ecoinvent 3.11 Dataset Documentation

'power sawing, without catalytic converter – RER – power sawing, without catalytic converter'

Note: This document contains only an extract of the information in the dataset. Additional data about properties of exchanges, mathematical relations, parameters, and contact information for authors and reviewers are available within the dataset, i.e. in ecoSpold format.

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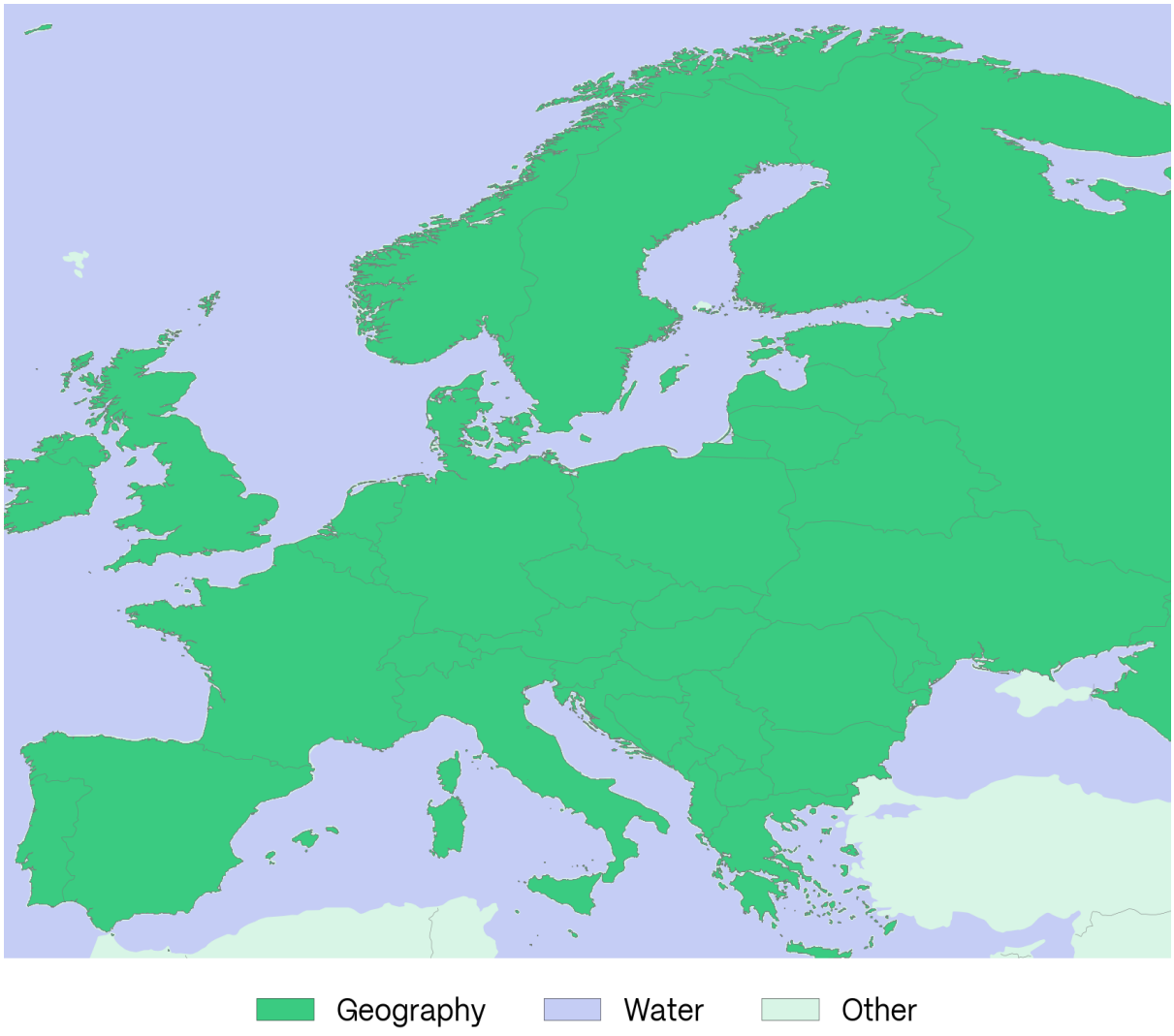
Dataset Identification

Activity name	power sawing, without catalytic converter
Geography	Europe
Time period	2011-01-01 to 2024-12-31 - Valid for the entire period
Synonyms	chainsaw, chain saw
ISIC rev.4 ecoinvent	1610:Sawmilling and planing of wood
Reference product	power sawing, without catalytic converter
CPC classification	88311: Wood manufacturing services
Dataset type	Ordinary transforming activity
Technology level	New
Version - system model	3.11 - Allocation, cut-off



Dataset Authorship

Data entry	Frank Werner,
Data generator	Frank Werner,

Exchange Summary

Reference product	Byproduct classification	Amount
power sawing, without catalytic converter	allocatable product	1 hour

Inputs from technosphere	Amount
petrol, two-stroke blend	1.6 kg
power saw, without catalytic converter	0.0004 unit
vegetable oil, refined	0.54 kg

Emissions to air	Amount
Acetaldehyde	0.000687 kg
Acetone	0.000157 kg
Acrolein	4.41e-05 kg
Benzaldehyde	0.000461 kg
Benzo(a)pyrene	2.38e-07 kg
Carbon dioxide, fossil	2.15 kg
Carbon monoxide, fossil	0.981 kg
Dinitrogen monoxide	8.64e-05 kg
Formaldehyde	0.0351 kg
Methane, fossil	0.0413 kg
NMVOC, non-methane volatile organic compounds	0.298 kg
Nitrogen oxides	0.0086 kg
PAH, polycyclic aromatic hydrocarbons	5.95e-05 kg
Pentane	0.0342 kg
Propanal	0.000124 kg
Sulfur dioxide	3.2e-05 kg
Toluene	0.0332 kg

Emissions to soil	Amount
Oils, non-fossil	0.054 kg

Dataset Description

General comment

The inventory represents the operation of a professional power saw with a fuel consumption of 1.6 kg of standard two-stroke petrol blend (0.75 kg/l) for power saws per working hour and with a power output of about 3.1 - 3.2 kW.

Included activities start
Service beginning with the input of fuel into the power saw.

Included activities end
Includes the input of machinery infrastructure, the input of fuel, lubricants/greases as well as their disposal, and the emissions into air from fuel consumption. Wood is not included in the dataset.

Sampling procedure
producer data and data from several scientific papers (emission measurements from different types of power saws, different fuels and additives)

Extrapolations
See geography

Technology comment
The module represents average technology used in Europe around 2010

Geography comment
Data sourced from several European studies

Detailed Information For Exchanges

Reference product	Annual prod.vol.	Amount
power sawing, without catalytic converter	3.48e+9 hour	1 hour

Production volume: 3.48e+9 hour
Production volume comment: 1,00,000 chainsaws with 2500 PMH, weighted by RER GDP/Global GDP

Inputs from technosphere	Amount
petrol, two-stroke blend	1.6 kg

Comment: average consumption per working hour; reference for normalizing values from different sources
Uncertainty distribution: lognormal; **GSD2:** 1.25; **Pedigree matrix:** [4, 5, 4, 1, 1]
Source: Willared, J. (2011)

power saw, without catalytic converter	0.0004 unit

Comment: calculated based on producer information
Uncertainty distribution: lognormal; **GSD2:** 1.25; **Pedigree matrix:** [4, 5, 4, 1, 1]
Source: Kellenberger D. (2007)

vegetable oil, refined	0.54 kg

Comment: lubricating oil for chain
Uncertainty distribution: lognormal; **GSD2:** 1.23; **Pedigree matrix:** [3, 5, 4, 1, 1]
Source: Kellenberger D. (2007)

Emissions to air	Subcompartment	Amount
Acetaldehyde	non-urban air or from high stacks	0.000687 kg

Comment: various sources: Magnussen et al (2002), Magnussen et al. (2000), Spielmann et al. 2007) as adequate
Uncertainty distribution: lognormal; **GSD2:** 1.79; **Pedigree matrix:** [1, 5, 4, 1, 5]

Acetone	non-urban air or from high stacks	0.000157 kg

Uncertainty distribution: lognormal; **GSD2:** 2.01; **Pedigree matrix:** [1, 5, 4, 1, 5]

Acrolein	non-urban air or from high stacks	4.41e-05 kg

Uncertainty distribution: lognormal; **GSD2:** 2.05; **Pedigree matrix:** [1, 5, 5, 1, 5]

Benzaldehyde	non-urban air or from high stacks	0.000461 kg

Uncertainty distribution: lognormal; **GSD2:** 2.05; **Pedigree matrix:** [1, 5, 5, 1, 5]

Benzo(a)pyrene	non-urban air or from high stacks	2.38e-07 kg

Uncertainty distribution: lognormal; **GSD2:** 2.33; **Pedigree matrix:** [1, 5, 5, 1, 5]

Carbon dioxide, fossil	non-urban air or from high stacks	2.15 kg

Comment: calculated based on a C content of petrol of 0.847 kg C/kg and 43% of carbon content emitted as CO2 (personal communication power saw producer)
Uncertainty distribution: lognormal; **GSD2:** 1.31; **Pedigree matrix:** [1, 5, 5, 3, 1]

Carbon monoxide, fossil	non-urban air or from high stacks	0.981 kg

Comment: calculated based on a C content of petrol of 0.8472 kg C/kg and 31% of carbon content emitted as CO (personal communication power saw producer)
Uncertainty distribution: lognormal; **GSD2:** 1.59; **Pedigree matrix:** [2, 5, 4, 1, 1]

Dinitrogen monoxide	non-urban air or from high stacks	8.64e-05 kg

Uncertainty distribution: lognormal; **GSD2:** 1.79; **Pedigree matrix:** [1, 5, 4, 1, 5]

Formaldehyde	non-urban air or from high stacks	0.0351 kg

Comment: various sources: Magnussen et al (2002), Magnussen et al. (2000), Spielmann et al. 2007) as adequate
Uncertainty distribution: lognormal; **GSD2:** 1.79; **Pedigree matrix:** [1, 5, 4, 1, 5]

Methane, fossil	non-urban air or from high stacks	0.0413 kg

Uncertainty distribution: lognormal; **GSD2:** 1.79; **Pedigree matrix:** [1, 5, 4, 1, 5]

NMVOC, non-methane volatile organic compounds	non-urban air or from high stacks	0.298 kg

Comment: amount of NMVOC emissions that are not inventoried as individual substances based on total NMVOC emissions of 26% of carbon content (personal communication by power saw producer) and based on a C content of petrol of 0.857 kg C/kg and excluding PAH, which are inventoried separately
Uncertainty distribution: lognormal; **GSD2:** 1.79; **Pedigree matrix:** [3, 5, 4, 3, 5]

Nitrogen oxides	non-urban air or from high stacks	0.0086 kg

Comment: personal communication of power chain producer
Uncertainty distribution: lognormal; **GSD2:** 1.79; **Pedigree matrix:** [1, 5, 4, 1, 5]

PAH, polycyclic aromatic hydrocarbons	non-urban air or from high stacks	5.95e-05 kg

Comment: amount of PAH that are not inventoried as individual substances as quantified based on Magnussen et al (2002) and Magnussen et al. (2000)
Uncertainty distribution: lognormal; **GSD2:** 2.29; **Pedigree matrix:** [1, 5, 4, 1, 5]

Pentane	non-urban air or from high stacks	0.0342 kg

Uncertainty distribution: lognormal; **GSD2:** 2.01; **Pedigree matrix:** [1, 5, 4, 1, 5]

Propanal	non-urban air or from high stacks	0.000124 kg

Uncertainty distribution: lognormal; **GSD2:** 2.01; **Pedigree matrix:** [1, 5, 4, 1, 5]

Sulfur dioxide	non-urban air or from high stacks	3.2e-05 kg

Comment: calculated based on an assumed S content of 0.001 % (by mass) as the threshold value for the Swiss tax on sulfur in Petrol
Uncertainty distribution: lognormal; **GSD2:** 1.20; **Pedigree matrix:** [1, 1, 4, 1, 1]

Toluene	non-urban air or from high stacks	0.0332 kg

Uncertainty distribution: lognormal; **GSD2:** 2.01; **Pedigree matrix:** [1, 5, 4, 1, 5]

Emissions to soil	Subcompartment	Amount
Oils, non-fossil	forestry	0.054 kg

Comment: 10% of the oil from lubricating the chain
Uncertainty distribution: lognormal; **GSD2:** 1.65; **Pedigree matrix:** [1, 5, 5, 3, 1]

Selected Impact Assessment Results

Method	Category	Indicator	Score
Ecological Scarcity 2021	total	UBP	2.25e+4 UBP
EF v3.1	material resources: metals/minerals	abiotic depletion potential (ADP): elements (ultimate reserves)	6.67e-06 kg Sb-Eq
IPCC 2021	climate change: total (excl. biogenic CO2)	global warming potential (GWP100)	7.05 kg CO2-Eq

Direct Impact Contributions

Ecological Scarcity 2021, total, UBP: 2.25e+4 UBP

Exchange	Amount	Impact (UBP)	Impact %
market for vegetable oil, refined GLO - vegetable oil, refined	0.54 kg	8.66e+3	38.45%
NMVOC, non-methane volatile organic compounds air - non-urban air or from high stacks	0.298 kg	3.58e+3	15.88%
market for petrol, two-stroke blend GLO - petrol, two-stroke blend	1.6 kg	3.31e+3	14.71%
Carbon dioxide, fossil air - non-urban air or from high stacks	2.15 kg	2.15e+3	9.53%
Carbon monoxide, fossil air - non-urban air or from high stacks	0.981 kg	1.57e+3	6.97%
Methane, fossil air - non-urban air or from high stacks	0.0413 kg	1.24e+3	5.5%
Formaldehyde air - non-urban air or from high stacks	0.0351 kg	4.21e+2	1.87%
Pentane air - non-urban air or from high stacks	0.0342 kg	4.10e+2	1.82%
Toluene air - non-urban air or from high stacks	0.0332 kg	3.98e+2	1.77%
Nitrogen oxides air - non-urban air or from high stacks	0.0086 kg	2.84e+2	1.26%
Benzo(a)pyrene air - non-urban air or from high stacks	2.38e-07 kg	2.62e+2	1.16%
market for power saw, without catalytic converter GLO - power saw, without catalytic converter	0.0004 unit	1.99e+2	0.89%
Dinitrogen monoxide air - non-urban air or from high stacks	8.64e-05 kg	23.3	0.1%
Acetaldehyde air - non-urban air or from high stacks	0.000687 kg	8.24	0.04%
Benzaldehyde air - non-urban air or from high stacks	0.000461 kg	5.53	0.02%

5 minor direct contributors have been omitted for clarity

EF v3.1, material resources: metals/minerals, abiotic depletion potential (ADP): elements (ultimate reserves): 6.67e-06 kg Sb-Eq

Exchange	Amount	Impact (kg Sb–Eq)	Impact %
market for vegetable oil, refined GLO - vegetable oil, refined	0.54 kg	3.03e-06	45.45%
market for power saw, without catalytic converter GLO - power saw, without catalytic converter	0.0004 unit	1.86e-06	27.94%
market for petrol, two-stroke blend GLO - petrol, two-stroke blend	1.6 kg	1.77e-06	26.61%

IPCC 2021, climate change: total (excl. biogenic CO2), global warming potential (GWP100): 7.05 kg CO2-Eq

Exchange	Amount	Impact (kg CO2–Eq)	Impact %
Carbon dioxide, fossil air - non-urban air or from high stacks	2.15 kg	2.15	30.44%
market for vegetable oil, refined GLO - vegetable oil, refined	0.54 kg	1.91	27.02%
market for petrol, two-stroke blend GLO - petrol, two-stroke blend	1.6 kg	1.67	23.67%
Methane, fossil air - non-urban air or from high stacks	0.0413 kg	1.23	17.45%
market for power saw, without catalytic converter GLO - power saw, without catalytic converter	0.0004 unit	0.0764	1.08%
Dinitrogen monoxide air - non-urban air or from high stacks	8.64e-05 kg	0.0236	0.33%

Source

First author	Schweizer Bundesrat
Title	Verordnung über die Lenkungsabgabe auf Benzin und Dieselöl mit einem Schwefelgehalt von mehr als 0.001 Prozent
Year	2003

First author	Magnusson R.
Additional author(s)	Nillson C., Andersson B.
Title	Emissions of aldehydes and ketones from a two-stroke engine using ethanol and ethanol-blended gasoline as fuel
Year	2002
Journal	Environmental Science and Technology
Volume number	36
Issue number	8

First author	Spielmann, M.
Additional author(s)	Barreto L., Erni V., Frutig F., Thees O.
Title	Life cycle assessment of energy wood chip supply chains
Year	2007

First author	Magnusson R.
Additional author(s)	Nilsson C., Andersson K., Andersson B., Rannug U., Östman C.
Title	Effect of gasoline and libricants on emissions and mutagenicity of particles and semivolatiles in chain saw exhaust
Year	2000
Journal	Environmental Science and Technology
Volume number	34

First author	Willared, J.
Title	Personal written communication, Mr. Willaredt, Husqvarna AB
Year	2011

First author	Magnusson R.
Additional author(s)	Nilsson C, Andersson K., Andersson B., Gieling R., Wiberg K., Östman C., Rannug U.
Title	Determination of chemical composition and mutagenicity in particles from chainsaw exhaust; experimental set-up, stability and results from two different fuels
Year	2010
Journal	Environmental Technology
Volume number	21
Issue number	7

First author	Kellenberger D.
Additional author(s)	Althaus H.-J., Jungbluth N., Künniger T.
Title	Life Cycle Inventories of Building Products
Year	2007
Volume number	7

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