



A Summary Review of Iran's GHGs Inventory and Policies to Mitigate Climate Change

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Sustainable Development of I.R.Iran**

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Presentation Overview

- **IPCC methodology for GHGs emission inventory**
- **Summary of GHGs inventory in 1994**
- **GHGs emissions in energy sector**
- **GHGs emission in industrial processes**
- **Why do we need more attention to energy sector**
- **Mitigation policies to address climate change**
 - **Energy sector**
 - **Non-energy sector**

IPCC Methodology for GHGs Emission Inventory

➤ Greenhouse gases

➤ Direct GHGs

➤ CO₂, CH₄, N₂O, HFCs, PFCs, SF₆

➤ In-direct GHGs

➤ NO_x, CO, NMVOC, SO₂

➤ Methodology

➤ $\sum E_i = \sum \sum A.D_i * E.F_{ij} * GWP_j$

➤ Depending on the availability of data and emission factors, different tiers has recommended by IPCC, have been used to estimate the emission inventory.

IPCC Methodology for GHGs Emission Inventory

- **GHGs emission sub-sectors:**
 - **Energy**
 - **Industrial processes**
 - **Solvents**
 - **Agriculture**
 - **Forestry & Land-use Change**
 - **Waste**

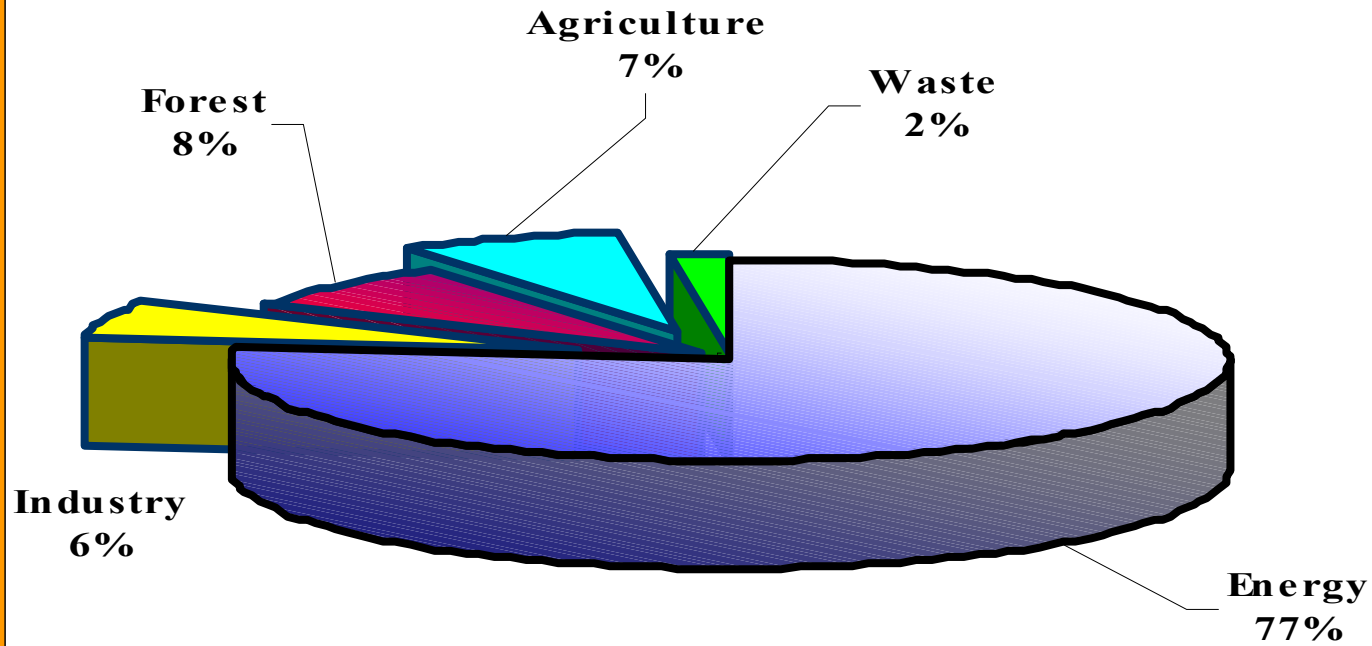
National GHGs Inventory

Summary of GHGs Inventory of I.R. Iran in 1994 (Ktons)

● Sources	CO ₂	CH ₄	N ₂ O
1. Energy	285,891	1559	8.79
Fuel Combustion	254,354	80.58	8.79
Fugitive Emission	31,537	1478	0
2. Industrial processes	24,754	1.85	2.2
3. Agriculture	0	643.09	54
4. Forestry	31,416	6.97	0.049
5. Waste	0	326.71	4.64
Total	342,062	2537	70
GWP	1	21	310
Total CO₂ Equ.	342,062	53,290	21,657

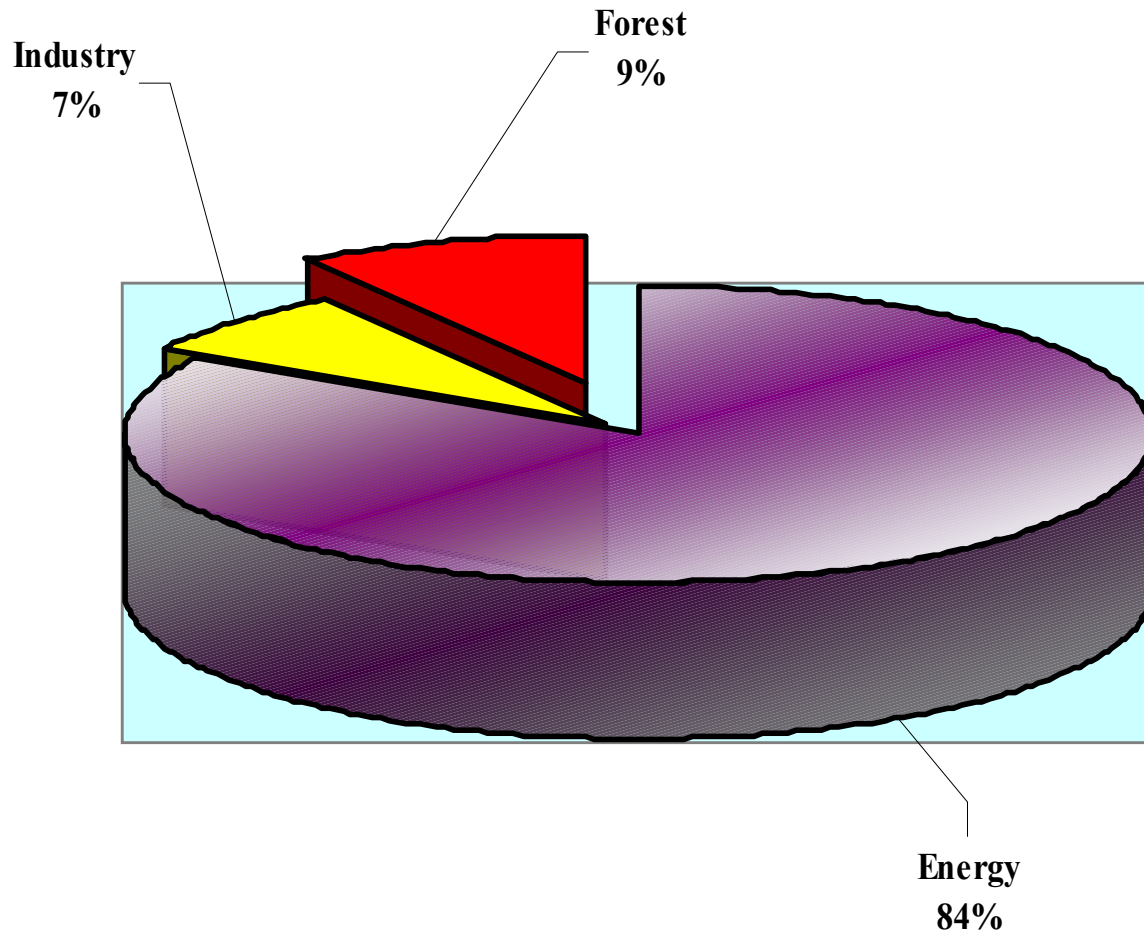
National GHGs Inventory

Contribution of Different Sectors to total CO₂ Eq. Emissions
in 1994 (Ktons)



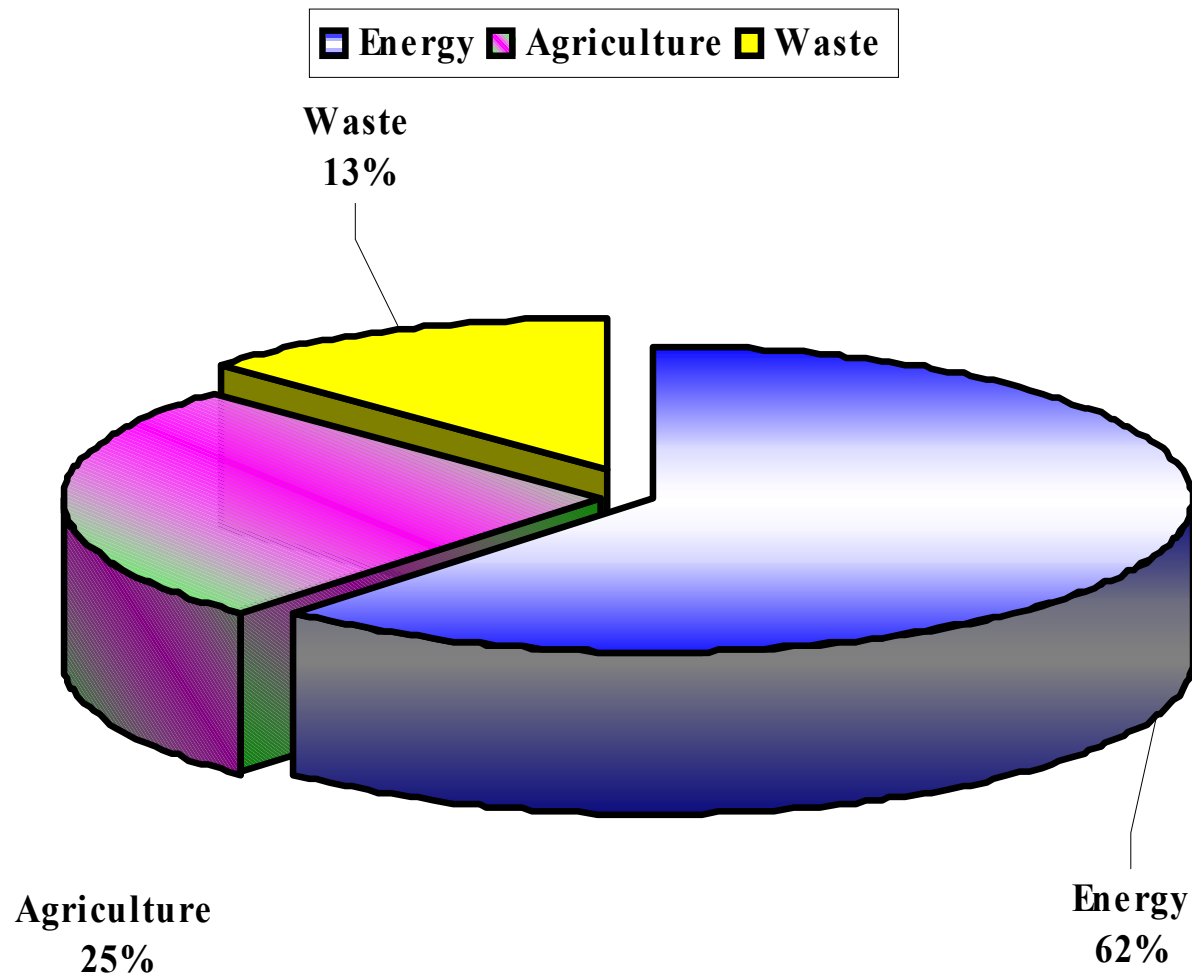
National GHGs Inventory

Contribution of Different Sectors to total CO₂ Emissions in 1994 (Ktons)



National GHGs Inventory

Contribution of Different Sectors to total CH₄ Emissions in 1994 (Ktons)



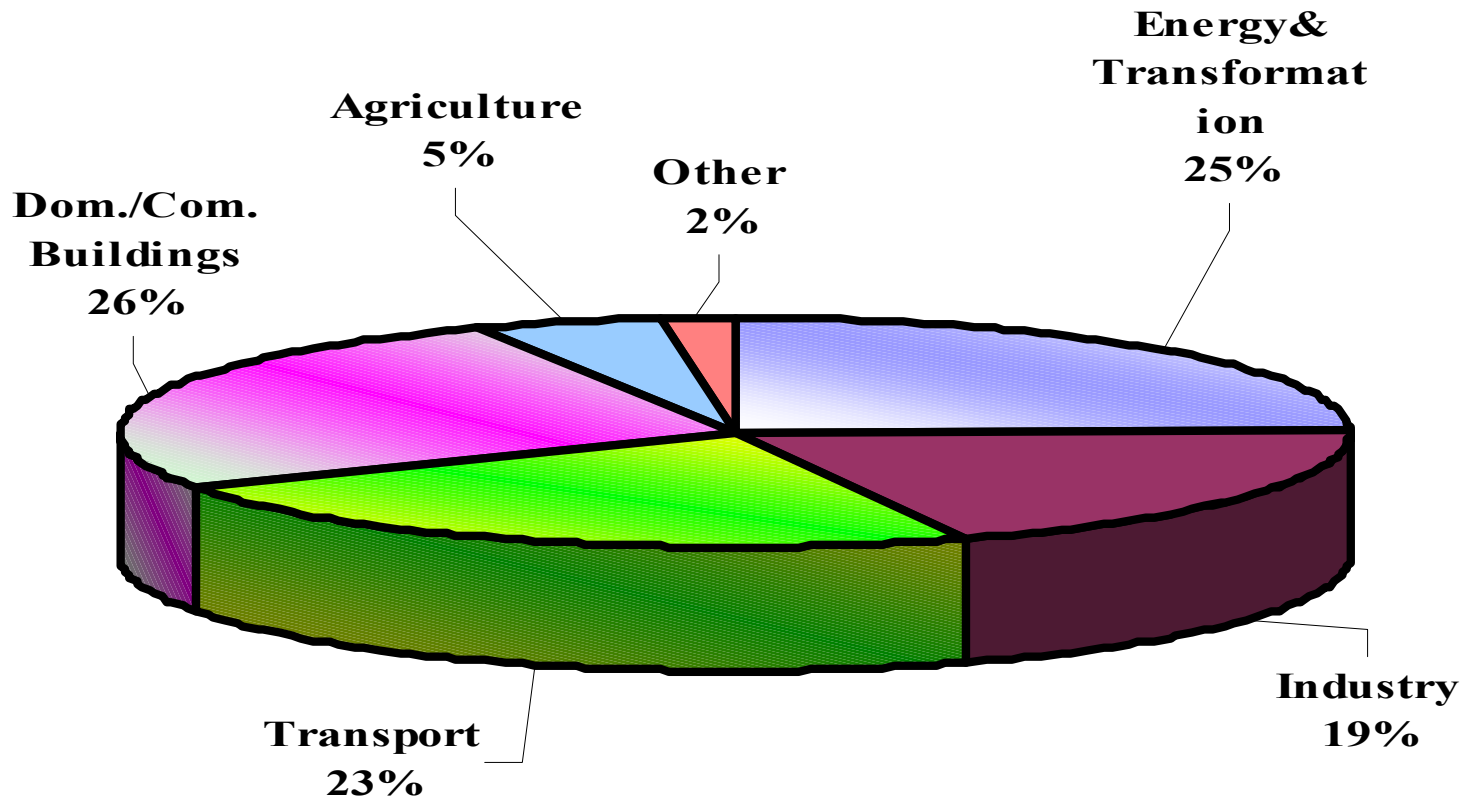
National GHGs Inventory

CO₂ Emissions from Different Energy Sub-sectors(Ktons)-1994

➤ Sources	CO ₂ Emissions
➤ Energy&Transformation	63,197
➤ Industry	48,179
➤ Transportation	58,709
➤ Commercial and Residential Buildings	66,512
➤ Agriculture	12,689
➤ Other	5,067
➤ Sub- total	254,354
➤ Hot Flare	31, 537
➤ Total	285,891

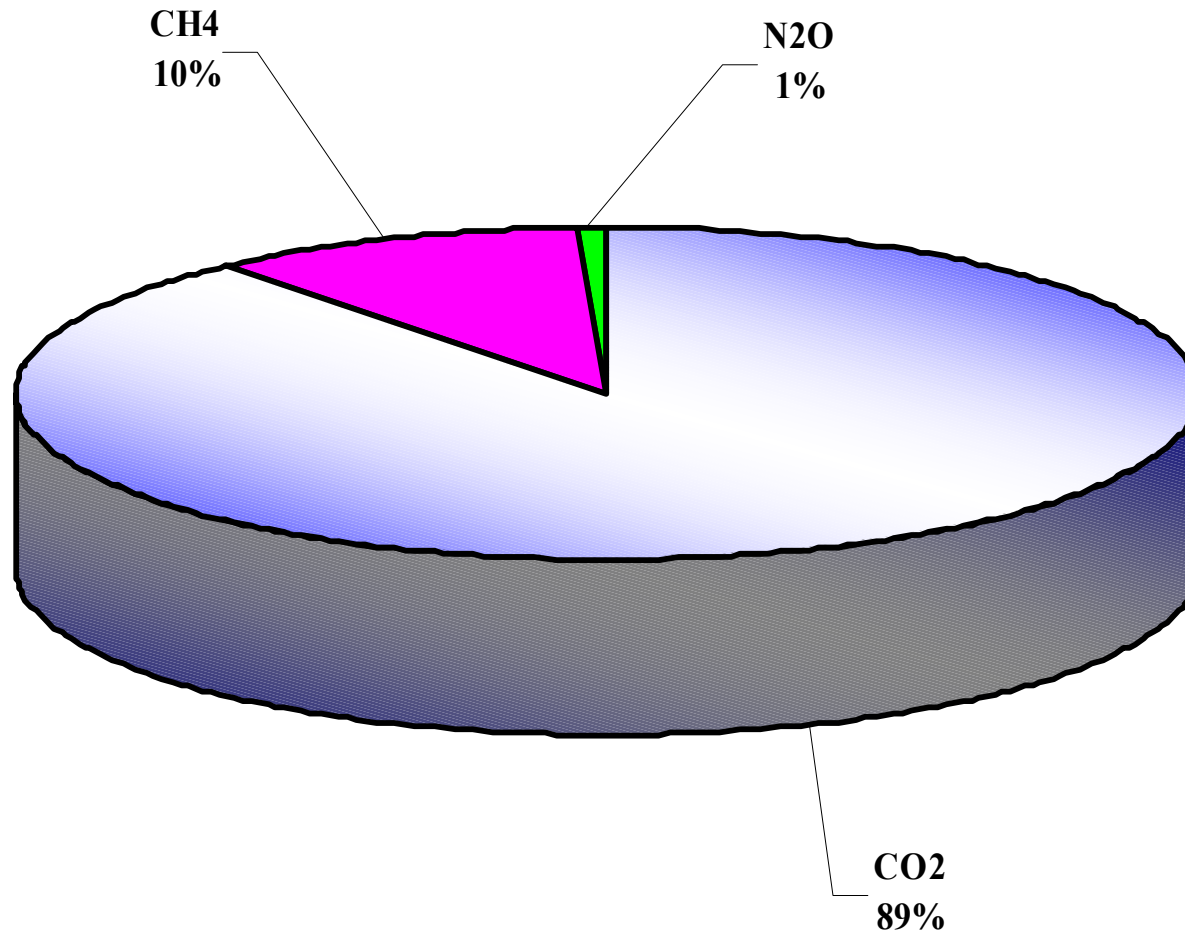
National GHGs Inventory

Contribution of Energy Sub-sectors to CO₂ Emissions (1994)

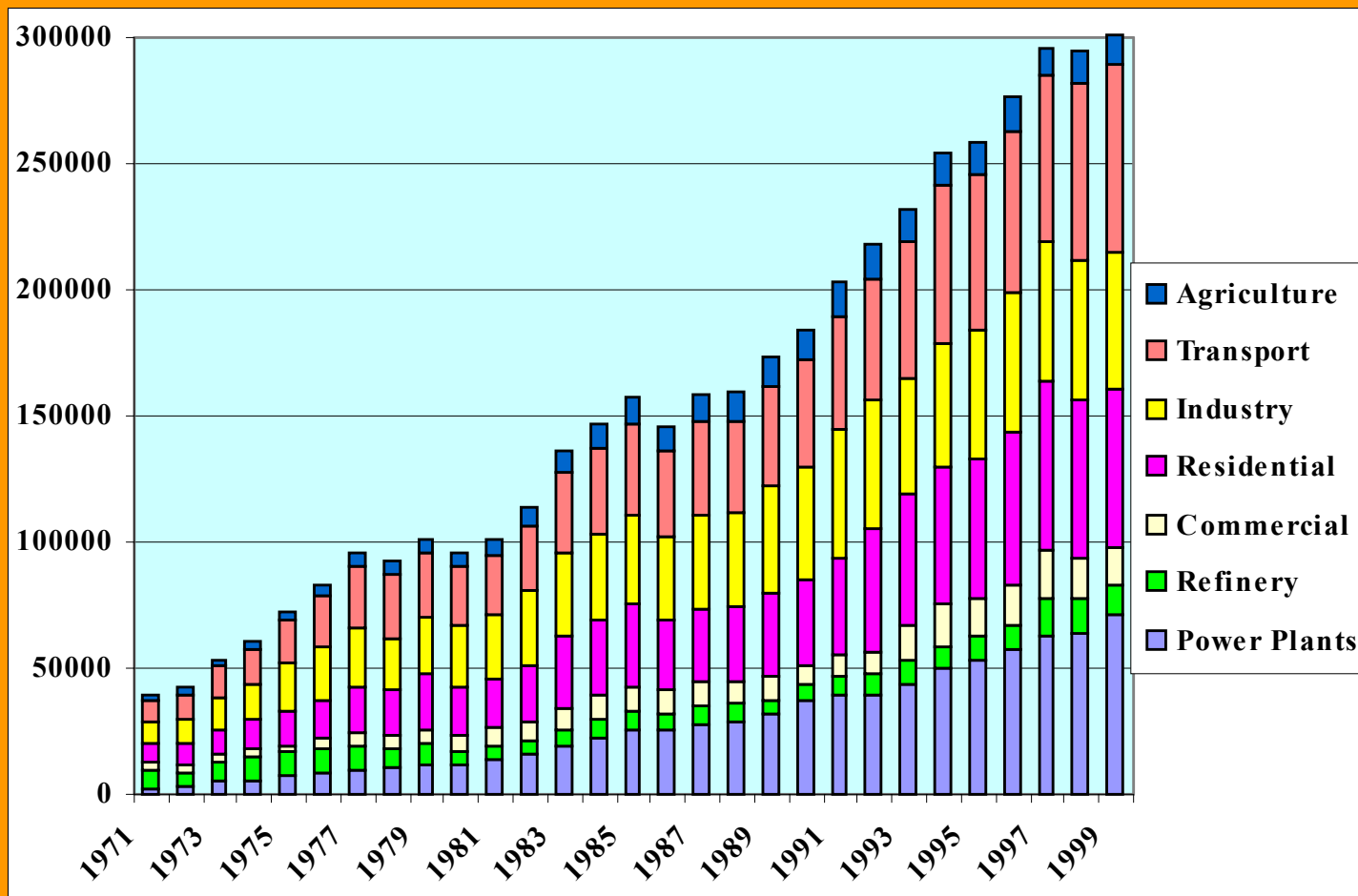


National GHGs Inventory

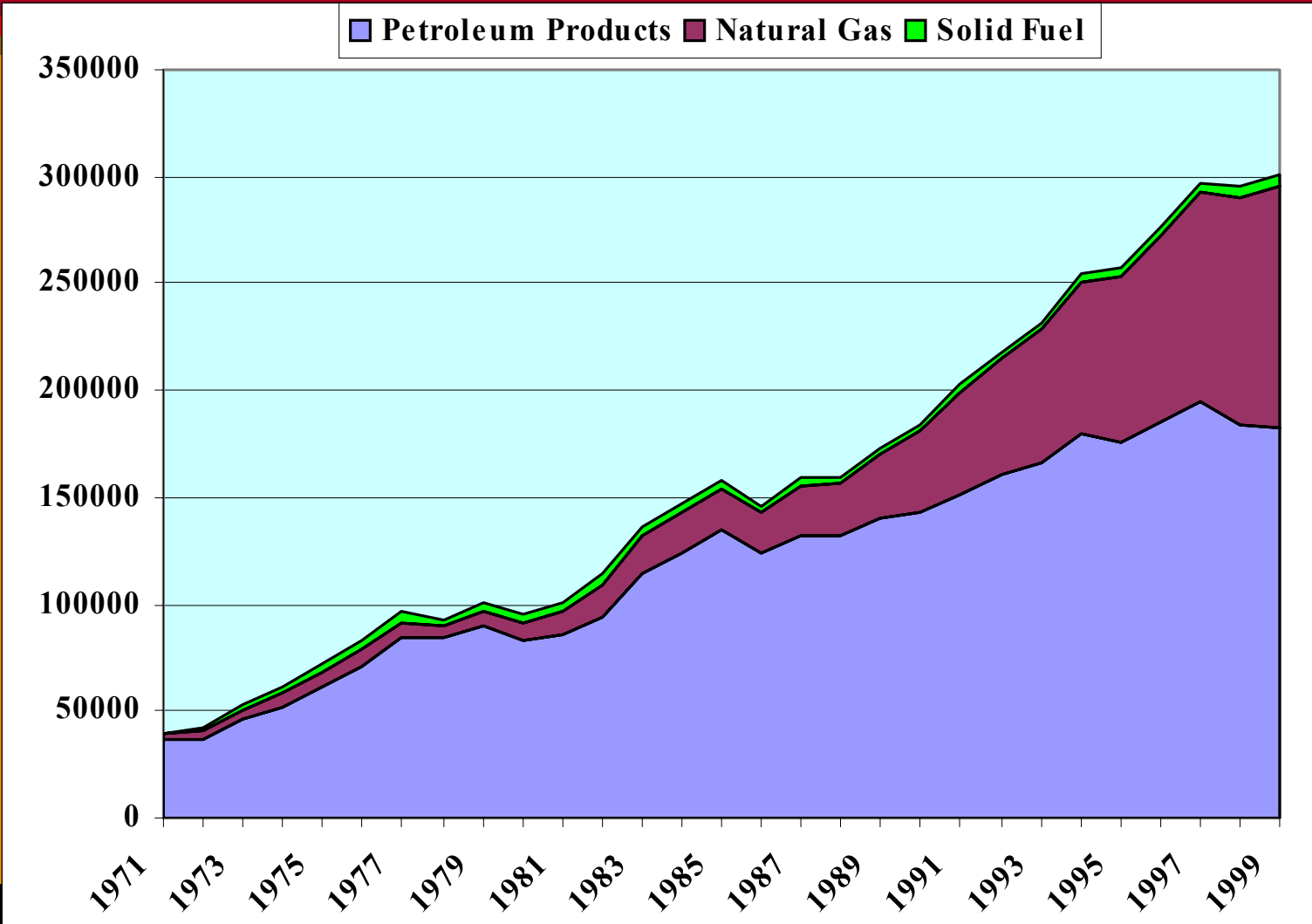
Contribution of Different Gases to total CO₂ Equivalent Emissions in Energy Sector – 1994



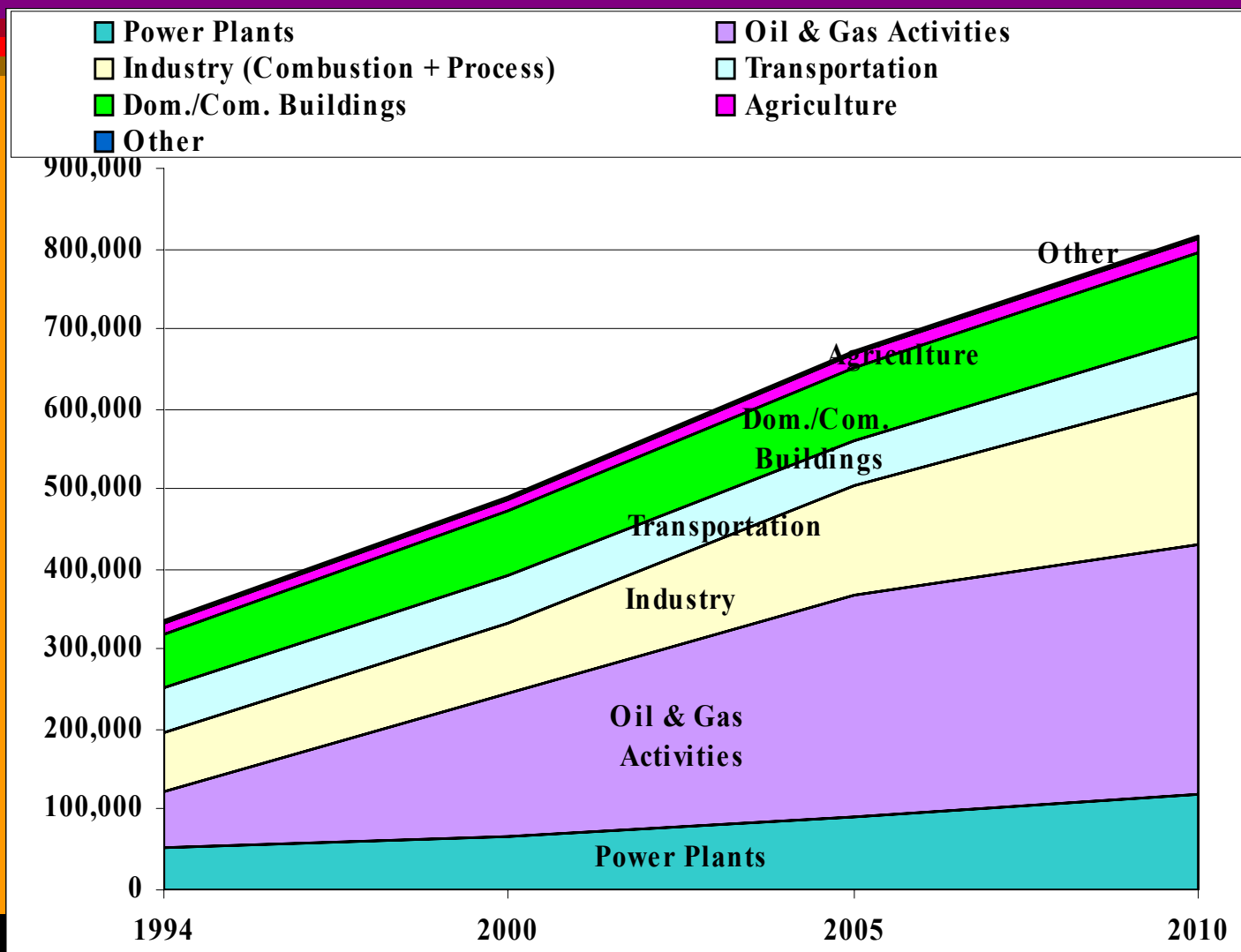
Trend of CO₂ Emissions in the Energy Sub-sector (Ktons)



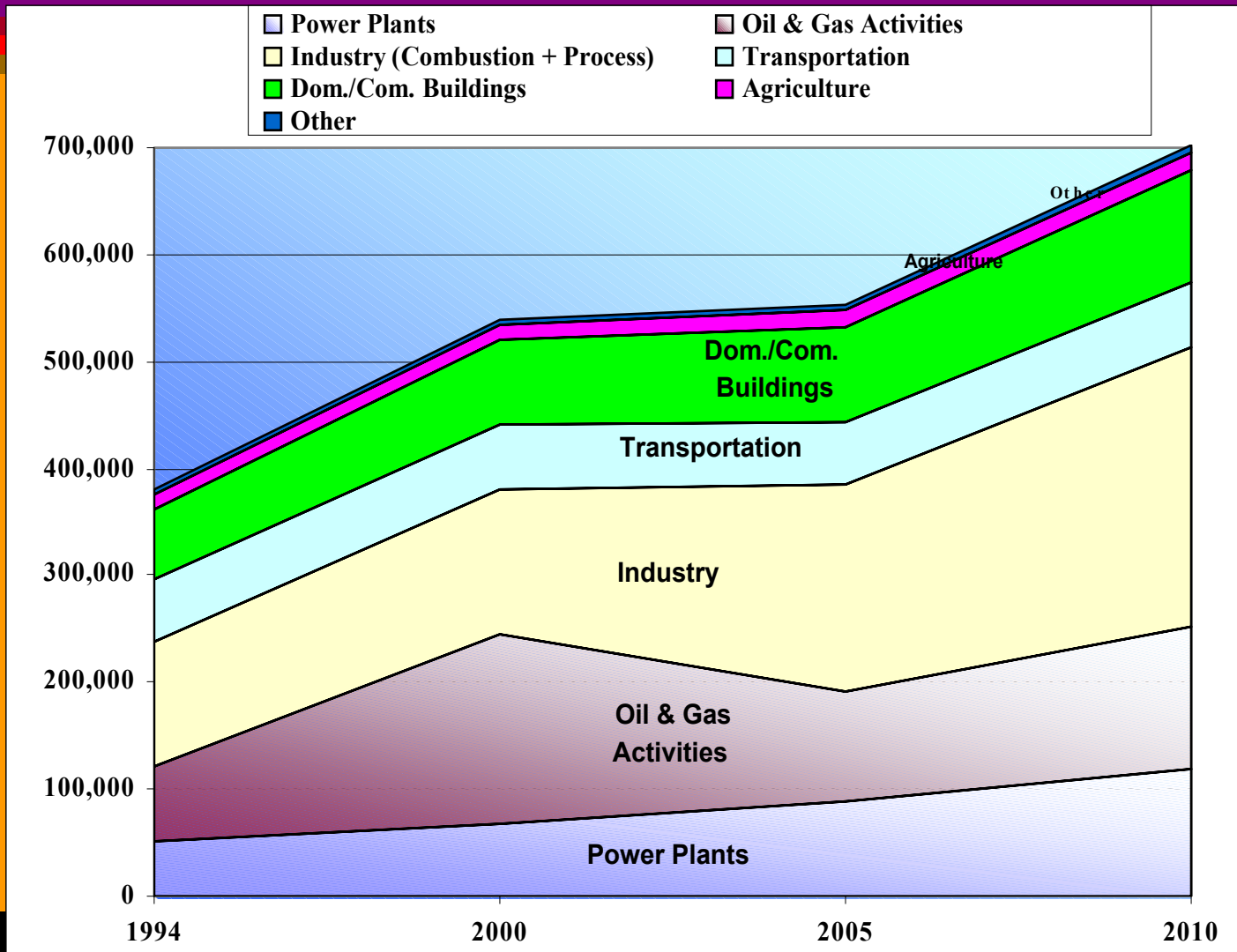
Trend of CO2 Emissions by Fuel Type in the Energy Sector (Ktons)



GHGs Emission Trends in Baseline Scenario without Recovery of Flare Gas (Energy Sector-Gg)



GHGs Emission Trends in Baseline Scenario with Recovery of Flare Gas (Energy Sector-Gg)



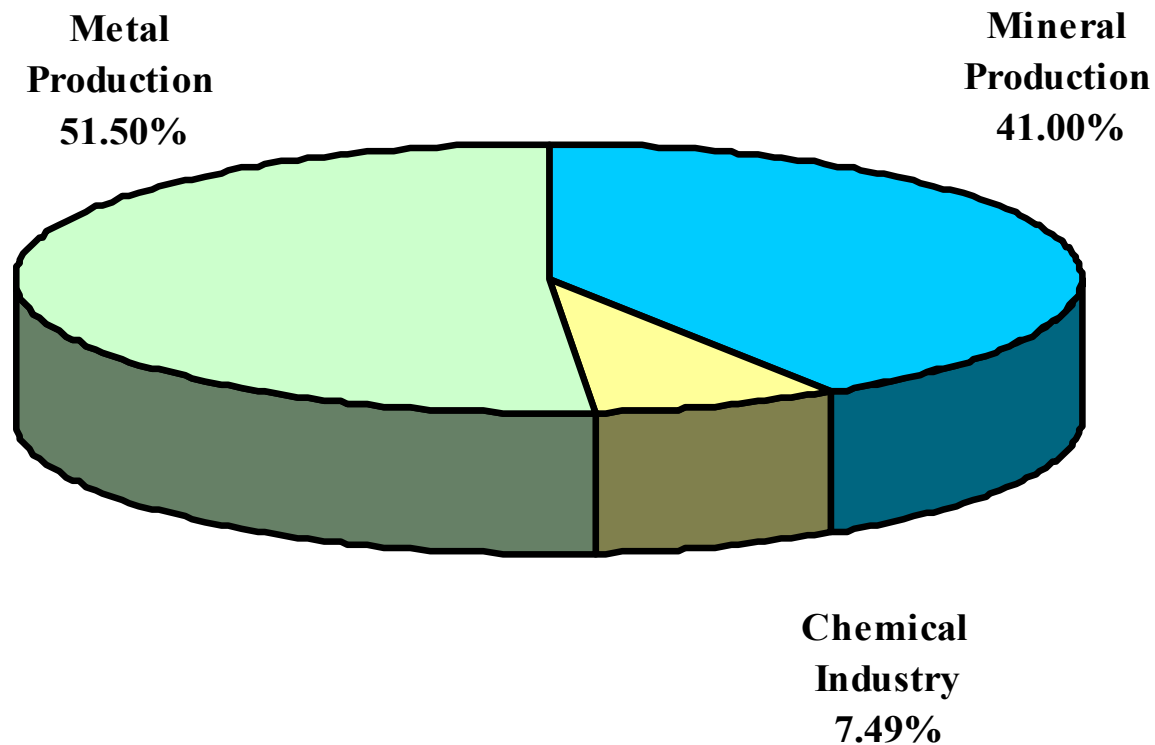
National GHGs Inventory

CO₂ Emissions from Different Sub-sectors for Industrial Processes(Ktons)-1994

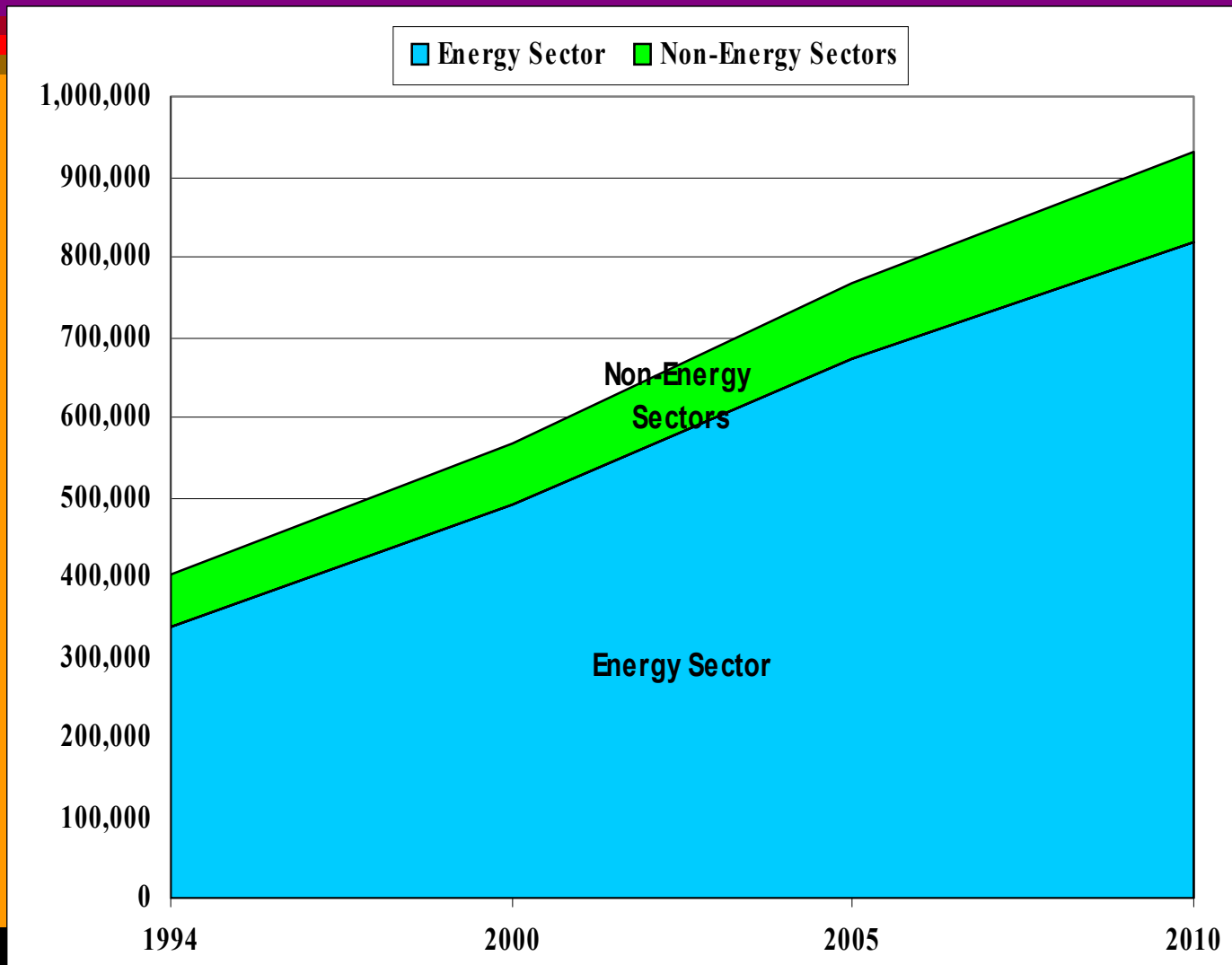
Emissions Sources	CO₂ Emissions
Mineral Products	<i>10,161</i>
Chemical Industry	<i>1,857</i>
Metal Production	<i>12,763</i>
Total	24,781

National GHGs Inventory

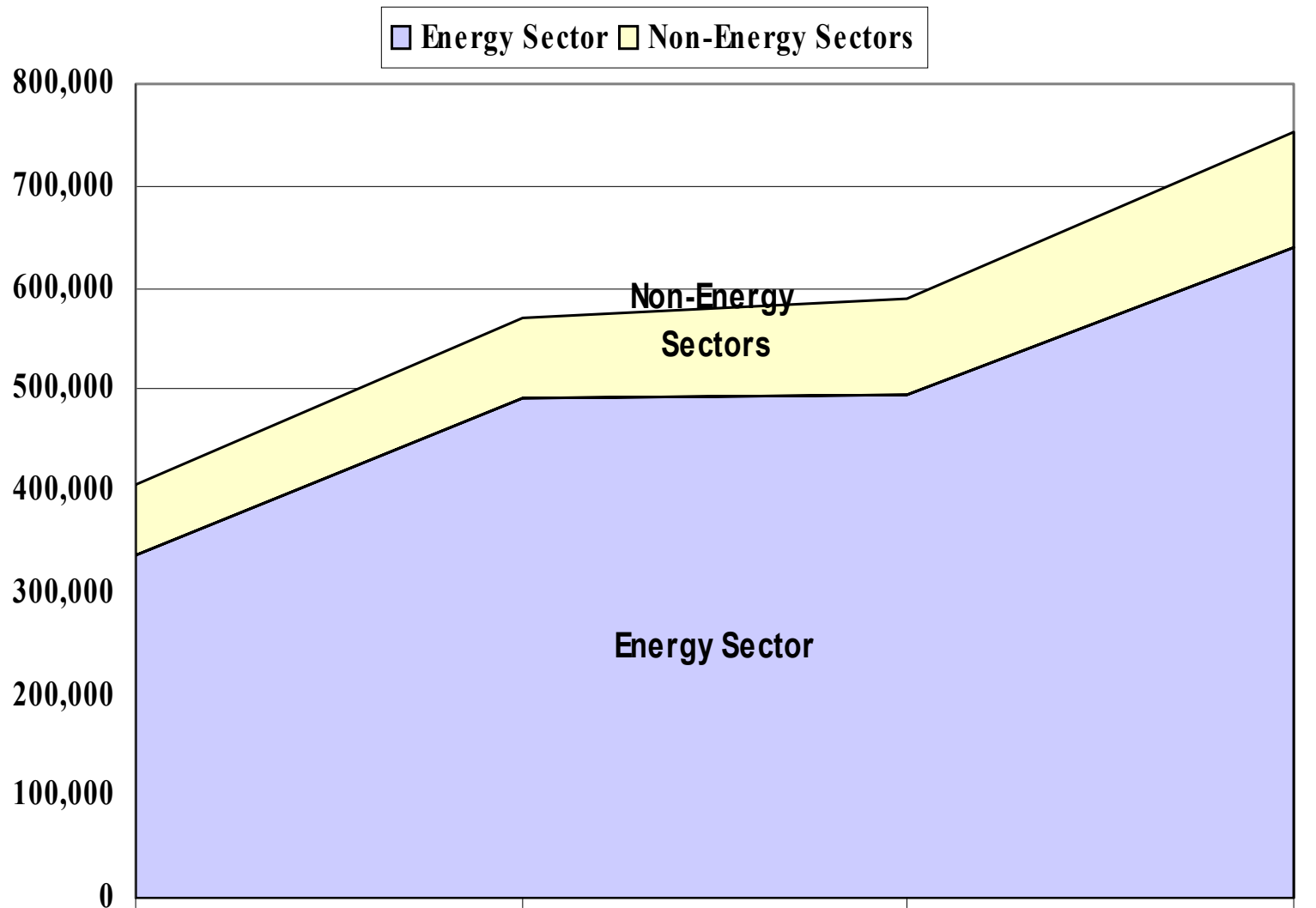
Share of Different Sub-sectors in CO₂ Emissions for Industrial Processes-1994



GHGs Emission Trends in Baseline Scenario without Recovery of Flare Gas(Ktons)



GHGs Emission Trends in Baseline Scenario with Recovery of Flare Gas(Ktons)

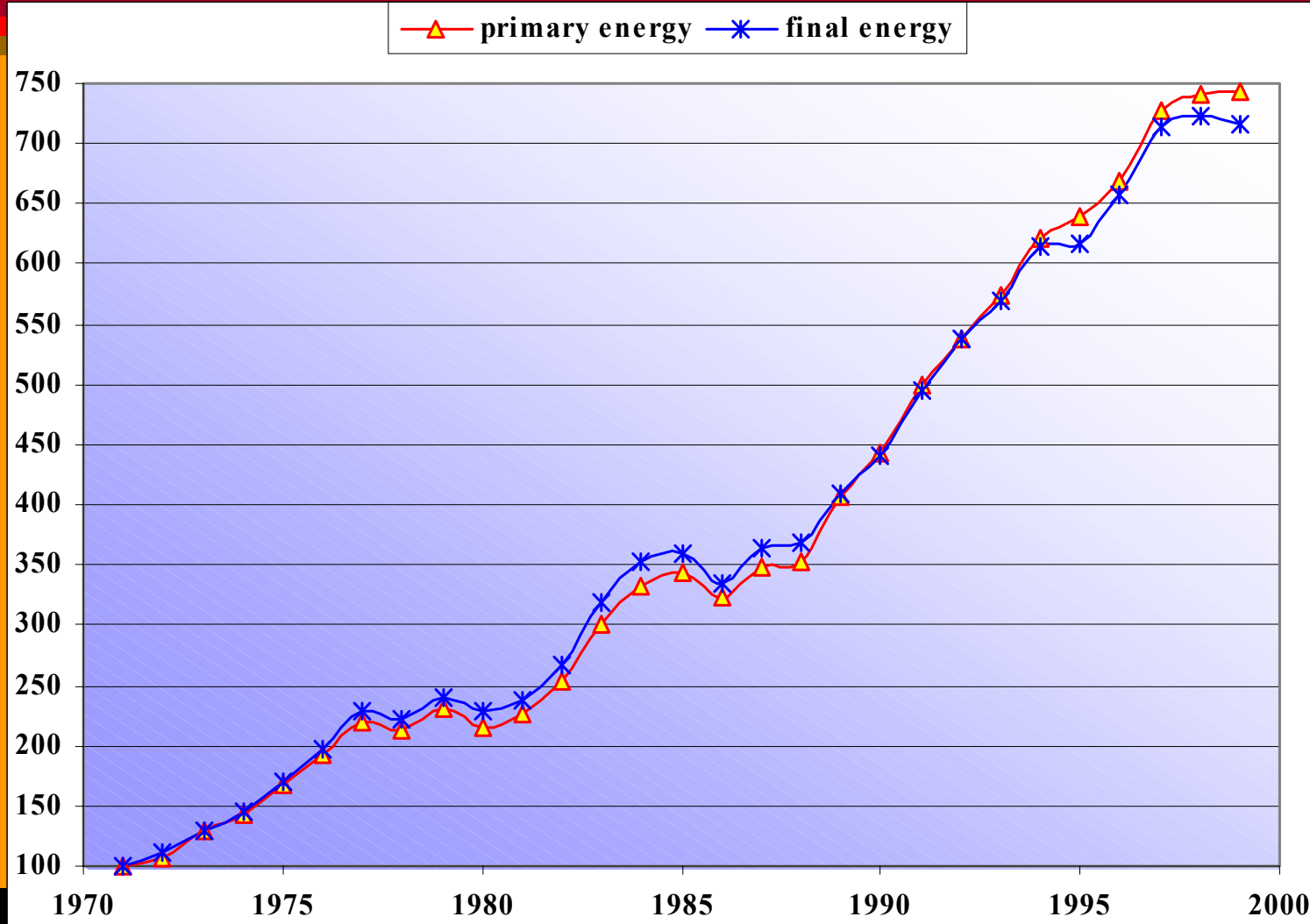


Why do we need to more attention to the energy sector

- The high share of the energy sector in foreign revenue
- The young population of the country and their need to job and employment
- The increasing rate of energy carriers consumption
- The waste of energy carriers in the country and inefficient consumption of the energy carriers
- The high share of energy sector on pollutants emission.

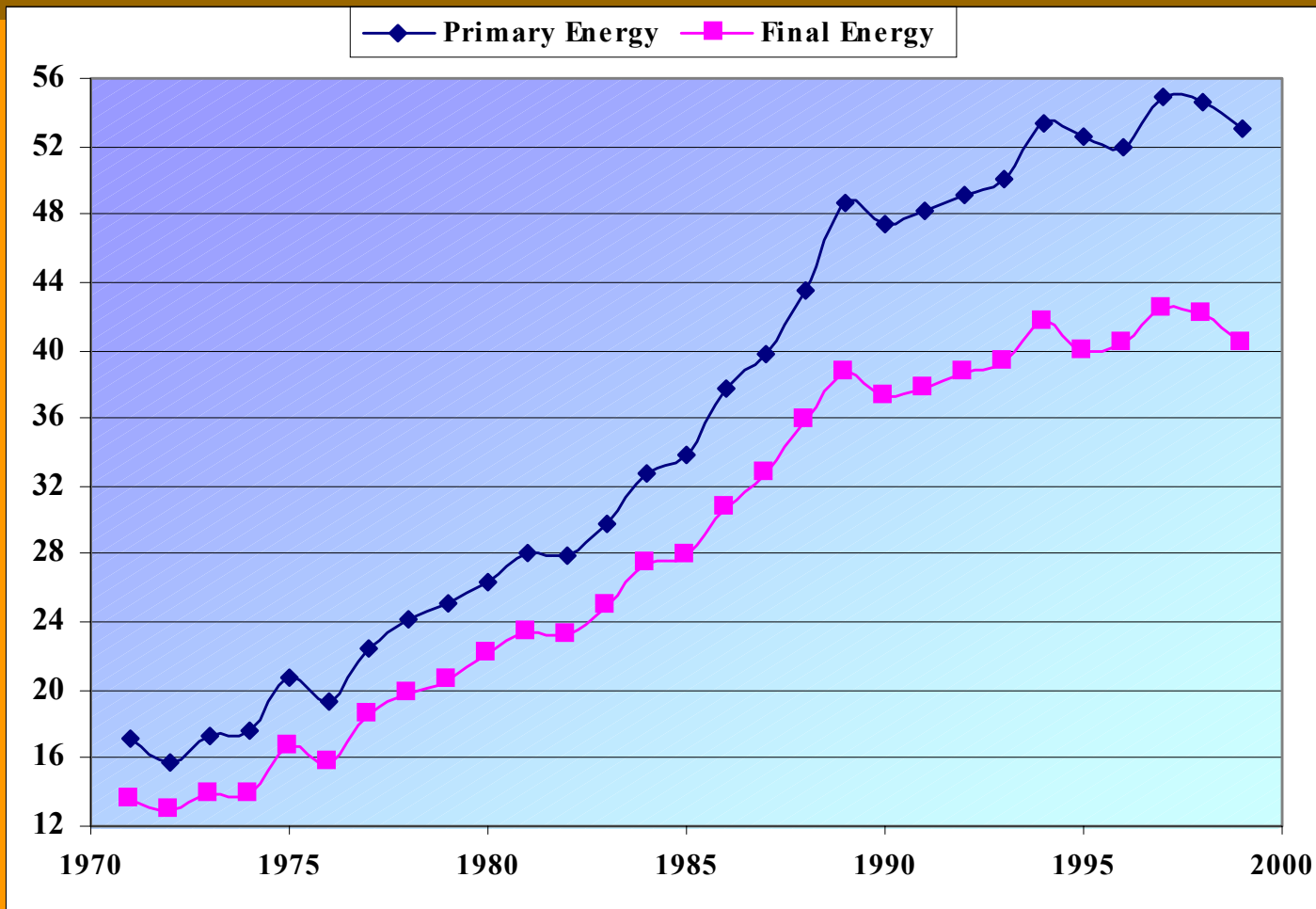
Why do we need to more(Continued)

Trend of Primary and Final Energy Consumption (1971=100)



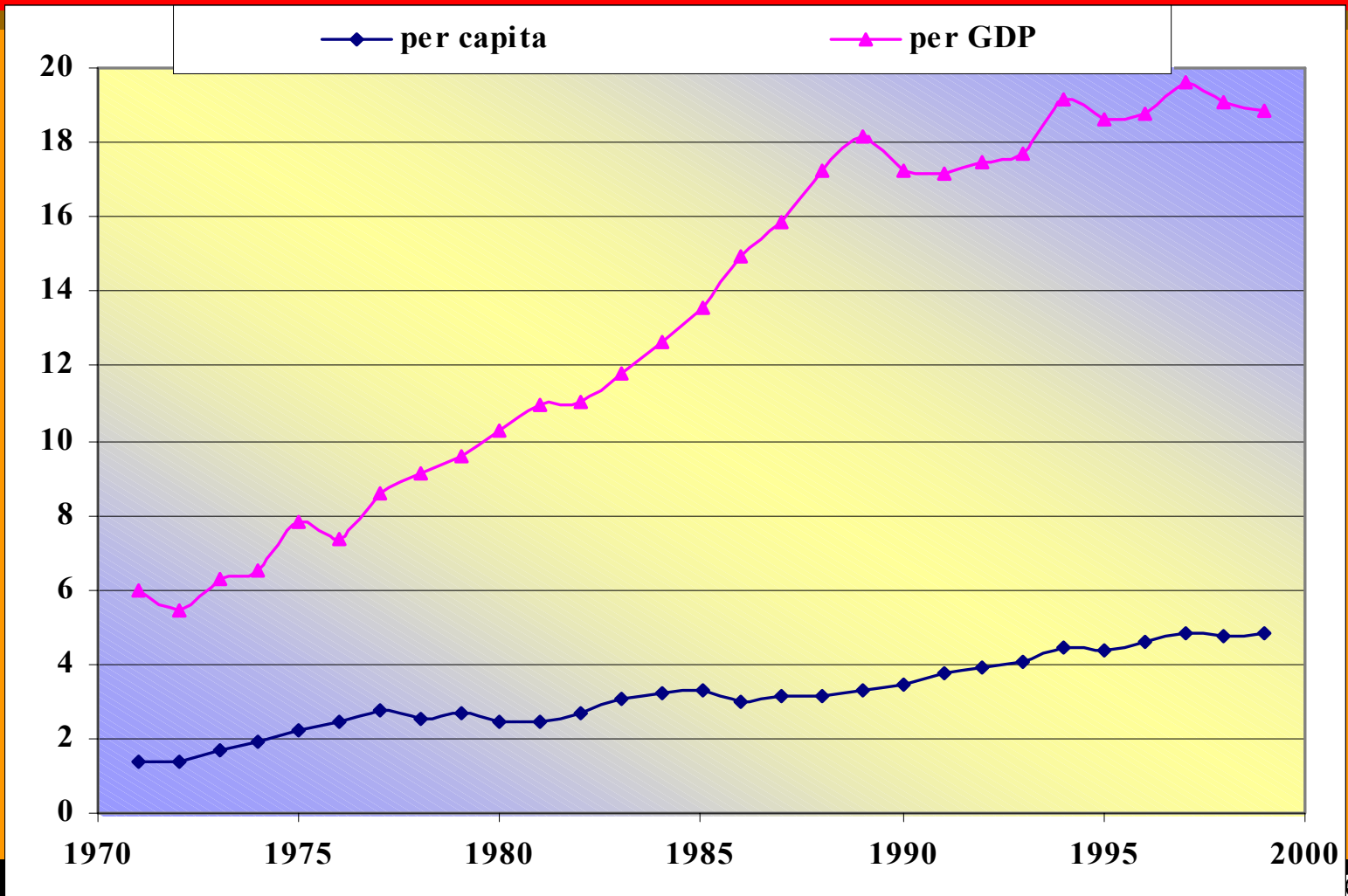
Why do we need to more(Continued)

Trend of Energy Intensity of GDP in the Economy
(BOE/Mn. Rial - at constant price of 1982)



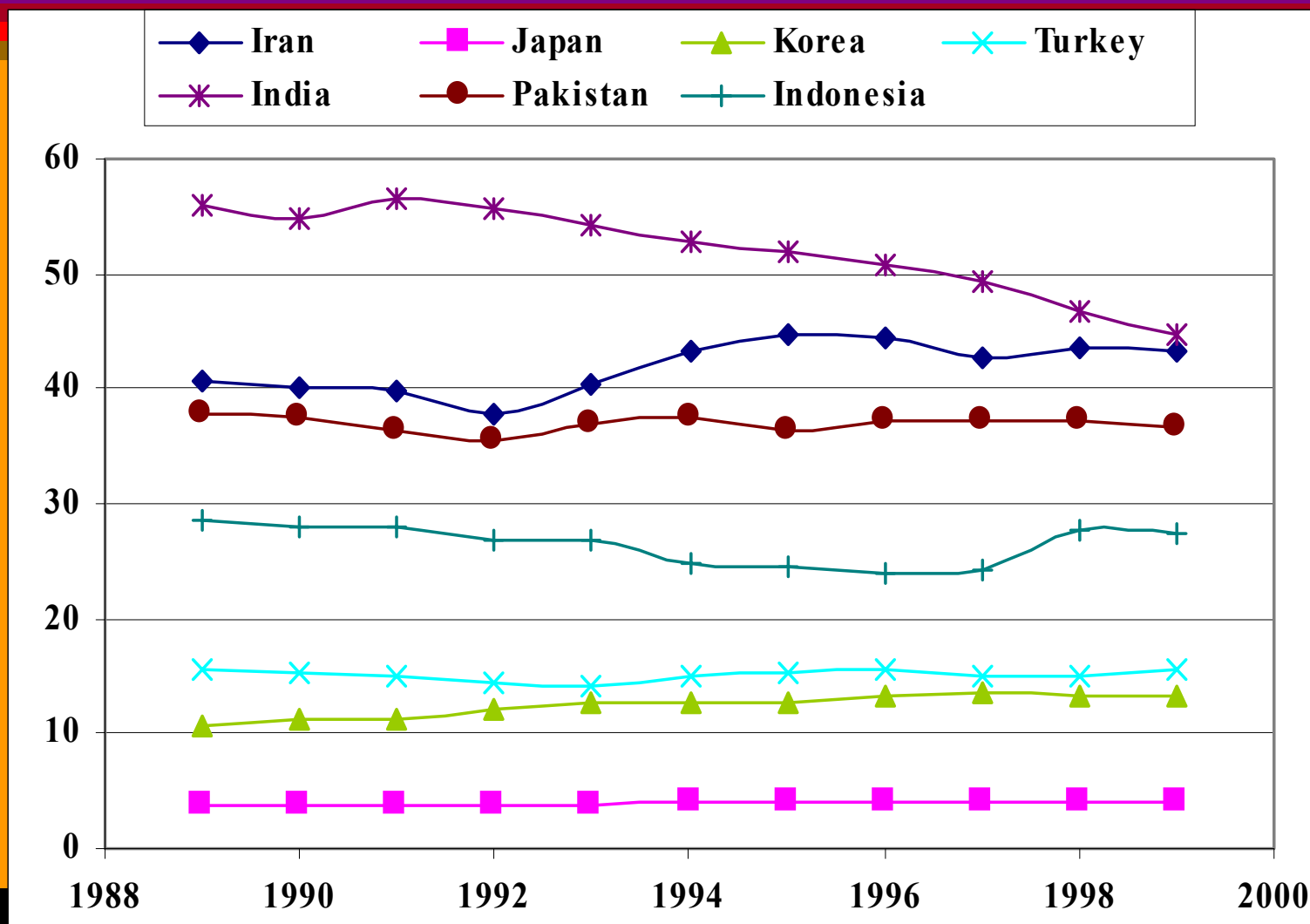
Why do we need to more(Continued)

Trend of CO2 Emission per Capita (tons/capita) and per GDP (tons/Mn. Rial)



Why do we need to more(Continued)

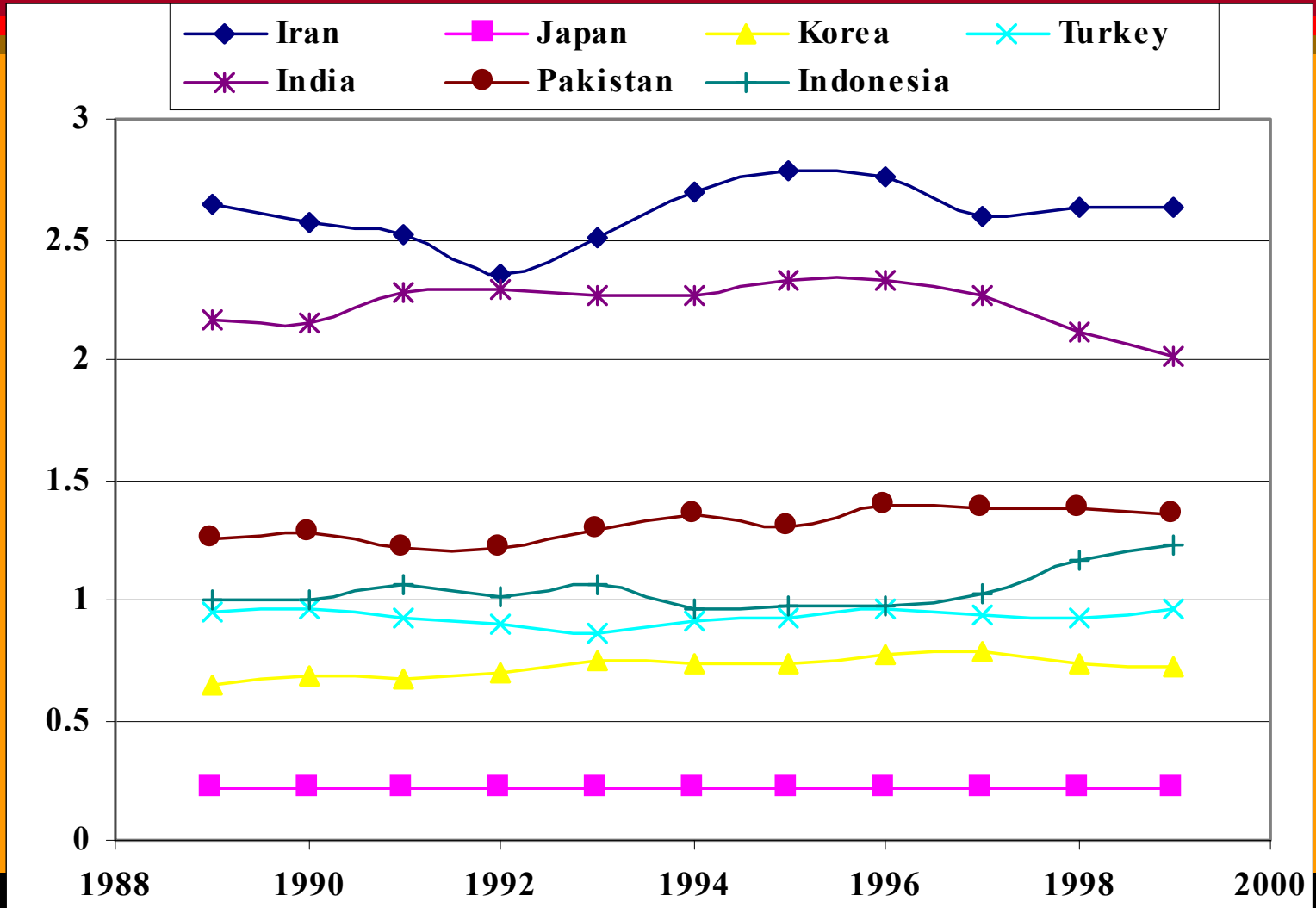
Energy Intensity of GDP in Selected Countries (TJ/ US\$- at 1995 price & exchange rate- Reference: IEA)



Why do we need to more(Continued)

CO2 Emission per GDP in Selected Countries

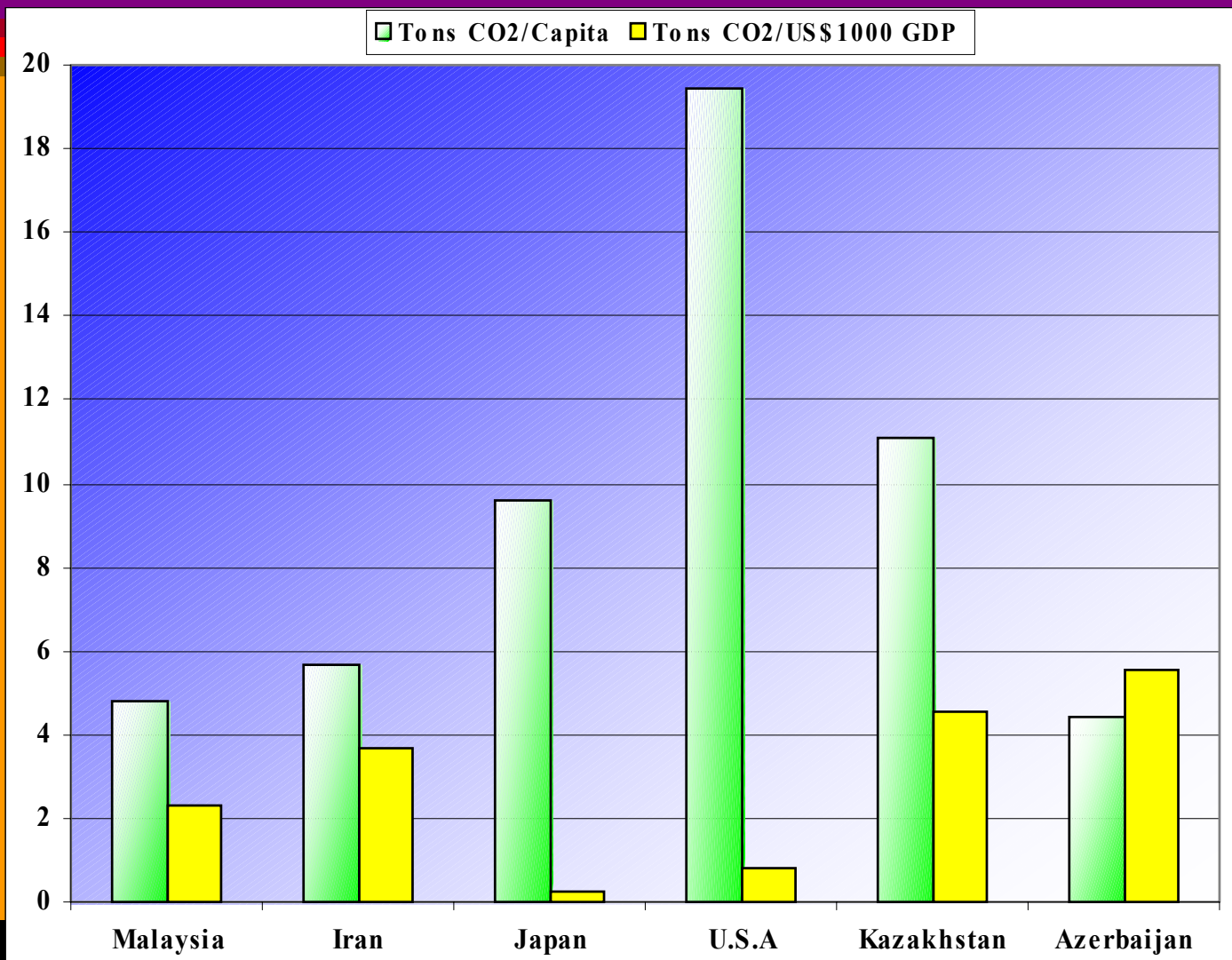
(tons / 1000 US\$- at 1995 price & exchange rate-Reference: IEA)



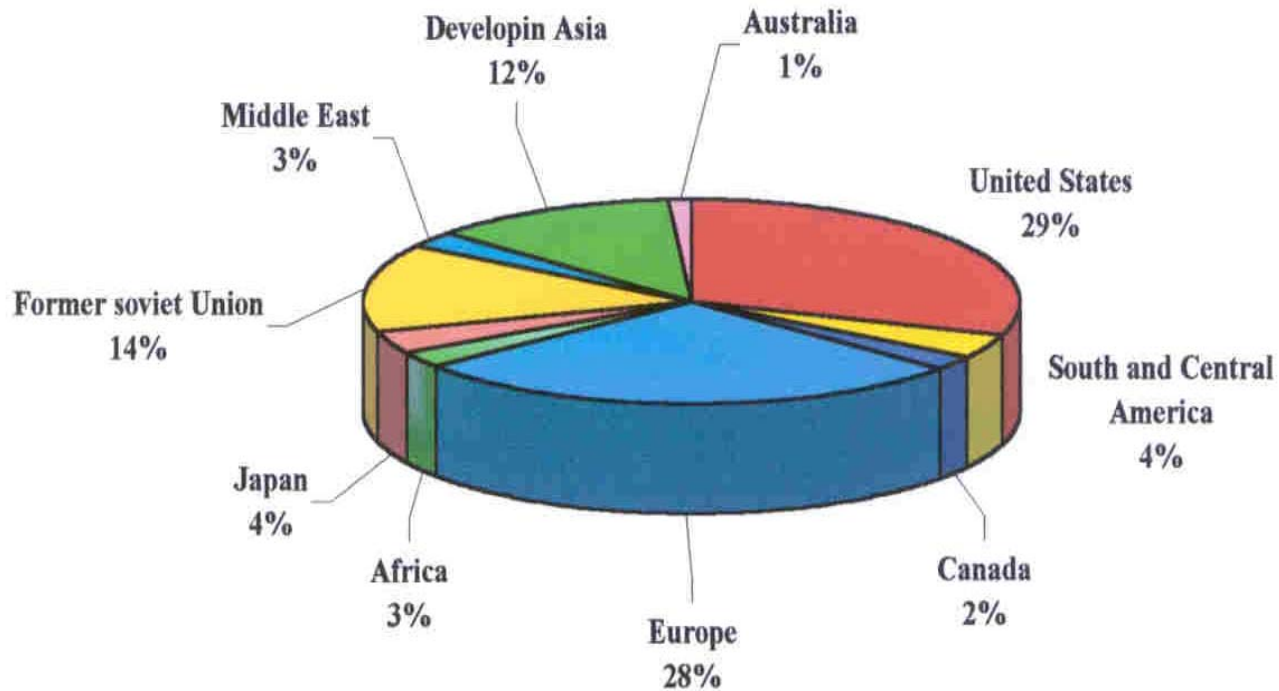
Why do we need to more(Continued)

CO₂ Emission per Capita (tons/ca.) and Emission/GDP (tons CO₂/US\$ 1000) in Selected Countries – 1994

Reference: UNFCCC Data Base



Contribution of Different Region on Global GHGs Emissions from Fuel Combustion



**CO2 Emissions from fossil fuel
combustion**

Mitigation Policies to Address Climate Change

- Top to Bottom Policies
- Bottom to Top Policies

Top to Bottom Polices

- Integrated Resource Planning
- Preparation of Energy Management Guidelines
- Encouragement of Industry towards Energy Auditing Programs
- Preparation of Regulation on Clean Technology Transfer
- Making ISO 14000 Compulsory for the Country's Industry
- Facility & Funding to Improve Industrial Equipment Efficiency

Top to Bottom Policies(Con.)

- Establishment of National Energy Conservation Research Centers
- Setting Appropriate Tariffs of Energy Carriers for Consumers
- Removal of Barriers on Foreign Investment for Renovating Industries
- Public Awareness

Bottom to Top(Con.)

Policies and Measures for GHGs Abatement

Power Generation

- Fuel Switching
- Hydro Power Plants
- Energy Efficiency
 - Combined Cycle
 - Combined Heat & Power
 - Small Power Plants
- Renewable & Clean Energy Resources
 - Nuclear
 - Solar and Wind
 - Geothermal, Wave, Tidal and Hydrogen

Industries

- Fuel Switching and Energy Efficiency

Comparison of the Impact of Different Policies in CO₂ Emission Reduction in Power Plants

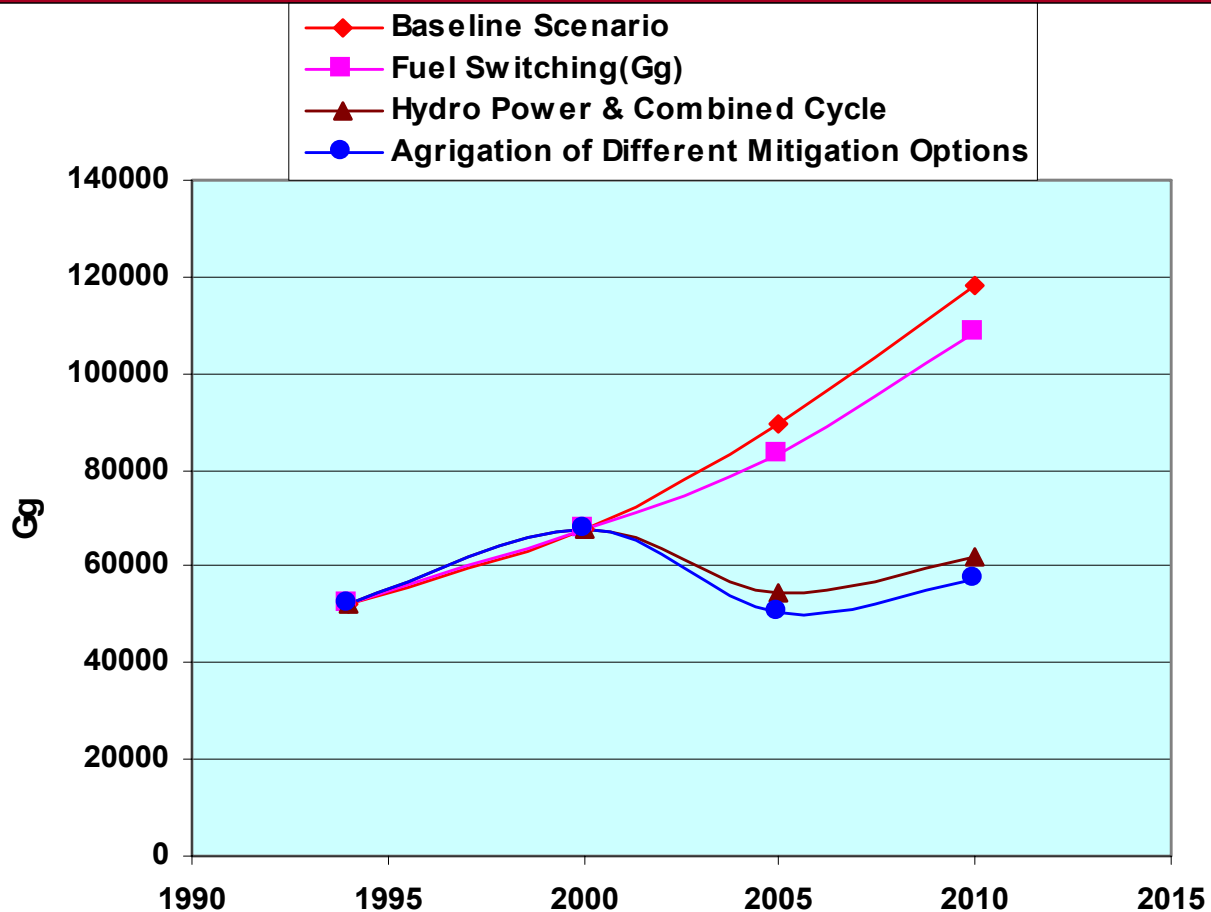


Fig.2 - Comparison of The Amount of CO₂ Emission in Different Mitigation Option

Bottom to Top Policies

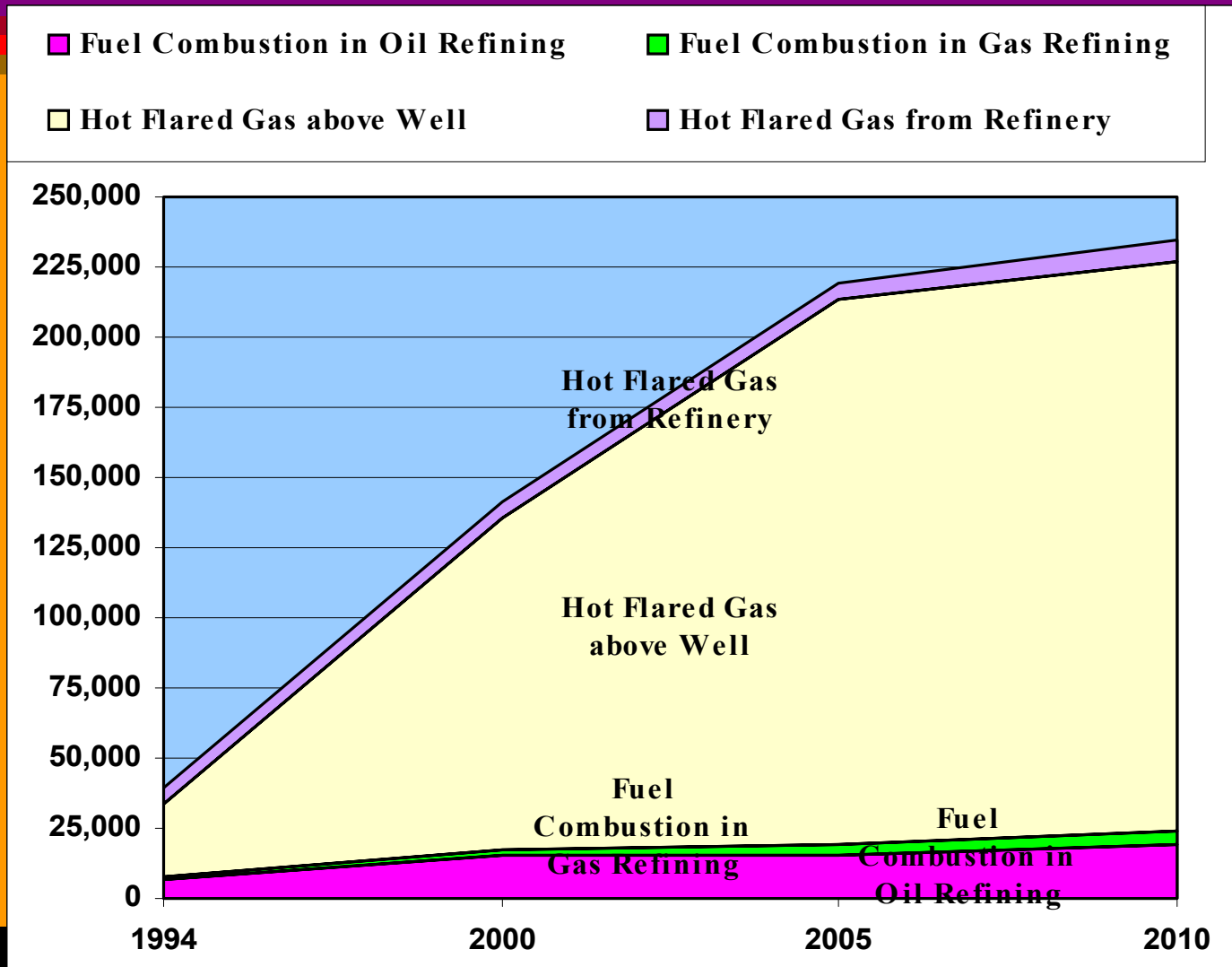
Policies and Measures for GHGs Abatement

● Oil & Gas Activities

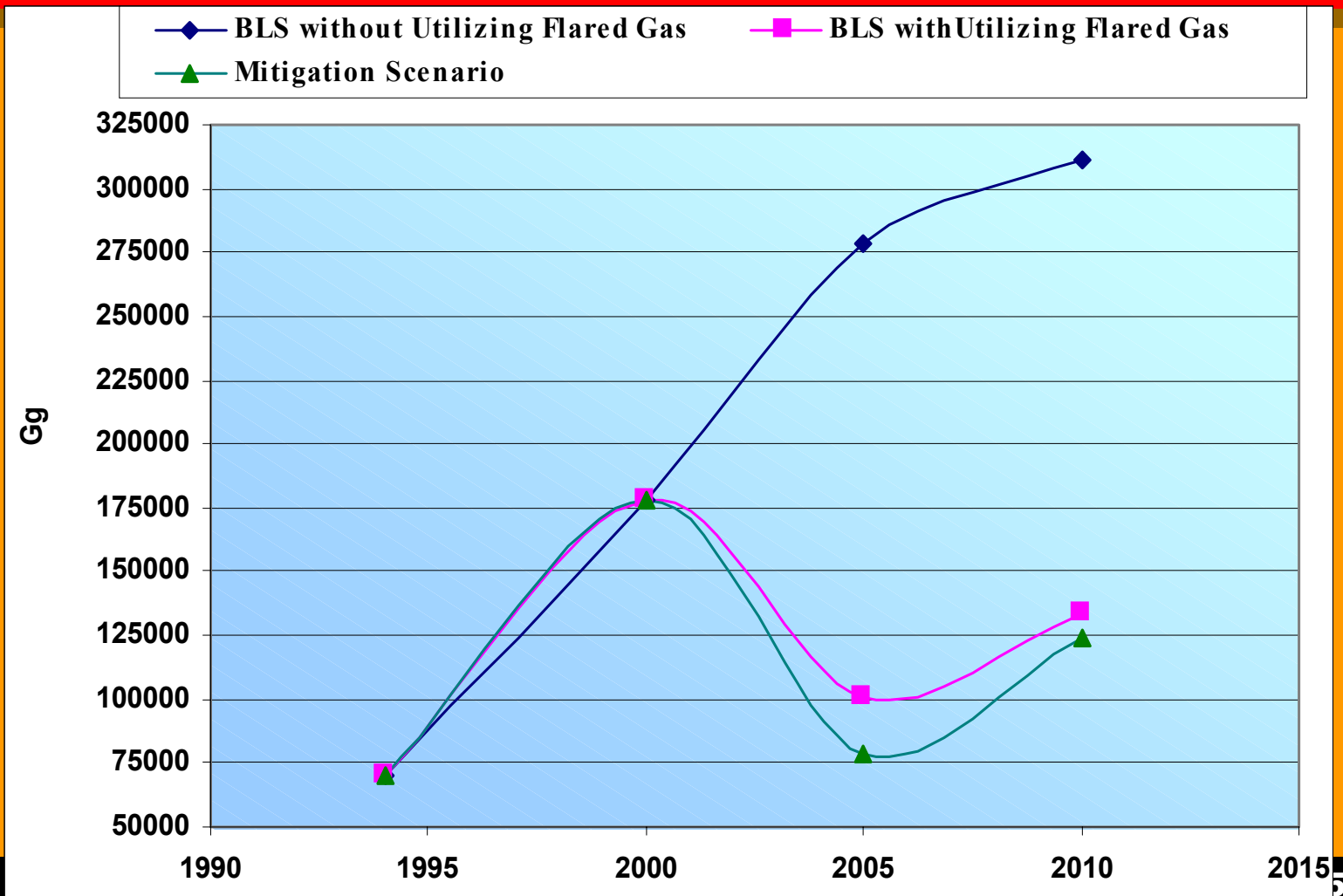
- Fuel switching
- Energy efficiency
- Gas injection to wells
- Collection and use of flared gas, needs to be supported by CDM and Technology Transfer in the following areas:
 - Gas-to-Liquid Processes (GTL)
 - Oxidative Coupling of Methane (OCM)
 - Methane conversion to DMC(DI-Methyl-Carbonate)
 - Electricity Generation by Expansion Turbine

Generation of Electricity in Oil Field (Well to Watt)

CO₂ Emission Trends in Baseline Scenario for Oil & Gas Activities without Utilizing Flared Gas (Gg)



CO2 Emission Trends in Different Scenarios for Oil & Gas Activities



Bottom to Top(Con.)

Policies and Measures for GHGs Abatement

Transportation

- **Improvement of Fuel Quality & Fuel Pricing**
- **Improvement of Public Transportation**
 - **Fleet Increase**
 - **Conversion to CNG**
 - **Catalytic Converter & Participate Trap**
 - **Expansion of Metro, LRT**
 - **Scrappage & Retrofit Program for a aged Vehicles**
- **Urban Traffic Management**
 - **Parking Policies**
 - **Intelligent Traffic Lights**
 - **Enforcement of Traffic Regulation**
- **Improved Vehicle Technology**

Bottom to Top(Con.)

Policies and Measures for GHGs Abatement

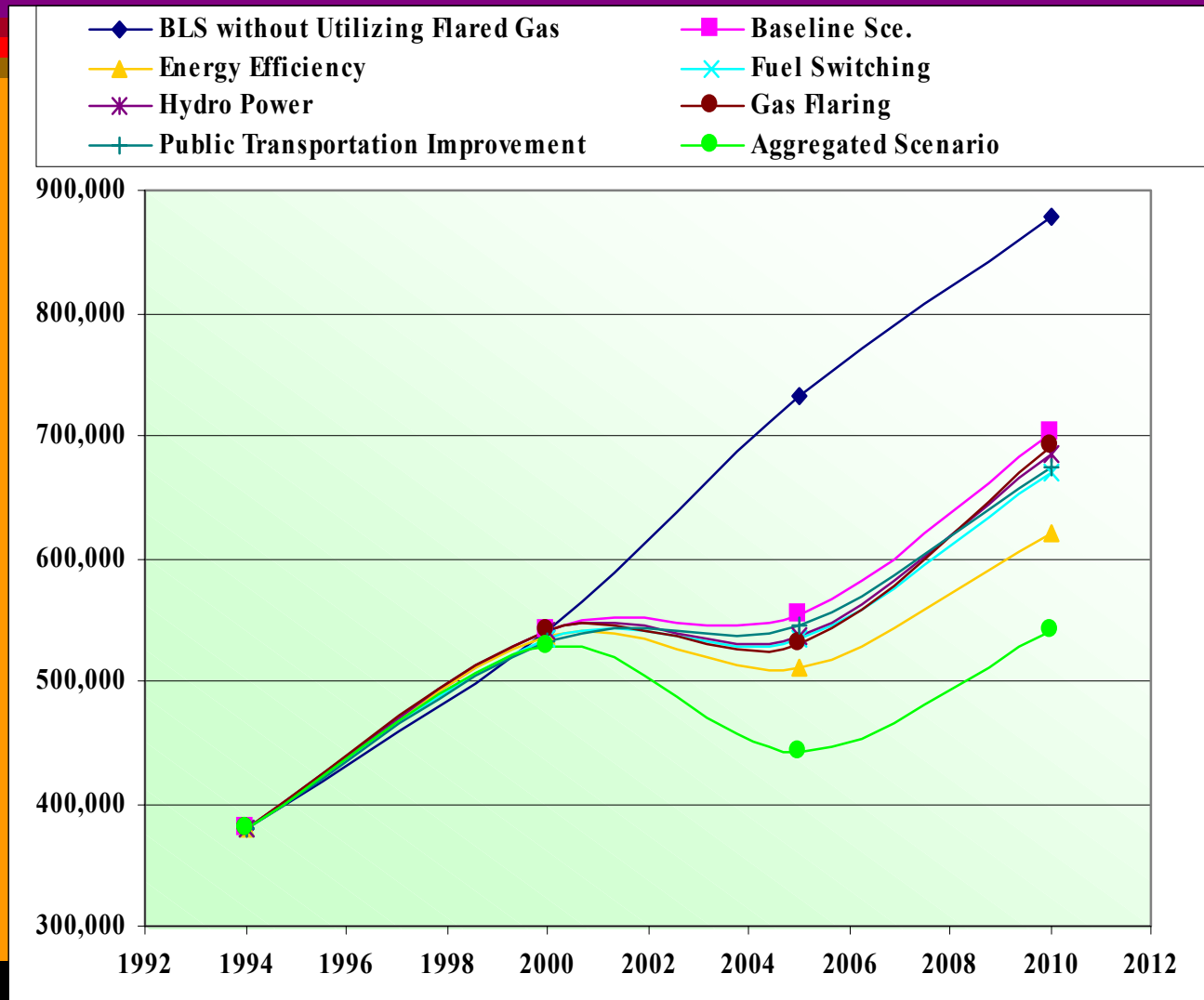
Commercial & Residential Building

- **Fuel Switching**
 - Expansion of Rural Electrification
 - Expansion of Rural LPG Uses
 - Expansion of Urban N.G Uses
- **Energy Efficiency**
 - Efficient Home Appliance
 - Buildings Insulation
 - Double Layer Windows

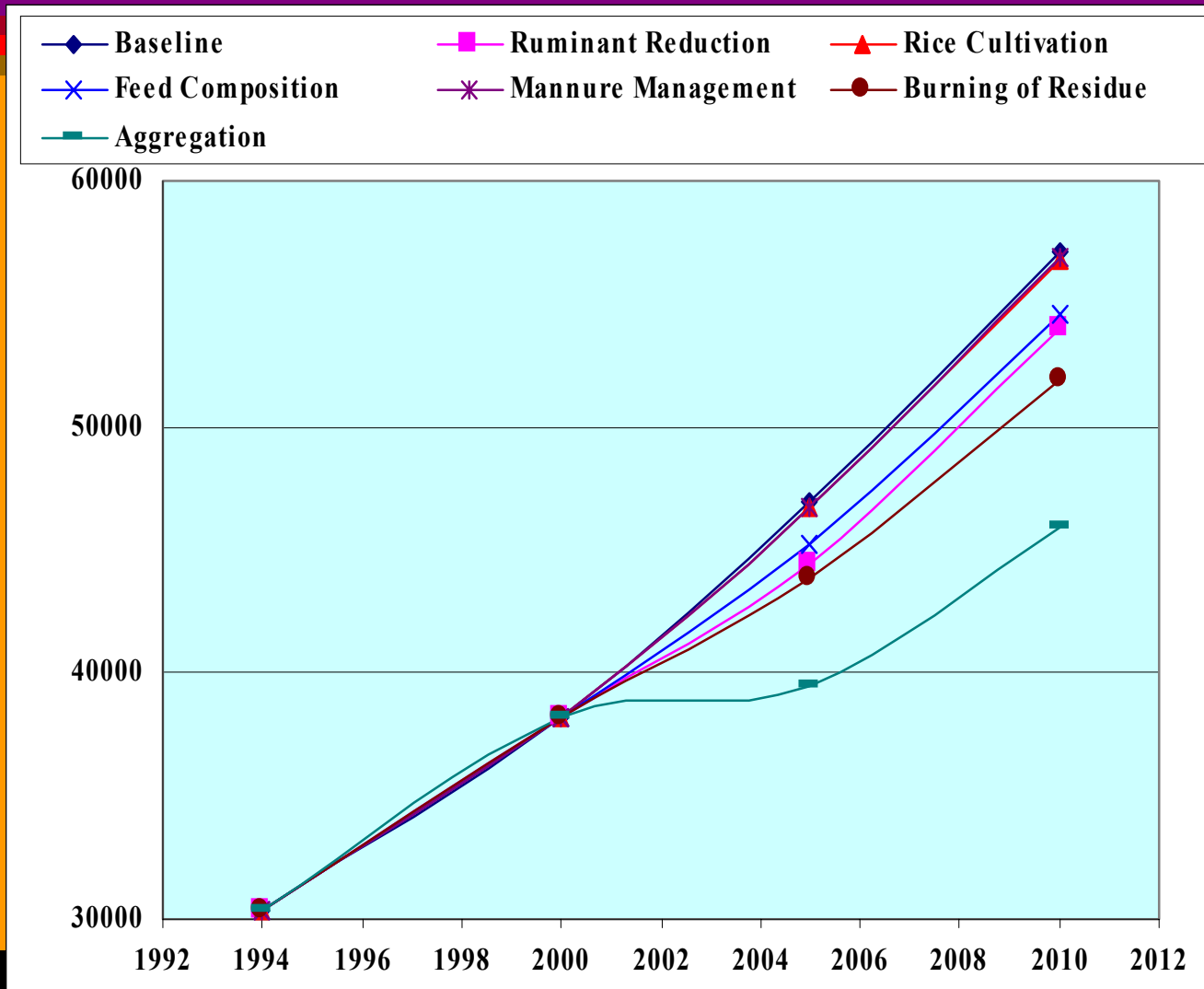
Agriculture

- Agricultural Irrigation system of Electricity Network
- Use of More Efficient Engine

GHGs Emission Trends in Different Scenarios for Energy Sector(Ktons)

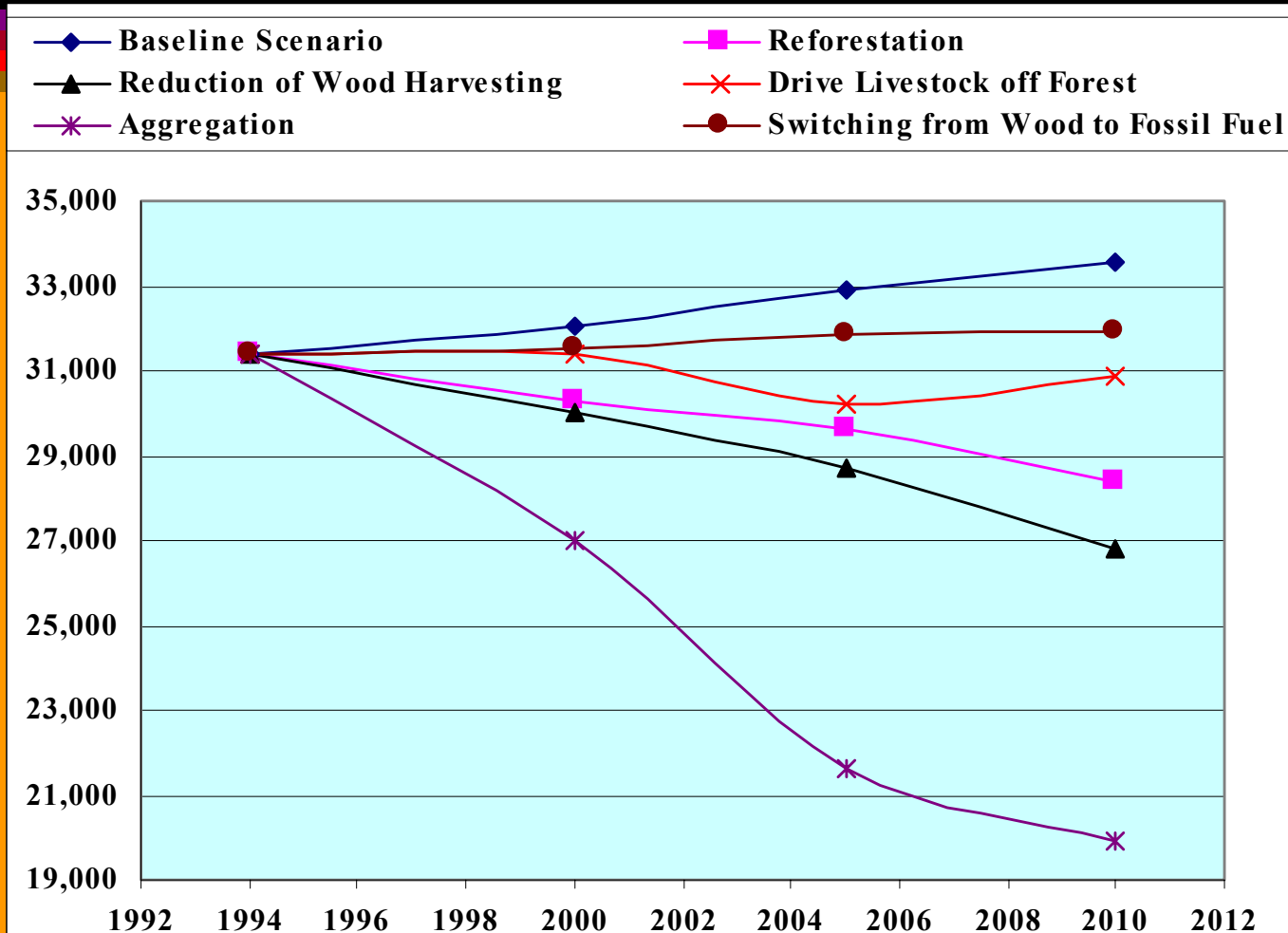


Contribution of Different Policies to GHGs Reduction in Agricultural Sector (Gg CO₂ - equivalent)

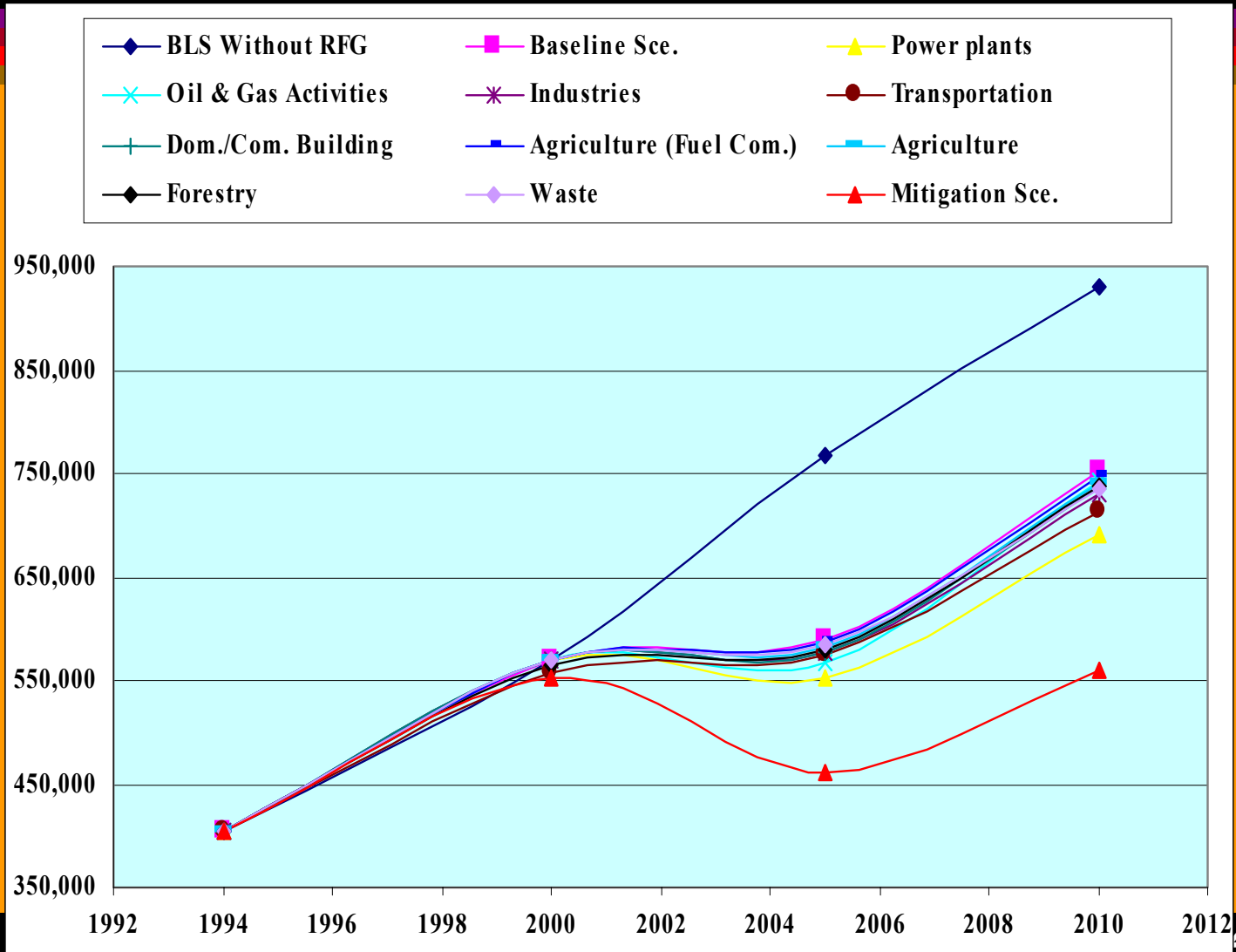


Contribution of Different Mitigation Policies to GHGs

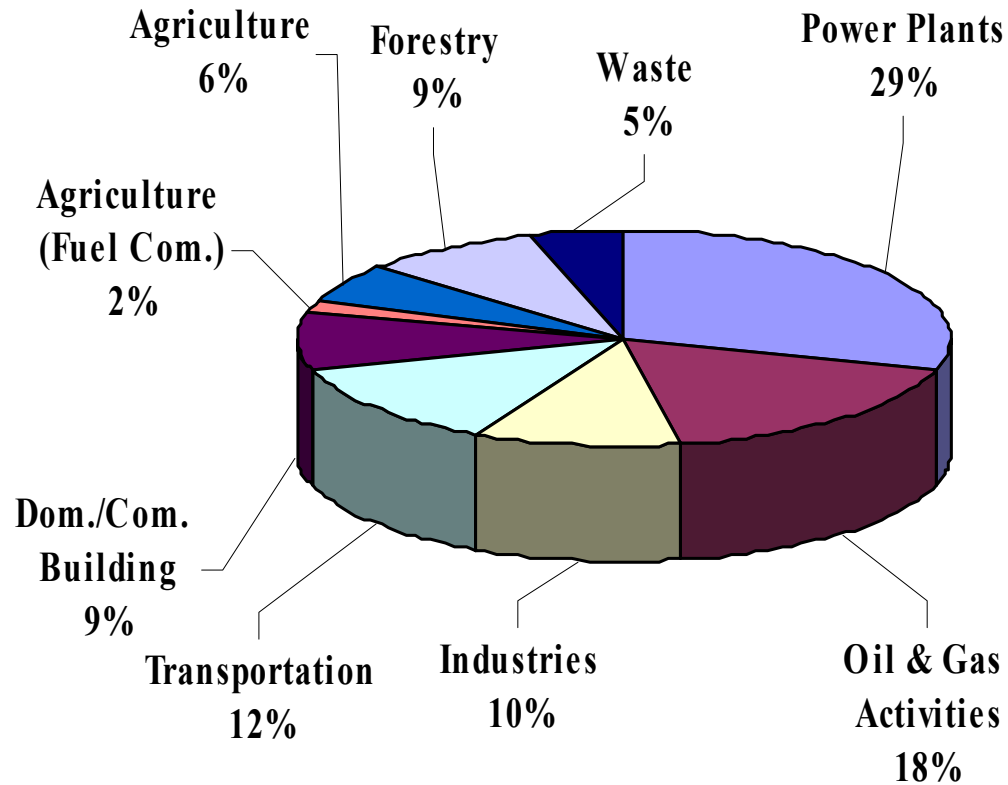
Reduction in Forestry Sector (Gg CO₂ Equivalent)



GHGs Emission Trends by Different Sectors in Mitigation Scenario (Gg CO₂ - Equivalent)



Contribution of Different Sectors to GHGs Emission Reduction in 2005(%)



Conclusion

- The potential for energy efficiency is very high, but without pricing reform, there aren't any incentives for EE programs by the household, industries & etc. and needs for financial supports by government.
- The potential for small CDM projects especially in Rural areas for Solar energy, Biogas & etc. is very high. The CDM benefits not only affect directly rural households' income, but also facilitate CBOs.
- The high energy intensity and energy bill of domestic manufactures (after the price reform) caused that there isn't competitive potential for Iran's goods in the global market.

Thank you for

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