



Virtual technical training on updating the national greenhouse gas inventories for the energy sector

Western Balkan and Eastern Europe

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Agenda

- GHG Inventory of North Macedonia
- Updating GHG inventory in energy sector Training
 - Questionnaires Results
 - Part 1: Source categories, methodological approach for emissions estimation, approach to data collection, time series consistency
 - Part 2: Reference vs sectoral approach, key category analyses, uncertainty analysis, QA/QC
- Interaction with participants (using Mentimeter)
- Presentations by country
- Q/A with participants
- Closing remarks

GHG Inventory of North Macedonia

Current status and next steps

Inventory process



Methodology

 2006 IPCC Guidelines for National Greenhouse Gas Inventories (Refinements of IPPC Guidelines from 2019)

(http://www.ipcc-nggip.iges.or.jp/public/2006gl/)

• IPPC Inventory Software Ver. 2.54

(http://www.ipcc-nggip.iges.or.jp/software/index.html)

• GWP factors - IPCC Forth Assessment Report (AR4), 2007, 100-years time horizon

(https://www.ipcc.ch/site/assets/uploads/2018/05/ar4_wg1_full_report-1.pdf)

Overview

- Reported gases:
 - GHG: CO₂, CH₄, N₂O, PFCs и HFCs
 - Indirect: CO, NO_x, NMVOC, SO₂и NH₃
- Time series 1990 2016
- Latest update for years 2014, 2015 and 2016 in the NIR 3rd BUR
- Tier 2 method applied in:
 - Energy (Fuel combustion activities Country-specific EF for CO₂ emissions)
 - Industrial Processes and Product Use IPPU (Mineral and metal industry)
 - Waste (IPCC FOD method)

Emissions trend - summary (net emissions)



Emissions trend - summary

Total GHG emissions by category, excluding Forestry and Other land use (in Gg CO2- eq)



Emissions trend - summary



Total GHG emissions by gas, excluding Forestry and Other land use (in Gg CO2- eq)

CO2 CH4 N2O F-gases

Precursors and indirect emissions - summary



NOX CO NMVOC SO2 NH3

Energy sector



Source: UN @

GLOBAL SUPPORT

Energy sector

• GHG emissions (in Gg CO₂-eq)



Other Sectors

Energy – Energy industries

GHG emissions (in Gg CO₂-eq)



• Main fuels:

- lignite (domestic resource)
- natural gas
- Residual fuel oil (gradually replaced by natural gas)

• GHG emission reduction due to:

- Fuel switch (RFO with natural gas) for electricity and heat production
- Reduced electricity generation (from fossil fuels)

Energy – Manufacturing industries and construction

GHG emissions (in Gg CO₂-eq)



• Fuels:

 Coking coal, other bituminous coal, lignite, liquefied petroleum gases, residual fuel oil, natural gas, wood/wood waste (biomass and wood wastes, wood briquettes and pellets), sub-bituminous coal, petroleum coke, and gas/diesel oil (road diesel, and heating and other gasoil

Energy – Transport

GHG emissions (in Gg CO₂-eq)



• Fuels:

• Diesel oil (for transport), motor gasoline, LPG, motor gasoline (used in domestic aviation) and natural gas

 Increase in emissions due to increased number of vehicles (mostly using diesel)

Energy – Other sectors



• Fuels:

- lignite, LPG, motor gasoline, biomass (fuelwood), wood waste, briquettes and pellets, diesel for transport and heating oil, and natural gas
- Reduced emissions due to :
 - Household reduced consumption of heating oil

Energy – Non-Specified

GHG emissions (in Gg CO₂-eq)



• Fuels:

 lignite, LPG, residual fuel oil, natural gas, biomass (fuelwood), diesel for transport and heating oil

- Increased emissions due to :
 - Increased consumption of fuel (RFO) in last years
 - Peak year is 2005 higher consumption of lignite, RFO and Gas/Diesel Oil in 2005, while in 2016 there is more Electricity consumption

Energy – Fugitive emissions

GHG emissions (in Gg CO₂-eq)



• Fuels:

- Coal mining and handling surface mines (Mining and Post-mining)
- Oil refining and transmission of natural gas

- The 2019 Refinements of 2006 IPCC Guidelines introduce a CO₂ emission factor
- Decrease in emissions due to reduced production from coal mines

Recommendations for future inventories

- Secure and constant channels for acquiring data on composition and carbon content of fuels should be established with relevant institutions in order to facilitate the estimation of country specific emission factors. This can be achieved by signing some kind of agreement, for instance, a Memorandum of Understanding.
- Having in mind that there are several existing biogas power plants, their electricity production should be also taken into account in the next inventories, especially if more of this type of power plants will become available in the future. Since there are no data available on the amount of biogas used for electricity production, it is recommended to develop a separate study for the existing biogas power plants. This study would be also relevant for the AFOLU and Waste sectors since the biogas is produced from manure.

Updating GHG inventory in energy sector - Training

Questionnaires - Results

Questionnaire - results

14





Do you know what is "activity data"?



Questionnaire - results

Electricity that is consumed by the industry sectors should be reported 5 5 under 3 2 Manufacturing Industrial Energy None of the Industry and Processes and Industries above Construction Product Used



2014,2016,2017 latest inventory, Other software – IPCC 1996, COPERT, LEAP, own etc.

Updating GHG inventory in energy sector – 1st part

Source categories, methodological approach for emissions estimation, approach to data collection, time series consistency

Presenter: Verica Taseska-Gjorgievska

Why is energy sector important?

- Energy sector contributes to approx. 70% of the world emissions
 - It has the highest share in total GHG emissions for most of the countries





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Sector Overview

- 2006 IPCC Guidelines for national GHG inventories identify around 70 source categories of GHG emissions in the Energy sector
- Scope:





Emissions from fossil fuel combustion Methodological approach

- CO₂ emissions depend almost entirely on the carbon content of the fuel, and are independent of the combustion technology
- During the combustion process, most carbon is immediately emitted as CO₂. Some carbon is released as CO, CH₄ or NMVOCs, which eventually oxidise to CO₂ in the atmosphere
- CH₄ and N₂O emissions are strongly dependent on the combustion technology (which differ widely between source categories)
- Three Tiers (levels of methodological complexity) presented in 2006 IPCC GL

Emissions = AD × EF = Amount of Fuel × NCV × EF

EF_{CO2} = **Carbon Content × Oxidation fraction × 44/12**

(where **AD** = Activity Data; **EF** = Emission Factor)

- *Tier 1* Amount of fuel combusted, default values for NCV, carbon content, CO₂ EF, N₂O EF, CH₄ EF
- Tier 2 Amount of fuel, country-specific values for NCV, carbon content and CO₂ EF, N₂O EF, CH₄ EF
- **Tier 3** Emissions depend on fuel type used, combustion technology, operating conditions, control technology, quality of maintenance, age of the equipment used to burn the fuel plant-specific EFs (measurements)

Emissions from fossil fuel combustion Methodological approach

- Generalised decision tree (Figure 2.1, Vol. 2, Chapter 1, 2006 IPCC GL)
 - applies in general for each of the fuel combustion activities and for each of the gases
- Relation to other inventory approaches
 - IPCC approach UNFCCC reporting needs
 - EMEP/CORINAIR approach technology based and includes spatial allocation of emissions (point and area sources)
 - Now both are generally well harmonized:
 - 2006 IPCC Guidelines concentrate on emissions of direct greenhouse gases, CO₂, CH₄ and N₂O
 - EMEP/CORINAIR Emission Inventory Guidebook emission estimation methods for indirect GHG and other air pollutants



• Inventory definition: Data on the magnitude of human activity resulting in emissions or removals taking place during a given period of time.

AD = Amount of Fuel (Consumption) × NCV

(The default NCV values are given in Table 1.2, Vol. 2, Chapter 1, 2006 IPCC GL)

- Fuels:
 - SOLID (Coal and Coal Products)
 - LIQUID (Crude Oil and Petroleum Products)
 - GAS (Natural Gas)
 - OTHER FOSSIL FUELS (Non-biomass municipal & Industrial wastes, waste oils)
 - PEAT, treated as fossil fuel
 - BIOMASS (Wood, Charcoal, Biofuels, Biomass fraction of MSW). CO₂ emissions not included in total Energy emissions (*Definition of fuel types in Table 1.1, Vol. 2, Chapter 1, 2006 IPCC GL*)

Fuel consumption units:

- Volume: cubic meters, litres
- Mass: tonnes, kg
- Energy (*expressed as either NCV or GCV*): oil/coalequivalent, calories, kW, MJ, BTU

The 2006 IPCC Guidelines - SI units :

- **1.** Fuel consumption Gg (TJ)
- **2. NCV** (conversion factor) TJ/Gg
- **3.** Carbon content kg/GJ
- **4. EF** kg/TJ (per energy basis)

Sources

- Most appropriate and accessible AD can be obtained from fuel statistics collected by an officially recognised national body
 - Energy balances from national statistical offices
- International energy statistics:
 - the International Energy Agency (IEA)
 - the United Nations (UN)
- European statistics (Eurostat)

The structure of categories under 1.A - Fuel Combustion Activities is very similar to the structure of the energy balances

IEA

	Coal	Crude oil	Oil products	Natural gas	Nuclear	Hydro	Wind, solar, etc.	Biofuels and waste	Electricity	Heat	Total
	ktoe	ktoe	ktoe	ktoe	ktoe	ktoe	ktoe	ktoe	ktoe	ktoe	ktoe
Production	3768012	4 461 494		3136586	687380	350 064	257 470	1305118		2073	<mark>13</mark> 968 196
Imports	823706	2 46 <mark>0 31</mark> 9	1370 698	990788				27061	62855	6	5735433
Exports	-852516	-2380169	-1477986	-1015549				-21660	-63251	-5	-5811136
International marine bunkers											
International aviation bunkers											
Stock changes	47999	16896	5 574	-12955				506			58 019
TES	3787200	4558540	-101715	3 0 9 8 8 7 0	687380	350 064	257 470	1311024	-395	2074	13 950 512
Transfers	-1226	-236903	263761								25 631
Statistical differences	-870	5184	12 424	4764			-101	-931	-1695	4195	22970
Electricity plants	-1709178	-35 046	-151304	-882500	-683 898	-350 064	-207944	-123 499	1859171	-894	-2285155
CHP plants	-643 762	-14	-15830	-321816	-3 482		-2703	-64548	343 065	241662	-467 429
Heat plants	-22065	-492	-9112	-64271			-1 417	-12581	-708	100 927	-9719
Gas works	-12894		-2702	5 5 7 5				-534			-10 555
Oil refineries		-4326398	4232632								-93 766
Coal transformation	-279 625		-2328	-43				-160			-282155
Liquefication plants	- <mark>1</mark> 4 471	153 <mark>4</mark> 9		-14 435							-13 557
Other transformation	-257	50145	-38 359	-14326				-81858		-696	-85350
Energy industry own use	-83 181	-9945	-209567	-278 734			-2	-13 114	-185 073	-37101	-816 717
Losses	-2245	-7743	-460	-18 909			-10	-189	- <mark>169131</mark>	-19 525	-218210
Total final consumption	1017425	12 678	3977441	1514175			45 293	1013611	1845233	290 643	9716500
Industry	812 748	3 3 1 5	302337	572 446			960	203730	771206	138 875	2805617
Transport	126	10	2600775	105 067				83769	31661		2821408
Residential	77389		215 185	446 996			32732	681952	497317	101 343	2052914
Commercial and public services	33330		83571	1923 <mark>4</mark> 9			8 175	30343	402271	38 9 2 9	788 970
Agriculture / forestry	16 481	11	108181	10190			2182	11 599	55622	3 472	207737
Fishing	2		6118	46			59	25	648	57	6955
Non-specified	26181	1	21 4 4 2	3368			1185	2193	86 508	7967	148846
Non-energy use	51168	9341	639 832	183713							884054

IPCC Inventory Software

COOP IPC	C Categories	
🖃 1 - Ene	irgy	
🖨 1.A	A - Fuel Combustion Activities	
0	1.A.1 - Energy Industries	
	I.A.1.a - Main Activity Electricity and Heat Production	
	- 1.A.1.a.i - Electricity Generation	
	1.A.1.a.ii - Combined Heat and Power Generation (CHP)	
	1.A.1.a.iii - Heat Plants	
	- 1.A.1.b - Petroleum Refining	
	1.A.1.c - Manufacture of Solid Fuels and Other Energy Industries	
e	1.A.2 - Manufacturing Industries and Construction	
	1.A.2.a - Iron and Steel	
	1.A.2.c - Chemicals	
	- 1.A.2.d - Pulp, Paper and Print	
	1.A.2.f - Non-Metallic Minerals	
	1.A.2.g - Transport Equipment	
	1.A.2.h - Machinery	
	-1.A.2.i - Mining (excluding fuels) and Quarrying	
	-1.A.2.k - Construction	
	1.A.2.m - Non-specified Industry	
9	1.A.3 - Transport	
	1.A.3.a - Civil Aviation	
	1.A.3.b - Road Transportation	
	1.A.3.c - Railways	
	1.A.3.d - Water-borne Navigation	
	1.A.3.e - Other Transportation	
9	1.A.4 - Other Sectors	
	1.A.4.a - Commercial/Institutional	
	1.A.4.b - Residential	
	- 1.A.4.c - Agriculture/Forestry/Fishing/Fish Farms	
	1.A.4.c.i - Stationary	
	- 1.A.4.c.ii - Off-road Vehicles and Other Machinery	
	1.A.4.c.iii - Fishing (mobile combustion)	
	1.A.5 - Non-Specified	
	1.A.5.a - Stationary	
	1.A.5.b - Mobile	

Country/Territory: The former Yugoslav Republic of Macedonia Inventory Year: 2018 Base year for assessment of uncertainty in trend: 1990

Good practices in N. Macedonia

- Energy balances from the State Statistical Office (SSO) are used:
 - Values in natural units*
 - Values in ktoe
 - NCV values are derived (TJ/Unit)*
 - Conversion of data from ktoe → TJ

 $NCV = \frac{fuel \ consumption \ in \ TJ}{fuel \ consumption \ in \ natural \ units}$

Improvements over the years

- Alignment of the methodology for development of energy balances developed by different state institutions (Ministry of Economy and SSO)
- Collaboration with SSO Department for environment, energy and transport
 - Data irregularities, possible uncertainties

*Input in IPCC software

Emissions from fossil fuel combustion Emission factors

- Default emission factors
 - CO₂ emission factors for fuel combustion are relatively insensitive to the combustion process itself and hence are primarily dependent only on the carbon content of the fuel (*Default values of carbon content, Table 1.3, Vol. 2, Chapter 1, 2006 IPCC GL; Default CO₂ emission factors for combustion, Table 1.4, Vol. 2, Chapter 1, 2006 IPCC GL)*
 - CH₄ and N₂O emissions are strongly dependent on the combustion technology (which differ widely between source categories)

(Default emission factors for stationary combustion, Tables 2.2 to 2.5, Vol. 2, Chapter 2, 2006 IPCC GL; Road transport default CO₂ emission factors, Table 3.2.1, Vol. 2, Chapter 3, 2006 IPCC GL)

• Country-specific emission factors

EF_{co2} = **Carbon Content × Oxidation fraction × 44/12**

• By default the 2006 IPCC Guidelines assume a complete combustion process (100% carbon conversion or oxidation fraction is 1)

Emissions from fossil fuel combustion Emission factors

Good practices in N. Macedonia

- Country-specific emission factors (CS-EF) for CO₂ emissions
 EF_{CO2} = Carbon Content × Oxidation fraction × 44/12
 - In three National Communications CS EF developed in line with 1996 IPCC Guidelines (oxidation fractions <1)
 - By default the 2006 IPCC Guidelines assume a complete combustion process (100% carbon conversion or oxidation fraction is 1)
 - Under the 1st BUR CS-EF were revised in line with 2006 IPCC Guidelines:
 - *Lignite* (data source for carbon content Power company ESM, experimental values on samples from coal mines)
 - *Residual fuel oil* (data source for carbon content Oil refinery OKTA)
 - *Natural gas* (data source for carbon content GAMA natural gas transmission system operator)

Emissions from fossil fuel combustion Other methodological issues for energy sector

- Biomass combustion
 - CO₂ emissions are not included in the national total. They are reported separately (information item)
 - CH₄ and N₂O emissions are reported in the national total
 - Net carbon emissions are accounted for in the AFOLU sector
 - Peat is treated as a fossil fuel
- Aviation and Shipping (water-borne navigation)
 - Domestic emissions included in the national total (Domestic trips journeys between points in one country)
 - International emissions reported separately as "Bunker Fuels" (International trips between countries)

Fugitive emissions Methodological approach

- *Fugitive emissions* are intentional or unintentional release GHG which may occur during the extraction, processing and delivery of fossil fuels to the point of final use.
- Majority of emissions are CH₄ from:
 - Coal mines
 - Refinery leaks
 - Gas distribution pipelines
- Simple Emission Factor methods at Tier 1 are used. Higher Tiers need more details on technologies and age of plant/mines etc.



Fugitive emissions Coal mining

- The major stages for the emission of greenhouse gases for both underground and surface coal mines are:
 - **Mining emissions** These emissions result from the liberation of stored gas during the breakage of coal, and the surrounding strata, during mining operations.
 - **Post-mining emissions** Emissions, during subsequent handling, processing and transportation of coal. These emissions occur more slowly than during the coal breakage stage.
 - Low temperature oxidation Once coal is exposed to oxygen in air, it oxidizes to produce CO₂. However, the rate of formation of CO₂ by this process is low.
 - **Uncontrolled combustion** On occasions, when the heat produced by low temperature oxidation is trapped, the temperature rises and an active fire may result. This is commonly known as uncontrolled combustion and is the most extreme manifestation of oxidation. Uncontrolled combustion may be natural or anthropogenic. It is characterised by rapid reactions, sometimes visible flames and rapid CO₂ formation.
 - Exploration emissions These emissions result from boreholes drilled through carbonaceous strata for the purposes of coal exploration. This is distinct from gas drainage boreholes which form part of a degasification system.
- Abandoned coal mines may also continue to emit methane (from left over coals).

✓ See 2019 Refinement to the 2006 IPCC Guidelines (Vol 2., Chapter 4)

Fugitive emissions Oil and natural gas

- The sources include, but are not limited to, equipment leaks, evaporation and flashing losses, venting, flaring and accidental releases (e.g., pipeline dig-ins, well blow-outs and spills).
 - Venting and flaring emission sources are engineered or intentional (e.g., vents from tanks, seal and process vents and flare systems).
 - Leak emissions (e.g. working losses from tanks, and leaks from other equipment) are unintentional (or uncontrolled).



✓ See 2019 Refinement to the 2006 IPCC Guidelines (Vol 2., Chapter 4)

Fugitive emissions Methodological updates

2019 Refinement to the 2006 IPCC Guidelines (Vol 2., Chapter 4)

- Fugitive CH4 and CO2 emissions from mining, processing, storage and transportation of coal:
 - Includes guidance on fugitive CO₂ emissions from underground and surface mines including CO₂ from methane utilization or flaring from underground coal mines.
 - Adds year specific default input values for fugitive CH₄ emissions from abandoned underground mines for period 2017 - 2050 (previously the series of default values ended at 2016)
- Fugitive emissions from oil and natural gas systems:
 - Includes updates to EF to reflect the range of technologies and practices in use, including for unconventional oil and gas exploration (provides additional information on the appropriate selection of factors).
 - Includes methods and emission factors for abandoned wells.
- Fugitive emissions from fuel transformation:
 - Includes a new section covering methods for fugitive emissions from charcoal production, biochar production, coke production (including flaring), wood pellet production, gasification transformation processes (coal to liquids, gas to liquids, biomass to liquids, and biomass to gas).

Carbon dioxide Transport, injection and storage Methodological approach

- The 2006 IPCC GL provide emission estimation guidance for carbon dioxide transport, injection and geological storage (CCGS) only.
- Subdivided in four systems:
 - **1.** Capture and compression system. The systems boundary includes capture, compression and, where necessary, conditioning, for transport.
 - 2. Transport system. Pipelines and ships are considered the most likely means of large-scale CO2 transport. The upstream systems boundary is the outlet of the compression/conditioning plant in the capture and compression system. The downstream systems boundary is the downstream end of a transport pipeline, or a ship offloading facility
 - **3.** Injection system. The injection system comprises surface facilities at the injection site, e.g. storage facilities, distribution manifold at end of transport pipeline, distribution pipelines to wells, additional compression facilities, measurement and control systems, wellhead(s) and the injection wells. The upstream systems boundary is the downstream end of transport pipeline, or ship offloading facility. The downstream systems boundary is the geological storage reservoir.
 - 4. Storage system. The storage system comprises the geological storage reservoir.

Carbon dioxide Transport, injection and storage Methodological approach

- CO₂ can be captured via pre-combustion, post-combustion and oxy-fuel capture activities and also at some industrial processes (e.g., in cement industry).
- CO₂ transport can be organized mainly by pipelines (and ships).
- CO₂ can be stored onshore and offshore in deep saline formations, depleted (partially depleted) oil and gas fields with or without enhanced oil/gas recovery, and in coal seams with or without enhanced coalbed methane recovery.
 - The 2006 IPCC GL does not include Tier 1 or Tier 2 methodology, due to insufficient empirical evidence to produce emission factors that could be applied to leakage from geological storage reservoirs.
 - However a site-specific Tier 3 approach can be developed.

Time series consistency

- GHG Inventory provides information on historical emissions trends and tracks the effects of strategies to reduce emissions at the national level.
- Annual estimates should be comparable
- Emissions and removals in time series should be estimated consistently
 - Use of the same method and data sources in all years, where possible
 - But not always possible for the entire time series, due to a lack of data
- Cases to ensure time series consistency
 - Recalculations due to methodological changes and refinements
 - Available data have changed
 - The previously used method is not consistent with the IPCC guidelines for that category
 - A category has become key
 - The capacity for inventory preparation has increased
 - Correction of errors...
 - Adding new categories

Time series consistency Resolving data gaps

- Data availability issues:
 - Periodic data
 - Changes and gaps in data availability
- Splicing techniques combining or joining of more than one method to form a complete time series
- ✓ We need to ensure quality of time series
 - Apply quality checks to entire time series
- ✓ All decisions, methods and reasons should be documented

	TABLE 5.1 SUMMARY OF SPLICING	TECHNIQUES
Approach	Applicability	Comments
Overlap	Data necessary to apply both the previously used and the new method must be available for at least one year, preferably more.	 Most reliable when the overlap between two or more sets of annual estimates can be assessed. If the trends observed using the previously used and new methods are inconsistent, this approach is not <i>good practice</i>.
Surrogate Data	Emission factors, activity data or other estimation parameters used in the new method are strongly correlated with other well-known and more readily available indicative data.	 Multiple indicative data sets (singly or in combination) should be tested in order to determine the most strongly correlated. Should not be done for long periods.
Interpolation	Data needed for recalculation using the new method are available for intermittent years during the time series.	 Estimates can be linearly interpolated for the periods when the new method cannot be applied. The method is not applicable in the case of large annual fluctuations.
Trend Extrapolation	Data for the new method are not collected annually and are not available at the beginning or the end of the time series.	 Most reliable if the trend over time is constant. Should not be used if the trend is changing (in this case, the surrogate method may be more appropriate). Should not be done for long periods.
Other Techniques	The standard alternatives are not valid when technical conditions are changing throughout the time series (e.g., due to the introduction of mitigation technology).	 Document customised approaches thoroughly. Compare results with standard techniques.

Time series consistency

Good practices in N. Macedonia

Better activity data available



Data collection and time series consistency

- Methodological principles Good practices (2006 IPCC GL):
 - Focus on the collection of data needed to improve estimates of key categories which are the largest, have the greatest potential to change, or have the greatest uncertainty.
 - Choose data collection procedures that iteratively improve the quality of the inventory in line with the data quality objectives.
 - Put in place data collection activities (resource prioritisation, planning, implementation, documentation etc.) that lead to continuous improvement of the data sets used in the inventory.
 - Collect data/information at a level of detail appropriate to the method used.
 - Review data collection activities and methodological needs on a regular basis, to guide progressive, and efficient, inventory improvement.
 - Introduce agreements with data suppliers to support consistent and continuing information flows.





Contents

Reference vs sectoral approach

- Key category analyses
- Uncertainty
- QA/QC

Reference vs sectoral

Energy data 2020 edition



BODIS eurostat



- 1. Let's start from the energy balanc
- 2. Divided in two parts:

General part

European Unio	n (27 countries)	Total	Solid fossil	Manufac- tured	Peat and peat
ktoe	2018		fuels	gases	products
+ Primary producti	on	634 751.4	116 090.5	Z	2 865.9
+ Recovered & rec	cycled products	1 747.5	650.9	Z	0.0
+ Imports		1 350 483.5	104 696.4	0.0	77.6
- Exports		464 688.8	12 946.5	0.0	8.6
+ Change in stock		285.7	1 766.4	0.0	-575.9
= Gross available	energy	1 522 579.4	210 257.7	0.0	2 359.0
- International ma	ritime bunkers	43 312.7	0.0	0.0	0.0
= Gross inland co	onsumption	1 479 266.6	210 257.7	0.0	2 359.0
- International avia	ation	40 906.4	Z	Z	Z
= Total energy su	pply	1 438 360.2	210 257.7	0.0	2 359.0

- Detailed consumption
- Main idea of the GHG inventory?
- Transfer the energy balance data int

	European Union (27 countries)	Total	fossil	tured	neat	and oil	netroleum	Natural	and	renewable	Nuclear	Heat	Electricity
	ktoe 2018	1004	fuels	Cases	products	sands	products	gas	biofuels	waste	heat	(Notes	Chevrony
	Transformation input	1 374 943 1	242 454 2	7 049 3	2 072 4	4 626 0	705.053.6	05 441 4	497 709 4	0.004.6	105 737 0	4 504 6	3 303 0
	+ Electricity & heat generation	594 611.8	142 366.9	7 918.3	1975.2	2 367.6	14 534.8	93 581 6	121 974 4	9 281.5	195 737.9	1 581.6	3 292.0
	+ Coke overs	35 158 2	34 669 9	0.0	0.0	194.0	294.3	0.0	0.0	7	7	7	7
-	+ Blast furnaces	30 271.5	30 186.1	0.0	0.0	0.0	43.5	41.9	0.0	Z	Z	Z	2
	+ Gas works	946.7	511.4	0.0	0.0	428.5	0.3	6.5	0.0	Z	Z	Z	Z
	+ Refineries & petrochemical industry	690 059.8	Z	Z	Z	Z	690 059.8	Z	Z	Z	Z	Z	Z
	+ Patent fuel plants	11.9	11.9	0.0	0.0	0.0	0.0	Z	0.0	0.0	Z	Z	Z
	+ BKB & PB plants	4 243.2	4 146.0	0.0	97.2	0.0	Z	Z	0.0	0.0	Z	Z	Z
	+ Coal liquefaction plants	1 636.8	0.0	0.0	0.0	1 636.8	Z	Z	Z	Z	Z	Z	Z
	+ For blended natural gas	473.7	Z	0.0	Z	Z	120.7	Z	353.0	Z	Z	Z	Z
	+ Liquid biofuels blended	15 123.3	Z	Z	Z	Z	Z	Z	15 123.3	Z	Z	Z	Z
	+ Charcoal production plants	236.8	Z	Z	Z	Z	Z	Z	236.8	Z	Z	Z	Z
	+ Gas-to-liquids plants	0.0	Z	Z	Z	Z	Z	0.0	Z	Z	Z	Z	Z
	+ Not elsewhere specified	2 169.3	262.0	0.0	0.0	0.0	0.3	1 811.5	95.5	0.0	Z	Z	Z
	Transformation output	1 062 857.0	29 681.3	19 124.7	66.2	z	688 750.9	383.6	15 198.8	z	z	56 337.8	253 313.7
nnc	+ Electricity & heat generation	309 651.4	Z	Z	Z	Z	Z	Z	Z	Z	Z	56 337.8	253 313.7
JIIC	+ Coke ovens	32 486.0	25 933.8	6 552.2				Z	Z				
	+ Blast rumaces	12 085.5	0.0	12 085.5	2			2					- 4
	+ Gas works	463.8	0.0	463.8	2	2	2	2			2		- 4
	 Refinences & petrochemical industry Rotect fuel plants 	685 826.0	7.0				685 826.0		0.0				
	Paters lidel parts PKD 8 PD electe	2,005,0	2 720 6		4								
	+ Coal Equatorion plants	3 808.9	3739.6	7	00.2	7		7	7	7	7	7	7
	+ Blended in natural cas	383.6	7	7	7	7	7	383.6	7	7	7	7	7
	+ Liquid historic blended	15 115 4	7	7	7	7	7	7	15 115 4	7	7	7	7
	+ Charcoal production plants	83.4	Z	Z	Z	Z	Z	7	83.4	Z	7	Z	7
	+ Gas-to-liquids plants	1 598.3	Z	Z	Z	Z	1 598.3	Z	Z	Z	Z	Z	7
01	+ Not elsewhere specified	1 349.9	0.0	23.3	0.0	Z	1 326.6	Z	Z	Z	Z	Z	Z
OII	S Energy sector	67 922.0	695.7	5 331.8	15.3	0.0	25 091.1	13 013.1	588.8	32.3	Z	4 407.9	18746.0
an	C + Own use in electricity & heat general	13 4 39.3	10.2	16.6	0.0	0.0	42.3	77.5	8.5	0.0	Z	1 239.3	12 044.7
sa	+ Coal mines	1 4 1 4.9	309.1	36.5	0.0	0.0	77.5	22.1	0.8	0.0	Z	111.4	857.5
	+ Oil & natural gas extraction plants	3 689.9	Z	Z	Z	Z	19.0	3 043.0	0.0	Z	Z	22.3	605.5
9 4	+ Patent fuel plants	0.9	0.0	0.0	0.0	0.0	Z	Z	0.0	0.0	Z	0.8	0.1
)	+ Coke ovens	3 520.1	174.9	2 964.8	0.0	0.0	0.2	127.7	10.0	4.1	Z	108.1	130.3
	+ BKB & PB plants	994.7	181.5	0.0	15.3	0.0	Z	Z	3.3	0.0	Z	362.3	432.3
5	+ Gas works	17.0	0.0	0.0	0.0	0.0	0.0	0.0	3.5	0.0	Z	0.3	13.2
6	+ Blast furnaces	1 930.1	1.4	1 720.7	0.0	0.0	0.5	56.8	0.0	14.3	Z	14.4	122.1
0	+ Petroleum refineries (oil refineries)	38 495.6	18.6	22.0	0.0	0.0	24 715.3	9 295.0	58.9	13.9	Z	1 494.8	2 877.2
	+ Nuclear industry	95.3	Z	Z	Z	Z	<u>z</u>	<u>Z</u>	<u>z</u>	<u>z</u>	Z	0.0	95.3
) 4	+ Coal Iquefaction plants	203.1	0.0	178.0	0.0	0.0	Z	Z	2	Z	Z	9.1	16.0
D	+ Liquefaction & regastrication plants (125.6	<u>Z</u>	<u></u>		<u></u>	Z	122.3	2 405.4	Z 0.0	Z	0.3	3.0
	T Carbon and the Construction of the Construction of the		£ 1	£	4				403.1		7	0.2	0.0
	A Gas to Equids (GTL) plants	0.0	7	7			<u> </u>	0.0	<u> </u>	4		n n	0.0
0 4	+ Gas-to-liquids (GTL) plants + Charged production plants	0.0	Z	Z	Z 7	7	7	7	0.0	0.0	7	0.0	0.0
0 4 Z	+ Gas-to-liquids (GTL) plants + Charcoal production plants + Not elsewhere specified (spergy)	0.0	Z Z	Z 2993.2	Z Z	Z	Z 236.2	268.7	0.0	0.0	Z 7	0.0	0.0
0 4 <u>7</u> 0 4	+ Gas-to-liquids (GTL) plants + Charcoal production plants + Not elsewhere specified (energy) Distribution losses	0.0 0.0 3 504.3 22 900 8	Z Z 0.0	Z 393.2 530.8	Z 2 0.0	Z 0.0	Z 236.2	268.7	0.0 18.6 83.7	0.0	Z Z Z	0.0 0.0 1 038.7 5 092 1	0.0 0.0 1 548.8 15 714 8
0 4 <u>7</u> 0 4	Gas-to-liquids (GTL) plants Charcoal production plants Not elsewhere specified (energy) Distribution losses Available for final consumption	0.0 0.0 3 504.3 22 900.8 1 035 451.4	Z Z 0.0 53.3 27 035.9	Z 393.2 530.8 5 343.8	Z 0.0 0.0 337.5	Z 0.0 0.0 38.1	Z 236.2 13.4 421 766.0	Z 268.7 1 412.5 215 117.1	0.0 18.6 83.7 98 813.7	0.0 0.0 0.2 4 401.0	Z Z 200	0.0 0.0 1 038.7 5 092.1 46 276.9	0.0 0.0 1 548.8 15 714.8 216 321.3
0 4 <u>7</u> 0 4	Gas-to-liquids (GTL) plants Charcoal production plants Not elsewhere specified (energy) Distribution losses Available for final consumption Final non-energy consumption	0.0 0.0 3 504.3 22 900.8 1 035 451.4 91 142.5	Z 0.0 53.3 27 035.9 1 584.6	Z 393.2 530.8 5 343.8 18.9	Z 0.0 0.0 337.5 0.0	Z 0.0 0.0 38.1 67.4	Z 236.2 13.4 421 766.0 74 553.9	Z 268.7 1 412.5 215 117.1 14 917.7	0.0 18.6 83.7 98 813.7 0.0	0.0 0.0 0.2 4 401.0 Z	Z Z 0.0 Z	0.0 0.0 1 038.7 5 092.1 46 276.9 Z	0.0 0.0 1 548.8 15 714.8 216 321.3 Z
0 4 <u>7</u> 0 4	Gas-to-liquids (GTL) plants Charcoal production plants Not elsewhere specified (energy) Distribution losses Available for final consumption Final non-energy consumption Final non-energy consumption	0.0 0.0 3 504.3 22 900.8 1 035 451.4 91 142.5 939 681.9	Z 0.0 53.3 27 035.9 1 584.6 22 535.9	Z 393.2 530.8 5 343.8 18.9 5 341.1	Z 0.0 337.5 0.0 462.1	Z 0.0 38.1 67.4 22.0	Z 236.2 13.4 421 766.0 74 553.9 345 079.2	Z 268.7 1 412.5 215 117.1 14 917.7 200 766.0	0.0 18.6 83.7 98 813.7 0.0 98 902.1	0.0 0.2 4 401.0 Z 4 401.0	Z Z 0.0 Z Z	0.0 0.0 1 038.7 5 092.1 46 276.9 Z 46 199.5	0.0 0.0 1 548.8 15714.8 216 321.3 Z 215 972.9
0 4 2 0 4	Gas-to-liquids (GTL) plants Charcoal production plants Not elsewhere specified (energy) Distribution leases Available for final consumption Final non-energy consumption Final energy consumption + Industry	0.0 0.0 3 504.3 22 900.8 1 035 451.4 91 142.5 939 681.9 242 166.7	Z 2 0.0 53.3 27 035.9 1 584.6 22 535.9 12 545.4	Z 393.2 530.8 5 343.8 18.9 5 341.1 5 336.9	Z 0.0 337.5 0.0 462.1 168.4	Z 0.0 38.1 67.4 22.0 22.0	Z 236.2 13.4 421 766.0 74 553.9 345 079.2 25 037.4	Z 268.7 1 412.5 215 117.1 14 917.7 200 766.0 75 197.1	0.0 18.6 83.7 98 813.7 0.0 98 902.1 22 361.6	0.0 0.2 4 401.0 Z 4 401.0 4 194.3	Z Z 0.0 Z Z Z	0.0 0.0 1 038.7 5 092.1 46 276.9 Z 46 199.5 15 062.5	0.0 0.0 1 548.8 216 321.3 2 215 972.9 82 240.9
0 4 <u>7</u> 0 4	Gas-to-liquids (GTL) plants Charcoal production plants Charcoal production plants Not elsewhere specified (energy) Distribution losses Available for final consumption Final energy consumption Final energy consumption Industry Iron & steel	0.0 0.0 3 504.3 22 900.8 1 035 451.4 91 142.5 939 681.9 242 166.7 26 567.8	Z 0.0 53.3 27 035.9 1 584.6 22 535.9 12 545.4 2 890.7	Z 393.2 530.8 5 343.8 18.9 5 341.1 5 336.9 5 083.2	Z 0.0 337.5 0.0 462.1 168.4 0.0	Z 0.0 38.1 67.4 22.0 22.0 0.0	Z 236.2 13.4 421 766.0 74 553.9 345 079.2 25 037.4 573.6	Z 268.7 1 412.5 215 117.1 14 917.7 200 766.0 75 197.1 7 956.5	0.0 18.6 83.7 98 813.7 0.0 98 902.1 22 361.6 11.8	0.0 0.2 4 401.0 2 4 401.0 4 194.3 2.7	Z Z 2 0.0 Z Z Z Z	0.0 0.0 1 038.7 5 092.1 46 276.9 2 46 199.5 15 062.5 403.7	0.0 0.0 1 548.8 216 321.3 215 972.9 82 240.9 9 645.4
0 4 <u>7</u> 0 4	Gas-to-liquids (GTL) plants Charcoal production plants Charcoal production plants Not elsewhere specified (energy) Distribution losses Available for final consumption Final non-energy consumption Final energy consumption Industry Iron & steel Chemical & petrochemical	0.0 0.0 3 504.3 22 900.8 1 035 451.4 91 142.5 939 681.9 242 166.7 26 567.8 49 136.4	Z 0.0 53.3 27 035.9 1 584.6 22 535.9 12 545.4 2 890.7 2 622.9	Z 393.2 530.8 5 343.8 18.9 5 341.1 5 336.9 5 083.2 100.8	Z 2 0.0 337.5 0.0 462.1 168.4 0.0 2.6	Z 0.0 38.1 67.4 22.0 22.0 0.0 0.0	2 236.2 13.4 421 766.0 74 553.9 345 079.2 25 037.4 573.6 7 968.1	Z 268.7 1 412.5 215 117.1 14 917.7 200 766.0 75 197.1 7 956.5 16 947.2	0.0 18.6 83.7 98 813.7 0.0 98 902.1 22 361.6 11.8 303.9	0.0 0.2 4 401.0 2 4 401.0 4 194.3 2.7 427.0	Z Z 2 0.0 Z Z Z Z	0.0 0.0 1 038.7 5 092.1 46 276.9 2 46 199.5 15 062.5 403.7 6 228.8	0.0 0.0 1 548.8 15 714.8 216 321.3 215 972.9 82 240.9 9 645.4 14 535.0
0 4 <u>7</u> 0 4	Gas-to-liquids (GTL) plants Charcoal production plants Charcoal production plants Not elsewhere specified (energy) Distribution losses Available for final consumption Final non-energy consumption Final non-energy consumption + Industry Iron & steel Chemical & petrochemical + Non-ferrous metals	0.0 0.0 3 504.3 22 900.8 1 035 451.4 91 142.5 939 681.9 242 166.7 242 166.7 8 49 136.4 9 970.2	Z 0.0 53.3 27 035.9 1 584.6 22 535.9 12 545.4 2 890.7 2 622.9 338.0	Z 393.2 530.8 5 343.8 18.9 5 341.1 5 336.9 5 083.2 100.8 35.0	Z 0.0 0.0 337.5 0.0 462.1 168.4 0.0 2.6 0.0	Z 0.0 0.0 38.1 67.4 22.0 22.0 0.0 0.0 0.0	Z 236.2 13.4 421 766.0 74 553.9 345 079.2 25 037.4 573.6 7 968.1 387.2	Z 268.7 1 412.5 215 117.1 14 917.7 200 766.0 75 197.1 7 956.5 16 947.2 3 571.0	0.0 18.6 83.7 98 813.7 0.0 98 902.1 22 361.6 11.8 303.9 3.2	0.0 0.2 4 401.0 2 4 401.0 4 194.3 2.7 427.0 10.1	Z Z 0.0 Z Z Z Z Z Z	0.0 0.0 1 038.7 5 092.1 46 276.9 2 46 199.5 15 062.5 403.7 6 228.8 156.0	0.0 0.0 1 548.8 15714.8 216 321.3 225 972.9 82 240.9 9 645.4 14 535.0 5 469.7
0 4 <u>2</u> 0 4	Gas-to-liquids (GTL) plants Charcoal production plants Charcoal production plants Not elsewhere specified (energy) Distribution losses Available for final consumption Final energy consumption Final energy consumption Industry Iron & steel Chemical & petrochemical Non-ferrous metals Non-metalic minerals	0.0 0.0 3 504.3 22 900.8 1 035 451.4 91 142.5 939 681.9 242 166.7 26 567.8 49 136.4 9 970.2 33 712.1	Z 0.0 53.3 27 035.9 1 584.6 22 535.9 12 545.4 2 890.7 2 622.9 338.0 3 906.8	Z 393.2 530.8 5 343.8 18.9 5 341.1 5 336.9 5 083.2 100.8 35.0 67.2	Z 2 0.0 0.0 337.5 0.0 462.1 168.4 0.0 2.6 0.0 1.1	Z 0.0 38.1 67.4 22.0 22.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0	Z 236.2 13.4 421 766.0 74 553.9 345 079.2 25 037.4 573.6 7 968.1 387.2 5 641.4	Z 268.7 1 412.5 215 117.1 14 917.7 200 766.0 75 197.1 7 956.5 16 947.2 3 571.0 13 072.5	0.0 18.6 83.7 98 813.7 98 902.1 22 361.6 11.8 303.9 3.2 1 624.1	0.0 0.2 4 401.0 2 4 401.0 4 194.3 2.7 427.0 10.1 3 459.9	Z Z 0.0 Z Z Z Z Z Z Z Z	0.0 0.0 1 038.7 5 092.1 46 276.9 2 46 199.5 15 062.5 403.7 6 228.8 156.0 337.5	0.0 0.0 1 548.8 15714.8 216 321.3 225 972.9 82 240.9 9 645.4 14 535.0 5 469.7 5 579.6
0 4 <u>7</u> 0 4		0.0 0.0 3 504.3 2 2 900.8 1 035 451.4 91 142.5 939 681.9 242 166.7 26 567.8 49 136.4 9 970.2 33 712.1 7 665.4	Z 0.0 53.3 27 035.9 1 584.6 22 535.9 12 545.4 2 890.7 2 622.9 338.0 3 306.8 156.2	Z 393.2 530.8 5 343.8 5 343.8 5 343.8 5 343.8 5 341.1 5 336.9 5 083.2 100.8 35.0 67.2 32.4	Z 0.0 0.0 337.5 0.0 462.1 168.4 0.0 2.6 0.0 1.1 0.0	Z 0.0 38.1 67.4 22.0 22.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0	2 236.2 13.4 421 766.0 74 553.9 345 079.2 25 037.4 573.6 7 968.1 387.2 5 641.4 216.4	Z 268.7 1 412.5 215 117.1 14 917.7 200 766.0 75 197.1 7 956.5 16 947.2 3 571.0 13 072.5 2 332.7	0.0 18.6 83.7 98 813.7 0.0 98 902.1 22 361.6 11.8 303.9 32 1 624.1 17.5	0.0 0.2 4 401.0 2 4 401.0 4 194.3 2.7 427.0 10.1 3 459.9 0.1	Z Z 0.0 Z Z Z Z Z Z Z Z Z Z	0.0 0.0 1 038.7 5 092.1 46 276.9 2 46 199.5 15 062.5 403.7 6 228.8 156.0 337.5 572.1	0.0 0.0 1 548.8 15714.8 216 321.3 215 972.9 82 240.9 9 645.4 14 535.0 5 469.7 5 579.6 4 338.0
	Gas-to-liquids (GTL) plants Charcoal production plants Charcoal production plants Not eleventres specified (energy) Distribution losses Available for final consumption Final energy consumption Final energy consumption Industry Industry Industry Industry Industry Industry Non-metallic minerals Non-metallic minerals Transport equipment Machinery	0.0 0.0 3 504.3 22 900.8 1 035 451.4 91 142.5 939 681.9 242 166.7 26 567.8 49 136.4 9 970.2 33 712.1 7 665.4 17 431.5	Z Z 0.0 53.3 27 035.9 12 545.4 2 2 535.9 12 545.4 2 890.7 2 622.9 338.0 3 906.8 3 906.8 156.2 78.4	Z 393.2 530.8 5 343.8 5 343.8 18.9 5 341.1 5 336.9 5 083.2 100.8 35.0 67.2 32.4 7.4	Z 0.0 337.5 0.0 462.1 168.4 0.0 2.6 0.0 1.1 0.0 0.1	Z 0.0 38.1 67.4 22.0 22.0 0.0 0.0 0.0 22.0 0.0 0.0 0.0	2 236.2 13.4 421 766.0 74 553.9 345 079.2 25 037.4 573.6 7 968.1 387.2 5 541.4 216.4 993.5	Z 268.7 1 412.5 215 117.1 14 917.7 200 766.0 75 197.1 7 956.5 16 947.2 3 571.0 13 072.5 2 332.7 5 901.8	0.0 18.6 83.7 98 813.7 0.0 98 902.1 22 361.6 11.8 303.9 3.2 1 624.1 17.5 122.0	0.0 0.2 4 401.0 2 4 401.0 4 194.3 2.7 427.0 10.1 3 459.9 0.1 11.4	Z Z Z 2 Z Z Z Z Z Z Z Z Z Z Z Z	0.0 0.0 1 038.7 5 092.1 46 276.9 Z 46 199.5 15 062.5 403.7 6 228.8 156.0 337.5 572.1 592.4	0.0 0.0 1 548.8 15714.8 216 321.3 215 972.9 82 240.9 9 645.4 14 535.0 5 469.7 5 579.6 4 338.0 9 724.5
	Gas-to-liquids (GTL) plants Charcoal production plants Charcoal production plants Not elsewhere specified (energy) Distribution losses Available for final consumption Final energy consumption Final energy consumption Industry Iron & steel Chemical & petrochemical Non-ferrous metals Non-metalic minerals Transport equipment Maining & quarrying	0.0 0.0 3 504.3 22 900.8 1 035 451.4 91 142.5 939 681.9 242 166.7 242 166.7 242 166.7 49 136.4 9 970.2 33 712.1 7 665.4 17 431.5 3 799.3	2 0.0 53.3 27 035.9 12 545.4 2 235.9 12 545.4 2 890.7 2 622.9 338.0 3 906.8 156.2 78.4 166.7	Z 393.2 530.8 5343.8 18.9 5341.1 5336.9 5083.2 100.8 35.0 67.2 32.4 7.4 9.5	Z 2 0.0 337.5 0.0 462.1 168.4 0.0 2.6 0.0 1.1 0.0 0.1 0.0	Z 0.0 38.1 67.4 22.0 0.0 0.0 0.0 22.0 0.0 0.0 0.0 0.0 0	Z 236.2 13.4 421 766.0 74 553.9 345 079.2 25 037.4 573.6 7 968.1 387.2 5 641.4 216.4 293.5 907.2	Z 268.7 1412.5 215 117.1 14 917.7 200 766.0 75 197.1 7 956.5 16 947.2 3 571.0 13 072.5 2 332.7 5 901.8 746.3	0.0 18.6 83.7 98 813.7 98 802.1 22 861.6 11.8 303.9 3.2 1 624.1 17.5 122.0 79.3	0.0 0.2 4 401.0 2 4 401.0 4 194.3 2.7 427.0 10.1 3 459.9 0.1 11.4 1.7	Z Z 20.0 Z Z Z Z Z Z Z Z Z Z Z Z Z	0.0 0.0 1 038.7 5 092.1 46 276.9 Z 46 199.5 15 062.5 403.7 6 228.8 156.0 337.5 572.1 592.4 139.6	0.0 0.0 1 548.8 15714.8 216 321.3 215 972.9 82 240.9 9 645.4 14 535.0 5 469.7 5 579.6 4 338.0 9 724.5 1 751.0
	Gas-to-liquids (GTL) plants Charcoal production plants Charcoal production plants Charcoal production plants Not elsewhere specified (energy) Distribution losses Available for final consumption Final energy consumption Final energy consumption Final energy consumption Chemical & petrochemical Chemical & petrochemical Non-ferrous metals Non-ferrous metals Non-ferrous metals Non-ferrous metals Transport equipment Machinery Mining & quarying Food, beverages & tobacco	0.0 0.0 3 504.3 22 900.8 1 035 451.4 9 39 681.9 242 166.7 26 567.8 49 136.4 9 970.2 33 712.1 7 665.4 17 431.5 3 799.3 27 559.3	Z Z 0.0 53.3 27 035.9 1 584.6 22 535.9 12 545.4 2 890.7 2 622.9 338.0 3 906.8 156.2 78.4 164.7 1410.1	Z 3903.2 550.8 5 343.8 18.9 5 341.1 5 336.9 5 083.2 100.8 35.0 67.2 32.4 7.4 9.5 0.0	Z 2 0.0 337.5 0.0 462.1 168.4 0.0 2.6 0.0 1.1 0.0 0.1 0.0 0.1 0.0 0.1 0.0 0.0	Z 0.0 38.1 67.4 22.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	Z 236.2 13.4 421 766.0 74 553.9 345 079.2 25 037.4 573.6 7 968.1 387.2 5 641.4 216.4 993.5 907.2 1 541.7	Z 268.7 1412.5 215 117.1 14 917.7 200 766.0 75 197.1 7 956.5 16 947.2 3 571.0 13 072.5 2 332.7 5 901.8 746.3 12 759.9	0.0 18.6 83.7 98 813.7 0.0 98 902.1 22 361.6 11.8 303.9 3.2 1 624.1 17.5 122.0 79.3 1 083.0 79.3	0.0 0.2 4 401.0 2 4 401.0 4 194.3 2.7 427.0 10.1 3 459.9 0.1 11.4 1.7 2.67 7	Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z	0.0 0.0 1 038.7 5 092.1 46 199.5 15 062.5 403.7 6 228.8 156.0 337.5 572.1 592.4 139.6 1 280.3	0.0 0.0 1548.8 15714.8 216321.3 225972.9 82240.9 9 645.4 14535.0 5 499.7 5 579.6 4 338.0 9 724.5 1 751.0 9 456.9 9 456.4 1 711.0 1
0 4 Z 0 4	Gas-to-liquids (GTL) plants Charcoal production plants Charcoal production plants Not eleventres specified (energy) Distribution losses Available for final consumption Final energy consumption Final energy consumption Industry Iron & steel Chemical & petrochemical Non-metallic minerals Non-metallic minerals Non-metallic minerals Transport equipment Machinery Mining & quarrying Food, beverages & tobacco Paper, pulp & printing	0.0 0.0 3 504.3 22 900.8 1035 451.4 939 681.9 242 166.7 26 567.8 49 136.4 9 970.2 33 712.1 7 665.4 17 431.5 3 799.3 27 559.3 32 030.7	Z Z 0.0 53.3 27 035.9 1 584.6 22 535.9 12 545.4 2 890.7 2 622.9 338.0 3 906.8 156.2 78.4 164.7 78.4 164.7 7.1 410.1	Z 2393.2 530.8 5343.8 5343.8 5345.9 538.9 5083.2 100.8 35.0 67.2 32.4 7.4 9.5 0.0 0 0.0	Z 2 0.0 337.5 0.0 462.1 168.4 0.0 2.6 0.0 1.1 0.0 0.1 0.0 0.1 0.0 0.7 158.0 0.7	Z 0.0 0.0 38.1 67.4 22.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	Z 236.2 13.4 421 766.0 74 553.9 345 079.2 25 037.4 573.6 7 968.1 387.2 5 641.4 216.4 993.5 5 641.4 216.4 990.7.2 1 541.7 681.5	Z 268.7 1412.5 215 117.1 14 917.7 200 766.0 75 197.1 7 956.5 16 947.2 3 571.0 13 072.5 2 332.7 5 901.8 746.3 12 759.9 6 157.8	0.0 18.6 83.7 98 813.7 0.0 98 902.1 22 361.6 11.8 303.9 3.2 1 624.1 17.5 122.0 79.3 1 083.0 12 996.8	0.0 0.2 0.2 4 401.0 4 194.3 2.7 427.0 10.1 3 459.9 0.1 11.4 1.7 26.7 202.0 202.0	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	0.0 0.0 1 038.7 5 092.1 46 276.9 2 46 199.5 15 062.5 403.7 6 228.8 156.0 337.5 572.1 592.4 139.6 1280.3 2 045.6	0.0 0.0 1 548.8 15714.8 216 321.3 2 215 972.9 8 2 240.9 9 645.4 14 535.0 5 409.7 5 579.6 4 338.0 9 724.5 1 751.0 9 456.9 9 9055.0
0 4 <u>7</u> 0 4	Gas-to-liquids (GTL) plants Charcoal production plants Charcoal production plants Not elsewhere specified (energy) Distribution losses Available for final consumption Final energy consumption Final energy consumption Industry Iron & steel Chemical & petrochemical Non-ferrous metals Non-metalic minerals Transport equipment Mining & quarrying Food, beverages & tobacco Paper, pub & printing Wood & wood products	0.0 0.0 3504.3 22900.8 1035451.4 91142.5 939681.9 242166.7 26567.8 9970.2 33712.1 7665.4 9970.2 33712.1 7665.4 3799.3 27559.3 3799.3 27559.3	Z Z 0.0 63.3 27 035.9 1 584.6 22 535.9 12 545.4 2 890.7 2 622.9 338.0 3 906.8 156.2 78.4 164.7 1 410.1 754.1 9.9 9 26.6	Z Z 393.2 530.8 5343.8 5343.8 5341.1 5336.9 5083.2 100.8 35.0 67.2 324 9.5 0.0 0.0 0.0 0.0 0.0	Z 2 0.0 0.0 337.5 0.0 462.1 168.4 0.0 2.6 0.0 1.1 0.0 0.1 0.0 0.1 158.0 5.7 5.7 5.7 5.7 5.7 5.7 5.7 5.7	Z 0.0 0.0 38.11 67.4 22.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	Z 236.2 13.4 421 766.0 74 553.9 25 037.4 573.6 7 968.1 387.2 5 641.4 216.4 903.5 907.2 1 541.7 681.5 202.1	Z 2687.7 1412.5 215 117.1 14 917.7 200 766.0 75 197.1 7 966.5 16 947.2 3 571.0 13 072.5 2 332.7 5 901.8 746.3 12 759.9 6 157.8 588.1 4 499.5	0.0 18.6 83.7 98 813.7 0.0 98 902.1 22 361.6 11.8 303.9 3.2 1 624.1 17.5 122.0 79.3 1 083.0 12 996.8 4 985.9 20.4 12 906.8	0.0 0.0 0.2 4 401.0 4 401.0 4 194.3 2.7 427.0 10.1 3 459.9 0.1 11.4 1.7 267 202.0 262 29.9	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	0.0 0.0 1 038.7 5 992.1 46 276.9 7 46 199.5 15 062.5 403.7 6 228.8 156.0 337.5 572.1 592.4 139.6 1 280.3 2 045.6 6 22.9 2 20.7 1 280.5 1	0.0 0.0 1 548.8 15714.8 15714.8 216 321.3 2 215 972.9 82 240.9 9 685.4 14 535.0 5 469.7 5 579.6 4 338.0 9 724.5 1 751.0 9 465.0 9 724.5 1 751.0 9 465.0 2 235.5 4 73.5 1 751.0 1 751.0 9 465.0 2 235.5 4 73.5 1 751.0 1 751
	Gas-to-liquids (GTL) plants Charcoal production plants Charcoal production plants Charcoal production plants Not elsewhere specified (energy) Distribution losses Available for final consumption Final non-energy consumption Final energy Final energy consumption Final energy Final energy	0.0 0.0 3504.3 22900.8 1035451.4 939681.9 242166.7 24567.8 49136.4 9970.2 33712.1 7665.4 17431.5 3790.3 3712.1 7665.4 17431.5 3790.3 27559.3 2030.7 8688.2 9020.1	Z Z 0.0 53.3 27 035.9 1 584.6 22 535.9 12 545.4 2 890.7 2 622.9 3 3906.8 156.2 78.4 164.7 1 410.1 754.1 754.1 39.9 9 45.6 90.5	Z Z 393.2 530.8 5 343.8 7 5 341.1 5 336.9 5 083.2 100.8 35.0 67.2 32.4 7.4 9.5 5 0.0 0.0 0.0 0.0 0.0	Z 2 0.0 0.0 337.5 0.0 462.1 168.4 0.0 2.6 0.0 1.1 0.0 0.1 1.0.0 0.7 158.0 0.7 158.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	2 0.0 38.1 67.4 22.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	Z 236.2 13.4 421 766.0 74 563.9 345 079.2 25 037.4 573.6 7 968.1 387.2 5 641.4 216.4 993.5 907.2 1 541.7 661.5 202.1 5 052.0	2 268.7 1 412.5 215 117.1 14 917.7 200 766.0 75 197.1 7 956.5 16 947.2 3 571.0 13 072.5 2 33 571.0 13 072.5 2 33 571.0 13 072.5 2 33 571.0 13 072.5 5 901.8 746.3 12 759.9 6 157.8 568.1 1 493.6 568.1	0.0 18.6 83.7 98 813.7 0.0 98 902.1 22 361.6 11.8 303.9 3.2 1 624.1 17.5 1 22.0 79.3 1 083.0 12 2968.8 4 985.9 220.1 24.6	0.0 0.0 0.2 4 401.0 4 194.3 2.7 427.0 10.1 3 459.9 0.1 11.4 1.7 26.7 202.0 26.2 3.8 9 9 9	2 2 2 0.0 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	0.0 0.0 1 038.7 5 092.1 46 276.9 7 46 199.5 15 062.5 403.7 6 228.8 15 062.5 403.7 6 228.8 15 062.5 572.1 592.4 139.6 1280.3 2 045.6 6 622.9 32.7 400.	0.0 0.0 1 548.3 216 371.8 2 245 372.9 8 2 240.9 9 645.4 14 535.0 5 479.6 9 645.4 14 535.0 5 479.6 9 645.4 1 751.0 9 456.9 9 035.0 9 2 235.5 2 172.3 4 509.5
	Gas-to-liquids (GTL) plants Charcoal production plants Charcoal production plants Not eleventres specified (energy) Distribution losses Available for final consumption Final non-energy consumption Final energy consumption Ford between the set of t	0.0 0.0 3.504.3 22.900.8 1 035 451.4 91 142.5 393 681.9 242 166.7 33 712.1 7 665.4 9 770.2 33 712.1 7 665.4 1 7 431.5 3 799.3 3 2 030.7 8 686.2 9 020.1 3 720.3 4 500.2 5 50.6 5 5	2 2 0.0 53.3 27 035.9 1 584.6 2 235.9 12 545.4 2 890.7 2 622.9 338.0 3 906.8 156.2 78.4 166.7 164.7 1410.1 754.1 39.9 45.6 30.5 5 403.5	Z Z 393.2 530.8 5 343.8 18.9 5 341.1 5 336.9 5 083.2 100.8 36.0 67.2 32.4 7.4 9.5 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0	Z Z 0.0 0.0 337.5 0.0 462.1 168.4 0.0 0.0 0.0 0.1 1.0 0.0 0.0 1.1 0.0 0.0	2 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	2 236.2 13.4 421 766.0 74 653.9 345 079.2 5 63.9 386 079.2 5 641.4 216.4 993.5 907.2 1 641.4 216.4 993.5 907.2 1 641.5 5 052.0 1 661.5 5 052.0 1 166.2	2 288.7 1412.5 288.7 1412.5 215117.1 14917.7 200766.0 75197.1 7 956.5 13072.5 2 332.7 5 901.8 776.3 12 759.9 6 157.8 568.1 1493.6 1743.3 2 966.1	0.0 18.6 83.7 98 813.7 0.0 98 902.1 22 361.6 11.8 30.3 9 3.2 1624.1 17.5 122.0 1624.1 17.5 122.0 1624.1 17.5 122.0 1.6 1.6 1.6 1.6 1.6 1.6 1.6 1.6	00 00 02 44010 44010 41943 27 4270 101 34599 0.1 11 114 17 2020 262 38 8 22	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	0.0 0.0 1 038.7 5 092.1 46 276.9 7 46 199.5 15 062. 403.7 6 228.8 15 60.3 337.5 572.1 592.4 139.6 1 280.3 2 045.6 6 229.3 2 045.6 6 229.3 2 7.1 159.4 1 280.3 2 045.6 1 280.5 1 290.5 1	0.0 0.0 1 548.8 15714.8 216 321.3 225 972.9 8 82 240.9 9 645.4 14 535.0 5 490.7 5 579.6 4 338.0 9 724.5 1 751.0 9 456.9 9 0035.0 2 235.5 2 1772.3 1 594.6
int	Gas-to-liquids (GTL) plants Charcoal production plants Charcoal production plants Not elsewhere specified (energy) Distribution losses Available for final consumption Final energy consumption Final energy consumption Industry Iron & steel Chemical & petrochemical Non-ferrous metals Non-metalic minerals Transport equipment Mining & quarrying Food, beverages & tobacco Paper, pub & printing Wood & wood products Construction Toxtles leasther Not elsewhere specified (industry) Transport	0.0 0.0 3504.3 22900.8 1035451.4 939681.9 242166.7 242166.7 242166.7 242166.7 242166.7 242166.7 2557.5 3799.3 37712.1 7655.4 3799.3 27559.3 3709.3 27559.3 3709.3 27559.3 3709.3 2030.7 8686.2 9002.1 3720.3 3720.3 3720.3 3720.3 3720.3 3720.3 3720.3 3720.3 3720.3 3720.3 3720.3 3720.3 3720.3 3720.3 3720.3 3720.3 3720.3 3720.3 3720.3 3720.3 3720.3 3720.3 3720.3 3720.3 3720.3 3720.3 3720.3 3720.3 3720.3 3720.3 3720.3 3720.3 3720.3 3720.3 3720.3 3720.3 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3720.5 3	Z Z 0.0 63.3 27 035.9 1 584.6 22 535.9 12 545.4 2 890.7 2 622.9 338.0 3 906.8 156.2 78.4 164.7 1 410.1 754.1 93.9 9 45.6 30.5	Z Z 393.2 530.8 534.8 534.1 538.1 538.1 508.2 100.8 350 67.2 32.4 7.4 7.4 7.4 9.5 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0	Z Z 0.0 0.0 337.5 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0	2 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	2 236.2 13.4 421 766.0 74 563.9 345 079.2 25 037.4 573.6 7 968.1 387.2 5 641.4 216.4 905.5 641.4 216.5 907.2 1 541.7 681.5 202.1 1 5052.0 1662.2 706.5 202.2 706.5 202.6 2706.5 2706.5	2 288.7 1412.5 215117.1 14917.7 200766.0 75197.1 7956.5 3571.0 3571.0 3571.0 3571.0 3571.0 3571.0 501.8 746.3 746.3 568.1 1493.6 568.1 1493.6 568.1 1493.6 1743.3 1946.4 3566	0.0 186 83.7 98 913.7 0.0 98 902.1 122 361.6 111.8 303.9 3.2 1 624.1 17.5 1 624.1 17.5 1 624.1 1 7.5 1 624.1 1 22 20.1 1 22 906.8 4 985.9 2 220.1 2 4 965.9 2 220.1 2 4 965.9 2 220.1 2 4 965.9 2 4 965.9 2 6 20.5 4 965.9 2 6 20.5 2 7 7 7 2 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	0.0 0.0 0.2 4401.0 4401.0 4401.0 4401.0 4401.0 10.1 3459.9 0.0 11 11 11 14 14 17 26.7 202.0 262 3.8 38 222 205 000	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	0.0 0.0 1 038.7 5 092.1 46 276.9 7 46 295. 15 062.5 403.7 6 228.8 15.60.3 337.5 572.1 592.4 139.6 1280.3 2 045.6 622.9 32.7 15.94.2 2 491.6 7 59.4 2 491.6 7 59.5 15.95.2 15.9	0.0 0.0 1 548.8 216 321.3 2 215 972.9 8 2 240.9 9 645.4 14 535.0 5 509.6 9 724.5 5 579.6 4 338 9 9 724.5 1 751.0 9 724.5 1 751.0 7
int	Gas-to-liquids (GTL) plants Charcoal production plants Distribution losses Available for final consumption Final non-nerrgy consumption Final non-nerrgy consumption Final non-nerrgy consumption Final non-state Chemical & petrochemical Chemical & petrochemical Non-ferrous metals Non-ferrous metals Non-neralis minerals Transport equipment Machinery Mining & quarrying Food, beverages & tobacco Paper, pulp & printing Vood & wood products Construction Textile & leather Not elsewhere specified (industry) Transport Rail	0.0 0.0 3504.3 22900.8 1035451.4 91142.5 939641.9 12421667 2421667 2421667 391641 99702 337121 7665.4 17431.5 3799.3 37121 7665.4 17657.8 8686.2 9020.1 3720.3 12580.2 286777.6 54582 54582	Z Z 0.0 53.3 27 035.9 1 584.6 22 535.9 12 545.4 2 890.7 2 622.9 338.0 3 306.8 156.2 78.4 164.7 1 410.1 754.1 754.1 39.9 45.6 30.5 107.5 0.9 0.9	Z Z 393.2 530.8 5343.8 5341.1 538.9 508.1 508.2 508.2 508.2 508.2 508.2 508.2 508.2 508.2 508.2 508.2 508.2 508.2 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0	Z Z 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	Z 0.0 38.1 67.4 22.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	2 236.2 13.4 421766.0 74563.9 345079.2 25037.4 573.6 7968.1 387.2 5641.4 216.4 993.5 907.2 1541.7 681.5 202.1 1541.7 681.5 202.1 1541.7 5052.0 166.2 7066.5 202.2 166.2 7066.5	2 288.7 1 412.5 215 117.1 14 917.7 200 766.0 75 197.1 7 956.5 16 947.2 3 571.0 13 072.5 2 332.7 5 001.8 7 466.3 13 072.5 2 332.7 5 001.8 7 466.3 12 759.9 6 157.8 5 68.1 1 493.6 1 743.3 1 946.4 3 566.8 5 7	0.0 1866 83.7 98 902.1 22 361.6 1188 303.9 3.2 1 624.1 17.5 122.0 1 624.1 17.5 122.0 1 624.1 1083.0 12 996.8 4 985.9 220.1 24.00 64.0 64.0 24.0 24.0 25.5 1	0.0 0.0 0.2 4401.0 4194.3 2.7 427.0 10.1 3459.9 0.1 11.4 1.7 2.67 2.67 2.67 2.62 3.8 2.2 2.6 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0	2 2 2 0.0 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	0.0 0.0 1038.7 5092.1 46276.9 2 46199.5 403.7 5028.8 1566.0 337.5 572.1 592.4 139.6 1280.3 2 045.6 622.9 32.7 1594. 2 491.6 2 491.6 2 291.6 2 291.6 2 291.6 2 291.7 2 491.6 2 291.6 2 291.7 2 491.6 2 291.7 2 491.6 2 291.7 2 491.7 2 491.6 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	0.0 0.0 15714.8 216321.3 2223714.8 226321.3 22240.9 9645.4 14535.0 54007 5579.6 43860 9724.5 1751.0 94569 9005.0 2235.5 2172.3 1594.6 6700.3 5570.6 4172.0
int	Gas-to-liquids (GTL) plants Charcoal production plants Charcoal production plants Not elsewhere specified (energy) Distribution losses Available for final consumption Final energy consumption Industry Iron & steel Chemical & perchemical Non-metallic minerals Non-metalic minerals Non-metallic minerals Non-metallic minerals	0.0 0.0 3.504.3 22.900.8 1 035 451.4 91 142.5 339 681.9 242 166.7 33 712.1 7 656.4 9 770.2 33 712.1 7 656.4 9 770.2 3 2 030.7 8 686.2 9 020.1 3 720.3 3 720.3 5 760.5 5 760.5 7 760.5	Z Z 0.0 63.3 27 035.9 1 584.6 2 235.9 12 545.4 2 890.7 2 622.9 338.0 3 906.8 156.2 78.4 166.7 164.7 1410.1 754.1 39.9 45.6 30.5 107.5 0.9 0.9 2 Z	Z Z 393.2 530.8 534.8 534.8 534.8 536.9 508.2 508.2 50.0 60.0 0.0 0.0 0.0 0.0 0.0 0.0	Z Z 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	Z 0.0 0.0 0.0 22.0 0.0 0.0 0.0 0.0 0.0 0.	2 236.2 13.4 421 766.0 74 653.9 345 079.2 25 037.4 573.6 7 968.1 387.2 5 641.4 993.5 907.2 164.4 993.5 107.2 164.1 5 052.0 166.2 2026.1 1 5 052.0 166.2 2026.3 1 1 253.0 206.4	2 288.7 1 412.5 215 117.1 14 917.7 200 766.0 75 197.1 13 072.5 2 33 571.0 13 072.5 2 332.7 5 901.8 746.3 12 769.9 6 157.8 568.1 1 493.6 1 743.3 1 946.4 3 556.8 2 2 1 637.1 1 637.1	0.0 1866 83.7 98 813.7 0.0 98 902.1 122 961.6 11.8 303.9 3.2 1 624.1 17.5 122.0 79.3 1 624.1 12.996.8 4 985.9 220.1 24.0 602.6 15.515.7 26.3 14.56.9 26.3 14.56.9 26.3 14.56.9 26.3 14.56.9 14.57.5 14	0.0 0.0 0.2 4401.0 4401.0 4194.3 2.7 427.0 1.0.1 1.3459.9 0.1 1.14 1.7 2.020 2.020 2.020 3.8 8 2.22 2.0.5 0.0 0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	0.0 0.0 1 038.7 5 092.1 46 276.9 7 2 46 199.5 403.7 6 2288 156.0 337.5 572.1 592.4 139.6 1280.3 2 045.6 622.9 32.7 1594.4 2 946.4 2 2045.4 6 22.9 32.7 1594.4 2 945.4 2 2 045.6 6 22.9 3.7 1594.4 2 945.4 2 2 045.6 6 22.9 3.7 1594.4 2 2 045.6 7 2 2 2 2 2 2 7 2 2 2 2 7 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	0.0 0.0 1 548.8 15714.8 216 321.3 216 321.3 2 245 972.9 9 645.4 14 535.0 9 9 645.4 14 535.0 9 9 645.4 14 535.0 9 724.5 1 7751.0 9 725.0 1 7751.0 1 77
int	Gas-to-liquids (GTL) plants Charcoal production plants Charcoal production plants Not elsewhere specified (energy) Distribution losses Available for final consumption Final energy consumption Final energy consumption Industry Iron & steel Chemical & petrochemical Non-ferrous metals Non-metalic minerals Transport equipment Mining & quarrying Food, Deverages & tobacco Paper, pub & printing Wood & wood products Construction Textile & leather Not elsewhere specified (industry) Transport Not elsewhere specified (industry) Transport Road Road Road	0.0 0.0 3504.3 22 900.8 1035451.4 939681.9 242166.7 25657.8 939681.9 242166.7 25759 33712.1 7665.4 9702 33712.1 7665.4 9702 33712.1 7665.4 9702 33712.1 7665.4 9702 33712.1 7665.4 9702 33712.1 7665.4 9702 33712.1 7665.4 9702 33712.1 7665.4 9702 33712.1 7665.4 9702 33712.1 7665.4 9702 33712.1 7665.4 9702 33712.1 7665.4 9702 33712.1 7665.4 9702 33712.1 7665.4 37203 37203 37203 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37205 37714 37305 37205 37714 37305 37205 37714 37305 37205 37714 37305 37205 37714 37305 37205 37714 37305 37205 37714 37305 37205 37714 37305 37205 37714 37305 37205 37714 37305 37205 37714 37305 37205 37714 37305 37205 37714 37305 37505 37505 37505 37505 37505 37505 37505 37505 37505 37505 37505 37505 37505 37505 37505 37505 37505 37505 37505 37505 37505 37505 37505 37505 37505 37505 37505 37505 37505 37505 37505 37505 37505 37505 37505 37505 37505 37505 37505 37505 37505 37505 37505 37505 37505 37505 37505 37505 3	Z Z 0.0 63.3 27 035.9 1 584.6 22 535.9 12 545.4 2 890.7 2 622.9 338.0 3 906.8 156.2 78.4 164.7 1 410.1 754.1 39.9 45.6 30.5 107.5 0.9 0.9 0.9 Z Z	Z Z 393.2 530.8 534.8 534.9 534.9 538.9 508.2 100.8 350.0 67.2 32.4 7.4 9.5 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0	Z Z 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	Z 0.0 0.0 0.0 22.0 0.0 0.0 0.0 0.0 0.0 0.	2 236.2 13.4 421 766.0 74 563.9 345 079.2 25 037.4 573.6 7 968.1 387.2 5 641.4 216.4 905.5 641.4 216.4 905.5 202.1 1541.7 681.5 202.1 1505.0 166.2 706.5 202.6 166.2 706.5 262 637.1 1253.0 250 457.2 6 383.5	Z 288.7 1 412.5 215 117.1 14 917.7 200 766.0 75 197.1 7 956.5 3 571.0 13 072.5 2 3571.0 13 072.5 2 3571.0 13 072.5 2 3571.0 13 072.5 2 3571.0 13 072.5 2 501.8 746.3 13 072.5 5 501.8 746.3 14 91.7 5 501.8 5 688.1 1 493.6 1 743.3 1 946.4 3 556.8 2 1 537.1 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1	0.0 1866 83.7 98 913.7 0.0 98 902.1 122 361.6 111.8 303.9 3.2 1 624.1 17.5 1220.0 79.3 1 683.0 12296.8 4 985.9 220.1 12296.8 4 985.9 220.1 1296.8 4 985.9 220.1 15515.7 26.3 15515.7 20.0	0.0 0.0 0.2 4401.0 4401.0 4494.3 2.7 427.0 10.1 3459.9 0.1 11.1 11.4 1.7 26.7 202.0 222 205 0.0 0.0 0.0 0.0 0.2 2.2 2.2 2.0 5.0 0.0 0.0 0.0 0.0 0.0 0.0 0	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	0.0 0.0 0.0 1038.7 5092.1 46276.9 2 46199.5 15062.5 403.7 6228.8 156.0 337.5 572.1 592.4 139.6 6229.9 32.7 1594.2 2491.6 Z Z Z Z Z Z	0.0 0.0 1 548.8 15 714.8 216 321.3 2 215 972.9 9 645.4 14 535.0 5 599.6 9 645.4 14 535.0 5 599.6 9 724.5 1 751.0 9 456.9 9 0 035.0 9 724.5 1 751.0 9 4 656.9 9 0 035.0 2 2172.3 1 594.6 6 703.3 5 667.0 5 667.0 5 677.0 1 5 677.3 1 5 94.6 6 703.3 5 667.0 5 677.3 1 5 94.6 8 6 703.3 5 667.0 5 677.4 8 705.0 7 74.8 75.0 75.0 75.0 75.0 75.0 75.0 75.0 75.0
int	Gas-to-liquids (GTL) plants Charcoal production plants Charcoal production plants Charcoal production plants Not elsewhere specified (energy) Distribution losses Available for final consumption Final non-energy consumption Final energy consumption Food, benergic energies Food, beverages & tobacco Paper, pulp & printing Food, beverages & tobacco Paper, pulp & printing Vood & wood products Construction Toxities leasther Not elsewhere specified (industry) Transport Rai Road Domestic aviation Domestic aviation	0.0 0.0 3504.3 22900.8 1035451.4 939681.9 242166.7 242166.7 242166.7 339681.9 2421667.3 74575.9 33712.1 7665.4 17431.5 3799.3 3712.1 7665.4 17431.5 3799.3 3712.1 7665.4 17431.5 3799.3 3712.1 3720.3 3712.1 3720.3 3712.1 3720.3 3712.1 3720.2 3712.1 3720.2 3712.1 3720.2 3712.1 3720.2 3712.1 3720.2 3712.1 3720.2 3712.1 3720.2 3712.1 3720.2 3712.1 3720.2 3712.1 3720.2 3712.1 3720.2 3712.1 3720.2 3712.1 3720.3 3712.1 3720.2 3712.1 3720.2 3712.1 3720.2 3712.1 3720.2 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3712.1 3	Z Z 0.0 53.3 27 035.9 1 584.6 22 535.9 12 545.4 2 990.7 2 622.9 338.0 3 906.8 156.2 78.4 164.7 1 410.1 754.1 39.9 45.6 30.5 107.5 0.9 0.9 0.9 2 Z 0.0	Z Z 393.2 530.8 5343.8 5341.1 538.9 5341.1 538.2 5083.2 5085.2 50	Z Z 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	Z 0.0 38.1 67.4 22.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	2 236.2 13.4 421766.0 74563.9 345079.2 25037.4 573.6 7968.1 387.2 5641.4 216.4 993.5 907.2 1541.7 681.5 202.1 1541.7 681.5 202.1 1552.0 1662.2 706.5 202.2 106.5 202.5 2	Z 288.7 1 412.5 215 117.1 14 917.7 200 766.0 75 197.1 7 956.5 16 947.2 3 571.0 13 072.5 2 332.7 5 901.8 746.3 12 759.9 6 157.8 568.1 1 493.6 1 743.3 1 946.4 3 556.8 Z 1 637.1 Z Z Z Z	0.0 1866 83.7 98 902.1 22 361.6 118.8 303.9 3.2 1 624.1 17.5 122.0 1 624.1 17.5 122.0 12.966.8 4.965.9 220.1 12.966.8 4.965.9 220.1 12.966.8 4.965.9 220.1 12.966.8 4.965.9 220.1 12.966.8 4.965.9 220.1 12.966.8 4.965.9 220.1 12.966.8 4.965.9 220.1 12.966.8 4.965.9 20.1 12.966.8 4.965.9 20.1 12.966.8 4.965.9 20.1 12.966.8 4.965.9 20.1 12.966.8 4.965.9 20.1 12.966.8 1.547.6 9 0.0 6.9 6.9 6.9 1.547.5 1.54	0.0 0.0 0.2 4401.0 4 401.0 4 194.3 2.7 427.0 10.1 3 459.9 0.1 11.4 1.7 205.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	0.0 0.0 1038.7 5092.1 46 276.9 2 46 199.5 403.7 5028.8 1566.0 337.5 572.1 592.4 139.6 1280.3 2 045.6 622.9 32.7 1594. 2 491.6 2 491.6 2 2.9 2 2.7 Z Z Z Z	0.0 0.0 1574.8 216321.3 226321.3 226321.3 2275972.9 262240.9 9.645.4 14535.0 5.4607 5.579.6 4.388.0 9.724.5 1.751.0 9.456.9 9.905.0 2.235.5 2.172.3 1.594.6 6.703.3 5.067.0 4.1764.8 4.388.0 2.235.5 2.172.3 1.594.8 5.772.0 1.438.8 5.772.0 5.775.0 5.775.0 5.775.0 5.775.0 5.775.0 5.775.0 5.775.0 5.775.0 5
int	Gas-to-liquids (GTL) plants Charcoal production plants Charcoal production plants Not elsewhere specified (energy) Distribution losses Available for final consumption Final energy consumption Final energy consumption Industry Industry	0.0 0.0 3504.3 1035451.4 91142.5 939681.9 2421667.2 93742.1 1035451.4 9170.2 33712.1 7665.4 9170.2 33712.1 7655.4 9170.2 33712.1 7655.4 9170.2 920.1 32030.7 8686.2 9020.1 3720.3 21250.2 200.7 71.4 9020.1 3720.3 21250.2 200.7 11.4 5456.2 200.7 11.4 5456.2 200.7 11.4 5456.2 200.7 11.4 5456.2 200.7 11.4 5456.2 200.7 11.4 5456.2 200.7 11.4 5456.2 200.7 11.4 5456.2 200.7 11.4 5456.2 200.7 11.4 5456.2 200.7 11.4 5456.2 200.7 11.4 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.5 11.511.5 11.5 11.511.	Z Z 0.0 63.3 27 035.9 1 584.6 2 235.9 12 545.4 2 890.7 2 622.9 338.0 3 906.8 156.2 78.4 166.7 164.7 1410.1 754.1 39.9 45.6 30.5 107.5 0.9 0.9 Z Z Z 0.0 0 Z Z	Z Z 393.2 534.8 534.8 534.8 534.8 536.9 508.2 100.8 35.0 67.2 32.4 9.5 0.0 0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	Z Z 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	Z 0.0 38.1 67.4 22.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	Z 236.2 13.4 421 766.0 74 553.9 345 079.2 25 37.4 573.6 7 968.1 387.2 5 641.4 216.4 993.5 5 641.4 216.4 993.5 5 641.4 216.4 997.2 1 541.7 6 861.5 202.1 5 052.0 1 662.2 262 633.1 1 253.0 250 457.2 5 633.5 4 237.7 0.0	2 288.7 1 412.5 215 117.1 14 917.7 200 766.0 75 197.1 13 072.5 2 3 571.0 13 072.5 2 3 571.0 14 91.6 1 493.6 1 493.7 1 497.1 1 497.	0.0 186 83.7 0.0 98 902.1 22 361.6 11.8 303.9 3.2 1 624.1 17.5 122.0 79.3 1 624.1 17.5 122.0 79.3 1 624.1 12.996.8 4 985.9 220.1 24.0 602.6 515.7 26.3 15 476.9 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0	0.0 0.0 0.2 4 401.0 4 401.0 4 194.3 2.7 427.0 1.01.1 3 459.9 0.1 1.14 1.7 2.62 7 2.02.0 2.62 3.8 8 2.22 2.0.5 0.0 0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	0.0 0.0 1038.7 5092.1 46276.9 72 46199.5 403.7 6228.8 156.0 337.5 572.1 592.4 139.6 1280.3 2045.6 6229 32.7 159.4 245.6 72 27 2 2 2 2 2 2 2 2 2 2 2 2 2	0.0 0.0 1 548.8 15714.8 216 321.3 2 216 321.3 2 226 321.3 2 24 5972.9 9 645.4 14 535.0 5 469.7 5 579.6 4 338.0 9 724.5 1 751.0 9 456.9 9 035.0 9 724.5 1 751.0 9 035.0 2 2355.2 1 753.0 5 067.0 4 178.0 1 784.6 6 700.3 5 5067.0 4 178.0 1 784.6 7 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
int		0.0 0.0 3504.3 22900.8 1035451.4 939631.9 2421667 2421667 33712.1 76557.8 3799.3 37712.1 7655.4 3799.3 37712.1 7655.4 3799.3 37712.1 7655.4 3799.3 3721.5 3799.3 3721.5 3799.3 3721.5 3729.3 3721.5 3729.3 3721.5 3729.3 3721.5 3729.3 3721.5 3729.3 3721.5 3729.3 3721.5 3721.5 3729.3 3721.5 3721.5 3729.3 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3721.5 3	Z Z 0.0 63.3 27 035.9 1 584.6 22 535.9 12 545.4 2 890.7 2 622.9 338.0 3 906.8 156.2 78.4 164.7 1 410.1 156.2 78.4 164.7 1 410.1 1755.1 39.9 45.6 30.5 107.5 0.9 0.9 2 Z 2 0.0 0.0 2 2 0.0	Z Z 393.2 530.8 534.8 534.9 536.9 508.2 100.8 35.0 67.2 32.4 7.4 9.5 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0	Z Z 0.0 0.0 0.0 0.0 0.0 1.0 1.0 0.0 0.0 0.0	Z 0.0 0.0 0.0 22.0 0.0 0.0 0.0 0.0 0.0 0.	2 236.2 13.4 421 766.0 74 553.9 345 079.2 25 037.4 573.6 7 968.1 387.2 5 641.4 216.4 905.5 641.4 216.4 905.5 202.1 1541.7 681.5 202.1 1565.0 166.2 706.5 202.6 166.2 706.5 262.6 37.1 1253.0 250.457.2 6.983.5 4 237.7 0.0 325.8	Z 288.7 1 412.5 215 117.1 14 917.7 200 766.0 75 197.1 7 956.5 3 571.0 13 072.5 2 332.7 5 901.8 746.3 746.3 746.3 12 759.9 6 157.8 568.1 1 493.6 1 743.3 1 946.4 3 556.8 3 556.8 2 2 1 637.1 2 7 2 1 91.1 8 5 2 2 3 5 1 1 1 1 1 1 1 1 1 1 1 1 1	0.0 1866 83.7 98 902.1 22 361.6 111.8 303.9 32.2 1 624.1 17.5 1 624.1 17.5 1 624.1 17.5 1 624.1 1 7.5 1 624.1 1 22 906.8 4 985.9 2 20.1 2 290.8 4 985.9 2 20.1 1 2 906.8 1 5 915.7 2 63.3 1 5 476.9 0.0 6.9 6.9 0.0 5 5 5 5 7 5 7 5 7 5 7 5 7 5 7 5	0.0 0.0 0.2 4401.0 4 401.0 4 194.3 2.7 427.0 1.0 1.1 1.1 1.1 1.1 1.1 1.1 1	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	0.0 0.0 0.0 1038.7 5092.1 46199.5 15062.5 403.7 6228.8 156.0 337.5 572.1 592.4 139.6 6229.9 32.7 1594.2 2491.6 22.9 2 2 2 2 2 2 2 2 2 2 2 2 2	0.0 0.0 1 548.8 15714.8 216 321.3 216 321.3 2 245 972.9 8 240.9 9 645.4 14 535.0 5 490.7 5 599.6 4 338.0 9 724.5 1 751.0 9 456.9 9 724.5 1 751.0 9 755.0 9 755
int	Gas-to-liquids (GTL) plants Charcoal production plants Charcoal production plants Charcoal production plants Not elsewhere specified (energy) Distribution losses Available for final consumption Final energy consumption Food, beverages & tobacco Paper, pulp & printing Food, beverages & tobacco Paper, pulp & printing Wood & wood products Construction Teotile & leather Not elsewhere specified (industry) Transport Rai Road Domestic avigation Pipeline transport Not elsewhere specified (transport Not else	0.0 0.0 3504.3 1035451.4 91142.5 939681.9 242166.7 726567.8 49136.4 9970.2 33712.1 7665.4 17431.5 3799.3 32030.7 7665.4 9070.2 33712.1 7665.4 9020.1 3720.3 32030.7 7665.4 9020.1 3720.3 32030.7 7665.4 9020.1 3720.3 32030.7 7665.4 9020.1 3720.3 32030.7 7665.4 9020.1 3720.3 32030.7 7665.4 9020.1 3720.3 32030.7 7655.4 9020.1 3720.3 32030.7 1656.6 5456.2 2087.6 5456.2 2087.6 5456.2 2087.6 5456.2 2087.6 2077.6 5456.2 2087.6 2087.6 2077.6 5456.2 2087.6 2087.6 2077.6 5456.2 2087.6 2077.6 5456.2 2087.6 2087.6 2087.6 2087.6 2087.6 2087.6 2087.6 2087.6 2087.7 2087.7 2087.7 2097.7 2087.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2097.7 2	Z Z 0.0 53.3 27 035.9 1 584.6 2 2355.9 12 545.4 2 290.7 2 622.9 338.0 3 906.8 166.2 78.4 164.7 1410.1 754.1 9.9 9.9 0.9 2 Z 0.0 9 999.6	Z Z 393.2 530.8 534.1 5336.9 5356.9 5336.9 536.9 5356.9 5356.9 5356.9 5356.9 5356.9 5356.9 5356.9 5356	Z Z 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	Z 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	2 236.2 13.4 421766.0 74563.9 25037.4 573.6 7968.1 387.2 5614.4 216.4 993.5 907.2 1541.7 681.5 202.1 1541.7 681.5 202.1 1541.7 681.5 202.1 1552.0 2166.5 202.5 202.5 205.2 1652.0 250.457.2 6 633.5 423.7 0.0 2256.8 57.404.7	Z 288.7 1 412.5 215 117.1 14 917.7 200 766.0 75 197.1 7 956.5 16 947.2 3 571.0 13 072.5 2 332.7 5 901.8 746.3 12 759.9 6 157.8 568.1 1 493.6 1 733.3 1 946.4 3 556.8 Z 1 637.1 Z 1 911.8 8.0 122 012.1 122 01	0.0 1866 83.7 98 902.1 22 361.6 118.8 303.9 3.2 1 624.1 17.5 122.0 1 624.1 17.5 122.0 1 624.1 1	0.0 0.0 0.2 4401.0 4 401.0 4 194.3 2.7 427.0 10.1 3 459.9 0.1 11.4 11.7 2020 2.62 3.8 2.22 2.0.5 0.0 0.0 0.0 0.0 0.0 0.0 0.0	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	0.0 0.0 1038.7 5092.1 46276.9 2 46199.5 403.7 5092.4 15062.5 403.7 5022.8 1560.0 337.5 572.1 1992.4 139.6 1280.3 2 045.6 622.9 32.7 1594. 2 491.6 2 2 2 2 2 2 2 2 3 136.0 337.5 572.1 139.6 128.3 2 2 2 2 2 2 2 2 2 2 2 2 2	0.0 0.0 1 548.8 1574.8 216 321.3 22 23 574.8 22 240.9 9 645.4 1 4 535.0 5 460 7 5 579.6 4 338.0 9 724.5 1 751.0 9 9 456.4 1 751.0 9 9 005.0 2 235.5 2 172.3 5 067.0 4 178.0 4 178.0 1 138.8 2 2 2 2 2 2 2 2 2 2 172.9 2 175.9 2 2 157.2 2 172.9 2 172.
int	Gas-to-liquids (GTL) plants Charcoal production plants Charcoal production plants Not elsewhere specified (energy) Distribution losses Available for final consumption Final non-energy consumption Industry Iron & steel Chemical & petrohemical Non-metallic minerals Non -metallic minerals Non -metallic minerals Non -metallic minerals Non-metallic minerals Non-metallic minerals Non-metallic minerals Non-metallic minerals Non-metallic minerals Non-metallic minerals Non -metallic minerals Non -metallic minerals Non-metallic minerals Non-metals	0.0 0.0 3504.3 1035451.4 91142.5 939681.9 2421667 . 33712.1 7665.4 9702.2 33712.1 7665.4 9702.2 33712.1 7665.4 9702.2 33712.1 7655.4 9702.2 33712.1 7655.4 9702.1 3720.3 32030.7 8686.2 9020.1 3720.3 21550.2 265771.49 6363.5 4244.6 2088.6 5458.2 266771.6 5458.2 26771.49 6363.5 4244.6 2088.6 507.8 410737.6 13360.09 73360.09	Z Z 0.0 63.3 27 035.9 1 584.6 2 235.9 12 545.4 2 890.7 2 622.9 338.0 3 906.8 156.2 78.4 166.7 164.7 1410.1 754.1 39.9 45.6 30.5 107.5 0.9 2 2 2 2 0.0 9 969.6 815.5	Z Z 393.2 534.8 534.8 534.8 534.8 536.8 536.9 536.9 508.2 100.8 35.0 67.2 32.4 9.5 0.0 0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	Z Z 0.0 0.0 337.5 0.0 4462.1 168.4 0.0 2.6 0.0 0.1 1.1 0.0 0.1 0.0 0.0 158.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	Z 0.0 0.0 0.0 22.0 0.0 0.0 0.0 0.0 0.0 0.	Z 236.2 13.4 421 766.0 74 553.9 539 345 079.2 25 37.4 573.6 7 968.1 387.2 5 541.4 216.4 993.5 5 641.4 216.4 993.5 5 641.4 216.4 997.2 1 541.7 6 81.5 202.1 5 052.0 1 681.5 202.1 5 052.0 1 682.5 202.5 202.5 5 052.5 20.5 20	2 288.7 1 412.5 215 117.1 14 917.7 200 766.0 75 197.1 13 072.5 2 3 571.0 13 072.5 2 3 571.0 13 072.5 2 3 571.0 13 072.5 2 3 571.0 13 072.5 2 3 571.0 14 91.6 1 493.6 1 493.7 1 497.1 1 497.1	0.0 1866 83.7 0.0 98 902.1 22 361.6 111.8 303.9 3.2 1 624.1 17.5 122.0 7.9.3 1 624.1 17.5 122.0 7.9.3 1 624.1 12.996.8 4.985.9 220.1 24.0 60.2 61.5 51.5 7.7 26.3 15.46.6 9 0.0 6.9 0.0 0.0 6.9 0.0 0.0 6.9 0.0 0.0 6.9 0.0 0.0 6.9 0.0 0.0 0.0 6.9 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0	0.0 0.0 0.2 4401.0 4401.0 4194.3 2.7 427.0 10.1 13359.9 0.1 11.1 3459.9 0.1 11.1 3459.9 0.1 11.1 262.7 202.0 202.0 20.5 0.0 0 0.0 0.0 0.0 200.7 200.7 200.7 200.7	Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z	0.0 0.0 0.0 1038.7 5092.1 46276.9 7 2 46199.5 403.7 6 228.8 1560.5 572.1 592.4 139.6 1280.3 2 045.6 6229.3 2 7 2 2 2 2 2 2 2 2 2 2 2 2 2	0.0 0.0 1 548.8 15714.8 216 321.3 216 321.3 2 24 5972.9 9 645.4 14 535.0 9 9 645.4 14 535.0 9 9 645.4 14 535.0 9 9 724.5 1 751.0 9 724.5 1 751.0 9 9 035.0 9 9 035.0 9 9 035.0 9 9 035.0 2 2 352.3 1 594.6 6 703.3 5 067.0 1 1438.8 2 2 2 172.3 1 594.6 6 703.3 5 067.0 1 1438.8 2 2 2 159.7 2 2 159.7 2 159
int	Gas-to-liquids (GTL) plants Charcoal production plants Charcoal production plants Not elsewhere specified (energy) Distribution losses Available for final consumption Final non-senergy consumption Final energy consumption Industry Iron & steel Chemical & petrochemical Non-ferrous metals Non-metalic minerals Transport equipment Maning & quarrying Food, beverages & tobacco Paper, pub & printing Wood & wood products Construction Textle & leather Not elsewhere specified (industry) Transport Real Road Domestic avigation Pomestic avigation Pomestic avigation Pomestic avigation Pother Not elsewhere specified (transport Note elsewhere specified (transport Note elsewhere specified (transport Note elsewhere specified (transport Note elsewh	0.0 0.0 3504.3 123900.8 1035451.4 939681.9 2421667 2421667 2421667 33712.1 76557.8 3792.3 37712.1 7655.4 3792.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.5 3772.5 3	Z Z 0.0 63.3 27 035.9 1 584.6 22 535.9 12 545.4 2 890.7 2 622.9 3388.0 3 906.8 156.2 78.4 164.7 1410.1 156.2 78.4 164.7 1410.1 1755.1 39.9 45.6 30.5 107.5 0.9 0.9 2 Z 2 0.0 9 989.6 815.5 8 076.4	Z Z 393.2 530.8 534.8 538.9 508.2 100.8 350.0 67.2 32.4 7.4 9.5 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0	Z Z 2 0.0 0.0 0.0 4452.1 168.4 0.0 2.6 6 0.0 0.1 1 1.1 0.0 0.0 0.1 1.1 0.0 0.0 0	Z 0.0 0.0 0.0 22.0 0.0 0.0 0.0 0.0 0.0 0.	2 236.2 13.4 421 766.0 74 553.9 345 079.2 25 037.4 573.6 7 968.1 387.2 5 541.4 216.4 935 5 541.4 216.4 935 5 541.4 216.5 202.1 155.2 202.1 155.2 202.1 166.2 706.5 202.6 363.5 4 237.7 0.0 325.8 57 404.7 10 944.7	Z 288.7 1 412.5 215 117.1 14 917.7 200 766.0 75 197.1 7 956.5 3 571.0 13 072.5 2 332.7 5 901.8 746.3 13 072.5 9 351.1 1 493.6 1 743.3 1 946.4 3 556.8 2 1 6157.8 5 2 1 91.1 1 493.6 1 743.3 1 946.4 3 556.8 2 1 911.8 8 056.8 1 2 1 911.8 1 915.7 1 915	0.0 1866 83.7 98 902.1 22 361.6 118.8 303.9 32.2 1 624.1 17.5 1 624.1 17.5 1 624.1 17.5 1 624.1 17.5 1 624.1 1 22 906.8 4 985.9 220.1 240.0 602.6 51551.5 263.3 15 5476.9 0.0 6.9 0.0 5.6 61 024.8 8 810.7 4 7 909.4	0.0 0.0 0.2 4401.0 4 401.0 4 194.3 2.7 427.0 1.1 3 459.9 0.1 1.1 1.1 1.1 1.1 2.6.7 2.0.5 2.22 2.0.5 2.0.5 0.0 0.0 0.0 0.0 2.2 2.2 2.0.5 0.0 0.0 0.0 0.0 2.0 2.2 2.0 0.0 0	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	0.0 0.0 0.0 1038.7 5092.1 46199.5 15062.5 403.7 6228.8 156.0 337.5 572.1 592.4 139.6 6229.9 32.7 1594.4 2491.6 622.9 32.7 7594.4 2491.6 72 7 7 7 7 7 7 7 7 7 7 7 7 7	0.0 0.0 1548.8 15714.3 216321.3 226321.3 2275972.9 82240.9 9645.4 145350 5469.7 5570.6 4338.0 9724.5 1751.0 9456.9 90550 9456.9 90550 22255 2172.3 1594.6 6703.3 5067.0 4388.0 1597.4 22555 2172.3 1594.6 6703.3 5067.0 4388.0 1597.4 1597.4 1597.4 1751.0 1597.4 1751.0
int	Gas-to-liquids (GTL) plants Charcoal production plants Charcoal production plants Not elsewhere specified (energy) Distribution losses Available for final consumption Final non-senergy consumption Final energy consumption Industry Industry Industry Industry Industry Industry Non-metalic minerals Non-metalic minerals Non-metalic minerals Non-metalic minerals Non-metalic minerals Transport equipment Modifiery Wood & wood products Construction Textile & leather Not elsewhere specified (industry) Transport Road Domestic aviation Pipeline transport Not elsewhere specified (transport Not elsewh	0.0 0.0 3504.3 1035451.4 939681.9 242166.7 726567.8 49136.4 9970.2 33712.1 7665.4 17431.5 3799.3 32030.7 7665.4 9770.2 33712.1 7665.4 9770.2 33712.1 7665.4 9770.2 33712.1 7665.4 9770.2 33720.3 12580.2 2087771.6 9020.1 3720.3 12580.2 208777.6 54582.2 208777.6 54582.2 208777.6 54582.2 208777.6 54582.2 208777.6 54582.2 208777.6 54582.2 208777.6 54582.2 208777.6 54582.2 208777.6 54582.2 208777.6 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4178.0 4178.0 4378.0
int	Gas-to-liquids (GTL) plants Charcoal production plants Charcoal production plants Not elsewhere specified (energy) Distribution losses Available for final consumption Final non-energy consumption Industry Iron & steel Chemical & petrohemical Non-metallic minerals Non disemption Not elsewhere specified (industry) Not elsewhere specified (industry) Not elsewhere specified (transport Not elsewhere specified	0.0 0.0 3504.3 1035451.4 91142.5 939681.9 1425451.4 91702.5 33712.1 7665.4 1970.2 33712.1 7665.4 1970.2 33712.1 7665.4 9702.2 33712.1 7655.4 9702.2 33712.1 7655.4 9702.2 33712.1 7655.4 9702.2 33712.1 7655.4 9702.1 3720.3 32030.7 8666.2 9020.1 3720.3 21250.2 265715.4 9020.1 3720.3 21250.2 265715.4 9020.1 3720.3 21250.2 267714.9 208777.6 5458.2 267714.9 208777.6 5458.2 208777.6 5458.2 208777.6 5458.2 208777.6 5458.2 208777.6 5458.2 20771.1 3350.0 245194.9 245194.9 245194.9 2727250.5 13350.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 13355.5 1355.5 1355.5 1355.5 1355.5 1355.5 1355.5 1355.5 1355.5 1355.5 1355.5 1355.5 1355.5 1355.5 1355.5 1355.5 1355.5 1355.5 1355.5 1355.5	Z Z 0.0 63.3 27 035.9 1 584.6 2 235.9 12 545.4 2 890.7 2 622.9 338.0 3 906.8 156.2 78.4 166.7 164.7 1410.1 754.1 39.9 45.6 30.5 107.5 0.9 2 2 2 2 0.0 9 969.6 815.5 8 076.4 9 051.4 0.0	Z Z 393.2 534.8 534.8 534.8 534.8 534.8 536.9 508.2 100.8 35.0 67.2 32.4 9.5 0.0 0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	Z Z Z 0.0 0.0 337.5 0.0 4462.1 168.4 0.0 2.6 0.0 0.1 1.1 0.0 0.1 1.1 0.0 0.0 1.1 0.0 0.0	Z 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	Z 236.2 13.4 421 766.0 74 553.9 539 345 079.2 537.4 573.6 7 968.1 387.2 5 641.4 216.4 907.2 5 641.4 216.4 907.2 5 641.4 216.5 907.2 1 541.7 6 861.5 202.1 5 052.0 166.2 706.5 262 635.1 1 253.0 250 457.2 6 363.5 4 237.7 0.0 250 457.2 6 363.5 7 404.7 10 944.7 28 330.6 15 448.6 15 448.6 12 163.3 17 457.5 17 457.	2 288.7 1 412.5 215 117.1 14 917.7 200 766.0 75 197.1 13 072.5 2 3 571.0 13 072.5 2 3 571.0 13 072.5 2 3 571.0 13 072.5 2 3 571.0 14 93.6 14	0.0 1866 83.7 0.0 98 902.1 22 361.6 111.8 303.9 3.2 1 624.1 17.5 122.0 7.9.3 1 624.1 17.5 122.0 7.9.3 1 624.1 122.96.8 4.985.9 220.1 24.0 62.6 55.15.7 26.3 15 476.9 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0	0.0 0.0 0.2 4401.0 4401.0 4194.3 27 427.0 10.1 13359.9 0.1 11.1 3459.9 0.1 11.1 3459.9 0.1 11.1 11.1 262.7 202.0 202.0 202.0 0.0 0.0 0.0 206.7 206.7 206.7 0.0 0.0 0.0 206.7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0	Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z	0.0 0.0 0.0 1038.7 5092.1 46276.9 15062.5 403.7 6228.8 1560.5 572.1 592.4 139.6 1280.3 2045.6 6229.3 2045.6 6229.3 2.7 7 2.7 7 7 7 7 7 7 7 7 7 7 7 7 7	0.0 0.0 0.0 1 548.8 15714.8 216321.3 216321.3 216321.3 2215972.9 9 645.4 14 535.0 9 724.5 14 535.0 9 724.5 1 751.0 9 724.5 1 771.0 9 724.5 1 771.0 1 751.0 9 724.5 1 772.0 1 772.5 1 772.5
int	Gas-to-liquids (GTL) plants Charcoal production plants Charcoal production plants Not elsewhere specified (energy) Distribution losses Available for final consumption Final non-senergy consumption Final non-senergy consumption Industry Iron & steel Chemical & petrochemical Non-ferrous metals Non-metallic minerals Non-metallic minerals Non-metallic minerals Non-ferrous metals Non-ferrous metals Non-ferrous metals Non-metallic minerals Not elsewhere specified (industry) Not elsewhere specified (other) Not elsewhere specified (other)	0.0 0.0 3504.3 123900.8 1035451.4 939681.9 242166.7 242166.7 242166.7 242166.7 242166.7 242166.7 2557.8 33712.1 7655.3 3792.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 3772.3 373 373333333333333	Z Z 0.0 63.3 27 035.9 1 584.6 22 535.9 12 545.4 2 890.7 2 622.9 3388.0 3 906.8 156.2 78.4 164.7 1410.1 754.1 39.9 45.6 30.5 107.5 0.9 0.9 2 Z 0.0 9 999.6 815.5 8 076.4 951.4 0.0	Z Z 393.2 530.8 534.8 534.8 536.9 5083.2 100.8 35.0 67.2 32.4 7.4 9.5 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0	Z Z Z 0.0 0.0 0.0 4452.1 168.4 0.0 2.6 6 0.0 0.1 1 0.0 0.0 0.1 0.0 0.0 0.0 0.0 0	Z 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	Z 236.2 13.4 421 766.0 74 553.9 345 079.2 25 037.4 573.6 7 968.1 387.2 5 541.4 216.4 935 5 541.4 216.4 935 5 541.4 216.5 907.2 1541.7 681.5 202.1 1505.2 202.1 166.2 706.5 202.6 263.6 5 4 237.7 0.0 225.8 4 237.7 0.0 225.8 57 404.7 10 944.7 10 944.7 10 944.5 1263.3 1 464.5 1216.3 1 1464.5 1216.3 1 1464.5 1216.3 1 1464.5 1216.3 1 1464.5 1216.3 1 1464.5 1216.3 1 1464.5 1 1 1464.5 1 1464.5 1	Z 288.7 1 412.5 215 117.1 14 917.7 200 766.0 75 197.1 7 956.5 16 947.2 3 571.0 13 072.5 2 332.7 5 901.8 746.3 13 072.5 9 301.7 5 901.8 746.3 14 946.4 3 556.8 1 494.6 3 556.8 1 494.8 3 556.8 1 494.8 1 494.	0.0 1866 83.7 98 902.1 22 361.6 118.8 303.9 32.2 1 624.1 17.5 1220.0 79.3 1 683.0 12966.8 4 985.9 220.1 12966.8 4 985.9 220.1 12966.8 4 985.9 220.1 15 515.7 263.3 15 515.7 200.0 555.5 15 7 200.0 555.5 15 7 15 7	0.0 0.0 0.0 0.2 4401.0 4194.3 2.7 427.0 10.1 11.1 11.1 11.1 11.1 1.1 1	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	0.0 0.0 1548.8 15714.8 216321.3
int	Gas-to-liquids (GTL) plants Charcoal production plants Charcoal production plants Charcoal production plants Not elsewhere specified (energy) Distribution losses Available for final consumption Final non-energy consumption Final non-energy consumption Industry Industry Industry Industry Industry Non-metalic minerals Non-metalic minerals Non-metalic minerals Non-metalic minerals Non-metalic minerals Transport equipment Modifiery Wood & wood products Construction Textile & leather Not elsewhere specified (industry) Transport Road Domestic aviation Pipeline transport Not elsewhere specified (transport Not elsewhere specified (tra	0.0 0.0 3504.3 1035451.4 939681.9 242166.7 26567.8 49136.4 9970.2 33712.1 7665.4 17431.5 3799.3 32030.7 7665.4 17431.5 3799.3 32030.7 7665.4 9970.2 33720.3 12580.2 286777.6 54582.2 286777.6 54582.2 286777.6 54582.2 286777.6 54582.2 286777.6 54582.2 286777.6 54582.2 286777.6 54582.2 286777.6 54582.2 286777.6 54582.2 286777.6 54582.2 286777.6 54582.2 286777.6 54582.2 286777.6 54582.2 286777.6 54582.2 286777.6 54582.2 286777.6 54582.2 287714.0 7140.0 13360.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 245194.9 24519245192451924519245192451924519245192451924519	Z Z 0.0 53.3 27 035.9 1 584.6 22 535.9 12 545.4 2 800.7 2 622.9 3 38.0 3 906.8 156.2 78.4 156.2 78.4 156.2 78.4 156.2 78.4 156.2 3 9.9 45.6 3 0.5 107.5 0.9 0.9 0.9 2 Z 2 0.0 0.0 2 2 0.0 0.0 2 2 0.0 0.0 2 2 0.0 0.0	Z Z 393.2 534.1 534.1 536.9 538.9 508.9 538.9 508.9 538.9 508.9 538.9 509.0 500.0 50	Z Z 2 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0	Z 0.0 0.0 38.1 67.4 22.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	2 236.2 13.4 421766.0 74553.9 345079.2 25037.4 573.6 573.6 574.4 216.4 993.5 907.2 1541.7 5041.4 216.4 993.5 907.2 1541.7 5052.0 1541.7 5052.0 1661.5 202.1 1552.0 250.457.2 262.637.1 1253.0 250.457.2 50.457.2 50.457.2 50.457.2 50.457.2 1258.8 57.404.7 10.944.7 15.448.6 1.2448.6 1.2548.8 57.404.7 10.944.7 11.944.8 11.944.8 11.944.8 11.944.7 12.944.8 11.	2 288.7 1 412.5 215 117.1 14 917.7 200 766.0 75 197.1 7 956.5 16 947.2 3 571.0 13 072.5 2 302.7 5 901.8 746.3 12 759.9 6 157.8 746.3 12 759.9 6 157.8 747.3 72 72 72 72 72 72 72 72 72 72 73 322.5 1.2 86.9 7.5 86.9 7.5 7.5 7.5 7.5 7.5 7.5 7.5 7.5	0.0 186 83.7 98 813.7 0.0 96 902.1 12 381.6 118.8 303.9 3.2 1 624.1 17.5 122.0 7.95.3 1 624.1 24.00 602.6 61 024.8 8 810.7 47 909.4 2 840.6 59.9 1 404.2 8 810.7 1 47.9 1 404.2 1 49.0 1 47.9 1 404.2 1 47.9 1 404.2 1 47.9 1 404.2 1 47.9 1 404.2 1 47.9 1 47.	0.0 0.0 0.2 4401.0 4 194.3 2.7 427.0 10.1 3 459.9 0.1 11.1 11.4 11.7 205.0 206.2 205.0 0.0 0.0 0.0 0.0 206.7 200.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	0.0 0.0 1038.7 5092.1 46276.9 2 46199.5 403.7 5092.4 15062.5 403.7 5022.8 1560.0 337.5 572.1 1992.4 139.6 1280.3 2 045.6 622.9 32.7 1594.2 2 491.6 2 2 491.6 2 2 9 2 7 2 2 3 1136.9 9 9 567.8 21 259.0 0.0 58.8 77.5	0.0 0.0 0.0 1 548.8 1574.8 216 321.3 22 23 572.8 22 240.9 9 645.4 14 535.0 5 469.7 5 579.6 4 338.0 9 724.5 1 751.0 9 456.2 1 751.0 9 9 456.2 1 751.0 9 9 005.0 2 235.5 2 172.3 5 067.0 4 178.0 1 78.0 6 703.3 5 067.0 4 178.0 1 78.0 6 703.3 5 067.0 4 178.0 1 78.0 5 58.4 1 28 665.0 6 3376.3 6 0 663.3 6 0 663.3 6 0 663.3 6 0 663.3 6 0 663.3 6 0 663.4 3 71.9 5 80.0 1 9 50.0 1 9 50.0 1 9 50.0 1 9 50.0 1 9 50.0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
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- Reference approach is top-down approach (Supply data) Tier 1
- Very fast GHG inventory could be created
- For countries with no detailed sectoral data
- Sectoral approach is a bottom-up approach (sectoral data disaggregation of input data) – Tier 1-3

• 1. Interface of the reference approach

ince Approach Data	Estimating Excluded Carbo	on Comparison														
r Energy jory Fuelco jory code 1.A t 1 of 1.0	, ombustion activities (CO2 from energy sources - Refe	erence Approach)														
						Nam d			S	tep 2	Ste	p 3	S	tep 4	S	tep 5
			A Production	B Imports	C Exports	D International Bunkers	E Stock chang	F Apparent Consumption	G Conversion Factor (TJ/Unit)	H Apprrent Consumption (TJ)	I Carbon content (t C/TJ)	J Total Carbon (Gg C)	K Excluded Carbon (Gg C)	L Net Carbon Emissions (Gg C)	M Fraction of Carbon Oxidised	N Actual CO2 Emissions (Gg CO2)
Fue	l Types	Unit						F=A+B-C-D-E		H=F*G		J=H*I/1000		L=J-K		N=L*M*44/12
uid Fuels: 22 item(s))									44883.94155		912.8971		784.25553		2875.60362
Primary Fuels	Crude Oil	Gg						0	42.3	0	20	0		0		0
	Orimulsion	Gg						0	27.5	0	21	0		0		0
	Natural Gas Liquids	Gg						0	44.2	0	17.5	0	0	0		0 😒
Secondary Fuels	Motor Gasoline	Gg		107.064	3.111	0	0.21	103.743	44.32	4597.88976	18.9	86.90012		86.90012	1	318.63376 🖬
	Aviation Gasoline	Gg						1	44.3	0	19.1	0		0		0 🗵
	Jet Gasoline	Gg						0	44.3	0	19.1	0		0		0 🖸
	Jet Kerosene	Gg		28.301	12.503	15.323	0.475	0	43.401	0	19.5	0		0	1	0 🖬
	Other Kerosene	Gg						0	43.8	0	19.6	0	0	0		0 🔁
	Shale Oil	Gg						0	38.1	0	20	0		0		0 👿
	Gas/Diesel Oil	Gg		653.56	38.829	0	11.795	602.936	42.95	25896.1012	20.209	523.33431	0	523.33431	1	1918.89247 🛃
	Residual Fuel Oil	Gg		97.461	4.836	0	1.715	90.91	40.1	3645.491	21.286	77.59792		77.59792	1	284.52571 🖬
	Liquefied Petroleum Gases	Gg		78.726	1.565		0.164	76.997	46.8	3603.4596	17.209	62.01194	0	62.01194	1	227.3771 🖬
	Ethane	Gg						0	46.4	0	16.8	0	0	0		0 🗾
	Naphtha	Gg						0	44.5	0	20	0	0	0		0 🗵
	Bitumen	Gg		151.723	1.904		0.614	149.205	39.19	5847.34395	22	128.64157	128.64157	0	1	0
	Lubricants	Gg					/	0	40.2	0	20	0	0	0		0 👿
	Petroleum Coke	Gg		96.082	47.227		7.108	41.747	30.988	1293.65604	26.6	34.41125	0	34.41125	1	126.17459 🛃
	Refinery Feedstocks	Gg						0	43	0	20	0		0		0 🗵
	Refinery Gas	Gg						0	49.5	0	15.7	0	0	0		0 💽
	Paraffin Waxes	Gg						0	40.2	0	20	0	0	0		0 🗵
					1		1	0	40.0	0		0	0	0		0

European Union (27 countries)	Total	Solid fossil fuels	Manufac- tured gases	Peat and peat products	Oil shale and oil sands	Oil and petroleum products	Natural gas	Renewables and biofuels	Non- renewable waste	Nuclear heat	Heat	Electricity
 Primary production 	634 751.4	116 090.5	Z	2 865.9	4 797.0	24 487.5	59 170.5	217 298.4	13 286.9	195 737.9	1 016.9	Z
 Recovered & recycled products 	1 747.5	650.9	Z	0.0	0.0	1 096.6	Z	0.0	Z	Z	Z	Z
Imports	1 350 483.5	104 696.4	0.0	77.6	0.0	865 222.2	329 615.4	18 373.1	472.4	Z	5.8	32 020.5
Exports	464 688.8	12 946.5	0.0	8.6	0.0	347 630.4	59 394.1	13 410.5	37.0	Z	1.8	31 260.0
Change in stock	285.7	1 766.4	0.0	-575.9	-132.0	4 156.9	-4 748.5	-173.9	-7.3	Z	Z	Z
= Gross available energy	1 522 579.4	210 257.7	0.0	2 359.0	4 665.0	547 332.7	324 643.3	222 087.2	13 715.0	195 737.9	1 020.8	760.5
 International maritime bunkers 	43 312.7	0.0	0.0	0.0	0.0	43 253.2	42.8	16.7	Z	Z	Z	Z
• • • • • • • • • • • • • • • • • • •									40 - 4 - 0			

Combination of both methods – check for errors



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• The reason for different GHG emission – different emission factors by sectors, refinery, losses, fugitive emissions etc.

IPCC Inventory Software - MANUadmin - [1.A - Reference Approach]

🚽 Application	Database	Inventory Year	Worksheets	Reports	Tools	Export/Import	Administrate	Window	Help
Reference Approa	ich Data Es	stimating Excluded (Carbon Compa	rison					
Sector Category Category code Sheet	Energy Fuel combus 1.A 1 of 1 - Comp	stion activities parison of CO2 Emiss	ions from Fuel Co	mbustion					

		Referenc	e Approach		Sectoral A	pproach	Difference			
Fuel Types	Apparent Excluded Consumption (TJ) (TJ)		Apparent Consumption (excluding non- energy use and feedstocks) (TJ)	CO2 Emissions (Gg)	Energy Consumption (TJ)	CO2 Emissions (Gg)	Energy Consumption (%)	CO2 Emissions (%)		
Liquid Fuels: 22 item(s)	39086.03833	1452.94454	37633.09378	2791.0448	35535.70086	2607.2179	5.90221	7.05069		
Solid Fuels: 11 item(s)	54216.08532	0	54216.08532	5730.56966	54215.70357	5730.55138	0.0007	0.00032		
Gaseous Fuels: 1 item(s)	4022.27055	0	4022.27055	221.49035	3991.38325	219.78951	0.77385	0.77385		
Other Fossil Fuels: 3 item(s)	0	0	0	0	0	0	0	0		
Peat: 1 item(s)	0	0	0	0	0	0	0	0		
Total										
	97324.3942	1452.94454	95871.44966	8743.10481	93742.78768	8557.55879	2.27075	2.16821		

• Let's make a short tour of the reference approach in the IPCC software



Key category analyses

- Uncertainty
- QA/QC



Key category analyses

- Key categories second tool in the IPCC software
- Why it is needed?
- To identified the categories with highest impact on the country GHG inventory.
- To allocate the country potential to the most important categories not on the categories with lowest impact.
- To implement higher Tier on the most important categories and improve the quality of the inventory
- You do not have a lot of resources for QA/QC? Make it only for the key categories



Key category analyses

- Two types
 - Absolute level
 - The trend (The purpose of this trend assessment is to emphasize the categories whose trend is significantly different from the trend of the overall inventory, regardless whether the category trend is increasing or





- Reference vs sectoral approach
- Key category analyses

• QA/QC

- In each analysis, the accuracy of input data is very important because they dictate the precision of the results.
- How many of us can say that we are 100% in the data that we are using in for GHG inventory creation?
- In most of the cases at least default emission factors are used





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- First step define the uncertainty for the activity data and emission factors.
 PCC Inventory Software MANUadmin [Worksheets]
 Application Database Inventory Year Worksheets Reports Tools Export/Import Administrate Window Help
 - Fuel Combustion Activities □ 1 - Energy Worksheet Sector: Energy Category: Fuel Combustion Activities - 1.A.1.a - Main Activity Electricity and Heat Produ Subcategory: 1.A.1.a.i - Electricity Generation 1.A.1.a.i - Electricity Generation CO2, CH4 and N2O from fuel combustion by source categories - Tier 1 Sheet: 1.A.1.a.ii - Combined Heat and Power Gener Data ···· 1.A.1.a.iii - Heat Plants Fuel Type Liquid Fuels Uncertainties for Liquid Fuels 1.A.1.b - Petroleum Refining CO2 - 1.A.1.c - Manufacture of Solid Fuels and Other E Liquid Fuels Energy Consumption … 1.A.1.c.i - Manufacture of Solid Fuels - 1.A.1.c.ii - Other Energy Industries Conversion Factor (TJ/Unit) CO2 Emission Factor Amount Captu (TJ) (C=A*B) - 1.A.2 - Manufacturing Industries and Construction (Mass, Volume or Energy Unit) (Gg CO2) Fuel **Consumption Unit** Residual Fuel Oil 27.968 🥜 Gg 1121.510 40.1 78049 1.A.2.b - Non-Ferrous Metals 1.A.2.c - Chemicals 🥑 Gg -1.A.2.d - Pulp, Paper and Print Total 1.A.2.e - Food Processing, Beverages and Toba 1121.5168 1.A.2.f - Non-Metallic Minerals - 1.A.2.g - Transport Equipment Uncertainties by Fuel Type -1.A.2.h - Machinery -1.A.2.i - Mining (excluding fuels) and Quarrying Liauid Fuels ... 1.A.2.j - Wood and wood products 1.A.2.k - Construction -1.A.2.I - Textile and Leather 1.A.1.a.i - Electricity Generation Category -1.A.2.m - Non-specified Industry - 1.A.3 - Transport Activitiy Data Uncertainties I.A.3.a - Civil Aviation -5.00 % 🖨 +5.00 % ≑ Upper - 1.A.3.a.i - International Aviation (Internationa Lower 1.A.3.a.ii - Domestic Aviation - 1.A.3.b - Road Transportation Emission Factors Uncertainties 1.A.3.b.i - Cars Gas CARBON DIOXIDE (CO2) \sim -1.A.3.b.i.2 - Passenger cars without 3-wa -5.00 % ≑ +5.00 % ≑ Lower Upper in 1.A.3.b.ii - Light-duty trucks 1.A.3.b.ii.2 - Light-duty trucks without 3-w OK Cancel 1.A.3.b.iii - Heavy-duty trucks and buses - 1.A.3.b.iv - Motorcycles

- Two basic approaches :
- Error Propagation very easy, already implemented in the IPCC Inventory Software, calculates the uncertainty of the whole inventory for a given year, as well as uncertainty in trend between a year of interest and a base year.
- Monte Carlo random values of the input variables are selected from within their probability density function and the corresponding output is calculated. This procedure is repeated many times or until the mean and the distribution of the output variables do not change. The input variables may include activity data, emission factors, conversion factors etc. and the output variable is the quantity of emissions.

Read

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IPCC Inventory Software - MANUadmin - [Uncertainty Analysis]

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manny Anarysis - Approach I (Table 3.2)	Uncertainty Analysis															
e year for assessment of uncertainty in trend	1990 V Key Category Applyin															
	Key Category Analysis		D	Jan E	- E	-	-10	н			1		-	ĸ		
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1.A - Fuel Combustion Activities	Arial - 10 - A^ A	= Tabqwe		o p { [}] \ Del	End PgDn Mv Up						2 ~	Ž	\mathcal{O}	44		
1.A.1.a.i - Electricity Generation - Liquid Fuels		Caps a s		I Enter	Insert Pause Mv Dn	Conc	itional Format as	Cell	Juscob Dalat	Format	↓ ~	Sort &	Find &	Ideas		
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A.1.a.i - Electricity Generation - Solid Fuels	Clipboard S Font S		Aignment	12	Tumbel	12	Styles		Cells			Editing		Ideas	^	_
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A.1.a ii - Combined Heat and Power Generation (CHP	012														v	
	ΑΑ	В	С	D	М	N O	P C	R	S	ΤU	JV	W	X	Y	Z	
	Base year for assessment of uncertainty in trend: 1990, Year T: 2016	D	0					-								
	2 A	D D	L.		M			Uncertaint	Uncertainty Un	certainty						d
A. I.a.II - Combined Heat and Power Generation (CHP			Base Year emissions			Contributio	Туре А Тур	e B in trend in	in trend in int	roduced						
	2006 IPCC Categories	Gas	or removals	removals	total national emissions	by Categor	Sensitivity Sens	tivity emissions	emissions tre	nto the nd in total						
	3		(Gg CO2 equivalent)	(Gg CO2 equivalent)		in Year T	(%) (7	introduced	I introduced r	ational						
A.1.a.ii - Combined Heat and Power Generation (CHP	4 1.A - Fuel Combustion Activities							by emissio	n by activity ei	nissions						
	5 1.A.1.a.i - Electricity Generation - Liquid Fuels	C02	3.12696	87.53326472	0.003287657	7 0.005	5				87.533	326 0.00650	J4			
	6 I.A. I.a.i - Electricity Generation - Liquid Fuels 7 I.A.1.a.i - Electricity Generation - Liquid Fuels	N20	0.00303	0.08411376	3.03539E-09 1.72515E-08	0.000	1				0.0841	14 6.01E-0	08 08			
	8 1.A.1.a.i - Electricity Generation - Solid Fuels	CO2	5610.054968	3378.731119	3.367850143	8.355	2				3378.7	731 9.6897	98			
	9 1.A.1.a.i - Electricity Generation - Solid Fuels	CH4	1.25823225	0.782990925	1.79877E-07	7 0.000	0				0.7829	391 5.2E-0	J7			
	10 1.A.1.a.i - Electricity Generation - Solid Fuels 11 1 A 1.a.ii - Combined Heat and Power Generation (CHP) - Liquid Fuels	N20 CO2	22.49/19263	13.9998/7/4	5./505/E-05 0.006772412	0.000	0.0239	0000 0 119423	9 0 0	0142621	13.999	J88 0.00016	56	0 #		
	12 1.A.1.a.ii - Combined Heat and Power Generation (CHP) - Liquid Fuels	CH4	0.29694	0	6.3619E-09	0.000	0.0000 0	.0000 0.000115	8 0	1.34E-08		0	0	0 #	******	
	13 1.A.1.a.ii - Combined Heat and Power Generation (CHP) - Liquid Fuels	N20	0.70790496	0	3.61575E-08	0.000	0 0.0001 0	.0000 0.00027	6 0 7	.615E-08		0	0	0 #	******	
	14 T.A.T.a.ii - Combined Heat and Power Generation (CHP) - Solid Fuels	CO2 CH4	87.98/59112 0.019734	0	0.000558514 2.80983E-11	0.000	0.0069 0	0000 0.03429 0000 7.693E-0		0011763 918E-11		0	0	0 #	/#######	
	16 1.A.1.a.ii - Combined Heat and Power Generation (CHP) - Solid Fuels	N2O	0.35284392	0	8.98286E-09	0.000	0 0000.0	.0000 0.000137	5 0 1	.892E-08		0	0	0 #	#######	
	17 1.A.1.a.ii - Combined Heat and Power Generation (CHP) - Gaseous Fuels	CO2	0	250.8996749	0.027465953	0.046	0.0244 0	0244 0.121851	4 0.172324 0	.0445433	250.89	97 0.0534	33	0.049896 #	*****	
	18 T.A. T.a.II - Combined Heat and Power Generation (CHP) - Gaseous Fuels 19 T.A.T.a.II - Combined Heat and Power Generation (CHP) - Gaseous Fuels	CH4 N2O	0	0.113908616	5.66119E-09 8.04378E-09	0.000		0000 5.532E-0 0000 6.594E-0	5 7.824E-05 5 5 9.326E-05 1	305E-08	0.1139	109 1.1E-(779 1.66E	J8 08	1.03E-08 #	******	
	20 1.A.1.a.iii - Heat Plants - Liquid Fuels	CO2	171.9828	0	0.002133564	0.000	0.0134 0	0000 0.067032	3 0 0	.0044933	0.1357	0	0	0 #	#######	
	21 1.A.1.a.iii - Heat Plants - Liquid Fuels	CH4	0.16665	0	2.00383E-09	0.000	0.0000 0	.0000 6.496E-0	5 0	4.22E-09		0	0	0 #	*****	
	22 1.A.1.a.iii - Heat Plants - Liquid Fuels 23 1 A 1 a iii - Heat Plants - Gaseous Fuels	N20	0.3972936	63 07775762	1.13887E-08 0.001735000	0.000	0.0000 0	0000 0.000154	9 0 2	.399E-08 0028154	62 077	776 0.0022	77	0 002154 #	****	
	24 1.A.1.a.iii - Heat Plants - Gaseous Fuels	CH4	0	0.028637343	3.57816E-10	0.002	0.0000 0	.0000 1.391E-0	5 1.967E-05 5	.803E-10	0.0286	637 6.96E-	10	6.5E-10 #	******	
	25 1.A.1.a.ii - Heat Plants - Gaseous Fuels	N20	0	0.034135713	5.08408E-10	0.000	0 0000.0 0	.0000 1.658E-0	5 2.345E-05 8	.245E-10	0.0341	136 9.89E-'	10	9.24E-10 #	3######	
	26 1.A.1.c.ii - Other Energy Industries - Liquid Fuels	C02	0	5.516827007	1.32792E-05	0.000	0.0005 0	0005 0.002679	3 0.0037891 2	.154E-05	5.5168	327 2.58E-0	J5	2.41E-05 #	*****	
	28 1.A.1.c.ii - Other Energy Industries - Liquid Fuels	N20	0	0.013208308	7.61183E-11	0.000	0.0000 0	.0000 6.415E-0	6 9.072E-06 1	.234E-10	0.005	208 1.48F-	10	2.43E-11 # 1.38E-10 #	******	
	29 1.A.1.c.ii - Other Energy Industries - Biomass	CO2	0	0.126838656	7.01936E-09	0.000	0 0.0000 0	.0000 6.16E-0	5 8.712E-05 1	.138E-08	0.1268	339 1.37E-	J8	1.28E-08 #	*****	
	30 1.A.1.c.li - Other Energy Industries - Biomass	CH4	0	0.000849366	3.14763E-13	0.000	0.0000 0	0000 4.125E-0	7 5.834E-07 5	105E-13	0.0008	349 6.12E-1	13	5.72E-13 #	****	
	31 1.A.T.C.II- Other Energy Industries - Biomass 32 1.A.2.a - Iron and Steel - Liquid Fuels	CO2	346.1649255	197.3354344	0,01164107	7 0.000	5 0.0078 0	.0000 6.556E-0 .0192 0.039093	7 0.1355348	0.019898	0.001	135 1.55E-1 354 0.0330	12 54	1.44E-12 #	;####### ########	
	33 1.A.2.a - Iron and Steel - Liquid Fuels	CH4	0.303842475	0.169491869	8.6443E-09	0.000	0 0.0000 0	.0000 3.613E-0	5 0.0001164 1	.486E-08	0.1694	492 2.44E-	08	2.28E-08 #	#######	
	34 1.A.2.a - Iron and Steel - Liquid Fuels	N20	0.698315827	0.40364325	4.85231E-08	0.000	0 0.0000 0	.0000 7.619E-0	5 0.0002772 8	.266E-08	0.4036	543 1.38E-(J7	1.29E-07 #	*****	
	35 1.A.Z.a - Iron and Steel - Solid Fuels	CO2	295.7755807	285.9911783	0.024667553	0.059	0.0047 0	0001 0.023585	8 0.1964257 0	0391393	285.99	312 0.06942	24	0.064829 #	#*****	
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- Reference vs sectoral approach
- Key category analyses
- Uncertainty

QA/QC

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QA/QC

- Why? Who?
- QA/QC Person not directly involved in the GHG sectoral emissions development
- https://www.mentimeter.com/s/243e42749edf8ff54167e7000dee2aa3/d769ddc2e8d1/editQC



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	QA Activity	Remarks / Comments / Examples						
	Check for transcription, typographical error and error transposition.	Compare the national data source with the inventory data contained in the IPCC Inventory Software						
	Compare with official published data	Compare the national energy related data (the data of the Energy balances published by the SSO and the data published by ESM), the annual data on industrial production (published by SSO) and the national waste related data (the Waste related data published by the SSO and the Regional Waste studies published by MOEPP) with the AD contained in the IPCC Inventory Software						
	Identify and fix outliers in data inputs (including checking the inclines and spikes in the trend)	Data which don't fall under the realistic range and are suspected as inaccurate are assessed and if necessary are removed and replaced with data from international sources or derived from expert judgment						
	Compare with other international data	Compare the Energy related data with the data published by the IEA						
	Check the documentation of all sources, data format and assumptions for easy reference	Keeping records on the data source and assumptions used in each data sheet of the IPCC Inventory Software.						
	Assure if the Party is able to provide an overview of the overall waste generation and treatment in the country	Assure that an overview of waste generation and treatment is provided and AD on all types of solid waste been collected (MSW, sludge, industrial and other waste)						
	Ensure that the AD are provided in the appropriate units	Check the background table for each category and ensure the consistency and the accuracy of the AD units						
	Check if the activity data for estimating of the GHG emissions are equal for the activity data used to estimate the emissions of precursors and indirect emissions	Export the activity data from each worksheet in the IPCC 2006 database and compare with the AD provided in the tables for estimation of the emissions of precursors and indirect emissions						
	Check the implied emission factors (time series)	Ensure consistency check of the use of the EF						
	Double check in regards to the country specific EF published in the EFDB and compare with the EF of the other countries	Ensure that the country specific EF in use are in the ranges provided by the IPCC guidelines						
	Check if the EFs used for estimation of the emissions of precursors and indirect emissions are	Check if the EFs used for estimation of the emissions of precursors and indirect emissions are in line with the EMEP/CORINAIR Emission Inventory Guidebook.						
	consistent, comparable and transparently documented	In case CS EFs are used, check the background materials, the estimation methodology, the EF range and the comparability with other national reports						
	Cross check all steps involved in the calculation	Ensure that all steps used for determining, estimating and deriving data are accurate, transparent and internally consistent						
ç	Check the documentation of sources and correct use of units	Check if the documentation template records are appropriately fulfilled						
	Check completeness of the data coverage	Ensuring that all relevant gases for all the activities were covered						
	Check if the excluded other non-energy use of fuels from activity data in energy sector is reported under the IPPU sector (in case emissions occurs from these non-energy uses)	Ensuring that the excluded from the Energy sector is accounted in the sector IPPU						
	Check the differences between the recalculated estimates and verify if proper justifications for	Identification of changes, revisions and reallocations in order to improve accuracy and the transparency						
	the recalculated estimates are provided	of the emission estimates						
	Identify and fix outliers in the results	Checking for inconsistency of the emission trends and levels						
	Check the difference between the sectorial and the reference approach in the Energy Sector	Ensure consistency between the emission estimates and the allocation of carbon in the sectoral and in the reference approach						
	Check the completeness, use of notation keys and confidential information	Check if complete estimates are provided and if notation keys are used where no estimates are provided						
	Creativeness of the use of the notation keys	Check if the appropriate notation keys are in use						
	Verify the assumptions, corrections, data and sources	Ensure consistency, transparency, facilitate repeatability and easy retrieval						
-	Check the improvement list, recommendations and encouragements provided (internal and external)	Check if the recommendations and the encouragements of the technical assessments / reviews have been taken into consideration and implemented						

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Emission factors

Activity Data Check

Data Type

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Calculation by the IPC Inventory Software

Results (emissions)

Documentation

QA/QC

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The process in a nutshell (MK good practice)

Step 1: Allocation of roles (CTA, IDT members, QAT members)	Step 2: Defining the GHG Inventory components	Step 3: Activity data collection	Step 4: Data input, documenting and calculating of emissions (Tier 1 QC procedures undertaken in parallel)	Step 5: QA at sectoral level	Step 6: Compilation of overall inventory	Step 7: QA of overall inventory summary	Step 8: Conduct key category analyses	Step 9: Uncertainty management (as decided)	Step 10: QA of key sources analysis and uncertainty management	Step 11: Drafting the sectoral chapters of NIR	Step 12: Draft summary inventory chapter	Step 13: QA of NIR	Step 14: Reporting
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- Input data collecting mechanisms
- Time series
- Emission factors (National/IPCC defaults)
- Methodologies for emission calculation

Thank you for your attention

Questions?

