia[air_unspecified]	1.95054E-05	1.95054E-05	kg	0.999999818
Ammonium carbonate[air_high population density]	5.53682E-08	5.53682E-08	kg	1.000000004
Ammonium, ion[water_ground-, long-term]	1.41486E-07	1.41486E-07	kg	0.999999983
Ammonium, ion[water_ground-]	1.35076E-07	1.35076E-07	kg	0.999999985
Ammonium, ion[water_ocean]	5.86257E-07	5.86257E-07	kg	1.000000002
Ammonium, ion[water_river]	2.11879E-06	2.11879E-06	kg	0.999999968
Ammonium, ion[water_unspecified]	9.66546E-10	9.66546E-10	kg	0.999999932
Anhydrite, in ground[resource_in ground]	-4.02895E-09	-4.02895E-09	kg	0.999999944
Antimony[air_high population density]	8.61414E-10	8.61414E-10	kg	0.999999977
Antimony[air_low population density]	3.69282E-08	3.69283E-08	kg	0.999999972
Antimony[air_unspecified]	1.49567E-11	1.49567E-11	kg	1.000000143
Antimony[soil_agricultural]	2.51621E-12	2.51621E-12	kg	0.999999968
Antimony[water_ground-, long-term]	4.99288E-07	4.99288E-07	kg	0.999999978
Antimony[water_ground-]	8.31394E-08	8.31394E-08	kg	1.000000003
Antimony[water_river]	2.02113E-07	2.02113E-07	kg	0.999999955
Antimony[water_unspecified]	8.82499E-13	8.82499E-13	kg	0.999999934
Antimony-122[water_river]	1.06678E-08	1.06678E-08	kBq	0.999999958
Antimony-124[air_low population density]	2.64603E-11	2.64603E-11	kBq	0.999999999
Antimony-124[water_river]	5.14777E-06	5.14777E-06	kBq	0.999999994
Antimony-125[air_low population density]	2.76136E-10	2.76136E-10	kBq	0.999999995
Antimony-125[water_river]	4.7023E-06	4.7023E-06	kBq	1.000000003
AOX, Adsorbable Organic Halogen as Cl[water_ocean]	2.96524E-09	2.96524E-09	kg	1.000000003
AOX, Adsorbable Organic Halogen as Cl[water_river]	5.83742E-08	5.83742E-08	kg	0.999999976
AOX, Adsorbable Organic Halogen as Cl[water_unspecified]	5.05082E-07	5.05082E-07	kg	0.999999994
Argon-41[air_low population density]	0.002462021	0.002462021	kBq	0.999999989
Arsenic, ion[water_ground-, long-term]	5.50961E-09	5.50962E-09	kg	0.999999773

Table A1 LCI results from LCI calculation of acetic acid, 98 % in H₂O, at plant – RER, ecoinvent data v2.0 (cont'd)

Elementary Flow	LCSoft	SimaPro7.1	Unit	Ratio
Arsenic, ion[water ground-]	4.2079E-07	4.2079E-07	kg	1.000000008
Arsenic, ion[water lake]	4.11133E-14	4.11133E-14	kg	0.999999984
Arsenic, ion[water ocean]	7.5502E-09	7.5502E-09	kg	0.999999994
Arsenic, ion[water river]	4.4471E-07	4.4471E-07	kg	0.999999988
Arsenic, ion[water unspecified]	2.39605E-09	2.39605E-09	kg	0.999999939
Arsenic[air high population density]	1.95226E-08	1.95226E-08	kg	0.999999998
Arsenic[air low population density]	2.60133E-07	2.60133E-07	kg	0.999999959
Arsenic[air unspecified]	9.0081E-11	9.0081E-11	kg	1.000000117
Arsenic[soil agricultural]	2.94214E-10	2.94214E-10	kg	0.999999969
Arsenic[soil industrial]	5.86779E-09	5.86779E-09	kg	0.999999994
Arsine[air high population density]	1.03446E-14	1.03446E-14	kg	0.999999957
Atrazine[soil agricultural]	5.98795E-12	5.98795E-12	kg	0.999999997
Barite, 15% in crude ore, in ground[resource in ground]	-0.002577373	-0.002577373	kg	1.000000001
Barite[water ocean]	0.00014158	0.00014158	kg	0.999999984
Barium[air high population density]	4.3179E-08	4.3179E-08	kg	0.999999984
Barium[air low population density]	9.8082E-08	9.8082E-08	kg	0.999999993
Barium[air unspecified]	1.35137E-16	1.35137E-16	kg	1.000000024
Barium[soil agricultural]	8.55137E-11	8.55137E-11	kg	0.999999997
Barium[soil industrial]	7.33474E-06	7.33474E-06	kg	0.999999996
Barium[water ground-, long-term]	1.30676E-05	1.30676E-05	kg	0.999999959
Barium[water ground-]	1.36361E-07	1.36362E-07	kg	0.999999984
Barium[water ocean]	7.15772E-06	7.15772E-06	kg	1
Barium[water river]	1.43392E-05	1.43392E-05	kg	1.000000021
Barium[water unspecified]	2.2322E-08	2.2322E-08	kg	0.999999942
Barium-140[air low population density]	1.79622E-08	1.79622E-08	kBq	1.000000004
Barium-140[water river]	4.67306E-08	4.67306E-08	kBq	1.000000007
Basalt, in ground[resource in ground]	-0.000158534	-0.000158534	kg	0.999999802
Benomyl[soil agricultural]	7.51559E-13	7.51559E-13	kg	0.999999941
Bentazone[soil agricultural]	4.13605E-11	4.13605E-11	kg	0.999999959
Benzal chloride[air unspecified]	5.53981E-17	5.53981E-17	kg	0.999999936
Benzaldehyde[air high population density]	2.47423E-11	2.47423E-11	kg	1.000000012
Benzene, chloro-[water river]	5.0996E-08	5.0996E-08	kg	0.999999964
Benzene, ethyl-[air high population density]	5.17951E-07	5.17951E-07	kg	0.999999998
Benzene, ethyl-[air low population density]	9.27005E-12	9.27005E-12	kg	0.999999989
Benzene, ethyl-[water ocean]	1.97027E-07	1.97027E-07	kg	0.999999983
Benzene, ethyl-[water river]	3.93797E-07	3.93797E-07	kg	1.000000007
Benzene, ethyl-[water unspecified]	7.39124E-12	7.39124E-12	kg	0.999999937
Benzene, hexachloro-[air high population density]	3.89602E-12	3.89602E-12	kg	0.999999896
Benzene, hexachloro-[air unspecified]	2.97082E-10	2.97083E-10	kg	0.999999949
Benzene, pentachloro-[air high population density]	9.77715E-12	9.77715E-12	kg	0.999999891
Benzene[air high population density]	4.76641E-06	4.76641E-06	kg	1.000000007
Benzene[air low population density]	2.91211E-06	2.91211E-06	kg	0.999999999
Benzene[air lower stratosphere + upper troposphere]	3.08793E-12	3.08793E-12	kg	0.999999975
Benzene[air unspecified]	2.58674E-07	2.58674E-07	kg	0.999999998
Benzene[water ocean]	6.78189E-07	6.78189E-07	kg	0.999999997

Table A1 LCI results from LCI calculation of acetic acid, 98 % in H₂O, at plant – RER, ecoinvent data v2.0 (cont'd)

Elementary Flow	LCSoft	SimaPro7.1	Unit	Ratio
Benzene[water river]	1.17535E-06	1.17535E-06	kg	1.000000029
Benzene[water unspecified]	1.3151E-10	1.3151E-10	kg	0.999999915
Benzo(a)pyrene[air_high population density]	1.69074E-10	1.69074E-10	kg	1.000000006
Benzo(a)pyrene[air_low population density]	1.25678E-08	1.25678E-08	kg	0.999999977
Benzo(a)pyrene[air unspecified]	2.11826E-09	2.11826E-09	kg	0.999999933
Beryllium[air_high population density]	4.66631E-10	4.66631E-10	kg	0.999999993
Beryllium[air_low population density]	2.09345E-10	2.09345E-10	kg	0.999999973
Beryllium[air unspecified]	2.24393E-11	2.24393E-11	kg	1.000000118
Beryllium[water_ground-, long-term]	1.10967E-07	1.10967E-07	kg	0.999999988
Beryllium[water_ground-]	1.35613E-10	1.35613E-10	kg	0.999999971
Beryllium[water river]	1.71755E-10	1.71755E-10	kg	0.999999992
Beryllium[water unspecified]	7.86091E-13	7.86091E-13	kg	0.999999936
BOD5, Biological Oxygen Demand[water_ground-, long-term]	0.00015759	0.00015759	kg	0.999999945
BOD5, Biological Oxygen Demand[water_ground-]	2.69525E-08	2.69525E-08	kg	0.999999997
BOD5, Biological Oxygen Demand[water ocean]	0.000779538	0.000779538	kg	0.999999997
BOD5, Biological Oxygen Demand[water river]	0.004469213	0.004469213	kg	0.999999993
BOD5, Biological Oxygen Demand[water unspecified]	9.62628E-05	9.62628E-05	kg	0.999999996
Borax, in ground[resource in ground]	-3.7751E-09	-3.7751E-09	kg	0.999999995
Boron trifluoride[air_high population density]	7.7204E-17	7.7204E-17	kg	0.999999979
Boron[air_high population density]	1.63808E-07	1.63808E-07	kg	1.000000022
Boron[air_low population density]	6.80954E-06	6.80954E-06	kg	1.000000004
Boron[air unspecified]	7.80019E-16	7.80019E-16	kg	0.999999993
Boron[soil agricultural]	1.489E-11	1.489E-11	kg	0.999999963
Boron[soil industrial]	1.46695E-07	1.46695E-07	kg	1.000000013
Boron[soil unspecified]	5.24642E-08	5.24642E-08	kg	0.999999992
Boron[water_ground-, long-term]	1.39242E-05	1.39242E-05	kg	1.000000022
Boron[water_ground-]	1.63054E-07	1.63054E-07	kg	0.999999988
Boron[water ocean]	6.7127E-08	6.7127E-08	kg	0.999999992
Boron[water river]	4.22296E-07	4.22296E-07	kg	0.999999995
Boron[water unspecified]	2.4621E-10	2.4621E-10	kg	0.999999955
Bromate[water river]	1.00593E-07	1.00593E-07	kg	0.999999955
Bromine[air_high population density]	1.59014E-08	1.59014E-08	kg	0.999999975
Bromine[air_low population density]	7.44222E-07	7.44222E-07	kg	0.999999994
Bromine[air unspecified]	6.3903E-16	6.3903E-16	kg	0.999999989
Bromine[water_ground-, long-term]	1.94222E-07	1.94222E-07	kg	0.9999999
Bromine[water_ground-]	1.96285E-07	1.96285E-07	kg	0.999999999
Bromine[water ocean]	5.74556E-06	5.74556E-06	kg	1.000000004
Bromine[water river]	1.23616E-05	1.23616E-05	kg	1.000000029
Bromine[water unspecified]	1.68095E-08	1.68095E-08	kg	0.999999934
Butadiene[air_low population density]	4.81372E-13	4.81372E-13	kg	0.999999978
Butadiene[air_lower stratosphere + upper troposphere]	2.92543E-12	2.92543E-12	kg	0.999999961
Butadiene[air unspecified]	6.82601E-12	6.82601E-12	kg	0.999999998
Butane[air_high population density]	2.7868E-05	2.7868E-05	kg	0.999999999

Table A1 LCI results from LCI calculation of acetic acid, 98 % in H₂O, at plant – RER, ecoinvent data v2.0 (cont'd)

Elementary Flow	LCSoft	SimaPro7.1	Unit	Ratio
Butane[air_low population density]	4.36763E-06	4.36763E-06	kg	1.000000007
Butane[air_unspecified]	7.92869E-10	7.92869E-10	kg	0.999999934
Butanol[air_high population density]	5.69292E-14	5.69292E-14	kg	0.99999997
Butanol[water_river]	5.78E-09	5.78E-09	kg	0.999999981
Butene[air_high population density]	5.12664E-07	5.12664E-07	kg	0.999999993
Butene[water_river]	1.47351E-09	1.47351E-09	kg	0.999999955
Butyl acetate[water_river]	7.51392E-09	7.51392E-09	kg	0.999999973
Butyrolactone[air_high population density]	5.31429E-12	5.31429E-12	kg	0.999999966
Butyrolactone[water_river]	1.27545E-11	1.27545E-11	kg	0.999999962
Cadmium, 0.30% in sulfide, Cd 0.18%, Pb, Zn, Ag, In, in ground[resource_in ground]	1.42741E-07	1.42741E-07	kg	1.000000048
Cadmium, ion[water_ground-, long-term]	6.19729E-08	6.19729E-08	kg	0.99999999
Cadmium, ion[water_ground-]	7.4699E-11	7.4699E-11	kg	1.000000001
Cadmium, ion[water_lake]	3.49198E-14	3.49198E-14	kg	0.99999996
Cadmium, ion[water_ocean]	3.01321E-09	3.01321E-09	kg	0.999999998
Cadmium, ion[water_river]	1.02217E-08	1.02217E-08	kg	0.99999993
Cadmium, ion[water_unspecified]	8.3117E-09	8.3117E-09	kg	0.999999926
Cadmium[air_high population density]	1.54979E-08	1.54979E-08	kg	0.999999974
Cadmium[air_low population density]	7.79521E-08	7.79521E-08	kg	0.999999954
Cadmium[air_lower stratosphere + upper troposphere]	1.54785E-15	1.54785E-15	kg	0.999999996
Cadmium[air_unspecified]	1.16342E-09	1.16342E-09	kg	0.999999941
Cadmium[soil_agricultural]	6.44049E-10	6.44049E-10	kg	0.999999989
Cadmium[soil_unspecified]	2.78827E-11	2.78827E-11	kg	1.000000011
Calcite, in ground[resource_in ground]	-0.027132338	-0.027132338	kg	1.000000018
Calcium, ion[water_ground-, long-term]	0.002526441	0.002526441	kg	0.999999985
Calcium, ion[water_ground-]	8.21632E-07	8.21632E-07	kg	0.999999997
Calcium, ion[water_lake]	8.52735E-07	8.52735E-07	kg	1.000000002
Calcium, ion[water_ocean]	0.000269472	0.000269472	kg	0.999999993
Calcium, ion[water_river]	0.000614528	0.000614528	kg	0.999999999
Calcium, ion[water_unspecified]	2.52142E-07	2.52143E-07	kg	0.999999932
Calcium[air_high population density]	1.51285E-06	1.51285E-06	kg	0.999999962
Calcium[air_low population density]	3.45996E-08	3.45996E-08	kg	0.999999979
Calcium[soil_agricultural]	6.51565E-06	6.51565E-06	kg	0.999999998
Calcium[soil_industrial]	5.86779E-05	5.86779E-05	kg	0.999999994
Carbetamide[soil_agricultural]	1.57031E-11	1.57031E-11	kg	0.999999939
Carbofuran[soil_agricultural]	4.12033E-10	4.12033E-10	kg	0.999999935
Carbon dioxide, biogenic[air_high population density]	0.022122988	0.022122988	kg	0.999999994
Carbon dioxide, biogenic[air_low population density]	0.003114523	0.003114523	kg	1.000000009
Carbon dioxide, biogenic[air_unspecified]	0.000438648	0.000438648	kg	1.000000017
Carbon dioxide, fossil[air_high population density]	0.667920557	0.66792056	kg	0.999999995
Carbon dioxide, fossil[air_low population density]	0.565607804	0.56560781	kg	0.999999989
Carbon dioxide, fossil[air_lower stratosphere + upper troposphere]	4.87572E-07	4.87572E-07	kg	0.999999975
Carbon dioxide, fossil[air_unspecified]	0.099315522	0.099315523	kg	0.999999989
Carbon dioxide, in air[resource_in air]	-0.027926729	-0.02792673	kg	0.999999964

Table A1 LCI results from LCI calculation of acetic acid, 98 % in H₂O, at plant – RER,ecoinvent data v2.0 (cont'd)

Elementary Flow	LCSoft	SimaPro7.1	Unit	Ratio
Carbon dioxide, land transformation[air_low population density]	5.89721E-05	5.89721E-05	kg	0.999999993
Carbon disulfide[air_high population density]	2.62604E-12	2.62604E-12	kg	0.999999981
Carbon disulfide[air_low population density]	6.75131E-06	6.75131E-06	kg	0.999999946
Carbon disulfide[air_unspecified]	1.02748E-17	1.02748E-17	kg	0.999999939
Carbon monoxide, biogenic[air_high population density]	2.38428E-06	2.38428E-06	kg	0.999999957
Carbon monoxide, biogenic[air_low population density]	2.75795E-06	2.75795E-06	kg	0.999999985
Carbon monoxide, biogenic[air_unspecified]	6.31221E-05	6.31221E-05	kg	0.999999942
Carbon monoxide, fossil[air_high population density]	0.000181283	0.000181283	kg	1.000000023
Carbon monoxide, fossil[air_low population density]	0.00034921	0.00034921	kg	1.000000005
Carbon monoxide, fossil[air_lower stratosphere + upper troposphere]	5.72704E-10	5.72704E-10	kg	0.999999978
Carbon monoxide, fossil[air_unspecified]	0.007273194	0.007273194	kg	0.999999991
Carbon, in organic matter, in soil[resource_in ground]	-5.20451E-07	-5.20451E-07	kg	0.999999949
Carbon[soil_agricultural]	3.96384E-07	3.96384E-07	kg	0.999999992
Carbon[soil_industrial]	4.40084E-05	4.40085E-05	kg	0.999999989
Carbon-14[air_low population density]	0.019157515	0.019157515	kBq	0.999999989
Carbonate[water_river]	7.98229E-07	7.98229E-07	kg	0.999999963
Carboxylic acids, unspecified[water_ocean]	4.68541E-05	4.68541E-05	kg	0.999999995
Carboxylic acids, unspecified[water_river]	6.03792E-05	6.03792E-05	kg	0.999999996
Cerium, 24% in bastnasite, 2.4% in crude ore, in ground[resource_in ground]	5.91914E-23	5.91914E-23	kg	0.999999984
Cerium-141[air_low population density]	4.35445E-09	4.35445E-09	kBq	0.999999995
Cerium-141[water_river]	1.86837E-08	1.86837E-08	kBq	1
Cerium-144[water_river]	5.68792E-09	5.68792E-09	kBq	1.000000007
Cesium[water_ocean]	8.20794E-09	8.20794E-09	kg	1
Cesium[water_river]	1.64073E-08	1.64073E-08	kg	0.999999985
Cesium-134[air_low population density]	2.0855E-10	2.0855E-10	kBq	1.000000002
Cesium-134[water_river]	4.30785E-06	4.30785E-06	kBq	0.999999988
Cesium-136[water_river]	3.31599E-09	3.31599E-09	kBq	1.000000006
Cesium-137[air_low population density]	3.69691E-09	3.69691E-09	kBq	1.000000002
Cesium-137[water_ocean]	0.00359801	0.00359801	kBq	0.999999986
Cesium-137[water_river]	1.4549E-05	1.4549E-05	kBq	0.999999979
Chlorate[water_river]	8.54197E-07	8.54197E-07	kg	0.999999974
Chloride[soil_agricultural]	7.30969E-08	7.30969E-08	kg	1
Chloride[soil_industrial]	5.13432E-05	5.13432E-05	kg	1.000000001
Chloride[soil_unspecified]	3.04924E-05	3.04924E-05	kg	1.000000428
Chloride[water_ground-, long-term]	4.03075E-05	4.03075E-05	kg	0.999999988
Chloride[water_ground-]	0.001729449	0.001729449	kg	0.999999986
Chloride[water_ocean]	0.004118459	0.004118459	kg	1.000000011
Chloride[water_river]	0.008799396	0.008799396	kg	1.000000001
Chloride[water_unspecified]	0.003133614	0.003133614	kg	0.999999924

Table A1 LCI results from LCI calculation of acetic acid, 98 % in H₂O, at plant – RER, ecoinvent data v2.0 (cont'd)

Elementary Flow	LCSoft	SimaPro7.1	Unit	Ratio
Chlorinated solvents, unspecified[water ocean]	6.28025E-16	6.28025E-16	kg	0.99999998
Chlorinated solvents, unspecified[water river]	9.25036E-10	9.25036E-10	kg	0.999999923
Chlorine[air_high population density]	4.65964E-07	4.65964E-07	kg	0.999999965
Chlorine[air_low population density]	2.61002E-11	2.61002E-11	kg	0.999999989
Chlorine[air_unspecified]	5.16001E-11	5.16001E-11	kg	0.999999947
Chlorine[water_ground-]	7.71812E-08	7.71812E-08	kg	0.999999998
Chlorine[water_river]	5.96992E-08	5.96992E-08	kg	0.999999996
Chloroform[air_high population density]	1.80057E-09	1.80057E-09	kg	0.999999984
Chloroform[air_low population density]	9.66036E-12	9.66036E-12	kg	0.999999988
Chloroform[air_unspecified]	4.67502E-18	4.67502E-18	kg	0.999999941
Chloroform[water_river]	1.17364E-10	1.17364E-10	kg	0.999999987
Chlorosilane, trimethyl-[air_high population density]	1.59432E-11	1.59433E-11	kg	0.999999958
Chlorothalonil[soil_agricultural]	1.0494E-09	1.0494E-09	kg	0.999999971
Chromium VI[air_high population density]	1.21559E-09	1.21559E-09	kg	0.999999995
Chromium VI[air_low population density]	4.79937E-08	4.79937E-08	kg	0.999999972
Chromium VI[air_unspecified]	4.49898E-12	4.49898E-12	kg	1.000000103
Chromium VI[soil_unspecified]	2.9619E-07	2.9619E-07	kg	0.999999992
Chromium VI[water_ground-, long-term]	4.64354E-06	4.64354E-06	kg	0.999999947
Chromium VI[water_ground-]	2.43828E-07	2.43828E-07	kg	1.000000006
Chromium VI[water_river]	1.4239E-06	1.4239E-06	kg	0.999999922
Chromium VI[water_unspecified]	3.56627E-09	3.56627E-09	kg	0.999999959
Chromium, 25.5% in chromite, 11.6% in crude ore, in ground[resource_in ground]	-0.000551332	-0.000551332	kg	0.999999972
Chromium, ion[water_ground-]	1.93711E-08	1.93711E-08	kg	1.000000002
Chromium, ion[water_ocean]	4.2593E-08	4.2593E-08	kg	1.000000001
Chromium, ion[water_river]	4.39999E-08	4.39999E-08	kg	0.999999989
Chromium, ion[water_unspecified]	2.15543E-08	2.15543E-08	kg	0.999999974
Chromium[air_high population density]	2.47162E-08	2.47162E-08	kg	0.999999993
Chromium[air_low population density]	1.88313E-06	1.88313E-06	kg	0.999999997
Chromium[air_lower stratosphere + upper troposphere]	7.73933E-15	7.73933E-15	kg	0.999999998
Chromium[air_unspecified]	3.9499E-08	3.9499E-08	kg	0.999999956
Chromium[soil_agricultural]	4.86106E-09	4.86106E-09	kg	0.999999989
Chromium[soil_industrial]	7.33474E-08	7.33474E-08	kg	0.999999996
Chromium[soil_unspecified]	1.32982E-10	1.32982E-10	kg	0.999999969
Chromium-51[air_low population density]	2.79032E-10	2.79032E-10	kBq	0.999999988
Chromium-51[water_river]	5.71991E-06	5.71991E-06	kBq	0.999999994
Chrysotile, in ground[resource_in ground]	-1.90265E-08	-1.90265E-08	kg	0.999999972
Cinnabar, in ground[resource_in ground]	-1.78516E-09	-1.78516E-09	kg	0.999999957
Clay, bentonite, in ground[resource_in ground]	-0.00057481	-0.00057481	kg	0.999999971
Clay, unspecified, in ground[resource_in ground]	-0.028075868	-0.028075869	kg	0.999999954
Coal, brown, in ground[resource_in ground]	-0.265901187	-0.26590119	kg	0.999999987
Coal, hard, unspecified, in ground[resource_in ground]	-0.185808781	-0.18580878	kg	1.000000005

Table A1 LCI results from LCI calculation of acetic acid, 98 % in H₂O, at plant – RER, ecoinvent data v2.0 (cont`d)

Elementary Flow	LCSof	SimaPro7.1	Unit	Ratio
Cobalt, in ground[resource in ground]	-7.32585E-10	-7.32585E-10	kg	0.999999991
Cobalt[air high population density]	4.33111E-08	4.33111E-08	kg	0.99999999
Cobalt[air low population density]	4.67228E-08	4.67228E-08	kg	0.999999981
Cobalt[air unspecified]	6.78211E-11	6.7821E-11	kg	1.00000013
Cobalt[soil agricultural]	4.14931E-10	4.14931E-10	kg	1
Cobalt[water ground-, long-term]	3.28568E-06	3.28568E-06	kg	0.999999982
Cobalt[water ground-]	1.17868E-09	1.17868E-09	kg	0.99999999
Cobalt[water ocean]	1.08387E-10	1.08387E-10	kg	0.999999977
Cobalt[water river]	1.59711E-08	1.59711E-08	kg	0.999999987
Cobalt[water unspecified]	1.73781E-12	1.73781E-12	kg	0.999999991
Cobalt-57[water river]	1.05262E-07	1.05262E-07	kBq	0.999999955
Cobalt-58[air low population density]	3.88564E-10	3.88564E-10	kBq	0.999999996
Cobalt-58[water river]	4.18318E-05	4.18318E-05	kBq	1.000000009
Cobalt-60[air low population density]	3.4326E-09	3.4326E-09	kBq	0.999999995
Cobalt-60[water river]	3.28764E-05	3.28764E-05	kBq	0.999999988
COD, Chemical Oxygen Demand[water ground-, long-term]	0.00047436	0.00047436	kg	0.999999958
COD, Chemical Oxygen Demand[water ground-]	2.69525E-08	2.69525E-08	kg	0.999999997
COD, Chemical Oxygen Demand[water ocean]	0.00078632	0.00078632	kg	0.999999995
COD, Chemical Oxygen Demand[water river]	0.004508963	0.004508963	kg	1.000000001
COD, Chemical Oxygen Demand[water unspecified]	0.00025284	0.00025284	kg	0.999999997
Colemanite, in ground[resource in ground]	-4.66405E-06	-4.66405E-06	kg	0.999999966
Copper, 0.99% in sulfide, Cu 0.36% and Mo 8.2E-3% in crude ore, in ground[resource in ground]	-5.81723E-05	-5.81724E-05	kg	0.999999958
Copper, 1.18% in sulfide, Cu 0.39% and Mo 8.2E-3% in crude ore, in ground[resource in ground]	-0.000319883	-0.000319883	kg	0.999999963
Copper, 1.42% in sulfide, Cu 0.81% and Mo 8.2E-3% in crude ore, in ground[resource in ground]	-8.48535E-05	-8.48535E-05	kg	0.999999956
Copper, 2.19% in sulfide, Cu 1.83% and Mo 8.2E-3% in crude ore, in ground[resource in ground]	-0.000425014	-0.000425014	kg	0.999999963
Copper, ion[water ground-, long-term]	2.53185E-06	2.53185E-06	kg	0.999999953
Copper, ion[water ground-]	6.80654E-09	6.80654E-09	kg	1.000000002
Copper, ion[water lake]	1.58501E-12	1.58501E-12	kg	0.999999968
Copper, ion[water ocean]	6.87209E-08	6.87209E-08	kg	0.999999971
Copper, ion[water river]	9.94689E-08	9.94689E-08	kg	0.999999971
Copper, ion[water unspecified]	2.5229E-08	2.5229E-08	kg	0.999999939
Copper[air high population density]	4.39632E-07	4.39632E-07	kg	1.000000002
Copper[air low population density]	8.38008E-07	8.38008E-07	kg	0.999999961
Copper[air lower stratosphere + upper troposphere]	2.63127E-13	2.63127E-13	kg	0.999999976
Copper[air unspecified]	2.71313E-08	2.71313E-08	kg	0.999999965
Copper[soil agricultural]	8.30773E-09	8.30773E-09	kg	0.999999982
Copper[soil industrial]	3.32155E-10	3.32155E-10	kg	0.999999978
Copper[soil unspecified]	1.86822E-07	1.86822E-07	kg	0.999999991

Table A1 LCI results from LCI calculation of acetic acid, 98 % in H₂O, at plant – RER, ecoinvent data v2.0 (cont'd)

Elementary Flow	LCSoft	SimaPro7.1	Unit	Ratio
Cumene[air_high population density]	6.19901E-08	6.19901E-08	kg	0.999999936
Cumene[air_low population density]	5.36687E-13	5.36687E-13	kg	0.999999997
Cumene[air_unspecified]	4.19553E-19	4.19553E-19	kg	0.999999994
Cumene[water_river]	1.48961E-07	1.48961E-07	kg	0.999999962
Cyanide[air_high population density]	1.68748E-08	1.68748E-08	kg	0.999999946
Cyanide[air_low population density]	2.65515E-08	2.65515E-08	kg	0.999999997
Cyanide[air_unspecified]	1.97789E-16	1.97789E-16	kg	0.999999933
Cyanide[water_ocean]	1.27186E-07	1.27186E-07	kg	0.999999983
Cyanide[water_river]	4.32162E-07	4.32162E-07	kg	0.999999962
Cyanide[water_unspecified]	2.37872E-08	2.37872E-08	kg	0.999999936
Cypermethrin[soil_agricultural]	5.85518E-11	5.85518E-11	kg	0.999999939
Diatomite, in ground[resource_in ground]	-3.51725E-11	-3.51725E-11	kg	0.999999984
Dichromate[water_river]	7.72756E-09	7.72756E-09	kg	0.999999995
Dinitrogen monoxide[air_high population density]	9.76167E-06	9.76167E-06	kg	0.999999991
Dinitrogen monoxide[air_low population density]	9.79125E-06	9.79125E-06	kg	0.999999999
Dinitrogen monoxide[air_lower stratosphere + upper troposphere]	4.64356E-12	4.64356E-12	kg	0.999999982
Dinitrogen monoxide[air_unspecified]	8.31403E-06	8.31403E-06	kg	0.999999998
Dioxins, measured as 2,3,7,8-tetrachlorodibenzo-p-dioxin[air_high population density]	7.45361E-14	7.45361E-14	kg	0.999999941
Dioxins, measured as 2,3,7,8-tetrachlorodibenzo-p-dioxin[air_low population density]	7.74883E-14	7.74883E-14	kg	0.999999977
Dioxins, measured as 2,3,7,8-tetrachlorodibenzo-p-dioxin[air_unspecified]	2.53632E-13	2.53632E-13	kg	0.999999972
Dissolved solids[water_ground-]	2.89787E-05		kg	
Dissolved solids[water_river]	1.74829E-05		kg	
Dissolved solids[water_unspecified]	3.4855E-06		kg	
DOC, Dissolved Organic Carbon[water_ground-, long-term]	0.000197359	0.000197359	kg	0.999999967
DOC, Dissolved Organic Carbon[water_lake]	1.68182E-09	1.68182E-09	kg	0.999999969
DOC, Dissolved Organic Carbon[water_ocean]	0.000262388	0.000262388	kg	0.999999995
DOC, Dissolved Organic Carbon[water_river]	0.001326054	0.001326054	kg	1.000000009
DOC, Dissolved Organic Carbon[water_unspecified]	0.000121909	0.000121909	kg	0.999999964
Dolomite, in ground[resource_in ground]	-7.6172E-05	-7.6172E-05	kg	0.999999995
Energy, gross calorific value, in biomass, primary forest[resource_biotic]	-3.60818E-05	-3.60818E-05	MJ	0.999999995
Energy, gross calorific value, in biomass[resource_biotic]	-0.27283371	-0.27283372	MJ	0.999999965
Energy, kinetic (in wind), converted[resource_in air]	-0.10919406	-0.10919406	MJ	0.999999996
Energy, potential (in hydropower reservoir), converted[resource_in water]	-0.761863288	-0.76186329	MJ	0.999999997
Energy, solar, converted[resource_in air]	-0.001571889	-0.001571889	MJ	0.999999966

Table A1 LCI results from LCI calculation of acetic acid, 98 % in H₂O, at plant – RER,ecoinvent data v2.0 (cont'd)

Elementary Flow	LCSoft	SimaPro7.1	Unit	Ratio
Ethane, 1,1,1,2-tetrafluoro-, HFC-134a[air_high population density]	9.93379E-11	9.93379E-11	kg	0.999999979
Ethane, 1,1,1,2-tetrafluoro-, HFC-134a[air_low population density]	4.51987E-10	4.51987E-10	kg	1.000000002
Ethane, 1,1,1-trichloro-, HCFC-140[air_low population density]	1.9711E-12	1.9711E-12	kg	0.999999994
Ethane, 1,1,1-trichloro-, HCFC-140[air_unspecified]	8.64792E-18	8.64792E-18	kg	0.999999939
Ethane, 1,1,2-trichloro-1,2,2-trifluoro-, CFC-113[air_high population density]	4.21189E-11	4.21189E-11	kg	0.999999978
Ethane, 1,1-difluoro-, HFC-152a[air_high population density]	5.78585E-10	5.78585E-10	kg	0.999999992
Ethane, 1,2-dichloro-[air_high population density]	2.38515E-08	2.38515E-08	kg	0.999999966
Ethane, 1,2-dichloro-[air_low population density]	3.93733E-12	3.93733E-12	kg	1.000000001
Ethane, 1,2-dichloro-[water_river]	1.65616E-09	1.65616E-09	kg	0.999999964
Ethane, 1,2-dichloro-1,1,2,2-tetrafluoro-, CFC-114[air_low population density]	7.82322E-09	7.82322E-09	kg	1.000000001
Ethane, hexafluoro-, HFC-116[air_high population density]	2.91697E-09	2.91697E-09	kg	0.999999964
Ethane, hexafluoro-, HFC-116[air_unspecified]	1.92739E-08	1.92739E-08	kg	0.999999929
Ethane[air_high population density]	8.93477E-06	8.93477E-06	kg	0.999999998
Ethane[air_low population density]	9.61012E-05	9.61012E-05	kg	0.999999996
Ethane[air_unspecified]	1.17304E-09	1.17304E-09	kg	0.999999919
Ethanol[air_high population density]	3.42056E-07	3.42056E-07	kg	1.000000009
Ethanol[air_low population density]	2.35856E-09	2.35856E-09	kg	0.999999986
Ethanol[water_river]	1.32995E-08	1.32995E-08	kg	0.999999977
Ethene, chloro-[air_high population density]	1.56661E-08	1.56661E-08	kg	0.999999968
Ethene, chloro-[air_unspecified]	3.16805E-18	3.16805E-18	kg	0.999999941
Ethene, chloro-[water_river]	2.05847E-10	2.05847E-10	kg	0.999999955
Ethene, tetrachloro-[air_high population density]	6.18904E-13	6.18904E-13	kg	1
Ethene, tetrachloro-[air_low population density]	4.23495E-12	4.23495E-12	kg	0.999999988
Ethene, tetrachloro-[air_unspecified]	6.84984E-15	6.84984E-15	kg	0.999999932
Ethene[air_high population density]	2.09245E-06	2.09245E-06	kg	1.000000014
Ethene[air_low population density]	5.49695E-07	5.49695E-07	kg	0.999999947
Ethene[water_river]	4.8376E-08	4.8376E-08	kg	0.999999943
Ethyl acetate[air_high population density]	1.59284E-06	1.59284E-06	kg	0.999999987
Ethyl acetate[water_river]	9.07212E-13	9.07212E-13	kg	0.999999971
Ethyl cellulose[air_high population density]	3.22186E-09	3.22186E-09	kg	0.999999986
Ethylene diamine[air_high population density]	3.04406E-13	3.04406E-13	kg	0.999999968
Ethylene diamine[water_river]	7.37954E-13	7.37954E-13	kg	0.999999963
Ethylene oxide[air_high population density]	1.71423E-09	1.71423E-09	kg	0.999999957
Ethylene oxide[air_low population density]	4.65323E-12	4.65323E-12	kg	0.999999968

Table A1 LCI results from LCI calculation of acetic acid, 98 % in H₂O, at plant – RER, ecoinvent data v2.0 (cont'd)

Elementary Flow	LCSoft	SimaPro7.1	Unit	Ratio
Ethylene oxide[air_lower stratosphere + upper troposphere]	2.82787E-11	2.82787E-11	kg	0.999999964
Ethylene oxide[air_unspecified]	6.5986E-11	6.5986E-11	kg	0.999999982
Ethylene oxide[water_river]	9.98111E-10	9.98111E-10	kg	0.999999975
Ethyne[air_high population density]	1.71042E-07	1.71042E-07	kg	0.999999999
Ethyne[air_low population density]	1.80724E-08	1.80724E-08	kg	0.999999955
Ethyne[air_unspecified]	1.18216E-09	1.18216E-09	kg	0.999999933
Feldspar, in ground[resource_in ground]	-3.22704E-10	-3.22704E-10	kg	0.999999972
Fenpiclonil[soil_agricultural]	4.40983E-11	4.40983E-11	kg	0.999999959
Fluoride[soil_industrial]	7.33474E-07	7.33474E-07	kg	0.999999996
Fluoride[soil_unspecified]	2.00519E-07	2.00519E-07	kg	1.000000002
Fluoride[water_ground-, long-term]	0.00014062	0.00014062	kg	0.999999956
Fluoride[water_ground-]	4.83121E-07	4.83121E-07	kg	0.999999985
Fluoride[water_ocean]	9.85714E-07	9.85714E-07	kg	0.999999997
Fluoride[water_river]	9.50512E-06	9.50513E-06	kg	0.999999974
Fluoride[water_unspecified]	6.11232E-08	6.11232E-08	kg	0.999999989
Fluorine, 4.5% in apatite, 1% in crude ore, in ground[resource_in ground]	-3.41582E-06	-3.41582E-06	kg	0.999999975
Fluorine, 4.5% in apatite, 3% in crude ore, in ground[resource_in ground]	-1.5121E-06	-1.5121E-06	kg	0.999999989
Fluorine[air_high population density]	8.73137E-09	8.73137E-09	kg	0.999999989
Fluorine[air_low population density]	3.68926E-08	3.68926E-08	kg	0.999999963
Fluorine[air_unspecified]	1.50909E-13	1.50909E-13	kg	0.999999991
Fluorspar, 92%, in ground[resource_in ground]	-0.000107903	-0.000107903	kg	0.999999939
Fluosilicic acid[air_high population density]	2.25264E-08	2.25264E-08	kg	0.999999945
Fluosilicic acid[water_river]	4.05475E-08	4.05475E-08	kg	0.999999948
Formaldehyde[air_high population density]	1.62028E-06	1.62028E-06	kg	0.999999997
Formaldehyde[air_low population density]	3.26739E-07	3.26739E-07	kg	0.999999964
Formaldehyde[air_lower stratosphere + upper troposphere]	2.43795E-11	2.43795E-11	kg	0.999999999
Formaldehyde[air_unspecified]	5.73035E-07	5.73035E-07	kg	0.999999959
Formaldehyde[water_river]	1.02725E-09	1.02725E-09	kg	0.999999926
Formaldehyde[water_unspecified]	5.05082E-05	5.05082E-05	kg	0.999999994
Formic acid[air_high population density]	1.99373E-09	1.99373E-09	kg	0.999999997
Formic acid[air_low population density]	2.35059E-09	2.35059E-09	kg	0.999999954
Furan[air_low population density]	6.67459E-10	6.67459E-10	kg	0.999999936
Furan[air_unspecified]	6.72997E-19	6.72997E-19	kg	0.999999939
Gadolinium, 0.15% in bastnasite, 0.015% in crude ore, in ground[resource_in ground]	6.83615E-27	6.83615E-27	kg	0.999999975
Gallium, 0.014% in bauxite, in ground[resource_in ground]	-4.45581E-12	-4.45581E-12	kg	1.000000007
Gas, mine, off-gas, process, coal mining[resource_in ground]	-0.001807344		Nm3	
Gas, natural, in ground[resource_in ground]	-0.596313063	-0.59631306	Nm3	1.000000005
Glutaraldehyde[water_ocean]	1.74791E-08	1.74791E-08	kg	1.000000001
Glyphosate[soil_agricultural]	1.52579E-09	1.52579E-09	kg	0.999999945
Glyphosate[soil_industrial]	2.25426E-08	2.25426E-08	kg	0.999999991

Table A1 LCI results from LCI calculation of acetic acid, 98 % in H₂O, at plant – RER, ecoinvent data v2.0 (cont'd)

Elementary Flow	LCSOft	SimaPro7.1	Unit	Ratio
Gold, Au 1.1E-4%, Ag 4.2E-3%, in ore, in ground[resource in ground]	-3.15607E-09	-3.15607E-09	kg	0.999999962
Gold, Au 1.3E-4%, Ag 4.6E-5%, in ore, in ground[resource in ground]	-5.78713E-09	-5.78713E-09	kg	0.999999979
Gold, Au 1.4E-4%, in ore, in ground[resource in ground]	-6.92938E-09	-6.92938E-09	kg	0.99999997
Gold, Au 2.1E-4%, Ag 2.1E-4%, in ore, in ground[resource in ground]	-1.05838E-08	-1.05838E-08	kg	0.999999977
Gold, Au 4.3E-4%, in ore, in ground[resource in ground]	-2.62312E-09	-2.62312E-09	kg	0.999999957
Gold, Au 4.9E-5%, in ore, in ground[resource in ground]	-6.28271E-09	-6.28271E-09	kg	0.999999977
Gold, Au 6.7E-4%, in ore, in ground[resource in ground]	-9.72665E-09	-9.72665E-09	kg	0.999999976
Gold, Au 7.1E-4%, in ore, in ground[resource in ground]	-1.09678E-08	-1.09678E-08	kg	0.999999963
Gold, Au 9.7E-4%, Ag 9.7E-4%, Zn 0.63%, Cu 0.38%, Pb 0.014%, in ore, in ground[resource in ground]	-6.57205E-10	-6.57205E-10	kg	0.999999969
Granite, in ground[resource in ground]	-2.14137E-12	-2.14137E-12	kg	0.999999812
Gravel, in ground[resource in ground]	-0.125088126	-0.12508811	kg	1.000000131
Gypsum, in ground[resource in ground]	-1.01825E-07	-1.01825E-07	kg	0.999999898
Heat, waste[air high population density]	14.90154126	14.901541	MJ	1.000000017
Heat, waste[air low population density]	10.25272062	10.252721	MJ	0.999999963
Heat, waste[air lower stratosphere + upper troposphere]	7.05817E-06	7.05817E-06	MJ	0.999999976
Heat, waste[air unspecified]	1.267040587	1.2670406	MJ	0.99999999
Heat, waste[soil industrial]	0.000210297	0.000210297	MJ	0.999999998
Heat, waste[soil unspecified]	0.034052566	0.034052566	MJ	1.000000003
Heat, waste[water ground-, long-term]	0.002830945	0.002830945	MJ	0.999999993
Heat, waste[water ocean]	0.000119027	0.000119027	MJ	0.999999988
Heat, waste[water river]	1.150445756	1.1504458	MJ	0.999999962
Heat, waste[water unspecified]	0.202283587	0.20228359	MJ	0.999999984
Helium, 0.08% in natural gas, in ground[resource in ground]	-2.24978E-11	-2.24978E-11	kg	0.999999995
Helium[air low population density]	9.54427E-07	9.54427E-07	kg	1.000000005
Helium[air unspecified]	5.02266E-16	5.02266E-16	kg	0.999999984
Heptane[air high population density]	5.1205E-06	5.1205E-06	kg	0.999999998
Hexane[air high population density]	1.27602E-05	1.27602E-05	kg	0.999999976
Hexane[air low population density]	1.84465E-07	1.84465E-07	kg	1.000000001
Hexane[air unspecified]	6.7899E-10	6.78991E-10	kg	0.999999938
Hydrocarbons, aliphatic, alkanes, cyclic[air high population density]	1.11853E-09	1.11853E-09	kg	0.999999901
Hydrocarbons, aliphatic, alkanes, cyclic[air low population density]	5.7084E-11	5.7084E-11	kg	0.999999995
Hydrocarbons, aliphatic, alkanes, unspecified[air high population density]	1.79588E-06	1.79588E-06	kg	1.000000024
Hydrocarbons, aliphatic, alkanes, unspecified[air low population density]	4.58089E-06	4.58089E-06	kg	1.000000005
Hydrocarbons, aliphatic, alkanes, unspecified[air unspecified]	3.75579E-06	3.75579E-06	kg	0.999999966
Hydrocarbons, aliphatic, alkanes, unspecified[water ocean]	1.06703E-06	1.06703E-06	kg	1.000000034

Table A1 LCI results from LCI calculation of acetic acid, 98 % in H₂O, at plant – RER, ecoinvent data v2.0 (cont'd)

Elementary Flow	LCSoft	SimaPro7.1	Unit	Ratio
Hydrocarbons, aliphatic, alkanes, unspecified[water river]	2.13295E-06	2.13295E-06	kg	1.000000008
Hydrocarbons, aliphatic, unsaturated[air_high population density]	* 7.4573E-07	7.4573E-07	kg	0.999999998
Hydrocarbons, aliphatic, unsaturated[air_low population density]	1.02048E-06	1.02048E-06	kg	1.000000002
Hydrocarbons, aliphatic, unsaturated[air_unspecified]	2.40465E-16	2.40465E-16	kg	0.999999987
Hydrocarbons, aliphatic, unsaturated[water_ocean]	9.84953E-08	9.84953E-08	kg	0.999999998
Hydrocarbons, aliphatic, unsaturated[water_river]	1.96888E-07	1.96888E-07	kg	0.999999984
Hydrocarbons, aromatic[air_high population density]	7.05244E-08	7.05244E-08	kg	0.999999982
Hydrocarbons, aromatic[air_low population density]	1.8593E-06	1.8593E-06	kg	0.999999993
Hydrocarbons, aromatic[air_unspecified]	1.15001E-06	1.15001E-06	kg	0.999999945
Hydrocarbons, aromatic[water_ocean]	4.59069E-06	4.59069E-06	kg	0.999999998
Hydrocarbons, aromatic[water_river]	8.62097E-06	8.62097E-06	kg	0.999999998
Hydrocarbons, chlorinated[air_high population density]	5.17597E-09	5.17597E-09	kg	0.999999975
Hydrocarbons, chlorinated[air_low population density]	2.00038E-11	2.00038E-11	kg	1.000000007
Hydrocarbons, chlorinated[air_unspecified]	1.33156E-08	1.33156E-08	kg	0.999999806
Hydrocarbons, unspecified[water_ocean]	2.68242E-06	2.68242E-06	kg	0.999999983
Hydrocarbons, unspecified[water_river]	1.63361E-07	1.63361E-07	kg	0.999999941
Hydrocarbons, unspecified[water_unspecified]	7.45956E-08	7.45956E-08	kg	0.999999956
Hydrogen chloride[air_high population density]	1.45338E-05	1.45338E-05	kg	0.999999987
Hydrogen chloride[air_low population density]	4.43515E-05	4.43515E-05	kg	0.999999999
Hydrogen chloride[air_lower stratosphere + upper troposphere]	1.33115E-13	1.33115E-13	kg	1.000000001
Hydrogen chloride[air_unspecified]	3.68161E-06	3.68161E-06	kg	0.999999726
Hydrogen fluoride[air_high population density]	5.28267E-07	5.28267E-07	kg	0.999999998
Hydrogen fluoride[air_low population density]	9.64841E-06	9.64841E-06	kg	1.000000001
Hydrogen fluoride[air_unspecified]	8.99555E-07	8.99556E-07	kg	0.999999945
Hydrogen peroxide[air_high population density]	2.38734E-09	2.38734E-09	kg	0.999999989
Hydrogen peroxide[water_river]	2.00207E-08	2.00207E-08	kg	0.999999994
Hydrogen sulfide[air_high population density]	6.01832E-10	6.01833E-10	kg	0.999999912
Hydrogen sulfide[air_low population density]	9.03112E-06	9.03112E-06	kg	0.999999997
Hydrogen sulfide[air_unspecified]	3.2217E-07	3.2217E-07	kg	0.999999959
Hydrogen sulfide[water_ground-, long-term]	4.57813E-07	4.57814E-07	kg	0.999999767
Hydrogen sulfide[water_river]	3.22063E-08	3.22063E-08	kg	0.999999954
Hydrogen[air_high population density]	3.17509E-06	3.17509E-06	kg	0.999999969

Table A1 LCI results from LCI calculation of acetic acid, 98 % in H₂O, at plant – RER, ecoinvent data v2.0 (cont'd)

Elementary Flow	LCSoft	SimaPro7.1	Unit	Ratio
Hydrogen[air_unspecified]	0.000296008	0.000296008	kg	0.999999997
Hydrogen-3, Tritium[air_low population density]	0.110468554	0.11046855	kBq	1.000000039
Hydrogen-3, Tritium[water_ocean]	7.475367881	7.4753679	kBq	0.999999997
Hydrogen-3, Tritium[water_river]	0.799481813	0.79948181	kBq	1.000000003
Hydroxide[water_river]	6.64498E-08	6.64498E-08	kg	0.999999967
Hypochlorite[water_ocean]	2.27981E-07	2.27981E-07	kg	1.000000008
Hypochlorite[water_river]	2.17811E-07	2.17811E-07	kg	1.000000005
Indium, 0.005% in sulfide, In 0.003%, Pb, Zn, Ag, Cd, in ground[resource_in ground]	2.16658E-09	2.16658E-09	kg	1.000000031
Iodide[water_ground-, long-term]	3.2595E-13	3.2595E-13	kg	1.000000006
Iodide[water_ground-]	2.38876E-08	2.38876E-08	kg	0.999999992
Iodide[water_ocean]	8.20794E-07	8.20794E-07	kg	1
Iodide[water_river]	1.66491E-06	1.66491E-06	kg	0.999999978
Iodine[air_high population density]	3.89881E-09	3.89881E-09	kg	0.999999999
Iodine[air_low population density]	4.00792E-07	4.00792E-07	kg	0.999999993
Iodine[air_unspecified]	3.25422E-16	3.25422E-16	kg	0.999999999
Iodine-129[air_low population density]	1.93309E-05	1.93309E-05	kBq	1.000000021
Iodine-131[air_low population density]	0.000973985	0.000973985	kBq	0.999999993
Iodine-131[water_river]	9.38669E-07	9.38669E-07	kBq	0.999999999
Iodine-133[air_low population density]	4.56454E-08	4.56454E-08	kBq	0.999999989
Iodine-133[water_river]	2.93365E-08	2.93365E-08	kBq	0.999999983
Iodine-135[air_low population density]	5.24189E-08	5.24189E-08	kBq	1.000000003
Iron, 46% in ore, 25% in crude ore, in ground[resource_in ground]	-0.031461718	-0.03146172	kg	0.999999942
Iron, ion[water_ground-, long-term]	0.000489433	0.000489433	kg	0.999999998
Iron, ion[water_ground-]	0.00042571	0.00042571	kg	0.999999995
Iron, ion[water_ocean]	4.4023E-07	4.4023E-07	kg	1.00000001
Iron, ion[water_river]	4.0365E-06	4.0365E-06	kg	0.999999987
Iron, ion[water_unspecified]	1.68815E-06	1.68815E-06	kg	0.999999925
Iron[air_high population density]	1.618E-06	1.618E-06	kg	1.000000004
Iron[air_low population density]	9.22316E-08	9.22316E-08	kg	0.999999953
Iron[air_unspecified]	2.39697E-07	2.39697E-07	kg	0.999999951
Iron[soil_agricultural]	6.44985E-07	6.44985E-07	kg	0.999999992
Iron[soil_industrial]	2.9339E-05	2.9339E-05	kg	1.000000011
Iron[soil_unspecified]	4.29453E-05	4.29453E-05	kg	0.999999987
Iron-59[water_river]	8.06522E-09	8.06522E-09	kBq	1
Isocyanic acid[air_high population density]	1.01304E-08	1.01304E-08	kg	0.999999947
Isoprene[air_low population density]	3.09728E-11	3.09728E-11	kg	0.999999948
Isoprene[air_unspecified]	8.99042E-18	8.99042E-18	kg	0.999999934
Kaolinite, 24% in crude ore, in ground[resource_in ground]	-3.15445E-06	-3.15445E-06	kg	0.999999967
Kieserite, 25% in crude ore, in ground[resource_in ground]	-1.50953E-08	-1.50953E-08	kg	0.999999985
Krypton-85[air_low population density]	0.007708449	0.007708449	kBq	0.999999993
Krypton-85m[air_low population density]	0.000382099	0.000382099	kBq	0.999999995
Krypton-87[air_low population density]	0.000151192	0.000151192	kBq	1.000000003
Krypton-88[air_low population density]	0.000149297	0.000149297	kBq	0.999999975
Krypton-89[air_low population density]	3.84563E-05	3.84563E-05	kBq	1.000000011

Table A1 LCI results from LCI calculation of acetic acid, 98 % in H₂O, at plant – RER, ecoinvent data v2.0 (cont'd)

Elementary Flow	LCSoft	SimaPro7.1	Unit	Ratio
Lanthanum, 7.2% in bastnasite, 0.72% in crude ore, in ground[resource in ground]	-1.8662E-22	-1.8662E-22	kg	1.00000001
Lanthanum-140[air_low population density]	1.53516E-09	1.53516E-09	kBq	1.000000016
Lanthanum-140[water river]	4.9772E-08	4.9772E-08	kBq	0.999999991
Lead, 5.0% in sulfide, Pb 3.0%, Zn, Ag, Cd, In, in ground[resource in ground]	-8.95914E-06	-8.95914E-06	kg	0.999999983
Lead[air_high population density]	8.41336E-08	8.41336E-08	kg	1
Lead[air_low population density]	7.6239E-07	7.6239E-07	kg	0.999999957
Lead[air_lower stratosphere + upper troposphere]	3.09577E-15	3.09577E-15	kg	0.999999979
Lead[air unspecified]	1.26966E-07	1.26966E-07	kg	0.999999984
Lead[soil agricultural]	2.1471E-09	2.1471E-09	kg	1.000000009
Lead[soil unspecified]	1.1475E-09	1.1475E-09	kg	1.000000002
Lead[water ground-, long-term]	6.12504E-07	6.12505E-07	kg	0.999999966
Lead[water ground-]	6.31091E-11	6.31091E-11	kg	1
Lead[water lake]	1.03474E-13	1.03474E-13	kg	0.999999943
Lead[water ocean]	6.93277E-08	6.93277E-08	kg	0.999999995
Lead[water river]	2.43125E-07	2.43125E-07	kg	0.999999978
Lead[water unspecified]	1.77802E-08	1.77802E-08	kg	0.999999958
Lead-210[air_high population density]	1.59013E-05	1.59013E-05	kBq	0.999999965
Lead-210[air_low population density]	0.000102604	0.000102604	kBq	0.999999957
Lead-210[air unspecified]	1.35137E-13	1.35137E-13	kBq	1.000000024
Lead-210[water ground-]	3.28297E-08	3.28297E-08	kBq	0.999999978
Lead-210[water ocean]	3.87111E-05	3.87111E-05	kBq	0.999999973
Lead-210[water river]	4.5242E-05	4.5242E-05	kBq	0.999999988
Lead-210[water unspecified]	2.26928E-08	2.26928E-08	kBq	0.999999932
Linuron[soil agricultural]	6.29358E-10	6.29358E-10	kg	0.999999955
Lithium, ion[water unspecified]	8.42947E-08	8.42947E-08	kg	0.999999994
Magnesite, 60% in crude ore, in ground[resource in ground]	-0.00043602	-0.00043602	kg	0.999999935
Magnesium, 0.13% in water[resource in water]	-1.90433E-08	-1.90433E-08	kg	0.999999991
Magnesium[air_high population density]	1.36031E-06	1.36031E-06	kg	0.999999973
Magnesium[air_low population density]	8.03898E-08	8.03898E-08	kg	0.999999996
Magnesium[air unspecified]	1.62684E-12	1.62684E-12	kg	0.999999951
Magnesium[soil agricultural]	7.36247E-07	7.36247E-07	kg	1.000000001
Magnesium[soil industrial]	1.17356E-05	1.17356E-05	kg	0.999999996
Magnesium[water ground-, long-term]	0.000374529	0.000374529	kg	0.999999987
Magnesium[water ground-]	1.60437E-07	1.60437E-07	kg	1.000000007
Magnesium[water ocean]	4.52258E-05	4.52258E-05	kg	0.999999991
Magnesium[water river]	9.63255E-05	9.63255E-05	kg	0.999999999
Magnesium[water unspecified]	4.91925E-08	4.91925E-08	kg	0.999999994
Mancozeb[soil agricultural]	1.36296E-09	1.36296E-09	kg	0.999999962
Manganese, 35.7% in sedimentary deposit, 14.2% in crude ore, in ground[resource in ground]	-5.92791E-05	-5.92791E-05	kg	0.99999999
Manganese[air_high population density]	4.6788E-08	4.6788E-08	kg	0.999999989
Manganese[air_low population density]	1.43261E-07	1.43261E-07	kg	0.999999996
Manganese[air unspecified]	3.19474E-08	3.19474E-08	kg	0.999999965
Manganese[soil agricultural]	4.57057E-07	4.57057E-07	kg	0.999999997
Manganese[soil industrial]	5.86779E-07	5.86779E-07	kg	0.999999994

Table A1 LCI results from LCI calculation of acetic acid, 98 % in H₂O, at plant – RER, ecoinvent data v2.0 (cont'd)

Elementary Flow	LCSOft	SimaPro7.1	Unit	Ratio
Manganese[water ground-, long-term]	8.63565E-06	8.63565E-06	kg	0.999999982
Manganese[water ground-]	2.01397E-07	2.01397E-07	kg	1.000000008
Manganese[water ocean]	3.62384E-07	3.62384E-07	kg	1.000000001
Manganese[water river]	1.16915E-06	1.16915E-06	kg	0.999999997
Manganese[water unspecified]	2.42423E-08	2.42423E-08	kg	0.999999932
Manganese-54[air_low population density]	1.42895E-10	1.42895E-10	kBq	1.000000003
Manganese-54[water river]	2.57238E-06	2.57238E-06	kBq	0.999999978
Mercury[air_high population density]	3.10844E-09	3.10844E-09	kg	1.000000009
Mercury[air_low population density]	5.73742E-08	5.73742E-08	kg	0.999999991
Mercury[air_lower stratosphere + upper troposphere]	1.08349E-17	1.08349E-17	kg	0.999999999
Mercury[air unspecified]	3.54156E-08	3.54156E-08	kg	0.999999953
Mercury[soil agricultural]	3.72387E-12	3.72387E-12	kg	0.999999971
Mercury[water ground-, long-term]	1.2549E-08	1.2549E-08	kg	0.999999938
Mercury[water ground-]	1.16974E-12	1.16974E-12	kg	1.000000017
Mercury[water lake]	8.95042E-16	8.95042E-16	kg	0.999999969
Mercury[water ocean]	2.65704E-10	2.65704E-10	kg	1.000000009
Mercury[water river]	1.2412E-09	1.2412E-09	kg	0.999999959
Mercury[water unspecified]	1.42233E-09	1.42233E-09	kg	0.999999974
Metaldehyde[soil agricultural]	3.22547E-12	3.22547E-12	kg	0.999999953
Metamorphous rock, graphite containing, in ground[resource in ground]	-1.21617E-06	-1.21617E-06	kg	0.999999946
Methane, biogenic[air_high population density]	1.54846E-07	1.54846E-07	kg	0.999999988
Methane, biogenic[air_low population density]	1.0217E-05	1.0217E-05	kg	0.999999995
Methane, biogenic[air unspecified]	7.13017E-06	7.13017E-06	kg	0.999999999
Methane, bromo-, Halon 1001[air unspecified]	1.26722E-17	1.26722E-17	kg	0.999999899
Methane, bromochlorodifluoro-, Halon 1211[air_low population density]	1.84115E-08	1.84115E-08	kg	1
Methane, bromotrifluoro-, Halon 1301[air_high population density]	1.67242E-15	1.67242E-15	kg	1
Methane, bromotrifluoro-, Halon 1301[air_low population density]	1.33151E-08	1.33151E-08	kg	0.999999985
Methane, chlorodifluoro-, HCFC-22[air_high population density]	1.46492E-09	1.46492E-09	kg	0.999999986
Methane, chlorodifluoro-, HCFC-22[air_low population density]	6.80219E-08	6.80219E-08	kg	1.000000006
Methane, dichloro-, HCC-30[air_high population density]	6.05412E-11	6.05412E-11	kg	0.999999983
Methane, dichloro-, HCC-30[air_low population density]	2.85908E-11	2.85908E-11	kg	0.999999985
Methane, dichloro-, HCC-30[water river]	3.7138E-07	3.7138E-07	kg	0.999999987
Methane, dichlorodifluoro-, CFC-12[air_high population density]	1.1435E-10	1.1435E-10	kg	1.000000001
Methane, dichlorodifluoro-, CFC-12[air_low population density]	6.35774E-11	6.35774E-11	kg	0.999999992
Methane, dichlorodifluoro-, CFC-12[air unspecified]	8.4253E-18	8.4253E-18	kg	0.999999932
Methane, dichlorofluoro-, HCFC-21[air_high population density]	2.82623E-13	2.82623E-13	kg	0.999999972

Table A1 LCI results from LCI calculation of acetic acid, 98 % in H₂O, at plant – RER, ecoinvent data v2.0 (cont'd)

Elementary Flow	LCSoft	SimaPro7.1	Unit	Ratio
Methane, fossil[air_high population density]	5.90387E-05	5.90387E-05	kg	0.99999999
Methane, fossil[air_low population density]	0.004220022	0.004220022	kg	0.999999996
Methane, fossil[air_lower stratosphere + upper troposphere]	7.73933E-12	7.73933E-12	kg	0.99999998
Methane, fossil[air_unspecified]	0.004992026	0.004992026	kg	1.000000001
Methane, monochloro-, R-40[air_high population density]	9.7881E-13	9.7881E-13	kg	0.999999973
Methane, monochloro-, R-40[air_low population density]	5.2205E-11	5.2205E-11	kg	0.999999991
Methane, tetrachloro-, R-10[air_high population density]	9.30352E-10		kg	
Methane, tetrachloro-, R-10[air_unspecified]	3.76741E-15		kg	
Methane, tetrafluoro-, R-14[air_high population density]	2.97571E-11		kg	
Methane, tetrafluoro-, R-14[air_unspecified]	1.73465E-07		kg	
Methane, trichlorofluoro-, CFC-11[air_high population density]	4.58824E-13	4.58824E-13	kg	0.999999984
Methane, trifluoro-, HFC-23[air_high population density]	8.99256E-11	8.99256E-11	kg	0.999999977
Methanol[air_high population density]	3.86877E-07	3.86877E-07	kg	1.000000006
Methanol[air_low population density]	0.000267714	0.000267714	kg	0.999999985
Methanol[air_unspecified]	0.002520071	0.002520071	kg	0.999999999
Methanol[water_ocean]	2.55159E-07	2.55159E-07	kg	0.999999999
Methanol[water_river]	3.78565E-08	3.78565E-08	kg	0.999999979
Methanol[water_unspecified]	1.51525E-05	1.51525E-05	kg	0.999999987
Methyl acrylate[air_high population density]	1.00692E-09	1.00692E-09	kg	0.999999993
Methyl acrylate[water_river]	1.96704E-08	1.96704E-08	kg	0.999999998
Methyl amine[air_high population density]	1.91562E-12	1.91562E-12	kg	0.999999984
Methyl amine[water_river]	4.5974E-12	4.5974E-12	kg	0.999999979
Methyl borate[air_high population density]	3.39915E-16	3.39915E-16	kg	0.999999967
Methyl ethyl ketone[air_high population density]	1.59284E-06	1.59284E-06	kg	0.999999944
Methyl formate[air_high population density]	3.90514E-12	3.90514E-12	kg	0.999999963
Methyl formate[water_river]	1.5591E-12	1.5591E-12	kg	0.999999952
Metolachlor[soil_agricultural]	4.51913E-09	4.51913E-09	kg	0.999999944
Metribuzin[soil_agricultural]	4.79907E-11	4.79907E-11	kg	0.999999966
Molybdenum, 0.010% in sulfide, Mo 8.2E-3% and Cu 1.83% in crude ore, in ground[resource_in ground]	-7.89833E-06	-7.89834E-06	kg	0.999999951
Molybdenum, 0.014% in sulfide, Mo 8.2E-3% and Cu 0.81% in crude ore, in ground[resource_in ground]	-1.11456E-06	-1.11456E-06	kg	0.999999944
Molybdenum, 0.022% in sulfide, Mo 8.2E-3% and Cu 0.36% in crude ore, in ground[resource_in ground]	-2.53459E-05	-2.53459E-05	kg	0.99999992

Table A1 LCI results from LCI calculation of acetic acid, 98 % in H₂O, at plant – RER,ecoinvent data v2.0 (cont'd)

Elementary Flow	LCSoft	SimaPro7.1	Unit	Ratio
Molybdenum, 0.025% in sulfide, Mo 8.2E-3% and Cu 0.39% in crude ore, in ground[resource in ground]	-4.08408E-06	-4.08408E-06	kg	0.999999948
Molybdenum, 0.11% in sulfide, Mo 4.1E-2% and Cu 0.36% in crude ore, in ground[resource in ground]	-5.11326E-05	-5.11326E-05	kg	0.999999926
Molybdenum[air_high population density]	1.41739E-08	1.41739E-08	kg	1.000000031
Molybdenum[air_low population density]	5.96228E-09	5.96228E-09	kg	1.000000004
Molybdenum[air_unspecified]	7.67348E-13	7.67348E-13	kg	1
Molybdenum[soil_agricultural]	8.67448E-11	8.67448E-11	kg	0.999999998
Molybdenum[water_ground-, long-term]	3.49565E-09	3.49565E-09	kg	0.999999936
Molybdenum[water_ground-]	5.59299E-07	5.59299E-07	kg	1.000000004
Molybdenum[water_ocean]	1.67819E-09	1.67819E-09	kg	0.999999994
Molybdenum[water_river]	2.24903E-07	2.24903E-07	kg	1.000000005
Molybdenum[water_unspecified]	1.80208E-12	1.80208E-12	kg	0.999999921
Molybdenum-99[water_river]	1.71603E-08	1.71603E-08	kBq	0.999999997
Monoethanolamine[air_high population density]	4.92351E-08	4.92351E-08	kg	0.999999961
m-Xylene[air_high population density]	2.0878E-08	2.0878E-08	kg	0.999999994
m-Xylene[water_unspecified]	2.37558E-12	2.37558E-12	kg	0.999999919
Napropamide[soil_agricultural]	5.70659E-12	5.70659E-12	kg	0.999999952
Neodymium, 4% in bastnasite, 0.4% in crude ore, in ground[resource in ground]	2.21552E-23	2.21552E-23	kg	1.000000001
Nickel, 1.13% in sulfide, Ni 0.76% and Cu 0.76% in crude ore, in ground[resource in ground]	-1.42327E-05	-1.42327E-05	kg	0.999999994
Nickel, 1.98% in silicates, 1.04% in crude ore, in ground[resource in ground]	-0.001591099	-0.0015911	kg	0.999999983
Nickel, ion[water_ground-, long-term]	1.27522E-05	1.27522E-05	kg	0.999999962
Nickel, ion[water_ground-]	1.6012E-08	1.6012E-08	kg	0.999999977
Nickel, ion[water_lake]	1.40544E-13	1.40544E-13	kg	0.999999989
Nickel, ion[water_ocean]	9.2225E-09	9.2225E-09	kg	0.999999981
Nickel, ion[water_river]	1.00839E-07	1.00839E-07	kg	1.000000003
Nickel, ion[water_unspecified]	4.57849E-08	4.57849E-08	kg	0.999999956
Nickel[air_high population density]	3.84833E-07	3.84833E-07	kg	0.999999998
Nickel[air_low population density]	6.03421E-07	6.03421E-07	kg	0.999999964
Nickel[air_lower stratosphere + upper troposphere]	1.08349E-14	1.08349E-14	kg	0.999999991
Nickel[air_unspecified]	2.16726E-08	2.16726E-08	kg	0.999999935
Nickel[soil_agricultural]	3.67075E-09	3.67075E-09	kg	0.999999972
Nickel[soil_unspecified]	3.60335E-10	3.60335E-10	kg	1
Niobium-95[air_low population density]	1.69629E-11	1.69629E-11	kBq	0.999999996
Niobium-95[water_river]	3.96023E-07	3.96023E-07	kBq	0.999999989
Nitrate[air_high population density]	1.69776E-09	1.69776E-09	kg	0.999999945
Nitrate[water_ground-, long-term]	3.93475E-07	3.93475E-07	kg	0.999999932
Nitrate[water_ground-]	8.66164E-07	8.66164E-07	kg	0.999999948
Nitrate[water_ocean]	3.72302E-06	3.72302E-06	kg	1.000000008
Nitrate[water_river]	7.94631E-06	7.94631E-06	kg	0.999999993
Nitrite[water_ground-, long-term]	7.69364E-09	7.69364E-09	kg	0.999999987
Nitrite[water_ocean]	4.87184E-08	4.87184E-08	kg	1.000000008
Nitrite[water_river]	2.49584E-08	2.49584E-08	kg	0.999999958

Table A1 LCI results from LCI calculation of acetic acid, 98 % in H₂O, at plant – RER, ecoinvent data v2.0 (cont'd)

Elementary Flow	LCSoft	SimaPro7.1	Unit	Ratio
Nitrogen oxides[air_high population density]	0.00075366	0.00075366	kg	0.999999999
Nitrogen oxides[air_low population density]	0.001426942	0.001426942	kg	1.000000021
Nitrogen oxides[air_lower stratosphere + upper troposphere]	2.16695E-09	2.16695E-09	kg	0.999999956
Nitrogen oxides[air_unspecified]	0.000415095	0.000415095	kg	0.999999986
Nitrogen, organic bound[water_ground-, long-term]	2.31045E-07	2.31045E-07	kg	0.999999996
Nitrogen, organic bound[water_ocean]	2.91892E-06	2.91892E-06	kg	0.999999999
Nitrogen, organic bound[water_river]	3.314E-06	3.314E-06	kg	0.999999981
Nitrogen[water_ocean]	4.05008E-08	4.05008E-08	kg	0.999999997
Nitrogen[water_river]	6.34804E-06	6.34804E-06	kg	0.999999999
NMVOC, non-methane volatile organic compounds, unspecified origin[air_high population density]	1.8763E-05	1.8763E-05	kg	0.999999978
NMVOC, non-methane volatile organic compounds, unspecified origin[air_low population density]	0.000634492	0.000634492	kg	0.999999999
NMVOC, non-methane volatile organic compounds, unspecified origin[air_lower stratosphere + upper troposphere]	1.03854E-10	1.03854E-10	kg	1.000000013
NMVOC, non-methane volatile organic compounds, unspecified origin[air_unspecified]	5.62246E-05	5.62246E-05	kg	0.999999959
Noble gases, radioactive, unspecified[air_low population density]	185.7631208	185.76312	kBq	1.000000005
Occupation, arable, non-irrigated[resource_land]	-2.39643E-05	-2.39643E-05	m2a	0.999999996
Occupation, construction site[resource_land]	-0.000238864	-0.000238864	m2a	1.000000007
Occupation, dump site, benthos[resource_land]	-0.000227228	-0.000227228	m2a	1.000000011
Occupation, dump site[resource_land]	-0.002514143	-0.002514143	m2a	0.999999984
Occupation, forest, intensive, normal[resource_land]	-0.02780032	-0.027800322	m2a	0.999999937
Occupation, forest, intensive, short-cycle[resource_land]	-9.05112E-06	-9.05112E-06	m2a	0.999999937
Occupation, forest, intensive[resource_land]	-0.00023404	-0.00023404	m2a	0.999999876
Occupation, industrial area, benthos[resource_land]	-1.93058E-06	-1.93058E-06	m2a	0.999999847
Occupation, industrial area, built up[resource_land]	-0.001642627	-0.00164263	m2a	0.999998198
Occupation, industrial area, vegetation[resource_land]	-0.000528585	-0.000528586	m2a	0.999998562
Occupation, industrial area[resource_land]	-0.001915845	-0.001915845	m2a	1.000000006
Occupation, mineral extraction site[resource_land]	-0.001030401	-0.001030401	m2a	1.000000054
Occupation, permanent crop, fruit, intensive[resource_land]	-1.26356E-05	-1.26356E-05	m2a	0.999999978

Table A1 LCI results from LCI calculation of acetic acid, 98 % in H₂O, at plant – RER, ecoinvent data v2.0 (cont'd)

Elementary Flow	LCSoft	SimaPro7.1	Unit	Ratio
Occupation, shrub land, sclerophyllous[resource land]	-2.81727E-05	-2.81727E-05	m2a	1.000000048
Occupation, traffic area, rail embankment[resource land]	-0.000334919	-0.000334919	m2a	1.000000011
Occupation, traffic area, rail network[resource land]	-0.000370343	-0.000370343	m2a	0.999999997
Occupation, traffic area, road embankment[resource land]	-0.000304655	-0.000304655	m2a	0.99999995
Occupation, traffic area, road network[resource land]	-0.00039779	-0.00039779	m2a	0.999999967
Occupation, urban, discontinuously built[resource land]	-6.83049E-08	-6.83049E-08	m2a	0.999999976
Occupation, water bodies, artificial[resource land]	-0.001502887	-0.001502887	m2a	0.999999978
Occupation, water courses, artificial[resource land]	-0.000631148	-0.000631148	m2a	0.999999994
o-Dichlorobenzene[water river]	2.46964E-09	2.09615E-08	kg	0.117817802
o-Dichlorobenzene[water river]	8.90091E-12		kg	
Oil, crude, in ground[resource in ground]	-0.386024813	-0.38602481	kg	1.000000009
Oils, biogenic[soil forestry]	3.24612E-07	3.24612E-07	kg	0.999999938
Oils, biogenic[soil unspecified]	2.42494E-07	2.42494E-07	kg	0.999999994
Oils, unspecified[soil forestry]	0.001752214	0.001752214	kg	0.999999998
Oils, unspecified[soil industrial]	1.3785E-07	1.3785E-07	kg	0.99999997
Oils, unspecified[soil unspecified]	6.12736E-06	6.12736E-06	kg	1.000000005
Oils, unspecified[water ocean]	0.000248737	0.000248737	kg	0.99999999
Oils, unspecified[water river]	0.00140791	0.00140791	kg	0.999999975
Oils, unspecified[water unspecified]	5.5558E-07	5.5558E-07	kg	0.999999859
Olivine, in ground[resource in ground]	-1.70258E-09	-1.70258E-09	kg	0.999999914
Orbencarb[soil agricultural]	2.59155E-10	2.59155E-10	kg	0.999999978
o-Xylene[water unspecified]	1.73039E-12	1.73039E-12	kg	0.999999937
o-Xylene[water unspecified]	3.65373E-14	3.65373E-14	kg	1.000000012
Ozone[air high population density]	3.73045E-09	3.73045E-09	kg	0.999999991
Ozone[air low population density]	2.90684E-10	2.90684E-10	kg	0.999999983
Ozone[air unspecified]	6.68651E-06	6.68651E-06	kg	0.999999996
PAH, polycyclic aromatic hydrocarbons[air high population density]	7.3834E-08	7.3834E-08	kg	1
PAH, polycyclic aromatic hydrocarbons[air low population density]	1.99459E-08	1.99459E-08	kg	0.999999975
PAH, polycyclic aromatic hydrocarbons[air unspecified]	8.54182E-08	8.54182E-08	kg	0.999999949
PAH, polycyclic aromatic hydrocarbons[water ocean]	6.49948E-08	6.49948E-08	kg	0.999999996
PAH, polycyclic aromatic hydrocarbons[water river]	8.11905E-08	8.11905E-08	kg	0.999999992
Paraffins[air high population density]	5.31639E-13	5.31639E-13	kg	0.999999785
Paraffins[water river]	1.54287E-12	1.54287E-12	kg	0.999999794
Particulates, < 2.5 um[air_high population density]	4.92071E-05	4.92071E-05	kg	0.999999988
Particulates, < 2.5 um[air_low population density]	0.000224787	0.000224787	kg	0.999999997
Particulates, < 2.5 um[air_lower stratosphere + upper troposphere]	5.88187E-12	5.88187E-12	kg	0.999999975
Particulates, < 2.5 um[air unspecified]	2.82247E-05	2.82247E-05	kg	0.999999986

Table A1 LCI results from LCI calculation of acetic acid, 98 % in H₂O, at plant – RER, ecoinvent data v2.0 (cont'd)

Elementary Flow	LCSoft	SimaPro7.1	Unit	Ratio
Particulates, > 10 um[air_high population density]	2.14176E-05	2.14176E-05	kg	1.00000016
Particulates, > 10 um[air_low population density]	0.000630025	0.000630025	kg	0.999999986
Particulates, > 10 um[air_unspecified]	2.55536E-05	2.55536E-05	kg	0.999999985
Particulates, > 2.5 um, and < 10um[air_high population density]	1.81625E-05	1.81625E-05	kg	1.000000024
Particulates, > 2.5 um, and < 10um[air_low population density]	0.000149435	0.000149435	kg	0.999999981
Particulates, > 2.5 um, and < 10um[air_unspecified]	3.54919E-05	3.54919E-05	kg	0.999999973
Pd, Pd 2.0E-4%, Pt 4.8E-4%, Rh 2.4E-5%, Ni 3.7E-2%, Cu 5.2E-2% in ore, in ground[resource in ground]	-1.08802E-09	-1.08802E-09	kg	1.000000016
Pd, Pd 7.3E-4%, Pt 2.5E-4%, Rh 2.0E-5%, Ni 2.3E+0%, Cu 3.2E+0% in ore, in ground[resource in ground]	-2.61482E-09	-2.61482E-09	kg	0.999999967
Peat, in ground[resource biotic]	-6.24897E-06	-6.24897E-06	kg	0.999999967
Pentane[air_high population density]	3.7281E-05	3.7281E-05	kg	1.000000003
Pentane[air_low population density]	6.82728E-07	6.82728E-07	kg	0.999999998
Pentane[air_unspecified]	9.84665E-10	9.84665E-10	kg	0.999999934
Phenol, pentachloro-[air_high population density]	2.47951E-12	2.47951E-12	kg	0.999999941
Phenol, pentachloro-[air_low population density]	5.26763E-09	5.26763E-09	kg	0.999999993
Phenol[air_high population density]	6.99448E-09	6.99448E-09	kg	0.999999932
Phenol[air_low population density]	3.09387E-08	3.09387E-08	kg	0.999999822
Phenol[air_unspecified]	2.37448E-09	2.37448E-09	kg	0.999999955
Phenol[water_ocean]	1.04814E-06	1.04814E-06	kg	0.999999967
Phenol[water_river]	1.34705E-06	1.34705E-06	kg	0.999999966
Phenol[water_unspecified]	5.05085E-06	5.05085E-06	kg	0.999999994
Phosphate[water_ground-, long-term]	3.58053E-05	3.58053E-05	kg	0.999999962
Phosphate[water_ground-]	1.46768E-08	1.46768E-08	kg	0.999999967
Phosphate[water_ocean]	6.53046E-07	6.53046E-07	kg	0.999999981
Phosphate[water_river]	8.96721E-07	8.96721E-07	kg	0.999999972
Phosphine[air_high population density]	7.67116E-13	7.67116E-13	kg	0.999999997
Phosphorus, 18% in apatite, 12% in crude ore, in ground[resource in ground]	-6.08005E-06	-6.08005E-06	kg	0.999999999
Phosphorus, 18% in apatite, 4% in crude ore, in ground[resource in ground]	-1.36633E-05	-1.36633E-05	kg	0.999999974
Phosphorus[air_high population density]	7.47549E-08	7.47549E-08	kg	0.999999997
Phosphorus[air_low population density]	1.21029E-09	1.21029E-09	kg	0.999999936
Phosphorus[air_unspecified]	5.4689E-11	5.4689E-11	kg	0.999999937
Phosphorus[soil_agricultural]	2.23859E-07	2.23859E-07	kg	0.999999985
Phosphorus[soil_industrial]	7.33474E-07	7.33474E-07	kg	0.999999996
Phosphorus[water_ground-]	5.72468E-11	5.72468E-11	kg	0.999999995
Phosphorus[water_ocean]	6.57986E-08	6.57986E-08	kg	1.000000001
Phosphorus[water_river]	1.158E-07	1.158E-07	kg	0.999999965
Phosphorus[water_unspecified]	5.05085E-06	5.05085E-06	kg	0.999999998
Pirimicarb[soil_agricultural]	3.91243E-12	3.91243E-12	kg	0.999999963
Platinum[air_high population density]	9.07486E-15	9.07486E-15	kg	1
Platinum[air_low population density]	2.57369E-13	2.57369E-13	kg	0.999999998

Table A1 LCI results from LCI calculation of acetic acid, 98 % in H₂O, at plant – RER, ecoinvent data v2.0 (cont'd)

Elementary Flow	LCSoft	SimaPro7.1	Unit	Ratio
Plutonium-238[air_low population density]	2.63705E-12	2.63705E-12	kBq	0.999999981
Plutonium-alpha[air_low population density]	6.0451E-12	6.0451E-12	kBq	0.999999995
Polonium-210[air_high population density]	2.90669E-05	2.90669E-05	kBq	1.000000011
Polonium-210[air_low population density]	0.000180929	0.000180929	kBq	1.000000016
Polonium-210[air unspecified]	2.46923E-13	2.46923E-13	kBq	0.999999985
Polonium-210[water ground-]	4.99583E-08	4.99583E-08	kBq	0.999999981
Polonium-210[water ocean]	5.90761E-05	5.90761E-05	kBq	0.999999988
Polonium-210[water river]	4.5242E-05	4.5242E-05	kBq	0.999999988
Polychlorinated biphenyls[air_high population density]	3.23332E-14	3.23332E-14	kg	0.999999963
Polychlorinated biphenyls[air unspecified]	5.08496E-10	5.08496E-10	kg	0.99999996
Potassium, ion[water ground-, long-term]	7.84193E-05	7.84193E-05	kg	0.999999999
Potassium, ion[water ground-]	4.36609E-05	4.36609E-05	kg	0.999999996
Potassium, ion[water ocean]	3.4646E-05	3.4646E-05	kg	1.000000005
Potassium, ion[water river]	8.91037E-05	8.91037E-05	kg	1.000000002
Potassium[air_high population density]	4.50346E-06	4.50346E-06	kg	0.999999995
Potassium[air_low population density]	2.36411E-08	2.36411E-08	kg	0.999999941
Potassium[soil agricultural]	1.24493E-06	1.24493E-06	kg	1.000000003
Potassium[soil industrial]	5.13432E-06	5.13432E-06	kg	1.000000001
Potassium-40[air_high population density]	4.61649E-06	4.61649E-06	kBq	0.999999996
Potassium-40[air_low population density]	2.2938E-05	2.2938E-05	kBq	1.000000011
Potassium-40[air unspecified]	3.32378E-14	3.32378E-14	kBq	0.999999981
Potassium-40[water ground-]	3.96818E-09	3.96818E-09	kBq	0.999999994
Potassium-40[water ocean]	4.67906E-06	4.67906E-06	kBq	0.999999981
Potassium-40[water river]	5.67932E-05	5.67932E-05	kBq	0.999999989
Praseodymium, 0.42% in bastnasite, 0.042% in crude ore, in ground[resource in ground]	-3.45078E-24	-3.45078E-24	kg	0.999999997
Propanal[air_high population density]	3.51473E-11	3.51473E-11	kg	0.999999995
Propanal[air unspecified]	3.00537E-17	3.00537E-17	kg	0.999999935
Propane[air_high population density]	2.46333E-05	2.46333E-05	kg	1.000000017
Propane[air_low population density]	2.34613E-05	2.34613E-05	kg	0.999999987
Propane[air unspecified]	6.03642E-10	6.03642E-10	kg	0.999999936
Propanol[air_high population density]	2.02436E-11		kg	
Propene[air_high population density]	1.23264E-06	1.23264E-06	kg	1.000000021
Propene[air_low population density]	1.11633E-07	1.11633E-07	kg	0.999999943
Propene[air unspecified]	7.11545E-13	7.11545E-13	kg	0.999999932
Propene[water river]	8.24841E-08	8.24841E-08	kg	0.999999953
Propionic acid[air_high population density]	1.40793E-07	1.40793E-07	kg	0.999999999
Propionic acid[air unspecified]	1.36997E-11	1.36997E-11	kg	0.999999915
Propylene oxide[air_high population density]	1.06262E-08	1.06262E-08	kg	1.000000011
Propylene oxide[water river]	2.55405E-08	2.55405E-08	kg	0.999999976

Table A1 LCI results from LCI calculation of acetic acid, 98 % in H₂O, at plant – RER, ecoinvent data v2.0 (cont'd)

Elementary Flow	LCSoft	SimaPro7.1	Unit	Ratio
Protactinium-234[air_low population density]	2.63359E-06	2.63359E-06	kBq	0.999999989
Protactinium-234[water river]	4.85416E-05	4.85416E-05	kBq	0.99999999
Pt, Pt 2.5E-4%, Pd 7.3E-4%, Rh 2.0E-5%, Ni 2.3E+0%, Cu 3.2E+0% in ore, in ground[resource in ground]	-2.20822E-11	-2.20822E-11	kg	1.000000007
Pt, Pt 4.8E-4%, Pd 2.0E-4%, Rh 2.4E-5%, Ni 3.7E-2%, Cu 5.2E-2% in ore, in ground[resource in ground]	-7.91613E-11	-7.91613E-11	kg	0.999999999
Radioactive species, alpha emitters[water river]	1.18138E-07	1.18138E-07	kBq	0.999999962
Radioactive species, Nuclides, unspecified[water ocean]	0.018772224	0.018772224	kBq	1.000000013
Radioactive species, Nuclides, unspecified[water river]	5.71978E-05	5.71978E-05	kBq	0.999999989
Radioactive species, other beta emitters[air_high population density]	5.64139E-05	5.64139E-05	kBq	0.999999991
Radioactive species, other beta emitters[air_low population density]	1.13457E-07	1.13457E-07	kBq	0.999999968
Radium-224[water ocean]	0.000410397	0.000410397	kBq	1.000000012
Radium-224[water river]	0.000820366	0.000820366	kBq	0.999999998
Radium-226[air_high population density]	4.10356E-06	4.10356E-06	kBq	0.999999994
Radium-226[air_low population density]	0.000110865	0.000110865	kBq	0.999999958
Radium-226[air_unspecified]	3.48773E-14	3.48773E-14	kBq	0.99999999
Radium-226[water_ground-]	3.6827E-08	3.6827E-08	kBq	0.999999981
Radium-226[water_ocean]	0.000700228	0.000700228	kBq	0.999999991
Radium-226[water_river]	0.031533399	0.031533399	kBq	1.000000001
Radium-226[water_unspecified]	1.03823E-07	1.03823E-07	kBq	0.999999954
Radium-228[air_high population density]	2.22271E-05	2.22271E-05	kBq	1.000000011
Radium-228[air_low population density]	8.70404E-06	8.70404E-06	kBq	0.999999993
Radium-228[air_unspecified]	1.0334E-14	1.0334E-14	kBq	1.000000029
Radium-228[water_ocean]	0.000820794	0.000820794	kBq	1
Radium-228[water_river]	0.001640732	0.001640733	kBq	0.999999985
Radium-228[water_unspecified]	1.46094E-07	1.46094E-07	kBq	0.999999939
Radon-220[air_high population density]	3.42185E-07	3.42185E-07	kBq	0.999999996
Radon-220[air_low population density]	0.00105035	0.00105035	kBq	0.999999965
Radon-220[air_unspecified]	7.25368E-13	7.25368E-13	kBq	0.999999991
Radon-222[air_high population density]	3.42094E-07	3.42094E-07	kBq	0.999999988
Radon-222[air_low population density, long-term]	339.7913007	339.7913	kBq	1.000000002
Radon-222[air_low population density]	8.117460656	8.1174607	kBq	0.999999995
Radon-222[air_unspecified]	4.07399E-13	4.07399E-13	kBq	1.000000004
Rh, Rh 2.0E-5%, Pt 2.5E-4%, Pd 7.3E-4%, Ni 2.3E+0%, Cu 3.2E+0% in ore, in ground[resource in ground]	-1.20784E-11	-1.20784E-11	kg	1.000000022
Rh, Rh 2.4E-5%, Pt 4.8E-4%, Pd 2.0E-4%, Ni 3.7E-2%, Cu 5.2E-2% in ore, in ground[resource in ground]	-3.78312E-11	-3.78312E-11	kg	1.000000006
Rhenium, in crude ore, in ground[resource in ground]	-1.15914E-11	-1.15914E-11	kg	1.000000004
Rubidium[water_ground-]	1.87613E-09	1.87613E-09	kg	0.999999997
Rubidium[water_ocean]	8.20794E-08	8.20794E-08	kg	1
Rubidium[water_river]	1.64073E-07	1.64073E-07	kg	0.999999985

Table A1 LCI results from LCI calculation of acetic acid, 98 % in H₂O, at plant – RER, ecoinvent data v2.0 (cont'd)

Elementary Flow	LCSoft	SimaPro7.1	Unit	Ratio
Ruthenium-103[air_low population density]	3.72687E-12	3.72687E-12	kBq	0.999999987
Ruthenium-103[water river]	3.62098E-09	3.62098E-09	kBq	0.999999991
Samarium, 0.3% in bastnasite, 0.03% in crude ore, in ground[resource in ground]	5.48317E-25	5.48317E-25	kg	1
Sand, unspecified, in ground[resource in ground]	-2.47381E-06	-2.47381E-06	kg	0.999999985
Scandium[air_high population density]	4.30866E-10	4.30866E-10	kg	0.999999992
Scandium[air_low population density]	4.50236E-11	4.50236E-11	kg	0.999999996
Scandium[water_ground-, long-term]	2.06595E-07	2.06595E-07	kg	1.000000008
Scandium[water_ground-]	2.6189E-08	2.6189E-08	kg	0.999999999
Scandium[water river]	2.29414E-08	2.29414E-08	kg	1.000000003
Selenium[air_high population density]	1.22937E-08	1.22937E-08	kg	1.000000006
Selenium[air_low population density]	7.93041E-08	7.93041E-08	kg	0.999999988
Selenium[air_lower stratosphere + upper troposphere]	1.54785E-15	1.54785E-15	kg	0.999999996
Selenium[air unspecified]	8.75233E-11	8.75233E-11	kg	1.000000016
Selenium[water_ground-, long-term]	1.24322E-07	1.24322E-07	kg	0.999999965
Selenium[water_ground-]	5.92344E-08	5.92344E-08	kg	1.000000003
Selenium[water ocean]	2.51537E-09	2.51537E-09	kg	0.999999988
Selenium[water river]	3.82663E-08	3.82663E-08	kg	0.999999989
Selenium[water unspecified]	1.74275E-13	1.74275E-13	kg	0.999999951
Shale, in ground[resource in ground]	-1.14072E-08	-1.14072E-08	kg	0.999999912
Silicon tetrafluoride[air_low population density]	1.02771E-10	1.02771E-10	kg	0.999999967
Silicon[air_high population density]	5.43632E-06	5.43632E-06	kg	0.999999999
Silicon[air_low population density]	3.70878E-07	3.70878E-07	kg	0.999999943
Silicon[air unspecified]	1.98368E-15	1.98368E-15	kg	0.999999971
Silicon[soil agricultural]	1.91038E-06	1.91038E-06	kg	0.999999984
Silicon[soil industrial]	1.46695E-06	1.46695E-06	kg	1.000000013
Silicon[water_ground-, long-term]	0.009466036	0.009466036	kg	0.999999983
Silicon[water_ground-]	3.23443E-05	3.23443E-05	kg	0.999999999
Silicon[water ocean]	4.06777E-09	4.06777E-09	kg	0.999999978
Silicon[water river]	1.34692E-05	1.34692E-05	kg	0.999999956
Silver, 0.007% in sulfide, Ag 0.004%, Pb, Zn, Cd, In, in ground[resource in ground]	-7.01006E-08	-7.01006E-08	kg	0.999999968
Silver, 3.2ppm in sulfide, Ag 1.2ppm, Cu and Te, in crude ore, in ground[resource in ground]	-5.00097E-08	-5.00097E-08	kg	0.999999983
Silver, Ag 2.1E-4%, Au 2.1E-4%, in ore, in ground[resource in ground]	-4.61688E-09	-4.61688E-09	kg	0.999999982
Silver, Ag 4.2E-3%, Au 1.1E-4%, in ore, in ground[resource in ground]	-1.05444E-08	-1.05444E-08	kg	0.999999952
Silver, Ag 4.6E-5%, Au 1.3E-4%, in ore, in ground[resource in ground]	-1.03358E-08	-1.03358E-08	kg	0.999999981
Silver, Ag 9.7E-4%, Au 9.7E-4%, Zn 0.63%, Cu 0.38%, Pb 0.014%, in ore, in ground[resource in ground]	-6.8197E-09	-6.8197E-09	kg	0.999999978
Silver, ion[water_ground-, long-term]	3.20375E-10	3.20375E-10	kg	0.999999965
Silver, ion[water_ground-]	8.3977E-11	8.3977E-11	kg	0.999999997
Silver, ion[water ocean]	4.92477E-09	4.92477E-09	kg	1.000000006
Silver, ion[water river]	1.47921E-08	1.47921E-08	kg	1.000000021
Silver, ion[water unspecified]	1.64387E-10	1.64387E-10	kg	0.999999946

Table A1 LCI results from LCI calculation of acetic acid, 98 % in H₂O, at plant – RER, ecoinvent data v2.0 (cont'd)

Elementary Flow	LCSoft	SimaPro7.1	Unit	Ratio
Silver[air_high population density]	9.29082E-11	9.29082E-11	kg	0.999999993
Silver[air_low population density]	1.62539E-12	1.62539E-12	kg	1.000000013
Silver-110[air_low population density]	3.69361E-11	3.69361E-11	kBq	1.000000006
Silver-110[water_river]	3.06635E-05	3.06635E-05	kBq	0.999999992
Sodium chlorate[air_high population density]	1.30305E-09	1.30305E-09	kg	0.999999997
Sodium chloride, in ground[resource_in ground]	-0.001226199	-0.001226199	kg	0.999999987
Sodium dichromate[air_high population density]	2.10708E-09	2.10708E-09	kg	1
Sodium formate[air_high population density]	4.17663E-11	4.17663E-11	kg	0.999999912
Sodium formate[water_river]	1.00341E-10	1.00341E-10	kg	0.999999876
Sodium hydroxide[air_high population density]	8.90215E-09	8.90215E-09	kg	0.999999997
Sodium nitrate, in ground[resource_in ground]	-1.35949E-12	-1.35949E-12	kg	0.999999947
Sodium sulphate, various forms, in ground[resource_in ground]	-2.69463E-05	-2.69463E-05	kg	0.999999996
Sodium, ion[water_ground-, long-term]	0.000144627	0.000144627	kg	0.999999938
Sodium, ion[water_ground-]	9.12878E-05	9.12878E-05	kg	0.999999993
Sodium, ion[water_ocean]	0.00251254	0.00251254	kg	1.000000018
Sodium, ion[water_river]	0.005134548	0.005134548	kg	0.999999996
Sodium, ion[water_unspecified]	2.36837E-05	2.36837E-05	kg	1.000000001
Sodium[air_high population density]	9.17027E-07	9.17027E-07	kg	0.999999997
Sodium[air_low population density]	1.14341E-08	1.14341E-08	kg	0.999999943
Sodium[air_unspecified]	1.84729E-11	1.84729E-11	kg	0.999999535
Sodium[soil_industrial]	2.9339E-05	2.9339E-05	kg	1.000000011
Sodium[soil_unspecified]	6.11036E-07	6.11028E-07	kg	1.000014291
Sodium-24[water_river]	1.2984E-07	1.2984E-07	kBq	0.999999999
Solids, inorganic[water_ground-]	0.000936485	0.000936485	kg	0.999999993
Solids, inorganic[water_river]	1.99017E-05	1.99017E-05	kg	0.999999946
Stibnite, in ground[resource_in ground]	-3.65518E-12	-3.65518E-12	kg	0.999999986
Strontium[air_high population density]	6.49753E-08	6.49753E-08	kg	0.999999988
Strontium[air_low population density]	9.66168E-08	9.66168E-08	kg	0.999999994
Strontium[air_unspecified]	1.23213E-16	1.23213E-16	kg	0.999999994
Strontium[soil_agricultural]	1.37544E-10	1.37544E-10	kg	1.000000029
Strontium[soil_industrial]	1.46695E-07	1.46695E-07	kg	1.000000013
Strontium[water_ground-, long-term]	1.2504E-05	1.2504E-05	kg	1.000000028
Strontium[water_ground-]	6.90691E-07	6.90691E-07	kg	0.999999995
Strontium[water_ocean]	1.48916E-05	1.48916E-05	kg	1.000000024
Strontium[water_river]	2.97228E-05	2.97228E-05	kg	0.999999999
Strontium[water_unspecified]	4.27653E-09	4.27653E-09	kg	0.999999946
Strontium-89[water_river]	5.5531E-07	5.5531E-07	kBq	0.999999993
Strontium-90[water_ocean]	0.000400027	0.000400027	kBq	0.999999996
Strontium-90[water_river]	0.02652055	0.02652055	kBq	0.999999997
Styrene[air_high population density]	2.34768E-09	2.34768E-09	kg	0.999999625
Styrene[air_low population density]	6.95138E-11	6.95138E-11	kg	1
Styrene[air_unspecified]	1.97789E-18	1.97789E-18	kg	0.999999929
Sulfate[air_high population density]	4.737E-06	4.737E-06	kg	0.999999991
Sulfate[air_low population density]	4.71309E-12	4.71309E-12	kg	0.999999984
Sulfate[air_unspecified]	2.09603E-10	2.09603E-10	kg	0.999999929

Table A1 LCI results from LCI calculation of acetic acid, 98 % in H₂O, at plant – RER, ecoinvent data v2.0 (cont'd)

Elementary Flow	LCSoft	SimaPro7.1	Unit	Ratio
Sulfate[water ground-, long-term]	0.002129098	0.002129098	kg	1.000000005
Sulfate[water ground-]	0.00166499	0.00166499	kg	1.000000002
Sulfate[water ocean]	7.05122E-05	7.05122E-05	kg	0.999999997
Sulfate[water river]	0.000599812	0.000599812	kg	0.999999975
Sulfate[water unspecified]	2.59628E-08	2.59628E-08	kg	0.999999918
Sulfide[water ocean]	1.96056E-08	1.96056E-08	kg	0.999999974
Sulfide[water river]	4.36746E-08	4.36746E-08	kg	0.999999999
Sulfite[water river]	1.21077E-06	1.21077E-06	kg	0.999999967
Sulfur dioxide[air_high population density]	0.000804073	0.000804073	kg	1.000000003
Sulfur dioxide[air_low population density]	0.003374275	0.003374275	kg	1.000000001
Sulfur dioxide[air_lower stratosphere + upper troposphere]	1.54785E-10	1.54785E-10	kg	0.999999996
Sulfur dioxide[air unspecified]	5.38443E-05	5.38443E-05	kg	0.999999997
Sulfur hexafluoride[air_low population density]	8.32793E-11	8.32793E-11	kg	0.999999974
Sulfur hexafluoride[air unspecified]	9.93558E-08	9.93558E-08	kg	0.999999999
Sulfur, in ground[resource in ground]	-8.40365E-07	-8.40366E-07	kg	0.999999968
Sulfur[soil agricultural]	2.17423E-07	2.17423E-07	kg	1.000000002
Sulfur[soil industrial]	8.80169E-06	8.80169E-06	kg	1
Sulfur[water ocean]	1.30438E-07	1.30438E-07	kg	1.000000033
Sulfur[water river]	4.55036E-06	4.55036E-06	kg	0.999999995
Sulfur[water unspecified]	2.07894E-10	2.07894E-10	kg	0.999999947
Sulfuric acid[air_high population density]	1.86365E-09	1.86365E-09	kg	0.999999984
Sulfuric acid[air_low population density]	5.74348E-13	5.74348E-13	kg	1.000000006
Sulfuric acid[soil agricultural]	1.15067E-12	1.15067E-12	kg	0.999999996
Suspended solids, unspecified[water ocean]	0.000507215	0.000507215	kg	1.000000004
Suspended solids, unspecified[water river]	4.08578E-05	4.08578E-05	kg	0.999999994
Suspended solids, unspecified[water unspecified]	1.67712E-05	1.67712E-05	kg	0.999999957
Sylvite, 25 % in sylvite, in ground[resource in ground]	-4.93527E-06	-4.93527E-06	kg	0.999999961
Talc, in ground[resource in ground]	-3.54773E-07	-3.54773E-07	kg	0.999999935
Tantalum, 81.9% in tantalite, 1.6E-4% in crude ore, in ground[resource in ground]	-5.52663E-08	-5.52663E-08	kg	0.999999965
t-Butyl methyl ether[air_high population density]	5.46818E-10	5.46818E-10	kg	0.999999949
t-Butyl methyl ether[water ocean]	5.31732E-08	5.31732E-08	kg	1
t-Butyl methyl ether[water river]	9.4182E-12	9.4182E-12	kg	0.999999946
t-Butyl methyl ether[water river]	5.66003E-13	5.66003E-13	kg	0.999999988
Tebutam[soil agricultural]	1.3522E-11	1.3522E-11	kg	0.999999976
Technetium-99m[water river]	3.9731E-07	3.9731E-07	kBq	0.999999987
Teflubenzuron[soil agricultural]	3.19938E-12	3.19938E-12	kg	0.999999966
Tellurium, 0.5ppm in sulfide, Te 0.2ppm, Cu and Ag, in crude ore, in ground[resource in ground]	-7.50158E-09	-7.50158E-09	kg	0.999999973
Tellurium-123m[water river]	5.5678E-07	5.5678E-07	kBq	1.000000002
Tellurium-132[water river]	9.93616E-10	9.93616E-10	kBq	0.999999997
Terpenes[air_low population density]	2.9287E-10	2.9287E-10	kg	0.999999947
Thallium[air_high population density]	5.40747E-10	5.40747E-10	kg	1

Table A1 LCI results from LCI calculation of acetic acid, 98 % in H₂O, at plant – RER,ecoinvent data v2.0 (cont'd)

Elementary Flow	LCSoft	SimaPro7.1	Unit	Ratio
Thallium[air low population density]	1.37257E-11	1.37257E-11	kg	0.999999978
Thallium[air unspecified]	9.7197E-11	9.7197E-11	kg	1.000000117
Thallium[water ground-, long-term]	1.40321E-08	1.40321E-08	kg	1.000000015
Thallium[water ground-]	3.60266E-12	3.60266E-12	kg	1.000000004
Thallium[water river]	2.30608E-09	2.30608E-09	kg	0.999999992
Thallium[water unspecified]	1.86388E-13	1.86388E-13	kg	0.999999939
Thiram[soil agricultural]	1.33335E-12	1.33335E-12	kg	0.999999946
Thorium[air high population density]	6.4972E-10	6.4972E-10	kg	1
Thorium[air low population density]	4.50248E-11	4.50248E-11	kg	0.999999948
Thorium-228[air high population density]	1.88079E-06	1.88079E-06	kBq	0.999999978
Thorium-228[air low population density]	4.68687E-06	4.68687E-06	kBq	0.999999994
Thorium-228[air unspecified]	5.56447E-15	5.56447E-15	kBq	0.999999996
Thorium-228[water ground-]	4.02515E-10	4.02515E-10	kBq	0.999999979
Thorium-228[water ocean]	0.001642064	0.001642064	kBq	1.000000001
Thorium-228[water river]	0.003281465	0.003281465	kBq	0.999999985
Thorium-230[air low population density]	9.91217E-06	9.91217E-06	kBq	0.999999998
Thorium-230[water river]	0.00662303	0.00662303	kBq	1.000000004
Thorium-232[air high population density]	1.19687E-06	1.19687E-06	kBq	0.999999981
Thorium-232[air low population density]	7.35946E-06	7.35946E-06	kBq	0.999999993
Thorium-232[air unspecified]	8.74417E-15	8.74417E-15	kBq	0.999999998
Thorium-232[water ground-]	-6.78005E-27	-6.78005E-27	kBq	0.999999975
Thorium-232[water river]	1.05886E-05	1.05886E-05	kBq	1.000000013
Thorium-234[air low population density]	2.6341E-06	2.6341E-06	kBq	1.000000005
Thorium-234[water river]	4.8547E-05	4.8547E-05	kBq	0.999999988
Tin, 79% in cassiterite, 0.1% in crude ore, in ground[resource in ground]	-2.43985E-06	-2.43985E-06	kg	0.999999974
Tin, ion[water ground-, long-term]	2.62304E-07	2.62304E-07	kg	0.999999965
Tin, ion[water ground-]	6.90737E-11	6.90737E-11	kg	0.999999991
Tin, ion[water river]	3.39823E-09	3.39823E-09	kg	1
Tin, ion[water unspecified]	8.63262E-12	8.63262E-12	kg	0.999999931
Tin[air high population density]	5.29897E-10	5.29897E-10	kg	0.999999974
Tin[air low population density]	4.34279E-08	4.34279E-08	kg	0.999999972
Tin[air unspecified]	3.3907E-09	3.3907E-09	kg	0.999999862
Tin[soil agricultural]	1.42227E-11	1.42227E-11	kg	0.999999962
TiO ₂ , 54% in ilmenite, 2.6% in crude ore, in ground[resource in ground]	-6.91034E-05	-6.91034E-05	kg	0.999999982
TiO ₂ , 95% in rutile, 0.40% in crude ore, in ground[resource in ground]	-3.3297E-10	-3.3297E-10	kg	0.999999972
Titanium, ion[water ground-, long-term]	3.66012E-05	3.66012E-05	kg	0.999999991
Titanium, ion[water ground-]	9.54323E-08	9.54323E-08	kg	1.000000002
Titanium, ion[water ocean]	6.35132E-10	6.35132E-10	kg	0.999999996
Titanium, ion[water river]	5.21712E-08	5.21712E-08	kg	0.999999968
Titanium, ion[water unspecified]	1.35465E-11	1.35465E-11	kg	0.999999965
Titanium[air high population density]	1.31007E-07	1.31007E-07	kg	1.000000013
Titanium[air low population density]	6.93402E-09	6.93402E-09	kg	0.999999957
Titanium[air unspecified]	4.07838E-10	4.07838E-10	kg	0.999999956
Titanium[soil agricultural]	3.15231E-08	3.15231E-08	kg	0.999999985
TOC, Total Organic Carbon[water ground-, long-term]	0.000197359	0.000197359	kg	0.999999967
TOC, Total Organic Carbon[water ocean]	0.000262383	0.000262383	kg	0.999999999

Table A1 LCI results from LCI calculation of acetic acid, 98 % in H₂O, at plant – RER, ecoinvent data v2.0 (cont'd)

Elementary Flow	LCSOft	SimaPro7.1	Unit	Ratio
TOC, Total Organic Carbon[water river]	0.001328268	0.001328268	kg	0.999999986
TOC, Total Organic Carbon[water unspecified]	0.000121909	0.000121909	kg	1.000000037
Toluene[air high population density]	4.3305E-06	4.3305E-06	kg	0.999999991
Toluene[air low population density]	5.96341E-07	5.96341E-07	kg	0.999999997
Toluene[air unspecified]	8.40386E-08	8.40386E-08	kg	0.999999995
Toluene[water ocean]	1.16618E-06	1.16618E-06	kg	1.000000033
Toluene[water river]	1.86982E-06	1.86982E-06	kg	1.000000012
Toluene[water unspecified]	1.24341E-10	1.24341E-10	kg	0.999999936
Transformation, from arable, non-irrigated, fallow[resource land]	-1.12472E-07	-1.12472E-07	m2	0.999999925
Transformation, from arable, non-irrigated[resource land]	-4.41792E-05	-4.41792E-05	m2	0.999999995
Transformation, from arable[resource land]	-8.76912E-07	-8.76912E-07	m2	0.999999998
Transformation, from dump site, inert material landfill[resource land]	-3.40584E-06	-3.40584E-06	m2	1.000000077
Transformation, from dump site, residual material landfill[resource land]	-2.17004E-06	-2.17004E-06	m2	0.999999967
Transformation, from dump site, sanitary landfill[resource land]	-4.79376E-08	-4.79376E-08	m2	0.999999965
Transformation, from dump site, slag compartment[resource land]	-7.25291E-09	-7.25291E-09	m2	0.999999801
Transformation, from forest, extensive[resource land]	-0.000219861	-0.000219861	m2	0.999999962
Transformation, from forest, intensive, clear-cutting[resource land]	-3.23256E-07	-3.23256E-07	m2	0.999999934
Transformation, from forest[resource land]	-0.000638696	-0.000638696	m2	1.000000001
Transformation, from industrial area, benthos[resource land]	-1.14008E-08	-1.14008E-08	m2	0.999999782
Transformation, from industrial area, built up[resource land]	-4.85309E-09	-4.85309E-09	m2	0.999999976
Transformation, from industrial area, vegetation[resource land]	-8.27881E-09	-8.27881E-09	m2	0.999999982
Transformation, from industrial area[resource land]	-4.37518E-06	-4.37518E-06	m2	1.000000119
Transformation, from mineral extraction site[resource land]	-2.1409E-05	-2.1409E-05	m2	1.000000029
Transformation, from pasture and meadow, intensive[resource land]	-3.59765E-08	-3.59765E-08	m2	0.999999966
Transformation, from pasture and meadow[resource land]	-1.68049E-05	-1.68049E-05	m2	1.000000028
Transformation, from sea and ocean[resource land]	-0.000227421	-0.000227421	m2	0.999999996
Transformation, from shrub land, sclerophyllous[resource land]	-9.16403E-06	-9.16403E-06	m2	1.000000016
Transformation, from tropical rain forest[resource land]	-3.23256E-07	-3.23256E-07	m2	0.999999934
Transformation, from unknown[resource land]	-0.000156394	-0.000156394	m2	0.999999539
Transformation, to arable, non-irrigated, fallow[resource land]	-2.24568E-07	-2.24568E-07	m2	0.999999946

Table A1 LCI results from LCI calculation of acetic acid, 98 % in H₂O, at plant – RER, ecoinvent data v2.0 (cont'd)

Elementary Flow	LCSoft	SimaPro7.1	Unit	Ratio
Transformation, to arable, non-irrigated[resource land]	-4.42161E-05	-4.42161E-05	m2	0.99999995
Transformation, to arable[resource land]	-3.06582E-05	-3.06582E-05	m2	0.99999993
Transformation, to dump site, benthos[resource land]	-0.000227228	-0.000227228	m2	1.00000011
Transformation, to dump site, inert material landfill[resource land]	-3.40584E-06	-3.40584E-06	m2	1.00000077
Transformation, to dump site, residual material landfill[resource land]	-2.17007E-06	-2.17007E-06	m2	0.99999985
Transformation, to dump site, sanitary landfill[resource land]	-4.79376E-08	-4.79376E-08	m2	0.99999965
Transformation, to dump site, slag compartment[resource land]	-7.25291E-09	-7.25291E-09	m2	0.999999801
Transformation, to dump site[resource land]	-1.92056E-05	-1.92056E-05	m2	0.99999963
Transformation, to forest, intensive, clear-cutting[resource land]	-3.23256E-07	-3.23256E-07	m2	0.99999934
Transformation, to forest, intensive, normal[resource land]	-0.000215876	-0.000215876	m2	0.99999946
Transformation, to forest, intensive, short-cycle[resource land]	-3.23256E-07	-3.23256E-07	m2	0.99999934
Transformation, to forest, intensive[resource land]	-1.55887E-06	-1.55887E-06	m2	0.99999914
Transformation, to forest[resource land]	-1.21103E-05	-1.21103E-05	m2	1.00000127
Transformation, to heterogeneous, agricultural[resource land]	-2.41585E-05	-2.41585E-05	m2	0.99999978
Transformation, to industrial area, benthos[resource land]	-1.93117E-07	-1.93117E-07	m2	0.999999809
Transformation, to industrial area, built up[resource land]	-3.63299E-05	-3.633E-05	m2	0.999998363
Transformation, to industrial area, vegetation[resource land]	-1.19319E-05	-1.19319E-05	m2	0.999998746
Transformation, to industrial area[resource land]	-1.70234E-05	-1.70234E-05	m2	1.00000023
Transformation, to mineral extraction site[resource land]	-0.000651572	-0.000651572	m2	1.00000002
Transformation, to pasture and meadow[resource land]	-3.08695E-06	-3.08695E-06	m2	1.00000161
Transformation, to permanent crop, fruit, intensive[resource land]	-1.77873E-07	-1.77873E-07	m2	0.99999945
Transformation, to sea and ocean[resource land]	-1.14008E-08	-1.14008E-08	m2	0.999999782
Transformation, to shrub land, sclerophyllous[resource land]	-5.63108E-06	-5.63108E-06	m2	1.00000031
Transformation, to traffic area, rail embankment[resource land]	-7.7933E-07	-7.7933E-07	m2	1.00000003
Transformation, to traffic area, rail network[resource land]	-8.56619E-07	-8.56619E-07	m2	0.99999993
Transformation, to traffic area, road embankment[resource land]	-2.2288E-06	-2.2288E-06	m2	0.99999933
Transformation, to traffic area, road network[resource land]	-5.54905E-06	-5.54905E-06	m2	0.99999999

Table A1 LCI results from LCI calculation of acetic acid, 98 % in H₂O, at plant – RER,ecoinvent data v2.0 (cont'd)

Elementary Flow	LCSoft	SimaPro7.1	Unit	Ratio
Transformation, to unknown[resource land]	-4.48649E-06	-4.48649E-06	m2	0.999999973
Transformation, to urban, discontinuously built[resource land]	-1.36059E-09	-1.36059E-09	m2	0.999999993
Transformation, to water bodies, artificial[resource land]	-1.72257E-05	-1.72257E-05	m2	1.000000034
Transformation, to water courses, artificial[resource land]	-7.55656E-06	-7.55656E-06	m2	0.999999994
Tributyltin compounds[water ocean]	2.91887E-08	2.91887E-08	kg	0.999999983
Triethylene glycol[water ocean]	2.31147E-07	2.31147E-07	kg	0.999999989
Tungsten[water ground-, long-term]	1.11322E-07	1.11322E-07	kg	0.999999954
Tungsten[water ground-]	4.6812E-08	4.6812E-08	kg	0.999999987
Tungsten[water river]	2.06751E-08	2.06751E-08	kg	1.000000015
Ulexite, in ground[resource in ground]	-2.26913E-07	-2.26913E-07	kg	1.000000008
Uranium alpha[air_low population density]	0.000143094	0.000143094	kBq	1
Uranium alpha[water river]	0.002796598	0.002796598	kBq	1.000000007
Uranium, in ground[resource in ground]	-1.07115E-05	-1.07115E-05	kg	0.999999995
Uranium[air_high population density]	8.65156E-10	8.65156E-10	kg	0.999999993
Uranium[air_low population density]	2.28923E-11	2.28923E-11	kg	0.999999942
Uranium-234[air_low population density]	3.07947E-05	3.07947E-05	kBq	0.999999992
Uranium-234[water river]	5.82499E-05	5.82499E-05	kBq	1.000000004
Uranium-235[air_low population density]	1.48537E-06	1.48537E-06	kBq	0.999999999
Uranium-235[water river]	9.61124E-05	9.61124E-05	kBq	0.999999994
Uranium-238[air_high population density]	3.41963E-06	3.41963E-06	kBq	0.999999987
Uranium-238[air_low population density]	4.8857E-05	4.8857E-05	kBq	0.999999995
Uranium-238[air_unspecified]	2.90644E-14	2.90644E-14	kBq	1.000000002
Uranium-238[water ground-]	1.68431E-08	1.68431E-08	kBq	0.999999985
Uranium-238[water ocean]	1.98611E-05	1.98611E-05	kBq	0.999999999
Uranium-238[water river]	0.000168735	0.000168735	kBq	0.999999989
Vanadium, ion[water ground-, long-term]	3.87249E-06	3.87249E-06	kg	0.999999973
Vanadium, ion[water ground-]	5.23569E-08	5.23569E-08	kg	0.999999988
Vanadium, ion[water ocean]	5.01566E-09	5.01566E-09	kg	0.999999994
Vanadium, ion[water river]	9.31888E-08	9.31888E-08	kg	0.999999998
Vanadium, ion[water_unspecified]	2.13085E-12	2.13085E-12	kg	0.999999944
Vanadium[air_high population density]	1.2384E-06	1.2384E-06	kg	1.000000021
Vanadium[air_low population density]	2.99344E-08	2.99344E-08	kg	0.999999998
Vanadium[air_unspecified]	1.15641E-09	1.15641E-09	kg	0.999999972
Vanadium[soil_agricultural]	9.0229E-10	9.0229E-10	kg	0.999999996
Vermiculite, in ground[resource_in ground]	-1.09329E-07	-1.09329E-07	kg	1.000000007
VOC, volatile organic compounds, unspecified origin[water ocean]	2.87278E-06	2.87278E-06	kg	1.000000004
VOC, volatile organic compounds, unspecified origin[water river]	5.86399E-06	5.86399E-06	kg	1.000000001
Volume occupied, final repository for low-active radioactive waste[resource_in ground]	-2.20888E-08	-2.20888E-08	m3	0.999999985
Volume occupied, final repository for radioactive waste[resource_in ground]	-5.5739E-09	-5.5739E-09	m3	0.999999996

Table A1 LCI results from LCI calculation of acetic acid, 98 % in H₂O, at plant – RER, ecoinvent data v2.0 (cont'd)

Elementary Flow	LCSoft	SimaPro7.1	Unit	Ratio
Volume occupied, reservoir[resource in water]	-0.014245173	-0.014245173	m3a	0.999999979
Volume occupied, underground deposit[resource in ground]	-4.02259E-08	-4.02259E-08	m3	0.999999981
Water, cooling, unspecified natural origin[resource in water]	-0.106784118		m3	
Water, lake[resource in water]	-0.000114789	-0.000114789	m3	1.000000022
Water, river[resource in water]	-0.005549403	-0.005549403	m3	1.000000001
Water, salt, ocean[resource in water]	-0.001066949	-0.001066949	m3	0.999999996
Water, salt, sole[resource in water]	-0.000306148	-0.000306148	m3	0.999999988
Water, turbine use, unspecified natural origin[resource in water]	-5.961019495	-5.9610195	m3	0.999999999
Water, unspecified natural origin[resource in water]	-0.002180705		m3	
Water, well, in ground[resource in water]	-0.001404695	-0.001404695	m3	0.999999965
Water[air high population density]	9.22999E-09	9.22999E-09	kg	0.999999989
Water[air low population density]	3.15814E-08	3.15814E-08	kg	0.999999999
Water[air lower stratosphere + upper troposphere]	1.91929E-07	1.91929E-07	kg	0.999999999
Water[air unspecified]	5.79537E-05	5.79537E-05	kg	0.999999907
Wood, hard, standing[resource biotic]	-6.49287E-06	-6.49287E-06	m3	0.999999999
Wood, primary forest, standing[resource biotic]	-3.34699E-09	-3.34699E-09	m3	0.999999955
Wood, soft, standing[resource biotic]	-2.06218E-05	-2.06218E-05	m3	0.999999965
Wood, unspecified, standing[resource biotic]	-4.38761E-11		m3	
Xenon-131m[air low population density]	0.000696309	0.000696309	kBq	1.000000004
Xenon-133[air low population density]	0.022218148	0.022218148	kBq	1.000000013
Xenon-133m[air low population density]	9.35735E-05	9.35735E-05	kBq	1.000000001
Xenon-135[air low population density]	0.009104532	0.009104532	kBq	1.000000001
Xenon-135m[air low population density]	0.005376923	0.005376923	kBq	1
Xenon-137[air low population density]	0.000105422	0.000105422	kBq	0.999999967
Xenon-138[air low population density]	0.000925085	0.000925085	kBq	0.999999999
Xylene[air high population density]	2.11055E-06	2.11055E-06	kg	1.000000016
Xylene[air low population density]	4.34937E-06	4.34937E-06	kg	0.999999986
Xylene[air unspecified]	9.80311E-08	9.80311E-08	kg	0.999999995
Xylene[water ocean]	9.71795E-07	9.71795E-07	kg	0.999999996
Xylene[water river]	1.55211E-06	1.55211E-06	kg	1.000000009
Xylene[water unspecified]	6.27884E-11	6.27884E-11	kg	0.999999939
Zinc, 9.0% in sulfide, Zn 5.3%, Pb, Ag, Cd, In, in ground[resource in ground]	-0.000289137	-0.000289137	kg	0.999999935
Zinc, ion[water ground-, long-term]	3.95862E-06	3.95862E-06	kg	0.999999997
Zinc, ion[water ground-]	2.75525E-08	2.75525E-08	kg	0.999999994
Zinc, ion[water lake]	1.01959E-13	1.01959E-13	kg	0.999999994
Zinc, ion[water ocean]	7.49818E-06	7.49818E-06	kg	0.999999997
Zinc, ion[water river]	1.93351E-06	1.93351E-06	kg	1.000000013
Zinc, ion[water unspecified]	1.35933E-07	1.35933E-07	kg	0.999999962
Zinc[air high population density]	4.28018E-07	4.28018E-07	kg	0.999999993
Zinc[air low population density]	1.22648E-06	1.22648E-06	kg	0.999999971
Zinc[air lower stratosphere + upper troposphere]	1.54785E-13	1.54785E-13	kg	0.999999996

Table A1 LCI results from LCI calculation of acetic acid, 98 % in H₂O, at plant – RER, ecoinvent data v2.0 (cont'd)

Elementary Flow	LCSoft	SimaPro7.1	Unit	Ratio
Zinc[air unspecified]	5.36214E-07	5.36214E-07	kg	0.999999967
Zinc[soil agricultural]	4.53919E-08	4.53919E-08	kg	0.999999993
Zinc[soil industrial]	2.20042E-07	2.20042E-07	kg	0.999999989
Zinc[soil unspecified]	7.87486E-08	7.87486E-08	kg	0.999999992
Zinc-65[air low population density]	7.13511E-10	7.13511E-10	kBq	0.999999992
Zinc-65[water river]	1.76033E-06	1.76033E-06	kBq	1.000000018
Zirconium, 50% in zircon, 0.39% in crude ore, in ground[resource in ground]	-7.56318E-08	-7.56318E-08	kg	0.999999978
Zirconium[air low population density]	5.54781E-10	5.54781E-10	kg	0.999999947
Zirconium-95[air low population density]	6.9743E-10	6.9743E-10	kBq	1.000000002
Zirconium-95[water river]	2.03851E-08	2.03851E-08	kBq	0.999999994

Appendix B Characterization Factors of New Impacts Categories

Table B1 Characterization factors contained in Cumulative Energy Demand (Frischknecht *et al.*, 2007)

Category	Compartment	Sub-Compartment	Substance	Factor	Unit per	
Non renewable, fossil	Resource	unspecified	Coal, 18 MJ per kg, in ground	18	MJ eq	kg
Non renewable, fossil	Resource	unspecified	Coal, 26.4 MJ per kg, in ground	26.4	MJ eq	kg
Non renewable, fossil	Resource	unspecified	Coal, 29.3 MJ per kg, in ground	29.3	MJ eq	kg
Non renewable, fossil	Resource	unspecified	Coal, unprocessed bituminous, in ground	24.8	MJ eq	kg
Non renewable, fossil	Resource	unspecified	Coal, bituminous, 24.8 MJ per kg	24.8	MJ eq	kg
Non renewable, fossil	Resource	unspecified	Coal, bituminous, 24.8 MJ per kg, in ground	24.8	MJ eq	kg
Non renewable, fossil	Resource	unspecified	Coal, bituminous, 24.8 MJ/kg, in ground	24.8	MJ eq	kg
Non renewable, fossil	Resource	unspecified	Coal, brown, 10 MJ per kg, in ground	10	MJ eq	kg
Non renewable, fossil	Resource	unspecified	Coal, brown, 8 MJ per kg, in ground	8	MJ eq	kg
Non renewable, fossil	Resource	unspecified	Coal, lignite, in ground	9.9	MJ eq	kg
Non renewable, fossil	Resource	unspecified	Lignite (in MJ)	1	MJ eq	MJ
Non renewable, fossil	Resource	unspecified	Lignite coal, at surface mine	9.9	MJ eq	kg
Non renewable, fossil	Resource	unspecified	Lignite coal, at surface mine	9.9	MJ eq	kg
Non renewable, fossil	Resource	unspecified	Lignite, 11 MJ per kg, in ground	11	MJ eq	kg
Non renewable, fossil	Resource	unspecified	Coal, brown, in ground	9.9	MJ eq	kg
Non renewable, fossil	Resource	unspecified	Coal, feedstock, 26.4 MJ per kg, in ground	26.4	MJ eq	kg
Non renewable, fossil	Resource	unspecified	Hard coal (in MJ)	1	MJ eq	MJ
Non renewable, fossil	Resource	unspecified	Coal, hard, unspecified, in ground	19.1	MJ eq	kg
Non renewable, fossil	Resource	unspecified	Coal, hard, 26.4 MJ per kg, in ground	26.4	MJ eq	kg
Non renewable, fossil	Resource	unspecified	Coal, hard, 30.7 MJ per kg	30.7	MJ eq	kg
Non renewable, fossil	Resource	unspecified	Coal, hard, 30.7 MJ per kg, in ground	30.7	MJ eq	kg
Non renewable, fossil	Resource	unspecified	Energy, from coal	1	MJ eq	MJ
Non renewable, fossil	Resource	unspecified	Energy, from coal, brown	1	MJ eq	MJ
Non renewable, fossil	Resource	unspecified	Energy, from gas, natural	1	MJ eq	MJ
Non renewable, fossil	Resource	unspecified	Energy, from oil	1	MJ eq	MJ
Non renewable, fossil	Resource	unspecified	Energy, from peat	1	MJ eq	MJ
Non renewable, fossil	Resource	unspecified	Energy, from sulfur	1	MJ eq	MJ
Non renewable, fossil	Resource	unspecified	Energy, unspecified	1	MJ eq	MJ

Table B1 Characterization factors contained in Cumulative Energy Demand (Frischknecht *et al.*, 2007) (cont'd)

Category	Compartment	Sub-Compartment	Substance	Factor	Unit per	
Non renewable, fossil	Resource	unspecified	Gas, mine, off-gas, process, coal mining/kg	49.8	MJ eq	kg
Non renewable, fossil	Resource	unspecified	Gas, mine, off-gas, process, coal mining/m ³	39.8	MJ eq	m ³
Non renewable, fossil	Resource	unspecified	Gas, natural, 30.3 MJ per kg, in ground	30.3	MJ eq	kg
Non renewable, fossil	Resource	unspecified	Gas, natural, 35 MJ per m ³ , in ground	35	MJ eq	m ³
Non renewable, fossil	Resource	unspecified	Gas, natural, 36.6 MJ per m ³ , in ground	36.6	MJ eq	m ³
Non renewable, fossil	Resource	unspecified	Gas, natural, 46.8 MJ per kg, in ground	46.8	MJ eq	kg
Non renewable, fossil	Resource	unspecified	Gas, natural, feedstock, 35 MJ per m ³ , in ground	35	MJ eq	m ³
Non renewable, fossil	Resource	unspecified	Gas, natural, feedstock, 46.8 MJ per kg, in ground	46.8	MJ eq	kg
Non renewable, fossil	Resource	unspecified	Gas, natural, 49.8 MJ per kg, in ground	49.8	MJ eq	kg
Non renewable, fossil	Resource	unspecified	Gas, natural, 50.0 MJ per kg, in ground	50	MJ eq	kg
Non renewable, fossil	Resource	unspecified	Gas, natural	37.3	MJ eq	m ³
Non renewable, fossil	Resource	unspecified	Gas, natural, in ground	37.3	MJ eq	m ³
Non renewable, fossil	Resource	unspecified	Natural gas (in MJ)	1	MJ eq	MJ
Non renewable, fossil	Resource	unspecified	Gas, off-gas, oil production, in ground	39.8	MJ eq	m ³
Non renewable, fossil	Resource	unspecified	Gas, petroleum, 35 MJ per m ³ , in ground	35	MJ eq	m ³
Non renewable, fossil	Resource	unspecified	Methane	35.9	MJ eq	kg
Non renewable, fossil	Resource	unspecified	Oil, crude, 38400 MJ per m ³ , in ground	38400	MJ eq	m ³
Non renewable, fossil	Resource	unspecified	Oil, crude, 41 MJ per kg, in ground	41	MJ eq	kg
Non renewable, fossil	Resource	unspecified	Oil, crude, 42 MJ per kg, in ground	42	MJ eq	kg
Non renewable, fossil	Resource	unspecified	Oil, crude, 42.6 MJ per kg, in ground	42.6	MJ eq	kg
Non renewable, fossil	Resource	unspecified	Oil, crude, 42.7 MJ per kg, in ground	42.7	MJ eq	kg
Non renewable, fossil	Resource	unspecified	Oil, crude, 43.7 MJ per kg, in ground	43.7	MJ eq	kg
Non renewable, fossil	Resource	unspecified	Oil, crude, 45.25 MJ per kg, in ground	45.25	MJ eq	kg
Non renewable, fossil	Resource	unspecified	Oil, crude, feedstock, 41 MJ per kg, in ground	41	MJ eq	kg
Non renewable, fossil	Resource	unspecified	Oil, crude, feedstock, 42 MJ per kg, in ground	42	MJ eq	kg
Non renewable, fossil	Resource	unspecified	Oil, crude, in ground	45.8	MJ eq	kg
Non renewable, fossil	Resource	unspecified	Oil, crude	45.8	MJ eq	kg
Non renewable, fossil	Resource	unspecified	Crude oil (in MJ)	1	MJ eq	MJ
Non renewable, fossil	Resource	unspecified	Peat, in ground	13	MJ eq	kg
Non renewable, fossil	Resource	unspecified	Peat (in MJ)	1	MJ eq	kg

Table B1 Characterization factors contained in Cumulative Energy Demand (Frischknecht *et al.*, 2007) (cont'd)

Category	Compartment	Sub-Compartment	Substance	Factor	Unit per	
Non renewable, fossil	Resource	biotic	Peat, in ground	9	MJ eq	kg
Non renewable, nuclear	Resource	unspecified	Energy, from uranium	1	MJ eq	MJ
Non renewable, nuclear	Resource	unspecified	Uranium ore, 1.11 GJ per kg, in ground	1110	MJ eq	kg
Non renewable, nuclear	Resource	unspecified	Uranium, 2291 GJ per kg, in ground	2291000	MJ eq	kg
Non renewable, nuclear	Resource	unspecified	Uranium oxide (U ₃ O ₈), 332 GJ per kg, in ore	332000	MJ eq	kg
Non renewable, nuclear	Resource	unspecified	Uranium oxide, 332 GJ per kg, in ore	332000	MJ eq	kg
Non renewable, nuclear	Resource	unspecified	Uranium, 451 GJ per kg, in ground	451000	MJ eq	kg
Non renewable, nuclear	Resource	unspecified	Uranium, 560 GJ per kg, in ground	560000	MJ eq	kg
Non renewable, nuclear	Resource	unspecified	Uranium natural (in MJ)	1	MJ eq	MJ
Non renewable, nuclear	Resource	unspecified	Uranium, in ground	560000	MJ eq	kg
Renewable, biomass	Resource	unspecified	Biomass, feedstock	1	MJ eq	MJ
Renewable, biomass	Resource	unspecified	Energy, from biomass	1	MJ eq	MJ
Renewable, biomass	Resource	unspecified	Wood and wood waste, 20.9 MJ per kg, oven-dry basis	20.9	MJ eq	kg
Renewable, biomass	Resource	unspecified	Wood and wood waste, 9.5 MJ per kg	9.5	MJ eq	kg
Renewable, biomass	Resource	unspecified	Energy, from wood	1	MJ eq	MJ
Renewable, biomass	Resource	unspecified	Energy, gross calorific value, in biomass	1	MJ eq	MJ
Renewable, biomass	Resource	unspecified	Energy, gross calorific value, in biomass, primary forest	1	MJ eq	MJ
Renewable, wind, solar, geothermal	Resource	unspecified	Energy, geothermal	1	MJ eq	MJ
Renewable, wind, solar, geothermal	Resource	unspecified	Energy, geothermal, converted	1	MJ eq	MJ
Renewable, wind, solar, geothermal	Resource	unspecified	Energy, kinetic, flow, in wind	1	MJ eq	MJ
Renewable, wind, solar, geothermal	Resource	unspecified	Energy, kinetic (in wind), converted	1	MJ eq	MJ
Renewable, wind, solar, geothermal	Resource	unspecified	Energy, solar	1	MJ eq	MJ
Renewable, wind, solar, geothermal	Resource	unspecified	Energy, solar, converted	1	MJ eq	MJ
Renewable, water	Resource	unspecified	Energy, from hydro power	1	MJ eq	MJ
Renewable, water	Resource	unspecified	Energy, from hydrogen	1	MJ eq	MJ
Renewable, water	Resource	unspecified	Energy, potential (in hydropower reservoir), converted	1	MJ eq	MJ

Table B1 Characterization factors contained in Cumulative Energy Demand (Frischknecht *et al.*, 2007) (cont'd)

Category	Compartment	Sub-Compartment	Substance	Factor	Unit per	
Renewable, water	Resource	unspecified	Water, barrage	0.01	MJ eq	kg
Renewable, water	Resource	unspecified	Energy, potential, stock, in barrage water	1	MJ eq	MJ

Table B2 Characterization factors contained in mineral extraction (van Oers, 2015)

Compartment	Sub-Compartment	Substance	CAS number	Factor	Unit
Resource	Unspecified	Aluminium, extracted for use	007429-90-5	1.09E-09	kg
Resource	Unspecified	Antimony, in ground	007440-36-0	1.00E+00	kg
Resource	Unspecified	Arsenic, in ground	007440-38-2	2.97E-03	kg
Resource	Unspecified	Barium, in ground	007440-39-3	6.04E-06	kg
Resource	Unspecified	Beryllium, in ground	007440-41-7	1.26E-05	kg
Resource	Unspecified	Bismuth, in ground	007440-69-9	4.11E-02	kg
Resource	Unspecified	Boron, in ground	007440-42-8	4.27E-03	kg
Resource	Unspecified	Bromine, in ground	007726-95-6	4.39E-03	kg
Resource	Unspecified	Cadmium, in ground	007440-43-9	1.57E-01	kg
Resource	Unspecified	Chlorine	007782-50-5	2.71E-05	kg
Resource	Unspecified	Chromium, in ground	007440-47-3	4.43E-04	kg
Resource	Unspecified	Cobalt, in ground	007440-48-4	1.57E-05	kg
Resource	Unspecified	Copper, in ground	007440-50-8	1.37E-03	kg
Resource	Unspecified	Gallium, in ground	007440-55-3	1.46E-07	kg
Resource	Unspecified	Germanium, in ground	007440-56-4	6.52E-07	kg
Resource	Unspecified	Gold, in ground	007440-57-5	5.20E+01	kg
Resource	Unspecified	Indium, in ground	007440-74-6	6.89E-03	kg
Resource	Unspecified	Iodine, in ground	007553-56-2	2.50E-02	kg
Resource	Unspecified	Iron, in ground	007439-89-6	5.24E-08	kg
Resource	Unspecified	Lead, in ground	007439-92-1	6.34E-03	kg
Resource	Unspecified	Lithium, in ground	007439-93-2	1.15E-05	kg
Resource	Unspecified	Magnesium, in ground	007439-95-4	2.02E-09	kg
Resource	Unspecified	Manganese, in ground	007439-96-5	2.54E-06	kg
Resource	Unspecified	Mercury, in ground	007439-97-6	9.22E-02	kg
Resource	Unspecified	Molybdenum, in ground	007439-98-7	1.78E-02	kg
Resource	Unspecified	Nickel, in ground	007440-02-0	6.53E-05	kg
Resource	Unspecified	Niobium, in ground	007440-03-1	1.93E-05	kg
Resource	Unspecified	Palladium, in ground	007440-05-3	5.71E-01	kg
Resource	Unspecified	Phosphorus, in ground	007723-14-0	5.52E-06	kg
Resource	Unspecified	Platinum, in ground	007440-06-4	2.22E+00	kg

Table B2 Characterization factors contained in mineral extraction (van Oers, 2015)
(cont'd)

Compartment	Sub-Compartment	Substance	CAS number	Factor	Unit
Resource	Unspecified	Potassium, in ground	007440-09-7	1.60E-08	kg
Resource	Unspecified	Rhenium, in ground	007440-15-5	6.03E-01	kg
Resource	Unspecified	Selenium, in ground	007782-49-2	1.94E-01	kg
Resource	Unspecified	Silicon, in ground	007440-21-3	1.40E-11	kg
Resource	Unspecified	Silver, in ground	007440-22-4	1.18E+00	kg
Resource	Unspecified	Sodium, in ground	007440-23-5	5.50E-08	kg
Resource	Unspecified	Strontium, in ground	007440-24-6	7.07E-07	kg
Resource	Unspecified	Sulfur, in ground	007704-34-9	1.93E-04	kg
Resource	Unspecified	Tantalum, in ground	007440-25-7	4.06E-05	kg
Resource	Unspecified	Tellurium, in ground	001349-48-9	4.07E+01	kg
Resource	Unspecified	Thallium, in ground	007440-28-0	2.43E-05	kg
Resource	Unspecified	Tin, in ground	007440-31-5	1.62E-02	kg
Resource	Unspecified	Titanium, in ground	007440-32-6	2.79E-08	kg
Resource	Unspecified	Tungsten, in ground	007440-33-7	4.52E-03	kg
Resource	Unspecified	Uranium, in ground	007440-61-1	1.40E-03	kg
Resource	Unspecified	Vanadium, in ground	007440-62-2	7.70E-07	kg
Resource	Unspecified	Yttrium, in ground	007440-65-5	5.69E-07	kg
Resource	Unspecified	Zinc, in ground	007440-66-6	5.38E-04	kg
Resource	Unspecified	Zirconium, in ground	007440-67-7	5.44E-06	kg

Table B3 Characterization factors of deposited wastes (Frischknecht and Büsser-Knöpfel, 2013)

Compartment	Sub-Compartment	Substance	Factor	Unit	
Waste	landfill	TOC, Total Organic Carbon	8.40E+03	UBP	kg
Waste	underground	Hazardous waste (deposited)	2.70E+04	UBP	kg
Waste	underground	Volume occupied, underground deposit	4.30E+07	UBP	m ³
Waste	radioactive	Volume occupied, final repository for low-active radioactive waste	2.10E+06	UBP	m ³
Waste	radioactive	Volume occupied, final repository for radioactive waste	3.50E+10	UBP	m ³

Table B4 Characterization factors of water resource consumption (Frischknecht and Büsser-Knöpfel, 2013)

Compartment	Sub-Compartment	Location	Factor	Unit	
Resource	unspecified	Australia	20.1	UBP	m ³
Resource	unspecified	Austria	21.2	UBP	m ³
Resource	unspecified	Belgium	1100	UBP	m ³
Resource	unspecified	Canada	2.4	UBP	m ³
Resource	unspecified	Chile	1.45	UBP	m ³
Resource	unspecified	Czech Republic	160	UBP	m ³
Resource	unspecified	Denmark	116	UBP	m ³
Resource	unspecified	Estonia	188	UBP	m ³
Resource	unspecified	Finland	2.11	UBP	m ³
Resource	unspecified	France	215	UBP	m ³
Resource	unspecified	Germany	421	UBP	m ³
Resource	unspecified	Greece	156	UBP	m ³
Resource	unspecified	Hungary	27.6	UBP	m ³
Resource	unspecified	Iceland	0.01	UBP	m ³
Resource	unspecified	Iceland	2.21	UBP	m ³
Resource	unspecified	Israel	11500	UBP	m ³
Resource	unspecified	Italy	539	UBP	m ³
Resource	unspecified	Japan	419	UBP	m ³
Resource	unspecified	Korea	1280	UBP	m ³
Resource	unspecified	Luxemburg	3.61	UBP	m ³
Resource	unspecified	Mexico	291	UBP	m ³
Resource	unspecified	Netherlands	130	UBP	m ³
Resource	unspecified	New Zealand	2.02	UBP	m ³
Resource	unspecified	Norway	0.57	UBP	m ³
Resource	unspecified	Poland	361	UBP	m ³
Resource	unspecified	Portugal	114	UBP	m ³
Resource	unspecified	Slovakia	1.8	UBP	m ³
Resource	unspecified	Slovenia	8.36	UBP	m ³
Resource	unspecified	Spain	811	UBP	m ³
Resource	unspecified	Sweden	2.16	UBP	m ³
Resource	unspecified	Switzerland	22.8	UBP	m ³
Resource	unspecified	Turkey	286	UBP	m ³
Resource	unspecified	UK (Great Britain and Northern Ireland)	74.7	UBP	m ³
Resource	unspecified	USA	232	UBP	m ³
Resource	unspecified	OECD (weighted mean)	318	UBP	m ³
Resource	unspecified	Afghanistan	1200	UBP	m ³
Resource	unspecified	Albania	19	UBP	m ³

Table B4 Characterization factors of water resource consumption (Frischknecht and Büsser-Knöpfel, 2013) (cont'd)

Compartment	Sub-Compartment	Location	Factor	Unit	
Resource	unspecified	Algeria	2700	UBP	m ³
Resource	unspecified	Angola	0.18	UBP	m ³
Resource	unspecified	Argentina	15	UBP	m ³
Resource	unspecified	Armenia	1300	UBP	m ³
Resource	unspecified	Azerbaijan	1200	UBP	m ³
Resource	unspecified	Bahrain	91000	UBP	m ³
Resource	unspecified	Bangladesh	8.2	UBP	m ³
Resource	unspecified	Barbados	5500	UBP	m ³
Resource	unspecified	Belarus	54	UBP	m ³
Resource	unspecified	Belize	0.63	UBP	m ³
Resource	unspecified	Benin	0.23	UBP	m ³
Resource	unspecified	Bhutan	0.18	UBP	m ³
Resource	unspecified	Bolivia	0.1	UBP	m ³
Resource	unspecified	Botswana	2.4	UBP	m ³
Resource	unspecified	Brazil	0.48	UBP	m ³
Resource	unspecified	Bulgaria	790	UBP	m ³
Resource	unspecified	Burkina Faso	59	UBP	m ³
Resource	unspecified	Burundi	5	UBP	m ³
Resource	unspecified	Cambodia	0.2	UBP	m ³
Resource	unspecified	Cameroon	0.11	UBP	m ³
Resource	unspecified	Cape Verde	51	UBP	m ³
Resource	unspecified	Chad	0.7	UBP	m ³
Resource	unspecified	China	360	UBP	m ³
Resource	unspecified	Columbia	0.34	UBP	m ³
Resource	unspecified	Congo	0.000029	UBP	m ³
Resource	unspecified	Costa Rica	5.4	UBP	m ³
Resource	unspecified	Croatia	0.34	UBP	m ³
Resource	unspecified	Cuba	380	UBP	m ³
Resource	unspecified	Cyprus	530	UBP	m ³
Resource	unspecified	Djibouti	38	UBP	m ³
Resource	unspecified	Dominican Republic	260	UBP	m ³
Resource	unspecified	Egypt	6100	UBP	m ³
Resource	unspecified	El Salvador	28	UBP	m ³
Resource	unspecified	Ecuador	12	UBP	m ³
Resource	unspecified	Equatorial Guinea	0.0043	UBP	m ³
Resource	unspecified	Eritrea	82	UBP	m ³
Resource	unspecified	Ethiopia	20	UBP	m ³

Table B4 Characterization factors of water resource consumption (Frischknecht and Büsser-Knöpfel, 2013) (cont'd)

Compartment	Sub-Compartment	Location	Factor	Unit	
Resource	unspecified	Fiji	0.078	UBP	m3
Resource	unspecified	Gambia	0.76	UBP	m3
Resource	unspecified	Georgia	5.7	UBP	m3
Resource	unspecified	Ghana	3.3	UBP	m3
Resource	unspecified	Guatemala	6.6	UBP	m3
Resource	unspecified	Guinea	0.49	UBP	m3
Resource	unspecified	Guinea-Bissau	0.3	UBP	m3
Resource	unspecified	Guyana	0.44	UBP	m3
Resource	unspecified	Haiti	70	UBP	m3
Resource	unspecified	Honduras	1.5	UBP	m3
Resource	unspecified	India	1300	UBP	m3
Resource	unspecified	Indonesia	30	UBP	m3
Resource	unspecified	Iraq	4500	UBP	m3
Resource	unspecified	Iran	4400	UBP	m3
Resource	unspecified	Ivory Coast	2.9	UBP	m3
Resource	unspecified	Jamaica	37	UBP	m3
Resource	unspecified	Jordan	3200	UBP	m3
Resource	unspecified	Kazakhstan	870	UBP	m3
Resource	unspecified	Kenya	76	UBP	m3
Resource	unspecified	Kyrgyzstan	410	UBP	m3
Resource	unspecified	Kuwait	20000000	UBP	m3
Resource	unspecified	Laos	1.6	UBP	m3
Resource	unspecified	Lesotho	0.87	UBP	m3
Resource	unspecified	Latvia	1.3	UBP	m3
Resource	unspecified	Lebanon	700	UBP	m3
Resource	unspecified	Libera	0.0057	UBP	m3
Resource	unspecified	Libya	500000	UBP	m3
Resource	unspecified	Lithuania	87	UBP	m3
Resource	unspecified	Madagascar	18	UBP	m3
Resource	unspecified	Malawi	30	UBP	m3
Resource	unspecified	Malaysia	5	UBP	m3
Resource	unspecified	Mali	41	UBP	m3
Resource	unspecified	Malta	11000	UBP	m3
Resource	unspecified	Mauritania	190	UBP	m3
Resource	unspecified	Mauritius	660	UBP	m3
Resource	unspecified	Moldavia	260	UBP	m3
Resource	unspecified	Mongolia	2.1	UBP	m3

Table B4 Characterization factors of water resource consumption (Frischknecht and Büsser-Knöpfel, 2013) (cont'd)

Compartment	Sub-Compartment	Location	Factor	Unit	
Resource	unspecified	Morocco	1800	UBP	m3
Resource	unspecified	Mozambique	0.11	UBP	m3
Resource	unspecified	Myanmar	7.7	UBP	m3
Resource	unspecified	Namibia	0.42	UBP	m3
Resource	unspecified	Nepal	21	UBP	m3
Resource	unspecified	Nicaragua	0.41	UBP	m3
Resource	unspecified	Niger	47	UBP	m3
Resource	unspecified	Nigeria	12	UBP	m3
Resource	unspecified	Oman	8500	UBP	m3
Resource	unspecified	Pakistan	3500	UBP	m3
Resource	unspecified	Panama	0.089	UBP	m3
Resource	unspecified	Paraguay	0.02	UBP	m3
Resource	unspecified	Peru	0.98	UBP	m3
Resource	unspecified	Philippines	280	UBP	m3
Resource	unspecified	Puerto Rico	190	UBP	m3
Resource	unspecified	Qatar	560000	UBP	m3
Resource	unspecified	Romania	10	UBP	m3
Resource	unspecified	Russia	2.1	UBP	m3
Resource	unspecified	Rwanda	2.4	UBP	m3
Resource	unspecified	Saudi Arabia	930000	UBP	m3
Resource	unspecified	Senegal	31	UBP	m3
Resource	unspecified	Sierra Leone	0.091	UBP	m3
Resource	unspecified	Somalia	480	UBP	m3
Resource	unspecified	Sri Lanka	580	UBP	m3
Resource	unspecified	South Africa	600	UBP	m3
Resource	unspecified	Sudan	590	UBP	m3
Resource	unspecified	Suriname	0.29	UBP	m3
Resource	unspecified	Swaziland	510	UBP	m3
Resource	unspecified	Syria	860	UBP	m3
Resource	unspecified	Tajikistan	140	UBP	m3
Resource	unspecified	Tanzania	28	UBP	m3
Resource	unspecified	Thailand	160	UBP	m3
Resource	unspecified	The Comoros	0.66	UBP	m3
Resource	unspecified	Togo	1.3	UBP	m3
Resource	unspecified	Trinidad and Tobago	35	UBP	m3
Resource	unspecified	Tunisia	3700	UBP	m3
Resource	unspecified	Turkmenistan	1600	UBP	m3

Table B4 Characterization factors of water resource consumption (Frischknecht and Büsser-Knöpfel, 2013) (cont'd)

Compartment	Sub-Compartment	Location	Factor	Unit	
Resource	unspecified	Uganda	0.24	UBP	m3
Resource	unspecified	Ukraine	730	UBP	m3
Resource	unspecified	United Arab Emirates	6800000	UBP	m3
Resource	unspecified	Uruguay	6.6	UBP	m3
Resource	unspecified	Uzbekistan	6500	UBP	m3
Resource	unspecified	Venezuela	0.52	UBP	m3
Resource	unspecified	Vietnam	82	UBP	m3
Resource	unspecified	Yemen	28000	UBP	m3
Resource	unspecified	Zambia	2.6	UBP	m3
Resource	unspecified	Zimbabwe	420	UBP	m3

Appendix C Bioethanol Production from Cassava Rhizome Flows Sheet Conversion and Data for Process Evaluation

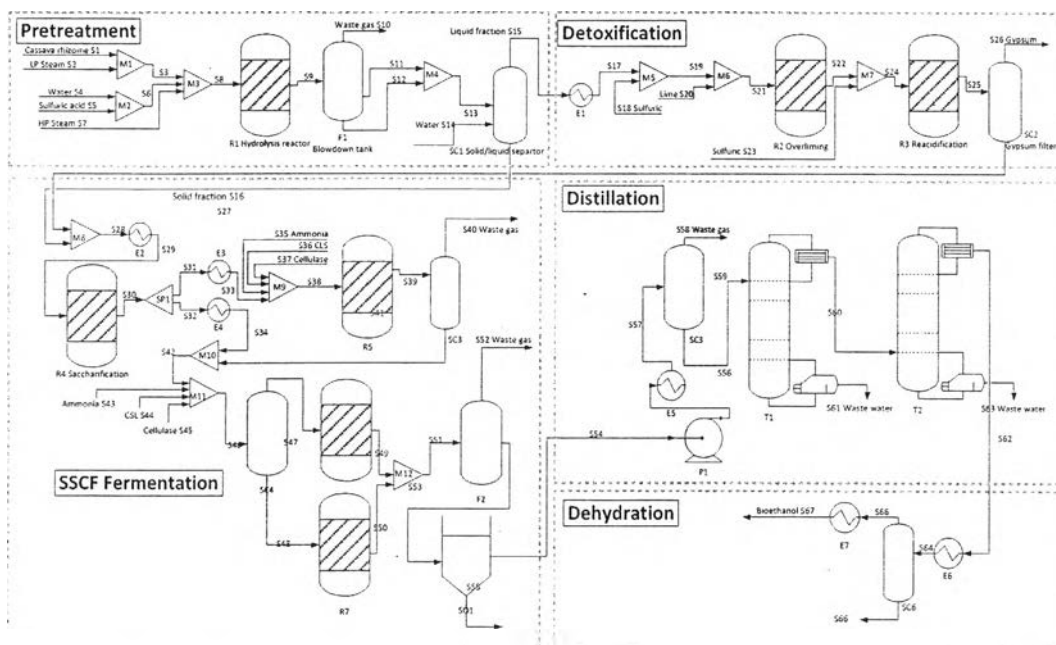


Figure C1 Bioethanol production from cassava rhizome process flow sheet.

Table C1 Stream table of the bioethanol process from cassava rhizome

Stream Name		S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16	S17
Stream Description																		
Stream Phase		Mixed	Vapor	Mixed	Liquid	Liquid	Liquid	Vapor	Mixed	Mixed	Vapor	Liquid	Solid	Mixed	Liquid	Mixed	Mixed	Mixed
Temperature	C	30.00	160.00	100.02	25.00	25.00	25.00	268.00	188.00	190.00	103.85	103.85	103.85	103.85	25.00	62.66	62.66	50.00
Pressure	ATM	1.00	6.00	1.00	1.00	1.00	1.00	13.00	12.10	12.10	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Total Molecular Weight		103.90	18.02	84.69	18.02	98.08	18.31	18.02	38.22	40.92	18.72	35.37	94.67	47.17	18.02	23.11	46.46	23.11
Total Weight Comp. Rates	kg/hr																	
Cellulose		4680.59	0.00	4680.59	0.00	0.00	0.00	0.00	4680.59	4320.19	0.00	0.00	4320.19	4320.19	0.00	21.60	4298.59	21.60
Hemicellulose		6674.09	0.00	6674.09	0.00	0.00	0.00	0.00	6674.09	333.70	0.00	0.00	333.70	333.70	0.00	1.67	332.04	1.67
Lignin		3653.45	0.00	3653.45	0.00	0.00	0.00	0.00	3653.45	3653.45	0.00	0.00	3653.45	3653.45	0.00	18.27	3635.18	18.27
Glucose		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	364.05	0.00	364.05	0.00	364.05	0.00	287.60	76.45	287.60
Xylose		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6825.73	0.00	6825.73	0.00	6825.73	0.00	4436.73	2389.01	4436.73
Cellobiose		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	34.58	0.00	34.58	0.00	34.58	0.00	27.32	7.26	27.32
Ethanol		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Water		129.52	785.09	914.61	4972.11	0.00	4972.11	3153.38	9040.11	8273.83	2371.59	5902.24	0.00	5902.24	12898.25	14852.38	3948.10	14852.38
Sulfuric Acid		0.00	0.00	0.00	0.00	99.44	99.44	0.00	99.44	99.44	0.00	99.44	0.00	99.44	0.00	78.56	20.88	78.56
Furfural		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	242.70	115.98	126.71	0.00	126.71	0.00	100.10	26.61	100.10
Ammonia		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Oxygen		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Carbon Dioxide		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Glycerol		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Succinic Acid		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lactic Acid		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HMF		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Xylitol		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Acetic Acid		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CornSteep Liquor		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ZM		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cellulase		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lime		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CASO4		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ash		578.25	0.00	578.25	0.00	0.00	0.00	0.00	578.25	578.25	0.00	0.00	578.25	578.25	0.00	0.00	578.25	0.00

Table C1 Stream table of the bioethanol process from cassava rhizome (cont'd)

Stream Name		S18	S19	S20	S21	S22	S23	S24	S25	S26	S27	S28	S29	S30	S31	S32	S33	S34	S35	
Stream Description																				
Stream Phase		Liquid	Mixed	Solid	Mixed	Mixed	Liquid	Mixed	Mixed	Mixed	Mixed	Mixed	Mixed	Mixed	Mixed	Mixed	Mixed	Mixed	Mixed	Vapor
Temperature	C	25.00	49.94	25.00	49.86	49.86	25.00	49.94	49.84	49.84	49.84	54.13	65.00	65.00	65.00	65.00	41.56	40.86	25.00	
Pressure	ATM	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Total Molecular Weight		98.08	23.21	74.09	23.35	23.30	98.08	23.34	23.33	137.76	22.96	29.48	29.48	30.09	30.09	30.09	30.09	30.09	17.03	
Total Weight Comp. Rates	kg/hr																			
Cellulose		0.00	21.60	0.00	21.60	21.60	0.00	21.60	21.60	21.60	0.00	4298.59	4298.59	378.29	37.83	340.45	37.83	340.45	0.00	
Hemicellulose		0.00	1.67	0.00	1.67	1.67	0.00	1.67	1.67	1.67	0.00	332.04	332.04	332.04	33.20	298.83	33.20	298.83	0.00	
Lignin		0.00	18.27	0.00	18.27	18.27	0.00	18.27	18.27	0.00	18.27	3653.45	3653.45	3653.45	365.34	3288.10	365.34	3288.10	0.00	
Glucose		0.00	287.60	0.00	287.60	287.60	0.00	287.60	287.60	0.58	287.02	363.47	363.47	4698.47	469.85	4228.63	469.85	4228.63	0.00	
Xylose		0.00	4436.73	0.00	4436.73	4436.73	0.00	4436.73	4436.73	8.87	4427.85	6816.86	6816.86	6816.86	681.69	6135.17	681.69	6135.17	0.00	
Cellobiose		0.00	27.32	0.00	27.32	27.32	0.00	27.32	27.32	0.00	27.32	34.58	34.58	54.45	5.44	49.00	5.44	49.00	0.00	
Ethanol		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Water		0.00	14852.38	0.00	14852.38	14922.47	0.00	14922.47	14939.62	0.00	14939.62	18887.72	18887.72	18453.19	1845.32	16607.87	1845.32	16607.87	0.00	
Sulfuric Acid		112.24	190.79	0.00	190.79	0.00	46.66	46.66	0.00	0.00	0.00	20.88	20.88	20.88	2.09	18.79	2.09	18.79	0.00	
Furfural		0.00	100.10	0.00	100.10	100.10	0.00	100.10	100.10	0.20	99.90	126.51	126.51	126.51	12.65	113.86	12.65	113.86	0.00	
Ammonia		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.83	
Oxygen		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Carbon Dioxide		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Glycerol		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Succinic Acid		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Lactic Acid		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
HMF		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Xylitol		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Acetic Acid		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Corn Steep Liquor		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
ZM		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Cellulase		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Lime		0.00	0.00	179.42	179.42	35.28	0.00	35.28	0.03	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
CASO4		0.00	0.00	0.00	0.00	264.84	0.00	264.84	329.61	329.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Ash		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	578.25	578.25	578.25	57.83	520.43	57.83	520.43	0.00	

Table C1 Stream table of the bioethanol process from cassava rhizome (cont'd)

Stream Name		S36	S37	S38	S39	S40	S41	S42	S43	S44	S45	S46	S47	S48	S49	S50	S51	S52	S53	S54
Stream Description																				
Stream Phase		Liquid	Mixed	Mixed	Mixed	Vapor	Mixed	Mixed	Vapor	Liquid	Solid	Mixed	Mixed	Liquid	Mixed	Liquid	Mixed	Vapor	Mixed	Liquid
Temperature	C	25.00	25.00	41.00	41.00	42.53	42.53	41.03	25.00	25.00	25.00	41.00	41.00	41.00	41.00	41.00	41.02	41.02	41.02	41.02
Pressure	ATM	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Total Molecular Weight		18.02	18.09	29.55	26.17	43.99	24.61	29.50	17.03	18.02	22.84	29.45	29.23	161.02	25.91	90.08	26.08	42.30	24.68	22.15
Total Weight Comp. Rates	kg/hr																			
Cellulose		0.00	0.00	37.83	37.83	0.00	37.83	378.28	0.00	0.00	0.00	378.28	378.28	0.00	37.37	0.00	37.37	0.00	37.37	0.00
Hemicellulose		0.00	0.00	33.20	33.20	0.00	33.20	332.04	0.00	0.00	0.00	332.04	332.04	0.00	332.04	0.00	332.04	0.00	332.04	0.00
Lignin		0.00	0.00	365.34	365.34	0.00	365.34	3653.45	0.00	0.00	0.00	3653.45	3653.45	0.00	3653.45	0.00	3653.45	0.00	3653.45	0.00
Glucose		0.00	0.00	469.85	43.90	0.00	43.90	4272.52	0.00	0.00	0.00	4272.52	4144.35	128.18	218.43	0.00	218.43	0.00	218.43	218.43
Xylose		0.00	0.00	681.69	121.40	0.00	121.40	6256.57	0.00	0.00	0.00	6256.57	6068.87	187.70	828.31	0.00	828.31	0.00	828.31	828.31
Cellobiose		0.00	0.00	5.44	5.44	0.00	5.44	54.45	0.00	0.00	0.00	54.45	54.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ethanol		0.00	0.00	0.00	495.17	37.14	458.03	458.03	0.00	0.00	0.00	458.03	458.03	0.00	5321.67	0.00	5321.67	258.60	5063.08	5063.08
Water		0.00	37.74	1883.06	1883.99	0.94	1883.04	18490.92	0.00	0.00	0.00	18490.92	18490.92	0.00	18449.79	0.00	18449.79	131.71	18318.08	18318.08
Sulfuric Acid		0.00	0.00	2.09	2.09	0.00	2.09	20.88	0.00	0.00	0.00	20.88	20.88	0.00	20.88	0.00	20.88	0.00	20.88	20.88
Furfural		0.00	0.00	12.65	12.65	0.00	12.65	126.51	0.00	0.00	0.00	126.51	126.51	0.00	126.51	0.00	126.51	2.19	124.32	124.32
Ammonia		0.00	0.00	0.83	0.00	0.00	0.00	0.00	2.48	0.00	0.00	2.48	2.48	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Oxygen		0.00	0.00	0.00	1.38	1.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.76	0.00	7.76	7.65	0.11	0.11
Carbon Dioxide		0.00	0.00	0.00	472.36	448.74	23.62	23.62	0.00	0.00	0.00	23.62	23.62	0.00	4665.47	0.00	4665.47	4068.94	596.53	596.53
Glycerol		0.00	0.00	0.00	0.59	0.00	0.59	0.59	0.00	0.00	0.00	0.59	0.59	0.00	4.24	0.00	4.24	0.00	4.24	4.24
Succinic Acid		0.00	0.00	0.00	1.82	0.00	1.82	1.82	0.00	0.00	0.00	1.82	1.82	0.00	13.60	0.00	13.60	0.00	13.60	13.60
Lactic Acid		0.00	0.00	0.00	0.33	0.00	0.33	0.33	0.00	0.00	0.00	0.33	0.33	0.00	2.43	315.87	318.30	0.00	318.30	318.30
HMF		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Xylitol		0.00	0.00	0.00	6.08	0.00	6.08	6.08	0.00	0.00	0.00	6.08	6.08	0.00	47.59	0.00	47.59	0.00	47.59	47.59
Acetic Acid		0.00	0.00	0.00	2.40	0.00	2.40	2.40	0.00	0.00	0.00	2.40	2.40	0.00	17.51	0.00	17.51	0.15	17.36	17.36
CornSteep Liquor		59.69	0.00	59.69	59.69	0.00	59.69	59.69	0.00	87.78	0.00	147.47	147.47	0.00	147.47	0.00	147.47	0.57	146.91	146.91
ZM		0.00	0.00	0.00	6.01	0.00	6.01	6.01	0.00	0.00	0.00	6.01	6.01	0.00	23.96	0.00	23.96	0.00	23.96	0.00
Cellulase		0.00	0.76	0.76	0.76	0.00	0.76	0.76	0.00	0.00	7.57	8.32	8.32	0.00	8.32	0.00	8.32	0.00	8.32	0.00
Lime		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CASO4		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ash		0.00	0.00	57.83	57.83	0.00	57.83	578.25	0.00	0.00	0.00	578.25	578.25	0.00	578.25	0.00	578.25	0.00	578.25	0.00

Table C1 Stream table of the bioethanol process from cassava rhizome (cont'd)

Stream Name		S55	S56	S57	S58	S59	S60	S61	S62	S63	S64	S65	S66	S67
Stream Description														
Stream Phase		Solid	Liquid	Liquid	Vapor	Liquid	Vapor	Liquid	Liquid	Liquid	Vapor	Vapor	Vapor	Liquid
Temperature	C	41.02	41.24	100.51	100.00	100.00	93.83	116.68	93.34	109.99	100.00	100.02	100.02	40.00
Pressure	ATM	1.00	4.76	4.76	4.76	4.76	1.77	1.77	1.77	1.77	1.77	1.00	1.00	1.00
Total Molecular Weight		67.37	22.15	22.15	42.46	21.89	38.74	19.42	42.12	18.75	42.12	46.03	18.02	46.03
Total Weight Comp. Rates	kg/hr													
Cellulose		37.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hemicellulose		332.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lignin		3653.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Glucose		0.00	218.43	218.43	0.00	218.43	0.00	218.43	0.00	0.00	0.00	0.00	0.00	0.00
Xylose		0.00	828.31	828.31	0.00	828.31	0.00	828.31	0.00	0.00	0.00	0.00	0.00	0.00
Cellobiose		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ethanol		0.00	5063.08	5063.08	15.19	5047.89	4987.13	60.76	4962.20	24.93	4962.20	4962.20	0.00	4962.20
Water		0.00	18318.08	18318.08	16.49	18301.59	689.61	17611.99	317.86	371.75	317.86	2.48	315.38	2.48
Sulfuric Acid		0.00	20.88	20.88	0.00	20.88	0.00	20.88	0.00	0.00	0.00	0.00	0.00	0.00
Furfural		0.00	124.32	124.32	0.74	123.58	0.36	123.23	0.00	0.36	0.00	0.00	0.00	0.00
Ammonia		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Oxygen		0.00	0.11	0.11	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Carbon Dioxide		0.00	596.53	596.53	596.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Glycerol		0.00	4.24	4.24	0.00	4.24	0.00	4.24	0.00	0.00	0.00	0.00	0.00	0.00
Succinic Acid		0.00	13.60	13.60	0.00	13.60	0.00	13.60	0.00	0.00	0.00	0.00	0.00	0.00
Lactic Acid		0.00	318.30	318.30	0.00	318.30	0.00	318.30	0.00	0.00	0.00	0.00	0.00	0.00
HMF		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Xylitol		0.00	47.59	47.59	0.00	47.59	0.00	47.59	0.00	0.00	0.00	0.00	0.00	0.00
Acetic Acid		0.00	17.36	17.36	0.01	17.36	0.01	17.34	0.00	0.01	0.00	0.00	0.00	0.00
CornSteep Liquor		0.00	146.91	146.91	0.13	146.78	0.04	146.74	0.00	0.04	0.00	0.00	0.00	0.00
ZM		23.96	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cellulase		8.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lime		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CASO4		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ash		578.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table C2 Equipment table of the bioethanol process from cassava rhizome

Pump		
Pump Name		P1
Work	KW	5.698

Reactor								
ConReactor Name		R1	R2	R3	R4	R5	R6	R7
Temperature	C	190	50	50	65	41	41	41
Pressure	ATM	12.100	1.000	1.000	1.000	1.000	1.000	1.000
Duty	MJ/HR	0.000	-399.600	-97.700	1613.200	-843.300	-8214.400	-322.900
Heat Of Reaction	MJ/HR	-1.288	-0.381	-0.093	-0.878	-0.011	-0.380	0.092
Product Enthalpy	KJ/KG	-227.731	1309.967	1335.907	821.194	-36.536	-272.505	8.343
Feed Enthalpy	KJ/KG	-4142.821	1205.755	1310.420	-1562.669	19.703	39.694	31.737
ΔEnthalpy	KJ/KG	3915.090	104.212	25.488	2383.863	-56.239	-312.199	-23.393
	GJ/KG	3.915	0.104	0.025	2.384	-0.056	-0.312	-0.023

Flash			
Flash Name		F1	F2
Temperature	C	103.854	41.021
Pressure	ATM	1.000	1.000
DP	ATM	11.100	0.000
Duty	MJ/HR	0.000	0.000

Stream Calculator							
Stream Calculator Name		SC1	SC2	SC3	SC4	SC5	SC6
Duty	MJ/HR	0.000	0.000	0.000	0.000	0.000	0.000
Overhead Product Temperature	C	62.663	49.837	42.531	41.000	100.000	100.018
Bottoms Product Temperature	C	62.663	49.837	42.531	41.000	100.000	100.018

Heat Exchanger								
Hx Name		E1	E2	E3	E4	E5	E6	E7
Duty	MJ/HR	859.300	1113.000	235.200	2180.000	5678.500	4804.000	4840.400

Column			
Column Name		T1	T2
Condenser Duty	MJ/HR	-18089.200	-19971.200
Reboiler Duty	MJ/HR	24889.600	14371.400
Column Total Molar Feed	MOL/DAY	27507.280	3517.017
Column Total Wt. Feed	KG/DAY	602124.669	136253.109
Column Condenser Pres	ATM	1.770	1.770
Column Condenser Temp	C	93.831	93.344
Column Reflux Rate	MOL/DAY	0.000	9628.490
Column Reflux Ratio		3.200	3.200

Appendix D Contribution Analysis

Table D1 LCI contribution results of bioethanol production process from cassava rhizome

No	Substance	Compartment	Sub compartment	Unit	Total	Pretreatment	Detoxification	SSCF	Distillation	Dehydration
1	1,4-Butanediol	air	high population density	kg	2.49E-08	7.98E-10	1.51E-09	4.50E-09	1.81E-08	5.10E-12
2	1,4-Butanediol	water	river	kg	9.97E-09	3.19E-10	6.04E-10	1.80E-09	7.24E-09	2.04E-12
3	2,4-D	soil	agricultural	kg	3.88E-07	1.68E-09	7.39E-09	5.41E-08	2.94E-07	3.05E-08
4	2-Propanol	air	high population density	kg	4.66E-04	1.49E-05	2.83E-05	8.42E-05	3.39E-04	8.47E-08
5	4-Methyl-2-pentanone	water	unspecified	kg	2.35E-08	1.23E-11	2.47E-11	9.45E-11	2.34E-08	7.35E-13
6	Acenaphthene	air	high population density	kg	5.68E-10	9.69E-12	2.17E-11	9.00E-11	4.23E-10	2.43E-11
7	Acenaphthene	air	low population density	kg	8.33E-11	4.92E-13	1.60E-12	1.48E-11	6.58E-11	5.47E-13
8	Acenaphthene	air	unspecified	kg	5.40E-11	2.83E-14	5.67E-14	2.17E-13	5.37E-11	1.69E-15
9	Acenaphthene	water	ocean	kg	4.64E-09	3.23E-10	5.59E-10	7.08E-10	2.89E-09	1.64E-10
10	Acenaphthene	water	river	kg	1.10E-08	6.67E-10	1.17E-09	1.65E-09	7.05E-09	4.52E-10
11	Acenaphthylene	water	ocean	kg	2.90E-10	2.02E-11	3.50E-11	4.43E-11	1.81E-10	1.02E-11
12	Acenaphthylene	water	river	kg	6.88E-10	4.17E-11	7.33E-11	1.03E-10	4.41E-10	2.82E-11
13	Acetaldehyde	air	high population density	kg	1.25E-04	1.10E-06	3.26E-06	1.91E-05	8.99E-05	1.18E-05
14	Acetaldehyde	air	low population density	kg	4.19E-06	1.75E-08	7.89E-08	5.83E-07	3.17E-06	3.31E-07
15	Acetaldehyde	air	unspecified	kg	8.69E-05	5.45E-06	9.50E-06	1.32E-05	5.72E-05	1.59E-06
16	Acetaldehyde	water	river	kg	1.43E-05	4.59E-07	8.69E-07	2.59E-06	1.04E-05	2.74E-09
17	Acetic acid	air	high population density	kg	9.52E-03	7.11E-06	1.45E-04	8.63E-04	7.04E-03	1.46E-03
18	Acetic acid	air	low population density	kg	2.75E-05	1.15E-07	5.18E-07	3.83E-06	2.09E-05	2.18E-06
19	Acetic acid	air	unspecified	kg	1.94E-04	4.09E-06	8.57E-06	2.87E-05	1.44E-04	8.63E-06
20	Acetic acid	water	river	kg	4.37E-05	1.27E-06	2.46E-06	7.54E-06	3.19E-05	6.19E-07
21	Acetone	air	high population density	kg	6.25E-04	1.91E-05	3.65E-05	1.15E-04	4.52E-04	2.06E-06
22	Acetone	air	low population density	kg	3.28E-05	3.60E-07	9.33E-07	5.47E-06	2.49E-05	1.13E-06
23	Acetone	water	unspecified	kg	5.61E-08	2.94E-11	5.89E-11	2.25E-10	5.58E-08	1.75E-12
24	Acetonitrile	air	low population density	kg	1.15E-06	4.82E-09	2.17E-08	1.60E-07	8.73E-07	9.10E-08
25	Acidity, unspecified	water	river	kg	2.62E-05	1.70E-07	5.78E-07	3.90E-06	1.99E-05	1.66E-06
26	Acidity, unspecified	water	unspecified	kg	1.18E-06	6.18E-10	1.24E-09	4.74E-09	1.17E-06	3.69E-11

Table D1 LCI contribution results of bioethanol production process from cassava rhizome (cont'd)

No	Substance	Compartment	Sub compartment	Unit	Total	Pretreatment	Detoxification	SSCF	Distillation	Dehydration
27	Acids, unspecified	water	unspecified	kg	8.88E-06	0.00E+00	0.00E+00	8.88E-06		
28	Aclonifen	soil	agricultural	kg	5.44E-08	2.69E-09	4.81E-09	8.52E-09	3.72E-08	1.22E-09
29	Acrolein	air	high population density	kg	5.06E-07	1.75E-09	8.06E-09	9.65E-08	3.98E-07	2.55E-09
30	Acrolein	air	low population density	kg	8.24E-08	7.02E-10	1.96E-09	1.44E-08	6.40E-08	1.28E-09
31	Acrolein	air	unspecified	kg	3.13E-08	1.64E-11	3.28E-11	1.26E-10	3.11E-08	9.77E-13
32	Acrylate, ion	water	river	kg	2.85E-06	9.14E-08	1.73E-07	5.15E-07	2.07E-06	5.21E-10
33	Acrylic acid	air	high population density	kg	1.21E-06	3.86E-08	7.32E-08	2.18E-07	8.76E-07	2.20E-10
34	Actinides, radioactive, unspecified	air	low population density	kBq	3.38E-04	2.00E-06	6.52E-06	6.03E-05	2.67E-04	2.22E-06
35	Actinides, radioactive, unspecified	water	ocean	kBq	3.51E-02	1.72E-04	6.42E-04	6.52E-03	2.73E-02	3.73E-04
36	Aerosols, radioactive, unspecified	air	low population density	kBq	4.13E-03	2.56E-05	8.44E-05	7.58E-04	3.21E-03	5.56E-05
37	Aldehydes, unspecified	air	high population density	kg	5.75E-06	1.09E-07	2.34E-07	9.90E-07	4.29E-06	1.22E-07
38	Aldehydes, unspecified	air	low population density	kg	1.19E-05	4.78E-08	2.00E-07	2.22E-06	9.28E-06	1.03E-07
39	Aldehydes, unspecified	air	unspecified	kg	1.13E-06	1.20E-10	2.41E-10	9.02E-07	2.29E-07	7.18E-12
40	Aldrin	soil	agricultural	kg	3.10E-08	9.93E-10	1.88E-09	5.60E-09	2.25E-08	5.71E-12
41	Aluminium, 24% in bauxite, 11% in crude ore, in ground	resource	in ground	kg	3.55E+00	3.37E-02	8.98E-02	6.76E-01	2.75E+00	4.12E-03
42	Aluminum	air	high population density	kg	1.02E-03	2.17E-05	4.49E-05	1.83E-04	7.58E-04	8.75E-06
43	Aluminum	air	low population density	kg	3.22E-04	6.90E-06	1.44E-05	5.41E-05	2.36E-04	1.02E-05
44	Aluminum	air	unspecified	kg	5.43E-02	8.29E-04	1.88E-03	9.84E-03	4.11E-02	5.83E-04
45	Aluminum	soil	agricultural	kg	2.34E-04	3.48E-06	8.06E-06	3.92E-05	1.76E-04	7.19E-06
46	Aluminum	soil	industrial	kg	1.41E-02	7.54E-05	2.98E-04	1.77E-03	1.05E-02	1.39E-03
47	Aluminum	water	ground-	kg	3.11E-04	5.65E-06	1.24E-05	5.01E-05	2.31E-04	1.18E-05
48	Aluminum	water	ground-, long-term	kg	4.49E-01	8.71E-03	1.86E-02	7.56E-02	3.34E-01	1.19E-02
49	Aluminum	water	ocean	kg	9.95E-03	1.16E-05	1.44E-04	1.30E-03	7.56E-03	9.27E-04
50	Aluminum	water	river	kg	6.02E-03	3.04E-05	1.12E-04	1.10E-03	4.68E-03	8.49E-05
51	Aluminum	water	unspecified	kg	1.67E-04	2.77E-07	1.16E-06	1.16E-05	1.52E-04	1.66E-06
52	Ammonia	air	high population density	kg	1.47E-03	3.17E-05	6.60E-05	2.43E-04	1.08E-03	4.31E-05

Table D1 LCI contribution results of bioethanol production process from cassava rhizome (cont'd)

No	Substance	Compartment	Sub compartment	Unit	Total	Pretreatment	Detoxification	SSCF	Distillation	Dehydration
53	Ammonia	air	low population density	kg	2.56E-03	4.43E-05	9.73E-05	4.48E-04	1.92E-03	5.02E-05
54	Ammonia	air	unspecified	kg	3.99E+00	3.90E+00	1.59E-03	3.17E-02	5.71E-02	2.62E-04
55	Ammonia	water	unspecified	kg	1.23E-05	0.00E+00	0.00E+00	1.23E-05		
56	Ammonium carbonate	air	high population density	kg	1.98E-06	2.41E-09	2.48E-08	3.71E-07	1.56E-06	2.11E-08
57	Ammonium ion	water	ground-	kg	7.19E-05	1.27E-06	2.80E-06	1.19E-05	5.37E-05	2.26E-06
58	Ammonium ion	water	ground-, long-term	kg	7.73E-04	6.39E-05	1.09E-04	1.02E-04	4.73E-04	2.51E-05
59	Ammonium ion	water	ocean	kg	1.57E-04	3.37E-05	5.46E-05	1.21E-05	5.29E-05	3.29E-06
60	Ammonium ion	water	river	kg	3.15E-03	1.18E-04	2.19E-04	5.31E-04	2.24E-03	3.93E-05
61	Ammonium ion	water	unspecified	kg	6.92E-05	3.62E-08	7.27E-08	2.78E-07	6.88E-05	2.16E-09
62	Anhydrite, in ground	resource	in ground	kg	1.28E-05	1.33E-07	3.48E-07	2.26E-06	9.83E-06	2.73E-07
63	Antimony	air	high population density	kg	6.14E-07	1.71E-08	3.32E-08	1.11E-07	4.51E-07	1.47E-09
64	Antimony	air	low population density	kg	1.07E-04	1.29E-06	3.13E-06	2.01E-05	8.18E-05	2.80E-07
65	Antimony	air	unspecified	kg	1.85E-08	4.29E-10	8.69E-10	3.62E-09	1.30E-08	6.10E-10
66	Antimony	soil	agricultural	kg	2.58E-09	1.06E-10	1.93E-10	4.53E-10	1.83E-09	3.44E-12
67	Antimony	water	ground-	kg	1.59E-05	4.46E-07	8.87E-07	2.24E-06	1.13E-05	9.52E-07
68	Antimony	water	ground-, long-term	kg	5.52E-04	1.58E-05	3.06E-05	9.85E-05	4.04E-04	3.12E-06
69	Antimony	water	river	kg	2.85E-04	8.08E-06	1.57E-05	5.14E-05	2.09E-04	8.94E-07
70	Antimony	water	unspecified	kg	6.32E-08	3.31E-11	6.64E-11	2.54E-10	6.28E-08	1.97E-12
71	Antimony-122	water	river	kBq	1.45E-04	6.65E-08	1.61E-06	2.83E-05	1.15E-04	1.10E-07
72	Antimony-124	air	low population density	kBq	3.60E-07	1.65E-10	4.00E-09	7.02E-08	2.85E-07	2.72E-10
73	Antimony-124	water	river	kBq	1.05E-02	2.86E-05	1.56E-04	2.01E-03	8.29E-03	6.08E-05
74	Antimony-125	air	low population density	kBq	3.76E-06	1.72E-09	4.17E-08	7.32E-07	2.98E-06	2.84E-09
75	Antimony-125	water	river	kBq	9.78E-03	2.64E-05	1.44E-04	1.86E-03	7.69E-03	5.63E-05
76	AOX, Adsorbable Organic Halogen as Cl	water	ocean	kg	1.24E-06	1.49E-07	2.49E-07	1.24E-07	6.49E-07	6.80E-08
77	AOX, Adsorbable Organic Halogen as Cl	water	river	kg	4.88E-05	1.59E-06	3.01E-06	8.68E-06	3.53E-05	2.17E-07
78	AOX, Adsorbable Organic Halogen as Cl	water	unspecified	kg	1.68E-07	2.43E-09	5.70E-09	2.73E-08	1.26E-07	6.36E-09

Table D1 LCI contribution results of bioethanol production process from cassava rhizome (cont'd)

No	Substance	Compartment	Sub compartment	Unit	Total	Pretreatment	Detoxification	SSCF	Distillation	Dehydration
79	Argon-41	air	low population density	kBq	1.36E+00	1.30E-02	3.53E-02	2.39E-01	1.04E+00	3.01E-02
80	Arsenic, ion	water	ground-	kg	1.12E-04	2.26E-06	4.82E-06	1.76E-05	8.29E-05	4.89E-06
81	Arsenic, ion	water	ground-long-term	kg	5.92E-06	2.26E-07	4.18E-07	1.00E-06	4.20E-06	6.59E-08
82	Arsenic, ion	water	lake	kg	5.58E-11	1.79E-12	3.38E-12	1.01E-11	4.05E-11	1.14E-14
83	Arsenic, ion	water	ocean	kg	1.26E-05	1.53E-07	3.97E-07	1.62E-06	9.27E-06	1.12E-06
84	Arsenic, ion	water	river	kg	3.96E-04	7.07E-06	1.55E-05	6.77E-05	2.97E-04	9.54E-06
85	Arsenic, ion	water	unspecified	kg	5.13E-06	8.49E-08	1.77E-07	6.40E-07	4.10E-06	1.25E-07
86	Arsenic	air	high population density	kg	6.68E-06	5.59E-07	9.47E-07	1.24E-06	3.83E-06	1.13E-07
87	Arsenic	air	low population density	kg	7.92E-04	9.18E-06	2.27E-05	1.49E-04	6.09E-04	2.19E-06
88	Arsenic	air	unspecified	kg	1.36E-07	2.59E-09	5.25E-09	3.62E-08	8.81E-08	3.66E-09
89	Arsenic	soil	agricultural	kg	2.58E-07	7.14E-09	1.39E-08	4.55E-08	1.89E-07	2.31E-09
90	Arsenic	soil	industrial	kg	5.63E-06	3.02E-08	1.19E-07	7.09E-07	4.22E-06	5.58E-07
91	Arsine	air	high population density	kg	1.41E-11	4.50E-13	8.53E-13	2.54E-12	1.02E-11	2.56E-15
92	Atrazine	soil	agricultural	kg	8.13E-09	2.61E-10	4.94E-10	1.47E-09	5.91E-09	1.50E-12
93	Barite, 15% in crude ore, in ground	resource	in ground	kg	3.24E+00	1.31E-02	6.17E-02	4.11E-01	2.43E+00	3.17E-01
94	Barite	water	ocean	kg	4.75E-01	6.31E-04	7.00E-03	6.13E-02	3.60E-01	4.55E-02
95	Barium	air	high population density	kg	1.23E-05	2.59E-07	5.38E-07	2.22E-06	9.20E-06	1.06E-07
96	Barium	air	low population density	kg	3.04E-05	6.04E-07	1.29E-06	4.83E-06	2.25E-05	1.23E-06
97	Barium	air	unspecified	kg	6.48E-10	1.14E-15	4.02E-15	6.48E-10	1.78E-13	1.53E-15
98	Barium	soil	agricultural	kg	6.96E-08	2.43E-09	4.56E-09	1.21E-08	4.95E-08	9.57E-10
99	Barium	soil	industrial	kg	7.04E-03	3.77E-05	1.49E-04	8.86E-04	5.27E-03	6.97E-04
100	Barium	water	ground-	kg	1.86E-04	7.48E-07	3.15E-06	3.50E-05	1.46E-04	1.62E-06
101	Barium	water	ground-, long-term	kg	4.43E-03	8.74E-05	1.87E-04	7.14E-04	3.28E-03	1.62E-04
102	Barium	water	ocean	kg	6.53E-04	4.63E-05	7.98E-05	9.93E-05	4.05E-04	2.29E-05
103	Barium	water	river	kg	1.60E-03	9.43E-05	1.66E-04	2.41E-04	1.03E-03	6.70E-05
104	Barium	water	unspecified	kg	1.60E-03	8.37E-07	1.68E-06	6.42E-06	1.59E-03	4.99E-08
105	Barium-140	air	low population density	kBq	2.44E-04	1.12E-07	2.72E-06	4.76E-05	1.94E-04	1.85E-07
106	Barium-140	water	river	kBq	6.36E-04	2.92E-07	7.07E-06	1.24E-04	5.04E-04	4.80E-07
107	Basalt, in ground	resource	in ground	kg	4.15E-01	6.68E-03	1.48E-02	7.73E-02	3.15E-01	1.04E-03

Table D1 LCI contribution results of bioethanol production process from cassava rhizome (cont'd)

No	Substance	Compartment	Sub compartment	Unit	Total	Pretreatment	Detoxification	SSCF	Distillation	Dehydration
108	Benomyl	soil	agricultural	kg	2.46E-09	1.03E-11	4.64E-11	3.43E-10	1.87E-09	1.95E-10
109	Bentazone	soil	agricultural	kg	2.78E-08	1.37E-09	2.46E-09	4.35E-09	1.90E-08	6.22E-10
110	Benzal chloride	air	unspecified	kg	3.97E-12	2.08E-15	4.17E-15	1.59E-14	3.94E-12	1.24E-16
111	Benzaldehyde	air	high population density	kg	2.64E-07	9.11E-10	4.20E-09	5.04E-08	2.07E-07	1.33E-09
112	Benzene, chloro-	water	river	kg	6.92E-05	2.21E-06	4.20E-06	1.25E-05	5.03E-05	1.42E-08
113	Benzene, ethyl-	air	high population density	kg	6.07E-05	3.43E-06	6.06E-06	9.66E-06	3.97E-05	1.80E-06
114	Benzene, ethyl-	air	low population density	kg	1.54E-08	9.07E-11	2.96E-10	2.74E-09	1.21E-08	1.01E-10
115	Benzene, ethyl-	water	ocean	kg	1.79E-05	1.25E-06	2.16E-06	2.73E-06	1.11E-05	6.32E-07
116	Benzene, ethyl-	water	river	kg	4.24E-05	2.58E-06	4.52E-06	6.38E-06	2.72E-05	1.74E-06
117	Benzene, ethyl-	water	unspecified	kg	5.29E-07	2.77E-10	5.56E-10	2.12E-09	5.26E-07	1.65E-11
118	Benzene, hexachloro-	air	high population density	kg	4.55E-09	1.59E-10	2.98E-10	7.87E-10	3.26E-09	4.28E-11
119	Benzene, hexachloro-	air	unspecified	kg	4.70E-07	1.06E-08	2.19E-08	7.58E-08	3.45E-07	1.63E-08
120	Benzene, pentachloro-	air	high population density	kg	1.14E-08	3.98E-10	7.47E-10	1.98E-09	8.20E-09	1.07E-10
121	Benzene	air	high population density	kg	2.49E-02	2.18E-05	3.86E-04	2.20E-03	1.85E-02	3.88E-03
122	Benzene	air	low population density	kg	1.31E-03	1.91E-05	4.46E-05	2.21E-04	9.88E-04	3.97E-05
123	Benzene	air	lower stratosphere + upper troposphere	kg	5.46E-09	1.33E-10	2.66E-10	1.01E-09	4.06E-09	1.11E-12
124	Benzene	air	unspecified	kg	5.04E-04	9.69E-06	1.92E-05	7.20E-05	4.00E-04	2.87E-06
125	Benzene	water	ocean	kg	7.05E-05	4.48E-06	7.82E-06	1.05E-05	4.47E-05	3.02E-06
126	Benzene	water	river	kg	4.07E-04	1.32E-05	2.52E-05	6.71E-05	2.90E-04	1.12E-05
127	Benzene	water	unspecified	kg	9.42E-06	4.93E-09	9.89E-09	3.78E-08	9.36E-06	2.94E-10
128	Benzo(a)pyrene	air	high population density	kg	6.58E-07	8.30E-10	1.05E-08	6.13E-08	4.87E-07	9.81E-08
129	Benzo(a)pyrene	air	low population density	kg	6.23E-06	8.41E-08	2.01E-07	1.06E-06	4.71E-06	1.77E-07
130	Benzo(a)pyrene	air	unspecified	kg	8.47E-06	8.18E-08	2.17E-07	1.60E-06	6.55E-06	2.28E-08
131	Beryllium	air	high population density	kg	1.30E-07	2.75E-09	5.71E-09	2.32E-08	9.72E-08	1.45E-09
132	Beryllium	air	low population density	kg	4.23E-07	7.97E-09	1.70E-08	7.73E-08	3.18E-07	2.38E-09
133	Beryllium	air	unspecified	kg	2.68E-08	6.43E-10	1.30E-09	4.19E-09	1.97E-08	9.15E-10
134	Beryllium	water	ground-	kg	3.34E-08	7.26E-10	1.52E-09	5.12E-	2.45E-08	1.57E-09

Table D1 LCI contribution results of bioethanol production process from cassava rhizome (cont'd)

No	Substance	Compartment	Sub compartment	Unit	Total	Pretreatment	Detoxification	SSCF	Distillation	Dehydration
								09		
135	Beryllium	water	ground-long-term	kg	2.86E-05	6.12E-07	1.29E-06	4.44E-06	2.10E-05	1.27E-06
136	Beryllium	water	river	kg	1.96E-07	9.61E-10	3.59E-09	3.66E-08	1.53E-07	2.00E-09
137	Beryllium	water	unspecified	kg	5.63E-08	2.95E-11	5.91E-11	2.26E-10	5.60E-08	1.76E-12
138	BOD5, Biological Oxygen Demand	water	ground-	kg	1.43E-05	2.54E-07	5.58E-07	2.37E-06	1.07E-05	4.50E-07
139	BOD5, Biological Oxygen Demand	water	ground-long-term	kg	2.74E-01	7.33E-03	1.45E-02	4.64E-02	2.00E-01	5.39E-03
140	BOD5, Biological Oxygen Demand	water	ocean	kg	3.10E-01	4.99E-03	1.16E-02	4.25E-02	2.27E-01	2.45E-02
141	BOD5, Biological Oxygen Demand	water	river	kg	5.22E-01	2.85E-02	5.05E-02	8.42E-02	3.44E-01	1.47E-02
142	BOD5, Biological Oxygen Demand	water	unspecified	kg	1.19E-02	1.87E-04	4.12E-04	2.03E-03	8.99E-03	3.02E-04
143	Borax, in ground	resource	in ground	kg	9.80E-06	3.05E-08	1.51E-07	1.87E-06	7.70E-06	4.35E-08
144	Boron trifluoride	air	high population density	kg	1.05E-13	3.36E-15	6.37E-15	1.89E-14	7.62E-14	1.91E-17
145	Boron	air	high population density	kg	4.85E-05	1.05E-06	2.16E-06	8.71E-06	3.62E-05	4.37E-07
146	Boron	air	low population density	kg	1.93E-03	3.68E-05	7.98E-05	3.07E-04	1.43E-03	7.97E-05
147	Boron	air	unspecified	kg	1.30E-12	6.55E-15	2.32E-14	2.30E-13	1.03E-12	8.82E-15
148	Boron	soil	agricultural	kg	1.02E-08	3.02E-10	5.84E-10	1.76E-09	7.30E-09	2.55E-10
149	Boron	soil	industrial	kg	1.41E-04	7.54E-07	2.98E-06	1.77E-05	1.05E-04	1.39E-05
150	Boron	soil	unspecified	kg	2.72E-04	3.08E-07	3.37E-06	5.10E-05	2.14E-04	2.94E-06
151	Boron	water	ground-	kg	5.62E-05	8.79E-07	2.01E-06	9.25E-06	4.21E-05	1.93E-06
152	Boron	water	ground-long-term	kg	4.84E-03	7.60E-05	1.74E-04	7.92E-04	3.62E-03	1.73E-04
153	Boron	water	ocean	kg	1.56E-05	4.06E-06	6.54E-06	9.41E-07	3.84E-06	2.17E-07
154	Boron	water	river	kg	1.99E-04	4.94E-06	1.01E-05	3.00E-05	1.45E-04	9.75E-06
155	Boron	water	unspecified	kg	1.76E-05	9.23E-09	1.85E-08	7.08E-08	1.75E-05	5.51E-10
156	Bromate	water	river	kg	1.56E-04	2.58E-06	5.75E-06	2.68E-05	1.17E-04	3.57E-06
157	Bromine	air	high population density	kg	7.69E-06	1.86E-07	3.76E-07	1.30E-06	5.66E-06	1.68E-07
158	Bromine	air	low population density	kg	1.92E-04	4.04E-06	8.55E-06	2.98E-05	1.41E-04	8.69E-06
159	Bromine	air	unspecified	kg	1.28E-12	5.46E-15	1.91E-14	1.89E-13	1.06E-12	7.20E-15
160	Bromine	water	ground-	kg	6.01E-05	1.05E-06	2.33E-06	9.68E-06	4.47E-05	2.30E-06

Table D1 LCI contribution results of bioethanol production process from cassava rhizome (cont'd)

No	Substance	Compartment	Sub compartment	Unit	Total	Pretreatment	Detoxification	SSCF	Distillation	Dehydration
								06		
161	Bromine	water	ground-, long-term	kg	1.72E-04	7.15E-06	1.30E-05	2.92E-05	1.21E-04	1.38E-06
162	Bromine	water	ocean	kg	5.22E-04	3.64E-05	6.29E-05	7.97E-05	3.25E-04	1.84E-05
163	Bromine	water	river	kg	2.02E-03	1.04E-04	1.85E-04	3.23E-04	1.36E-03	5.65E-05
164	Bromine	water	unspecified	kg	1.20E-03	6.30E-07	1.26E-06	4.83E-06	1.20E-03	3.76E-08
165	Butadiene	air	low population density	kg	8.52E-10	2.07E-11	4.14E-11	1.57E-10	6.32E-10	1.72E-13
166	Butadiene	air	lower stratosphere + upper troposphere	kg	5.18E-09	1.26E-10	2.52E-10	9.53E-10	3.84E-09	1.05E-12
167	Butadiene	air	unspecified	kg	1.21E-08	2.94E-10	5.87E-10	2.22E-09	8.97E-09	2.44E-12
168	Butane	air	high population density	kg	4.57E-02	1.60E-04	8.90E-04	4.16E-03	3.36E-02	6.87E-03
169	Butane	air	low population density	kg	6.29E-02	8.61E-06	7.24E-04	1.06E-02	4.91E-02	2.42E-03
170	Butane	air	unspecified	kg	5.68E-05	2.97E-08	5.96E-08	2.28E-07	5.65E-05	1.77E-09
171	Butanol	air	high population density	kg	7.72E-11	2.47E-12	4.68E-12	1.39E-11	5.61E-11	1.58E-14
172	Butanol	water	river	kg	7.85E-06	2.51E-07	4.76E-07	1.42E-06	5.70E-06	1.51E-09
173	Butene	air	high population density	kg	5.29E-05	3.40E-06	5.92E-06	8.22E-06	3.36E-05	1.71E-06
174	Butene	water	river	kg	5.04E-06	5.96E-08	1.46E-07	9.77E-07	3.85E-06	1.94E-09
175	Butyl acetate	water	river	kg	1.02E-05	3.27E-07	6.19E-07	1.84E-06	7.41E-06	1.96E-09
176	Butyrolactone	air	high population density	kg	7.21E-09	2.31E-10	4.37E-10	1.30E-09	5.24E-09	1.48E-12
177	Butyrolactone	water	river	kg	1.73E-08	5.54E-10	1.05E-09	3.13E-09	1.26E-08	3.54E-12
178	Cadmium, 0.30% in sulfide, Cd 0.18%, Pb, Zn, Ag, In, in ground	resource	in ground	kg	2.53E-04	1.96E-06	5.72E-06	4.81E-05	1.96E-04	6.08E-07
179	Cadmium, ion	water	ground-	kg	9.82E-08	4.23E-10	1.70E-09	1.84E-08	7.68E-08	9.04E-10
180	Cadmium, ion	water	ground-, long-term	kg	3.35E-05	1.71E-06	3.06E-06	4.91E-06	2.27E-05	1.16E-06
181	Cadmium, ion	water	lake	kg	4.74E-11	1.52E-12	2.87E-12	8.56E-12	3.44E-11	9.72E-15
182	Cadmium, ion	water	ocean	kg	2.11E-06	1.28E-07	2.25E-07	2.77E-07	1.37E-06	1.10E-07
183	Cadmium, ion	water	river	kg	1.45E-05	3.67E-07	7.32E-07	2.52E-06	1.07E-05	2.22E-07
184	Cadmium, ion	water	unspecified	kg	1.81E-05	2.83E-07	6.42E-07	3.01E-06	1.36E-05	5.32E-07
185	Cadmium	air	high population density	kg	7.39E-06	1.19E-06	1.94E-06	1.51E-06	2.66E-06	9.36E-08
186	Cadmium	air	low population	kg	2.59E-04	2.88E-06	7.23E-06	4.90E-05	2.00E-04	6.32E-07

Table D1 LCI contribution results of bioethanol production process from cassava rhizome (cont'd)

No	Substance	Compartment	Sub compartment	Unit	Total	Pretreatment	Detoxification	SSCF	Distillation	Dehydration
187	Cadmium	air	lower stratosphere + upper troposphere	kg	2.74E-12	6.67E-14	1.33E-13	5.04E-13	2.03E-12	5.54E-16
188	Cadmium	air	unspecified	kg	1.83E-06	4.07E-08	8.40E-08	2.93E-07	1.35E-06	6.04E-08
189	Cadmium	soil	agricultural	kg	5.68E-07	1.60E-08	3.11E-08	1.00E-07	4.15E-07	4.94E-09
190	Cadmium	soil	unspecified	kg	1.35E-08	1.05E-09	1.80E-09	1.92E-09	8.42E-09	2.89E-10
191	Calcite, in ground	resource	in ground	kg	3.13E+01	7.07E-01	1.46E+00	5.13E+00	2.30E+01	9.71E-01
192	Calcium, ion	water	ground-	kg	2.80E-04	4.45E-06	1.01E-05	4.60E-05	2.10E-04	9.74E-06
193	Calcium, ion	water	ground-, long-term	kg	1.15E+00	2.57E-02	5.31E-02	1.90E-01	8.48E-01	3.28E-02
194	Calcium, ion	water	lake	kg	1.56E-04	1.11E-06	2.47E-06	1.00E-04	5.22E-05	3.56E-07
195	Calcium, ion	water	ocean	kg	3.75E-02	2.47E-03	4.30E-03	5.38E-03	2.38E-02	1.62E-03
196	Calcium, ion	water	river	kg	2.26E-01	5.99E-03	1.18E-02	3.94E-02	1.65E-01	4.03E-03
197	Calcium, ion	water	unspecified	kg	1.81E-02	9.45E-06	1.90E-05	7.25E-05	1.80E-02	5.64E-07
198	Calcium	air	high population density	kg	5.78E-04	1.39E-05	2.82E-05	9.70E-05	4.23E-04	1.65E-05
199	Calcium	air	low population density	kg	3.99E-05	8.37E-07	1.74E-06	7.54E-06	2.85E-05	1.21E-06
200	Calcium	soil	agricultural	kg	2.80E-03	4.38E-05	1.00E-04	4.61E-04	2.10E-03	9.60E-05
201	Calcium	soil	industrial	kg	5.63E-02	3.02E-04	1.19E-03	7.09E-03	4.22E-02	5.58E-03
202	Carbetamide	soil	agricultural	kg	1.15E-08	5.11E-10	9.28E-10	1.84E-09	7.97E-09	2.36E-10
203	Carbofuran	soil	agricultural	kg	1.35E-06	5.66E-09	2.54E-08	1.88E-07	1.02E-06	1.07E-07
204	Carbon dioxide, biogenic	air	high population density	kg	9.59E+00	3.22E-01	6.12E-01	1.54E-00	6.85E+00	2.79E-01
205	Carbon dioxide, biogenic	air	low population density	kg	1.42E+00	3.06E-02	6.38E-02	2.37E-01	1.05E+00	3.89E-02
206	Carbon dioxide, biogenic	air	unspecified	kg	2.70E-01	4.95E-03	1.08E-02	4.44E-02	2.01E-01	8.58E-03
207	Carbon dioxide, fossil	air	high population density	kg	5.89E+03	7.76E+00	8.73E+01	7.41E+02	4.46E+03	5.91E+02
208	Carbon dioxide, fossil	air	low population density	kg	3.69E+02	3.20E+00	9.45E+00	5.34E+01	2.77E+02	2.51E+01
209	Carbon dioxide, fossil	air	lower stratosphere + upper troposphere	kg	8.63E-04	2.10E-05	4.19E-05	1.59E-04	6.41E-04	1.75E-07
210	Carbon dioxide, fossil	air	unspecified	kg	1.16E+02	2.10E+00	4.18E+00	4.75E+01	6.00E+01	2.56E+00
211	Carbon dioxide, in air	resource	in air	kg	1.22E+01	3.92E-01	7.51E-01	1.98E+00	8.78E+00	3.44E-01
212	Carbon	air	low	kg	3.55E-02	4.09E-04	1.06E-03	5.38E-	2.67E-02	2.01E-03

Table D1 LCI contribution results of bioethanol production process from cassava rhizome (cont'd)

No	Substance	Compartment	Sub compartment	Unit	Total	Pretreatment	Detoxification	SSCF	Distillation	Dehydration
	dioxide, land transformation		population density					03		
213	Carbon dioxide	air	unspecified	kg	4.55E+03	4.55E+03	0.00E+00	0.00E+00		
214	Carbon disulfide	air	high population density	kg	2.82E-08	9.71E-11	4.47E-10	5.40E-09	2.21E-08	1.03E-10
215	Carbon disulfide	air	low population density	kg	1.95E-02	2.44E-04	5.86E-04	3.67E-03	1.49E-02	5.30E-05
216	Carbon disulfide	air	unspecified	kg	7.36E-13	3.85E-16	7.73E-16	2.95E-15	7.32E-13	2.30E-17
217	Carbon monoxide, biogenic	air	high population density	kg	1.23E-03	5.62E-05	1.02E-04	1.96E-04	8.47E-04	2.58E-05
218	Carbon monoxide, biogenic	air	low population density	kg	2.25E-03	3.35E-05	7.66E-05	4.08E-04	1.71E-03	2.50E-05
219	Carbon monoxide, biogenic	air	unspecified	kg	2.72E-01	2.49E-03	6.74E-03	5.19E-02	2.11E-01	2.85E-04
220	Carbon monoxide, fossil	air	high population density	kg	2.15E+00	2.06E-03	2.68E-02	3.80E-01	1.68E+00	5.68E-02
221	Carbon monoxide, fossil	air	low population density	kg	5.56E-01	2.91E-03	1.15E-02	7.53E-02	4.20E-01	4.70E-02
222	Carbon monoxide, fossil	air	lower stratosphere + upper troposphere	kg	1.01E-06	2.47E-08	4.93E-08	1.87E-07	7.52E-07	2.05E-10
223	Carbon monoxide, fossil	air	unspecified	kg	1.51E+00	3.32E-02	6.90E-02	2.49E-01	1.11E+00	4.77E-02
224	Carbon, in organic matter, in soil	resource	in ground	kg	1.70E-03	7.14E-06	3.21E-05	2.37E-04	1.29E-03	1.35E-04
225	Carbon	soil	agricultural	kg	7.18E-02	4.87E-06	7.52E-04	1.40E-02	5.70E-02	6.86E-06
226	Carbon	soil	industrial	kg	4.22E-02	2.26E-04	8.93E-04	5.31E-03	3.16E-02	4.18E-03
227	Carbon-14	air	low population density	kBq	2.82E+01	1.05E-01	4.63E-01	5.32E+00	2.21E+01	2.26E-01
228	Carbonate	water	river	kg	1.24E-03	2.04E-05	4.52E-05	2.26E-04	9.40E-04	1.06E-05
229	Carboxylic acids, unspecified	water	ocean	kg	9.80E-03	2.94E-04	5.79E-04	1.36E-03	6.87E-03	6.93E-04
230	Carboxylic acids, unspecified	water	river	kg	6.51E-03	3.95E-04	6.93E-04	9.79E-04	4.17E-03	2.67E-04
231	Cerium, 24% in bastnasite, 2.4% in crude ore, in ground	resource	in ground	kg	8.64E-20	8.75E-22	2.31E-21	1.55E-20	6.62E-20	1.49E-21
232	Cerium-141	air	low population density	kBq	5.92E-05	2.72E-08	6.58E-07	1.15E-05	4.70E-05	4.48E-08
233	Cerium-141	water	river	kBq	2.54E-04	1.17E-07	2.82E-06	4.96E-05	2.02E-04	1.92E-07

Table D1 LCI contribution results of bioethanol production process from cassava rhizome (cont'd)

No	Substance	Compartment	Sub compartment	Unit	Total	Pretreatment	Detoxification	SSCF	Distillation	Dehydration
234	Cerium-144	water	river	kBq	7.74E-05	3.55E-08	8.60E-07	1.51E-05	6.14E-05	5.85E-08
235	Cesium	water	ocean	kg	7.46E-07	5.20E-08	8.99E-08	1.14E-07	4.64E-07	2.63E-08
236	Cesium	water	river	kg	1.77E-06	1.07E-07	1.88E-07	2.66E-07	1.13E-06	7.26E-08
237	Cesium-134	air	low population density	kBq	2.84E-06	1.30E-09	3.15E-08	5.53E-07	2.25E-06	2.14E-09
238	Cesium-134	water	river	kBq	4.33E-03	2.40E-05	8.38E-05	7.99E-04	3.37E-03	5.23E-05
239	Cesium-136	water	river	kBq	4.51E-05	2.07E-08	5.01E-07	8.80E-06	3.58E-05	3.41E-08
240	Cesium-137	air	low population density	kBq	5.03E-05	2.31E-08	5.59E-07	9.81E-06	3.99E-05	3.80E-08
241	Cesium-137	water	ocean	kBq	4.02E+00	1.97E-02	7.36E-02	7.48E-01	3.13E+00	4.27E-02
242	Cesium-137	water	river	kBq	8.15E-02	8.47E-05	9.82E-04	1.58E-02	6.45E-02	1.67E-04
243	Chlorate	water	river	kg	1.31E-03	2.19E-05	4.88E-05	2.25E-04	9.83E-04	3.09E-05
244	Chloride	soil	agricultural	kg	3.02E-05	4.85E-07	1.10E-06	4.95E-06	2.26E-05	1.07E-06
245	Chloride	soil	industrial	kg	4.93E-02	2.64E-04	1.04E-03	6.20E-03	3.69E-02	4.88E-03
246	Chloride	soil	unspecified	kg	3.78E-02	1.15E-03	2.21E-03	6.62E-03	2.75E-02	3.06E-04
247	Chloride	water	ground-	kg	9.06E-01	1.65E-02	3.61E-02	1.50E-01	6.75E-01	2.90E-02
248	Chloride	water	ground-long-term	kg	5.59E-02	1.21E-03	2.55E-03	8.11E-03	4.07E-02	3.30E-03
249	Chloride	water	ocean	kg	3.80E-01	2.68E-02	4.63E-02	5.76E-02	2.36E-01	1.36E-02
250	Chloride	water	river	kg	1.37E+00	6.20E-02	1.13E-01	2.14E-01	9.30E-01	5.04E-02
251	Chloride	water	unspecified	kg	1.22E+01	1.85E-02	1.76E-01	1.67E+00	9.34E+00	9.71E-01
252	Chlorinated solvents, unspecified	water	ocean	kg	5.96E-13	1.61E-14	3.16E-14	1.06E-13	4.38E-13	3.80E-15
253	Chlorinated solvents, unspecified	water	river	kg	1.92E-06	3.25E-08	7.17E-08	3.40E-07	1.45E-06	3.14E-08
254	Chlorine	air	high population density	kg	7.11E-04	1.08E-05	2.50E-05	1.17E-04	5.33E-04	2.56E-05
255	Chlorine	air	low population density	kg	3.71E-08	1.13E-09	2.16E-09	6.72E-09	2.71E-08	1.26E-11
256	Chlorine	air	unspecified	kg	2.72E-08	2.02E-09	3.42E-09	3.17E-09	1.81E-08	4.22E-10
257	Chlorine	water	ground-	kg	1.06E-04	4.23E-07	1.78E-06	1.98E-05	8.27E-05	9.19E-07
258	Chlorine	water	river	kg	1.28E-05	3.01E-07	6.10E-07	2.24E-06	9.44E-06	1.70E-07
259	Chloroform	air	high population density	kg	1.49E-06	3.38E-08	6.87E-08	2.75E-07	1.11E-06	2.73E-09
260	Chloroform	air	low population density	kg	1.60E-08	9.46E-11	3.08E-10	2.85E-09	1.27E-08	1.05E-10
261	Chloroform	air	unspecified	kg	3.35E-13	1.75E-16	3.52E-16	1.34E-15	3.33E-13	1.05E-17
262	Chloroform	water	river	kg	1.59E-07	5.11E-09	9.68E-09	2.88E-08	1.16E-07	2.92E-11

Table D1 LCI contribution results of bioethanol production process from cassava rhizome (cont'd)

No	Substance	Compartment	Sub compartment	Unit	Total	Pretreatment	Detoxification	SSCF	Distillation	Dehydration
263	Chlorosilan e, trimethyl-	air	high population density	kg	2.17E-08	6.94E-10	1.31E-09	3.91E-09	1.57E-08	3.95E-12
264	Chlorothalol nil	soil	agricultural	kg	1.64E-06	2.55E-08	5.75E-08	2.99E-07	1.24E-06	1.50E-08
265	Chromium VI	air	high population density	kg	3.55E-07	1.26E-08	2.35E-08	6.34E-08	2.50E-07	5.00E-09
266	Chromium VI	air	low population density	kg	8.62E-05	1.92E-06	3.91E-06	1.58E-05	6.44E-05	2.37E-07
267	Chromium VI	air	unspecific d	kg	6.55E-09	1.32E-10	2.71E-10	9.43E-10	5.03E-09	1.72E-10
268	Chromium VI	soil	unspecific d	kg	1.54E-03	1.74E-06	1.91E-05	2.88E-04	1.21E-03	1.66E-05
269	Chromium VI	water	ground-	kg	5.40E-05	1.30E-06	2.67E-06	8.01E-06	3.92E-05	2.82E-06
270	Chromium VI	water	ground-long-term	kg	7.95E-03	1.54E-04	3.30E-04	1.32E-03	5.91E-03	2.40E-04
271	Chromium VI	water	river	kg	2.51E-03	4.87E-05	1.04E-04	4.17E-04	1.87E-03	7.57E-05
272	Chromium VI	water	unspecific d	kg	6.73E-06	1.24E-07	2.69E-07	1.12E-06	5.01E-06	2.07E-07
273	Chromium, 25.5% in chromite, 11.6% in crude ore, in ground	resource	in ground	kg	1.02E+00	2.25E-02	4.59E-02	1.86E-01	7.59E-01	3.05E-03
274	Chromium ion	water	ground-	kg	2.65E-05	1.08E-07	4.49E-07	4.97E-06	2.07E-05	2.31E-07
275	Chromium ion	water	ocean	kg	1.39E-05	2.24E-06	3.68E-06	1.21E-06	6.11E-06	6.14E-07
276	Chromium ion	water	river	kg	3.24E-05	1.44E-06	2.62E-06	5.20E-06	2.25E-05	6.48E-07
277	Chromium ion	water	unspecific d	kg	5.41E-05	7.22E-07	1.70E-06	8.69E-06	4.15E-05	1.47E-06
278	Chromium	air	high population density	kg	8.59E-06	6.99E-07	1.19E-06	1.55E-06	4.96E-06	1.93E-07
279	Chromium	air	low population density	kg	3.45E-03	7.66E-05	1.56E-04	6.33E-04	2.58E-03	9.08E-06
280	Chromium	air	lower stratosphere + upper troposphere	kg	1.37E-11	3.34E-13	6.66E-13	2.52E-12	1.02E-11	2.77E-15
281	Chromium	air	unspecific d	kg	6.20E-05	1.41E-06	2.90E-06	1.01E-05	4.56E-05	2.02E-06
282	Chromium	soil	agricultural	kg	2.48E-06	4.61E-08	9.98E-08	4.17E-07	1.85E-06	6.84E-08
283	Chromium	soil	industrial	kg	7.04E-05	3.77E-07	1.49E-06	8.86E-06	5.27E-05	6.97E-06
284	Chromium	soil	unspecific d	kg	6.43E-08	5.01E-09	8.57E-09	9.15E-09	4.02E-08	1.38E-09
285	Chromium-51	air	low population density	kBq	3.80E-06	1.74E-09	4.22E-08	7.40E-07	3.01E-06	2.87E-09
286	Chromium-51	water	river	kBq	4.77E-02	3.42E-05	5.51E-04	9.28E-03	3.78E-02	6.37E-05
287	Chrysotile, in ground	resource	in ground	kg	2.92E-05	4.86E-07	1.08E-06	5.02E-06	2.19E-05	6.78E-07
288	Cinnabar, in ground	resource	in ground	kg	2.87E-06	4.61E-08	1.04E-07	4.96E-07	2.16E-06	6.32E-08
289	Clay, bentonite, in	resource	in ground	kg	8.68E-01	1.47E-02	3.30E-02	1.37E-01	6.45E-01	3.84E-02

Table D1 LCI contribution results of bioethanol production process from cassava rhizome (cont'd)

No	Substance	Compartment	Sub compartment	Unit	Total	Pretreatment	Detoxification	SSCF	Distillation	Dehydration
	ground									
290	Clay, unspecified, in ground	resource	in ground	kg	1.21E+01	1.16E+00	1.96E+00	1.70E+00	7.12E+06	1.95E-01
291	Coal, brown, in ground	resource	in ground	kg	8.12E+01	1.43E+00	3.16E+00	1.31E+01	6.04E+01	3.12E+00
292	Coal, hard, unspecified, in ground	resource	in ground	kg	9.96E+01	1.75E+00	3.86E+00	1.66E+01	7.43E+01	3.11E+00
293	Cobalt, in ground	resource	in ground	kg	5.70E-07	1.13E-08	2.43E-08	8.88E-08	4.20E-07	2.51E-08
294	Cobalt	air	high population density	kg	1.40E-05	1.34E-06	2.25E-06	2.52E-06	7.51E-06	4.12E-07
295	Cobalt	air	low population density	kg	5.47E-05	1.18E-06	2.42E-06	1.09E-05	3.98E-05	4.37E-07
296	Cobalt	air	unspecified	kg	9.07E-08	1.07E-09	2.59E-09	1.67E-08	6.86E-08	1.68E-09
297	Cobalt	soil	agricultural	kg	1.88E-07	2.84E-09	6.55E-09	3.12E-08	1.41E-07	6.14E-09
298	Cobalt	water	ground-	kg	8.97E-07	6.39E-09	1.97E-08	1.63E-07	6.94E-07	1.38E-08
299	Cobalt	water	ground-, long-term	kg	4.56E-03	9.90E-05	2.04E-04	8.20E-04	3.40E-03	4.07E-05
300	Cobalt	water	ocean	kg	1.21E-07	5.93E-10	2.22E-09	2.25E-08	9.44E-08	1.29E-09
301	Cobalt	water	river	kg	2.82E-05	5.42E-07	1.16E-06	4.69E-06	2.10E-05	8.40E-07
302	Cobalt	water	unspecified	kg	1.24E-07	6.52E-11	1.31E-10	5.00E-10	1.24E-07	3.89E-12
303	Cobalt-57	water	river	kBq	1.43E-03	6.57E-07	1.59E-05	2.79E-04	1.14E-03	1.08E-06
304	Cobalt-58	air	low population density	kBq	5.29E-06	2.42E-09	5.87E-08	1.03E-06	4.19E-06	3.99E-09
305	Cobalt-58	water	river	kBq	2.14E-01	2.42E-04	2.61E-03	4.14E-02	1.69E-01	4.81E-04
306	Cobalt-60	air	low population density	kBq	4.67E-05	2.14E-08	5.19E-07	9.10E-06	3.70E-05	3.53E-08
307	Cobalt-60	water	river	kBq	1.88E-01	1.91E-04	2.26E-03	3.65E-02	1.49E-01	3.76E-04
308	COD, Chemical Oxygen Demand	water	ground-	kg	1.43E-05	2.54E-07	5.58E-07	2.37E-06	1.07E-05	4.50E-07
309	COD, Chemical Oxygen Demand	water	ground-, long-term	kg	8.05E-01	2.44E-02	4.70E-02	1.35E-01	5.83E-01	1.53E-02
310	COD, Chemical Oxygen Demand	water	ocean	kg	3.12E-01	5.15E-03	1.19E-02	4.27E-02	2.27E-01	2.46E-02
311	COD, Chemical Oxygen Demand	water	river	kg	1.07E+00	2.92E-02	5.74E-02	1.90E-01	7.80E-01	1.77E-02
312	COD, Chemical Oxygen Demand	water	unspecified	kg	1.34E-02	1.88E-04	4.15E-04	2.75E-03	9.75E-03	3.04E-04
313	Colemanite, in ground	resource	in ground	kg	8.16E-03	1.84E-04	3.75E-04	1.49E-03	6.08E-03	2.36E-05
314	Copper,	resource	in ground	kg	1.99E-01	2.21E-03	5.55E-03	3.76E-03	1.53E-01	4.58E-04

Table D1 LCI contribution results of bioethanol production process from cassava rhizome (cont'd)

No	Substance	Compartment	Sub compartment	Unit	Total	Pretreatment	Detoxification	SSCF	Distillation	Dehydration
	0.99% in sulfide, Cu 0.36% and Mo 8.2E-3% in crude ore, in ground							02		
315	Copper, 1.18% in sulfide, Cu 0.39% and Mo 8.2E-3% in crude ore, in ground	resource	in ground	kg	1.10E+00	1.21E-02	3.05E-02	2.08E-01	8.47E-01	2.54E-03
316	Copper, 1.42% in sulfide, Cu 0.51% and Mo 8.2E-3% in crude ore, in ground	resource	in ground	kg	2.92E-01	3.22E-03	8.10E-03	5.51E-02	2.25E-01	6.74E-04
317	Copper, 2.19% in sulfide, Cu 1.83% and Mo 8.2E-3% in crude ore, in ground	resource	in ground	kg	1.45E+00	1.61E-02	4.05E-02	2.74E-01	1.12E+00	3.34E-03
318	Copper, ion	water	ground-	kg	8.86E-06	3.86E-08	1.54E-07	1.66E-06	6.93E-06	8.23E-08
319	Copper, ion	water	ground-long-term	kg	5.69E-03	1.70E-04	3.28E-04	9.92E-04	4.15E-03	5.53E-05
320	Copper, ion	water	lake	kg	2.15E-09	6.88E-11	1.30E-10	3.88E-10	1.56E-09	4.41E-13
321	Copper, ion	water	ocean	kg	1.06E-04	2.65E-06	5.33E-06	1.77E-05	7.79E-05	2.66E-06
322	Copper, ion	water	river	kg	1.83E-04	3.78E-06	7.86E-06	3.29E-05	1.37E-04	1.58E-06
323	Copper, ion	water	unspecified	kg	4.83E-05	8.75E-07	1.90E-06	7.90E-06	3.62E-05	1.44E-06
324	Copper	air	high population density	kg	1.71E-04	5.43E-06	1.03E-05	3.13E-05	1.23E-04	9.71E-07
325	Copper	air	low population density	kg	2.62E-03	3.08E-05	7.57E-05	4.92E-04	2.01E-03	7.88E-06
326	Copper	air	lower stratosphere + upper troposphere	kg	4.65E-10	1.13E-11	2.26E-11	8.57E-11	3.46E-10	9.42E-14
327	Copper	air	unspecified	kg	3.18E-05	9.33E-07	1.82E-06	5.10E-06	2.30E-05	9.66E-07
328	Copper	soil	agricultural	kg	8.11E-06	2.23E-07	4.36E-07	1.45E-06	5.96E-06	4.34E-08
329	Copper	soil	industrial	kg	4.72E-07	8.85E-09	1.94E-08	7.22E-08	3.48E-07	2.33E-08
330	Copper	soil	unspecified	kg	9.60E-04	1.16E-06	1.20E-05	1.80E-04	7.56E-04	1.04E-05
331	Cumene	air	high population density	kg	1.07E-04	2.04E-06	4.38E-06	1.81E-05	7.98E-05	2.81E-06
332	Cumene	air	low population	kg	8.90E-10	5.25E-12	1.71E-11	1.59E-10	7.03E-10	5.84E-12

Table D1 LCI contribution results of bioethanol production process from cassava rhizome (cont'd)

No	Substance	Compartment	Sub compartment	Unit	Total	Pretreatment	Detoxification	SSCF	Distillation	Dehydration
333	Cumene	air	unspecified density	kg	3.00E-14	1.57E-17	3.15E-17	1.21E-16	2.99E-14	9.39E-19
334	Cumene	water	river	kg	2.57E-04	4.90E-06	1.05E-05	4.34E-05	1.92E-04	6.76E-06
335	Cyanide	air	high population density	kg	2.92E-05	6.83E-07	1.38E-06	5.22E-06	2.16E-05	2.36E-07
336	Cyanide	air	low population density	kg	4.27E-05	8.84E-07	1.84E-06	7.73E-06	3.20E-05	3.13E-07
337	Cyanide	air	unspecified	kg	1.42E-11	7.42E-15	1.49E-14	5.69E-14	1.41E-11	4.42E-16
338	Cyanide	water	ocean	kg	1.40E-04	6.03E-06	1.09E-05	2.45E-05	9.85E-05	1.18E-07
339	Cyanide	water	river	kg	9.85E-04	1.68E-05	3.67E-05	1.82E-04	7.45E-04	4.14E-06
340	Cyanide	water	unspecified	kg	3.89E-05	8.43E-07	1.76E-06	6.35E-06	2.87E-05	1.25E-06
341	Cypermethrin	soil	agricultural	kg	1.91E-07	8.10E-10	3.61E-09	2.66E-08	1.45E-07	1.51E-08
342	Diatomite, in ground	resource	in ground	kg	4.40E-08	5.68E-10	1.36E-09	8.05E-09	3.36E-08	3.96E-10
343	Dichuomate	water	river	kg	4.15E-05	4.56E-08	5.12E-07	7.80E-06	3.27E-05	4.33E-07
344	Dinitrogen monoxide	air	high population density	kg	1.02E-01	1.20E-04	1.29E-03	1.87E-02	8.03E-02	1.83E-03
345	Dinitrogen monoxide	air	low population density	kg	5.53E-03	5.67E-05	1.53E-04	8.75E-04	4.18E-03	2.64E-04
346	Dinitrogen monoxide	air	lower stratosphere + upper troposphere	kg	8.21E-09	2.00E-10	4.00E-10	1.51E-09	6.10E-09	1.66E-12
347	Dinitrogen monoxide	air	unspecified	kg	8.88E-03	6.94E-05	1.94E-04	2.33E-03	6.15E-03	1.38E-04
348	Dioxins, measured as 2,3,7,8-tetrachlorodibenzo-p-dioxin	air	high population density	kg	1.08E-10	2.24E-12	4.68E-12	1.89E-11	8.06E-11	1.75E-12
349	Dioxins, measured as 2,3,7,8-tetrachlorodibenzo-p-dioxin	air	low population density	kg	1.06E-10	1.68E-12	3.75E-12	1.92E-11	7.99E-11	9.65E-13
350	Dioxins, measured as 2,3,7,8-tetrachlorodibenzo-p-dioxin	air	unspecified	kg	4.18E-10	8.94E-12	1.86E-11	6.64E-11	3.10E-10	1.34E-11
351	Dissolved solids	water	ground-	kg	1.54E-02	2.73E-04	6.00E-04	2.55E-03	1.15E-02	4.84E-04
352	Dissolved solids	water	river	kg	2.63E-01	9.76E-02	1.56E-01	1.69E-03	7.34E-03	2.50E-04
353	Dissolved solids	water	unspecified	kg	2.50E-01	1.31E-04	2.62E-04	1.00E-03	2.48E-01	7.80E-06
354	DOC, Dissolved Organic Carbon	water	ground-, long-term	kg	3.65E-01	1.38E-02	2.56E-02	5.95E-02	2.58E-01	7.62E-03
355	DOC,	water	lake	kg	8.11E-05	4.26E-08	9.13E-07	1.57E-	6.42E-05	2.45E-07

Table D1 LCI contribution results of bioethanol production process from cassava rhizome (cont'd)

No	Substance	Compartment	Sub compartment	Unit	Total	Pretreatment	Detoxification	SSCF	Distillation	Dehydration
	Dissolved Organic Carbon							05		
356	DOC, Dissolved Organic Carbon	water	ocean	kg	9.07E-02	1.67E-03	3.73E-03	1.25E-02	6.58E-02	7.01E-03
357	DOC, Dissolved Organic Carbon	water	river	kg	2.06E-01	8.50E-03	1.56E-02	3.49E-02	1.43E-01	4.62E-03
358	DOC, Dissolved Organic Carbon	water	unspecified	kg	1.76E-03	2.40E-05	5.70E-05	3.02E-04	1.33E-03	4.41E-05
359	Dolomite, in ground	resource	in ground	kg	1.21E-01	2.69E-03	5.57E-03	1.99E-02	8.93E-02	3.68E-03
360	Energy, from coal	resource	in ground	MJ	4.33E+02	0.00E+00	0.00E+00	4.33E+02		
361	Energy, gross calorific value, in biomass, primary forest	resource	biotic	MJ	1.18E-01	4.95E-04	2.23E-03	1.65E-02	8.96E-02	9.34E-03
362	Energy, gross calorific value, in biomass	resource	biotic	MJ	1.21E+02	4.20E+00	7.93E+00	1.94E+01	8.62E+01	3.39E+00
363	Energy, kinetic (in wind), converted	resource	in air	MJ	4.11E+01	5.74E-01	1.36E+00	6.80E+00	3.10E+01	1.43E+00
364	Energy, potential (in hydropower reservoir), converted	resource	in water	MJ	1.85E+03	5.36E+00	2.81E+01	3.45E+02	1.45E+03	2.13E+01
365	Energy, solar, converted	resource	in air	MJ	1.03E+00	8.28E-03	2.41E-02	1.84E-01	7.91E-01	1.89E-02
366	Ethane, 1,1,1,2-tetrafluoro-, HFC-134a	air	high population density	kg	1.33E-07	4.21E-09	8.00E-09	2.40E-08	9.67E-08	5.76E-11
367	Ethane, 1,1,1,2-tetrafluoro-, HFC-134a	air	low population density	kg	6.34E-07	2.49E-09	1.06E-08	1.19E-07	4.96E-07	5.55E-09
368	Ethane, 1,1,1-trichloro-, HCFC-140	air	low population density	kg	3.27E-09	1.93E-11	6.29E-11	5.82E-10	2.58E-09	2.14E-11
369	Ethane, 1,1,1-trichloro-, HCFC-140	air	unspecified	kg	6.19E-13	3.24E-16	6.50E-16	2.49E-15	6.16E-13	1.93E-17
370	Ethane, 1,1,2-trichloro-, 1,2,2-trifluoro-, CFC-113	air	high population density	kg	5.72E-08	1.83E-09	3.47E-09	1.03E-08	4.16E-08	1.04E-11
371	Ethane, 1,1-difluoro-,	air	high population	kg	3.81E-07	3.05E-09	8.91E-09	6.83E-08	2.93E-07	6.97E-09

Table D1 LCI contribution results of bioethanol production process from cassava rhizome (cont'd)

No	Substance	Compartment	Sub compartment	Unit	Total	Pretreatment	Detoxification	SSCF	Distillation	Dehydration
	HFC-152a		density							
372	Ethane, 1,2-dichloro-	air	high population density	kg	5.96E-05	8.94E-07	2.03E-06	1.09E-05	4.52E-05	5.53E-07
373	Ethane, 1,2-dichloro-	air	low population density	kg	6.53E-09	3.85E-11	1.26E-10	1.16E-09	5.16E-09	4.28E-11
374	Ethane, 1,2-dichloro-	water	river	kg	2.04E-06	2.47E-08	6.10E-08	3.57E-07	1.55E-06	4.64E-08
375	Ethane, 1,2-dichloro-1,1,2,2-tetrafluoro-, CFC-114	air	low population density	kg	1.24E-05	4.30E-08	1.99E-07	2.34E-06	9.74E-06	9.56E-08
376	Ethane, hexafluoro-, HFC-116	air	high population density	kg	3.95E-06	1.26E-07	2.40E-07	7.14E-07	2.87E-06	8.91E-10
377	Ethane, hexafluoro-, HFC-116	air	unspecified	kg	8.31E-05	7.61E-07	2.06E-06	1.58E-05	6.43E-05	8.70E-08
378	Ethane	air	high population density	kg	1.65E-03	5.46E-05	1.04E-04	2.62E-04	1.17E-03	6.09E-05
379	Ethane	air	low population density	kg	6.84E-01	1.18E-04	8.44E-03	1.00E-01	5.27E-01	4.86E-02
380	Ethane	air	unspecified	kg	8.40E-05	4.40E-08	8.82E-08	3.37E-07	8.35E-05	2.62E-09
381	Ethanol	air	high population density	kg	1.14E-04	2.03E-06	4.38E-06	2.52E-05	7.88E-05	3.96E-06
382	Ethanol	air	low population density	kg	3.31E-06	1.33E-08	5.60E-08	6.15E-07	2.59E-06	3.72E-08
383	Ethanol	water	river	kg	1.81E-05	5.78E-07	1.10E-06	3.26E-06	1.31E-05	3.47E-09
384	Ethene, chloro-	air	high population density	kg	4.06E-05	6.08E-07	1.38E-06	7.45E-06	3.08E-05	3.20E-07
385	Ethene, chloro-	air	unspecified	kg	2.27E-13	1.19E-16	2.38E-16	9.11E-16	2.26E-13	7.09E-18
386	Ethene, chloro-	water	river	kg	5.23E-07	7.99E-09	1.81E-08	9.56E-08	3.97E-07	4.41E-09
387	Ethene, tetrachloro-	air	high population density	kg	4.99E-10	8.29E-12	1.83E-11	8.97E-11	3.77E-10	5.90E-12
388	Ethene, tetrachloro-	air	low population density	kg	7.02E-09	4.15E-11	1.35E-10	1.25E-09	5.55E-09	4.61E-11
389	Ethene, tetrachloro-	air	unspecified	kg	4.91E-10	2.57E-13	5.15E-13	1.97E-12	4.88E-10	1.53E-14
390	Ethene	air	high population density	kg	6.36E-04	1.42E-05	2.90E-05	1.13E-04	4.71E-04	8.29E-06
391	Ethene	air	low population density	kg	9.09E-04	1.93E-05	4.04E-05	1.49E-04	6.71E-04	2.90E-05
392	Ethene	air	unspecified	kg	1.67E-02	0.00E+00	0.00E+00	1.67E-02		
393	Ethene	water	river	kg	6.13E-05	1.43E-06	2.95E-06	9.44E-06	4.47E-05	2.75E-06
394	Ethyl acetate	air	high population density	kg	2.16E-03	6.93E-05	1.31E-04	3.91E-04	1.57E-03	4.15E-07
395	Ethyl acetate	water	river	kg	1.23E-09	3.95E-11	7.48E-11	2.23E-10	8.95E-10	2.31E-13
396	Ethyl	air	high	kg	4.38E-06	1.40E-07	2.66E-07	7.91E-	3.18E-06	7.98E-10

Table D1 LCI contribution results of bioethanol production process from cassava rhizome (cont'd)

No	Substance	Compartment	Sub compartment	Unit	Total	Pretreatment	Detoxification	SSCF	Distillation	Dehydration
	cellulose	.	population density					07		
397	Ethylene diamine	air	high population density	kg	3.71E-10	7.35E-12	1.55E-11	6.64E-11	2.78E-10	4.09E-12
398	Ethylene diamine	water	river	kg	9.00E-10	1.78E-11	3.75E-11	1.61E-10	6.74E-10	9.92E-12
399	Ethylene oxide	air	high population density	kg	1.71E-05	6.41E-08	2.80E-07	3.27E-06	1.34E-05	6.63E-08
400	Ethylene oxide	air	low population density	kg	8.23E-09	2.01E-10	4.00E-10	1.52E-09	6.11E-09	1.67E-12
401	Ethylene oxide	air	lower stratosphere + upper troposphere	kg	5.00E-08	1.22E-09	2.43E-09	9.21E-09	3.72E-08	1.01E-11
402	Ethylene oxide	air	unspecified	kg	1.17E-07	2.84E-09	5.68E-09	2.15E-08	8.67E-08	2.36E-11
403	Ethylene oxide	water	river	kg	1.36E-06	4.33E-08	8.22E-08	2.46E-07	9.90E-07	2.98E-10
404	Ethyne	air	high population density	kg	4.76E-05	1.01E-06	2.10E-06	8.56E-06	3.55E-05	4.05E-07
405	Ethyne	air	low population density	kg	3.10E-05	6.24E-07	1.33E-06	5.01E-06	2.29E-05	1.11E-06
406	Ethyne	air	unspecified	kg	9.34E-07	3.90E-08	7.11E-08	1.60E-07	6.57E-07	6.19E-09
407	Feldspar, in ground	resource	in ground	kg	1.05E-05	1.18E-08	1.28E-07	2.05E-06	8.32E-06	5.29E-09
408	Fenpiclonil	soil	agricultural	kg	6.64E-08	1.10E-09	2.43E-09	1.21E-08	5.02E-08	6.33E-10
409	Fluoride	air	unspecified	kg	1.65E-05	0.00E+00	0.00E+00	1.65E-05		
410	Fluoride	soil	industrial	kg	7.04E-04	3.77E-06	1.49E-05	8.86E-05	5.27E-04	6.97E-05
411	Fluoride	soil	unspecified	kg	1.04E-03	1.18E-06	1.29E-05	1.95E-04	8.19E-04	1.12E-05
412	Fluoride	water	ground-	kg	2.40E-04	4.24E-06	9.33E-06	3.97E-05	1.79E-04	7.69E-06
413	Fluoride	water	ground-, long-term	kg	1.97E-01	6.04E-03	1.15E-02	3.57E-02	1.44E-01	1.99E-04
414	Fluoride	water	ocean	kg	3.18E-04	5.00E-05	8.21E-05	3.06E-05	1.44E-04	1.10E-05
415	Fluoride	water	river	kg	1.25E-02	3.90E-04	7.43E-04	2.22E-03	9.09E-03	5.81E-05
416	Fluoride	water	unspecified	kg	5.29E-05	1.64E-06	3.20E-06	7.51E-06	3.72E-05	3.31E-06
417	Fluorine, 4.5% in apatite, 1% in crude ore, in ground	resource	in ground	kg	3.02E-03	9.26E-05	1.81E-04	4.23E-04	2.14E-03	1.83E-04
418	Fluorine, 4.5% in apatite, 3% in crude ore, in ground	resource	in ground	kg	1.35E-03	4.11E-05	8.04E-05	1.89E-04	9.56E-04	8.13E-05
419	Fluorine	air	high population density	kg	3.63E-06	6.02E-08	1.35E-07	5.93E-07	2.71E-06	1.28E-07
420	Fluorine	air	low population density	kg	9.81E-05	1.38E-06	3.19E-06	1.83E-05	7.48E-05	3.43E-07
421	Fluorine	air	unspecified	kg	1.37E-10	2.33E-12	5.01E-12	2.29E-	1.05E-10	1.35E-12

Table D1 LCI contribution results of bioethanol production process from cassava rhizome (cont'd)

No	Substance	Compartment	Sub compartment	Unit	Total	Pretreatment	Detoxification	SSCF	Distillation	Dehydration
			und					11		
422	Fluorspar, 92% in ground	resource	in ground	kg	1.34E-01	2.62E-03	5.64E-03	2.15E-02	9.94E-02	5.27E-03
423	Fluosilicic acid	air	high population density	kg	9.71E-05	8.89E-07	2.41E-06	1.85E-05	7.52E-05	1.02E-07
424	Fluosilicic acid	water	river	kg	1.75E-04	1.60E-06	4.33E-06	3.33E-05	1.35E-04	1.83E-07
425	Formaldehyde	air	high population density	kg	6.49E-03	7.73E-06	1.03E-04	6.04E-04	4.80E-03	9.74E-04
426	Formaldehyde	air	low population density	kg	2.45E-04	3.83E-06	8.65E-06	4.32E-05	1.85E-04	4.17E-06
427	Formaldehyde	air	lower stratosphere + upper troposphere	kg	4.31E-08	1.05E-09	2.10E-09	7.94E-09	3.20E-08	8.73E-12
428	Formaldehyde	air	unspecified	kg	2.67E-04	2.30E-05	3.89E-05	3.85E-05	1.63E-04	3.60E-06
429	Formaldehyde	water	river	kg	1.32E-06	3.67E-08	7.15E-08	2.39E-07	9.71E-07	3.56E-09
430	Formaldehyde	water	unspecified	kg	1.68E-05	2.43E-07	5.70E-07	2.73E-06	1.26E-05	6.36E-07
431	Formic acid	air	high population density	kg	2.71E-06	8.68E-08	1.64E-07	4.89E-07	1.97E-06	4.92E-10
432	Formic acid	air	low population density	kg	7.70E-06	3.23E-08	1.45E-07	1.07E-06	5.84E-06	6.09E-07
433	Furan	air	low population density	kg	2.19E-06	9.16E-09	4.12E-08	3.04E-07	1.66E-06	1.73E-07
434	Furan	air	unspecified	kg	4.82E-14	2.52E-17	5.06E-17	1.93E-16	4.79E-14	1.51E-18
435	Gadolinium, 0.15% in bastnasite, 0.015% in crude ore, in ground	resource	in ground	kg	1.62E-23	2.82E-25	6.11E-25	3.04E-24	1.23E-23	7.34E-27
436	Gallium, 0.014% in bauxite, in ground	resource	in ground	kg	2.94E-09	2.35E-11	6.87E-11	5.27E-10	2.27E-09	5.37E-11
437	Gas, mine-off-gas, process, coal mining	resource	in ground	Nm ³	9.72E-01	1.71E-02	3.76E-02	1.62E-01	7.26E-01	3.00E-02
438	Gas, natural, in ground	resource	in ground	Nm ³	2.92E+03	6.81E-01	3.84E+01	3.68E+02	2.22E+03	2.95E+02
439	Glutaraldehyde	water	ocean	kg	5.86E-05	7.79E-08	8.64E-07	7.57E-06	4.45E-05	5.62E-06
440	Glyphosate	soil	agricultural	kg	3.55E-06	3.80E-08	1.02E-07	5.26E-07	2.67E-06	2.19E-07
441	Glyphosate	soil	industrial	kg	5.54E-06	8.09E-07	1.33E-06	6.00E-07	2.69E-06	1.10E-07
442	Gold, Au 1.1E-4%, Ag 4.2E-3%, in ore, in ground	resource	in ground	kg	4.29E-06	1.37E-07	2.60E-07	7.74E-07	3.12E-06	7.82E-10
443	Gold, Au 1.3E-4%	resource	in ground	kg	7.86E-06	2.52E-07	4.77E-07	1.42E-06	5.71E-06	1.43E-09

Table D1 LCI contribution results of bioethanol production process from cassava rhizome (cont'd)

No	Substance	Compartment	Sub compartment	Unit	Total	Pretreatment	Detoxification	SSCF	Distillation	Dehydration
	Ag 4.6E-5%, in ore, in ground									
444	Gold, Au 1.4E-4%, in ore, in ground	resource	in ground	kg	9.41E-06	3.02E-07	5.71E-07	1.70E-06	6.84E-06	1.72E-09
445	Gold, Au 2.1E-4%, Ag 2.1E-4%, in ore, in ground	resource	in ground	kg	1.44E-05	4.61E-07	8.73E-07	2.60E-06	1.04E-05	2.62E-09
446	Gold, Au 4.3E-4%, in ore, in ground	resource	in ground	kg	3.56E-06	1.14E-07	2.16E-07	6.44E-07	2.59E-06	6.50E-10
447	Gold, Au 4.9E-5%, in ore, in ground	resource	in ground	kg	8.54E-06	2.73E-07	5.18E-07	1.54E-06	6.20E-06	1.56E-09
448	Gold, Au 6.7E-4%, in ore, in ground	resource	in ground	kg	1.32E-05	4.23E-07	8.02E-07	2.39E-06	9.60E-06	2.41E-09
449	Gold, Au 7.1E-4%, in ore, in ground	resource	in ground	kg	1.49E-05	4.77E-07	9.04E-07	2.69E-06	1.08E-05	2.72E-09
450	Gold, Au 9.7E-4%, Ag 9.7E-4%, Zn 0.63%, Cu 0.38%, Pb 0.014%, in ore, in ground	resource	in ground	kg	8.93E-07	2.86E-08	5.42E-08	1.61E-07	6.49E-07	1.63E-10
451	Granite, in ground	resource	in ground	kg	3.57E-09	8.07E-11	1.66E-10	5.96E-10	2.64E-09	9.49E-11
452	Gravel, in ground	resource	in ground	kg	2.05E+02	3.73E+00	8.24E+00	3.13E+01	1.52E+02	1.03E+01
453	Gypsum, in ground	resource	in ground	kg	2.76E-04	2.20E-06	6.64E-06	4.37E-05	2.10E-04	1.34E-05
454	Heat, waste	air	high population density	MJ	1.01E+05	1.42E+02	1.54E+03	1.17E+04	7.58E+04	1.16E+04
455	Heat, waste	air	low population density	MJ	8.23E+03	4.48E+01	1.63E+02	1.39E+03	6.34E+03	2.92E+02
456	Heat, waste	air	lower stratosphere + upper troposphere	MJ	1.25E-02	3.04E-04	6.07E-04	2.30E-03	9.27E-03	2.53E-06
457	Heat, waste	air	unspecified	MJ	1.64E+03	3.60E+01	7.40E+01	2.65E+02	1.22E+03	4.30E+01
458	Heat, waste	soil	industrial	MJ	4.34E-01	1.01E-01	1.63E-01	2.67E-02	1.33E-01	1.14E-02
459	Heat, waste	soil	unspecified	MJ	3.19E+02	1.46E-01	3.63E+00	5.99E+01	2.52E+02	3.64E+00
460	Heat, waste	water	ground-, long-term	MJ	1.44E+01	1.13E+00	1.94E+00	1.91E+00	8.94E+00	5.01E-01
461	Heat, waste	water	ocean	MJ	1.98E-01	1.00E-03	3.54E-03	3.52E-02	1.57E-01	1.35E-03
462	Heat, waste	water	river	MJ	4.51E+02	3.01E+01	5.22E+01	6.48E+01	2.91E+02	1.26E+01
463	Heat, waste	water	unspecified	MJ	1.22E+00	1.03E-02	2.89E-02	2.29E-	9.43E-01	5.19E-03

Table D1 LCI contribution results of bioethanol production process from cassava rhizome (cont'd)

No	Substance	Compartment	Sub compartment	Unit	Total	Pretreatment	Detoxification	SSCF	Distillation	Dehydration
								01		
464	Helium, 0.08% in natural gas, in ground	resource	in ground	kg	1.48E-08	1.19E-10	3.46E-10	2.66E-09	1.14E-08	2.71E-10
465	Helium	air	low population density	kg	1.65E-04	6.92E-06	1.28E-05	2.44E-05	1.12E-04	8.35E-06
466	Helium	air	unspecified	kg	9.20E-08	1.12E-14	9.54E-10	1.80E-08	7.30E-08	2.08E-14
467	Heptane	air	high population density	kg	5.08E-04	3.37E-05	5.86E-05	7.81E-05	3.20E-04	1.71E-05
468	Hexane	air	high population density	kg	1.70E-03	8.20E-05	1.48E-04	2.64E-04	1.14E-03	6.44E-05
469	Hexane	air	low population density	kg	2.53E-04	1.01E-06	4.26E-06	4.74E-05	1.98E-04	2.20E-06
470	Hexane	air	unspecified	kg	4.86E-05	2.55E-08	5.11E-08	1.95E-07	4.83E-05	1.52E-09
471	Hydrocarbons, aliphatic, alkanes, cyclic	air	high population density	kg	1.72E-06	3.46E-08	7.40E-08	2.69E-07	1.27E-06	7.58E-08
472	Hydrocarbons, aliphatic, alkanes, cyclic	air	low population density	kg	9.46E-08	5.59E-10	1.82E-09	1.69E-08	7.48E-08	6.21E-10
473	Hydrocarbons, aliphatic, alkanes, unspecified	air	high population density	kg	6.79E-04	1.15E-05	2.52E-05	1.32E-04	4.97E-04	1.28E-05
474	Hydrocarbons, aliphatic, alkanes, unspecified	air	low population density	kg	3.08E-02	1.12E-05	4.06E-04	4.01E-03	2.34E-02	2.91E-03
475	Hydrocarbons, aliphatic, alkanes, unspecified	air	unspecified	kg	6.10E-03	1.33E-04	2.77E-04	9.95E-04	4.50E-03	1.97E-04
476	Hydrocarbons, aliphatic, alkanes, unspecified	water	ocean	kg	9.70E-05	6.76E-06	1.17E-05	1.48E-05	6.03E-05	3.42E-06
477	Hydrocarbons, aliphatic, alkanes, unspecified	water	river	kg	2.30E-04	1.39E-05	2.45E-05	3.46E-05	1.47E-04	9.44E-06
478	Hydrocarbons, aliphatic, unsaturated	air	high population density	kg	3.18E-04	4.96E-06	1.13E-05	5.46E-05	2.38E-04	8.69E-06
479	Hydrocarbons, aliphatic, unsaturated	air	low population density	kg	3.76E-04	6.11E-06	1.38E-05	6.17E-05	2.81E-04	1.31E-05
480	Hydrocarbons, aliphatic,	air	unspecified	kg	4.01E-13	2.02E-15	7.15E-15	7.10E-14	3.18E-13	2.72E-15

Table D1 LCI contribution results of bioethanol production process from cassava rhizome (cont'd)

No	Substance	Compartment	Sub compartment	Unit	Total	Pretreatment	Detoxification	SSCF	Distillation	Dehydration
	unsaturated									
481	Hydrocarbons, aliphatic, unsaturated	water	ocean	kg	8.95E-06	6.24E-07	1.08E-06	1.37E-06	5.57E-06	3.16E-07
482	Hydrocarbons, aliphatic, unsaturated	water	river	kg	2.12E-05	1.29E-06	2.26E-06	3.19E-06	1.36E-05	8.71E-07
483	Hydrocarbons, aromatic	air	high population density	kg	2.17E-04	1.62E-06	4.82E-06	4.30E-05	1.65E-04	3.01E-06
484	Hydrocarbons, aromatic	air	low population density	kg	1.59E-02	2.96E-06	2.05E-04	2.06E-03	1.21E-02	1.51E-03
485	Hydrocarbons, aromatic	air	unspecified	kg	2.25E-03	4.09E-05	8.46E-05	2.94E-04	1.77E-03	6.27E-05
486	Hydrocarbons, aromatic	water	ocean	kg	1.09E-03	3.52E-05	6.85E-05	1.48E-04	7.62E-04	7.90E-05
487	Hydrocarbons, aromatic	water	river	kg	9.55E-04	6.01E-05	1.05E-04	1.42E-04	6.08E-04	3.98E-05
488	Hydrocarbons, chlorinated	air	high population density	kg	1.20E-05	2.18E-07	4.67E-07	2.28E-06	9.05E-06	6.89E-09
489	Hydrocarbons, chlorinated	air	low population density	kg	3.32E-08	1.96E-10	6.39E-10	5.91E-09	2.62E-08	2.18E-10
490	Hydrocarbons, chlorinated	air	unspecified	kg	7.32E-06	5.32E-07	9.13E-07	1.13E-06	4.67E-06	7.96E-08
491	Hydrocarbons, unspecified	air	unspecified	kg	1.13E-03	0.00E+00	0.00E+00	1.13E-03		
492	Hydrocarbons, unspecified	water	ocean	kg	8.80E-03	1.29E-05	1.32E-04	1.14E-03	6.67E-03	8.43E-04
493	Hydrocarbons, unspecified	water	river	kg	2.08E-04	3.58E-06	7.88E-06	3.66E-05	1.57E-04	3.70E-06
494	Hydrocarbons, unspecified	water	unspecified	kg	1.77E-04	2.49E-06	5.88E-06	3.02E-05	1.34E-04	5.13E-06
495	Hydrogen chloride	air	high population density	kg	4.31E-03	1.38E-04	2.61E-04	7.83E-04	3.09E-03	3.90E-05
496	Hydrogen chloride	air	low population density	kg	1.14E-02	2.44E-04	5.13E-04	1.77E-03	8.39E-03	5.14E-04
497	Hydrogen chloride	air	lower stratosphere + upper troposphere	kg	2.35E-10	5.74E-12	1.15E-11	4.34E-11	1.75E-10	4.76E-14
498	Hydrogen chloride	air	unspecified	kg	2.62E-02	1.46E-04	5.03E-04	5.02E-03	2.05E-02	8.30E-05
499	Hydrogen fluoride	air	high population density	kg	1.90E-04	8.78E-06	1.58E-05	3.49E-05	1.29E-04	1.64E-06
500	Hydrogen fluoride	air	low population density	kg	2.97E-03	5.39E-05	1.18E-04	4.76E-04	2.20E-03	1.15E-04
501	Hydrogen fluoride	air	unspecified	kg	2.28E-03	3.50E-05	7.89E-05	4.20E-04	1.73E-03	1.79E-05
502	Hydrogen peroxide	air	high population density	kg	3.24E-06	1.04E-07	1.97E-07	5.86E-07	2.36E-06	6.05E-10
503	Hydrogen	water	river	kg	3.41E-05	8.54E-07	1.70E-06	6.27E-06	2.53E-05	1.10E-08

Table D1 LCI contribution results of bioethanol production process from cassava rhizome (cont'd)

No	Substance	Compartment	Sub compartment	Unit	Total	Pretreatment	Detoxification	SSCF	Distillation	Dehydration
	peroxide							06		
504	Hydrogen sulfide	air	high population density	kg	8.92E-07	1.77E-08	3.72E-08	1.60E-07	6.68E-07	9.12E-09
505	Hydrogen sulfide	air	low population density	kg	7.41E-02	2.96E-05	9.88E-04	9.48E-03	5.64E-02	7.26E-03
506	Hydrogen sulfide	air	unspecified	kg	4.52E-04	9.55E-06	2.00E-05	7.44E-05	3.34E-04	1.45E-05
507	Hydrogen sulfide	water	ground-, long-term	kg	8.71E-04	1.65E-05	3.57E-05	1.41E-04	6.46E-04	3.13E-05
508	Hydrogen sulfide	water	river	kg	4.76E-05	1.01E-06	2.11E-06	7.80E-06	3.52E-05	1.51E-06
509	Hydrogen	air	high population density	kg	3.30E-03	7.31E-05	1.52E-04	5.10E-04	2.41E-03	1.48E-04
510	Hydrogen	air	unspecified	kg	1.11E-05	2.42E-07	5.07E-07	1.70E-06	8.11E-06	5.12E-07
511	Hydrogen-3, Tritium	air	low population density	kBq	1.14E+02	6.04E-01	2.17E+00	2.12E+01	8.92E+01	1.31E+00
512	Hydrogen-3, Tritium	water	ocean	kBq	8.35E+03	4.09E+01	1.53E+02	1.55E+03	6.51E+03	8.87E+01
513	Hydrogen-3, Tritium	water	river	kBq	9.40E+02	4.38E+00	1.69E-01	1.75E+02	7.34E+02	9.53E+00
514	Hydroxide	water	river	kg	8.99E-05	2.87E-06	5.44E-06	1.62E-05	6.53E-05	2.30E-08
515	Hypochlorite	water	ocean	kg	5.84E-05	1.24E-06	2.62E-06	9.01E-06	4.29E-05	2.68E-06
516	Hypochlorite	water	river	kg	7.31E-05	1.18E-06	2.68E-06	1.19E-05	5.47E-05	2.64E-06
517	Indium, 0.005% in sulfide, In 0.003%, Pb, Zn, Ag, Cd, in ground	resource	in ground	kg	4.35E-06	3.38E-08	9.85E-08	3.26E-07	3.38E-06	1.27E-08
518	Iodide	water	ground-	kg	7.48E-06	1.28E-07	2.86E-07	1.21E-06	5.57E-06	2.81E-07
519	Iodide	water	ground-, long-term	kg	1.40E-09	3.74E-10	6.03E-10	6.08E-11	3.23E-10	3.51E-11
520	Iodide	water	ocean	kg	7.46E-05	5.20E-06	8.99E-06	1.14E-05	4.64E-05	2.63E-06
521	Iodide	water	river	kg	1.83E-04	1.09E-05	1.92E-05	2.75E-05	1.18E-04	7.51E-06
522	Iodine	air	high population density	kg	1.08E-06	2.31E-08	4.76E-08	1.93E-07	8.02E-07	9.20E-09
523	Iodine	air	low population density	kg	9.96E-05	2.17E-06	4.55E-06	1.53E-05	7.29E-05	4.67E-06
524	Iodine	air	unspecified	kg	5.42E-13	2.73E-15	9.68E-15	9.61E-14	4.30E-13	3.68E-15
525	Iodine-129	air	low population density	kBq	2.16E-02	1.06E-04	3.95E-04	4.02E-03	1.68E-02	2.29E-04
526	Iodine-131	air	low population density	kBq	4.93E-01	5.15E-03	1.35E-02	8.59E-02	3.77E-01	1.19E-02
527	Iodine-131	water	river	kBq	2.49E-03	5.26E-06	3.44E-05	4.77E-04	1.96E-03	1.11E-05
528	Iodine-133	air	low population density	kBq	3.32E-04	3.37E-07	3.97E-06	6.41E-05	2.64E-04	4.94E-07
529	Iodine-133	water	river	kBq	3.99E-04	1.83E-07	4.44E-06	7.78E-05	3.16E-04	3.01E-07
530	Iodine-135	air	low	kBq	8.73E-05	4.40E-07	1.56E-06	1.55E-05	6.92E-05	5.93E-07

Table D1 LCI contribution results of bioethanol production process from cassava rhizome (cont'd)

No	Substance	Compartment	Sub compartment	Unit	Total	Pretreatment	Detoxification	SSCF	Distillation	Dehydration
			population density					05		
531	Iron, 46% in ore, 25% in crude ore, in ground	resource	in ground	kg	5.15E+01	1.11E+00	2.32E+00	8.40E+00	3.80E+01	1.66E+00
532	Iron, ion	water	ground-	kg	1.30E-01	2.29E-03	5.06E-03	2.09E-02	9.67E-02	5.00E-03
533	Iron, ion	water	ground-long-term	kg	2.67E-01	3.89E-03	9.02E-03	4.63E-02	2.02E-01	6.00E-03
534	Iron, ion	water	ocean	kg	6.40E-05	7.32E-06	1.22E-05	7.72E-06	3.42E-05	2.56E-06
535	Iron, ion	water	river	kg	5.84E-03	3.51E-05	1.19E-04	1.03E-03	4.51E-03	1.42E-04
536	Iron, ion	water	unspecified	kg	6.13E-03	1.87E-05	1.00E-04	8.26E-04	4.75E-03	4.40E-04
537	Iron	air	high population density	kg	4.67E-04	1.51E-05	2.86E-05	8.50E-05	3.34E-04	4.41E-06
538	Iron	air	low population density	kg	1.53E-04	3.34E-06	6.93E-06	2.55E-05	1.13E-04	4.26E-06
539	Iron	air	unspecified	kg	3.74E-04	8.60E-06	1.77E-05	6.12E-05	2.75E-04	1.14E-05
540	Iron	soil	agricultural	kg	5.90E-04	7.73E-06	1.85E-05	1.05E-04	4.49E-04	9.58E-06
541	Iron	soil	industrial	kg	2.82E-02	1.51E-04	5.95E-04	3.54E-03	2.11E-02	2.79E-03
542	Iron	soil	unspecified	kg	3.38E-02	1.54E-03	2.78E-03	5.70E-03	2.36E-02	2.10E-04
543	Iron	water	unspecified	kg	4.65E-10	0.00E+00	0.00E+00	4.65E-10		
544	Iron-59	water	river	kBq	1.10E-04	5.03E-08	1.22E-06	2.14E-05	8.70E-05	8.29E-08
545	Isocyanic acid	air	high population density	kg	6.45E-06	1.31E-07	2.76E-07	1.13E-06	4.81E-06	1.04E-07
546	Isoprene	air	low population density	kg	1.01E-07	4.25E-10	1.91E-09	1.41E-08	7.69E-08	8.02E-09
547	Isoprene	air	unspecified	kg	6.44E-13	3.37E-16	6.76E-16	2.58E-15	6.40E-13	2.01E-17
548	Kaolinite, 24% in crude ore, in ground	resource	in ground	kg	5.59E-03	7.64E-05	1.79E-04	1.03E-03	4.26E-03	3.91E-05
549	Kieserite, 25% in crude ore, in ground	resource	in ground	kg	2.04E-05	3.00E-07	6.87E-07	3.72E-06	1.55E-05	1.83E-07
550	Krypton-85	air	low population density	kBq	4.42E+00	4.08E-02	1.12E-01	7.82E-01	3.40E+00	9.41E-02
551	Krypton-85m	air	low population density	kBq	3.58E+00	2.27E-03	4.08E-02	6.96E-01	2.83E+00	4.17E-03
552	Krypton-87	air	low population density	kBq	8.27E-01	8.54E-04	9.96E-03	1.60E-01	6.54E-01	1.74E-03
553	Krypton-88	air	low population density	kBq	1.07E+00	8.61E-04	1.25E-02	2.08E-01	8.46E-01	1.68E-03
554	Krypton-89	air	low population density	kBq	4.43E-01	2.34E-04	4.97E-03	8.63E-02	3.51E-01	4.07E-04
555	Lanthanum, 7.2% in	resource	in ground	kg	1.63E-19	4.05E-21	8.24E-21	2.46E-20	1.18E-19	7.91E-21

Table D1 LCI contribution results of bioethanol production process from cassava rhizome (cont'd)

No	Substance	Compartment	Sub compartment	Unit	Total	Pretreatment	Detoxification	SSCF	Distillation	Dehydration
	bastnasite, 0.72% in crude ore, in ground									
556	Lanthanum-140	air	low population density	kBq	2.09E-05	9.58E-09	2.32E-07	4.07E-06	1.66E-05	1.58E-08
557	Lanthanum-140	water	river	kBq	6.77E-04	3.10E-07	7.53E-06	1.32E-04	5.37E-04	5.12E-07
558	Lead, 5.0% in sulfide, Pb 3.0%, Zn, Ag, Cd, In, in ground	resource	in ground	kg	3.00E-02	1.36E-04	5.38E-04	5.40E-03	2.33E-02	5.77E-04
559	Lead	air	high population density	kg	3.20E-05	2.54E-06	4.31E-06	5.86E-06	1.87E-05	5.77E-07
560	Lead	air	low population density	kg	2.30E-03	2.77E-05	6.75E-05	4.32E-04	1.76E-03	6.46E-06
561	Lead	air	lower stratosphere + upper troposphere	kg	5.48E-12	1.33E-13	2.66E-13	1.01E-12	4.07E-12	1.11E-15
562	Lead	air	unspecified	kg	2.05E-04	4.50E-06	9.36E-06	3.35E-05	1.51E-04	6.68E-06
563	Lead	soil	agricultural	kg	1.66E-06	3.76E-08	7.68E-08	2.89E-07	1.23E-06	2.57E-08
564	Lead	soil	unspecified	kg	5.55E-07	4.32E-08	7.40E-08	7.89E-08	3.47E-07	1.19E-08
565	Lead	water	ground-	kg	3.12E-08	5.64E-10	1.23E-09	5.14E-09	2.32E-08	1.01E-09
566	Lead	water	ground-long-term	kg	5.70E-04	5.78E-05	9.70E-05	7.20E-05	3.28E-04	1.58E-05
567	Lead	water	lake	kg	1.40E-10	4.49E-12	8.51E-12	2.54E-11	1.02E-10	2.88E-14
568	Lead	water	ocean	kg	5.17E-05	3.23E-06	5.70E-06	5.87E-06	3.30E-05	3.93E-06
569	Lead	water	river	kg	3.09E-04	4.30E-06	1.00E-05	5.67E-05	2.36E-04	2.63E-06
570	Lead	water	unspecified	kg	3.82E-05	6.09E-07	1.36E-06	6.11E-06	2.91E-05	1.08E-06
571	Lead-210	air	high population density	kBq	4.38E-03	9.41E-05	1.94E-04	7.88E-04	3.27E-03	3.75E-05
572	Lead-210	air	low population density	kBq	4.87E-02	5.65E-04	1.42E-03	8.44E-03	3.71E-02	1.19E-03
573	Lead-210	air	unspecified	kBq	2.25E-10	1.14E-12	4.02E-12	3.99E-11	1.78E-10	1.53E-12
574	Lead-210	water	ground-	kBq	2.90E-05	8.87E-07	1.74E-06	4.05E-06	2.05E-05	1.77E-06
575	Lead-210	water	ocean	kBq	3.43E-02	1.05E-03	2.05E-03	4.80E-03	2.44E-02	2.10E-03
576	Lead-210	water	river	kBq	1.81E-02	2.53E-04	5.98E-04	3.02E-03	1.36E-02	5.78E-04
577	Lead-210	water	unspecified	kBq	1.62E-03	8.51E-07	1.71E-06	6.52E-06	1.62E-03	5.08E-08
578	Limestone, in ground	resource	in ground	kg	4.00E-01	0.00E+00	0.00E+00	4.00E-01		
579	Linuron	soil	agricultural	kg	4.26E-07	2.09E-08	3.75E-08	6.69E-08	2.91E-07	9.40E-09
580	Lithium, ion	water	unspecified	kg	6.04E-03	3.16E-06	6.34E-06	2.42E-05	6.00E-03	1.89E-07
581	Magnesite,	resource	in ground	kg	6.89E-01	1.55E-02	3.20E-02	1.11E-01	5.06E-01	2.38E-02

Table D1 LCI contribution results of bioethanol production process from cassava rhizome (cont'd)

No	Substance	Compartment	Sub compartment	Unit	Total	Pretreatment	Detoxification	SSCF	Distillation	Dehydration
	60% in crude ore, in ground							01		
582	Magnesium, 0.13% in water	resource	in water	kg	1.81E-05	4.89E-07	9.58E-07	3.23E-06	1.33E-05	1.15E-07
583	Magnesium	air	high population density	kg	3.85E-04	8.16E-06	1.69E-05	6.88E-05	2.87E-04	4.01E-06
584	Magnesium	air	low population density	kg	1.18E-04	2.49E-06	5.21E-06	2.02E-05	8.62E-05	3.65E-06
585	Magnesium	air	unspecified	kg	2.45E-07	6.10E-11	1.22E-10	1.29E-07	1.16E-07	3.64E-12
586	Magnesium	soil	agricultural	kg	3.16E-04	4.95E-06	1.13E-05	5.21E-05	2.37E-04	1.08E-05
587	Magnesium	soil	industrial	kg	1.13E-02	6.03E-05	2.38E-04	1.42E-03	8.43E-03	1.12E-03
588	Magnesium	water	ground-	kg	5.24E-05	8.63E-07	1.94E-06	8.55E-06	3.91E-05	1.89E-06
589	Magnesium	water	ground-long-term	kg	1.37E-01	2.71E-03	5.80E-03	2.21E-02	1.01E-01	5.02E-03
590	Magnesium	water	ocean	kg	4.70E-03	5.13E-04	8.57E-04	6.28E-04	2.56E-03	1.45E-04
591	Magnesium	water	river	kg	1.62E-02	7.96E-04	1.43E-03	2.50E-03	1.09E-02	5.85E-04
592	Magnesium	water	unspecified	kg	3.52E-03	1.84E-06	3.70E-06	1.41E-05	3.50E-03	1.10E-07
593	Mancozeb	soil	agricultural	kg	2.13E-06	3.32E-08	7.46E-08	3.88E-07	1.61E-06	1.95E-08
594	Manganese, 35.7% in sedimentary deposit, 14.2% in crude ore, in ground	resource	in ground	kg	2.87E-02	2.28E-03	3.90E-03	4.08E-03	1.78E-02	6.69E-04
595	Manganese	air	high population density	kg	1.67E-05	3.00E-07	6.57E-07	2.74E-06	1.24E-05	5.63E-07
596	Manganese	air	low population density	kg	3.48E-04	4.34E-06	1.05E-05	6.51E-05	2.66E-04	1.32E-06
597	Manganese	air	unspecified	kg	5.10E-05	1.14E-06	2.35E-06	8.40E-06	3.76E-05	1.58E-06
598	Manganese	soil	agricultural	kg	1.90E-04	3.04E-06	6.89E-06	3.11E-05	1.42E-04	6.71E-06
599	Manganese	soil	industrial	kg	5.63E-04	3.02E-06	1.19E-05	7.09E-05	4.22E-04	5.58E-05
600	Manganese	water	ground-	kg	1.17E-04	1.85E-06	4.20E-06	1.98E-05	8.81E-05	3.30E-06
601	Manganese	water	ground-long-term	kg	4.77E-03	1.11E-04	2.27E-04	7.81E-04	3.51E-03	1.47E-04
602	Manganese	water	ocean	kg	3.81E-05	4.12E-06	6.89E-06	5.09E-06	2.08E-05	1.19E-06
603	Manganese	water	river	kg	8.45E-04	8.70E-06	2.27E-05	1.55E-04	6.48E-04	1.05E-05
604	Manganese	water	unspecified	kg	6.29E-05	8.10E-07	1.91E-06	9.70E-06	4.89E-05	1.66E-06
605	Manganese-54	air	low population density	kBq	1.94E-06	8.91E-10	2.16E-08	3.79E-07	1.54E-06	1.47E-09
606	Manganese-54	water	river	kBq	1.29E-02	1.49E-05	1.58E-04	2.49E-03	1.02E-02	2.97E-05
607	Mercury	air	high population density	kg	4.68E-06	1.25E-07	2.55E-07	5.52E-07	3.30E-06	4.42E-07

Table D1 LCI contribution results of bioethanol production process from cassava rhizome (cont'd)

No	Substance	Compartment	Sub compartment	Unit	Total	Pretreatment	Detoxification	SSCF	Distillation	Dehydration
608	Mercury	air	low population density	kg	2.15E-05	3.92E-07	8.65E-07	3.22E-06	1.58E-05	1.16E-06
609	Mercury	air	lower stratosphere + upper troposphere	kg	1.92E-14	4.67E-16	9.32E-16	3.53E-15	1.42E-14	3.88E-18
610	Mercury	air	unspecified	kg	5.60E-05	1.26E-06	2.60E-06	9.04E-06	4.12E-05	1.93E-06
611	Mercury	soil	agricultural	kg	4.79E-09	5.78E-11	1.42E-10	8.66E-10	3.66E-09	6.39E-11
612	Mercury	water	ground-	kg	2.39E-10	6.76E-12	1.34E-11	3.43E-11	1.71E-10	1.36E-11
613	Mercury	water	ground-long-term	kg	1.78E-05	3.88E-07	8.08E-07	2.88E-06	1.31E-05	5.93E-07
614	Mercury	water	lake	kg	1.21E-12	3.89E-14	7.36E-14	2.19E-13	8.82E-13	2.49E-16
615	Mercury	water	ocean	kg	8.26E-07	2.21E-09	1.39E-08	1.07E-07	6.25E-07	7.86E-08
616	Mercury	water	river	kg	1.65E-06	3.55E-08	7.35E-08	2.86E-07	1.22E-06	2.87E-08
617	Mercury	water	unspecified	kg	3.20E-06	4.80E-08	1.11E-07	5.38E-07	2.41E-06	9.41E-08
618	Metaldehyde	soil	agricultural	kg	2.58E-09	1.03E-10	1.89E-10	4.23E-10	1.82E-09	4.82E-11
619	Metallic ions, unspecified	water	unspecified	kg	1.91E-06	0.00E+00	0.00E+00	1.91E-06		
620	Metamorphous rock, graphite containing, in ground	resource	in ground	kg	3.91E-03	4.73E-05	1.15E-04	7.38E-04	3.00E-03	6.91E-06
621	Methane, biogenic	air	high population density	kg	2.74E-04	4.21E-06	9.59E-06	4.76E-05	2.07E-04	5.78E-06
622	Methane, biogenic	air	low population density	kg	1.32E-02	2.10E-03	3.44E-03	1.30E-03	6.06E-03	3.43E-04
623	Methane, biogenic	air	unspecified	kg	3.00E-03	3.75E-05	9.21E-05	5.10E-04	2.27E-03	8.71E-05
624	Methane, bromo-, Halon 1001	air	unspecified	kg	9.07E-13	4.75E-16	9.53E-16	3.64E-15	9.02E-13	2.83E-17
625	Methane, bromochlorodifluoro-, Halon 1211	air	low population density	kg	1.57E-04	2.81E-08	2.04E-06	2.03E-05	1.20E-04	1.52E-05
626	Methane, bromotrifluoro-, Halon 1301	air	high population density	kg	2.09E-12	2.70E-14	6.45E-14	3.83E-13	1.60E-12	1.88E-14
627	Methane, bromotrifluoro-, Halon 1301	air	low population density	kg	1.45E-06	8.96E-08	1.57E-07	2.23E-07	9.27E-07	4.96E-08
628	Methane, chlorodifluoro-, HCFC-22	air	high population density	kg	1.91E-06	6.21E-08	1.17E-07	3.44E-07	1.39E-06	1.05E-09
629	Methane, chlorodifluoro-, HCFC-22	air	low population density	kg	5.42E-04	1.22E-07	7.06E-06	7.00E-05	4.13E-04	5.21E-05
630	Methane, dichloro-,	air	high population	kg	6.53E-08	1.26E-09	2.66E-09	1.20E-08	4.91E-08	2.64E-10

Table D1 LCI contribution results of bioethanol production process from cassava rhizome (cont'd)

No	Substance	Compartment	Sub compartment	Unit	Total	Pretreatment	Detoxification	SSCF	Distillation	Dehydration
	HCC-30		density							
631	Methane, dichloro-, HCC-30	air	low population density	kg	4.74E-08	2.80E-10	9.13E-10	8.45E-09	3.74E-08	3.11E-10
632	Methane, dichloro-, HCC-30	water	river	kg	3.56E-04	1.91E-06	7.53E-06	4.49E-05	2.67E-04	3.53E-05
633	Methane, dichlorodifluoro-, CFC-12	air	high population density	kg	3.23E-07	4.69E-09	1.07E-08	6.20E-08	2.45E-07	1.27E-10
634	Methane, dichlorodifluoro-, CFC-12	air	low population density	kg	5.43E-07	1.01E-10	7.02E-09	7.05E-08	4.14E-07	5.17E-08
635	Methane, dichlorodifluoro-, CFC-12	air	unspecified	kg	6.03E-13	3.16E-16	6.34E-16	2.42E-15	6.00E-13	1.88E-17
636	Methane, dichlorofluoro-, HCFC-21	air	high population density	kg	3.78E-10	1.20E-11	2.28E-11	6.83E-11	2.75E-10	1.64E-13
637	Methane, fossil	air	high population density	kg	9.98E-01	1.07E-03	1.26E-02	1.77E-01	7.82E-01	2.55E-02
638	Methane, fossil	air	low population density	kg	2.01E+01	1.70E-02	2.72E-01	2.88E+00	1.54E+01	1.53E+00
639	Methane, fossil	air	lower stratosphere + upper troposphere	kg	1.37E-08	3.34E-10	6.66E-10	2.52E-09	1.02E-08	2.77E-12
640	Methane, fossil	air	unspecified	kg	2.27E-02	6.84E-05	1.27E-04	1.83E-03	2.06E-02	5.74E-05
641	Methane, monochloro-, R-40	air	high population density	kg	1.09E-09	2.82E-11	5.57E-11	1.97E-10	8.07E-10	4.71E-12
642	Methane, monochloro-, R-40	air	low population density	kg	8.65E-08	5.11E-10	1.67E-09	1.54E-08	6.84E-08	5.68E-10
643	Methane, tetrachloro-, R-10	air	high population density	kg	1.13E-06	2.00E-08	4.41E-08	1.86E-07	8.46E-07	3.83E-08
644	Methane, tetrachloro-, R-10	air	unspecified	kg	2.70E-10	1.41E-13	2.83E-13	1.08E-12	2.68E-10	8.43E-15
645	Methane, tetrafluoro-, R-14	air	high population density	kg	1.96E-08	1.57E-10	4.58E-10	3.51E-09	1.51E-08	3.58E-10
646	Methane, tetrafluoro-, R-14	air	unspecified	kg	7.47E-04	6.85E-06	1.85E-05	1.43E-04	5.79E-04	7.83E-07
647	Methane, trichlorofluoro-, CFC-11	air	high population density	kg	6.14E-10	1.95E-11	3.69E-11	1.11E-10	4.46E-10	2.66E-13
648	Methane, trifluoro-, HFC-23	air	high population density	kg	1.20E-07	3.81E-09	7.24E-09	2.17E-08	8.75E-08	5.22E-11
649	Methanol	air	high population density	kg	1.86E-04	2.89E-06	6.44E-06	4.29E-05	1.29E-04	4.58E-06
650	Methanol	air	low population density	kg	1.35E-04	1.67E-06	4.18E-06	2.15E-05	1.02E-04	6.09E-06

Table D1 LCI contribution results of bioethanol production process from cassava rhizome (cont'd)

No	Substance	Compartment	Sub compartment	Unit	Total	Pretreatment	Detoxification	SSCF	Distillation	Dehydration
651	Methanol	air	unspecified	kg	9.40E-05	2.06E-06	4.32E-06	1.44E-05	6.88E-05	4.35E-06
652	Methanol	water	ocean	kg	2.13E-03	3.70E-07	2.76E-05	2.77E-04	1.63E-03	2.04E-04
653	Methanol	water	river	kg	5.08E-05	1.62E-06	3.07E-06	9.17E-06	3.69E-05	1.14E-08
654	Methanol	water	unspecified	kg	5.03E-06	7.28E-08	1.71E-07	8.19E-07	3.78E-06	1.91E-07
655	Methyl acrylate	air	high population density	kg	1.37E-06	4.38E-08	8.30E-08	2.47E-07	9.94E-07	2.50E-10
656	Methyl acrylate	water	river	kg	2.67E-05	8.56E-07	1.62E-06	4.83E-06	1.94E-05	4.88E-09
657	Methyl amine	air	high population density	kg	2.60E-09	8.32E-11	1.58E-10	4.69E-10	1.89E-09	5.32E-13
658	Methyl amine	water	river	kg	6.24E-09	2.00E-10	3.78E-10	1.13E-09	4.53E-09	1.28E-12
659	Methyl borate	air	high population density	kg	4.62E-13	1.48E-14	2.80E-14	8.34E-14	3.36E-13	8.43E-17
660	Methyl ethyl ketone	air	high population density	kg	2.16E-03	6.93E-05	1.31E-04	3.91E-04	1.57E-03	4.15E-07
661	Methyl formate	air	high population density	kg	5.31E-09	1.70E-10	3.22E-10	9.58E-10	3.85E-09	9.64E-13
662	Methyl formate	water	river	kg	2.12E-09	6.79E-11	1.29E-10	3.83E-10	1.54E-09	3.85E-13
663	Metolachlor	soil	agricultural	kg	3.03E-06	1.50E-07	2.68E-07	4.75E-07	2.07E-06	6.80E-08
664	Metribuzin	soil	agricultural	kg	7.50E-08	1.17E-09	2.63E-09	1.37E-08	5.68E-08	6.86E-10
665	Molybdenum, 0.010% in sulfide. Mo 8.2E-3% and Cu 1.83% in crude ore. in ground	resource	in ground	kg	2.70E-02	3.00E-04	7.53E-04	5.10E-03	2.08E-02	6.21E-05
666	Molybdenum, 0.014% in sulfide. Mo 8.2E-3% and Cu 0.81% in crude ore. in ground	resource	in ground	kg	3.83E-03	4.23E-05	1.06E-04	7.24E-04	2.95E-03	8.85E-06
667	Molybdenum, 0.022% in sulfide. Mo 8.2E-3% and Cu 0.36% in crude ore. in ground	resource	in ground	kg	9.58E-03	7.89E-04	1.34E-03	1.34E-03	5.87E-03	2.35E-04
668	Molybdenum, 0.025% in sulfide. Mo 8.2E-3% and Cu 0.39% in crude ore. in ground	resource	in ground	kg	1.40E-02	1.55E-04	3.90E-04	2.65E-03	1.08E-02	3.24E-05
669	Molybdenum, 0.11% in	resource	in ground	kg	1.93E-02	1.59E-03	2.71E-03	2.70E-03	1.18E-02	4.74E-04

Table D1 LCI contribution results of bioethanol production process from cassava rhizome (cont'd)

No	Substance	Compartment	Sub compartment	Unit	Total	Pretreatment	Detoxification	SSCF	Distillation	Dehydration
	sulfide, Mo 4.1E-2% and Cu 0.36% in crude ore, in ground									
670	Molybdenum	air	high population density	kg	5.21E-06	6.30E-07	1.04E-06	9.82E-07	2.45E-06	1.09E-07
671	Molybdenum	air	low population density	kg	1.31E-06	3.31E-08	6.73E-08	1.94E-07	9.50E-07	6.99E-08
672	Molybdenum	air	unspecified	kg	4.92E-08	4.16E-12	5.16E-10	9.71E-09	3.90E-08	9.37E-12
673	Molybdenum	soil	agricultural	kg	4.55E-08	6.25E-10	1.48E-09	7.71E-09	3.44E-08	1.30E-09
674	Molybdenum	water	ground-	kg	1.17E-04	2.99E-06	6.05E-06	1.70E-05	8.41E-05	6.44E-06
675	Molybdenum	water	ground-, long-term	kg	2.60E-06	1.97E-07	3.37E-07	3.85E-07	1.64E-06	4.14E-08
676	Molybdenum	water	ocean	kg	3.90E-07	1.01E-07	1.63E-07	2.35E-08	9.59E-08	5.42E-09
677	Molybdenum	water	river	kg	2.07E-04	1.32E-06	4.29E-06	3.82E-05	1.61E-04	2.55E-06
678	Molybdenum	water	unspecified	kg	1.29E-07	6.76E-11	1.36E-10	5.18E-10	1.28E-07	4.03E-12
679	Molybdenum-99	water	river	kBq	2.33E-04	1.07E-07	2.59E-06	4.55E-05	1.85E-04	1.76E-07
680	Monoethanolamine	air	high population density	kg	7.11E-05	2.07E-06	3.99E-06	1.29E-05	5.21E-05	4.66E-08
681	m-Xylene	air	high population density	kg	8.65E-06	1.43E-07	3.22E-07	1.42E-06	6.46E-06	3.05E-07
682	m-Xylene	water	unspecified	kg	1.70E-07	8.91E-11	1.79E-10	6.83E-10	1.69E-07	5.31E-12
683	Napropamide	soil	agricultural	kg	4.57E-09	1.82E-10	3.35E-10	7.49E-10	3.22E-09	8.53E-11
684	Neodymium, 4% in bastnasite, 0.4% in crude ore, in ground	resource	in ground	kg	2.94E+20	3.22E+22	8.21E+22	5.29E+21	2.25E+20	4.78E+22
685	Nickel, 1.13% in sulfide, Ni 0.76% and Cu 0.76% in crude ore, in ground	resource	in ground	kg	2.60E+03	1.84E+05	4.09E+05	1.67E+03	8.66E+04	5.92E+06
686	Nickel, 1.98% in silicates, 1.04% in crude ore, in ground	resource	in ground	kg	2.75E+00	6.34E+02	1.29E+01	4.94E+01	2.04E+00	2.06E+02
687	Nickel, ion	water	ground-	kg	7.73E-06	1.41E-07	3.08E-07	1.27E-06	5.75E-06	2.55E-07
688	Nickel, ion	water	ground-, long-term	kg	2.12E-02	4.36E-04	9.11E-04	3.75E-03	1.58E-02	2.87E-04
689	Nickel, ion	water	lake	kg	1.91E-10	6.10E-12	1.16E-11	3.44E-11	1.39E-10	3.91E-14
690	Nickel, ion	water	ocean	kg	8.91E-06	3.67E-07	6.72E-07	1.47E-06	6.25E-06	1.47E-07
691	Nickel, ion	water	river	kg	2.62E-04	3.48E-06	8.23E-06	4.84E-05	2.00E-04	1.99E-06

Table D1 LCI contribution results of bioethanol production process from cassava rhizome (cont'd)

No	Substance	Compartment	Sub compartment	Unit	Total	Pretreatment	Detoxification	SSCF	Distillation	Dehydration
692	Nickel, ion	water	unspecific	kg	1.00E-04	1.56E-06	3.54E-06	1.66E-05	7.54E-05	2.94E-06
693	Nickel	air	high population density	kg	1.48E-04	1.26E-05	2.13E-05	3.44E-05	7.62E-05	3.59E-06
694	Nickel	air	low population density	kg	1.57E-03	1.86E-05	4.57E-05	2.96E-04	1.21E-03	5.40E-06
695	Nickel	air	lower stratosphere + upper troposphere	kg	1.92E-11	4.67E-13	9.32E-13	3.53E-12	1.42E-11	3.88E-15
696	Nickel	air	unspecific	kg	3.35E-05	7.70E-07	1.58E-06	5.49E-06	2.46E-05	1.10E-06
697	Nickel	soil	agricultural	kg	3.86E-06	1.13E-07	2.17E-07	6.87E-07	2.82E-06	2.13E-08
698	Nickel	soil	unspecific	kg	1.74E-07	1.36E-08	2.32E-08	2.48E-08	1.09E-07	3.73E-09
699	Niobium-95	air	low population density	kBq	2.31E-07	1.06E-10	2.56E-09	4.50E-08	1.83E-07	1.74E-10
700	Niobium-95	water	river	kBq	9.14E-04	2.30E-06	1.32E-05	1.74E-04	7.19E-04	4.93E-06
701	Nitrate	air	high population density	kg	2.48E-06	3.74E-08	8.51E-08	4.49E-07	1.88E-06	2.68E-08
702	Nitrate	water	ground-	kg	9.86E-04	2.54E-05	5.11E-05	1.53E-04	7.16E-04	4.04E-05
703	Nitrate	water	ground-, long-term	kg	8.83E-04	2.01E-05	4.10E-05	1.53E-04	6.54E-04	1.50E-05
704	Nitrate	water	ocean	kg	2.94E-03	9.60E-05	1.82E-04	5.07E-04	2.12E-03	3.23E-05
705	Nitrate	water	river	kg	7.82E-03	4.12E-04	7.31E-04	1.25E-03	5.31E-03	1.18E-04
706	Nitrate	water	unspecific	kg	7.88E-02	0.00E+00	0.00E+00	7.88E-02		
707	Nitrite	water	ground-, long-term	kg	4.20E-05	3.48E-06	5.94E-06	5.53E-06	2.57E-05	1.37E-06
708	Nitrite	water	ocean	kg	5.44E-05	2.66E-07	9.96E-07	1.01E-05	4.24E-05	5.78E-07
709	Nitrite	water	river	kg	6.36E-05	2.55E-06	4.68E-06	1.10E-05	4.50E-05	3.01E-07
710	Nitrogen oxide	air	unspecific	kg	2.55E+00	2.55E+00	0.00E+00	0.00E+00		
711	Nitrogen oxides	air	high population density	kg	3.34E+00	5.88E-02	1.35E-01	4.05E-01	2.42E+00	3.19E-01
712	Nitrogen oxides	air	low population density	kg	9.69E-01	8.78E-03	2.56E-02	1.35E-01	7.26E-01	7.42E-02
713	Nitrogen oxides	air	lower stratosphere + upper troposphere	kg	3.83E-06	9.34E-08	1.86E-07	7.06E-07	2.85E-06	7.76E-10
714	Nitrogen oxides	air	unspecific	kg	3.89E-01	1.24E-02	2.38E-02	6.36E-02	2.75E-01	1.39E-02
715	Nitrogen, organic bound	water	ground-, long-term	kg	1.26E-03	1.04E-04	1.78E-04	1.66E-04	7.72E-04	4.10E-05
716	Nitrogen, organic bound	water	ocean	kg	2.76E-04	5.83E-05	9.45E-05	2.56E-05	9.27E-05	4.76E-06
717	Nitrogen, organic bound	water	river	kg	4.35E-03	9.22E-05	1.90E-04	8.02E-04	3.25E-03	1.62E-05

Table D1 LCI contribution results of bioethanol production process from cassava rhizome (cont'd)

No	Substance	Compartment	Sub compartment	Unit	Total	Pretreatment	Detoxification	SSCF	Distillation	Dehydration
718	Nitrogen	water	ocean	kg	5.95E-05	2.27E-07	1.10E-06	7.87E-06	4.49E-05	5.38E-06
719	Nitrogen	water	river	kg	2.32E-03	3.98E-05	8.48E-05	6.55E-04	1.47E-03	7.00E-05
720	Nitrous oxide	air	unspecified	kg	6.00E-01	6.00E-01	0.00E+00	0.00E+00		
721	NMVOC, non-methane volatile organic compounds, unspecified origin	air	high population density	kg	1.20E-01	7.66E-04	2.51E-03	2.13E-02	9.27E-02	2.59E-03
722	NMVOC, non-methane volatile organic compounds, unspecified origin	air	low population density	kg	1.68E+00	3.45E-03	2.65E-02	2.23E-01	1.28E+00	1.52E-01
723	NMVOC, non-methane volatile organic compounds, unspecified origin	air	lower stratosphere + upper troposphere	kg	1.84E-07	4.48E-09	8.94E-09	3.38E-08	1.36E-07	3.72E-11
724	NMVOC, non-methane volatile organic compounds, unspecified origin	air	unspecified	kg	6.96E-02	1.65E-03	3.36E-03	1.12E-02	5.13E-02	2.03E-03
725	Noble gases, radioactive, unspecified	air	low population density	kBq	2.07E+05	1.02E+03	3.80E+03	3.86E+04	1.62E+05	2.20E+03
726	Occupation, arable, non-irrigated	resource	land	m2a	1.93E-02	7.65E-04	1.41E-03	3.16E-03	1.36E-02	3.57E-04
727	Occupation, construction site	resource	land	m2a	6.71E-01	3.46E-03	1.32E-02	1.07E-01	5.14E-01	3.26E-02
728	Occupation, dump site, benthos	resource	land	m2a	7.62E-01	1.01E-03	1.12E-02	9.84E-02	5.78E-01	7.31E-02
729	Occupation, dump site	resource	land	m2a	4.22E+00	6.52E-02	1.47E-01	7.75E-01	3.20E+00	2.88E-02
730	Occupation, forest, intensive, normal	resource	land	m2a	1.24E+01	8.10E-01	1.41E+00	1.90E+00	8.10E+00	2.27E-01
731	Occupation, forest, intensive, short-cycle	resource	land	m2a	2.96E-02	1.24E-04	5.58E-04	4.13E-03	2.25E-02	2.34E-03
732	Occupation, forest, intensive	resource	land	m2a	2.19E-01	9.02E-03	1.65E-02	3.78E-02	1.55E-01	1.48E-03
733	Occupation, industrial area	resource	land	m2a	8.18E-03	8.16E-06	1.15E-04	1.10E-03	6.24E-03	7.15E-04

Table D1 LCI contribution results of bioethanol production process from cassava rhizome (cont'd)

No	Substance	Compartment	Sub compartment	Unit	Total	Pretreatment	Detoxification	SSCF	Distillation	Dehydration
	benthos									
734	Occupation, industrial area, built up	resource	land	m2a	5.14E-01	6.29E-02	1.04E-01	6.61E-02	2.73E-01	7.25E-03
735	Occupation, industrial area, vegetation	resource	land	m2a	1.61E-01	2.04E-02	3.37E-02	2.01E-02	8.40E-02	2.57E-03
736	Occupation, industrial area	resource	land	m2a	1.41E+00	1.38E-02	3.84E-02	2.07E-01	1.06E+00	9.10E-02
737	Occupation, mineral extraction site	resource	land	m2a	1.07E+00	1.40E-02	3.41E-02	1.70E-01	8.01E-01	4.65E-02
738	Occupation, permanent crop, fruit, intensive	resource	land	m2a	4.23E-02	1.64E-04	7.77E-04	5.86E-03	3.21E-02	3.40E-03
739	Occupation, shrub land, sclerophyllous	resource	land	m2a	3.08E-02	9.99E-04	1.91E-03	5.00E-03	2.21E-02	8.18E-04
740	Occupation, traffic area, rail embankment	resource	land	m2a	8.23E-02	1.20E-02	1.98E-02	8.91E-03	3.99E-02	1.64E-03
741	Occupation, traffic area, rail network	resource	land	m2a	9.10E-02	1.33E-02	2.19E-02	9.85E-03	4.42E-02	1.81E-03
742	Occupation, traffic area, road embankment	resource	land	m2a	1.59E-01	9.17E-03	1.61E-02	2.50E-02	1.06E-01	2.53E-03
743	Occupation, traffic area, road network	resource	land	m2a	4.43E-01	1.07E-02	2.17E-02	7.32E-02	3.25E-01	1.28E-02
744	Occupation, urban, discontinuously built	resource	land	m2a	1.32E-04	9.99E-07	3.10E-06	2.10E-05	1.01E-04	6.45E-06
745	Occupation, water bodies, artificial	resource	land	m2a	1.42E+00	1.02E-02	3.19E-02	2.38E-01	1.09E+00	5.11E-02
746	Occupation, water courses, artificial	resource	land	m2a	1.16E+00	5.42E-03	2.08E-02	2.19E-01	9.09E-01	8.21E-03
747	o-Dichlorobenzene	water	river	kg	3.35E-06	1.07E-07	2.03E-07	6.05E-07	2.43E-06	6.86E-10
748	Oil, crude, in ground	resource	in ground	kg	4.12E+01	2.55E+00	4.46E+00	6.47E+00	2.63E+01	1.36E+00
749	Oils, biogenic	soil	forestry	kg	1.39E-04	1.13E-05	1.92E-05	2.05E-05	8.55E-05	1.90E-06
750	Oils, biogenic	soil	unspecified	kg	5.96E-05	8.70E-06	1.43E-05	6.45E-06	2.89E-05	1.19E-06
751	Oils, unspecified	soil	forestry	kg	1.59E-01	1.11E-02	1.92E-02	2.43E-02	9.91E-02	5.62E-03
752	Oils, unspecified	soil	industrial	kg	2.45E-04	3.73E-06	8.57E-06	4.12E-05	1.84E-04	7.37E-06
753	Oils,	soil	unspecified	kg	1.64E-03	4.08E-05	8.16E-05	2.95E-	1.20E-03	2.60E-05

Table D1 LCI contribution results of bioethanol production process from cassava rhizome (cont'd)

No	Substance	Compartment	Sub compartment	Unit	Total	Pretreatment	Detoxification	SSCF	Distillation	Dehydration
	unspecified		d					04		
754	Oils, unspecified	water	ocean	kg	9.78E-02	1.59E-03	3.70E-03	1.34E-02	7.14E-02	7.71E-03
755	Oils, unspecified	water	river	kg	1.29E-01	8.94E-03	1.55E-02	1.97E-02	8.02E-02	4.54E-03
756	Oils, unspecified	water	unspecified	kg	9.57E-04	1.11E-05	2.74E-05	1.39E-04	7.18E-04	6.05E-05
757	Olivine, in ground	resource	in ground	kg	5.49E-06	5.61E-08	1.48E-07	9.71E-07	4.20E-06	1.11E-07
758	Orbencarb	soil	agricultural	kg	4.05E-07	6.31E-09	1.42E-08	7.38E-08	3.07E-07	3.71E-09
759	Organic substances, unspecified	air	unspecified	kg	7.34E-04	0.00E+00	0.00E+00	7.34E-04		
760	o-Xylene	water	unspecified	kg	1.24E-07	6.49E-11	1.30E-10	4.97E-10	1.23E-07	3.87E-12
761	Ozone	air	high population density	kg	4.90E-07	1.13E-08	2.30E-08	8.37E-08	3.62E-07	1.00E-08
762	Ozone	air	low population density	kg	7.48E-07	1.22E-08	2.33E-08	7.15E-08	6.40E-07	2.13E-10
763	Ozone	air	unspecified	kg	6.44E-03	3.72E-05	1.27E-04	1.18E-03	5.00E-03	9.65E-05
764	PAH, polycyclic aromatic hydrocarbons	air	high population density	kg	6.19E-04	1.68E-07	8.99E-06	5.41E-05	4.58E-04	9.69E-05
765	PAH, polycyclic aromatic hydrocarbons	air	low population density	kg	9.97E-06	1.48E-07	3.47E-07	1.56E-06	7.44E-06	4.80E-07
766	PAH, polycyclic aromatic hydrocarbons	air	unspecified	kg	3.02E-04	3.17E-06	8.14E-06	5.61E-05	2.32E-04	1.89E-06
767	PAH, polycyclic aromatic hydrocarbons	water	ocean	kg	7.36E-06	5.42E-07	9.34E-07	1.04E-06	4.52E-06	3.21E-07
768	PAH, polycyclic aromatic hydrocarbons	water	river	kg	1.03E-05	7.00E-07	1.21E-06	1.52E-06	6.52E-06	3.87E-07
769	Paraffins	air	high population density	kg	1.29E-09	2.25E-11	4.88E-11	2.39E-10	9.74E-10	4.22E-12
770	Paraffins	water	river	kg	3.74E-09	6.53E-11	1.42E-10	6.93E-10	2.83E-09	1.22E-11
771	Particulates, < 2.5 um	air	high population density	kg	3.95E-02	1.52E-03	2.85E-03	5.92E-03	2.66E-02	2.65E-03
772	Particulates, < 2.5 um	air	low population density	kg	1.77E-01	2.90E-03	6.54E-03	2.91E-02	1.32E-01	6.12E-03
773	Particulates, < 2.5 um	air	lower stratosphere + upper troposphere	kg	1.04E-08	2.53E-10	5.06E-10	1.92E-09	7.73E-09	2.11E-12
774	Particulates, < 2.5 um	air	unspecified	kg	4.24E-02	8.66E-04	1.84E-03	6.83E-03	3.13E-02	1.52E-03

Table D1 LCI contribution results of bioethanol production process from cassava rhizome (cont'd)

No	Substance	Compartment	Sub compartment	Unit	Total	Pretreatment	Detoxification	SSCF	Distillation	Dehydration
775	Particulates, > 10 um	air	high population density	kg	8.65E-03	5.55E-04	9.62E-04	1.53E-03	5.44E-03	1.68E-04
776	Particulates, > 10 um	air	low population density	kg	4.63E-01	8.46E-03	1.84E-02	7.71E-02	3.45E-01	1.37E-02
777	Particulates, > 10 um	air	unspecified	kg	1.42E-02	9.11E-04	1.58E-03	2.12E-03	9.27E-03	2.80E-04
778	Particulates, > 2.5 um, and < 10um	air	high population density	kg	8.00E-03	3.80E-04	6.82E-04	1.39E-03	5.39E-03	1.54E-04
779	Particulates, > 2.5 um, and < 10um	air	low population density	kg	2.42E-01	4.61E-03	9.88E-03	4.15E-02	1.80E-01	5.38E-03
780	Particulates, > 2.5 um, and < 10um	air	unspecified	kg	2.55E-02	1.27E-03	2.27E-03	4.09E-03	1.75E-02	3.91E-04
781	Particulates	air	unspecified	kg	2.99E-02	0.00E+00	0.00E+00	2.99E-02		
782	Pd, Pd 2.0E-4%, Pt 4.8E-4%, Rh 2.4E-5%, Ni 3.7E-2%, Cu 5.2E-2% in ore, in ground	resource	in ground	kg	3.13E-06	3.84E-08	9.27E-08	5.93E-07	2.40E-06	1.72E-09
783	Pd, Pd 7.3E-4%, Pt 2.5E-4%, Rh 2.0E-5%, Ni 2.3E+0%, Cu 3.2E+0% in ore, in ground	resource	in ground	kg	7.51E-06	9.22E-08	2.23E-07	1.42E-06	5.77E-06	4.13E-09
784	Peat, in ground	resource	biotic	kg	1.42E-02	2.04E-04	4.83E-04	2.23E-03	1.06E-02	6.51E-04
785	Pentane	air	high population density	kg	7.74E-02	2.29E-04	1.44E-03	6.98E-03	5.70E-02	1.17E-02
786	Pentane	air	low population density	kg	2.37E-04	3.74E-06	8.52E-06	3.89E-05	1.77E-04	8.28E-06
787	Pentane	air	unspecified	kg	7.05E-05	3.69E-08	7.40E-08	2.83E-07	7.01E-05	2.20E-09
788	Phenol, pentachloro-	air	high population density	kg	1.83E-09	5.33E-11	1.03E-10	3.12E-10	1.33E-09	3.24E-11
789	Phenol, pentachloro-	air	low population density	kg	2.31E-06	2.78E-08	6.91E-08	3.95E-07	1.75E-06	6.35E-08
790	Phenol	air	high population density	kg	1.07E-05	2.95E-07	5.75E-07	1.95E-06	7.90E-06	2.28E-08
791	Phenol	air	low population density	kg	8.10E-05	1.30E-06	2.89E-06	1.51E-05	6.15E-05	2.06E-07
792	Phenol	air	unspecified	kg	7.78E-07	1.02E-07	1.69E-07	1.01E-07	4.01E-07	5.09E-09
793	Phenol	water	ocean	kg	1.16E-04	8.71E-06	1.50E-05	1.65E-05	7.12E-05	5.00E-06
794	Phenol	water	river	kg	1.61E-04	1.03E-05	1.79E-05	2.43E-05	1.03E-04	5.97E-06
795	Phenol	water	unspecified	kg	4.98E-06	2.56E-08	5.97E-08	1.07E-	3.76E-06	6.37E-08

Table D1 LCI contribution results of bioethanol production process from cassava rhizome (cont'd)

No	Substance	Compartment	Sub compartment	Unit	Total	Pretreatment	Detoxification	SSCF	Distillation	Dehydration
			d					06		
796	Phosphate ore. in ground	resource	in ground	kg	1.96E-01	0.00E+00	0.00E+00	1.96E-01		
797	Phosphate	soil	unspecified	kg	7.79E-02	0.00E+00	0.00E+00	7.79E-02		
798	Phosphate	water	ground-	kg	5.89E-06	1.06E-07	2.32E-07	9.81E-07	4.40E-06	1.79E-07
799	Phosphate	water	ground-long-term	kg	4.70E-02	9.35E-04	1.99E-03	7.80E-03	3.49E-02	1.39E-03
800	Phosphate	water	ocean	kg	5.79E-04	1.76E-05	3.46E-05	8.10E-05	4.11E-04	3.55E-05
801	Phosphate	water	river	kg	1.39E-03	3.85E-05	7.51E-05	2.49E-04	1.02E-03	6.92E-06
802	Phosphine	air	high population density	kg	1.04E-09	3.34E-11	6.33E-11	1.88E-10	7.57E-10	1.90E-13
803	Phosphorus. 18% in apatite. 12% in crude ore. in ground	resource	in ground	kg	5.42E-03	1.65E-04	3.22E-04	7.64E-04	3.85E-03	3.24E-04
804	Phosphorus. 18% in apatite, 4% in crude ore. in ground	resource	in ground	kg	1.21E-02	3.70E-04	7.25E-04	1.69E-03	8.57E-03	7.34E-04
805	Phosphorus	air	high population density	kg	2.96E-05	5.16E-07	1.14E-06	4.95E-06	2.21E-05	8.78E-07
806	Phosphorus	air	low population density	kg	1.91E-06	4.08E-08	8.53E-08	3.12E-07	1.41E-06	6.06E-08
807	Phosphorus	air	unspecified	kg	2.38E-08	2.15E-09	3.63E-09	3.34E-09	1.42E-08	4.47E-10
808	Phosphorus	soil	agricultural	kg	9.26E-05	1.49E-06	3.37E-06	1.52E-05	6.93E-05	3.29E-06
809	Phosphorus	soil	industrial	kg	7.04E-04	3.77E-06	1.49E-05	8.86E-05	5.27E-04	6.97E-05
810	Phosphorus	water	ground-	kg	1.86E-07	8.06E-10	3.54E-09	2.60E-08	1.41E-07	1.47E-08
811	Phosphorus	water	ocean	kg	1.61E-05	3.92E-06	6.34E-06	1.10E-06	4.52E-06	2.21E-07
812	Phosphorus	water	river	kg	1.09E-04	4.04E-06	7.56E-06	1.64E-05	7.63E-05	4.20E-06
813	Phosphorus	water	unspecified	kg	1.77E-06	2.58E-08	6.04E-08	2.91E-07	1.33E-06	6.36E-08
814	Pirimicarb	soil	agricultural	kg	2.63E-09	1.30E-10	2.32E-10	4.11E-10	1.79E-09	5.89E-11
815	Platinum	air	high population density	kg	2.34E-07	5.73E-14	2.43E-09	4.59E-08	1.86E-07	9.31E-14
816	Platinum	air	low population density	kg	1.08E-10	1.36E-12	3.33E-12	1.84E-11	8.21E-11	3.14E-12
817	Plutonium-238	air	low population density	kBq	2.94E-09	1.44E-11	5.39E-11	5.48E-10	2.30E-09	3.13E-11
818	Plutonium-alpha	air	low population density	kBq	6.75E-09	3.30E-11	1.24E-10	1.26E-09	5.26E-09	7.17E-11
819	Polonium-210	air	high population density	kBq	8.01E-03	1.72E-04	3.55E-04	1.44E-03	5.98E-03	6.85E-05
820	Polonium-210	air	low population density	kBq	8.01E-02	9.95E-04	2.44E-03	1.38E-02	6.08E-02	2.09E-03

Table D1 LCI contribution results of bioethanol production process from cassava rhizome (cont'd)

No	Substance	Compartment	Sub compartment	Unit	Total	Pretreatment	Detoxification	SSCF	Distillation	Dehydration
821	Polonium-210	air	unspecified	kBq	4.11E-10	2.07E-12	7.34E-12	7.29E-11	3.26E-10	2.79E-12
822	Polonium-210	water	ground-	kBq	4.41E-05	1.35E-06	2.64E-06	6.16E-06	3.12E-05	2.70E-06
823	Polonium-210	water	ocean	kBq	5.24E-02	1.60E-03	3.13E-03	7.32E-03	3.72E-02	3.21E-03
824	Polonium-210	water	river	kBq	1.81E-02	2.53E-04	5.98E-04	3.02E-03	1.36E-02	5.78E-04
825	Polychlorinated biphenyls	air	high population density	kg	4.39E-11	1.41E-12	2.67E-12	7.93E-12	3.19E-11	7.99E-15
826	Polychlorinated biphenyls	air	unspecified	kg	8.13E-07	1.81E-08	3.75E-08	1.32E-07	5.98E-07	2.75E-08
827	Potassium oxide	resource	in ground	kg	4.88E-02	0.00E+00	0.00E+00	4.88E-02		
828	Potassium ion	water	ground-	kg	1.32E-02	2.34E-04	5.16E-04	2.12E-03	9.80E-03	5.12E-04
829	Potassium ion	water	ground-, long-term	kg	2.97E-02	7.10E-04	1.45E-03	4.59E-03	2.17E-02	1.30E-03
830	Potassium ion	water	ocean	kg	3.84E-03	3.10E-04	5.30E-04	5.40E-04	2.31E-03	1.56E-04
831	Potassium ion	water	river	kg	2.05E-02	7.18E-04	1.37E-03	2.96E-03	1.43E-02	1.16E-03
832	Potassium	air	high population density	kg	1.81E-03	3.05E-05	6.81E-05	2.98E-04	1.35E-03	6.06E-05
833	Potassium	air	low population density	kg	4.00E-05	8.51E-07	1.78E-06	6.60E-06	2.96E-05	1.21E-06
834	Potassium	soil	agricultural	kg	5.15E-04	8.26E-06	1.88E-05	8.44E-05	3.85E-04	1.83E-05
835	Potassium	soil	industrial	kg	4.93E-03	2.64E-05	1.04E-04	6.20E-04	3.69E-03	4.88E-04
836	Potassium-40	air	high population density	kBq	1.27E-03	2.73E-05	5.64E-05	2.29E-04	9.49E-04	1.09E-05
837	Potassium-40	air	low population density	kBq	7.16E-03	1.27E-04	2.79E-04	1.16E-03	5.33E-03	2.66E-04
838	Potassium-40	air	unspecified	kBq	5.54E-11	2.79E-13	9.88E-13	9.82E-12	4.39E-11	3.76E-13
839	Potassium-40	water	ground-	kBq	3.50E-06	1.07E-07	2.10E-07	4.89E-07	2.48E-06	2.14E-07
840	Potassium-40	water	ocean	kBq	4.15E-03	1.26E-04	2.48E-04	5.80E-04	2.94E-03	2.54E-04
841	Potassium-40	water	river	kBq	2.27E-02	3.17E-04	7.51E-04	3.80E-03	1.71E-02	7.26E-04
842	Praseodymium, 0.42% in bastnasite, 0.042% in crude ore, in ground	resource	in ground	kg	2.78E-21	7.82E-23	1.55E-22	4.04E-22	1.99E-21	1.51E-22
843	Propanal	air	high population density	kg	2.71E-07	9.65E-10	4.36E-09	5.16E-08	2.13E-07	1.45E-09
844	Propanal	air	unspecified	kg	2.15E-12	1.13E-15	2.26E-15	8.64E-15	2.14E-12	6.72E-17
845	Propane	air	high population density	kg	1.50E-02	1.54E-04	4.45E-04	1.49E-03	1.09E-02	2.03E-03
846	Propane	air	low population density	kg	2.29E-01	3.75E-05	2.78E-03	3.48E-02	1.77E-01	1.45E-02
847	Propane	air	unspecified	kg	4.32E-05	2.26E-08	4.54E-08	1.74E-07	4.30E-05	1.35E-09

Table D1 LCI contribution results of bioethanol production process from cassava rhizome (cont'd)

No	Substance	Compartment	Sub compartment	Unit	Total	Pretreatment	Detoxification	SSCF	Distillation	Dehydration
								07		
848	Propanol	air	high population density	kg	1.33E-08	1.07E-10	3.12E-10	2.39E-09	1.03E-08	2.44E-10
849	Propene	air	high population density	kg	2.12E-04	9.09E-06	1.66E-05	3.51E-05	1.47E-04	5.04E-06
850	Propene	air	low population density	kg	9.15E-05	1.67E-06	3.66E-06	1.48E-05	6.80E-05	3.41E-06
851	Propene	air	unspecified	kg	5.10E-08	2.67E-11	5.35E-11	2.05E-10	5.07E-08	1.59E-12
852	Propene	water	river	kg	1.30E-04	2.93E-06	6.01E-06	2.23E-05	9.61E-05	2.61E-06
853	Propionic acid	air	high population density	kg	1.23E-03	2.89E-07	1.79E-05	1.08E-04	9.14E-04	1.94E-04
854	Propionic acid	air	unspecified	kg	9.81E-07	5.14E-10	1.03E-09	3.94E-09	9.75E-07	3.06E-11
855	Propylene oxide	air	high population density	kg	1.13E-05	4.35E-07	8.01E-07	1.98E-06	8.02E-06	2.92E-08
856	Propylene oxide	water	river	kg	2.71E-05	1.05E-06	1.92E-06	4.75E-06	1.93E-05	7.03E-08
857	Protactinium-234	air	low population density	kBq	3.61E-03	1.45E-05	6.09E-05	6.78E-04	2.83E-03	3.13E-05
858	Protactinium-234	water	river	kBq	6.65E-02	2.66E-04	1.12E-03	1.25E-02	5.20E-02	5.78E-04
859	Pt 2.5E-4%, Pd 7.3E-4%, Rh 2.0E-5%, Ni 2.3E+0%, Cu 3.2E+0% in ore, in ground	resource	in ground	kg	8.00E-06	3.29E-10	8.35E-08	1.57E-06	6.35E-06	1.79E-10
860	Pt 4.8E-4%, Pd 2.0E-4%, Rh 2.4E-5%, Ni 3.7E-2%, Cu 5.2E-2% in ore, in ground	resource	in ground	kg	2.87E-05	1.18E-09	2.99E-07	5.61E-06	2.28E-05	6.41E-10
861	Radioactive species, alpha emitters	water	river	kBq	1.15E-04	3.17E-06	6.32E-06	1.68E-05	8.25E-05	6.27E-06
862	Radioactive species, Nuclides, unspecified	water	ocean	kBq	2.10E+01	1.03E-01	3.84E-01	3.90E+00	1.63E+01	2.23E-01
863	Radioactive species, Nuclides, unspecified	water	river	kBq	6.23E-02	3.17E-04	1.16E-03	1.16E-02	4.86E-02	6.63E-04
864	Radioactive species, other beta emitters	air	high population density	kBq	7.05E-02	9.10E-04	2.18E-03	1.29E-02	5.39E-02	6.35E-04
865	Radioactive species, other beta	air	low population density	kBq	6.98E-05	6.00E-07	1.70E-06	1.24E-05	5.37E-05	1.38E-06

Table D1 LCI contribution results of bioethanol production process from cassava rhizome (cont'd)

No	Substance	Compartment	Sub compartment	Unit	Total	Pretreatment	Detoxification	SSCF	Distillation	Dehydration
	emitters									
866	Radium-224	water	ocean	kBq	3.73E-02	2.60E-03	4.50E-03	5.69E-03	2.32E-02	1.32E-03
867	Radium-224	water	river	kBq	8.84E-02	5.37E-03	9.42E-03	1.33E-02	5.67E-02	3.63E-03
868	Radium-226	air	high population density	kBq	1.13E-03	2.43E-05	5.01E-05	2.03E-04	8.44E-04	9.68E-06
869	Radium-226	air	low population density	kBq	1.28E-01	6.13E-04	2.32E-03	2.39E-02	9.99E-02	1.32E-03
870	Radium-226	air	unspecified	kBq	5.81E-11	2.93E-13	1.04E-12	1.03E-11	4.61E-11	3.94E-13
871	Radium-226	water	ground-	kBq	3.25E-05	9.95E-07	1.95E-06	4.54E-06	2.30E-05	1.99E-06
872	Radium-226	water	ocean	kBq	9.84E-02	5.34E-03	9.50E-03	1.45E-02	6.46E-02	4.47E-03
873	Radium-226	water	river	kBq	4.15E+01	1.74E-01	7.13E-01	7.79E+00	3.25E+01	3.66E-01
874	Radium-226	water	unspecified	kBq	7.43E-03	3.89E-06	7.81E-06	2.98E-05	7.39E-03	2.32E-07
875	Radium-228	air	high population density	kBq	6.13E-03	1.32E-04	2.71E-04	1.10E-03	4.57E-03	5.24E-05
876	Radium-228	air	low population density	kBq	2.55E-03	4.77E-05	1.04E-04	4.08E-04	1.89E-03	1.00E-04
877	Radium-228	air	unspecified	kBq	1.72E-11	8.68E-14	3.07E-13	3.05E-12	1.36E-11	1.17E-13
878	Radium-228	water	ocean	kBq	7.46E-02	5.20E-03	8.99E-03	1.14E-02	4.64E-02	2.63E-03
879	Radium-228	water	river	kBq	1.77E-01	1.07E-02	1.88E-02	2.66E-02	1.13E-01	7.26E-03
880	Radium-228	water	unspecified	kBq	1.05E-02	5.48E-06	1.10E-05	4.20E-05	1.04E-02	3.27E-07
881	Radon-220	air	high population density	kBq	9.46E-05	2.03E-06	4.18E-06	1.70E-05	7.06E-05	8.09E-07
882	Radon-220	air	low population density	kBq	3.65E-01	5.28E-03	1.32E-02	5.98E-02	2.73E-01	1.28E-02
883	Radon-220	air	unspecified	kBq	1.21E-09	6.09E-12	2.16E-11	2.14E-10	9.58E-10	8.20E-12
884	Radon-222	air	high population density	kBq	9.45E-05	2.02E-06	4.18E-06	1.70E-05	7.05E-05	8.08E-07
885	Radon-222	air	low population density	kBq	1.11E+04	4.50E+01	1.88E+02	2.09E+03	8.69E+03	9.76E+01
886	Radon-222	air	low population density, long-term	kBq	4.65E+05	1.86E+03	7.85E+03	8.74E+04	3.64E+05	4.05E+03
887	Radon-222	air	unspecified	kBq	6.79E-10	3.42E-12	1.21E-11	1.20E-10	5.38E-10	4.61E-12
888	Rh, Rh 2.0E-5%, Pt 2.5E-4%, Pd 7.3E-4%, Ni 2.3E+0%, Cu 3.2E+0% in ore, in ground	resource	in ground	kg	1.57E-06	2.57E-10	1.67E-08	3.07E-07	1.25E-06	5.61E-11
889	Rh, Rh 2.4E-5%, Pt	resource	in ground	kg	4.92E-06	8.04E-10	5.23E-08	9.63E-07	3.91E-06	1.76E-10

Table D1 LCI contribution results of bioethanol production process from cassava rhizome (cont'd)

No	Substance	Compartment	Sub compartment	Unit	Total	Pretreatment	Detoxification	SSCF	Distillation	Dehydration
	4.8E-4%, Pd 2.0E-4%, Ni 3.7E-2%, Cu 5.2E-2% in ore, in ground									
890	Rhenium, in crude ore, in ground	resource	in ground	kg	6.97E-09	1.37E-09	2.22E-09	6.54E-10	2.69E-09	4.88E-11
891	Rubidium	water	ground-	kg	2.57E-06	1.03E-08	4.33E-08	4.83E-07	2.01E-06	2.23E-08
892	Rubidium	water	ocean	kg	7.46E-06	5.20E-07	8.99E-07	1.14E-06	4.64E-06	2.63E-07
893	Rubidium	water	river	kg	1.77E-05	1.07E-06	1.88E-06	2.66E-06	1.13E-05	7.26E-07
894	Ruthenium-103	air	low population density	kBq	5.07E-08	2.32E-11	5.63E-10	9.89E-09	4.02E-08	3.83E-11
895	Ruthenium-103	water	river	kBq	4.93E-05	2.26E-08	5.47E-07	9.60E-06	3.91E-05	3.72E-08
896	Salts, unspecified	water	unspecified	kg	2.08E-04	0.00E+00	0.00E+00	2.08E-04		
897	Samarium, 0.3% in bastnaesite, 0.03% in crude ore, in ground	resource	in ground	kg	5.30E-22	4.24E-24	1.22E-23	1.02E-22	4.11E-22	1.16E-24
898	Sand, unspecified, in ground	resource	in ground	kg	1.65E-03	3.02E-05	6.54E-05	2.88E-04	1.24E-03	3.23E-05
899	Scandium	air	high population density	kg	1.19E-07	2.55E-09	5.26E-09	2.14E-08	8.86E-08	1.02E-09
900	Scandium	air	low population density	kg	7.41E-08	1.60E-09	3.33E-09	1.21E-08	5.46E-08	2.36E-09
901	Scandium	water	ground-	kg	6.78E-06	1.40E-07	2.97E-07	1.05E-06	4.99E-06	3.05E-07
902	Scandium	water	ground-, long-term	kg	4.84E-05	1.12E-06	2.32E-06	7.40E-06	3.53E-05	2.23E-06
903	Scandium	water	river	kg	5.10E-06	1.26E-07	2.57E-07	7.74E-07	3.71E-06	2.39E-07
904	Selenium	air	high population density	kg	4.43E-06	5.09E-07	8.45E-07	8.21E-07	2.18E-06	8.07E-08
905	Selenium	air	low population density	kg	9.64E-05	1.27E-06	3.01E-06	1.77E-05	7.36E-05	8.24E-07
906	Selenium	air	lower stratosphere + upper troposphere	kg	2.74E-12	6.67E-14	1.33E-13	5.04E-13	2.03E-12	5.54E-16
907	Selenium	air	unspecified	kg	9.11E-08	2.75E-09	5.19E-09	1.14E-08	6.85E-08	3.20E-09
908	Selenium	water	ground-	kg	1.44E-05	3.17E-07	6.63E-07	2.21E-06	1.06E-05	6.85E-07
909	Selenium	water	ground-, long-term	kg	4.29E-05	8.07E-07	1.75E-06	7.06E-06	3.19E-05	1.41E-06
910	Selenium	water	ocean	kg	5.84E-07	1.52E-07	2.45E-07	3.52E-08	1.44E-07	8.12E-09
911	Selenium	water	river	kg	3.86E-05	3.60E-07	9.75E-07	7.09E-06	2.97E-05	4.19E-07
912	Selenium	water	unspecified	kg	1.25E-08	6.53E-12	1.31E-11	5.01E-11	1.24E-08	3.90E-13

Table D1 LCI contribution results of bioethanol production process from cassava rhizome (cont'd)

No	Substance	Compartment	Sub compartment	Unit	Total	Pretreatment	Detoxification	SSCF	Distillation	Dehydration
913	Shale, in ground	resource	in ground	kg	3.64E-05	3.76E-07	9.87E-07	6.41E-06	2.78E-05	7.74E-07
914	Silicon tetrafluoride	air	low population density	kg	9.07E-08	2.78E-09	5.43E-09	1.27E-08	6.43E-08	5.55E-09
915	Silicon	air	high population density	kg	1.56E-03	3.29E-05	6.82E-05	2.79E-04	1.16E-03	1.51E-05
916	Silicon	air	low population density	kg	7.46E-04	1.35E-05	2.92E-05	1.29E-04	5.59E-04	1.54E-05
917	Silicon	air	unspecified	kg	3.63E-07	4.43E-14	3.77E-09	7.11E-08	2.88E-07	8.22E-14
918	Silicon	soil	agricultural	kg	8.57E-04	1.32E-05	3.03E-05	1.42E-04	6.43E-04	2.82E-05
919	Silicon	soil	industrial	kg	1.41E-03	7.54E-06	2.98E-05	1.77E-04	1.05E-03	1.39E-04
920	Silicon	water	ground-	kg	1.01E-02	1.74E-04	3.87E-04	1.64E-03	7.54E-03	3.80E-04
921	Silicon	water	ground-long-term	kg	8.99E+00	2.14E-01	4.31E-01	1.59E+00	6.66E+00	9.81E-02
922	Silicon	water	ocean	kg	1.54E-05	1.77E-08	2.21E-07	2.02E-06	1.17E-05	1.43E-06
923	Silicon	water	river	kg	1.87E-02	4.69E-04	9.34E-04	3.32E-03	1.38E-02	1.81E-04
924	Silver, 0.007% in sulfide, Ag 0.004%, Pb, Zn, Cd, In, in ground	resource	in ground	kg	9.49E-05	3.03E-06	5.75E-06	1.71E-05	6.90E-05	2.31E-08
925	Silver, 3.2ppm in sulfide, Ag 1.2ppm, Cu and Te, in crude ore, in ground	resource	in ground	kg	6.77E-05	2.16E-06	4.10E-06	1.22E-05	4.92E-05	1.66E-08
926	Silver, Ag 2.1E-4%, Au 2.1E-4%, in ore, in ground	resource	in ground	kg	6.25E-06	2.00E-07	3.79E-07	1.13E-06	4.54E-06	1.52E-09
927	Silver, Ag 4.2E-3%, Au 1.1E-4%, in ore, in ground	resource	in ground	kg	1.43E-05	4.56E-07	8.64E-07	2.58E-06	1.04E-05	3.48E-09
928	Silver, Ag 4.6E-5%, Au 1.3E-4%, in ore, in ground	resource	in ground	kg	1.40E-05	4.47E-07	8.47E-07	2.53E-06	1.02E-05	3.41E-09
929	Silver, Ag 9.7E-4%, Au 9.7E-4%, Zn 0.63%, Cu 0.38%, Pb 0.014%, in ore, in ground	resource	in ground	kg	9.23E-06	2.95E-07	5.59E-07	1.67E-06	6.71E-06	2.25E-09
930	Silver, ion	water	ground-	kg	1.15E-07	4.61E-10	1.94E-09	2.16E-08	9.00E-08	1.00E-09
931	Silver, ion	water	ground-long-term	kg	6.84E-07	8.08E-08	1.34E-07	8.53E-08	3.71E-07	1.18E-08
932	Silver, ion	water	ocean	kg	4.48E-07	3.12E-08	5.39E-08	6.83E-	2.78E-07	1.58E-08

Table D1 LCI contribution results of bioethanol production process from cassava rhizome (cont'd)

No	Substance	Compartment	Sub compartment	Unit	Total	Pretreatment	Detoxification	SSCF	Distillation	Dehydration
								08		
933	Silver, ion	water	river	kg	2.32E-06	3.59E-07	5.90E-07	2.51E-07	1.06E-06	6.12E-08
934	Silver, ion	water	unspecified	kg	1.18E-05	6.16E-09	1.24E-08	4.73E-08	1.17E-05	3.68E-10
935	Silver	air	high population density	kg	6.11E-08	4.92E-10	1.43E-09	1.10E-08	4.71E-08	1.12E-09
936	Silver	air	low population density	kg	3.48E-10	2.89E-12	6.71E-12	1.82E-10	1.53E-10	3.00E-12
937	Silver-110	air	low population density	kBq	5.03E-07	2.30E-10	5.58E-09	9.80E-08	3.98E-07	3.80E-10
938	Silver-110	water	river	kBq	1.84E-01	1.78E-04	2.20E-03	3.57E-02	1.46E-01	3.46E-04
939	Sodium chlorate	air	high population density	kg	1.24E-06	2.95E-08	6.06E-08	1.86E-07	8.97E-07	6.16E-08
940	Sodium chloride, in ground	resource	in ground	kg	1.88E+00	3.30E-02	7.24E-02	3.21E-01	1.41E+00	4.65E-02
941	Sodium dichromate	air	high population density	kg	1.12E-05	1.34E-08	1.40E-07	2.11E-06	8.85E-06	1.17E-07
942	Sodium formate	air	high population density	kg	3.85E-08	1.66E-09	3.01E-09	6.60E-09	2.70E-08	2.57E-10
943	Sodium formate	water	river	kg	9.24E-08	3.98E-09	7.23E-09	1.58E-08	6.48E-08	6.17E-10
944	Sodium hydroxide	air	high population density	kg	1.21E-05	3.87E-07	7.34E-07	2.18E-06	8.79E-06	2.23E-09
945	Sodium nitrate, in ground	resource	in ground	kg	3.29E-09	4.87E-11	1.14E-10	5.21E-10	2.46E-09	1.45E-10
946	Sodium sulphate, various forms, in ground	resource	in ground	kg	2.29E-02	7.15E-04	1.40E-03	3.14E-03	1.62E-02	1.49E-03
947	Sodium, ion	water	ground-	kg	2.60E-02	4.88E-04	1.06E-03	4.13E-03	1.93E-02	1.07E-03
948	Sodium, ion	water	ground-, long-term	kg	2.31E-01	3.25E-03	7.58E-03	4.17E-02	1.76E-01	2.94E-03
949	Sodium, ion	water	ocean	kg	2.36E-01	1.86E-02	3.19E-02	3.49E-02	1.42E-01	8.06E-03
950	Sodium, ion	water	river	kg	7.87E-01	3.68E-02	6.65E-02	1.24E-01	5.32E-01	2.80E-02
951	Sodium, ion	water	unspecified	kg	9.62E-02	8.88E-04	1.80E-03	8.39E-03	8.49E-02	2.23E-04
952	Sodium	air	high population density	kg	3.87E-04	3.11E-05	5.28E-05	7.13E-05	2.24E-04	7.81E-06
953	Sodium	air	low population density	kg	1.89E-05	4.31E-07	8.87E-07	3.08E-06	1.39E-05	6.00E-07
954	Sodium	air	unspecified	kg	2.13E-07	7.79E-10	3.43E-09	4.12E-08	1.67E-07	8.55E-11
955	Sodium	soil	industrial	kg	2.82E-02	1.51E-04	5.95E-04	3.54E-03	2.11E-02	2.79E-03
956	Sodium	soil	unspecified	kg	8.80E-04	2.63E-05	5.04E-05	1.59E-04	6.43E-04	6.60E-07
957	Sodium-24	water	river	kBq	1.77E-03	8.10E-07	1.96E-05	3.44E-04	1.40E-03	1.33E-06
958	Solids, inorganic	water	ground-	kg	2.87E-01	5.05E-03	1.12E-02	4.63E-02	2.14E-01	1.10E-02

Table D1 LCI contribution results of bioethanol production process from cassava rhizome (cont'd)

No	Substance	Compartment	Sub compartment	Unit	Total	Pretreatment	Detoxification	SSCF	Distillation	Dehydration
959	Solids, inorganic	water	river	kg	2.33E-02	6.00E-04	1.20E-03	3.71E-03	1.70E-02	8.28E-04
960	Subnrite, in ground	resource	in ground	kg	4.57E-09	5.90E-11	1.41E-10	8.37E-10	3.49E-09	4.12E-11
961	Strontium	air	high population density	kg	1.79E-05	3.85E-07	7.94E-07	3.22E-06	1.34E-05	1.53E-07
962	Strontium	air	low population density	kg	2.77E-05	5.96E-07	1.25E-06	4.32E-06	2.03E-05	1.20E-06
963	Strontium	air	unspecific d	kg	2.05E-13	1.03E-15	3.66E-15	3.64E-14	1.63E-13	1.39E-15
964	Strontium	soil	agricultural	kg	7.46E-08	1.53E-09	3.24E-09	1.27E-08	5.39E-08	3.27E-09
965	Strontium	soil	industrial	kg	1.41E-04	7.54E-07	2.98E-06	1.77E-05	1.05E-04	1.39E-05
966	Strontium	water	ground-	kg	3.64E-04	6.45E-06	1.42E-05	6.03E-05	2.72E-04	1.15E-05
967	Strontium	water	ground-, long-term	kg	3.62E-03	6.85E-05	1.49E-04	5.75E-04	2.68E-03	1.48E-04
968	Strontium	water	ocean	kg	1.37E-03	1.01E-04	1.73E-04	2.07E-04	8.42E-04	4.77E-05
969	Strontium	water	river	kg	3.31E-03	1.98E-04	3.48E-04	4.94E-04	2.13E-03	1.42E-04
970	Strontium	water	unspecific d	kg	3.06E-04	1.60E-07	3.22E-07	1.23E-06	3.05E-04	9.57E-09
971	Strontium-89	water	river	kBq	4.00E-03	3.33E-06	4.69E-05	7.77E-04	3.17E-03	6.39E-06
972	Strontium-90	water	ocean	kBq	4.47E-01	2.19E-03	8.18E-03	8.31E-02	3.48E-01	4.75E-03
973	Strontium-90	water	river	kBq	1.32E+01	1.40E-01	3.65E-01	2.29E+00	1.01E+01	3.24E-01
974	Styrene	air	high population density	kg	1.19E-06	9.69E-08	1.65E-07	1.78E-07	7.37E-07	1.45E-08
975	Styrene	air	low population density	kg	3.34E-08	3.78E-10	9.58E-10	5.75E-09	2.55E-08	8.36E-10
976	Styrene	air	unspecific d	kg	1.42E-13	7.42E-17	1.49E-16	5.69E-16	1.41E-13	4.42E-18
977	Sulfate	air	high population density	kg	1.09E+00	4.19E-01	6.69E-01	1.05E-03	4.73E-03	1.99E-04
978	Sulfate	air	low population density	kg	7.81E-09	4.61E-11	1.51E-10	1.39E-09	6.17E-09	5.13E-11
979	Sulfate	air	unspecific d	kg	1.61E-06	1.50E-09	2.05E-08	2.71E-07	1.25E-06	6.24E-08
980	Sulfate	water	ground-	kg	5.15E-01	9.27E-03	2.04E-02	8.27E-02	3.82E-01	1.99E-02
981	Sulfate	water	ground-, long-term	kg	8.00E-01	1.57E-02	3.36E-02	1.29E-01	5.93E-01	2.94E-02
982	Sulfate	water	ocean	kg	3.92E-02	2.89E-03	5.00E-03	4.88E-03	2.44E-02	2.07E-03
983	Sulfate	water	river	kg	9.69E-01	4.87E-02	8.68E-02	1.60E-01	6.65E-01	8.06E-03
984	Sulfate	water	unspecific d	kg	4.91E-04	3.36E-07	1.57E-06	1.24E-05	4.71E-04	6.28E-06
985	Sulfur dioxide	air	unspecific d	kg	1.50E-01	1.50E-01	0.00E+00	0.00E+00		
986	Sulfide	water	ocean	kg	8.16E-06	9.47E-07	1.57E-06	1.07E-06	4.46E-06	1.02E-07
987	Sulfide	water	river	kg	1.33E-05	7.75E-07	1.37E-06	1.93E-06	8.81E-06	4.45E-07
988	Sulfite	water	river	kg	3.73E-04	6.61E-06	1.46E-05	5.99E-05	2.77E-04	1.46E-05

Table D1 LCI contribution results of bioethanol production process from cassava rhizome (cont'd)

No	Substance	Compartment	Sub compartment	Unit	Total	Pretreatment	Detoxification	SSCF	Distillation	Dehydration
989	Sulfur dioxide	air	high population density	kg	3.54E+00	1.26E+00	2.02E+00	4.54E-02	2.11E-01	1.20E-02
990	Sulfur dioxide	air	low population density	kg	3.43E+00	2.41E-02	7.88E-02	5.03E-01	2.59E+00	2.30E-01
991	Sulfur dioxide	air	lower stratosphere + upper troposphere	kg	2.74E-07	6.67E-09	1.33E-08	5.04E-08	2.03E-07	5.54E-11
992	Sulfur dioxide	air	unspecified	kg	1.47E+00	1.91E-03	4.07E-03	1.36E+00	1.06E-01	2.37E-03
993	Sulfur hexafluoride	air	low population density	kg	9.14E-08	2.29E-09	4.45E-09	1.46E-08	6.96E-08	4.60E-10
994	Sulfur hexafluoride	air	unspecified	kg	6.40E-05	4.83E-07	1.46E-06	1.13E-05	4.94E-05	1.41E-06
995	Sulfur, in ground	resource	in ground	kg	1.30E-03	2.91E-05	5.94E-05	2.33E-04	9.64E-04	1.11E-05
996	Sulfur	soil	agricultural	kg	1.21E-04	1.60E-06	3.85E-06	2.07E-05	9.18E-05	3.29E-06
997	Sulfur	soil	industrial	kg	8.45E-03	4.53E-05	1.79E-04	1.06E-03	6.32E-03	8.37E-04
998	Sulfur	water	ocean	kg	1.72E-04	7.42E-07	3.32E-06	2.29E-05	1.30E-04	1.54E-05
999	Sulfur	water	river	kg	1.10E-03	2.91E-05	5.90E-05	1.50E-04	7.82E-04	8.34E-05
1000	Sulfur	water	unspecified	kg	1.49E-05	7.80E-09	1.56E-08	5.98E-08	1.48E-05	4.65E-10
1001	Sulfuric acid	air	high population density	kg	2.53E-06	8.11E-08	1.54E-07	4.57E-07	1.84E-06	4.76E-10
1002	Sulfuric acid	air	low population density	kg	3.79E-10	3.03E-12	8.85E-12	6.79E-11	2.92E-10	6.92E-12
1003	Sulfuric acid	soil	agricultural	kg	1.56E-09	5.01E-11	9.49E-11	2.82E-10	1.14E-09	2.85E-13
1004	Suspended solids, unspecified	water	ocean	kg	1.67E+00	2.37E-03	2.49E-02	2.16E-01	1.27E+00	1.60E-01
1005	Suspended solids, unspecified	water	river	kg	2.87E-01	9.75E-02	1.56E-01	5.91E-03	2.62E-02	9.95E-04
1006	Suspended solids, unspecified	water	unspecified	kg	1.64E-02	2.24E-04	5.32E-04	2.80E-03	1.24E-02	4.35E-04
1007	Suspended substances, unspecified	water	unspecified	kg	1.94E-04	0.00E+00	0.00E+00	1.94E-04		
1008	Sylvite, 25% in sylvite, in ground	resource	in ground	kg	7.60E-03	2.01E-04	3.97E-04	1.32E-03	5.57E-03	1.02E-04
1009	Talc, in ground	resource	in ground	kg	6.06E-04	1.05E-05	2.28E-05	1.11E-04	4.57E-04	3.79E-06
1010	Tantalum, 81.9% in tantalite, 1.6E-4% in crude ore, in ground	resource	in ground	kg	7.49E-05	2.39E-06	4.54E-06	1.35E-05	5.44E-05	1.74E-08
1011	t-Butyl methyl ether	air	high population density	kg	1.75E-05	2.03E-08	2.14E-07	3.41E-06	1.39E-05	4.48E-09
1012	t-Butyl	water	ocean	kg	1.23E-05	3.21E-06	5.18E-06	7.45E-	3.04E-06	1.72E-07

Table D1 LCI contribution results of bioethanol production process from cassava rhizome (cont'd)

No	Substance	Compartment	Sub compartment	Unit	Total	Pretreatment	Detoxification	SSCF	Distillation	Dehydration
	methyl ether							07		
1013	t-Butyl methyl ether	water	river	kg	3.43E-07	3.52E-10	4.12E-09	6.70E-08	2.72E-07	8.03E-11
1014	Tebutam	soil	agricultural	kg	1.08E-08	4.31E-10	7.94E-10	1.78E-09	7.63E-09	2.02E-10
1015	Technetium-99m	water	river	kBq	5.37E-03	2.48E-06	5.97E-05	1.05E-03	4.25E-03	4.09E-06
1016	Teflubenzuron	soil	agricultural	kg	5.60E-09	7.79E-11	1.75E-10	9.11E-10	3.79E-09	4.58E-11
1017	Tellurium, 0.5ppm in sulfide, Te 0.2ppm, Cu and Ag, in crude ore, in ground	resource	in ground	kg	1.02E-05	3.24E-07	6.15E-07	1.83E-06	7.38E-06	2.48E-09
1018	Tellurium-123m	water	river	kBq	6.66E-04	3.09E-06	1.19E-05	1.24E-04	5.20E-04	6.69E-06
1019	Tellurium-132	water	river	kBq	1.35E-05	6.20E-09	1.50E-07	2.64E-06	1.07E-05	1.02E-08
1020	Terpenes	air	low population density	kg	9.59E-07	4.02E-09	1.81E-08	1.34E-07	7.27E-07	7.58E-08
1021	Thallium	air	high population density	kg	1.51E-07	3.21E-09	6.64E-09	2.71E-08	1.13E-07	1.33E-09
1022	Thallium	air	low population density	kg	1.98E-08	4.16E-10	8.74E-10	3.24E-09	1.46E-08	6.26E-10
1023	Thallium	air	unspecified	kg	1.13E-07	2.79E-09	5.64E-09	1.82E-08	8.27E-08	3.96E-09
1024	Thallium	water	ground-	kg	1.13E-09	1.93E-11	4.31E-11	1.83E-10	8.43E-10	4.24E-11
1025	Thallium	water	ground-, long-term	kg	4.76E-06	9.91E-08	2.09E-07	7.68E-07	3.51E-06	1.71E-07
1026	Thallium	water	river	kg	6.91E-07	1.26E-08	2.76E-08	1.10E-07	5.13E-07	2.76E-08
1027	Thallium	water	unspecified	kg	1.33E-08	6.99E-12	1.40E-11	5.36E-11	1.33E-08	4.17E-13
1028	Thiram	soil	agricultural	kg	1.37E-09	1.83E-11	8.22E-11	6.08E-10	3.31E-09	3.45E-10
1029	Thorium	air	high population density	kg	1.79E-07	3.84E-09	7.93E-09	3.22E-08	1.34E-07	1.53E-09
1030	Thorium	air	low population density	kg	7.41E-08	1.60E-09	3.33E-09	1.21E-08	5.47E-08	2.36E-09
1031	Thorium-228	air	high population density	kBq	5.19E-04	1.11E-05	2.30E-05	9.32E-05	3.87E-04	4.44E-06
1032	Thorium-228	air	low population density	kBq	1.38E-03	2.57E-05	5.60E-05	2.20E-04	1.02E-03	5.39E-05
1033	Thorium-228	air	unspecified	kBq	9.27E-12	4.67E-14	1.65E-13	1.64E-12	7.35E-12	6.29E-14
1034	Thorium-228	water	ground-	kBq	3.55E-07	1.09E-08	2.13E-08	4.96E-08	2.52E-07	2.17E-08
1035	Thorium-228	water	ocean	kBq	1.50E-01	1.04E-02	1.80E-02	2.28E-02	9.31E-02	5.29E-03
1036	Thorium-228	water	river	kBq	3.54E-01	2.15E-02	3.77E-02	5.32E-02	2.27E-01	1.45E-02
1037	Thorium-230	air	low population density	kBq	1.35E-02	5.85E-05	2.35E-04	2.52E-03	1.05E-02	1.26E-04
1038	Thorium-230	water	river	kBq	9.07E+00	3.63E-02	1.53E-01	1.70E+00	7.10E+00	7.89E-02
1039	Thorium-	air	high	kBq	3.30E-04	7.08E-06	1.46E-05	5.93E-	2.46E-04	2.82E-06

Table D1 LCI contribution results of bioethanol production process from cassava rhizome (cont'd)

No	Substance	Compartment	Sub compartment	Unit	Total	Pretreatment	Detoxification	SSCF	Distillation	Dehydration
	232		population density		•			05		
1040	Thorium-232	air	low population density	kBq	2.16E-03	4.04E-05	8.79E-05	3.45E-04	1.60E-03	8.47E-05
1041	Thorium-232	air	unspecified	kBq	1.46E-11	7.34E-14	2.60E-13	2.58E-12	1.15E-11	9.89E-14
1042	Thorium-232	water	ground-	kBq	1.61E-23	2.79E-25	6.06E-25	3.01E-24	1.22E-23	7.28E-27
1043	Thorium-232	water	river	kBq	4.24E-03	5.92E-05	1.40E-04	7.08E-04	3.19E-03	1.35E-04
1044	Thorium-234	air	low population density	kBq	3.61E-03	1.45E-05	6.10E-05	6.78E-04	2.83E-03	3.14E-05
1045	Thorium-234	water	river	kBq	6.65E-02	2.66E-04	1.12E-03	1.25E-02	5.20E-02	5.78E-04
1046	Tin, 79% in cassiterite. 0.1% in crude ore, in ground	resource	in ground	kg	3.57E-03	1.05E-04	2.02E-04	6.47E-04	2.61E-03	2.50E-06
1047	Tin, ion	water	ground-	kg	3.34E-08	5.89E-10	1.30E-09	5.51E-09	2.49E-08	1.08E-09
1048	Tin, ion	water	ground-. long-term	kg	3.09E-04	1.00E-05	1.91E-05	5.19E-05	2.22E-04	5.15E-06
1049	Tin, ion	water	river	kg	2.11E-06	3.07E-08	7.11E-08	3.70E-07	1.60E-06	4.26E-08
1050	Tin, ion	water	unspecified	kg	6.18E-07	3.24E-10	6.49E-10	2.48E-09	6.14E-07	1.93E-11
1051	Tin	air	high population density	kg	5.95E-07	1.09E-08	2.33E-08	1.09E-07	4.49E-07	4.09E-09
1052	Tin	air	low population density	kg	1.24E-04	1.67E-06	3.92E-06	2.32E-05	9.47E-05	4.18E-07
1053	Tin	air	unspecified	kg	1.38E-06	1.42E-07	2.37E-07	1.96E-07	7.97E-07	1.32E-08
1054	Tin	soil	agricultural	kg	4.91E-08	4.74E-10	1.26E-09	9.21E-09	3.79E-08	2.74E-10
1055	TiO ₂ , 54% in ilmenite. 2.6% in crude ore, in ground	resource	in ground	kg	5.60E-02	1.57E-03	3.11E-03	8.16E-03	4.01E-02	3.01E-03
1056	TiO ₂ , 95% in rutile. 0.40% in crude ore, in ground	resource	in ground	kg	5.64E-07	1.43E-08	2.83E-08	1.03E-07	4.17E-07	4.76E-10
1057	Titanium, ion	water	ground-	kg	1.15E-04	5.22E-07	2.04E-06	2.15E-05	8.98E-05	1.13E-06
1058	Titanium, ion	water	ground-. long-term	kg	5.92E-02	6.56E-04	1.66E-03	1.10E-02	4.55E-02	4.27E-04
1059	Titanium, ion	water	ocean	kg	2.50E-06	2.70E-09	3.57E-08	3.28E-07	1.90E-06	2.33E-07
1060	Titanium, ion	water	river	kg	1.07E-04	1.03E-06	2.74E-06	2.01E-05	8.28E-05	6.07E-07
1061	Titanium, ion	water	unspecified	kg	9.70E-07	5.08E-10	1.02E-09	3.89E-09	9.65E-07	3.03E-11
1062	Titanium	air	high population density	kg	3.99E-05	8.22E-07	1.71E-06	7.20E-06	2.99E-05	3.44E-07
1063	Titanium	air	low population density	kg	1.14E-05	2.46E-07	5.13E-07	1.87E-06	8.42E-06	3.64E-07
1064	Titanium	air	unspecified	kg	6.67E-07	1.44E-08	3.01E-08	1.09E-07	4.92E-07	2.15E-08

Table D1 LCI contribution results of bioethanol production process from cassava rhizome (cont'd)

No	Substance	Compartment	Sub compartment	Unit	Total	Pretreatment	Detoxification	SSCF	Distillation	Dehydration
1065	* Titanium	soil	agricultural	kg	1.30E-05	2.09E-07	4.75E-07	2.14E-06	9.76E-06	4.63E-07
1066	TOC, Total Organic Carbon	water	ground-, long-term	kg	3.65E-01	1.38E-02	2.56E-02	5.95E-02	2.58E-01	7.62E-03
1067	TOC, Total Organic Carbon	water	ocean	kg	9.08E-02	1.67E-03	3.73E-03	1.25E-02	6.59E-02	7.01E-03
1068	TOC, Total Organic Carbon	water	river	kg	2.13E-01	8.58E-03	1.58E-02	3.61E-02	1.48E-01	4.64E-03
1069	TOC, Total Organic Carbon	water	unspecified	kg	1.76E-03	2.40E-05	5.70E-05	3.02E-04	1.33E-03	4.41E-05
1070	Toluene	air	high population density	kg	1.26E-02	2.27E-05	2.13E-04	1.12E-03	9.30E-03	1.94E-03
1071	Toluene	air	low population density	kg	2.45E-04	4.17E-06	9.29E-06	4.04E-05	1.83E-04	8.22E-06
1072	Toluene	air	unspecified	kg	3.95E-04	3.01E-06	6.92E-06	3.93E-05	3.45E-04	5.46E-07
1073	Toluene	water	ocean	kg	1.29E-04	1.13E-05	1.92E-05	1.78E-05	7.53E-05	4.79E-06
1074	Toluene	water	river	kg	2.15E-04	1.75E-05	2.98E-05	3.04E-05	1.29E-04	8.18E-06
1075	Toluene	water	unspecified	kg	8.90E-06	4.66E-09	9.35E-09	3.57E-08	8.85E-06	2.78E-10
1076	Transformation, from arable, non-irrigated, fallow	resource	land	m2	4.31E-04	4.08E-06	1.09E-05	8.20E-05	3.33E-04	4.99E-07
1077	Transformation, from arable, non-irrigated	resource	land	m2	3.54E-02	1.41E-03	2.60E-03	5.81E-03	2.50E-02	6.59E-04
1078	Transformation, from arable	resource	land	m2	2.12E-03	1.57E-05	4.69E-05	3.99E-04	1.64E-03	1.17E-05
1079	Transformation, from dump site, inert material landfill	resource	land	m2	3.01E-03	1.27E-04	2.33E-04	4.46E-04	2.08E-03	1.20E-04
1080	Transformation, from dump site, residual material landfill	resource	land	m2	3.07E-03	6.65E-05	1.37E-04	5.41E-04	2.28E-03	4.20E-05
1081	Transformation, from dump site, sanitary landfill	resource	land	m2	6.14E-05	6.31E-06	1.06E-05	8.07E-06	3.53E-05	1.19E-06
1082	Transformation, from dump site, slag compartment	resource	land	m2	1.68E-05	2.41E-07	5.57E-07	3.09E-06	1.28E-05	1.36E-07
1083	Transformation, from forest, extensive	resource	land	m2	9.88E-02	6.74E-03	1.16E-02	1.50E-02	6.37E-02	1.71E-03

Table D1 LCI contribution results of bioethanol production process from cassava rhizome (cont'd)

No	Substance	Compartment	Sub compartment	Unit	Total	Pretreatment	Detoxification	SSCF	Distillation	Dehydration
1084	Transformation, from forest, intensive, clear-cutting	resource	land	m2	1.06E-03	4.44E-06	1.99E-05	1.47E-04	8.03E-04	8.37E-05
1085	Transformation, from forest	resource	land	m2	7.36E-01	3.29E-03	1.45E-02	9.35E-02	5.53E-01	7.19E-02
1086	Transformation, from industrial area, benthos	resource	land	m2	1.03E-04	1.67E-08	1.32E-06	1.37E-05	7.89E-05	9.44E-06
1087	Transformation, from industrial area, built up	resource	land	m2	4.28E-06	1.31E-07	2.57E-07	5.98E-07	3.04E-06	2.62E-07
1088	Transformation, from industrial area, vegetation	resource	land	m2	7.31E-06	2.24E-07	4.38E-07	1.02E-06	5.18E-06	4.47E-07
1089	Transformation, from industrial area	resource	land	m2	1.50E-02	1.02E-05	2.04E-04	1.96E-03	1.14E-02	1.40E-03
1090	Transformation, from mineral extraction site	resource	land	m2	2.60E-02	3.94E-04	9.11E-04	4.23E-03	1.95E-02	9.74E-04
1091	Transformation, from pasture and meadow, intensive	resource	land	m2	2.88E-05	1.15E-06	2.11E-06	4.72E-06	2.03E-05	5.37E-07
1092	Transformation, from pasture and meadow	resource	land	m2	6.04E+00	3.56E-04	9.22E-04	6.02E+00	2.34E-02	1.71E-03
1093	Transformation, from sea and ocean	resource	land	m2	7.62E-01	1.02E-03	1.12E-02	9.85E-02	5.79E-01	7.31E-02
1094	Transformation, from shrub land, sclerophyllous	resource	land	m2	1.31E-02	2.28E-04	4.98E-04	2.31E-03	9.85E-03	2.07E-04
1095	Transformation, from tropical rain forest	resource	land	m2	1.06E-03	4.44E-06	1.99E-05	1.47E-04	8.03E-04	8.37E-05
1096	Transformation, from unknown	resource	land	m2	1.56E-01	4.10E-03	8.18E-03	2.50E-02	1.13E-01	5.14E-03
1097	Transformation, to arable, non-irrigated, fallow	resource	land	m2	5.09E-04	8.68E-06	1.89E-05	9.47E-05	3.85E-04	1.25E-06
1098	Transformation, to arable, non-irrigated	resource	land	m2	3.55E-02	1.41E-03	2.60E-03	5.82E-03	2.50E-02	6.59E-04

Table D1 LCI contribution results of bioethanol production process from cassava rhizome (cont'd)

No	Substance	Compartment	Sub compartment	Unit	Total	Pretreatment	Detoxification	SSCF	Distillation	Dehydration
1099	Transformation, to arable	resource	land	m2	1.64E-01	1.17E-04	2.25E-03	2.13E-02	1.24E-01	1.54E-02
1100	Transformation, to dump site, benthos	resource	land	m2	7.62E-01	1.01E-03	1.12E-02	9.84E-02	5.78E-01	7.31E-02
1101	Transformation, to dump site, wert material landfill	resource	land	m2	3.01E-03	1.27E-04	2.33E-04	4.46E-04	2.08E-03	1.20E-04
1102	Transformation, to dump site, residual material landfill	resource	land	m2	3.07E-03	6.65E-05	1.37E-04	5.42E-04	2.28E-03	4.20E-05
1103	Transformation, to dump site, sanitary landfill	resource	land	m2	6.14E-05	6.31E-06	1.06E-05	8.07E-06	3.53E-05	1.19E-06
1104	Transformation, to dump site, slag compartment	resource	land	m2	1.68E-05	2.41E-07	5.57E-07	3.09E-06	1.28E-05	1.36E-07
1105	Transformation, to dump site	resource	land	m2	3.19E-02	4.80E-04	1.09E-03	5.87E-03	2.42E-02	2.13E-04
1106	Transformation, to forest, intensive, clear-cutting	resource	land	m2	1.06E-03	4.44E-06	1.99E-05	1.47E-04	8.03E-04	8.37E-05
1107	Transformation, to forest, intensive, normal	resource	land	m2	9.54E-02	6.60E-03	1.14E-02	1.45E-02	6.13E-02	1.64E-03
1108	Transformation, to forest, intensive, short-cycle	resource	land	m2	1.06E-03	4.44E-06	1.99E-05	1.47E-04	8.03E-04	8.37E-05
	Transformation, to							2.52E-		

Table D1 LCI contribution results of bioethanol production process from cassava rhizome (cont'd)

1111	Transformation, to heterogeneous, agricultural	resource	land	m2	3.86E-02	1.50E-04	7.19E-04	5.05E-03	2.91E-02	3.55E-03
1112	Transformation, to industrial area, benthos	resource	land	m2	3.98E-04	5.66E-06	1.35E-05	6.18E-05	2.97E-04	1.94E-05
1113	Transformation, to	resource	land	m2	1.60E-02	1.31E-03	2.22E-03	2.43E-	9.93E-03	1.31E-04

Table D1 LCI contribution results of bioethanol production process from cassava rhizome (cont'd)

No	Substance	Compartment	Sub compartment	Unit	Total	Pretreatment	Detoxification	SSCF	Distillation	Dehydration
	ion, to industrial area, built up							03		
1114	Transformation, to industrial area, vegetation	resource	land	m2	3.64E-03	4.40E-04	7.30E-04	4.66E-04	1.95E-03	5.61E-05
1115	Transformation, to industrial area	resource	land	m2	6.04E+00	1.46E-04	5.09E-04	6.02E+00	1.73E-02	1.78E-03
1116	Transformation, to mineral extraction site	resource	land	m2	6.14E-01	4.51E-03	1.48E-02	7.97E-02	4.58E-01	5.64E-02
1117	Transformation, to pasture and meadow	resource	land	m2	1.33E-02	4.08E-06	1.78E-04	1.65E-03	1.01E-02	1.38E-03
1118	Transformation, to permanent crop, fruit, intensive	resource	land	m2	5.95E-04	2.31E-06	1.09E-05	8.25E-05	4.52E-04	4.78E-05
1119	Transformation, to sea and ocean	resource	land	m2	1.03E-04	1.67E-08	1.32E-06	1.37E-05	7.89E-05	9.44E-06
1120	Transformation, to shrub land, sclerophyllous	resource	land	m2	6.16E-03	2.00E-04	3.81E-04	9.99E-04	4.41E-03	1.63E-04
1121	Transformation, to traffic area, rail embankment	resource	land	m2	1.91E-04	2.80E-05	4.60E-05	2.07E-05	9.29E-05	3.81E-06
1122	Transformation, to traffic area, rail network	resource	land	m2	2.10E-04	3.07E-05	5.06E-05	2.28E-05	1.02E-04	4.19E-06
1123	Transformation, to traffic area, road embankment	resource	land	m2	1.05E-03	6.91E-05	1.20E-04	1.61E-04	6.81E-04	1.70E-05
1124	Transformation, to traffic area, road network	resource	land	m2	5.37E-03	1.46E-04	2.90E-04	8.52E-04	3.89E-03	1.96E-04
1125	Transformation, to unknown	resource	land	m2	5.69E-03	1.42E-04	2.83E-04	1.03E-03	4.21E-03	2.90E-05
1126	Transformation, to urban, discontinuously built	resource	land	m2	2.64E-06	1.99E-08	6.17E-08	4.19E-07	2.01E-06	1.28E-07
1127	Transformation, to water bodies.	resource	land	m2	2.14E-02	2.80E-04	6.84E-04	3.38E-03	1.61E-02	9.74E-04

Table D1 LCI contribution results of bioethanol production process from cassava rhizome (cont'd)

No	Substance	Compartment	Sub compartment	Unit	Total	Pretreatment	Detoxification	SSCF	Distillation	Dehydration
	artificial									
1128	Transformation, to water courses, artificial	resource	land	m ²	1.42E-02	6.34E-05	2.49E-04	2.68E-03	1.11E-02	9.66E-05
1129	Tributyltin compounds	water	ocean	kg	8.84E-06	2.51E-07	4.91E-07	1.47E-06	6.38E-06	2.47E-07
1130	Triethylene glycol	water	ocean	kg	1.75E-03	3.08E-07	2.27E-05	2.26E-04	1.34E-03	1.70E-04
1131	Tungsten	water	ground-	kg	1.54E-05	2.51E-07	5.68E-07	2.53E-06	1.16E-05	5.50E-07
1132	Tungsten	water	ground-, long-term	kg	3.17E-05	6.04E-07	1.31E-06	5.05E-06	2.35E-05	1.27E-06
1133	Tungsten	water	river	kg	4.77E-06	1.14E-07	2.34E-07	7.27E-07	3.48E-06	2.21E-07
1134	Ulexite, in ground	resource	in ground	kg	1.14E-04	2.27E-06	4.80E-06	1.94E-05	8.46E-05	2.62E-06
1135	Uranium alpha	air	low population density	kBq	1.96E-01	7.85E-04	3.31E-03	3.68E-02	1.53E-01	1.70E-03
1136	Uranium alpha	water	river	kBq	3.83E+00	1.53E-02	6.46E-02	7.19E-01	3.00E+00	3.33E-02
1137	Uranium, in ground	resource	in ground	kg	1.47E-02	5.90E-05	2.48E-04	2.76E-03	1.15E-02	1.28E-04
1138	Uranium	air	high population density	kg	2.38E-07	5.12E-09	1.06E-08	4.29E-08	1.78E-07	2.04E-09
1139	Uranium	air	low population density	kg	3.77E-08	8.12E-10	1.69E-09	6.16E-09	2.78E-08	1.20E-09
1140	Uranium-234	air	low population density	kBq	4.21E-02	1.73E-04	7.17E-04	7.90E-03	3.29E-02	3.75E-04
1141	Uranium-234	water	river	kBq	7.98E-02	3.20E-04	1.35E-03	1.50E-02	6.24E-02	6.94E-04
1142	Uranium-235	air	low population density	kBq	2.03E-03	8.15E-06	3.43E-05	3.82E-04	1.59E-03	1.77E-05
1143	Uranium-235	water	river	kBq	1.32E-01	5.27E-04	2.22E-03	2.47E-02	1.03E-01	1.14E-03
1144	Uranium-238	air	high population density	kBq	9.43E-04	2.02E-05	4.18E-05	1.69E-04	7.03E-04	8.06E-06
1145	Uranium-238	air	low population density	kBq	4.71E-02	2.72E-04	9.29E-04	8.68E-03	3.66E-02	5.82E-04
1146	Uranium-238	air	unspecified	kBq	4.84E-11	2.44E-13	8.64E-13	8.58E-12	3.84E-11	3.29E-13
1147	Uranium-238	water	ground-	kBq	1.49E-05	4.55E-07	8.91E-07	2.08E-06	1.05E-05	9.09E-07
1148	Uranium-238	water	ocean	kBq	1.76E-02	5.36E-04	1.05E-03	2.46E-03	1.25E-02	1.08E-03
1149	Uranium-238	water	river	kBq	2.10E-01	9.28E-04	3.68E-03	3.92E-02	1.64E-01	2.03E-03
1150	Vanadium, ion	water	ground-	kg	5.51E-05	2.85E-07	1.03E-06	1.02E-05	4.30E-05	6.18E-07
1151	Vanadium, ion	water	ground-, long-term	kg	4.58E-03	7.45E-05	1.67E-04	7.97E-04	3.45E-03	9.37E-05
1152	Vanadium, ion	water	ocean	kg	1.16E-06	3.03E-07	4.88E-07	7.03E-08	2.87E-07	1.62E-08
1153	Vanadium, ion	water	river	kg	9.94E-05	8.46E-07	2.39E-06	1.82E-05	7.68E-05	1.24E-06
1154	Vanadium, ion	water	unspecified	kg	1.53E-07	7.99E-11	1.60E-10	6.13E-10	1.52E-07	4.77E-12
1155	Vanadium	air	high population density	kg	4.81E-04	2.73E-05	4.75E-05	1.29E-04	2.65E-04	1.22E-05

Table D1 LCI contribution results of bioethanol production process from cassava rhizome (cont'd)

No	Substance	Compartment	Sub compartment	Unit	Total	Pretreatment	Detoxification	SSCF	Distillation	Dehydration
1156	Vanadium	air	low population density	kg	1.31E-05	2.32E-07	5.09E-07	2.21E-06	9.79E-06	3.55E-07
1157	Vanadium	air	unspecified	kg	1.88E-06	4.07E-08	8.48E-08	3.08E-07	1.38E-06	6.06E-08
1158	Vanadium	soil	agricultural	kg	3.73E-07	5.99E-09	1.36E-08	6.11E-08	2.79E-07	1.32E-08
1159	Vermiculite, in ground	resource	in ground	kg	1.43E-05	3.29E-07	6.72E-07	2.44E-06	1.06E-05	2.94E-07
1160	VOC, volatile organic compounds, unspecified origin	water	ocean	kg	2.61E-04	1.82E-05	3.15E-05	3.99E-05	1.62E-04	9.21E-06
1161	VOC, volatile organic compounds, unspecified origin	water	river	kg	7.78E-04	3.82E-05	6.86E-05	1.23E-04	5.21E-04	2.69E-05
1162	VOC, volatile organic compounds	air	unspecified	kg	9.00E-01	9.00E-01	0.00E+00	0.00E+00		
1163	Volume occupied, final repository for low-active radioactive waste	resource	in ground	m3	3.02E-05	1.21E-07	5.10E-07	5.68E-06	2.37E-05	2.63E-07
1164	Volume occupied, final repository for radioactive waste	resource	in ground	m3	6.86E-06	3.05E-08	1.21E-07	1.28E-06	5.36E-06	6.63E-08
1165	Volume occupied, reservoir	resource	in water	m3a	3.90E+01	7.81E-02	5.42E-01	7.15E+00	3.06E+01	6.46E-01
1166	Volume occupied, underground deposit	resource	in ground	m3	1.33E-04	5.87E-07	2.48E-06	2.05E-05	1.02E-04	7.56E-06
1167	Waste water/m3	water	unspecified	m3	1.22E-06	0.00E+00	0.00E+00	1.22E-06		
1168	Water, cooling, unspecified natural origin	resource	in water	m3	9.70E+00	2.25E-01	4.62E-01	1.57E+00	7.12E+00	3.17E-01
1169	Water, lake	resource	in water	m3	1.51E-02	3.46E-04	7.07E-04	2.58E-03	1.12E-02	3.09E-04
1170	Water, process, unspecified natural origin/kg	kg	resource	kg	1.70E+02	0.00E+00	0.00E+00	1.70E+02		
1171	Water, river	resource	in water	m3	7.98E+01	4.69E-02	9.03E-01	1.55E+01	6.32E+01	6.09E-02
1172	Water, salt, ocean	resource	in water	m3	2.24E+00	4.88E-03	3.63E-02	2.78E-01	1.69E+00	2.29E-01
1173	Water, salt, sole	resource	in water	m3	3.46E-02	1.97E-03	3.49E-03	5.14E-03	2.24E-02	1.58E-03

Table D1 LCI contribution results of bioethanol production process from cassava rhizome (cont'd)

No	Substance	Compartment	Sub compartment	Unit	Total	Pretreatment	Detoxification	SSCF	Distillation	Dehydration
1174	Water, turbine use, unspecified natural origin	resource	in water	m3	1.14E+04	4.63E+01	1.93E+02	2.15E+03	8.91E+03	7.58E+01
1175	Water, unspecified natural origin/m3	resource	in ground	m3	1.74E-01	0.00E+00	0.00E+00	1.74E-01		
1176	Water, unspecified natural origin	resource	in water	m3	1.44E+01	4.90E+00	7.85E+00	2.86E-01	1.33E+00	7.93E-02
1177	Water, well, in ground	resource	in water	m3	4.92E-01	8.96E-03	1.96E-02	8.03E-02	3.66E-01	1.74E-02
1178	Water	air	high population density	kg	7.44E-06	1.24E-07	2.73E-07	1.34E-06	5.62E-06	8.81E-08
1179	Water	air	low population density	kg	5.59E-05	1.36E-06	2.72E-06	1.03E-05	4.15E-05	1.13E-08
1180	Water	air	lower stratosphere + upper troposphere	kg	3.40E-04	8.27E-06	1.65E-05	6.25E-05	2.52E-04	6.87E-08
1181	Water	air	unspecified	kg	8.42E-02	1.29E-03	2.93E-03	1.53E-02	6.38E-02	8.96E-04
1182	Wood, hard, standing	resource	biotic	m3	2.92E-03	4.54E-05	1.04E-04	4.82E-04	2.19E-03	9.80E-05
1183	Wood, primary forest, standing	resource	biotic	m3	1.10E-05	4.59E-08	2.06E-07	1.53E-06	8.31E-06	8.67E-07
1184	Wood, soft, standing	resource	biotic	m3	8.92E-03	3.92E-04	7.14E-04	1.41E-03	6.19E-03	2.21E-04
1185	Wood, unspecified, standing	resource	biotic	m3	1.17E-07	1.53E-09	3.66E-09	2.10E-08	8.91E-08	1.68E-09
1186	Xenon-131m	air	low population density	kBq	4.30E+00	3.97E-03	5.10E-02	8.33E-01	3.40E+00	7.93E-03
1187	Xenon-133	air	low population density	kBq	1.56E+02	1.28E-01	1.83E+00	3.03E+01	1.24E+02	2.50E-01
1188	Xenon-133m	air	low population density	kBq	1.82E-01	5.04E-04	2.71E-03	3.46E-02	1.43E-01	1.12E-03
1189	Xenon-135	air	low population density	kBq	6.25E+01	5.23E-02	7.33E-01	1.21E+01	4.95E+01	1.03E-01
1190	Xenon-135m	air	low population density	kBq	3.93E+01	3.11E-02	4.57E-01	7.62E+00	3.11E+01	6.03E-02
1191	Xenon-137	air	low population density	kBq	1.21E+00	6.42E-04	1.36E-02	2.36E-01	9.61E-01	1.12E-03
1192	Xenon-138	air	low population density	kBq	9.10E+00	5.52E-03	1.03E-01	1.77E+00	7.21E+00	1.00E-02
1193	Xylene	air	high population density	kg	2.88E-04	1.49E-05	2.65E-05	4.71E-05	1.92E-04	6.96E-06
1194	Xylene	air	low population density	kg	1.52E-03	2.42E-05	5.50E-05	2.50E-04	1.14E-03	5.29E-05
1195	Xylene	air	unspecified	kg	3.58E-04	3.57E-06	8.23E-06	4.68E-06	2.99E-04	6.73E-07

Table D1 LCI contribution results of bioethanol production process from cassava rhizome (cont'd)

No	Substance	Compartment	Sub compartment	Unit	Total	Pretreatment	Detoxification	SSCF	Distillation	Dehydration
			d					05		
1196	Xylene	water	ocean	kg	9.89E-05	7.03E-06	1.22E-05	1.45E-05	6.12E-05	3.96E-06
1197	Xylene	water	river	kg	1.69E-04	1.07E-05	1.87E-05	2.52E-05	1.07E-04	6.86E-06
1198	Xylene	water	unspecified	kg	4.50E-06	2.35E-09	4.72E-09	1.81E-08	4.47E-06	1.40E-10
1199	Zinc, 9.0% in sulfide, Zn 5.3%, Pb, Ag, Cd, In, in ground	resource	in ground	kg	4.52E-01	1.08E-02	2.16E-02	8.32E-02	3.36E-01	3.46E-04
1200	Zinc, ion	water	ground-	kg	2.63E-05	2.06E-07	6.05E-07	4.77E-06	2.03E-05	3.93E-07
1201	Zinc, ion	water	ground-, long-term	kg	2.83E-03	1.77E-04	3.10E-04	4.06E-04	1.85E-03	8.81E-05
1202	Zinc, ion	water	lake	kg	1.38E-10	4.43E-12	8.39E-12	2.50E-11	1.01E-10	2.84E-14
1203	Zinc, ion	water	ocean	kg	2.29E-02	4.09E-05	3.54E-04	2.97E-03	1.74E-02	2.18E-03
1204	Zinc, ion	water	river	kg	1.59E-03	3.95E-05	7.88E-05	2.87E-04	1.18E-03	1.15E-05
1205	Zinc, ion	water	unspecified	kg	1.41E-04	4.98E-06	9.35E-06	2.20E-05	1.01E-04	3.93E-06
1206	Zinc	air	high population density	kg	1.40E-04	3.91E-06	7.62E-06	2.54E-05	1.02E-04	1.46E-06
1207	Zinc	air	low population density	kg	2.42E-03	4.22E-05	9.15E-05	4.48E-04	1.83E-03	8.11E-06
1208	Zinc	air	lower stratosphere + upper troposphere	kg	2.74E-10	6.67E-12	1.33E-11	5.04E-11	2.03E-10	5.54E-14
1209	Zinc	air	unspecified	kg	6.24E-04	2.04E-05	3.89E-05	9.87E-05	4.46E-04	2.02E-05
1210	Zinc	soil	agricultural	kg	2.35E-05	3.17E-07	7.57E-07	4.00E-06	1.78E-05	6.55E-07
1211	Zinc	soil	industrial	kg	2.11E-04	1.13E-06	4.46E-06	2.66E-05	1.58E-04	2.09E-05
1212	Zinc	soil	unspecified	kg	3.81E-05	2.97E-06	5.08E-06	5.42E-06	2.38E-05	8.15E-07
1213	Zinc-65	air	low population density	kBq	9.71E-06	4.45E-09	1.08E-07	1.89E-06	7.70E-06	7.33E-09
1214	Zinc-65	water	river	kBq	2.40E-02	1.10E-05	2.66E-04	4.67E-03	1.90E-02	1.81E-05
1215	Zirconium, 50% in zircon, 0.39% in crude ore, in ground	resource	in ground	kg	1.03E-04	3.29E-06	6.23E-06	1.86E-05	7.46E-05	1.93E-08
1216	Zirconium	air	low population density	kg	9.12E-07	1.97E-08	4.11E-08	1.49E-07	6.73E-07	2.91E-08
1217	Zirconium-95	air	low population density	kBq	9.49E-06	4.35E-09	1.05E-07	1.85E-06	7.52E-06	7.17E-09
1218	Zirconium-95	water	river	kBq	2.77E-04	1.27E-07	3.08E-06	5.41E-05	2.20E-04	2.10E-07

