



# OVERVIEW OF F-GAS INVENTORIES IN INDONESIA

Ministry of Environment and Forestry  
Republic of Indonesia

# OUTLINE

1. Institutional arrangements for GHG inventory as general
2. The current F-gases inventory
3. Identified gaps and challenges in preparing the F-gases inventory, including the effort to address them
4. Future plans for sources that have not been covered previously



# Institutional Arrangement for GHG Inventory

Sector/Categories	Sub sectoral Responsible Units
<b>A. GHG Emissions from Energy</b>	
<b>Coordinator:</b>	
Ministry of Energy and Mineral Resources (MEMR) - Centre for Data and Information Technology	
Reference Approach	Centre for Data and Information Technology-MEMR
Electricity generation	Centre for Data and Information Technology-MEMR
Oil and gas ( <i>Fuel + Fugitive</i> )	Centre for Data and Information Technology-MEMR
Coal mining ( <i>Fuel + Fugitive</i> )	Centre for Data and Information Technology-MEMR
Transportation	Centre for Sustainable Transportation Management - Ministry of Transportation (MoT)
Energy industry	Centre for Data and Information Technology-MEMR Centre for Research and Development of Green Industry and Environment- Ministry of Industry (MoI)
Energy in commercial areas	Centre for Data and Information Technology-MEMR
Energy in residential areas	Centre for Data and Information Technology-MEMR
<b>B. GHG Emissions from Industrial Processes and Products Use (IPPU)</b>	
<b>Coordinator:</b>	
Ministry of Industry (MoI)- Centre for Research and Development of Green Industry and Environment	
Industrial processes	Centre for Research and Development of Green Industry and Environment-MoI and Centre for Data and Information-MoI
Products use	Directorate for Industrial Statistics-National Bureau of Statistics of Indonesia (BPS) Centre for Data and Information Technology-MoI



# Institutional Arrangement for GHG Inventory.....(2)

## C. GHG Emissions from Waste Management

**Coordinator:** Ministry of Environment and Forestry (MoEF)—Directorate of Waste Management

<b>Municipal Solid Waste (MSW)</b>	Directorate for Waste Management-MoEF
	Directorate for Development of Environmental Sanitation and Housing-Ministry of Public Works and Housing (MPWH)
<b>Domestic wastewater</b>	Directorate for Water Pollution Control-MoEF
	Directorate for Development of Environmental Sanitation and Housing-MPWH
	Centre for Research and Development of Housing and Settlement-MPWH
<b>Industrial solid waste (including pharmaceutical waste)</b>	Directorate for Management of Hazardous Waste-MoEF
	Centre for Research and Development of Green Industry and Environment-Mol
	Centre for Data and Information-Mol
	Directorate of Statistical Industry-BPS
<b>Industrial Wastewater</b>	Secretariat for the Directorate General Control of Pollution and Environmental Damage-MoEF, Directorate for Performance Appraisal of Hazardous Waste Management-MoEF
	Centre for Research and Development of Green Industry and Environment-Mol
	Centre for Data and Information-Mol, Directorate for Beverage, Tobacco, and Refreshment Industry-Mol, Directorate for Food, Marine and Fishery Products Industry-Mol
	Directorate of Statistical Industry-BPS



# Institutional Arrangement for GHG Inventory.....(3)

<b>D. GHG Emissions from Agriculture</b>	
<b>Coordinator:</b> Ministry of Agriculture (MoA)— Planning Bureau	
<b>Livestock</b>	Directorate General for Animal Husbandry and Health, Centre for Data and Information, Planning Bureau, Centre for Livestock Research and Development, Agency for Research in Agriculture Environment-MoA Directorate for Animal Husbandry, Fisheries, and Forestry-BPS
<b>Aggregate Sources and Non CO<sub>2</sub> Emissions</b>	Directorate General for Crops, Directorate General for Agricultural Infrastructure and Facilities, Directorate General for Horticulture, Directorate General for Plantation, Centre for Data and Information, Planning Bureau, Centre for Agricultural Land Resources, Agency for Research in Agriculture Environment -- MoA Directorate for Statistics on Crops, Horticulture and Estate-- Statistics Indonesia (BPS)
<b>D. GHG Emissions from Forestry and Other Land Uses</b>	
<b>Coordinator :</b> Ministry of Environment and Forestry (MoEF)— Directorate of GHG Inventory and MRV	
<b>Forestry and Other Land Uses</b>	Directorate General for Sustainable Production Forest Management, Centre for Data and Information, Directorate for Forest Resources Inventory and Monitoring, Centre for Research and Development on Social Economy Policy and Climate Change, Centre for Forestry Research and Development, Directorate for Peat Damage Control -- MoEF Centre for Agricultural Land Resources --MoA Deputy for Thematic Geospatial Information -- Geospatial Information Agency Remote Sensing Application Centre, Deputy for Remote Sensing-- National Institute of Aeronautics and Space ( <i>LAPAN</i> )



# Current F-gases Inventory

- F-gases (CF<sub>4</sub>, and C<sub>2</sub>F<sub>6</sub>) have been estimated only for aluminium production, Source : Indonesian 2<sup>nd</sup> BUR (2018)

Categories	Total 3 Gases	Net CO <sub>2</sub> (1) (2)	CH <sub>4</sub>	N <sub>2</sub> O	NO <sub>x</sub>	CO	NMVOCS	SO <sub>2</sub>	HFCs	PFCs	SF <sub>6</sub>	Other halogenated gases with CO <sub>2</sub> equivalent conversion factors (3)	Other halogenated gases without CO <sub>2</sub> equivalent conversion factors (4)
CO <sub>2</sub> equivalents (Gg)													
2B3 Adipic Acid Production	0	NO	NO	NO	NO	NO	NO	NO					
2B4 Caprolactam, Glyoxal and Glyoxylic Acid Production	0	NE	NE	NE	NO	NO	NO	NO					
2B5 Carbide Production	25	25	NE	NE	NO	NO	NO	NO					
2B6 Titanium Dioxide Production	0	NE	NE	NE	NO	NO	NO	NO					
2B7 Soda Ash Production	0	NE	NE	NE	NO	NO	NO	NO					
2B8a Methanol	292	259	33	NE	NO	NO	NO	NO					
2B8b Ethylene	1,783	1,734	49	NE	NO	NO	NO	NO					
2B8c Ethylene dichloride and VCM	395	394	1	NE	NO	NO	NO	NO					
2B8f Carbon Black	219	219	0	NE	NO	NO	NO	NO					
2B9 Fluorochemical Production					NO	NO	NO	NO	NE	NE	NE	NE	NE
2B10 Other (please specify)	0	NE	NE	NE	NO	NO	NO	NO	NE	NE	NE	NE	NE
<b>2C Metal Industry</b>	<b>8,732</b>	<b>8,732</b>	<b>0</b>	<b>NE</b>	<b>NO</b>	<b>NO</b>	<b>NO</b>	<b>NO</b>		<b>48</b>			
2C1 Iron and Steel Production	8,196	8,196	0	NE	NO	NO	NO	NO					
2C2 Ferroalloys Production	0	NE	NE	NE	NO	NO	NO	NO					
2C3 Aluminium Production	393	393	NE		NO	NO	NO	NO		<b>48</b>			
2C4 Magnesium Production	0	NE			NO	NO	NO	NO	NE	NE	NE	NE	NE
2C5 Lead Production	74	74			NO	NO	NO	NO					
2C6 Zinc Production	69	69			NO	NO	NO	NO					
2C7 Other (please specify)	0	NE	NE	NE	NO	NO	NO	NO	NE	NE	NE	NE	NE



# Identified Sources of F-Gases

Industrial Process and Product Use (IPPU)	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	HFCs	PFCs	SF <sub>6</sub>	Other Hallogenated
<b>2A. Mineral Industry</b>							
2A1 Cement production	X	*					
2A2: Lime production	X	*					
2A3: Glass production	X	*					
2A4: Other Process Uses of Carbonates							
2A4a: Ceramic	X	*					
2A4b: Other uses of soda ash	X	*					
2A4c: Non-Metallurgical Magnesia Production	X	*					
2A4d: Other	X	*					
2A5: Other	X	*	*				
<b>2B. Chemical Industry</b>							
2B1: Ammonia Production	X	*	*				
2B2: Nitric Acid Production	*	*	X				
2B3: Adipic Acid Production			X				
2B4: Caprolactam, Glyoxal and Glyoxylic Acid Production	*	*	X				
2B5: Carbide Production	X	x	*				
2B6: Titanium Dioxide Production	X	*	*				
2B7: Soda Ash Production	X	*	*				
2B8: Petrochemical and Carbon Black Production							
2B8a: Methanol	X	x	*				
2B8b: Ethylene	X	x	*				
2B8c: Ethylene Dichloride and VCM	X	x	*				
2B8d: Ethylene Oxide	X	x	*				
2B8e: Acrylonitrile	X	x	*				
2B8f: Carbon Black	X	x	*				
2B9: Fluorochemical Production							
2B9a: By-product Emission				X	x	x	X
2B9b: Fugitive Emission				X	x	x	X
2B10: Other	*	*	*	*	*	*	*

‘X’ denotes gases for which methodological guidance is provided in this volume.

‘\*’ denotes gases for which emissions may occur but for which no methodological guidance is provided in this volume.





# Identified Sources of F-Gases.....(2)

Industrial Process and Product Use (IPPU)	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	HFCs	PFCs	SF <sub>6</sub>	Other Hallogenated
<b>2C. Metal Industry</b>							
2C1: Iron and Steel Production	X	x	*				
2C2: Ferroalloys Production	X	x	*				
2C3: Aluminium Production	X	*			x		
2C4: Magnesium Production	X			X	x	x	X
2C5: Lead Production	X						
2C6: Zinc Production	X						
2C7: Other	*	*	*	*	*	*	*
<b>2D. Non-Energy Products from Fuels and Solvent Use</b>							
2D1: Lubricant Use	X						
2D2: Paraffin wax Use	X	*	*				
2D3: Solvent use							
2D4: Other	*	*	*				
<b>2E. Elektroniks Industry</b>							
2E1: Integrated Circuit/Semiconductor	*		*	X	x	x	X
2E2: TFT Flat Panel Display				X	x	x	X
2E3: Photovoltaics				X	x	x	X
2E4: Heat Transfer Fluid							X
2E5: Other	*	*	*	*	*	*	*
<b>2F. Product Uses as Substitutes for ODS</b>							
2F1: Refrigeration and AC							
2F1a: Refrigeration and Stationary AC	*			X	x		*
2F1b: Mobile AC	*			X			*
2F2: Foam Blowing Agents	*			X	x		*
2F3: Fire Protection	*			X	x		*
2F4: Aerosols				X	x		*
2F5: Solvents				X	x		*
2F6: Other applications	*	*	*	X	x		*

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# Identified Sources of F-Gases.....(3)

Industrial Process and Product Use (IPPU)	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O	HFCs	PFCs	SF <sub>6</sub>	Other Hallogenated
<b>2G. Other Product Manufacture and Use</b>							
2G1: Electrical Equipment							
2G1a: Manufacture of Electrical Equipment					X	X	*
2G1b: Use of Electrical Equipment					X	X	*
2G1c: Disposal of Electrical Equipment					X	X	*
2G2: SF <sub>6</sub> /PFCs From Other Product Use							
2G2a: Military Applications					*	X	*
2G2b: Accelerators					*	X	*
2G2c: Other					X	X	*
2G3: N <sub>2</sub> O From Product Use							
2G3a: Medical Applications			X				
2G3b: Propellant for Pressure and Aerosol			X				
2G3c: Other			X				
2G4: Other	*	*		*			*
<b>2H Other</b>							
2H1: Pulp and paper Industry	*	*					
2H2: Food and Beverages Industry	*	*					
2H3: Other	*	*	*				

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# Gap/Challenge in Preparing the F-gases Inventory

## The availability of Activity Data to estimate the GHG emissions from Product Uses as Substitutes for ODS

*All ODS used in Indonesia is imported. The import ODS has been identified, however it could not be distinguished either the ODS used in the new products or substituted the old ones.*



<b>Substance</b>	<b>ASHRAE name</b>	<b>ODP</b>	<b>GWP</b>	<b>App-temp<sup>1)</sup></b>	<b>Atm lifetime<sup>2)</sup></b>
<b>CCl<sub>2</sub>F<sub>2</sub></b>	<b>R12</b>	<b>1</b>	<b>4500</b>	<b>H, M</b>	<b>130</b>
<b>CH<sub>2</sub>F-CF<sub>3</sub></b>	<b>R134a</b>	<b>0</b>	<b>420</b>	<b>H, M</b>	<b>16</b>
<b>CHClF<sub>2</sub></b>	<b>R22</b>	<b>0.06</b>	<b>510</b>	<b>H, M, L</b>	<b>15</b>
<b>CHClF<sub>2</sub>/ CClF<sub>2</sub>CF<sub>3</sub></b>	<b>R12/R115 (R502)</b>	<b>0.23</b>	<b>4300</b>	<b>H, M, L</b>	<b>&gt;200</b>
<b>CH<sub>3</sub>CH(CH<sub>3</sub>)<sub>2</sub></b>	<b>R600a (Ecool-ISO)</b>	<b>0</b>	<b>~0</b>	<b>H, M</b>	<b>&lt;1</b>
<b>CH<sub>3</sub>CH<sub>2</sub>CH<sub>3</sub>/ CH<sub>3</sub>CH(CH<sub>3</sub>)<sub>2</sub></b>	<b>R290/R600a (Ecool-PIB)</b>	<b>0</b>	<b>~0</b>	<b>H, M</b>	<b>&lt;1</b>
<b>CH<sub>3</sub>CH<sub>2</sub>CH<sub>3</sub></b>	<b>R290 (Ecool-PRO)</b>	<b>0</b>	<b>~0</b>	<b>H, M, L</b>	<b>&lt;1</b>

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# Efforts to Address Gap/Challenge

Identifying the activity data for Refrigeration and Air Conditioning in the new products, i.e :

1. Stationary AC → air conditioning for buildings : a) split, b) central, c) others
  - *The possibility to collect the data based on the survey established by DG of Renewable Energy (Ministry of Energy and Natural Resources)*
2. Mobile AC → air conditioning for vehicles
  - *All mobile AC service centers has been certified and registered, thus there is possibility to collect the data of mobile AC for improvement in the future*
3. Refrigerant



# Future Plan

Identifying the other sources of F-gases, i.e :

1. SF6 for electricity transformer (category of 2G1b in Inventory GLs 2006)
2. SF6 used in sport shoes, etc
3. SF6 used in foam blowing, fire protection, aerosol propellant, and others



Thank You