11th Workshop on Greenhouse Gas Inventories in Asia

Application of National GHG Inventories to mitigation related policies in Japan

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Outline

I. Introduction - Various aspects of GHG inventories

II. Relationship between GHG inventories and mitigation policies

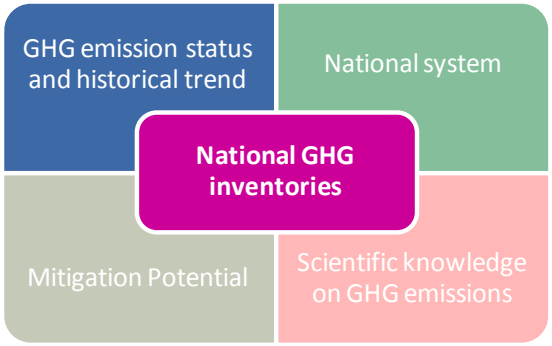
III. Relationship between GHG inventories and other policy fields

IV. Summary

Introduction of MURC

Mitsubishi UFJ Research & Consulting (MURC) has been in charge of the following project related to the GHG inventories and national communications.

- Preparation of Japanese GHG inventories (1997-2008)
- Development and improvement of methodologies for GHG emissions and removals (1997-)
- QC of the draft Japanese GHG inventories prepared by GIO (2008-)
- Factor analysis of change of GHG emissions (2001-)
- Projections and development of mitigation actions (2005-)
- Analysis of International negotiation of UNFCCC, especially MRV issues (2003-)
- Capacity building of GHG inventory preparation for developing countries (Viet nam and Indonesia) (2010-)
- Capacity building of Biennial Update Report for developing countries (2013-)
- Development of 1st Biennial Report of Japan (2013-)

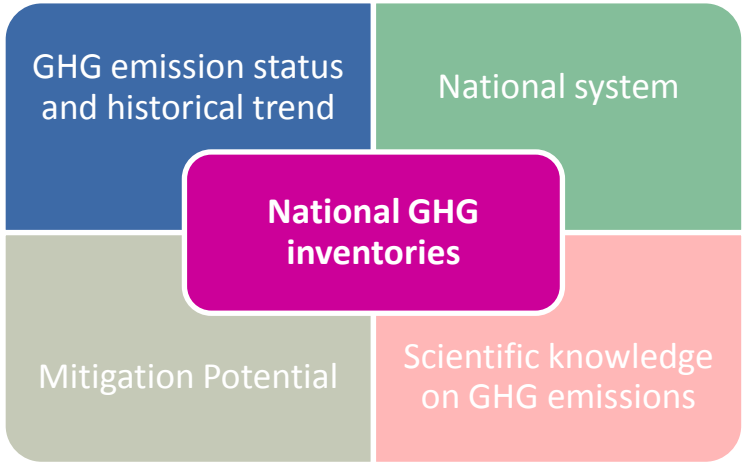


I. Introduction - Various aspects of GHG inventories

Various aspects of GHG inventories

The National GHG inventories for long time series provide quantitative information on GHG emission status and trend by each gas and category.

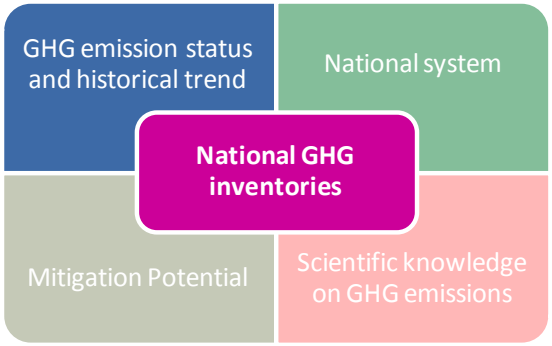
Relationship and collaboration between related ministries, agencies and organizations are enhanced through the data collection process.



The information on GHG emissions and parameters in the GHG inventories contribute to mitigation potential analysis.

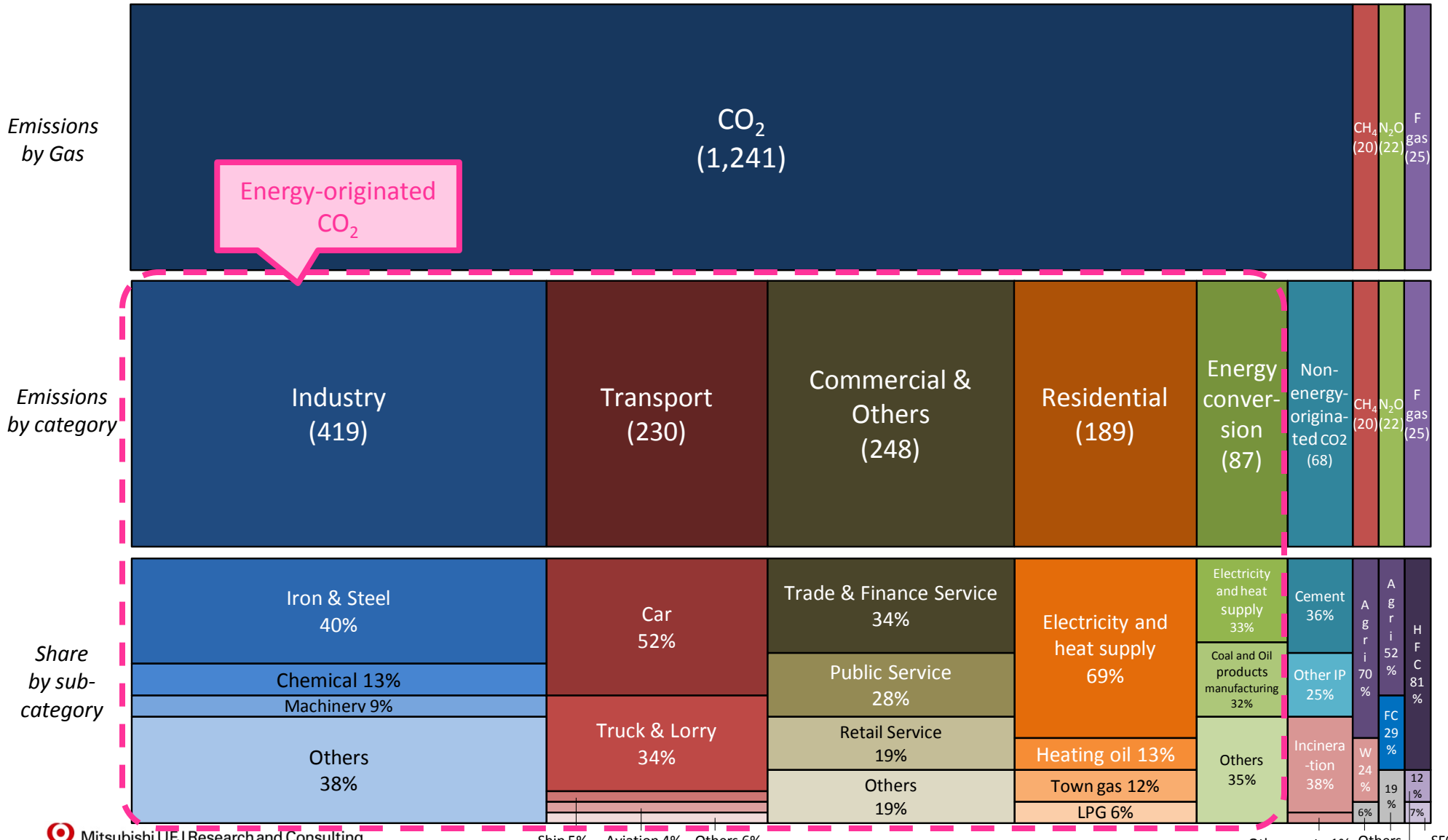
Scientific knowledge on GHG emission such as emission sources, emission mechanism and emission factor is developed and accumulated.

How are the National GHG inventories related to mitigation actions?



II. Relationship between GHG inventories & Mitigation actions in Japan

Emission structure of GHG emissions in Japan

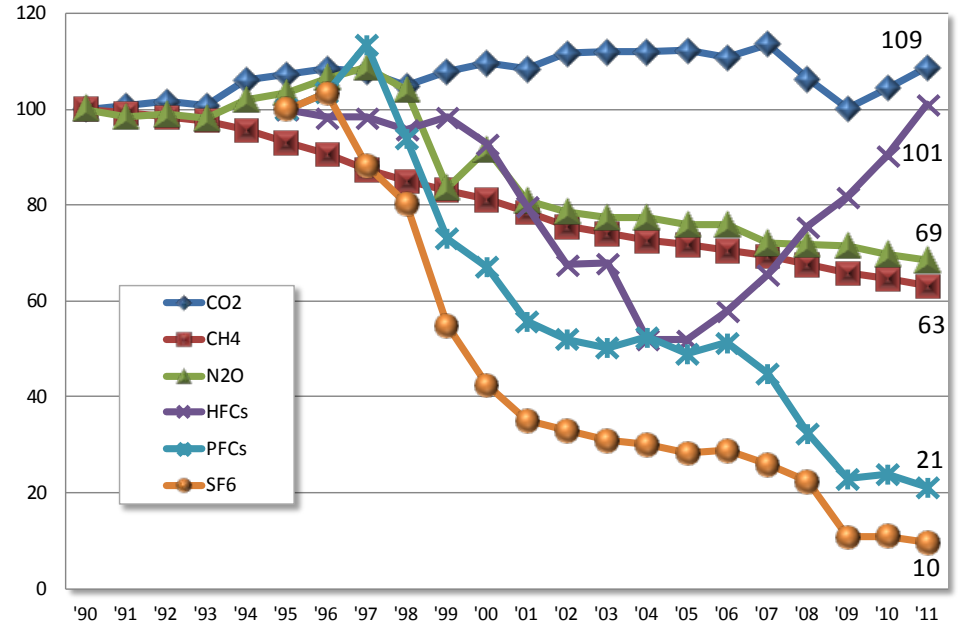


Source : created based on data from National GHG inventories of Japan, MOE, GIO/CGER/NIES

Emission Trend by gas

(CO2, CH4, N2O: 1990FY=100, Fgas : 1995CY = 100)

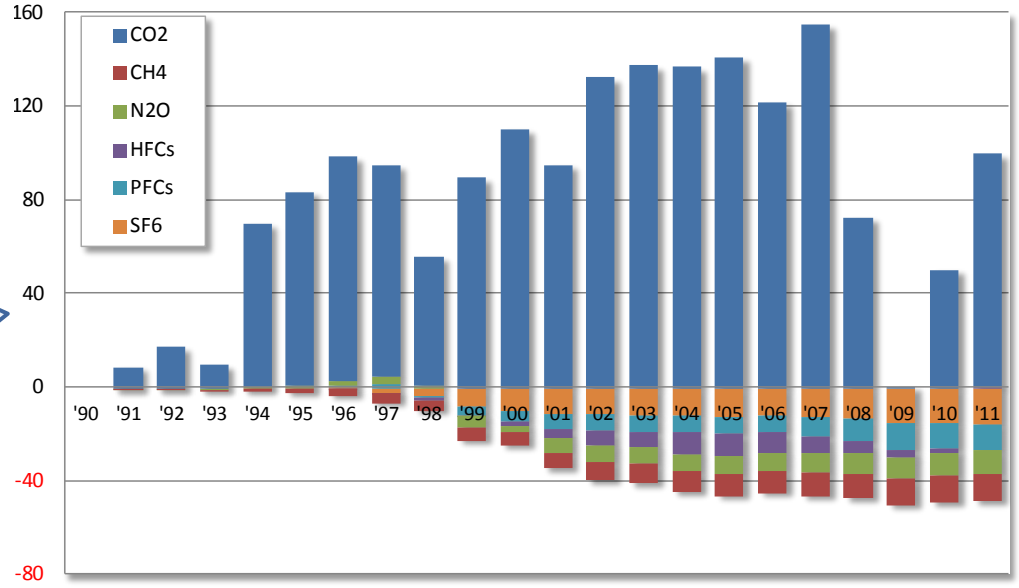
Trend of Emissions Index by gas



- ✓ CO_2 emissions have increased by 9% compared to 1990.
- ✓ Though HFCs emissions are increasing recently, the emissions in 2011 are almost same as 1990.
- ✓ Other gases have decreased.

(Mt-CO2)

Changes of emissions compared to 1990 by gas



The increase of total GHG emissions of Japan since 1990 is caused by the increase of CO_2 emissions (especially, CO_2 emissions from fuel combustion).

Source : created based on data from National GHG inventories of Japan, MOE, GIO/CGER/NIES

Kyoto Protocol Target Achievement Plan (KPTAP)

Most concrete countermeasures listed in the KPTAP are those for reducing energy-originated CO_2 emissions in accordance with GHG emission structure in Japan.

	Protocol Base Year	Target Emissions in FY2010	
		Emissions	Base-year total emissions ratio
Energy-originated CO_2	1,059	1,076 – 1,089	**+1.3% – +2.3%**
Industrial sector	482	424 – 428	-4.6% – -4.3%
Commercial and other sector	164	208 – 210	+3.4% – +3.6%
Residential sector	127	138 – 141	+0.9% – +1.1%
Transport sector	217	240 – 243	+1.8% – +2.0%
Energy industries sector	68	66	-0.1%
Non-energy-originated CO_2, CH_4, N_2O	151	132	**-1.5%**
Non-energy-originated CO_2	85	85	0.0%
CH_4	33	23	-0.9%
N_2O	33	25	-0.6%
Three fluorinated gases	51	31	**-1.6%**
HFCs	20	22	0.1%
PFCs	14	5	-0.7%
SF_6	17	4	-1.0%
Greenhouse Gas Emissions	**1,261**	**1,239 – 1,2**	**-1.8% – -0.8%**
CO2 removal by sinks			**-3.8%**
Kyoto Mechanisms			**-1.6%**

Concrete measures listed in KPTAP

Energy-originated CO_2
- ✓Promotion and Reinforcement of Voluntary Action Plans of Industry
- ✓ Improvement of the Efficiency of Devices Based on the Top-runner Standards
- ✓Improvement of the Energy Efficiency Performance of Houses
- ✓Improvements in the Fuel Efficiency of Automobile

etc. **Total 174 measures**

Non-energy-originated CO_2, CH_4, N_2O
- ✓Promotion of Measures to Reduce CO_2 Emissions Derived From Waste Incineration
- ✓Reduction in the Amount of Final Waste Disposal
- ✓ Optimization and Reduction of Fertilizer Application

etc. **Total 7 measures**

F gas (HFCs, PFCs, SF_6)
- ✓Promotion of Development of Substitute Materials and Use of Substitute Products

etc. **Total 4 measures**

Source : Kyoto Protocol Target Achievement Plan, Totally revised March 28, 2008

Evaluating progress of mitigation policies and measures

Japan evaluates the progress of mitigation policies and actions by mainly two approaches.

Factor Analysis of GHG emission trends

- Analyze the effects of overall mitigation policies in each sector by understanding the causes of change of GHG emission trend based on the national GHG inventory.
- Mainly the two following approaches are used.
  - **Intensity index analysis**
  - **Factor decomposition**

Progress Evaluation of the KPTAP

- Analyze the progress of each countermeasure listed in the KPTAP.
- Collect comprehensive data concerning the status of achievement of targets by type of gas or other category as well as the progress of individual measures and policies.
- Clarify the actual figures for all countermeasure evaluation indices such as countermeasure evaluation indices, volume of emission reductions and other related indices.

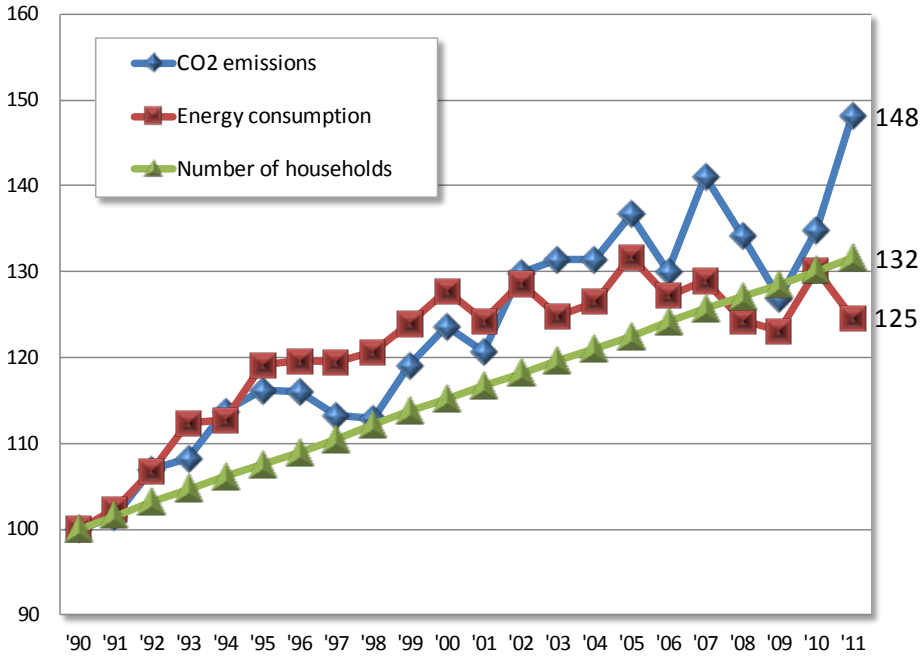
Consider the introduction of new polices and measures as well as the reinforcement of policies and measures already included in KPTAP.

Factor Analysis - Overview of Intensity index Analysis

The intensity index analysis is an analysis method to focus on the change of "intensity index" such as "CO_2 emissions per energy consumption" and "Energy consumption per unit of activity".

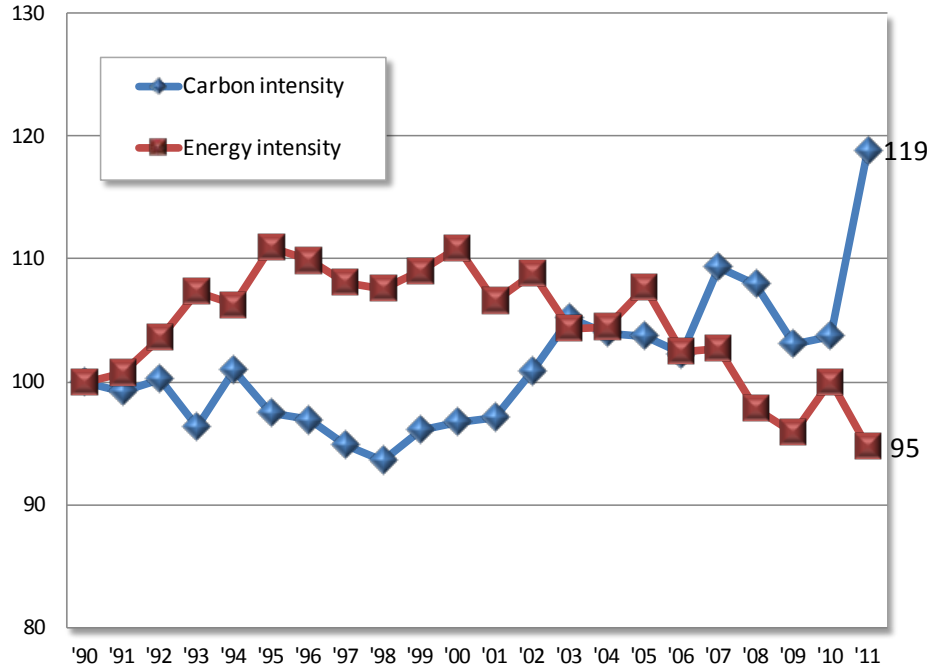
CO2 emissions from residential sector have largely increased since 1990. Energy consumption and the number of households have also increased.

(1990FY=100) **Relevant indicators of Residential sector**



Carbon intensity has increased since 1990 because of the shutdown of the nuclear power reactor, but Energy intensity which is energy consumption per household has decreased. Therefore, policies and measures for reducing the energy consumption in households have a certain effect.

(1990FY=100) **Carbon and Energy Intensity of Residential sector**



Source : created based on data from National GHG inventories of Japan, MOE, GIO/CGER/NIES

Factor Analysis - Method of Factor Decomposition

- The factor decomposition is an analysis method to evaluate the factors of GHG emissions. In principle, the GHG emissions can be factorized into the "volume of activity" such as number of households, floor area, production etc. and the "volume of GHG emissions per unit of activity".
- In case of residential sector, CO_2 emissions can be decomposed into the following factors.

$$CO_2\ emissions\ (C) = \frac{CO_2\ emissions\ (C)}{Energy\ consumption\ (E)} * \frac{Energy\ consumption\ (E)}{Number\ of\ households\ (V)} * Number\ of\ household\ (V)$$

Carbon Intensity

"CO_2 emissions per unit of Energy consumption"

Carbon intensity expresses the change of carbon intensity of power generation and fuel shift.

Energy Intensity

"Energy consumption per unit of household"

Energy intensity expresses the change of technology and number of electrical appliances in a household.

Volume of activity

Factor Analysis - Method of Factor Decomposition (-cont.)

The amount of change of emissions caused by each factor can be estimated by the following formula.

The amount of emission change caused by the change of Carbon Intensity

$$F_1 = \Delta(C/E) * E/V * V + (\Delta(C/E) * \Delta(E/V) * V)/2 + (\Delta(C/E) * E/V * \Delta V)/2 + (\Delta(C/E) * \Delta(E/V) * \Delta V)/3$$

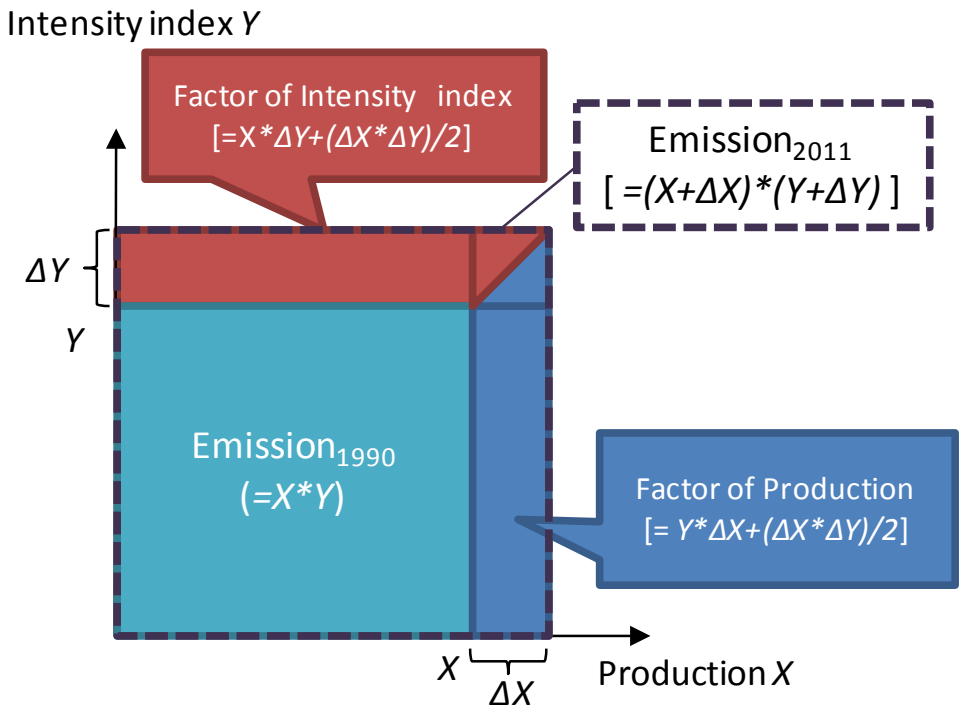
The amount of emission change caused by the change of Energy Intensity

$$F_2 = C/E * \Delta(E/V) * V + (\Delta(C/E) * \Delta(E/V) * V)/2 + (C/E * \Delta(E/V) * \Delta V)/2 + (\Delta(C/E) * \Delta(E/V) * \Delta V)/3$$

The amount of emission change caused by the change of Activity

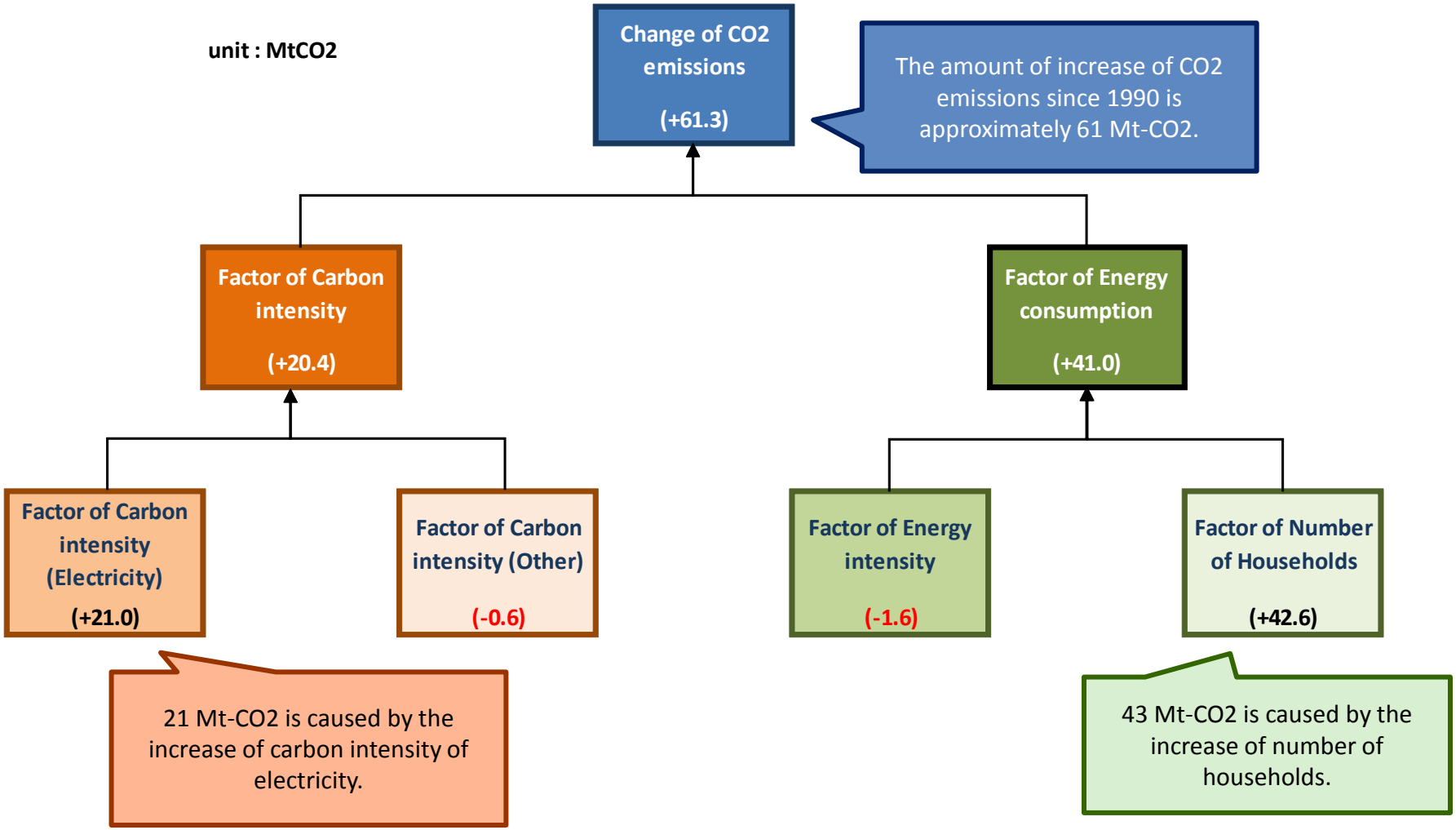
$$F_3 = C/E * E/V * \Delta V + (\Delta(C/E) * E/V * \Delta V)/2 + (\Delta(C/E) * \Delta(E/V) * \Delta V)/2 + (\Delta(C/E) * \Delta(E/V) * \Delta V)/3$$

Conceptual image of factor decomposition (Where the emission is decomposed into the factor of production and intensity index)



Factor Analysis - Results of Factor Decomposition

Results of factor decomposition of CO_2 emissions from residential sector between 1990 and 2011

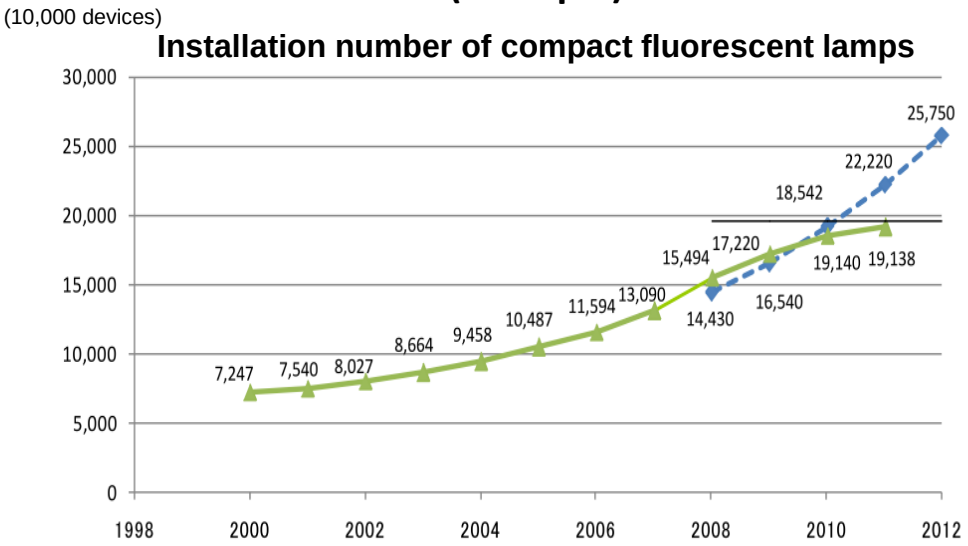


Source : created based on data from National GHG inventories of Japan, MOE, GIO/CGER/NIES

Progress Evaluation of Kyoto Protocol Target Achievement Plan

- The Japanese government clarifies the actual figures for all countermeasure evaluation indices such as countermeasure evaluation indices, volume of emission reductions and other related indices.

(Example) Dissemination of high-efficiency energy saving devices

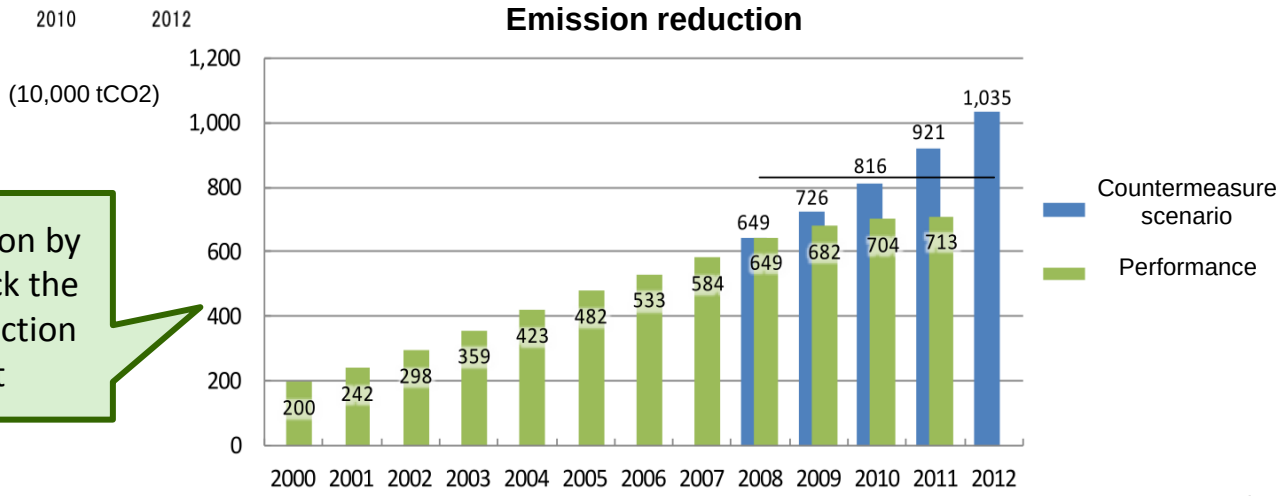


Check the progress of installation compared to forecast

Countermeasure scenario

Performance

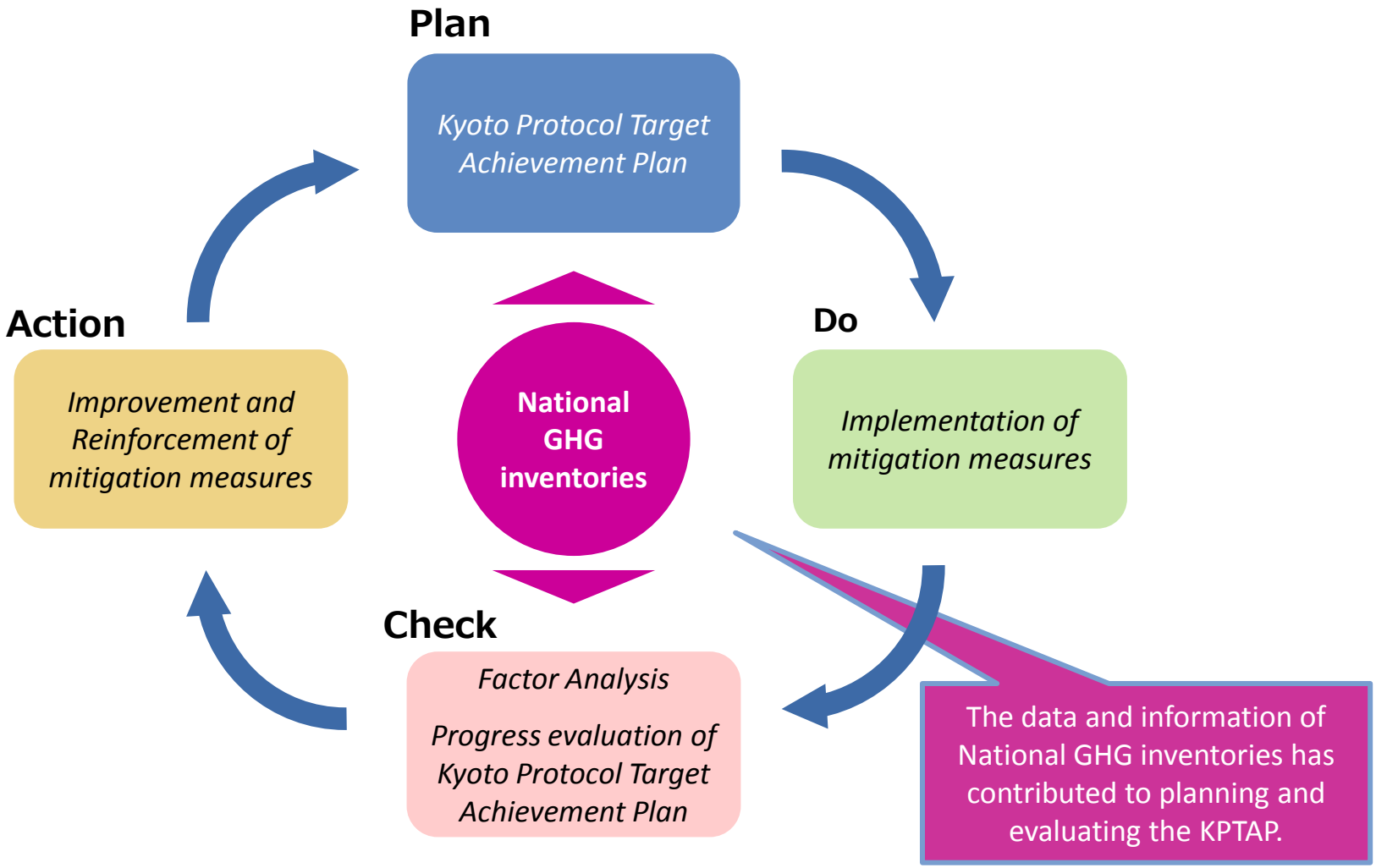
Average of 1st commitment period

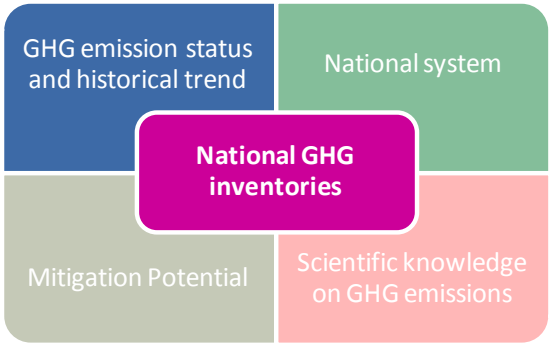


Estimate emission reduction by evaluation index and check the progress of emission reduction compared to forecast

Source :Progress Evaluation of Kyoto Protocol Target Achievement Plan, 5 April 2013, the Global Warming Prevention Headquarters

PDCA cycle of mitigation policies in Japan

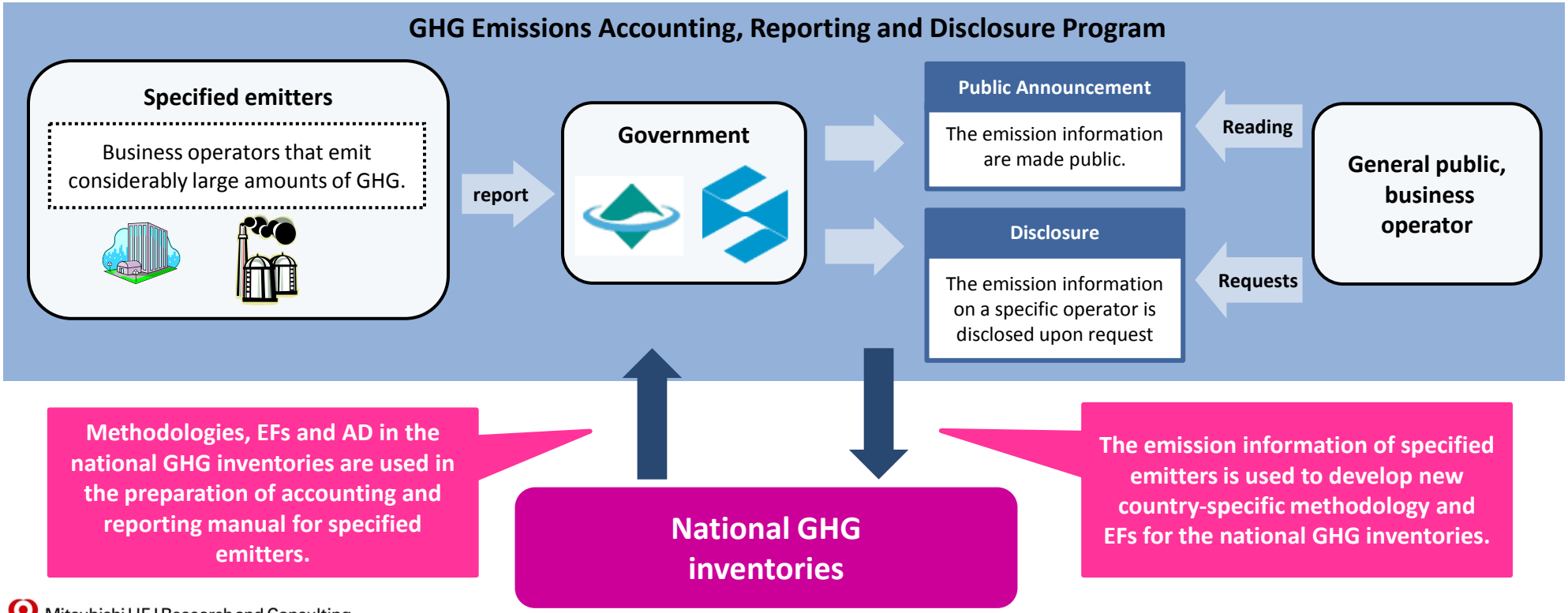




III. Relationship between GHG inventories and Other Policy fields in Japan

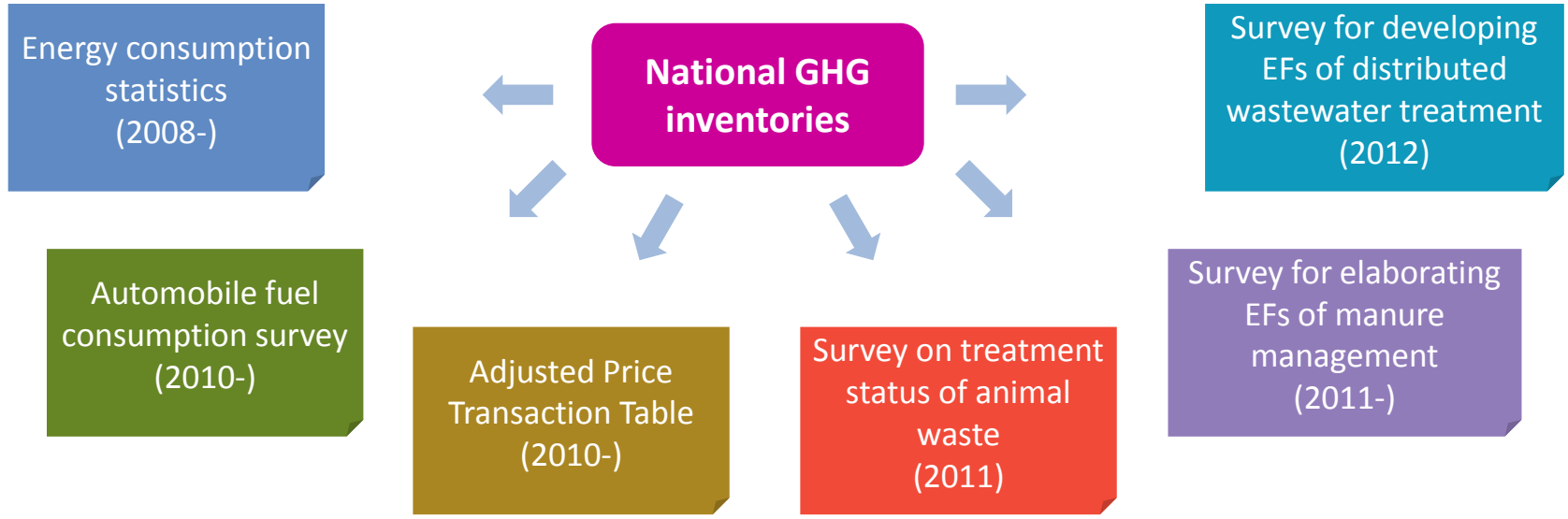
GHG Inventories and GHG Emissions Accounting, Reporting and Disclosure Program

- GHG Emissions Accounting, Reporting and Disclosure Program makes it obligatory for specified emitters to calculate and report GHG emissions, and the government collects these data and publishes them.
- Manual on GHG emissions accounting and reporting for specified emitters is developed based on methodologies, EFs and AD used in the national GHG inventories.
- The emission information reported in this program is used to develop new country-specific methodology and EFs for the national GHG inventories.

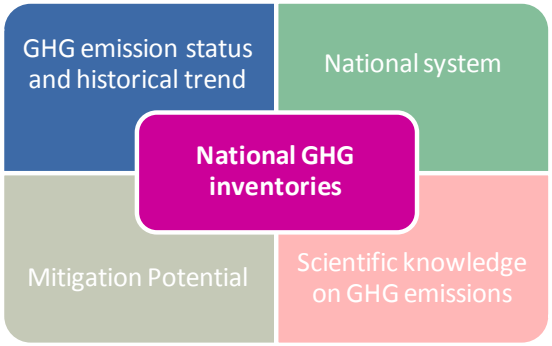


GHG inventories and development of official statistics and academic research

- Need for understanding detailed emission status leads to the development of new official statistics, country-specific emission factors and academic research on GHG emissions.

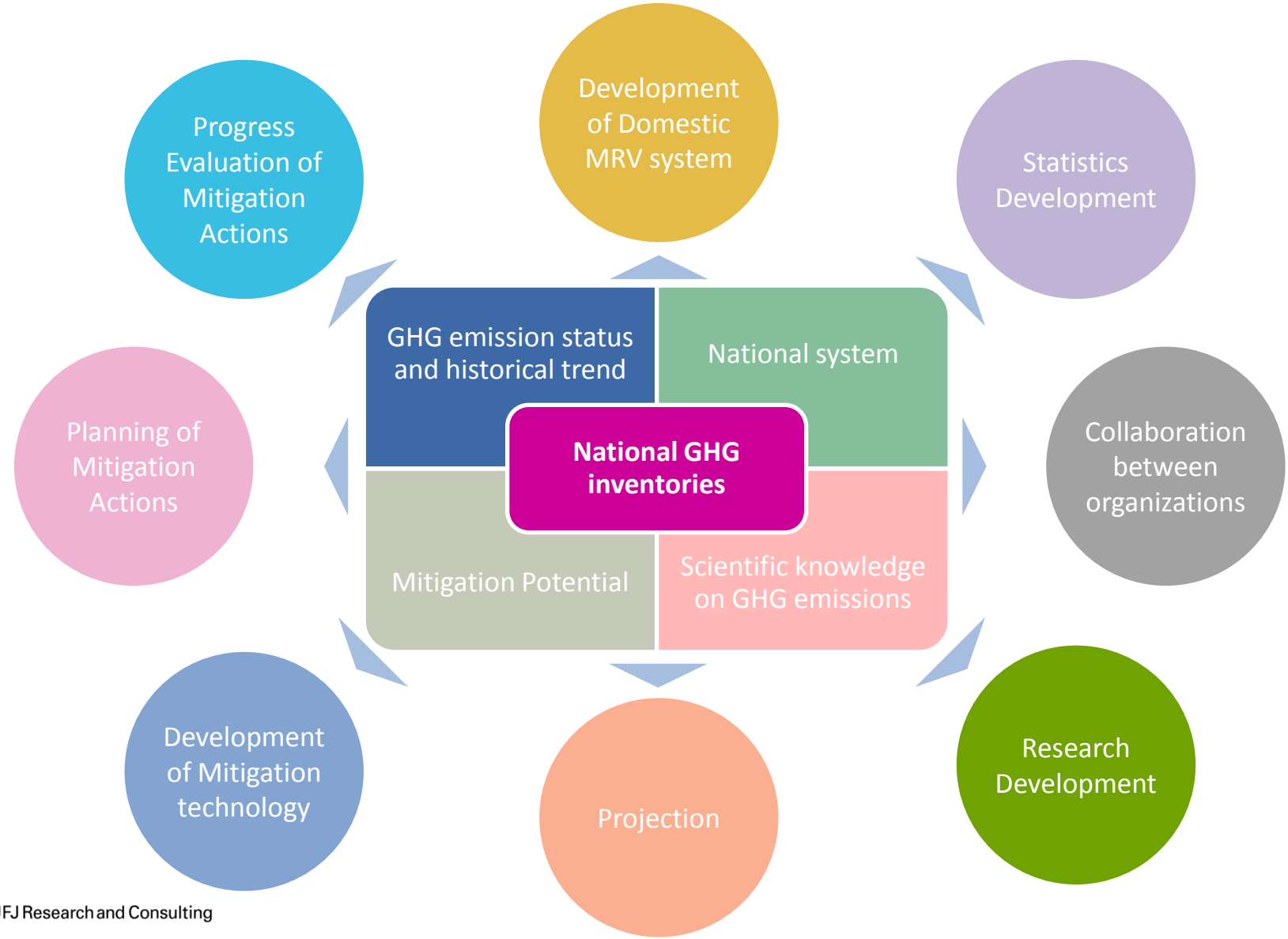


- Outcome and information of the above statistics and research can be applied to not only GHG inventories improvement but also wide range of policy fields.


GHG emission status and historical trend
National system
National GHG inventories
Mitigation Potential
Scientific knowledge on GHG emissions

IV. Summary

Summary


Development of Domestic MRV system
Statistics Development
Collaboration between organizations
Research Development
Projection
Development of Mitigation technology
Planning of Mitigation Actions
Progress Evaluation of Mitigation Actions
GHG emission status and historical trend
National system
National GHG inventories
Mitigation Potential
Scientific knowledge on GHG emissions

Thank you for your attention!

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