

#### Session 3: IPCC Inventory Software for National GHG inventories – New Functionalities in the Energy Sector SBSTA - 56

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INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE

**Overview of elements upgraded** 

#### ✓ Fuel Manager

- Stationary Combustion
- ✓ Road Transportation
- ✓ Railways
- ✓ Off-road transportation
- Fugitive Solid Abandoned mines

- ✓ Fugitive Oil Venting
- ✓ Fugitive Oil Flaring



### **Fuel Manager**

- Contains main parameters on fuels, i.e. fuel type, calorific value, carbon content- needed to estimate GHG emissions from combustion
- Allows input of user-defined fuels and their parameters
- Information from fuel manager transfers to all corresponding worksheets
- In any relevant worksheets to estimate GHG emissions from source-categories where fuels are used, if IPCC default fuels are selected, the parameters are filled automatically in the worksheet





#### **Fuel Manager**

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Fuel Manager									
Conversion Fa	actor Type O NCV  GCV	] Show user-define	ed fuels only						
		Basic Fuel Da	ata			Re	eference Approach Spe	ecific Data	
			Primary	Gross	Calorific Carbon co	Used in	Used in Excluded	Used in	
el Manager								- 0	2
onversion Factor Type	) NCV 🔾 GCV 🗹 Show user-defi	ned fuels only	$\mathcal{I}$						
	Basic Fuel	Data				Referer	nce Approach Specif	fic Data	
Fuel Type 🛛 🖓	Fuel Name	Primary Fuel ⊽	Used in Aviation 고	Net Calorific Value (TJ / Gg)	Carbon content (kg C / GJ)	Used in Reference ⊽ Approach	Used in Excluded Carbon ⊽ estimation	Used in International Bunkers	V
Liquid Fuels	Diesel for off-road			38	17	$\checkmark$			2
Liquid Fuels	Diesel for trains			40	19	$\checkmark$			
Solid Fuels	Lignite Power Plants	$\checkmark$		12	30	$\checkmark$			
Gaseous Fuels	Natural Gas Power Plants			45	15	$\checkmark$			
Biomass	Biomass Residential		$\checkmark$	10	25				
×									2
Liq Other Liquid Fuel						26.6			
Liquid Fuel						20 🗹			
Liquid Fuel Liquid Fuel						15.7 🔽 21.1 🗹			
Liq Bioma Liquid Fuel						20			
Liq Bioma Liquid Fuel						20 2			
e an Selected C Type and Name	Anthracite					26.2			
Type and Name	of default fuels cannot be changed and default sion Factor Type is automatically applied in all t			ne Inventory Years.					
									Close

### **Stationary Combustion**

2 worksheets are provided to estimate emissions

- **A. Fuel Consumption Data** subdivision, fuel, consumption amount, units, conversion factor
  - consumption units can be selected from the defaults (Gg, TJ) in this case conversion factor being filled automatically from Fuel Manager
  - or entered directly whatever unit is provided and conversion factor thus be entered manually
- **B.** Fuel Combustion Emissions technology type and penetration rate by subdivision/fuel, EFs for each technology/fuel
  - click "+" at left to expand subdivision and fill in data
  - Technology type can be left "unspecified" (e.g. Tier 1) or compiled with several ones (if available)
  - All technology penetration rates should sum up to 100% for each fuel in subdivision



#### **Stationary Combustion**

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1.		I.A.2 - Manufacturing Indust I.A.2.a - Iron and Steel		Subdivision		Fu	el		nsumption TJ)	CO2 Emissio (Gg CO2)		CH4 Emissions (Gg CH4)		missions 3 N20)	
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	- 1.A.2.e - Food P	1 A 2 d Dule Person		Eastern CHP	Other Biog	jas		003	15120		825.552	0.0151		0.001	51
1. 1.		t		Ter Type of Technology	chnology Technology penetration (%)	nsumption (TJ)	CO2 Emission Factor (kg CO2/TJ)	CO2 Amount Captured (Gg CO2)	CO2 Emissions (Gg CO2)	CH CH4 Emission Factor (kg CH4/TJ)	CH4 Emission (Gg CH4		N2O Emissions (Gg N20)		
····1. ····1. ····1.				T CCGT	P C=	TC*(P/100) 15120	EF(CO2) 54600	z	CO2=C*EF (CO2)/10^6-Z 825.552	EF(CH4)	CH4=C*E (CH4)/10 <sup>^</sup> 0.01512	6 EF(N2O)		3	
< 1 2006 IPC(	<ul> <li>1 A 2 m - Non-er</li> <li>2006 IPCC Guidelines</li> </ul>			Total		15120		Fa	825.552 uation 2.4		0.01		0.00151		
<				Subdivision		Fu	el	Total co	nsumption TJ)	CO2 Emissio (Gg CO2)	ins	CH4 Emissions (Gg CH4)		missions g N20)	v
2006												Fuel Manager	Time	Series data ent	ry
			Workshe <u>S</u> ave	et remarks				i - Time Series	NUXIDE (CU2)						• 1 ~
		Country/Territory: Japan Inventor	y Year:	2000 Base year for assess	ment of uncertainty	in trend: 1	990 CO2 Equivaler	nts: SAR GW	Ps (100 year time	e horizon) Databa	se file:				
		Worksheet remarks				<b>, , 1</b> .A	.1.a.ii - Time Serie	s							• 7
		Save				Ga	CARBON	DIOXIDE (CO	2)						~
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1 1 1	ry/Territory: Japan Ir	iventory Year: 2000 Base year for	r assessn	nent of uncertainty in tr	end: 1990   CO2	Equivalent					PANEL	ON CIIM	ате (	chan	\$e

Tier 1, 2, 3 are implemented via 4 worksheets

- Fuel Consumption Data: the amount of fuel consumed for each [fuel type/vehicle type/emission control technology]
- Fuel Combustion Emissions: EFs and calculation of emissions for each [fuel type/vehicle type/emission control technology]
- CH<sub>4</sub> and N<sub>2</sub>O Emissions Tier 3: used for Tier 3 estimations of methane and nitrous oxide considering the fuel type, vehicle type, emission control technology, operating conditions, distance travelled and emissions on cold start of the vehicle
- Fuel Consumption Validation: estimation of fuel use from the distance travelled data based on the types of fuel/vehicle/road



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1.A.3.b - Road Transportation ⊟- 1.A.3.b.i - Cars — 1.A.3.b.i.1 - Passenger c	Sector: Category: Subcategory:	: 1.A.3.b.i.1 - F		rs with 3-way cataly	ysts									200	0
	Sheet: Data	Fuel Combus	stion Emissions												
-1.A.3.b.ii.1 - Light-duty tr	Fuel Type (	(All fuels)		~											
1.A.3.b.ii.2 - Light-duty tr 1.A.3.b.iii - Heavy-duty truck							Equation 3.2.1, 3.	.2.3, 3.2.4							
1.A.3.b.iv - Motorcycles			Fuel co	onsumption				CO2		CH4		N2O			
1.A.3.b.v - Evaporative emis 1.A.3.b.vi - Urea-based catal 1.A.3.c - Railways	Subdivi	sion	Fuel	Vehicle type	Emission control technology	Total fuel consumption (TJ)	CO2 Emission Factor (kg CO2/TJ)	Amount Captured (Gg CO2)	CO2 Emissions (Gg CO2)	CH4 Emission Factor (kg CH4/TJ)	CH4 Emissions (Gg CH4)	N2O Emission Factor (kg N2O/TJ)	N2O Emissions (Gg N20)		
1.A.3.d - Water-borne Navigatio     1.A.3.d.i - International wate     1.A.3.d.ii - Domestic Water-	S	Y	FΥ	VT V	ECT 🖓	С	EF(CO2)	z	CO2=C*EF (CO2)/10^6 -Z	EF(CH4)	CH4=C*EF (CH4)/10^6	EF(N2O)	N2O=C*EF (N2O)/10^6		
1.A.3.e - Other Transportation 1.A.3.e.i - Pipeline Transpor	Taxis in of		as/Diesel Oil		TWC	86000	74100		6372.6 🥑	3.9 25	the second se		0.3354 🥑		
1.A.3.e.ii - Off-road	Taxis in ot Total	ther cities   not	otor Gasoli	5-/ seat	00	66450	69300		4604 🥑	20	1.001 🥑	0	0.5316 🥑		-
.4 - Other Sectors 1.A.4.a - Commercial/Institution						152450			10977.585		1.99665		0.867		
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Category: Fuel Combustion Activities LA3.bi.1 - Light-duty trucks LA3.bi.1 - Light-duty trucks LA3.bi.1 - Light-duty trucks LA3.bi.1 - Light-duty trucks LA3.bi.2 - Passenger coms with 3/way catajots Sheet: CH4 and N2O Emissions - Tier3 Lata METHANE (CH4) METHANE (CH4	Application         Database         In           2006 IPCC Categories         -			<u>Reports</u> <u>T</u> ools uel Combustion Emission				ion - Validation					1	- 8
1.A.3.b.ii.2 - Light-duty tr 1.A.3.b.iii - Heavy-duty truck 1.A.3.b.iv - Exaporative emis 1.A.3.b.v - Exaporative emis 1.A.3.c Railways A.3.d - Water-borne Navigatio 1.A.3.d. i - International wate 1.A.3.d. i - International wate 1.A.3.e. i - Pipeline Transpor 1.A.3.e. i - Pipeline Transpor 1.A.3.e. i - Other Sectors A.4.a - Commercial/Institution       Fuel       Vehicle type       Emission control technology       Operating Conditions       CH4 Emissions (kg)       CH4 Emissions (kg)       CH4 Emissions (kg)       CH4 Emissions (kg)         3.d - Water-borne Navigatio 1.A.3.e.i - Pipeline Transpor 1.A.3.e.i - Other Sectors A.4.a - Commercial/Institution       Taxis       Motor Gasoline       5 seat       TWC-OC       Urban       100000000       0.00004       3900       170       0.00407	A.3.b - Road Transportation ⇒ 1.A.3.b.i - Cars 1.A.3.b.i.1 - Passenger c 1.A.3.b.i.2 - Passenger c	Sector Catego Subca Sheet:	r: Energy ory: Fuel Com itegory: 1.A.3.b.i. <sup>*</sup>	1 - Passenger cars with 3 N2O Emissions - Tier3									20	000
- 1.A.3.biii - Heavy-duty truck       - 1.A.3.bii - Motorcycles       - 1.A.3.bii - Motorcycles         - 1.A.3.bii - Motorcycles       - 1.A.3.bii - Motorcycles       - 1.A.3.bii - Motorcycles       - 1.A.3.bii - Motorcycles       - 1.A.3.bii - Motorcycles       - 1.A.3.bii - Motorcycles       - 1.A.3.bii - Motorcycles       - 1.A.3.bii - Motorcycles       - 1.A.3.bii - Motorcycles       - 1.A.3.bii - Motorcycles       - 1.A.3.bii - Motorcycles       - 1.A.3.bii - Motorcycles       - 1.A.3.bii - Motorcycles       - 1.A.3.bii - Motorcycles       - 1.A.3.bii - Motorcycles       - 1.A.3.bii - Motorcycles       - 1.A.3.bii - Motorcycles       - 1.A.3.bii - Motorcycles       - 1.A.3.cii - Popeline Transportation       - 0.00004	-1.A.3.b.ii.1 - Light-duty tr	Gas		V Fuel	Type (All fuels)	~								_
- 1A3.biv - Motorcycles         - 1A3.biv - Evaporative emis         - 1A3.biv - Evaporative emis         - 1A3.biv - Urea-based catal         A3.c - Railways         A3.d - Water-borne Navigatio         - 1.A3.di - International water         - 1.A3.ei - Other Transportation         - 1.A3.eii - Offeroad         - Other Sectors         A4.a - Commercial/Institution			NITROUS OXIDE (N	20)			Equation	n 3.2.5						
I.A.3.d.ii - Domestic Water-         I.A.3.d.ii - Domestic Water-         I.A.3.d.i - Domestic Water-         I.A.3.e. Other Transportation         I.A.3.e.i - Pipeline Transportation         I.A.3.e.ii - Pipeline Transportation         I.A.3.e.ii - Other Sectors         I.A.4.a - Commercial/Institution	<ul> <li>1.A.3.b.iv - Motorcycles</li> <li>1.A.3.b.v - Evaporative emis</li> <li>1.A.3.b.vi - Urea-based catal</li> <li>A.3.c - Railways</li> <li>I.A.3.d - Water-borne Navigatio</li> </ul>		Subdivision	Fuel	Vehicle type			travelled	Factor	Emissions	Emissions during warm- up			
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Image: A.3.e.i - Pipeline Transport       Image: A.3.e.i - Off-road       Image: A.4.a - Commercial/Institution       Image: A.4.a -		► Ta	axis	Motor Gasoline	5 seat	TWC-OC	Urban	100000000 🥜	0.00004	3900	170	0.00407 🥑	221	2 ×
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1A3b: Road Transportation       1A3b: Cases       2000         1A3b: Category:       La3bi: Category:       La2bi: 1 - Passenger cases with 3 way catalysts       Subcategory:       La2bi: 1 - Passenger cases with 3 way catalysts         1A3b: 1 - Light-duty trucks       1A3bi: 1 - Light-duty trucks       Subcategory:       La2bi: 1 - Passenger cases with 3 way catalysts       Subcategory:       La2bi: 1 - Passenger cases with 3 way catalysts         1A3b: 1 - Light-duty trucks       1A3bi: 1 - Light-duty truck       Fuel Type       Fuel Type       Fuel Type       Fuel Type       Passenger cases with 3 way catalysts       Subcategory:       N20       Emissions       Cases       Subcategory:       N20       Emissions       Subcategory:       N20       Emissions       Main Sub: - Use - Subsect catal       N20       Emissions       N20       Emissions       Main Sub: - Use - Subcategory:       N20       Emissions       Main Sub: - Use - Subcategory:       N20       Emissions       Main Sub: - Use - Subcategory:       N20       Emissions       Main Sub: - Use - Sub: - Subcategory:       N20       Emissions       Main Sub: - Use - Sub: - Sub	2006 IPCC Categories 🚽 👎			uel Combustion Emission	CH4 and N2O	Emissions - Tier 3	Fuel Consumption	- Validation					
-1A3bii 1- Light-duty tr         -1A3bii 2- Light-duty tr         -1A3bii - Heavy-duty truck         -1A3bii - Heavy-duty truck         -1A3bii - Heavy-duty truck         -1A3bii - Vevaporative emis         -1A3bii - Vevaporative emis         1A3bii - Urea-based catal         1A3c - Railways         1A3d Nater-borne Navigatio         -1A3dii - International wate         -1A3dii - International wate         -1A3dii - Pipeline Transport         -1A3eii - Off-road         4 - Other Sectors	<ul> <li>1.A.3.b.i - Cars</li> <li>1.A.3.b.i.1 - Passenger c</li> <li>1.A.3.b.i.2 - Passenger c</li> </ul>	Sect Cate Sub Shee	egory: Energy egory: Fuel Com ocategory: 1.A.3.b.i. cet: CH4 and	.1 - Passenger cars with 3-	-way catalysts								2000
-1A3.biii - Heavy-duty truck         -1A3.biii - Meavy-duty truck         -1A3.biii - Meavy-duty truck         -1A3.bii - Viea-based catal         1A3.c - Railways         1A3.d Railways         1A3.d International wate         -1A3.dii - International wate         -1A3.eii - Other Transportation         -1A3.eii - Pipeline Transportation         -1A3.eii - Other Sectors	- 1.A.3.b.ii.1 - Light-duty tr	Ga	NITROUS OXIDE (N	N2O) - <b>Fuel</b> T	(All fuels)	,	~						
-1.A.3.b.v - Motorcycles         -1.A.3.b.v - Evaporative emis         -1.A.3.b.v - Evaporative emis         1.A.3.b.v - Urea-based catal         1.A.3.b.v - Urea-based catal         1.A.3.b.v - Urea-based catal         1.A.3.c - Railways         1.A.3.d Water-borne Navigatio         -1.A.3.d.i - International wate         -1.A.3.d.i - International wate         -1.A.3.d.i - Other Transportation         -1.A.3.e.i - Off-road         -1.A.3.e.i - Off-road         -1.A.3.e.i - Off-road         -4 - Other Sectors						v	Equation 3	.2.5		16		<i></i>	
1.A.3.e - Other Transportation       1.A.3.e.i - Pipeline Transport         1.A.3.e.i - Pipeline Transport       1.A.3.e.i - Off-road         1.A.3.e.ii - Off-road       Image: Contract of the sectors         4 - Other Sectors       100000000	- 1.A.3.b.iv - Motorcycles - 1.A.3.b.v - Evaporative emis - 1.A.3.b.vi - Urea-based catal 1.A.3.c - Railways 1.A.3.d - Water-borne Navigatio - 1.A.3.d.i - International wate		Subdivision	Fuel	Vehicle type			travelled	Factor	Emissions	Emissions during warm- up		
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2006 IPCC Categories 🚽 💂	Fuel Consumption Data Fu	el Combustion Emissions	CH4 and N2O Emis	ssions - Tier 3 Fuel	Consumption	- Validation						
I.A.3.a.ii - Domestic Aviatio     A.3.b - Road Transportation     1.A.3.b.i - Cars     I.A.3.b.i - Cars     I.A.3.b.i.2 - Passenger c     I.A.3.b.i.2 - Passenger c	Subcategory: 1.A.3.b.i.1	bustion Activities 1 - Passenger cars with 3-wa sumption - Validation	y catalysts								200	00
⊟ 1.A.3.b.ii - Light-duty trucks 1.A.3.b.ii.1 - Light-duty tr	Data Fuel Type (All fuels)	~										
					Equation 3	.2.6						
<ul> <li>1.A.3.b.iv - Motorcycles</li> <li>1.A.3.b.iv - Evaporative emis</li> <li>1.A.3.b.vi - Urea-based catal</li> <li>1.A.3.c - Railways</li> <li>1.A.3.d - Water-borne Navigatio</li> <li>1.A.3.d.i - International wate</li> </ul>	Subdivision	Fuel	Vehicle type	Road type	Number of vehicles	Distance travelled (km)	Consumption (I/km)	Total fuel consumption (I)	Conversion Factor (Gg/I)	Total fuel consumption (Gg)		
1.A.3.d.ii - Domestic Water-	7	7 🗸 🗸	V	7	A	В	C	D=B*C	E	F=D*E		
1.A.3.e - Other Transportation	Maxis	Gas/Diesel Oil	5 seat	Urban	1	100000	0.8	80000	7.5E-07	0.06	2 🖬 🤈	X
1.A.3.e.i - Pipeline Transpor A.3.e.ii - Off-road	*											
4 - Other Sectors	Total				1	100000	0.8	80000		0.06		_





Tier 1, 2, 3 are implemented via 3 worksheets

- Fuel Consumption Data: the amount of fuel consumed for each [fuel/locomotive type], either entered directly, or calculated via Equation 3.4.5 based on the number of locomotives, specific fuel consumption and number of days in operation
- Fuel Combustion Emissions: EFs and pollutant weighting factors for each [fuel/locomotive type], calculation of emissions
- CH<sub>4</sub> and N<sub>2</sub>O emissions Tier 3: used for Tier 3 estimations of methane and nitrous oxide considering the fuel, locomotive type, number of locomotives, annual hours of use, rated power of locomotive and load factor of locomotive





#### Railways

🍪 IPCC Inventory Software -	- user - [Worksheets]											ť	7	Х
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2006 IPCC Cat. ▼ 7 1.A.3.b.vi - ↑ 1.A.3.c - Railwa □- 1.A.3.d - Water- □- 1.A.3.d - Int □- 1.A.3.d.i - Int □- 1.A.3.e - Other	Subcategory: 1.A.3.c - 1 Sheet: CH4 and Data	bustion Activities		nissions - Tie	ir 3								200	0
	Fuel Type (All fuels)	~				Equation 3.4.3								
- 1.A.4 - Other Sector									CH4		N2O			
9 • - 1.A.4.b - Reside ⊡- 1.A.4.c - Agricult - 1.A.4.c.i - St	Subdivision	Locomotive type	Fuel	Number of locomotive s	Annual hours of use (hours)	Average rated power of locomotive (kW)	lypical load factor of locomotive (Fraction)	CH4 Emissi on Factor	CH4 Emissions (Gg CH4)	N2O Emissi on Factor	N2O Emissions (Gg N20)			
1.A.4.c.ii - 0 1.A.4.c.iii - F	S 7	7 LT T	F 7	7 N	н	Р	LF	EF (CH4)	CH4=N*H*P*LF*EF (CH4)/10^6	EF (N2O)	N2O=N*H*P*LF*EF (N2O)/10^6			
I A.5 - Non-Specifie I A.5.a - Station R I A.5.b - Mobile	North-Central Rail	EMD SD-40	Diesel for trains	50 🥑	6000	2247	0.9	0.004	2.42676 🥑	0.013	7.88697 🥑	2	19	X
1.A.5.b.i - M	Total			50	6000				2.42676		7.88697			
1A56														



#### **Off-road transportation**

Tier 1, 2, 3 are implemented via 3 worksheets

- Fuel Consumption Data: the amount of fuel consumed for each [fuel/vehicle/equipment type]
- **Fuel Combustion Emissions:** EFs for each [fuel/vehicle/equipment type], calculation of emissions
- CH4 and N2O emissions Tier 3: used for Tier 3 estimations of methane and nitrous oxide considering the fuel, vehicle type, number of vehicles, annual hours of use, rated power of vehicle and load factor of vehicle





#### **Off-road transportation**

Application Database In	ventory <u>Y</u> ear <u>W</u> orksheets	s <u>R</u> eports <u>T</u> oo	ls Export/ <u>I</u> mport	Ad <u>m</u> inistr	ate <u>W</u> indow	<u>H</u> elp						-
6 IPCC Categories 🚽 🖡	Fuel Consumption Data   Worksheet	Fuel Combustion Em	issions CH4 and N2	O Emissions	- Tier 3							
1.A.3.b - Road Transportat □ 1.A.3.b.i - Cars □ 1.A.3.b.i.1 - Passe □ 1.A.3.b.i.2 - Passe □ 1.A.3.b.ii - Light-duty tr	Subcategory: 1.A.3.e.	mbustion Activities ii - Off-road d N2O Emissions - Ti	er 3									200
1.A.3.b.ii.1 - Light-	Fuel Type Liquid Fuels		V Uncertaintie	es for Liquid Fi	uels							
						Equation 3.3.	3					
-1.A.3.b.iv - Motorcycle								(	CH4	1	N2O	
1.A.3.b.v - Evaporative 1.A.3.b.vi - Urea-base 1.A.3.c - Railways	Subdivision	Vehicle type	Fuel	Source populatio n	Annual hours of use (hours)	Average rated power of vehicle (kW)	lypical load factor of vehicle (Fraction)	CH4 Emission Factor (kg CH4/TJ)	CH4 Emissions (Gg CH4)	N2O Emission Factor (kg N2O/TJ)	N2O Emissions (Gg N20)	5 16
I.A.3.d - Water-borne Nav 1.A.3.d.i - International 1.A.3.d.ii - Domestic W	S 7	LT V	F 1	7 N	Н	P	ŀF	EF(CH4)	CH4=N*H*P*LF* EF(CH4)/10^6	EF(N2O)	N2O=N*H*P*L F*EF (N2O)/10^6	
1.A.3.e - Other Transporta	Industry	Forklifts	Motor Gasoline	100 🥑	2000	5	0.8	130	104 🧹	4		329
1.A.3.e.i - Pipeline Tra 1.A.3.e.ii - Off-road	Forestry	Chainsaw	Motor Gasoline	1000 🥑	3000	1.3	0.9	250	877.5 🥑	1	3.51 🧹	and the owner of the owner, where the ow
1.A.3.6.11 - Oll-Todu	*			6					1		1	2
- Other Sectors	Total											

WMO UNEP

#### Fugitive – Solid – Abandoned mines

Tier 1, 2, 3 are implemented via 2 worksheets

- CH<sub>4</sub> Emissions From Abandoned Coal Mines: counts for Tier 1 emissions based on time from closure, number of mines and fraction of gassy mines
- CH<sub>4</sub> Emissions From Abandoned Coal Mines Tier 2&3: counts for Tier 2 and 3 methane emissions

IPCC Inventory Soft	ware	e - user - [Work	(sheets]													15
Application D	atab	ase Invento	ry <u>Y</u> ear	<u>W</u> orksheets	Reports	<u>T</u> ools Expo	ort/ <u>I</u> mport	Ad <u>m</u> inistrate	Winde	ow <u>H</u> e	lp					
🏟 IP 2006 IPCC Cat 👻 🛱		CH4 Emissions	s From Aba	ndoned Coal M	ines CH4 E	Emissions Fro	m Abandone	ed Coal Mines - T	ier 2 & 3							
💀 A.5.b.ii - Mobile (wate 🔥		Worksheet														
2006 A.5.b.iii - Mobile (Oth		Sector:	Energy													
c - Multilateral Operat		Category:	Fugitive	e Emissions from	Fuels - Solid I	Fuels										
emissions from fuels		Subcategory:	: 1.B.1.a	i.3 - Abandone	d underground	mines										
1.A.5 lid Fuels		Sheet:	CH4 en	nissions from ab	andoned unde	erground coal n	nines - Tier 2	2 & 3								
gitives - Coal mining and h		Data														
1 - SB.1.a.i - Underground	Ш							l	Equation	4.1.11, 4.1	1.12, 4.1.13					
1.B.1 1.B.1.a.i.1 - Mining □-1 1.B.1.a.i.2 - Post-mi 1.B.1.a.i.3 - Abando 1.B.1.a.i.4 - Flaring		Subdivision	Region / Basin	Closure Interval	Coal rank	Number of abandoned mines	Fraction of Gassy Coal	Average emission rate before abandonment	Coeffici entA	Coeffici ent b	Years elapsed since abandonment and inventory	Emission Factor	Conversion Factor (Gg	Methane Emissions (Gg CH4)	Methane recovered (Gg CH4)	Methane emissions to be reported
B.1.a.ii - Surface min							Mines	(m3/Year)			year		CH4/m3)			(Gg CH4)
		s 🗸	B 7	CI 🖓	CR 🖓	N	G	ER	A	b	т	EF= (1+A*T)^b	CF	E=N*G*ER* EF*CF	Methane recovered (Gg CH4)	ER=E-R
1.B.1 1.B.1 1.B.1 - Solid fuel transfor		Mid-cent	West	1951 - 1975	Anthracite	100 🥑	0.9	1000000	1.72	-0.58	25	0.11138	0	67.16063		67.16063 🥑
1.B.1 and Natural Gas		New	East	1976 - 2000	Bituminous	120 🥑	0.95	18800000	3.72	-0.42	5	0.28658	0	411.51906	110	301.51906 🥑
1.B.2a - Oil		*				3										6
1B.2.a.i - Venting		Total														
<sup>1</sup> B.2.a.ii - Flaring						220								478.67969		368.67969

### Fugitive – Oil – Venting

Tier 1 and 2 are implemented via 3 worksheets

- Activity Data: amount of oil production for each [subdivision/industry segment/subcategory], selection of calculation method Tier 1 or 2. This information transfers to "Flaring" category automatically and vice-versa
- Emissions Tier 1: CO<sub>2</sub> and CH<sub>4</sub> emissions for Tier 1 for each [subdivision/industry segment/subcategory]
- Emissions Tier 2: CO<sub>2</sub> and CH<sub>4</sub> emissions for Tier 2 for each [subdivision/industry segment/subcategory] based on the molecular weight and fraction of associated gas

😻 IPCC Inventory Software - user - [Worksheets]

Application Database Inventory Year Worksh	ets <u>R</u> eports <u>T</u> ools	Export/ <u>I</u> mport Ad <u>m</u> i	nistrate <u>W</u> ind	ow <u>H</u> elp					
2006 IPCC Categories - 4 Activity Data Emissio	ns - Tier 1 Emissions - Tier	12							
1.B.1.a.ii - Surface mines     Sector:     Ene	rgy tive Emissions from Fuels - Oil								
including a second s	2.a.i - Venting								
	vity Data								
1.B.1.c - Solid fuel transformatio Data									
3.2 - Oil and Natural Gas									
1.B.2.a - Oil									(I
1.B.2.a.i - Venting				Total annual	Average gas-	Gas	Fraction of		And the second
1.B.2.a.ii - Flaring Subdivision	Industry Segment	Subcategory	Calculation method	oil production / Activity	to-oil ratio	conservation efficiency	waste gas	Total gas vented (10 <sup>^</sup> 3 m3)	Total gas flared (10^3 m3)
- 1.B.2.a.iii - All Other - 1.B.2.a.iii.1 - Exploration			meanod	(10 <sup>4</sup> 3 m3)	(m3/m3)	factor	flared	(10 5 113)	(10 5 115)
- 1.B.2.a.iii.2 - Production									
- 1.B.2.a.iii.3 - Transport	7	7 5	- 7	Q/A	GOR	CE		V=Q*GOR*(1- CE)*(1-X)	F=Q*GOR*(1- CE)*X
1.B.2.a.iii.4 - Refining	Well Testing	All	Tier 1	1000 🥑				OL) (1-A)	UL/ A
- 1.B.2.a.iii.5 - Distribution Central production	-	Conventional Oil	Tier 2	2000	120	0.5	0.9	12000	108000
1.B.2.a.iii.6 - Other	Tia On Production	Conventional OII	Tier 2	and the second se	120	U.D	0.5	12000	100000
1.B.2.b - Natural Gas				<u>ď</u>					
- 1.B.2.b.i - Venting Total			$\underline{}$						
1.B.2.b.ii - Flaring				3000				12000	108000

#### Fugitive – Oil – Venting

IPCC Inventory Software - user - [Worksheets]

🛃 Application Database	Invento	ory Year	Worksheets	Reports	Tools	Export/Import	Administr	ate Window	Help	)			
2006 IPCC Categories 🛛 👻 👎			Emissions - T	ier 1 Emi	ssions - Ti	er 2							
		orksheet	-										
⊟ 1.B.1.a.ii - Surface mines		ector:	Energy										
1.B.1.a.ii.1 - Mining		ategory:		missions fro	m Fuels - C								
1.B.1.a.ii.2 - Post-minin		ubcategory		-									
1.B.1.b - Uncontrolled combusti		heet:	Emissions	- Tier 1									
1.B.1.c - Solid fuel transformatio		Data			-								
8.2 - Oil and Natural Gas	G		ON DIOXIDE (C										
1.B.2.a - Oil			ON DIOXIDE (C	02)		)			Equati	ion 4.2.1			
1.B.2.a.i - Venting		METHA	ANE (CH4)				_		Equal	1011 4.2.1			
1.B.2.a.ii - Flaring													
⊟ 1.B.2.a.iii - All Other										Activity	C	CO2 Emission Factor	CO2 Emissions
- 1.B.2.a.iii.1 - Exploration		2	ubdivision		Indu	stry Segment		Subcategory		(10 <sup>3</sup> m3)		(Gg/10^3 m3)	(Gg CO2)
- 1.B.2.a.iii.2 - Production													
- 1.B.2.a.iii.3 - Transport													
···· 1.B.2.a.iii.4 - Refining				Y			7		$\nabla$	A		EF	E=A*EF
- 1.B.2.a.iii.5 - Distribution		Upstream	n i	V	Vell Testin	g	All			10	00	0.0053	5.3 🥑
1.B.2.a.iii.6 - Other	T	Total											
1.B.2.b - Natural Gas										10	00		5.3
1.B.2.b.i - Ventina													

IPCC Inventory Software - user - [Worksheets]



## Fugitive – Oil – Flaring

Tier 1 and 2 are implemented via 5 worksheets

- Activity Data: amount of oil production for each [subdivision/industry segment/subcategory], selection of calculation method Tier 1 or 2. This information transfers to "Venting" category automatically and vice-versa
- Emissions Tier 1: CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O emissions for Tier 1 for each [subdivision/industry segment/subcategory]
- CH<sub>4</sub> Emissions Tier 2: CH<sub>4</sub> emissions for Tier 2 for each [subdivision/industry segment/subcategory] based on the flaring destruction efficiency, molecular weight and fraction of associated gas
- CO<sub>2</sub> Emissions Tier 2: CO<sub>2</sub> emissions for Tier 2 for each [subdivision/industry segment/subcategory] based on the molecular weight, fraction of associated gas and fraction of non-CO<sub>2</sub> carbon of waste gas
- N<sub>2</sub>O Emissions Tier 2: N<sub>2</sub>O emissions for Tier 2 for each [subdivision/industry segment/subcategory] based on the nitrous oxide EF



#### Fugitive – Oil – Flaring

(i) IPCC Inventory Software - user - [Worksheets]

Application Database In	ventory <u>Y</u> ear	<u>W</u> orksheets	<u>R</u> eports <u>T</u> ools	Export/Import	Ad <u>m</u> inistrate	Window He	elp				
2006 IPCC Categories 🚽 📮	Activity Data	Emissions - Tier	r 1 CH4 Emission	s - Tier 2 CO2 Em	issions - Tier 2	N2O Emissions	- Tier 2				
I.B.1.a.i.4 - Flaring of dr     I.B.1.a.ii - Surface mines     I.B.1.a.ii Mining     I.B.1.a.ii.2 - Post-minin     I.B.1.b - Uncontrolled combusti     I.B.1.c - Solid fuel transformatio     J.2 - Oil and Natural Gas	Worksheet Sector: Category: Subcategor Sheet: Data		-	đ							
1.B.2.a - Oil 1.B.2.a.i - Venting 1.B.2.a.ii - Flaring 1.B.2.a.iii - All Other 1.B.2.a.iii 1 - Exploration	Su	ubdivision	Industry Segment	Subcategory	Calculation method	Total annual oil production / Activity (10^3 m3)	Average gas-to -oil ratio (m3/m3)	Gas conservation efficiency factor	Fraction of waste gas flared	Total gas vented (10^3 m3)	Total gas flared (10^3 m3)
- 1.B.2.a.iii.2 - Production 1.B.2.a.iii.3 - Transport			v v	V	V	Q/A	GOR	CE	x	V=Q*GOR*(1- CE)*(1-X)	F=Q*GOR*(1- CE)*X
1.B.2.a.iii.4 - Refining 1.B.2.a.iii.5 - Distribution	Upstrea	m	Well Testing	All	Tier 1	1000 🥑					
1.B.2.a.iii.6 - Other	Central	production facility	Oil Production	Conventional Oil	Tier 2	2000 🥳	120	0.5	0.9	12000	108000
1.B.2.b - Natural Gas	*					<u> </u>					
1.B.2.b.i - Venting	Total				$\overline{}$	2000				10000	100000
						3000				12000	108000

🕲 IPCC Inventory Software - user - [Worksheets]

entory <u>Y</u> ear <u>W</u> orksheets <u>R</u> eports	<u>T</u> ools Export/ <u>I</u> mport	Ad <u>m</u> inistrate <u>W</u> indow <u>H</u> e	lp				
-	14 Emissions - Tier 2 CO2 Emis	ssions - Tier 2 N2O Emissions -	Tier 2				
Sector: Energy	rom Fuels - Oil						
CARBON DIOXIDE (CO2)							
NITROUS OXIDE (N2O)				CH4 Emission Factor	CH4 Emissions		
Subdivision	Industry Segment	Subcategory	(10 <sup>4</sup> 3 m3)	(Gg/10^3 m3)	(Gg CH4)		
$\bigtriangledown$	V	V	A	EF	E=A*EF		
▶ Upstream	Well Testing	All	1000	0.000165	0.165 🥑		
Total							
			1000		0.165		
	Activity Data Emissions - Tier 1 CH Worksheet Sector: Energy Category: Fugitive Emissions fr Subcategory: 1.B.2.a.ii - Flaring Sheet: Emissions - Tier 1 Data Ga METHANE (CH4) CARBON DIOXIDE (CO2) METHANE (CH4) NITROUS OXIDE (N2O) Subdivision	Activity Data Emissions - Tier 1 CH4 Emissions - Tier 2 CO2 Emis Worksheet Sector: Energy Category: Fugitive Emissions from Fuels - Oil Subcategory: 1.8.2.a.ii - Flaring Sheet: Emissions - Tier 1 Data Gate METHANE (CH4) CARBON DIOXIDE (CO2) METHANE (CH4) NITROUS OXIDE (N2O) Subdivision Industry Segment V V	Activity Data Emissions - Tier 1 CH4 Emissions - Tier 2 CO2 Emissions - Tier 2 N2O Emissions - Worksheet Sector: Energy Category: Fugitive Emissions from Fuels - Oil Subcategory: 1.8.2.a.ii - Flaring Sheet: Emissions - Tier 1 Data Gate METHANE (CH4) CARBON DIOXIDE (CO2) METHANE (CH4) VITROUS OXIDE (N2O) Subdivision Industry Segment Subcategory Upstream Well Testing All	Activity Data Emissions - Tier 1 CH4 Emissions - Tier 2 CO2 Emissions - Tier 2 N2O Emissions - Tier 2 Worksheet Sector: Energy Category: I.B.2.a.ii - Raring Sheet: Emissions - Tier 1 Data Gate METHANE (CH4) CARBON DIOXIDE (CO2) METHANE (CH4) NITROUS OXIDE (N2O) Subdivision Industry Segment Subcategory Activity (10 <sup>4</sup> 3 m3) V A Upstream Well Testing All 1000 Total	Activity Data Emissions - Tier 1 CH4 Emissions - Tier 2 CO2 Emissions - Tier 2 N2O Emissions - Tier 2 Worksheet Sector: Energy Category: Fugitive Emissions from Fuels - Oil Subcategory: 1.8.2.a.ii - Plaring Sheet: Emissions - Tier 1 Data CARBON DIOXIDE (CO2) METHANE (CH4) CARBON DIOXIDE (CO2) Subdivision Industry Segment Subcategory Activity (10^3 m3) CH4 Emission Factor (Gg/10^3 m3) CH4 Emission Factor (Gg/10^3 m3) Total		

#### Fugitive – Oil – Flaring

IPCC Inventory Software - user - [Worksheets]

IPCC Inventory Software	ware - user - [V	Vorksheets]							_			
Application Da	atabase Inve	entory <u>Y</u> ear <u>W</u> orksheets <u>R</u> eports	<u>T</u> ools Export/ <u>I</u> mpor	rt Ad <u>m</u> inistrate <u>W</u> in	ndow <u>H</u> elp	0						
2006 IPCC Categories		The second s	4 Emissions - Tier 2 CO2	2 Emissions - Tier 2 N2O	Emissions - T	ier 2						
	mines ning st-minin combusti	Worksheet Sector: Energy Category: Fugitive Emissions fm Subcategory: 1.B.2.a.ii - Flaring Sheet: CH4 Emissions - Tier Data										
8.2 - Oil and Natural Gas	Equation 4.2.4											
1.B.2.a - Oil 1.B.2.a.i - Venting 1.B.2.a.ii - Flaring □ 1.B.2.a.iii - All Other 1.B.2.a.iii.1 - Exp		Subdivision	Industry Segment Subca	Total gas flared (10^3 m3)	Flaring des efficier			CH4 Emissions (Gg CH4)				
() IPCC Inventory Sol	ftware - user -	[Worksheets]										
Application	<u>D</u> atabase Ir	nventory <u>Y</u> ear <u>W</u> orksheets <u>R</u> e	ports <u>T</u> ools Export	t/ <u>I</u> mport Ad <u>m</u> inistrat	e <u>W</u> indow	v <u>H</u> elp						
2006 IPC 🚽 📮	Activity Data	Emissions - Tier 1 CH4 Emission	s - Tier 2 CO2 Emission	ns - Tier 2 N2O Emissi	ons - Tier 2							
	Worksheet											
⊟-1.B.1.a.ii -	Sector: Energy											
- 1.B.1.a.i	Category: Fugitive Emissions from Fuels - Oil											
- 1.B.1.a.i	Subcategory: 1.B.2.a.ii - Flaring											
1.B.1.b - Uncon	Sheet:	N2O Emissions - Tier 2										
1.B.1.c - Solid f	Data											
.2 - Oil and Natu	Equation 4.2.8											
1.B.2.a - Oil												
		Subdivision	Industry Segment	Subcategory		Total gas flared (10^3 m3)	N2O Emission Factor (Gg/10^3 m3)	N2O Emissions (Gg N2O)				
- 1.B.2.a.i												
- 1.B.2.a.i 1.B.2.a.i		P	7	V	V	F	EF	E=F*EF				
- 1.B.2.a.i	Central	production facility	Oil Production	Conventional Oil		108000	0.0003	32.4 🥑				
1.B.2.a.i	Total							Announced 100				
1.B.2.a.i						108000	)	32.4	4			
1 B 2 h - Natura									_			



# Thank you

#### https://www.ipcc-nggip.iges.or.jp/index.html

