Greenhouse gas Inventory Office of Japan

Session III: Fluorinated Gas Emissions from Non-Annex I Parties

The Status of Reporting of Fluorinated Gases in Asia: Emissions, Methods, and Gaps

The 17th Workshop on GHG Inventories in Asia (WGIA17)
July 31, 2019

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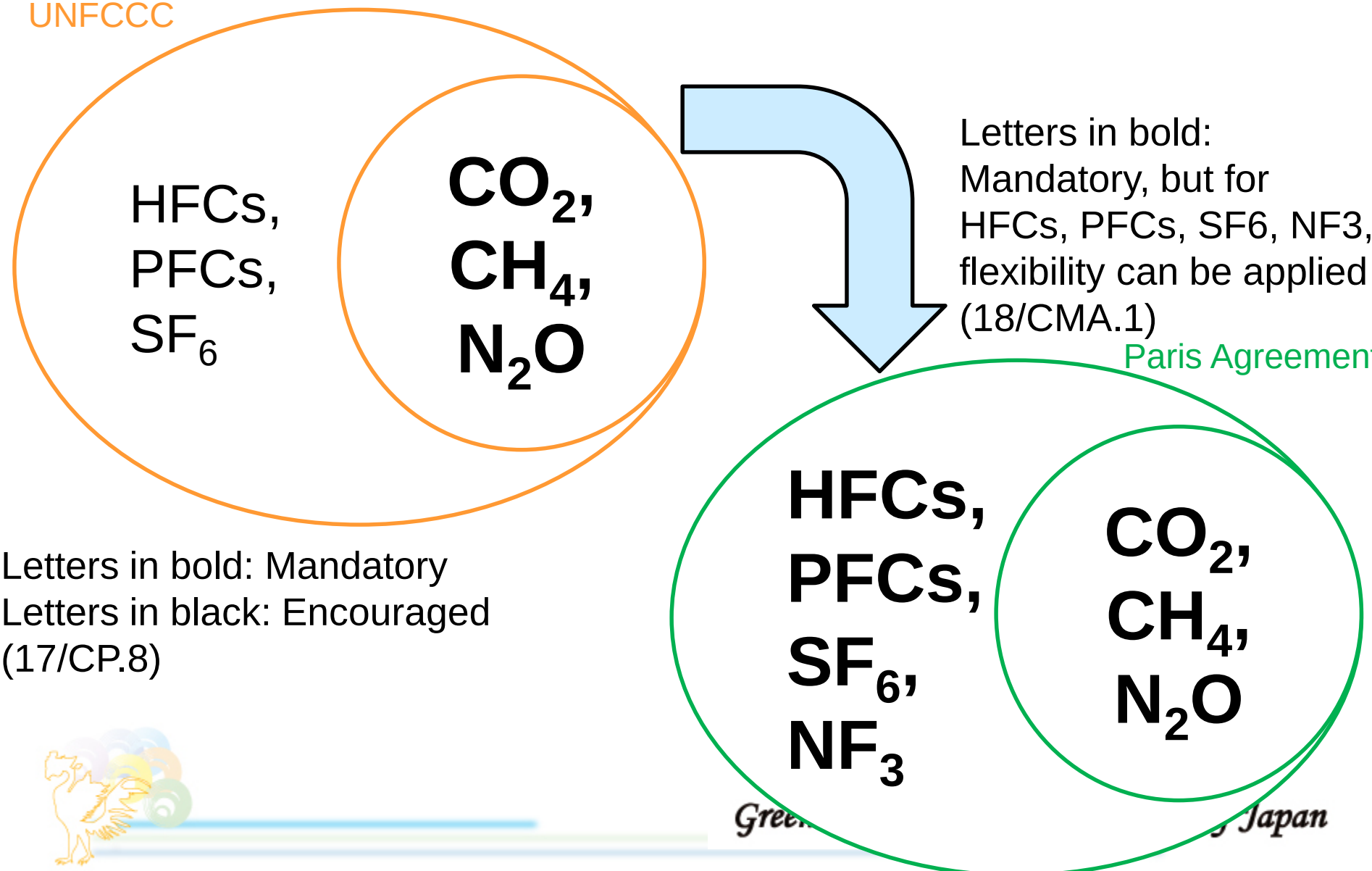
Gas coverage in UNFCCC/PA

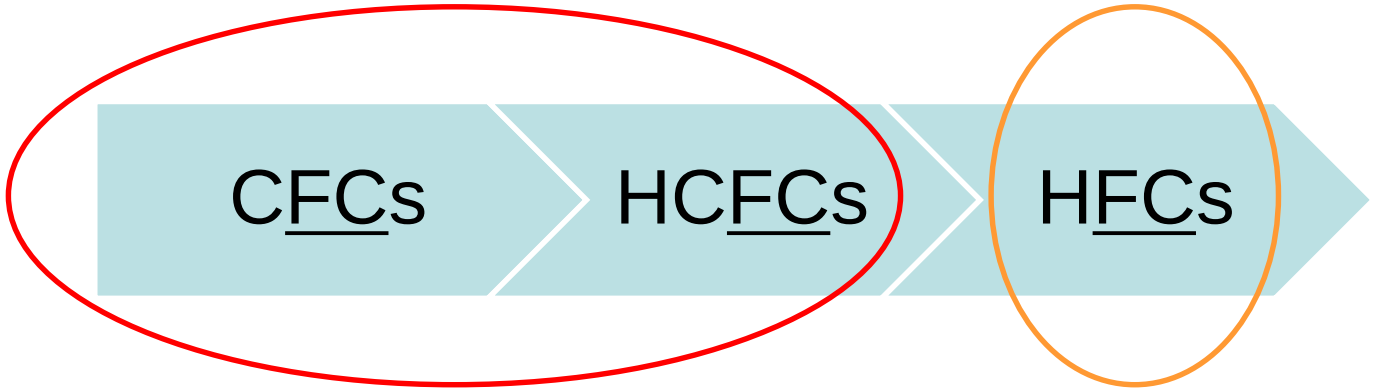


Letters in bold: Mandatory
Letters in black: Encouraged
(17/CP.8)

The Kigali Amendment to the Montreal Protocol

Montreal Protocol

UNFCCC



production and consumption of global warming and ozone depleting substances

emissions of global warming substances

The Kigali Amendment to the MP

- In October of 2016, the amendment to newly include HFCs in the Montreal Protocol (the Kigali Amendment) was adopted.
- The phase-down schedule set in the Kigali Amendment is as shown in the table below.

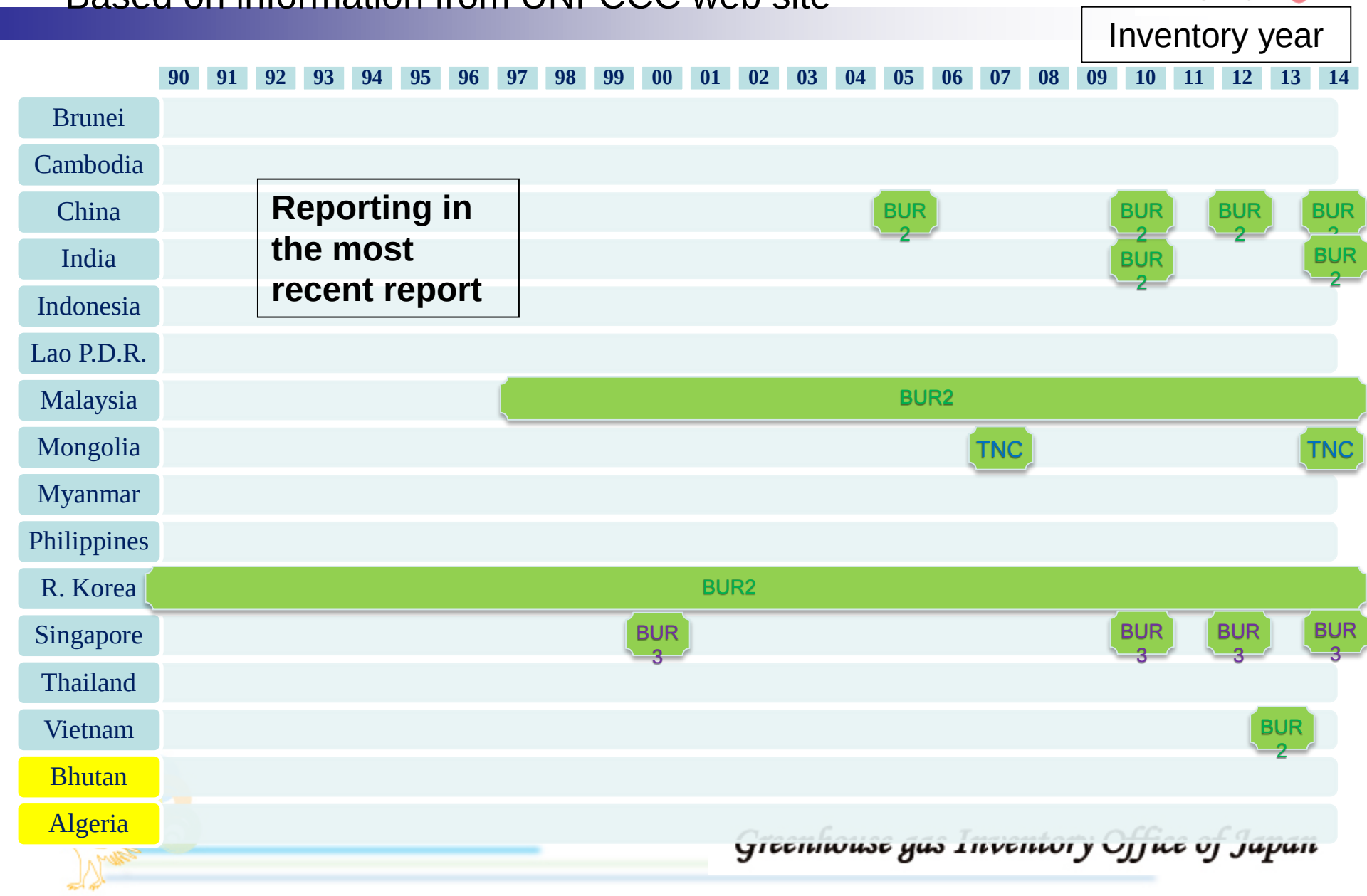
	Developed countries	**Developing countries Group 1**	**Developing countries Group 2**
Baseline Years	2011 - 2013	2020 - 2022	2024 - 2026
Baseline Calculation（HFC＋HCFC）	Average production /consumption of HFCs for baseline years + 15% of HCFC baseline production/consumption	Average production /consumption of HFCs for baseline years + 65% of HCFC baseline production/consumption	Average production /consumption of HFCs for baseline years + 65% of HCFC baseline production/consumption
Freeze year	-	2024	2028 *4
Reduction steps	2019: - 10% 2024: - 40% 2029: - 70% 2034: - 80% 2036: - 85%	2029: -10% 2035: - 30% 2040: - 50% 2045: - 80%	2032: - 10% 2037: - 20% 2042: - 30% 2047: - 85%

Note: For Belarus, the Russian Federation, Kazakhstan, Tajikistan and Uzbekistan, a 25% HCFC component of baseline and different initial two steps (1) 5% reduction in 2020 and (2) 35% reduction in 2025
Note: Developing countries Group 1: Developing countries other than Group 2
Note: Developing countries Group 2: India, Pakistan, Iran, Iraq, and Gulf countries
Note: 2028 Freeze year Developing countries Group 2: for Technology review four to five years before 2028 to consider the compliance deferral of two years from the freeze of 2028
Note: Reduction steps for all countries: for Technology review in 2022 and every five years

Source of the table and notes: Fluorocarbon Countermeasure WG, Ministry of Economy, Trade and Industry, Japan (2018.1.11) (translated by E.Hatanaka)

HFC reporting status for WGIA countries + Others

Based on information from UNFCCC web site



Sources of HFCs

Fluorochemical Production

- By-product Emissions (e.g. HFC-23 from HCFC-22 production)
- Fugitive Emissions (e.g. Leaks from producing HFC-134a)

Metal Industry

- Magnesium Production

Electronics Industry (during manufacturing)

- Integrated Circuit/Semiconductor
- TFT Flat Panel Display
- Photovoltaics

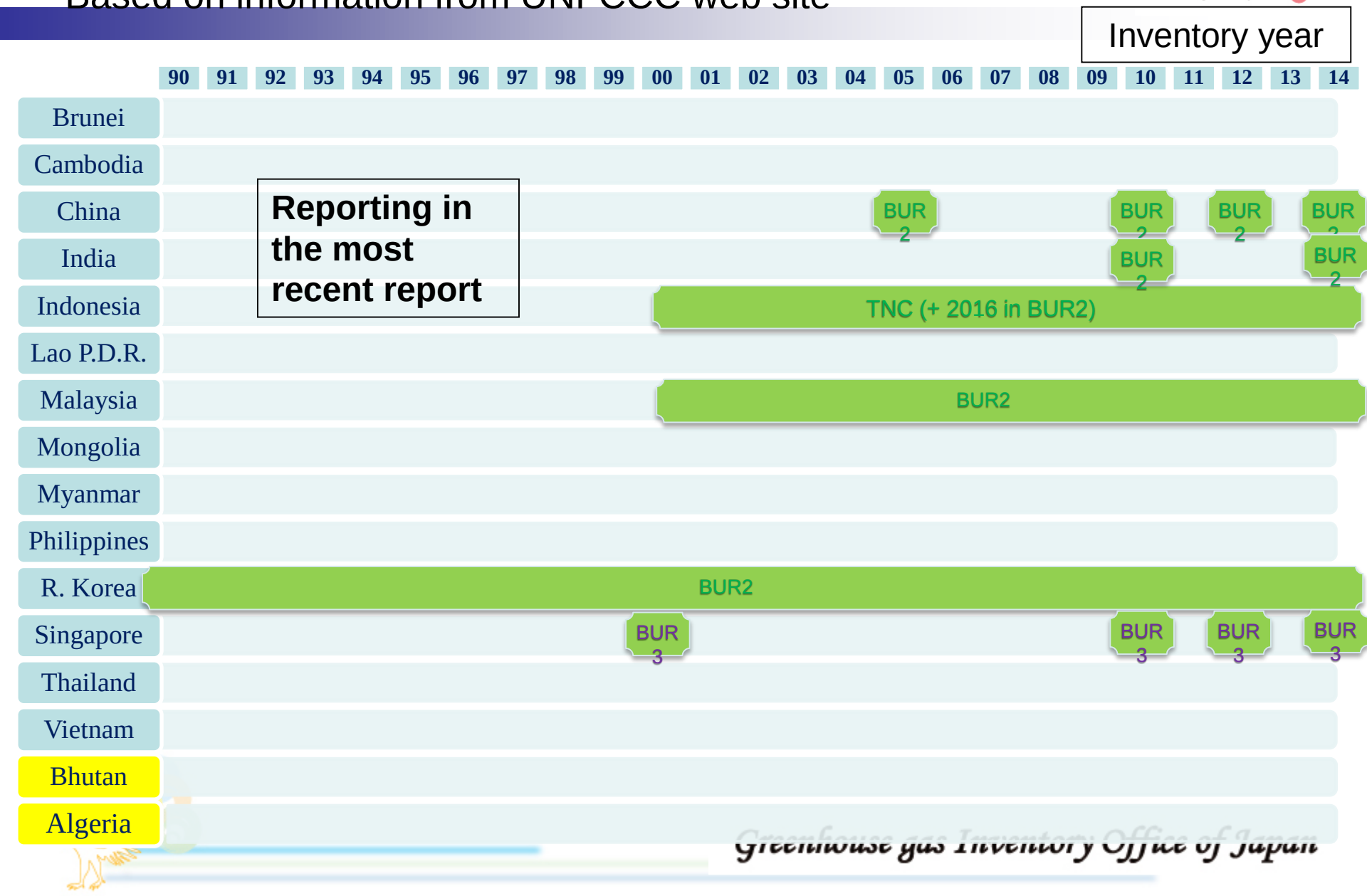
Product Uses as Substitutes for Ozone Depleting Substances (from manufacturing, stocks, and disposal)

- Refrigeration and Air Conditioning
- Foam Blowing Agents
- Fire Protection
- Aerosols
- Solvents

Typical delayed emissions

PFC reporting status for WGIA countries + Others

Based on information from UNFCCC web site



Sources of PFCs

Fluorochemical Production

- By-product Emissions
- Fugitive Emissions (e.g. Leaks from producing PFCs)

Metal Industry

- Aluminium Production
- Magnesium Production

Electronics Industry (during manufacturing)

- Integrated Circuit/Semiconductor
- TFT Flat Panel Display
- Photovoltaics

Typical prompt emissions

Product Uses as Substitutes for Ozone Depleting Substances (from manufacturing, stocks, and disposal)

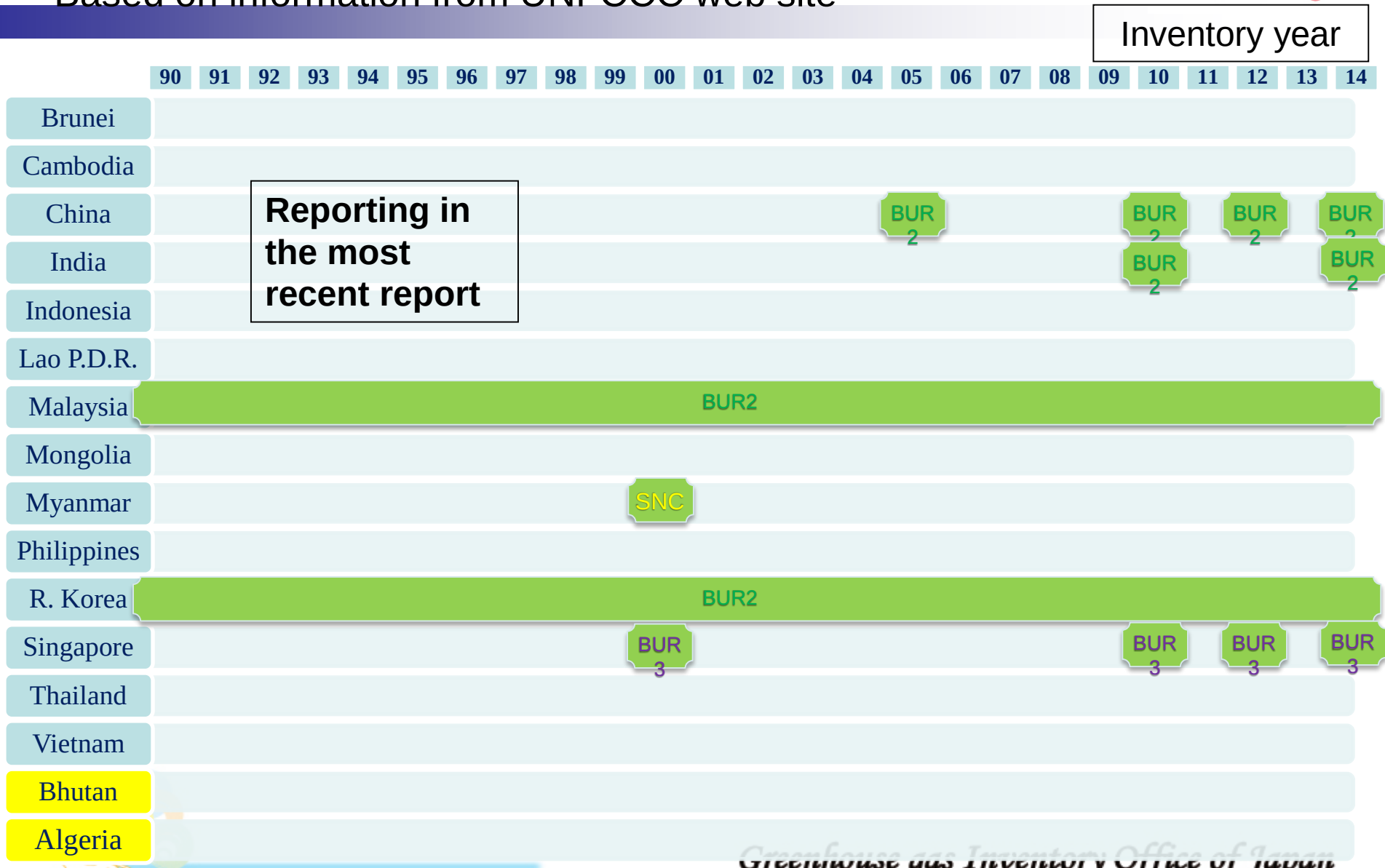
- Refrigeration and Air Conditioning
- Fire Protection
- Aerosols
- Solvents

Other Product Manufacture and Use

- Electrical Equipment

SF_6 reporting status for WGIA countries + Others

Based on information from UNFCCC web site



Sources of SF_6

Fluorochemical Production

- By-product Emissions
- Fugitive Emissions (e.g. Leaks from producing SF_6)

Metal Industry

- Magnesium Production

Electronics Industry (during manufacturing)

- Integrated Circuit/Semiconductor
- TFT Flat Panel Display
- Photovoltaics

Other Product Manufacture and Use

- Electrical Equipment
- SF_6 and PFCs from Other Product Uses (e.g. Accelerators)

NF3 reporting status for WGIA countries + Others

Based on information from UNFCCC web site

Inventory year

	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14
Brunei																									
Cambodia																									
China																									
India																									
Indonesia																									
Lao P.D.R.																									
Malaysia	BUR2																								
Mongolia																									
Myanmar																									
Philippines																									
R. Korea																									
Singapore																									
Thailand																									
Vietnam																									
Bhutan																									
Algeria																									

Reporting in the most recent report

Sources of NF_3

Fluorochemical Production

- By-product Emissions
- Fugitive Emissions (e.g. Leaks from producing NF_3)

Electronics Industry (during manufacturing)

- Integrated Circuit/Semiconductor
- TFT Flat Panel Display
- Photovoltaics

Estimation Methodology

	HFCs	PFCs	SF_6	NF_3
Brunei	---	---	---	---
Cambodia	---	---	---	---
China	1996/GPG Tier 1, 2	1996/GPG Tier 1, 2	1996/GPG Tier 1, 2	---
India	2006	2006	2006	---
Indonesia	---	2006 Tier 2	---	---
Lao P.D.R.	---	---	---	---
Malaysia	2006 Tier 1, Tier 2	2006 Tier 1	2006 Tier 1	2006 Tier 1
Mongolia	2006 Tier 1	---	---	---
Myanmar	---	---	---	---
Philippines	---	---	---	---
R. Korea	1996/GPG/2006	1996/GPG/2006	1996/GPG/2006	---
Singapore	2006 Tier 1, Tier 2	2006 Tier 1, Tier 2	2006 Tier 1, Tier 2	---
Thailand	---	---	---	---
Vietnam	---	---	---	---
Bhutan	---	---	---	---
Algeria	---	---	---	---

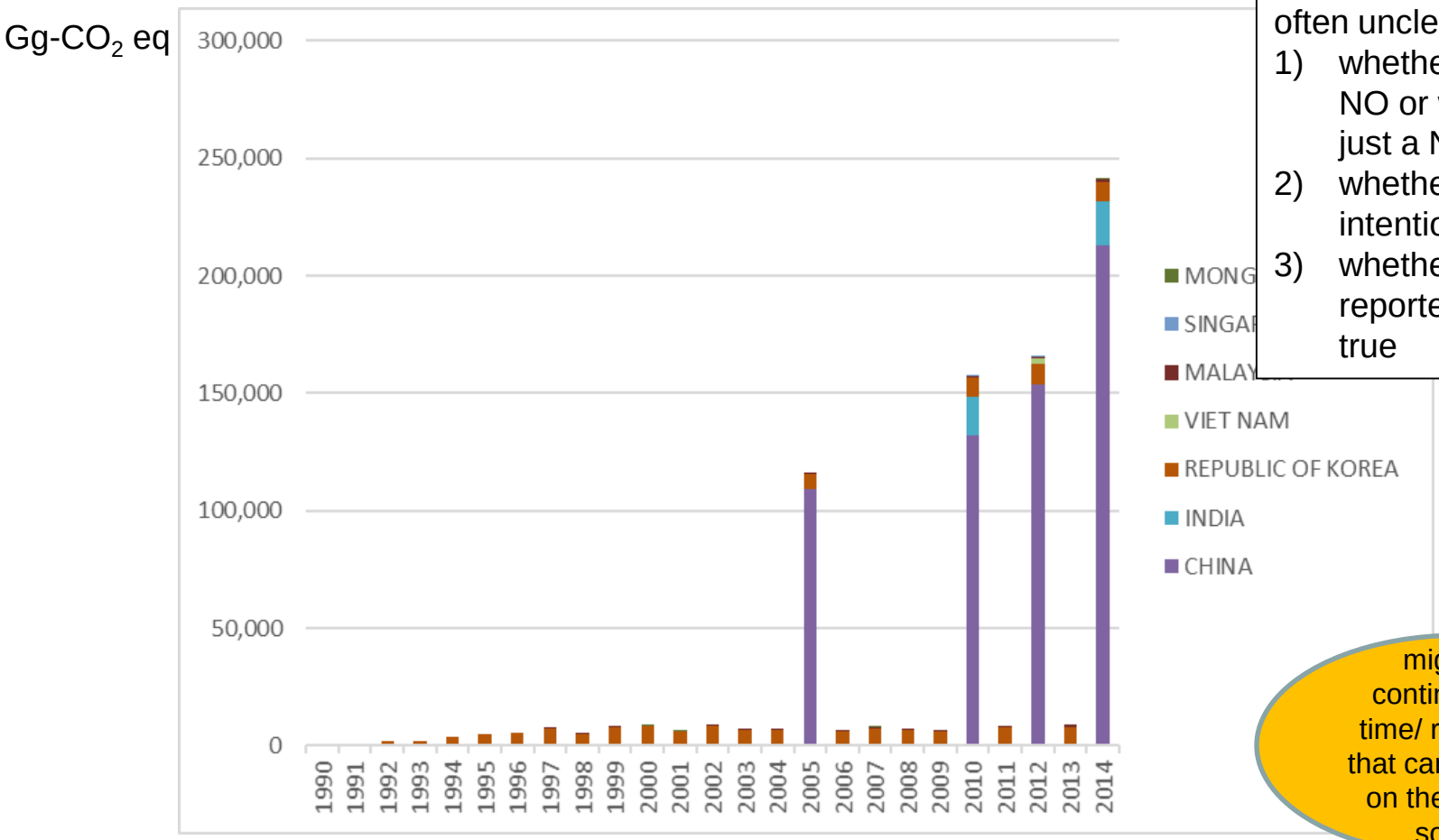
No mention of tier indicates that description in BUR is unclear or lacking

HFC Emissions from WGIA countries

(as reported to UNFCCC)

Note: It is difficult to grasp the general picture of F-gas emissions because it is often unclear:

1) whether it is a true NO or whether it is just a NE,
2) whether it is an intentional NE, or
3) whether the reported data are true



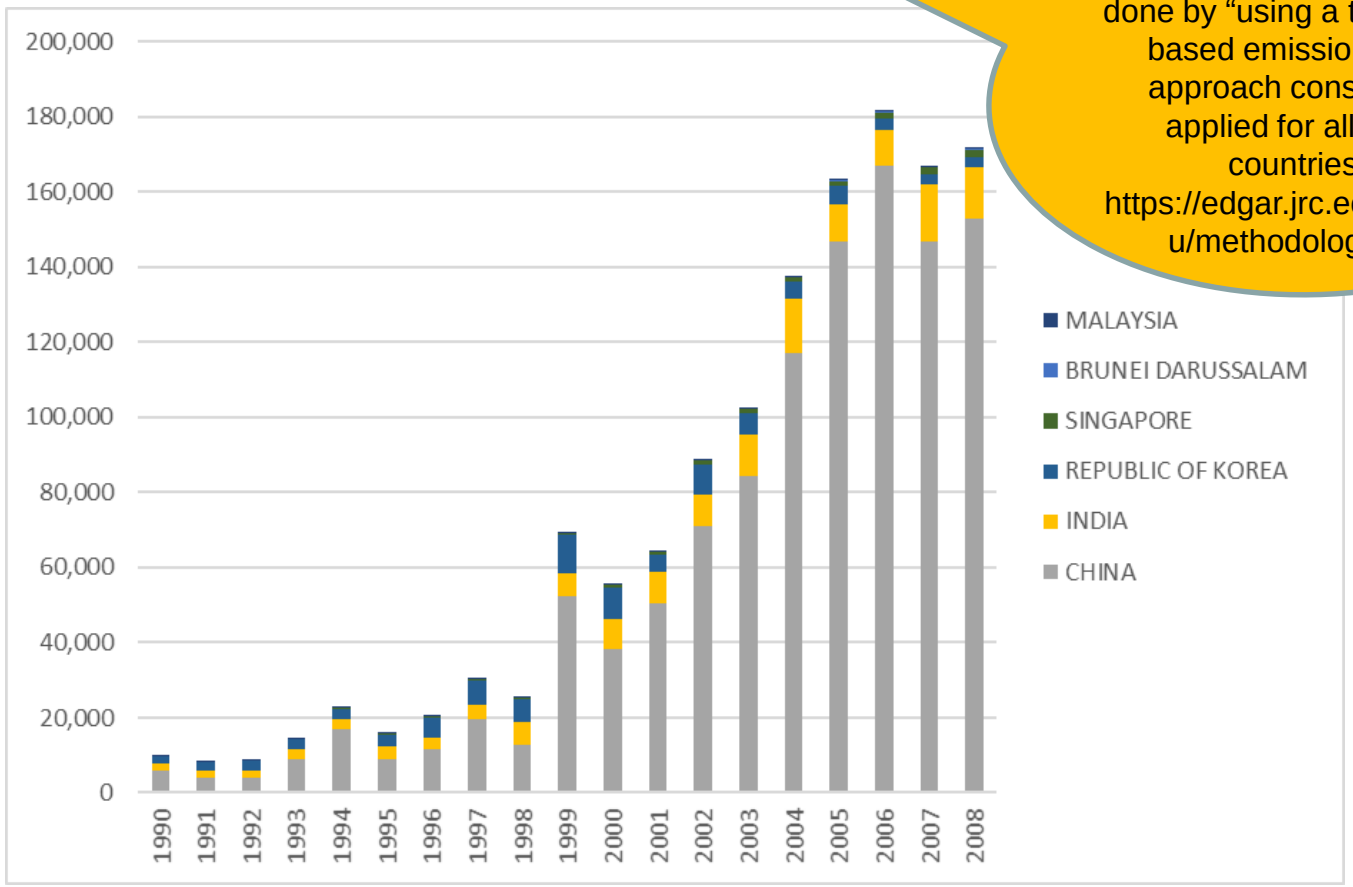
might be contingent on time/ resources that can be spent on the specific source

Data based on the most recent report (as at July 12, 2019), and compiled by E.Hatanaka

HFC Emissions from WGIA countries

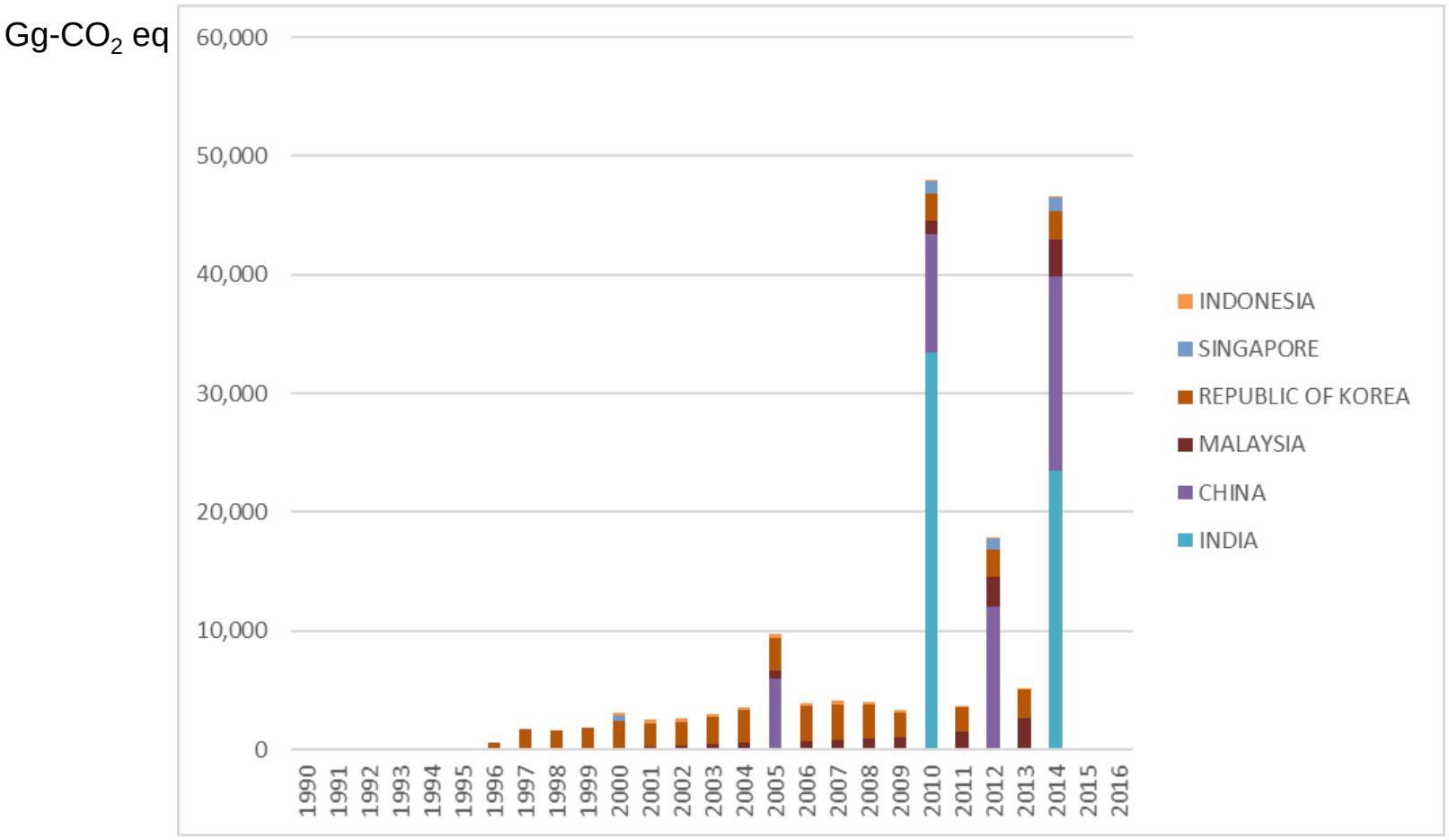
(for reference: Global Emissions EDGAR v4.2)

Calculation of emissions is done by “using a technology based emission factor approach consistently applied for all world countries.” https://edgar.jrc.ec.europa.eu/methodology.php



European Commission, Joint Research Centre (JRC)/Netherlands Environmental Assessment Agency (PBL), Global Emissions EDGAR v4.2 (November 2011) Timeseries 1970-2008, converted into CO_2 eq using IPCC SAR GWP

PFC Emissions from WGIA countries
(as reported to UNFCCC)



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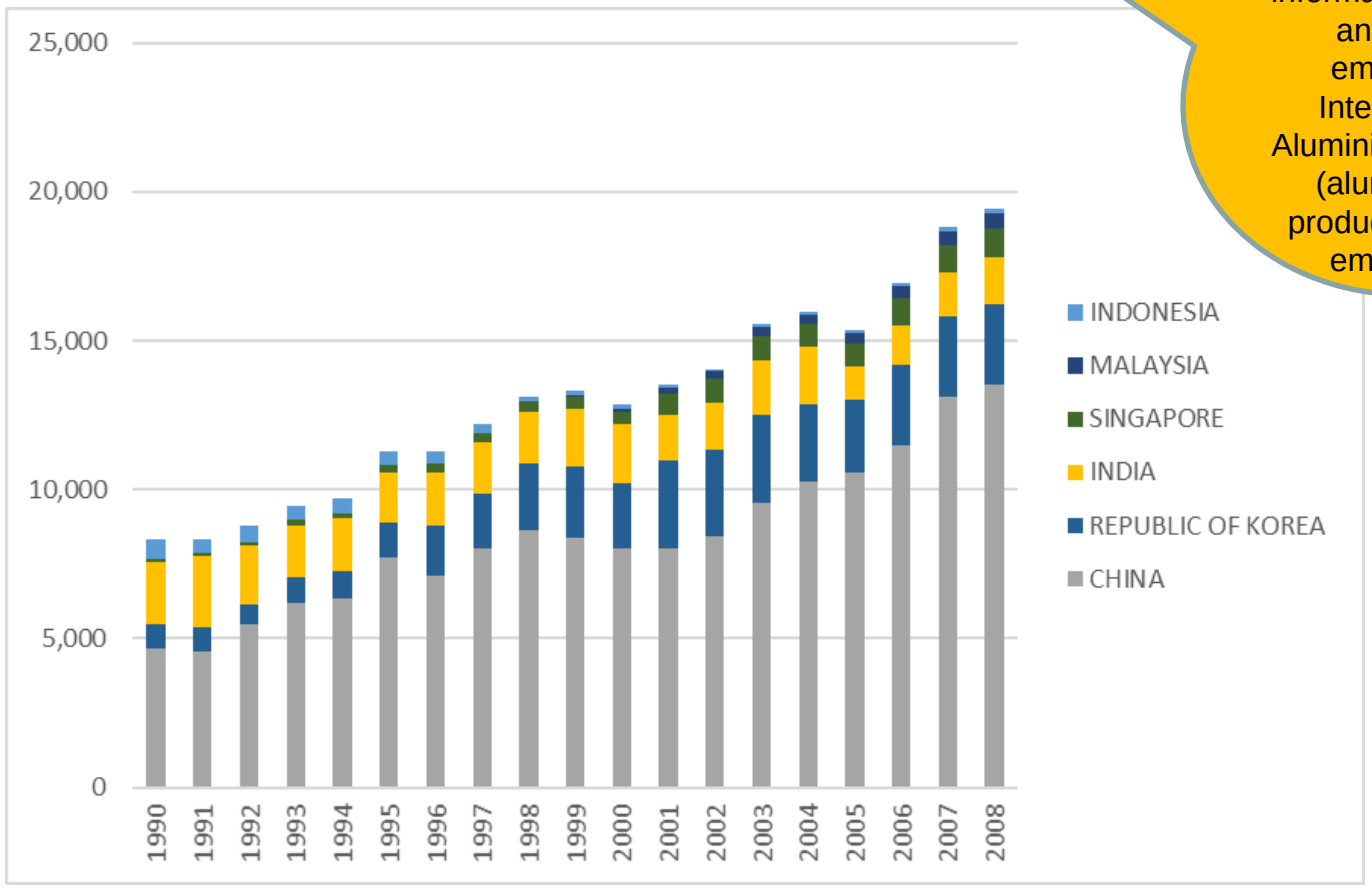
and compiled by E.Hatanaka

PFC Emissions from WGIA countries

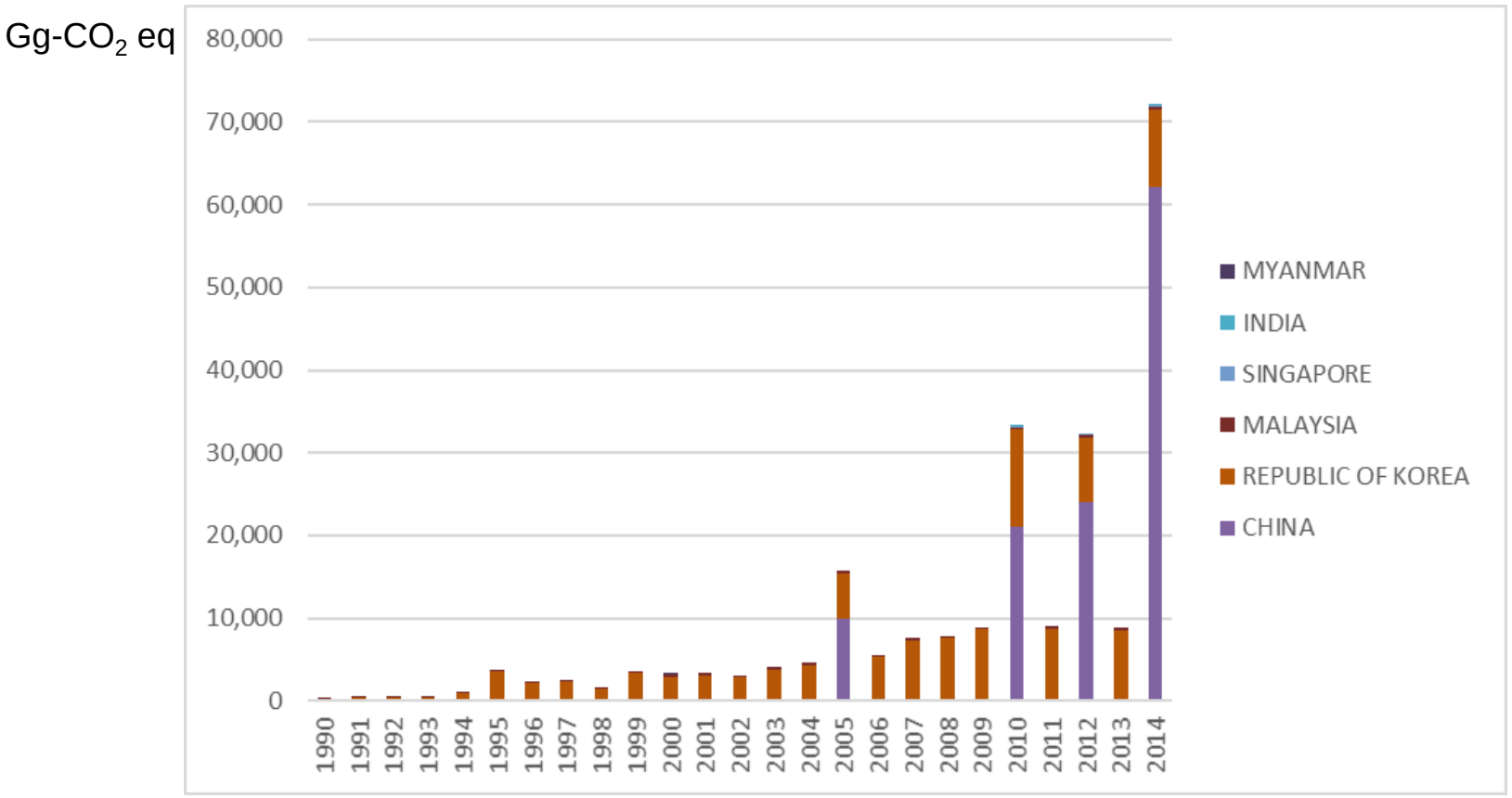
(for reference: Global Emissions EDGAR v4.2)

Other sources of information on CF4 and C2F6 emissions: International Aluminium Institute (alumininium production-origin emissions)



European Commission, Joint Research Centre (JRC)/Netherlands Environmental Assessment Agency (PBL), Global Emissions EDGAR v4.2 (November 2011) Timeseries 1970-2008, converted into CO_2 eq using IPCC SAR GWP

SF_6 Emissions from WGIA countries
(as reported to UNFCCC)



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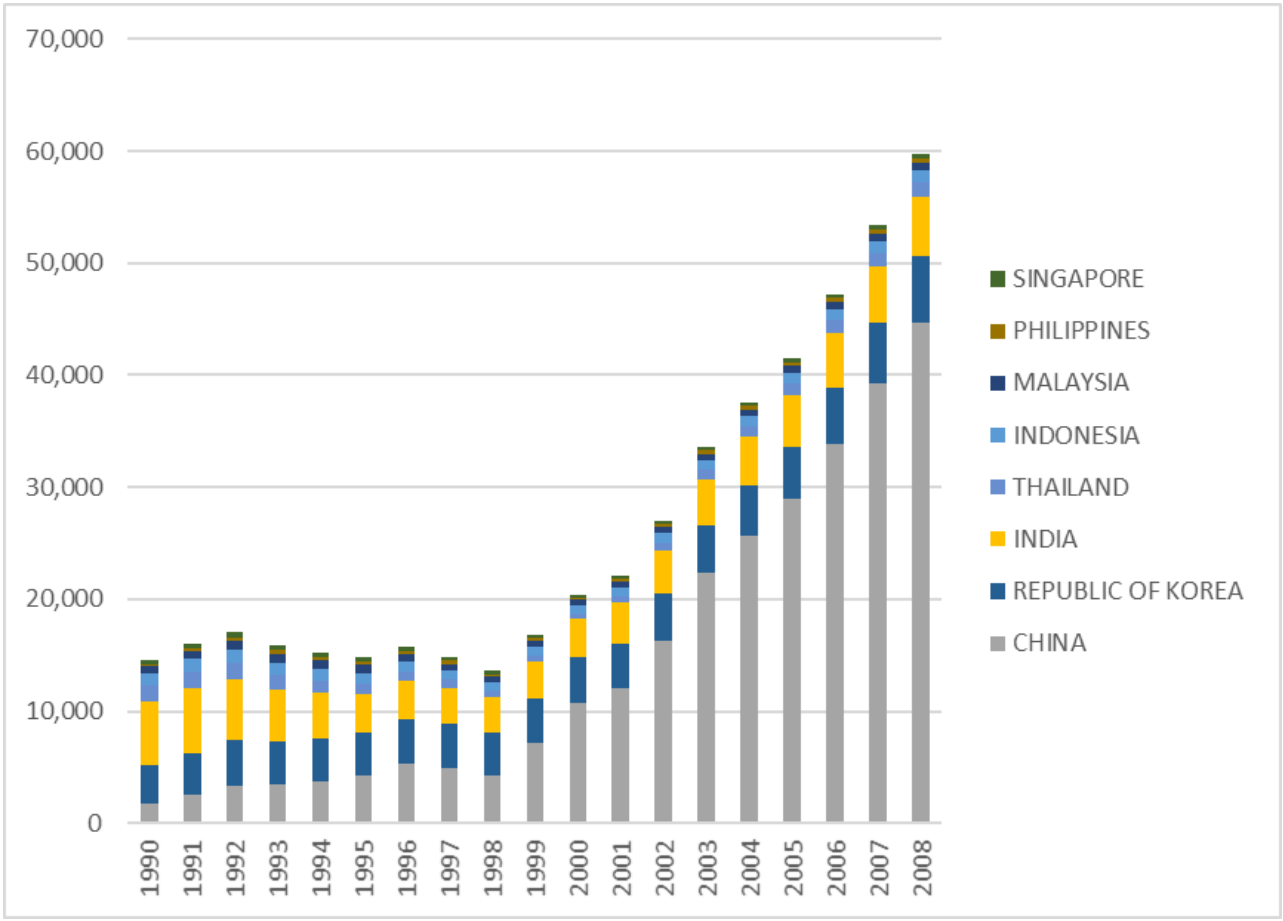
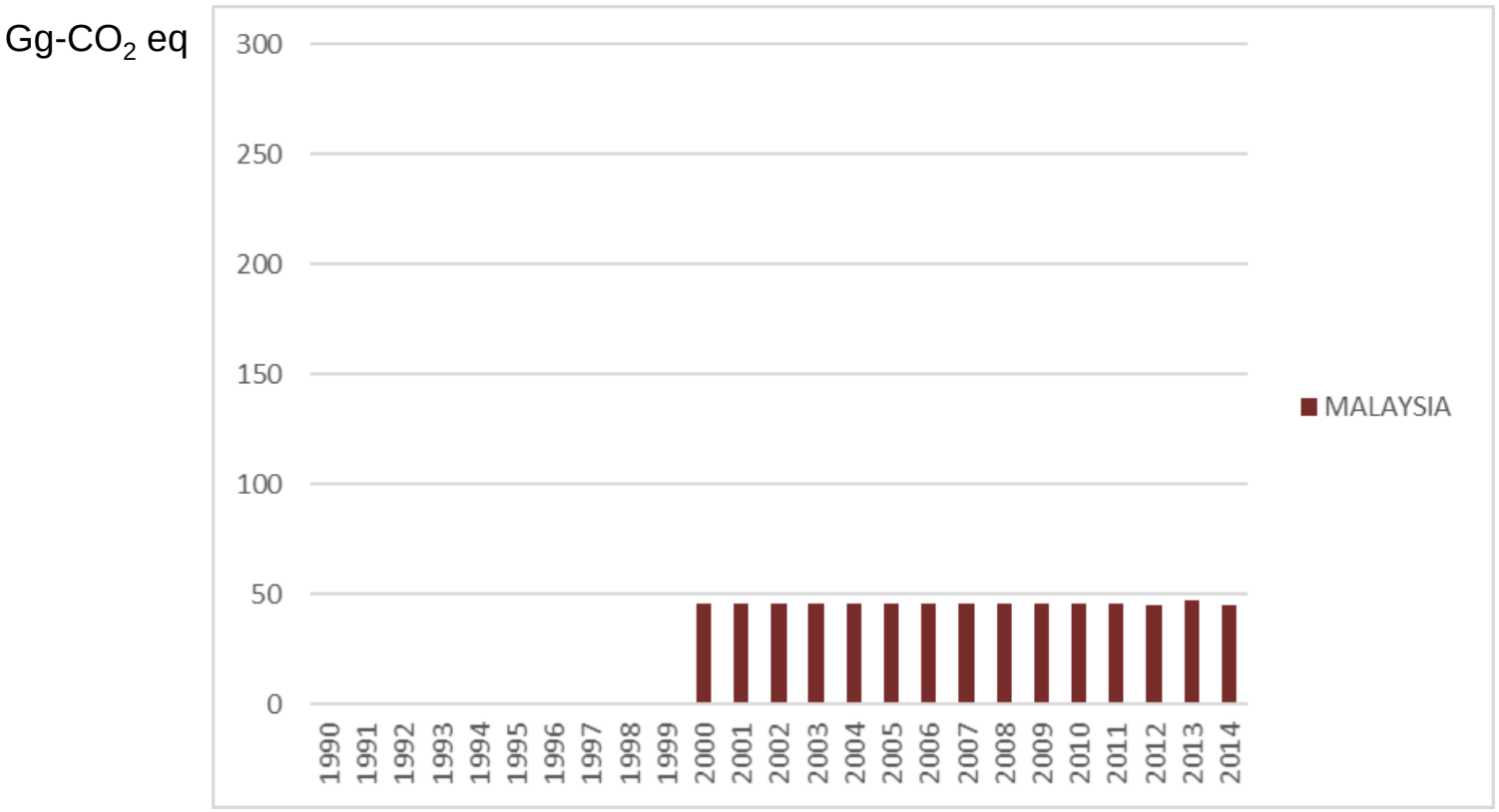
SF_6 Emissions from WGIA countries
(for reference: Global Emissions EDGAR v4.2)

Gg-CO_2 eq



European Commission, Joint Research Centre (JRC)/Netherlands Environmental Assessment Agency (PBL), Global Emissions EDGAR v4.2 (November 2011) Timeseries 1970-2008, converted into CO_2 eq using IPCC SAR GWP

NF_3 Emissions from WGIA countries
(as reported to UNFCCC)



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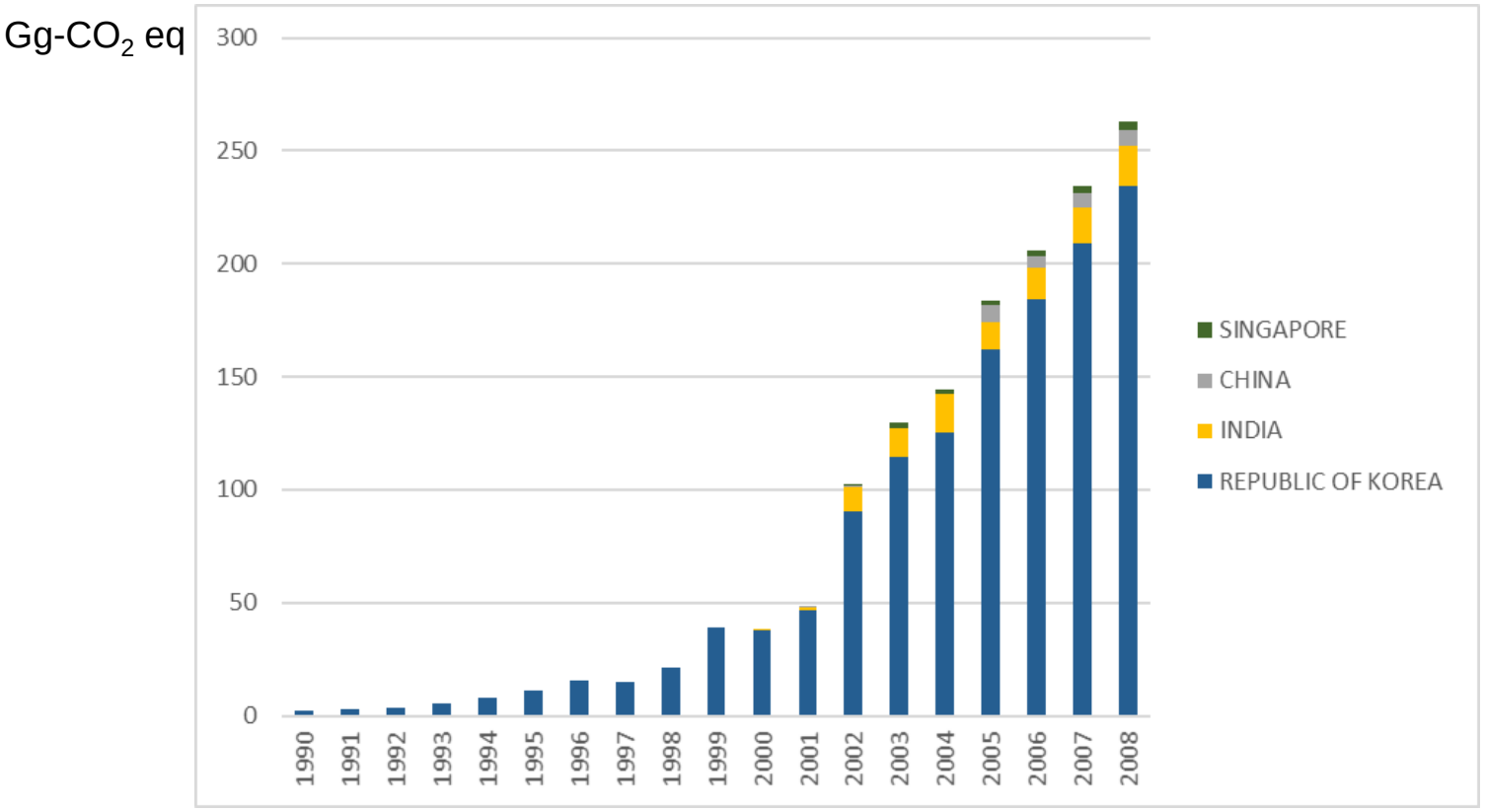
NF_3 Emissions from WGIA countries
(for reference: Global Emissions EDGAR v4.2)



European Commission, Joint Research Centre (JRC)/Netherlands Environmental Assessment Agency (PBL), Global Emissions EDGAR v4.2 (November 2011) Timeseries 1970-2008, converted into CO_2 eq using IPCC AR4 GWP

Observations

- Isolated peaks in emissions occur for certain years when reporting took place
- New reporting occurring for NF_3
- New reporting occurring for 2016
- Size of emissions are quite different between the gases: HFCs >>>> PFCs and SF_6 >>>> NF_3
- Difficult to evaluate consistency across years within one country's reporting when there is no time-series data
- However, comparison between HFC/PFC/SF_6/ NF_3 emissions within one country, during one reporting might be useful
- Comparison across countries for the same inventory year might be also useful
- Comparison with other estimates (e.g. from Global Emissions EDGAR) might also be useful, bearing in mind that various assumptions are made to prepare the estimates
- Other estimates have uncertainties, but reported emissions also seem unstable at times, as observed in some recalculations made from previous submissions

Summary

- Under the newly adopted Modalities, Procedures and Guidelines (MPGs) for the enhanced transparency framework of the Paris Agreement, the reporting of HFCs, PFCs, SF_6, and NF_3 have become mandatory, but with room to apply the flexibility clause if capacity is lacking
- Preparation is needed to report, with the first Biennial Transparency Report (BTR) to be submitted by the end of 2024
- The Kigali Amendment to the Montreal Protocol, adopted in 2016, will be controlling HFCs as well, through the phase down of production and consumption
- Although the reporting of F-gases such as HFCs, PFCs, SF_6, and NF_3 are currently not mandatory for UNFCCC Non-Annex I countries, the F-gas emissions are expected to keep rising, and dealing with these gases is becoming increasingly important