

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

## **The Status of Reporting of Fluorinated Gases (under the UNFCCC)**

The 15th Workshop on GHG Inventories in Asia (WGIA15)  
July 12, 2017

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# HFC reporting status for WGIA countries + Iran

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  |     |  |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| Brunei      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | NC1 |  |
| Cambodia    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| China       |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | BUR |     |     |     |     |     |     |     | BUR |  |
| India       |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | BUR |     |  |
| Indonesia   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| Lao P.D.R.  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| Malaysia    |     |     |     |     |     |     |     |     |     |     | BUR |  |
| Mongolia    | NC2 |     |     |     |     | NC2 |     |     |     |     | NC2 |     |     |     |     |     |     |     |  |
| Myanmar     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| Philippines |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| R. Korea    | BUR |  |
| Singapore   |     |     |     |     |     |     |     |     |     |     | BUR |     |     |     |     |     |     |     |     |     |     | BUR |     | BUR |  |
| Thailand    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| Vietnam     |     |     |     |     |     |     |     |     |     |     | NC2 |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| Iran        |     |     |     |     |     |     |     |     |     |     | NC2 |     |     |     |     |     |     |     |     |     |     |     |     |     |  |

Reporting in the most recent report



# 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



# PFC reporting status for WGIA countries + Iran

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  |     |     |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Brunei      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| Cambodia    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| China       |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | BUR |     |     |     |     |     |     | BUR |     |     |
| India       |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | BUR |     |     |     |
| Indonesia   |     |     |     |     |     |     |     |     |     |     | BUF | BUR | BUR | BUR | BUR | BUR | BUI | BUF | BUR | BUR | BUR | BUR | BUR | BUI | BUR |
| Lao P.D.R.  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| Malaysia    | BUR |     |
| Mongolia    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| Myanmar     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| Philippines |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| R. Korea    | BUR |     |
| Singapore   |     |     |     |     |     |     |     |     |     |     | BUR |     |     |     |     |     |     |     |     |     |     | BUR |     | BUR |     |
| Thailand    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| Vietnam     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| Iran        |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | NC2 |     |

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# 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

## 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<sub>6</sub> reporting status for WGIA countries + Iran

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  |     |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Brunei      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| Cambodia    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| China       |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | BUR |     |     |     |     |     |     |     | BUR |
| India       |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | BUR |     |     |
| Indonesia   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| Lao P.D.R.  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| Malaysia    |     |     |     |     |     |     |     |     |     |     | BUF | BUR |
| Mongolia    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| Myanmar     |     |     |     |     |     |     |     |     |     |     | NC2 |     |     |     |     |     |     |     |     |     |     |     |     |     |
| Philippines |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| R. Korea    | BUF | BUR |
| Singapore   |     |     |     |     |     |     |     |     |     |     | BUR |     |     |     |     |     |     |     |     |     |     | BUR |     | BUR |
| Thailand    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| Vietnam     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| Iran        |     |     |     |     |     |     |     |     |     |     | NC2 |     |     |     |     |     |     |     |     |     |     |     |     |     |

Reporting in the most recent report



# Sources of SF<sub>6</sub>

## Fluorochemical Production

- By-product Emissions
- Fugitive Emissions (e.g. Leaks from producing SF<sub>6</sub>)

## Metal Industry

- Magnesium Production

## Electronics Industry (during manufacturing)

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

## Other Product Manufacture and Use

- Electrical Equipment
- SF<sub>6</sub> and PFCs from Other Product Uses (e.g. Accelerators)



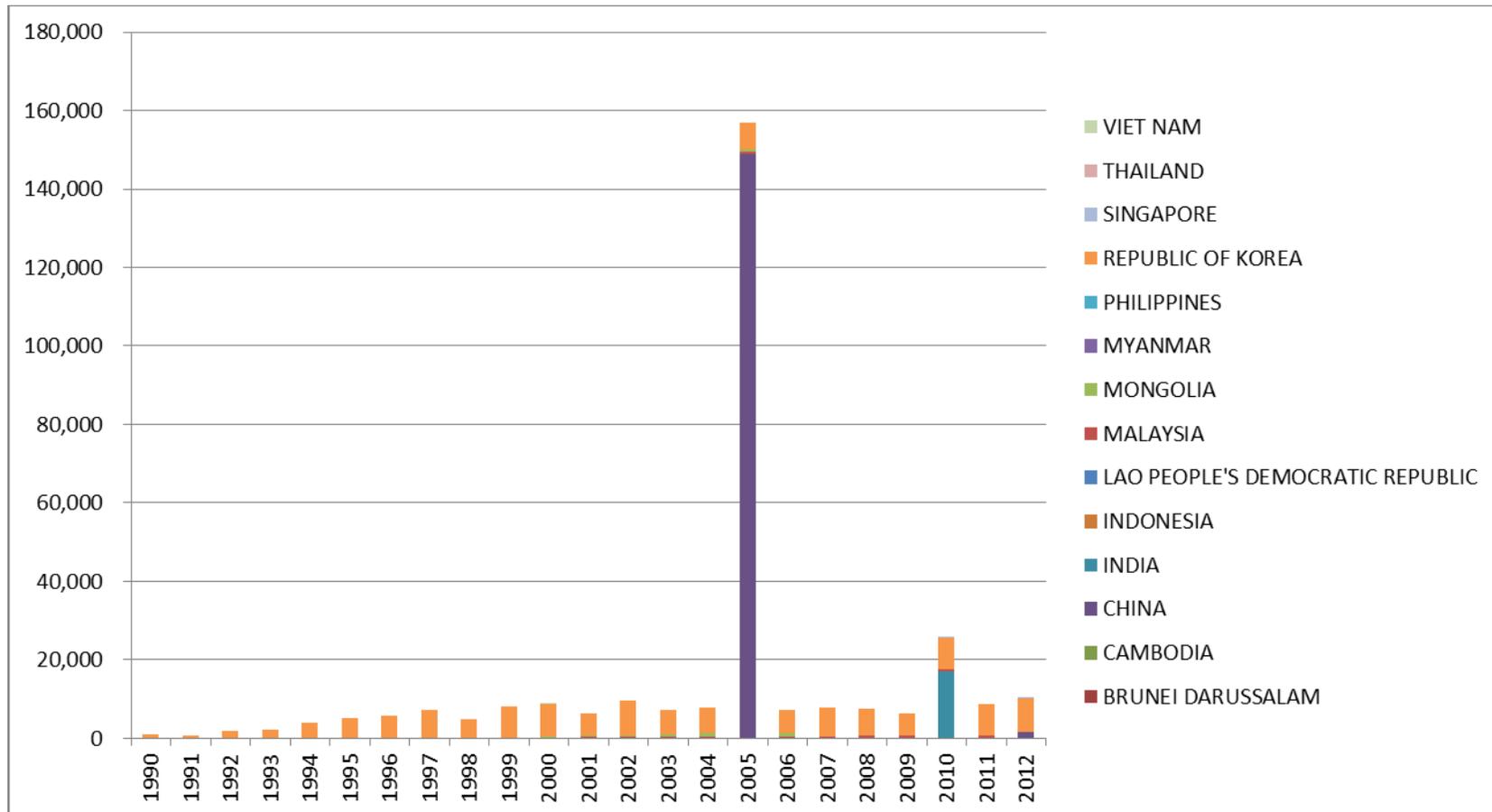
# Estimation Methodology

|             | HFCs                | PFCs            | SF <sub>6</sub> |
|-------------|---------------------|-----------------|-----------------|
| Brunei      | No                  | ---             | ---             |
| Cambodia    | ---                 | ---             | ---             |
| China       | 1996/GPG Tier 1     | 1996/GPG Tier 1 | 1996/GPG Tier 1 |
| India       | No                  | No              | No              |
| Indonesia   | ---                 | 2006 Tier 1     | ---             |
| Lao P.D.R.  | ---                 | ---             | ---             |
| Malaysia    | 1996 Tier 1, Tier 2 | 1996 Tier 1     | 1996 Tier 1     |
| Mongolia    | 1996 Tier 1         | ---             | ---             |
| Myanmar     | ---                 | ---             | ---             |
| Philippines | ---                 | ---             | ---             |
| R. Korea    | No                  | No              | No              |
| Singapore   | 2006 Tier 2         | 2006 Tier 2     | 2006 Tier 2     |
| Thailand    | ---                 | ---             | ---             |
| Vietnam     | No                  | ---             | ---             |
| Iran        | CS                  | NC              | NC              |



*Japan*

# HFC Emissions in WGIA countries (as reported)



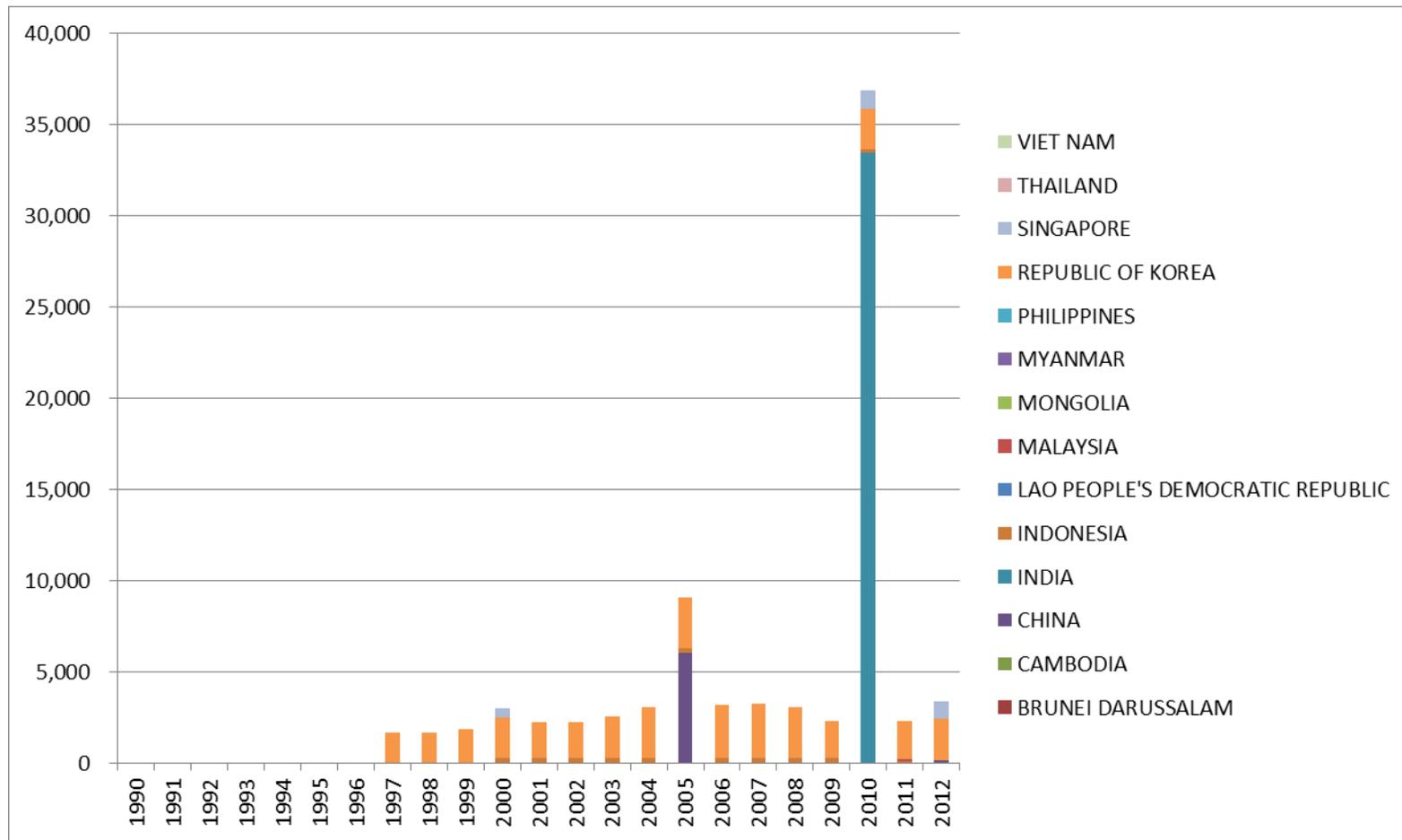
Gg-CO<sub>2</sub> eq

Iran in year 2000  
322.4 Gg-CO<sub>2</sub> eq



Note: Data based on the most recent report (as at June 28, 2017),  
and compiled by E.Hatanaka

# PFC Emissions in WGIA countries (as reported)



Gg-CO<sub>2</sub> eq

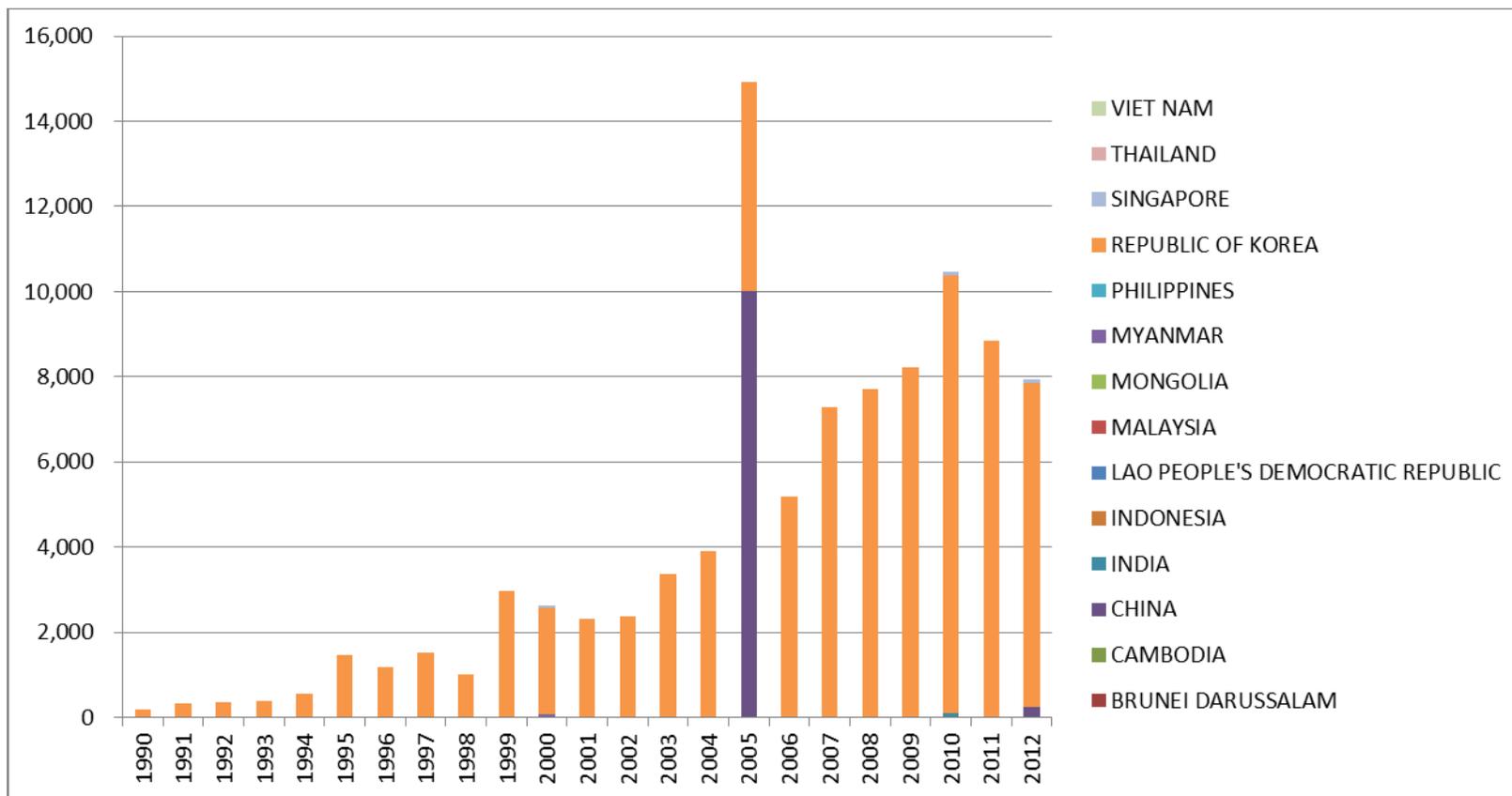
Data based on the most recent report (as at June 28, 2017),  
and compiled by E.Hatanaka

Iran in year 2000  
1,484 Gg-CO<sub>2</sub> eq

*Greenhouse gas Inventory Office of Japan*



# SF<sub>6</sub> Emissions in WGIA countries (as reported)



Gg-CO<sub>2</sub> eq

Iran in year 2000  
95.6 Gg-CO<sub>2</sub> eq



Data based on the most recent report (as at June 28, 2017),  
and compiled by E.Hatanaka

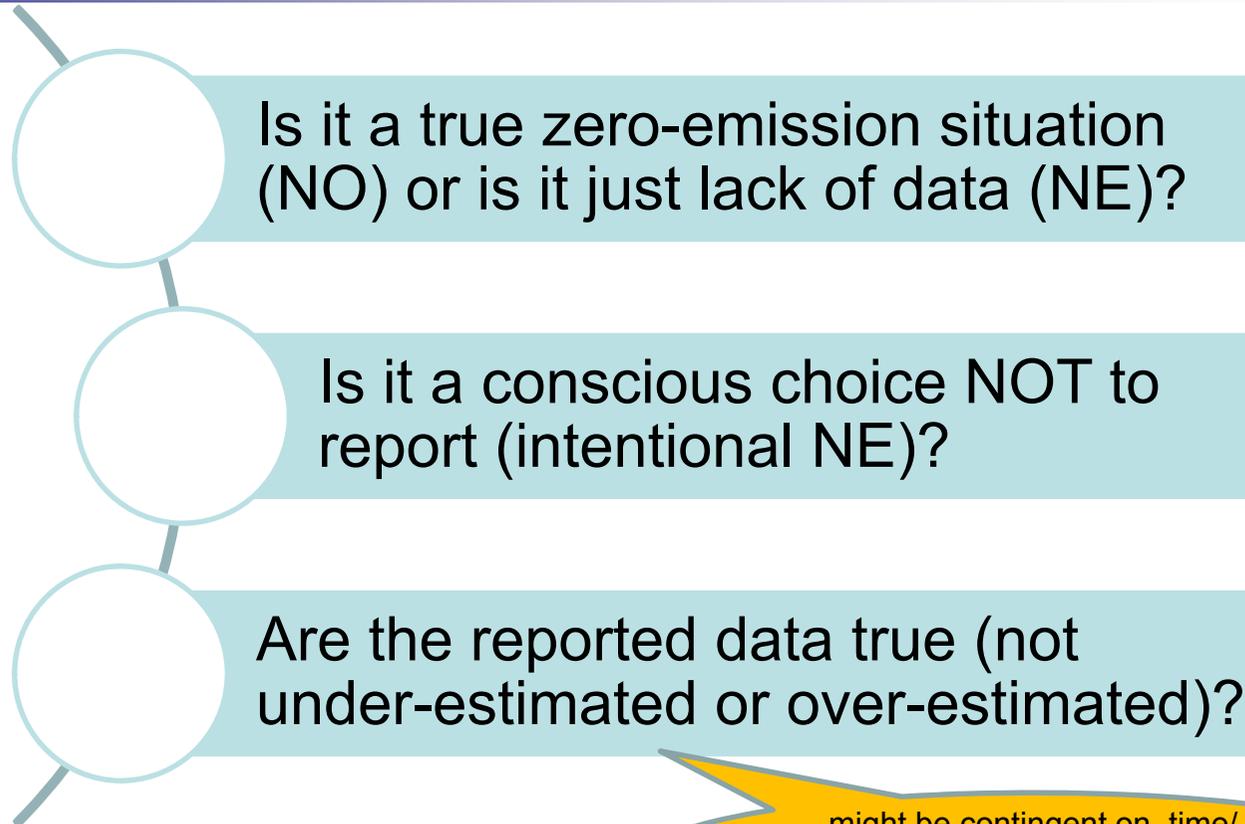
*Greenhouse gas Inventory Office of Japan*

# Observations

- Obvious peaks in emissions for certain years when reporting took place
- Size of emissions are quite different between the gases: HFCs >>>> PFCs > SF<sub>6</sub>
- Difficult to evaluate consistency across years within one country's reporting when there is no time-series data
- However, comparison between HFC/PFC/SF<sub>6</sub> emissions within one country, during one reporting might be useful
- And comparison across countries for the same inventory year might be useful



# Difficulties in grasping the general picture of F-gas emissions

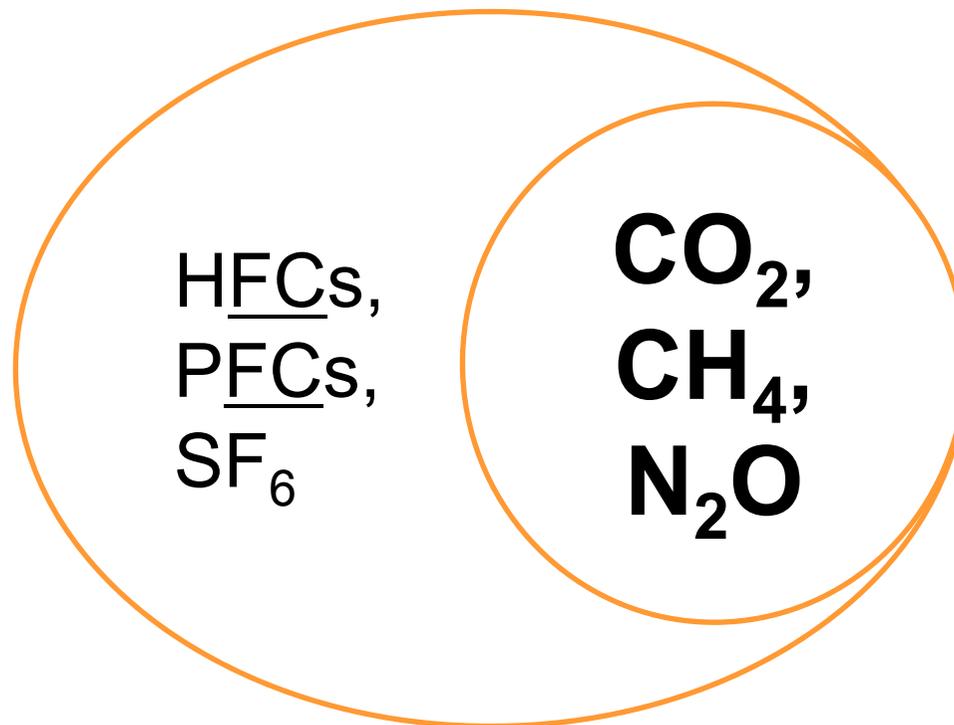


might be contingent on time/  
resources that can be spent on the  
specific source

**However**, with the HFC phase down planned under the Montreal Protocol and other efforts under UNFCCC, it will surely be more important to further develop each country's F-gas inventory !



# Gas coverage in UNFCCC



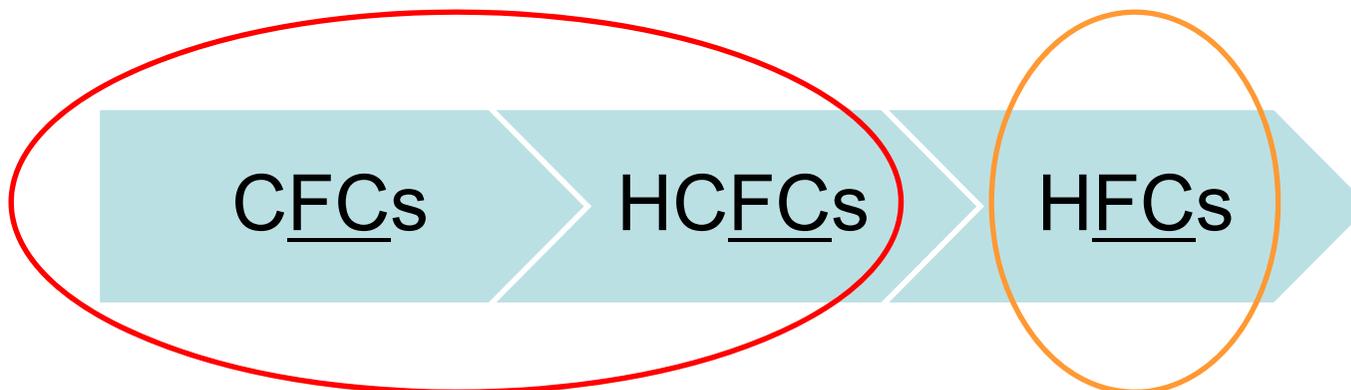
Letters in bold: Mandatory  
Letters in black: Encouraged  
(17/CP.8)



# The Kigali Amendment to the Montreal Protocol

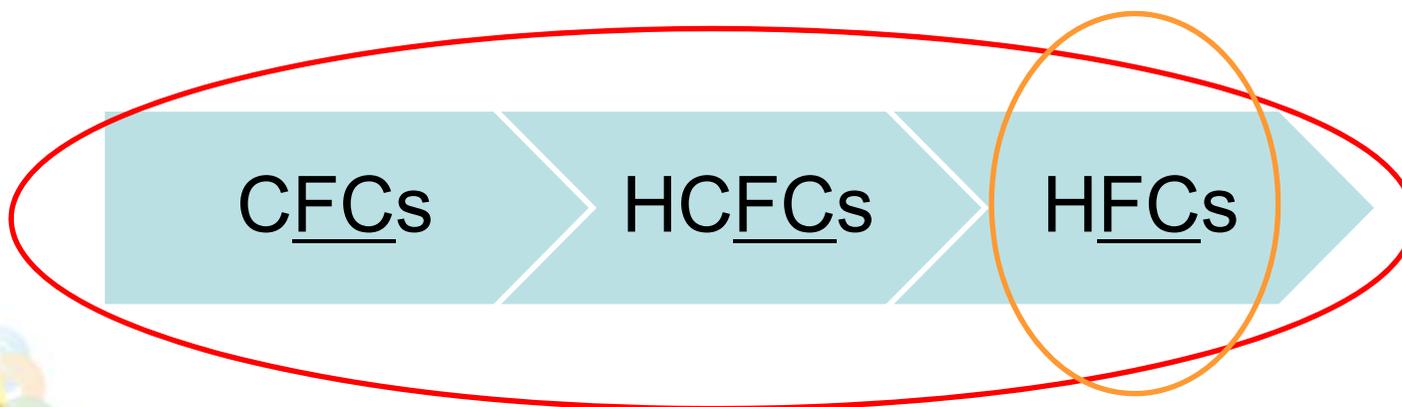
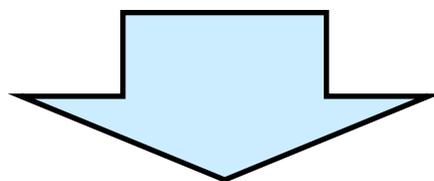
Montreal Protocol

UNFCCC



Global warming  
and Ozone depleting

Global warming



# Session III Presentations



|                               |  |                                 |
|-------------------------------|--|---------------------------------|
| 15:30 – 15:50                 | The Status of Reporting of Fluorinated Gases   | Ms. Elsa Hatanaka (GIO)         |
| 15:50 – 16:05                 | The Kigali Amendment and Policy for Fluorocarbons in Japan                               | Mr. Masahiko Suzuki (MOEJ)      |
| 16:05 – 16:20                 | Estimation Methodology for Fluorinated Gases   | Mr. Kiyoto Tanabe (IPCC/TFI)    |
| <a href="#">16:20 – 16:35</a> | <a href="#">Questions and Answers, Discussion</a>  | <a href="#">All</a>             |
| 16:35 – 16:50                 | Fluorinated Gas Emissions in India (Tentative)   | Dr. Sumana Bhattacharya (India) |
| 16:50 – 17:05                 | Hydrofluorocarbon Emissions in China: An Inventory for 2005–2013 and Projections to 2050 | Prof. Jianxin Hu (China)        |
| 17:05 – 17:20                 | F-gas Emission Trends in the Republic of Korea   | Ms. Min-Sun Kim (Korea)         |
| <a href="#">17:20 – 17:35</a> | <a href="#">Questions and Answers, Discussion</a>  | <a href="#">All</a>             |

# Possible questions for discussion



- ✓ What are the challenges in F-gas reporting?
- ✓ What are the good practices in F-gas reporting?

**Let's start the session!**

