

Joint Wood Energy Enquiry (JWEE)

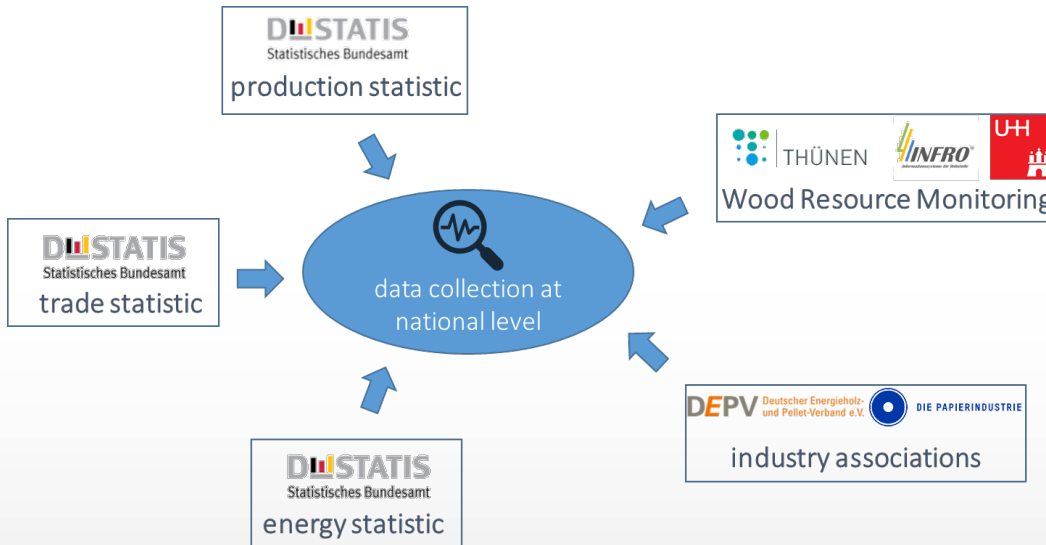
German reporting example

Dr. Sebastian Glasenapp, Dr. Holger Weimar
Thünen Institute of Forestry

Outline

1. **Overview: Empirical data for the JWEE in Germany**
2. **Overview: Data flows in Germany**
3. **Joint Wood Energy Enquiry (JWEE)**
 1. Table I and Table II
 2. Table III
 3. Table IV
 4. Conversion Factor Sheet
4. **Summary**

Empirical data for the JWEE in Germany



Production statistic

Legal obligation for companies to report information on the production of wood products in Germany.
Cut-off thresholds: 10 to 20 employees depending on sector.

Trade statistic

Legal obligation to report trade information. Trade **within the EU** is recorded via company reports. Trade **outside the EU** is recorded via the customs administration.

Energy statistic

Energy producers are required to report fuel use for electricity and/or heat generation. Fuel use in the residential sector is not included. Cut-off thresholds also applies for energy producers.

Wood Resource Monitoring

Voluntary surveys on wood products production and wood resource demand (material and energy) in Germany.

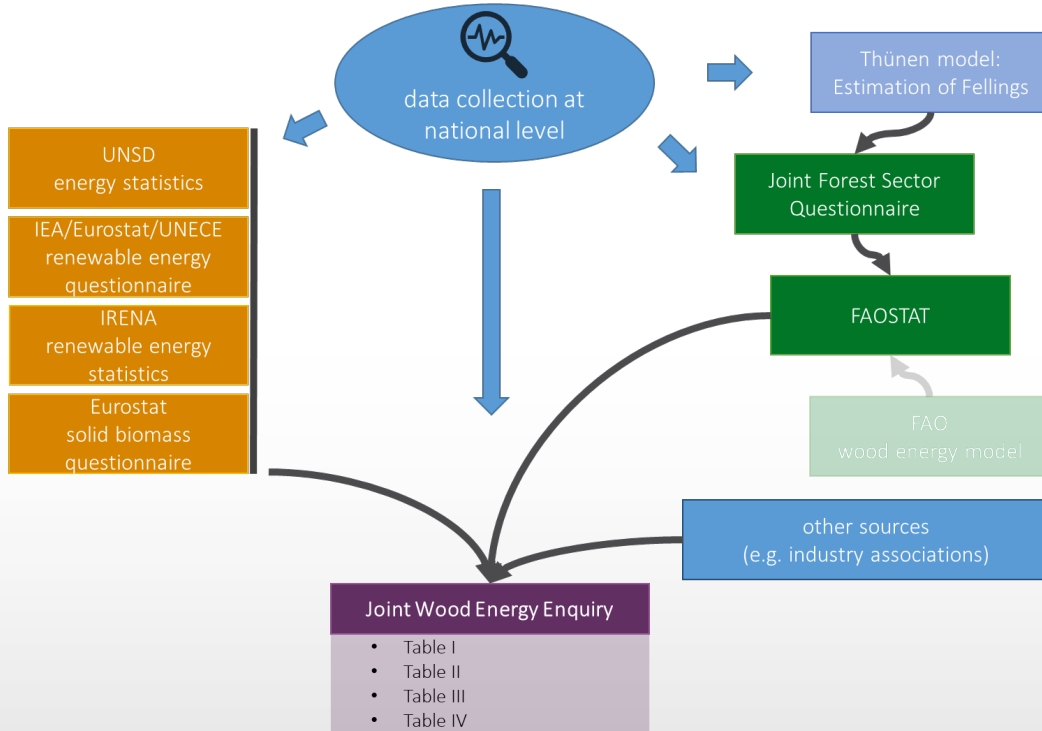
Industry associations

Specific data from yearbooks, reports, etc.

Sources: Destatis (2023a), Destatis (2023b), Glasenapp & Weimar (2020), Thünen (2023)

Overview on wood energy data flows in Germany

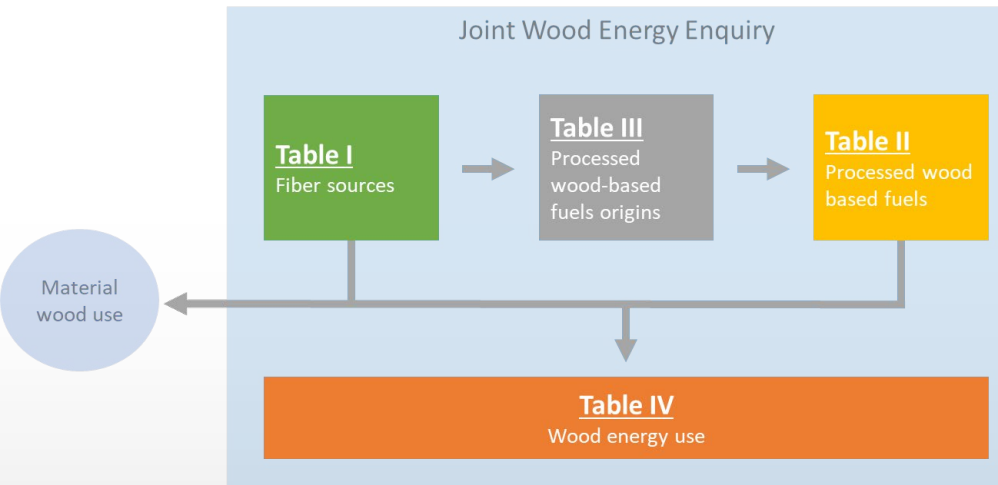
energy statistics



JWEE data sources

- Production statistic
- Trade statistic
- Energy statistic
- Wood Resource Monitoring
- Industry associations
- Thünen model: Estimation of Fellings

Joint Wood Energy Enquiry (JWEE)



JWEE tables

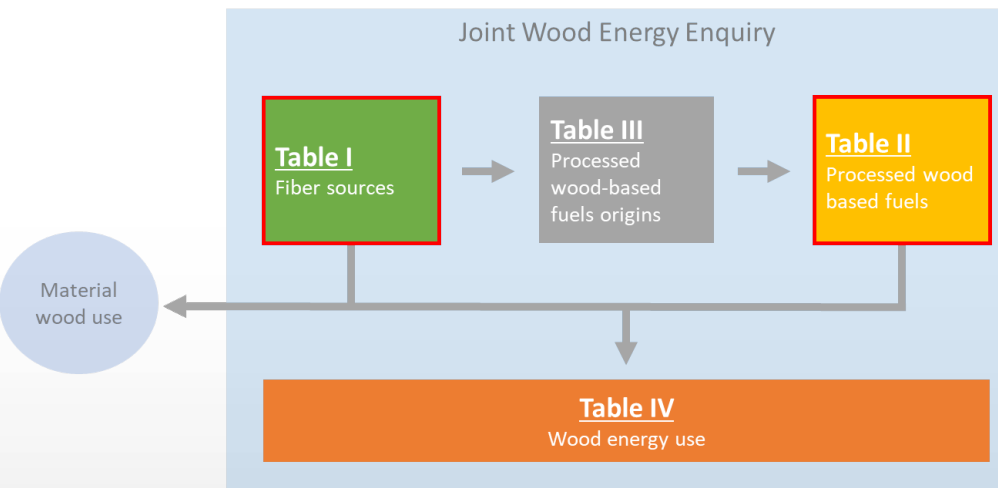
total wood use

- **Table I:** wood fiber sources
- **Table II:** processed wood-based fuels
- **Table III:** processed wood based fuels origins

energy use only

- **Table IV:** wood energy use

Joint Wood Energy Enquiry (JWEE)



JWEE tables

total wood use

- Table I: wood fiber sources
- Table II: processed wood-based fuels
- Table III: processed wood based fuels origins

energy use only

- Table IV: wood energy use

JWEE: Table I and Table II

Table I: fibre sources

Fibre SOURCES		Fibre TYPES	Unit [1 000]	For all purposes, not only energy				
				Domestic production	Imports	Exports	Gross Domestic supply	
Primary solid biomass	Woody Biomass from Forests	Industrial Roundwood (C & NC)	m ³	...	...	...	...
		Fuelwood (C & NC)	m ³	...	...	...	...
		... of which from short rotation coppice	m ³	...	...	...	...
	Woody Biomass Outside Forests	Industrial Roundwood (C & NC)	m ³	...	...	...	...
		Fuelwood (C & NC)	m ³	...	...	...	...
		... of which from short rotation coppice	m ³	...	...	...	...
Wood Sources	Industrial waste (co-products)	Forest based Industry	Solid co-products (C & NC)	Chips and particles	m ³
			Wood residues	m ³	...	...	...
			Bark	m ³	...	...	...
		Liquid co-products (C & NC)	Black liquor (without crude tall oil)	t	...	...	...
			Crude tall oil	t	...	...	...
			Wood from unknown sources	m ³	...	...	...
Municipal solid waste biodegradable	Wood waste	Post-consumer recovered wood	Non-hazardous wood waste	t	
			Hazardous wood waste	t	
		Unspecified wood waste	t		

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Table I

- ...includes all relevant forest products (excl. processed wood based fuels),
- ...considers the flows domestic production and trade,
- ...doesn't use harmonized units,
- ...includes wood resources used for all purposes (i.e. not only energy).

JWEE: Table I and Table II

Table II: processed wood based fuels

Fibre TYPES		Original unit	Domestic production		Import		Export		Gross Domestic supply
				DQ		DQ		DQ	
Processed wood-based fuel production	Processed solid biofuels from wood	Wood Charcoal	t (thousand)	...	...	...	...	...	...
		Wood Pellets	t (thousand)	...	...	...	...	...	...
		...of which: torrefied	t (thousand)	...	...	...	...	...	...
		Wood Briquettes	t (thousand)	...	...	...	...	...	...
	Processed liquid biofuels from wood	Pyrolysis Oils	L (million)	...	...	...	...	...	...
		Cellulose based ethanol	L (million)
		Wood based biodiesel	L (million)
Gaseous Wood-based Fuels	Synthesis Gas								

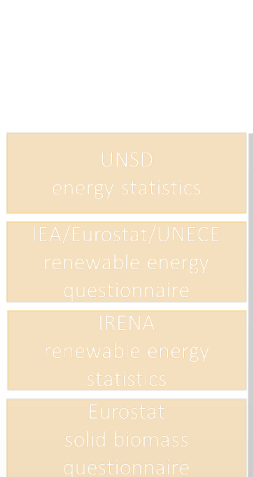
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Table II

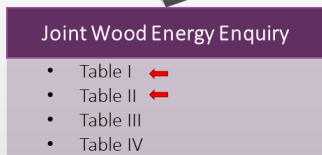
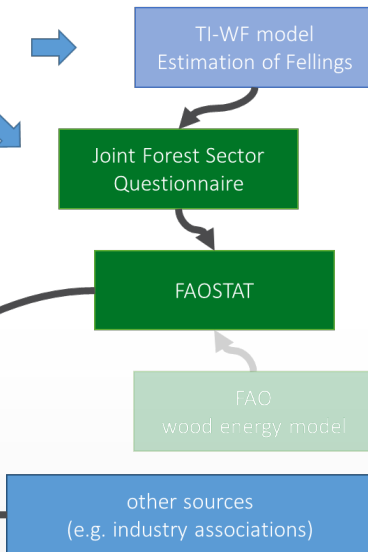
- ...includes relevant processed wood based fuels (not covered in Table I),
- ...considers the flows domestic production and trade,
- ...doesn't use harmonized units.

JWEE Germany: Table I and Table II

energy statistics



forest products statistics



Data to complete Table I and II

- **Thünen model: Estimation of Fellings**
- **estimates based on official production statistics**
- **official trade statistics**
- **Wood Resource Monitoring**
- **industry associations**

= JFSQ data

JWEE Germany : Table I

Table I: fibre sources							
Fibre SOURCES	Fibre TYPES		Unit [1 000]	For all purposes, not only energy			
				Domestic production	Imports	Exports	Gross Domestic supply
				DQ	DQ	DQ	
Primary solid biomass	Woody Biomass from Forests	Industrial Roundwood (C & NC)	m³	...	...	...	...
		Fuelwood (C & NC)	m³	...	...	...	...
		... of which from short rotation coppice	m³
	Woody Biomass Outside Forests	Industrial Roundwood (C & NC)	m³
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		... of which from short rotation coppice	m³
Wood Sources	Industrial waste (co-products)	Forest based Industry	Solid co-products (C & NC)	m³
			Chips and particles	m³	...	...	...
			Wood residues	m³	...	...	...
		Liquid co-products (C & NC)	Black liquor (without crude tall oil)	t	...	...	...
			Crude tall oil	t	...	...	...
			...	t	...	...	...
Municipal solid waste biodegradable	Wood waste	Post-consumer recovered wood	Non-hazardous wood waste	t	...	...	...
			Hazardous wood waste	t	...	...	...
		Unspecified wood waste	t	...	...	...
		Wood from unknown sources	m³	...	...	...	...

...reported to the JFSQ

- Thünen model: estimation of fellings
- estimates based on production statistic
- trade statistic
- UNECE/FAO estimate
- industry association

...reported to the JFSQ

- Wood Resource Monitoring

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JWEE Germany : Table II

Table II: processed wood based fuels

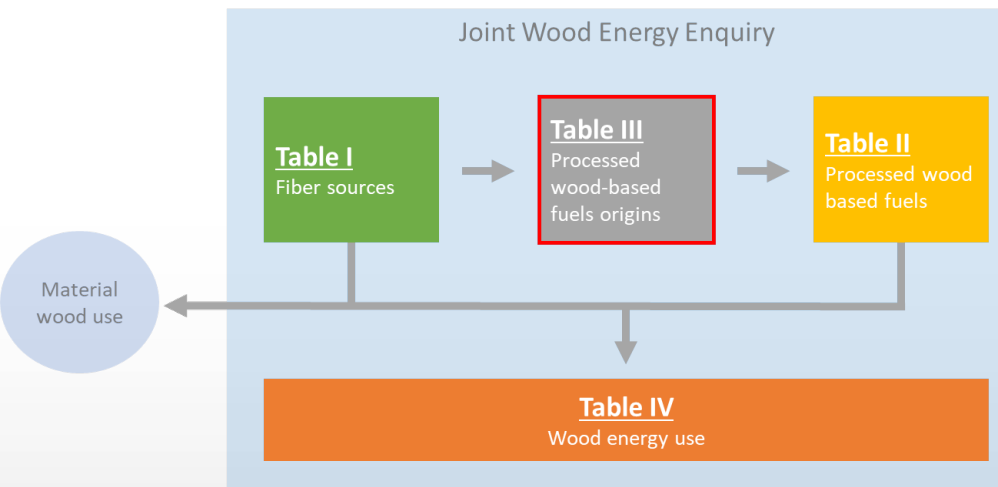
Fibre TYPES		Original unit	Domestic production	Import	Export	Gross Domestic supply
Processed wood-based fuel production	Processed solid biofuels from wood	Wood Charcoal	t (thousand)
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		...of which: torrefied	t (thousand)
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	Processed liquid biofuels from wood	Pyrolysis Oils	L (million)
		Cellulose based ethanol	L (million)
		Wood based biodiesel	L (million)
	Gaseous Wood-based Fuels	Synthesis Gas				

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...reported to the JFSQ

- trade statistic
- expert estimate (energy/forestry side)
- industry association
- trade statistic
- estimate based on production statistic and industry association

Joint Wood Energy Enquiry (JWEE)



JWEE tables

total wood use

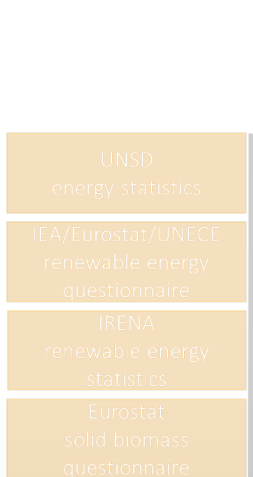
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energy use only

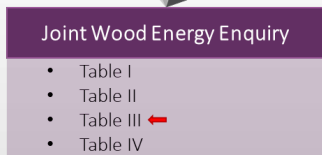
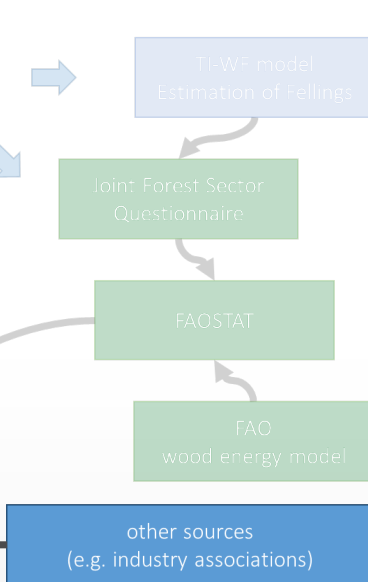
- **Table IV:** wood energy use

JWEE Germany: Table III

energy statistics



forest products statistics



- *Germany doesn't complete Table III yet* -

Potential data to complete Table III

- **industry associations**
- **international organizations**

JWEE Germany: Table III

TIII: processed wood based fuels origins																																																													
Share of raw materials in domestic production																																																													
Processed solid biofuels for power generation																																																													
<table border="1"> <thead> <tr> <th colspan="2">Wood Charcoal</th> <th colspan="2">Wood Pellets</th> </tr> </thead> <tbody> <tr> <td colspan="2">0.0 %</td> <td colspan="2">0.0 %</td> </tr> <tr> <td colspan="2">100.0 %</td> <td colspan="2">100.0 %</td> </tr> <tr> <td colspan="2"> <table border="1"> <thead> <tr> <th>...</th> <th>Prod=0</th> <th>0%</th> </tr> </thead> <tbody> <tr><td>+</td><td>...</td><td>Prod=0</td></tr> <tr><td>+</td><td>...</td><td>Prod=0</td></tr> <tr><td>+</td><td>...</td><td>Prod=0</td></tr> <tr><td>+</td><td>...</td><td>Prod=0</td></tr> <tr><td>+</td><td>...</td><td>Prod=0</td></tr> </tbody> </table> </td> <td colspan="2"> <table border="1"> <thead> <tr> <th>...</th> <th>Prod=0</th> <th>0%</th> </tr> </thead> <tbody> <tr><td>+</td><td>...</td><td>Prod=0</td></tr> <tr><td>+</td><td>...</td><td>Prod=0</td></tr> <tr><td>+</td><td>...</td><td>Prod=0</td></tr> <tr><td>+</td><td>...</td><td>Prod=0</td></tr> <tr><td>+</td><td>...</td><td>Prod=0</td></tr> </tbody> </table> </td> </tr> <tr> <td colspan="2">= 0.0 [1000 t.d.m.]</td> <td colspan="2">= 0.0 [1000 t.d.m.]</td> </tr> <tr> <td colspan="2">... 1000 t.d.m.</td> <td colspan="2">... 1000 t.d.m.</td> </tr> </tbody> </table>		Wood Charcoal		Wood Pellets		0.0 %		0.0 %		100.0 %		100.0 %		<table border="1"> <thead> <tr> <th>...</th> <th>Prod=0</th> <th>0%</th> </tr> </thead> <tbody> <tr><td>+</td><td>...</td><td>Prod=0</td></tr> <tr><td>+</td><td>...</td><td>Prod=0</td></tr> <tr><td>+</td><td>...</td><td>Prod=0</td></tr> <tr><td>+</td><td>...</td><td>Prod=0</td></tr> <tr><td>+</td><td>...</td><td>Prod=0</td></tr> </tbody> </table>		...	Prod=0	0%	+	...	Prod=0	+	...	Prod=0	+	...	Prod=0	+	...	Prod=0	+	...	Prod=0	<table border="1"> <thead> <tr> <th>...</th> <th>Prod=0</th> <th>0%</th> </tr> </thead> <tbody> <tr><td>+</td><td>...</td><td>Prod=0</td></tr> <tr><td>+</td><td>...</td><td>Prod=0</td></tr> <tr><td>+</td><td>...</td><td>Prod=0</td></tr> <tr><td>+</td><td>...</td><td>Prod=0</td></tr> <tr><td>+</td><td>...</td><td>Prod=0</td></tr> </tbody> </table>		...	Prod=0	0%	+	...	Prod=0	+	...	Prod=0	+	...	Prod=0	+	...	Prod=0	+	...	Prod=0	= 0.0 [1000 t.d.m.]		= 0.0 [1000 t.d.m.]		... 1000 t.d.m.		... 1000 t.d.m.	
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The indicated national production in Table II requires the following wood feedstock:																																																													

industry associations

Germany: **DEPV** Deutscher Energieholz- und Pellet-Verband e.V.

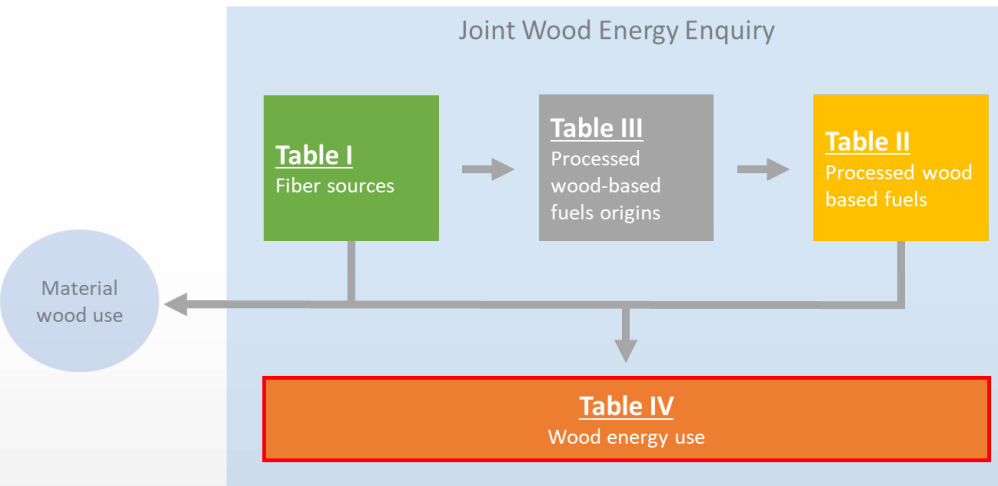
Europe: **BiOenergy EUROPE**

international organizations

Global: **IRENA** International Renewable Energy Agency

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Joint Wood Energy Enquiry (JWEE)



JWEE tables

total wood use

- **Table I:** wood fiber sources
- **Table II:** processed wood-based fuels
- **Table III:** processed wood based fuels origins

energy use only

- **Table IV:** wood energy use

JWEE: Table IV

TIV: energy use

			Energy use of wood fibres by ISIC-sectors (in 1000 t.d.m or t)																	
			Energy Transformation Sector					Industry Sector					Other direct final consumption							
			Main Activity Producer					Direct Final Consumer and Autoproducer (Heat, CHP and Electricity)												
Unit [t 000]	Net Domestic supply [t d.m. or t]	Wood used for energy [t d.m. or t]	Electricity	CHP	Heat	Unspecified	Total	Pulp & Paper [ISIC No.21]	Wood & wood products	Other industry	Unspecified	Total	Residential	Agriculture, Forestry and Fishing	Commercial and Public services	Transport Sector	Other	Unspecified	Total	
			DG	DG	DG	DG	DG	DG	DG	DG	DG	DG	DG	DG	DG	DG	DG	DG	DG	DG
Primary solid biomass	Woody Biomass from Forests	Industrial Roundwood (C & NC)	t d.m.	0	0	...	0	...	...	...	...	0	...	...	...	...	...	...	...	0
		Fuelwood (C & NC)	t d.m.	0	0	...	0	...	...	...	...	0	...	...	...	...	...	...	...	0
	Woody Biomass Outside Forests	Industrial Roundwood (C & NC)	t d.m.	0	0	...	0	...	...	...	...	0	...	...	...	...	...	...	...	0
		Fuelwood (C & NC)	t d.m.	0	0	...	0	...	...	...	...	0	...	...	...	...	...	...	...	0
	Unspecified primary solid biomass	t d.m.	0	0	...	0	...	...	...	...	...	0	...	...	...	...	...	...	...	0
Forest based industry	Solid co-products (C & NC)	Chips and particles	t d.m.	0	0	...	0	...	...	...	...	0	...	...	...	...	...	...	...	0
		Wood residues	t d.m.	0	0	...	0	...	...	...	...	0	...	...	...	...	...	...	...	0
		Bark	t d.m.	0	0	...	0	...	...	...	...	0	...	...	...	...	...	...	...	0
		Unspecified solid co-products	t d.m.	0	0	...	0	...	...	...	...	0	...	...	...	...	...	...	...	0
	Liquid co-products (C & NC)	Black liquor (without crude tall oil)	t d.m.	0	0	...	0	...	...	...	...	0	...	...	...	...	...	...	...	0
		Crude tall oil	t	0	0	...	0	...	...	...	...	0	...	...	...	...	...	...	...	0
		Unspecified liquid co-products	t d.m.	0	0	...	0	...	...	...	...	0	...	...	...	...	...	...	...	0
Processed wood-based fuel production	Processed solid biofuels from wood	Wood Charcoal	t d.m.	0	0	...	0	...	...	...	...	0	...	...	...	...	...	...	...	0
		Wood Pellets	t d.m.	0	0	...	0	...	...	...	...	0	...	...	...	...	...	...	...	0
		...of which: torrefied	t d.m.	0	0	...	0	...	...	...	...	0	...	...	...	...	...	...	...	0
	Processed liquid biofuels from wood	Wood Briquettes	t d.m.	0	0	...	0	...	...	...	...	0	...	...	...	...	...	...	...	0
		Pyrolysis Oils	t	0	0	...	0	...	...	...	...	0	...	...	...	...	...	...	...	0
		Cellulose based ethanol	t	0	0	...	0	...	...	...	...	0	...	...	...	...	...	...	...	0
Wood based biodiesel	t	0	0	...	0	...	...	...	...	0	...	...	...	...	...	...	...	...	0	
Post-consumer recovered wood	Non-hazardous wood waste	t d.m.	0	0	...	0	...	...	...	...	0	...	...	...	...	...	...	...	...	0
	Hazardous wood waste	t d.m.	0	0	...	0	0	0
	Unspecified wood waste	t d.m.	0	0	...	0	0	0
Wood from unknown sources	t d.m.	0	0	...	0	0	0	

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JWEE: Table IV

TIV: energy use

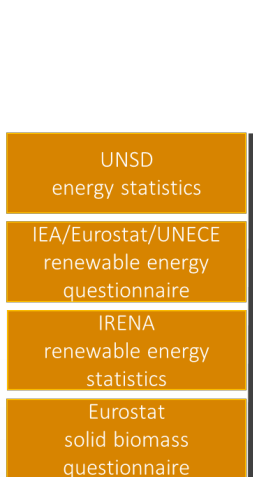
Energy use of wood fibres by ISIC-sectors (in 1000 t.d.m or t)

			Unit [t 000]	Net Domestic supply [t d.m. or t]	Wood used for energy [t d.m. or t]	Energy Transformation Sector														Industry Sector									
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						Electricity	CHP	Heat	Unspecified	Total	Pulp & Paper [ISIC No.21]	Wood & wood products	Other Industry	Unspecified	Total	DC	DC	DC	DC	DC								DC	DC
Primary solid biomass	Woody Biomass from Forests	Industrial Roundwood (C & NC)	t d.m.	0	0	0	0	0	
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	Woody Biomass Outside Forests	Industrial Roundwood (C & NC)	t d.m.	0	0	0	0	0	
		Fuelwood (C & NC)	t d.m.	0	0	0	0	0	
	Unspecified primary solid biomass		t d.m.	0	0	...	...	...	...	...	0	...	...	...	...	...	0	...	...	...	...	...	...	...	...	...	...	0
Forest based industry	Solid co-products (C & NC)	Chips and particles	t d.m.	0	0	...	...	...	...	...	0	...	...	...	...	...	0	...	...	...	...	...	...	...	...	...	...	0
		Wood residues	t d.m.	0	0	...	...	...	...	...	0	...	...	...	...	...	0	...	...	...	...	...	...	...	...	...	...	0
		Bark	t d.m.	0	0	...	...	...	...	...	0	...	...	...	...	...	0	...	...	...	...	...	...	...	...	...	...	0
		Unspecified solid co-products	t d.m.	0	0	...	...	...	...	...	0	...	...	...	...	...	0	...	...	...	...	...	...	...	...	...	...	0
	Liquid co-products (C & NC)	Black liquor (without crude tall oil)	t d.m.	0	0	...	...	...	...	...	0	...	...	...	...	...	0	...	...	...	...	...	...	...	...	...	...	0
		Crude tall oil	t	0	0	...	...	...	...	...	0	...	...	...	...	...	0	...	...	...	...	...	...	...	...	...	...	0
	Unspecified liquid co-products	t d.m.	0	0	...	...	...	...	...	0	...	...	...	...	...	0	...	...	...	...	...	...	...	...	...	...	0	
Processed wood-based fuel production	Processed solid biofuels from wood	Wood Charcoal	t d.m.	0	0	0	0	0	
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		...of which: torrefied	t d.m.	0	0	0	0	0	
		Wood Briquettes	t d.m.	0	0	0	0	0	
	Processed liquid biofuels from wood	Pyrolysis Oils	t	0	0	0	0	0	
		Cellulose based ethanol	t	0	0	...	...	...	...	...	0	...	...	...	...	...	0	...	...	...	...	...	...	...	...	...	...	0
	Wood based biodiesel	t	0	0	...	...	...	...	...	0	...	...	...	...	...	0	...	...	...	...	...	...	...	...	...	...	0	
Post-consumer recovered wood	Non-hazardous wood waste	t d.m.	0	0	...	...	...	...	...	0	...	...	...	...	...	0	...	...	...	...	...	...	...	...	...	...	...	0
	Hazardous wood waste	t d.m.	0	0	0	0	0		
	Unspecified wood waste	t d.m.	0	0	0	0	0		
Wood from unknown sources		t d.m.	0	0	0	0	0		

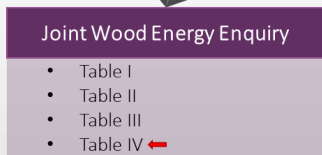
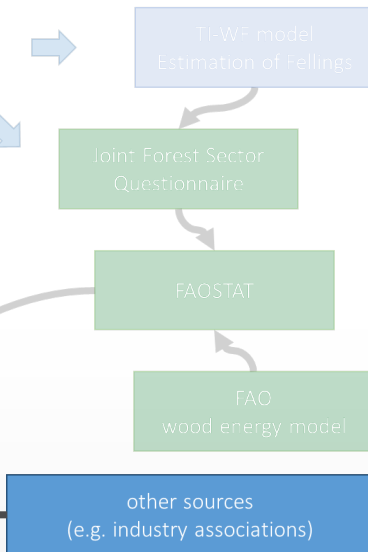
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JWEE Germany: Table IV

energy statistics



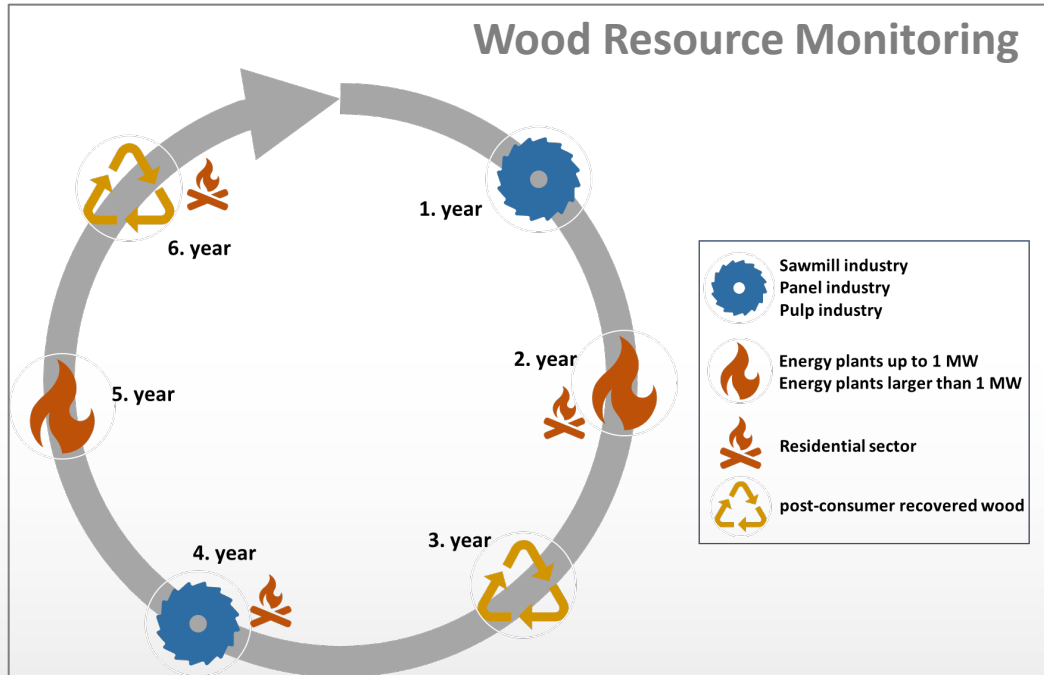
forest products statistics



Data to complete Table IV

- **Wood Resource Monitoring**
- **energy statistic**
- **expert estimates (energy/forestry experts)**
- **industry association**

Wood Resource Monitoring



Residential sector:

- cycle: 2 years
- sample size: 10,000 households
- extrapolation: census data

Wood energy plants

- cycle: 3 years
- sample size: ca. 3,000 plants
- extrapolation: total population of wood energy plants

>> modeled wood energy demand in years without empirical data

Covariates:

- temperature
- energy prices

JWEE: Conversion Factor Sheet

Conversion Factors Energy									
Factors applied for conversion									
* please adjust conversion factors where necessary									
	Original Unit [1 000]	conversion factor (tdm or t)	Unit	conversion factor (m³)	Unit	conversion factor (GJ)	Unit		
								Table I and II to IV	Table IV	Overview
Primary solid biomass	Woody Biomass from Forests	Industrial Roundwood (C & NC)	m³	0.42	tdm / m³	2.40	m³ / tdm	20.21	GJ / tdm
		Fuelwood (C & NC)	m³	0.42	tdm / m³	2.40	m³ / tdm	20.21	GJ / tdm
	Woody Biomass Outside Forests	Industrial Roundwood (C & NC)	m³	0.42	tdm / m³	2.40	m³ / tdm	20.21	GJ / tdm
		Fuelwood (C & NC)	m³	0.42	tdm / m³	2.40	m³ / tdm	20.21	GJ / tdm
	Unspecified primary solid biomass	m³	0.42	tdm / m³	2.40	m³ / tdm	20.21	GJ / tdm	
Forest based Industry	Solid co-products (C & NC)	Chips and particles	m³	0.42	tdm / m³	2.40	m³ / tdm	20.21	GJ / tdm
		Wood residues	m³	0.42	tdm / m³	2.40	m³ / tdm	20.21	GJ / tdm
		Bark	m³	0.47	tdm / m³	2.13	m³ / tdm	19.84	GJ / tdm
		Unspecified solid co-products	m³	0.42	tdm / m³	2.40	m³ / tdm	20.21	GJ / tdm
	Liquid co-products (C & NC)	Black liquor (without crude tall oil)	t	0.80	tdm / t	1.56	m³ / tdm	13.89	GJ / tdm
		Crude tall oil	t	1.00	t / t	4.38	m³ / t	36.90	GJ / t
	Unspecified liquid co-products	t			1.56	m³ / tdm	13.89	GJ / t	
Processed wood-based fuel production	Processed solid biofuels from wood	Wood Charcoal	t	0.94	tdm / t	6.00	m³ / tdm p	30.00	GJ / tdm
		Wood Pellets	t	0.92	tdm / t	2.35	m³ / tdm p	20.37	GJ / tdm
		...of which: torrefied	t	0.97	tdm / t	2.70	m³ / tdm p	22.70	GJ / tdm
		Wood Briquettes	t	0.92	tdm / t	2.29	m³ / tdm p	20.37	GJ / tdm
	Processed liquid biofuels from wood	Pyrolysis Oils	Million L	880	t / Million L	8.39	m³ / t	36.90	GJ / t
		Cellulose based ethanol	Million L	792.39	t / Million L	9.73	m³ / t	23.40	GJ / t
		Wood based biodiesel	Million L	880	t / Million L	3.84	m³ / t	37.80	GJ / t
Wood from unknown sources	Non-hazardous wood waste	t	0.80	tdm / t	2.09	m³ / tdm	20.21	GJ / tdm	
	Hazardous wood waste	t	0.80	tdm / t	2.09	m³ / tdm	20.21	GJ / tdm	
	Unspecified wood waste	t	0.80	tdm / t	2.09	m³ / tdm	20.21	GJ / tdm	
	Wood from unknown sources	m³	0.42	tdm / m³	2.40	m³ / tdm	20.21	GJ / tdm	

JWEE: Conversion Factor Sheet

TIV: energy use

			Net Domestic supply [t d.m. or t]	Wood used for energy [t d.m. or t]	Energy use of wood fibres by ISIC-sectors (1000 m3 solid)																	
					Energy Transformation Sector					Industry Sector					Other Direct final consumption							
					Main Activity Producer					Consumed and Autoproducer Heat, CHP and Electricity					Residential, Agriculture, Forestry and Fishing, Commercial and Public services, Transport Sector, Other, Unspecified							
					Electricity	CHP	Heat	Unspecified	Total	Pulp & Paper [ISIC No.21]	Wood and wood products	Other Industry	Unspecified	Total	Residential	Agriculture, Forestry and Fishing	Commercial and Public services	Transport Sector	Other	Unspecified	Total	
					DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	DO	
Primary solid biomass	Woody Biomass from Forests	Industrial Roundwood (C & NC)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		Fuelwood (C & NC)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Woody Biomass Outside Forests	Industrial Roundwood (C & NC)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Fuelwood (C & NC)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			Unspecified primary solid biomass	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Forest based industry	Solid co-products (C & NC)	Chips and particles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Wood residues	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Bark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Liquid co-products (C & NC)	Unspecified solid co-products	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Black liquor (without crude tall oil)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Crude tall oil	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Unspecified liquid co-products	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Processed wood-based fuel production	Processed solid biofuels from wood	Wood Charcoal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Wood Pellets	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		...of which: torrefied	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Processed liquid biofuels from wood	Wood Briquettes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Pyrolysis Oils	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Cellulose based ethanol	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Wood based biodiesel	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Post-consumer recovered wood	Non-hazardous wood waste	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Hazardous wood waste	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Unspecified wood waste	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Wood from unknown sources			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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Summary

- **Table I and II data sources:**
 - JFSQ
- **Table III data sources:**
 - industry associations can potentially provide information
- **Table IV data sources:**
 - Wood Resource Monitoring
 - expert estimates
(energy/forestry side)
 - industry associations

Collaboration of forestry and energy experts is key!

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Thank you for your attention!

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