Multi-Gas Emission mitigation

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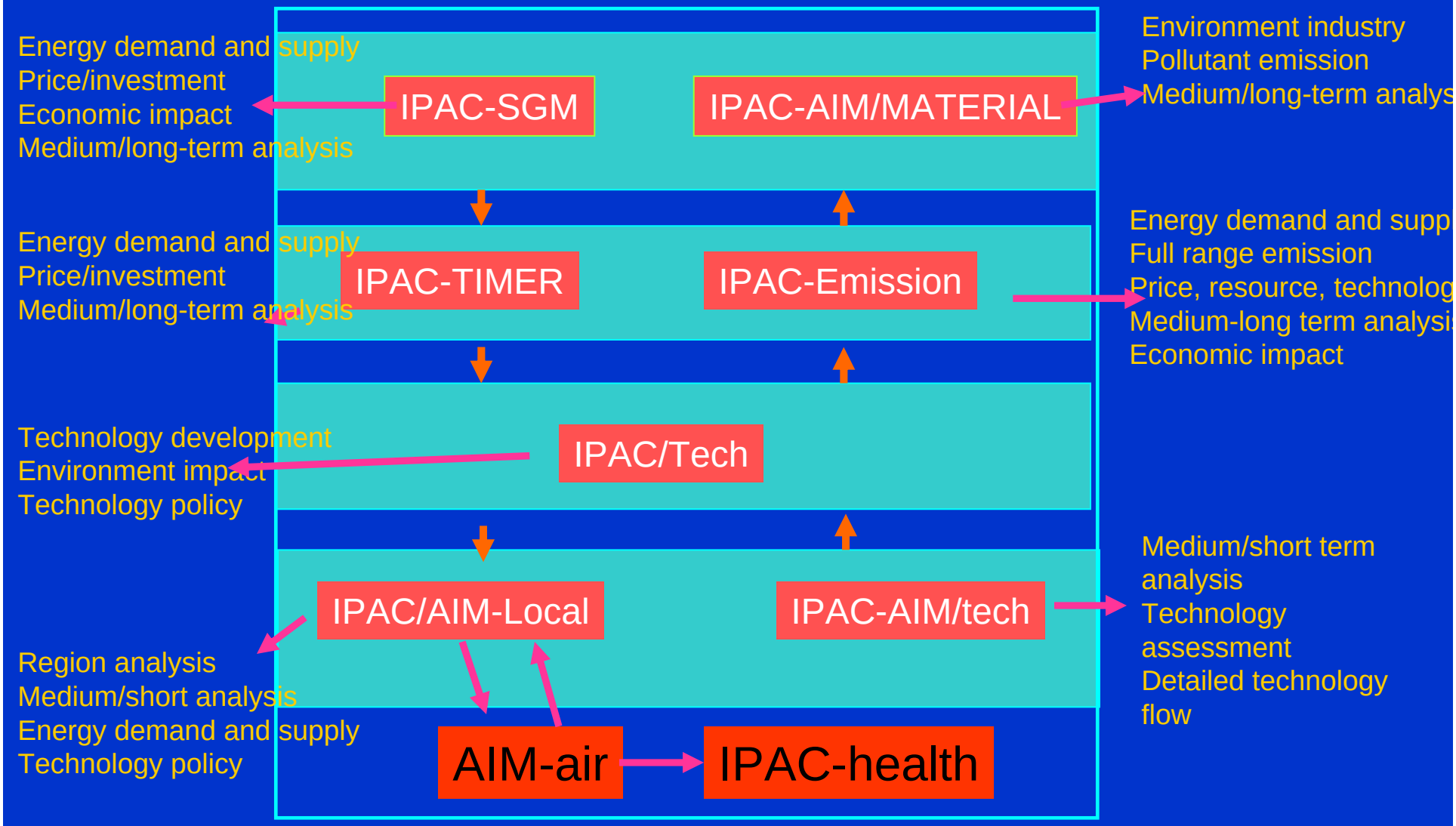
Presentation Content

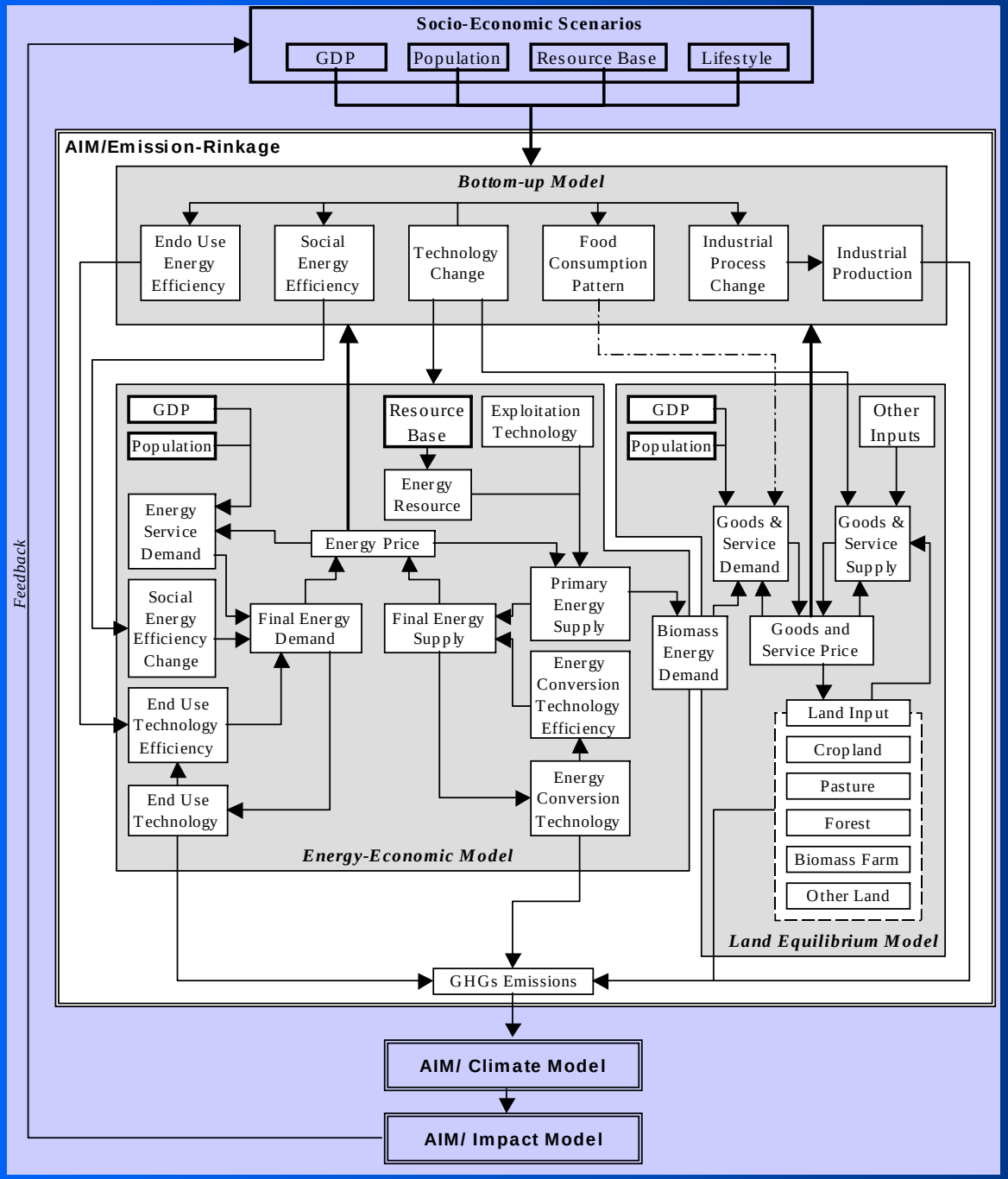
- **Modeling framework**
- **Scenario assumption**
- **Scenarios**

Framework of IPAC



IPAC-Emission

- Partial equilibrium model
- Global model:9 regions
- 3 economic sector: industry, building and transport
- Energy sources: coal,oil, natural gas, modern biomass, hydro, nuclear, unconventional oil, unconventional gas, wind and solar
- Cover all emission source: energy activities, industrial process and land use
- Technology description: around 40 technologies
- Long-term analysis up to 2100
- 9 gases:CO2，CH4，NOx, N2O，CO，SO2，HFC，PFC，SF6)


Socio-Economic Scenarios
GDP
Population
Resource Base
Lifestyle
AIM/Emission-Rinkage
Bottom-up Model
Endo Use Energy Efficiency
Social Energy Efficiency
Technology Change
Food Consumption Pattern
Industrial Process Change
Industrial Production
GDP
Population
Resource Base
Exploitation Technology
Energy Resource
Energy Service Demand
Energy Price
Social Energy Efficiency Change
Final Energy Demand
Final Energy Supply
Primary Energy Supply
Energy Conversion Technology Efficiency
End Use Technology Efficiency
End Use Technology
Energy Conversion Technology
Energy-Economic Model
GDP
Population
Other Inputs
Goods & Service Demand
Goods & Service Supply
Biomass Energy Demand
Goods and Service Price
Land Input
Cropland
Pasture
Forest
Biomass Farm
Other Land
Land Equilibrium Model
GHGs Emissions
AIM/ Climate Model
AIM/ Impact Model
Feedback

Source of emissions

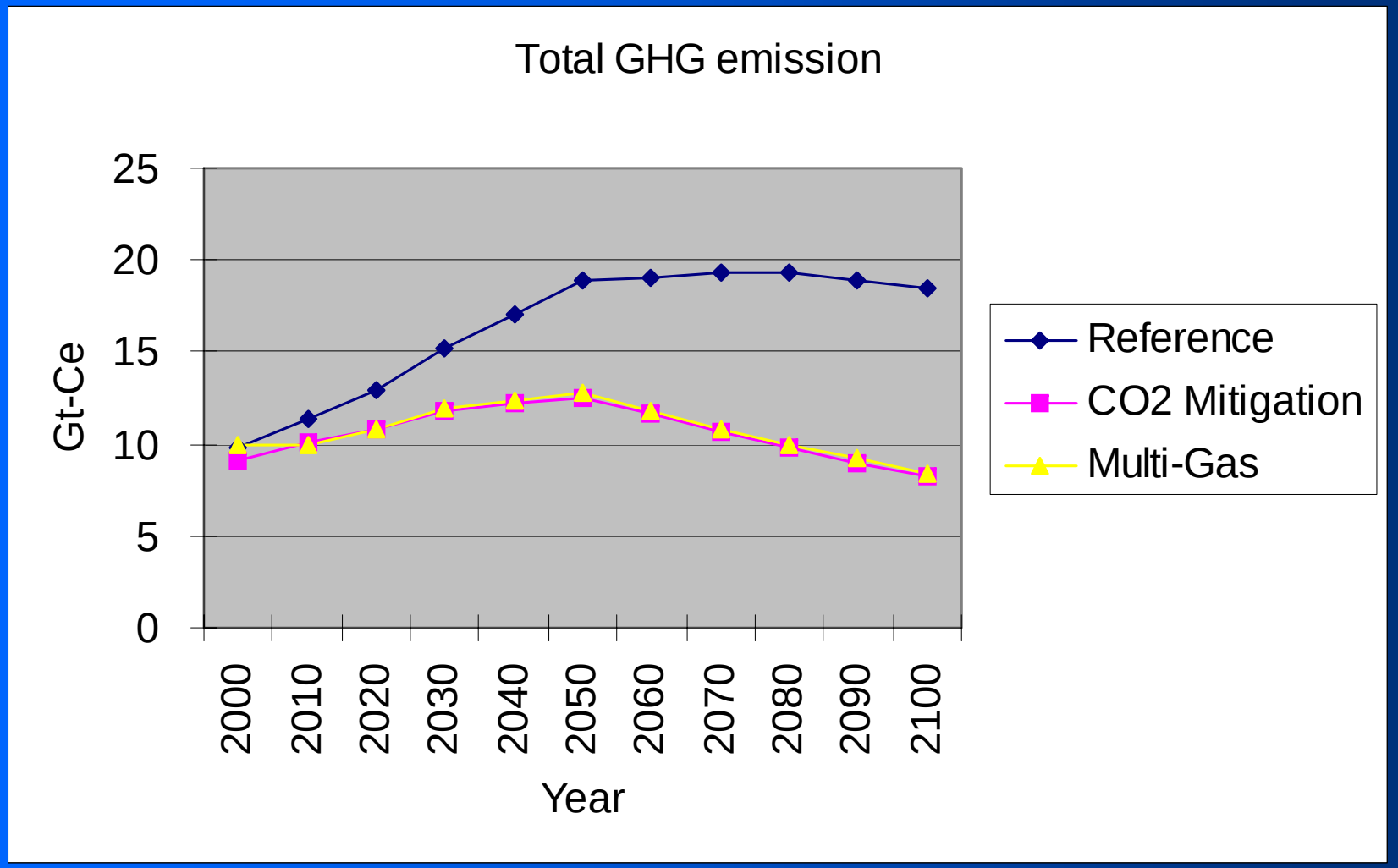
- CO2: Energy combustion
  Industry process(Cement, steel)
  Land use change
- CH4: Energy combustion
  Energy production(Coal mining, natural gas)
  Land use(rice, husbundry)
- N2O: Energy combustion
  Land use(agriculture activities)
  Industry process
- HFC: ODS substitution
  Industry process
  Use of products(Aerosols, fire extinguishing, foams)
- PFC: Aluminum production
- SF6: Electric GIS manufecture, Electicity D&T, Semiconductor

Methodology and data source

- CO2: IPAC-Emission model
- CH4: IPAC-Emission model
- N2O: IPAC-Emission model
- HFC, PFC, SF6: EMF-21 methodology(USEPA:Deborah Ottinger-Schaefer, Casey Delhotal)
  Data based on USEPA

Scenarios

- Reference scenario: based on IPCC SRES B2
- CO2 Mitigation scenario
- Multi-gas mitigation scenario


Total GHG emission
25
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15
10
5
0
Gt-Ce
2000
2010
2020
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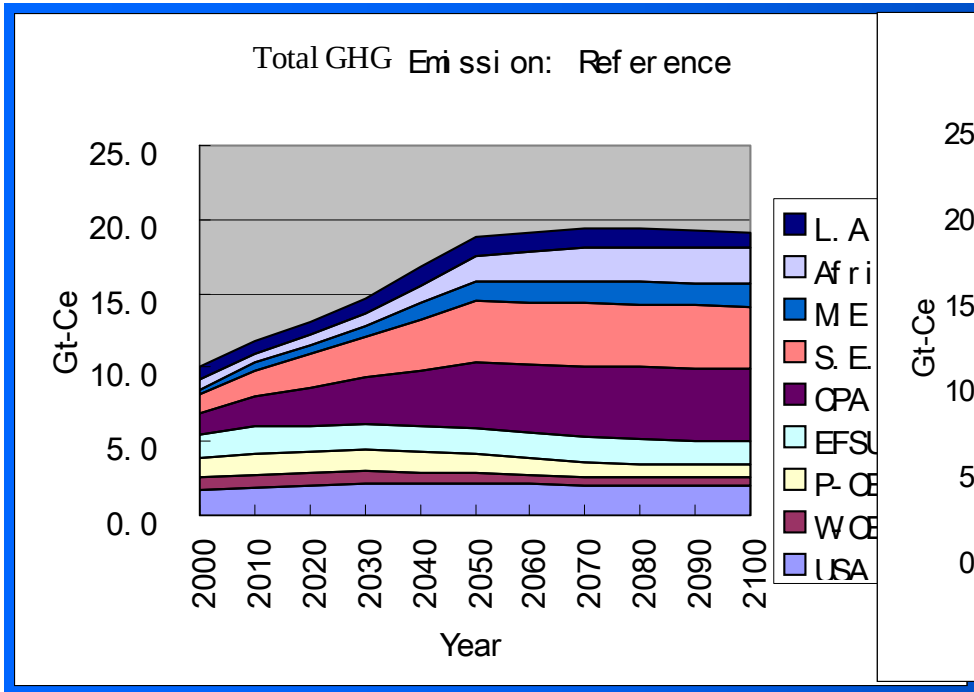
Year
Reference
CO2 Mitigation
Multi-Gas


Total GHG Emission: Reference
25.0
20.0
15.0
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Gt-Ce
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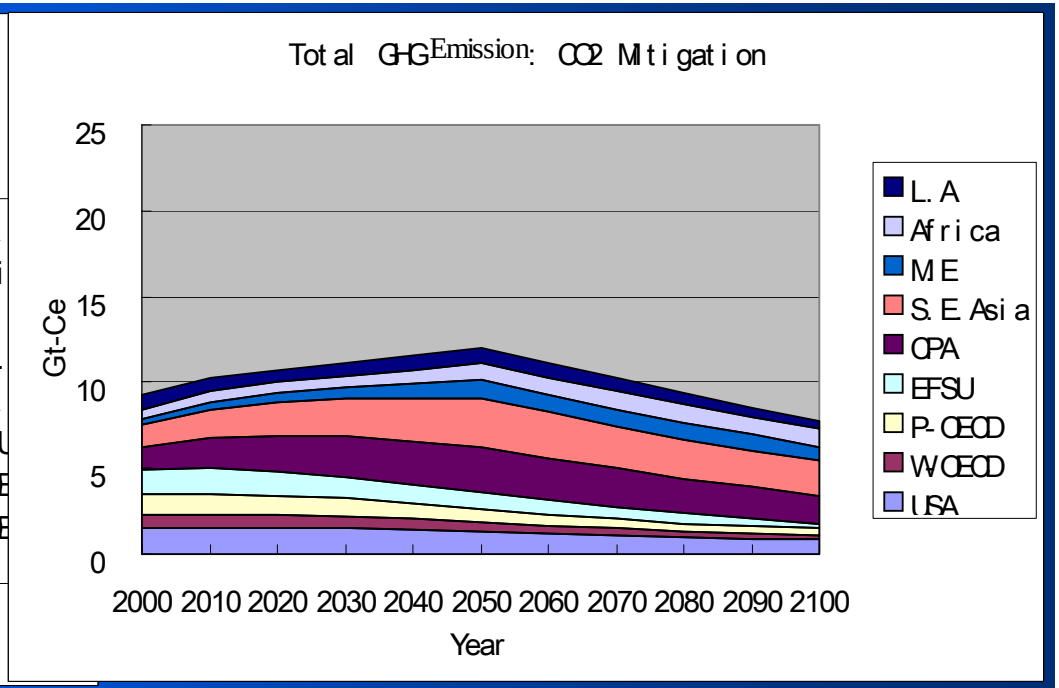
Total GHG Emission: CO2 Mitigation
25
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Gt-Ce
2000 2010 2020 2030 2040 2050 2060 2070 2080 2090 2100
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P-OECD
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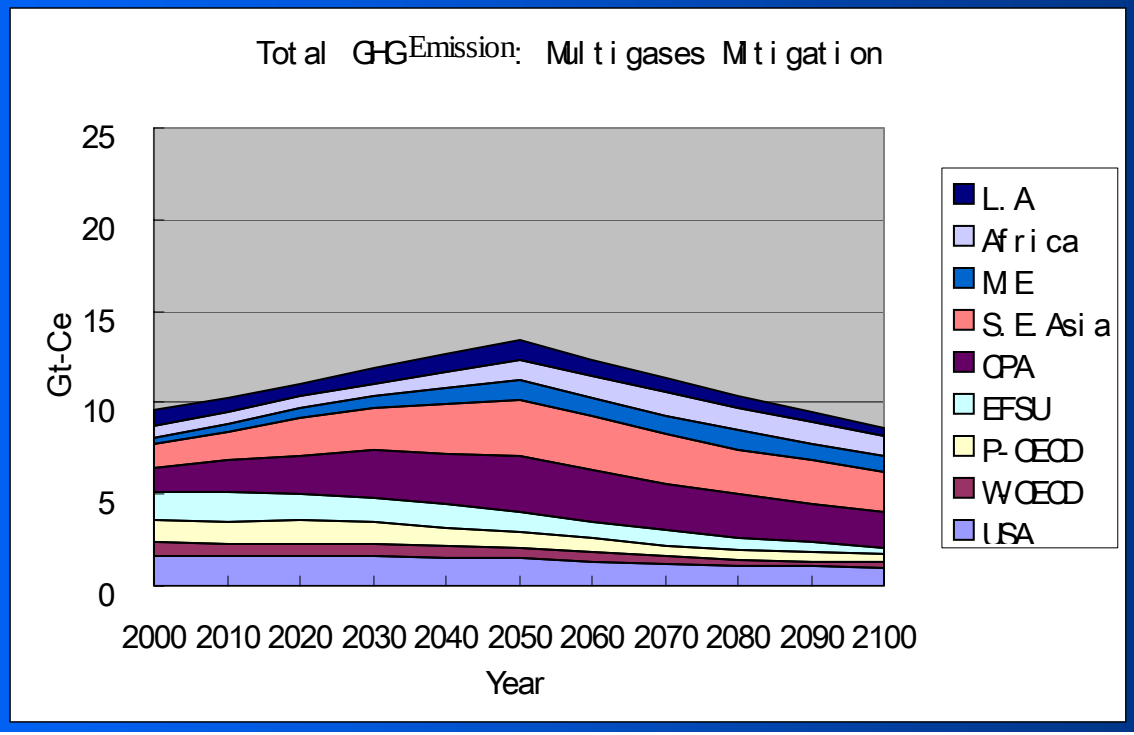
USA


Total GHG Emission: Multigases Mitigation
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Gt-Ce
2000 2010 2020 2030 2040 2050 2060 2070 2080 2090 2100
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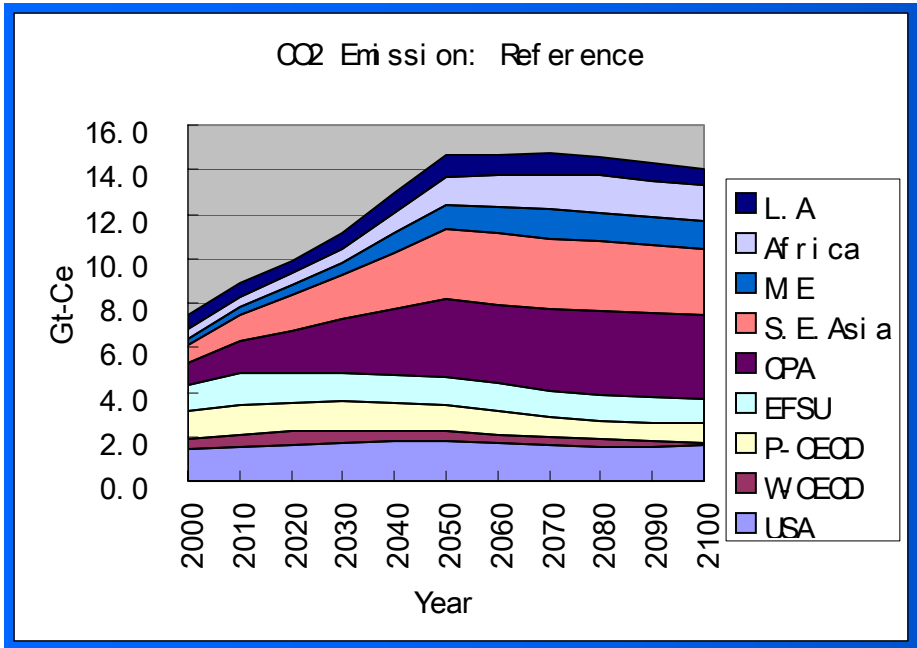
CO2 Emission: Reference
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
Gt-Ce
2000 2010 2020 2030 2040 2050 2060 2070 2080 2090 2100
Year
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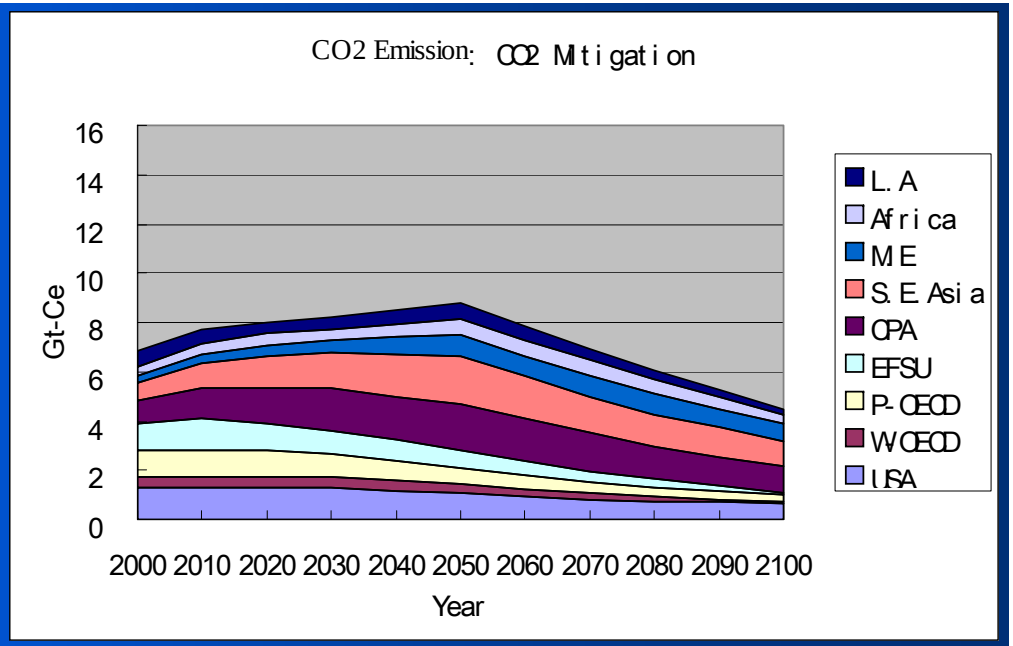
CO2 Emission: CO2 Mitigation
16
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Gt-Ce
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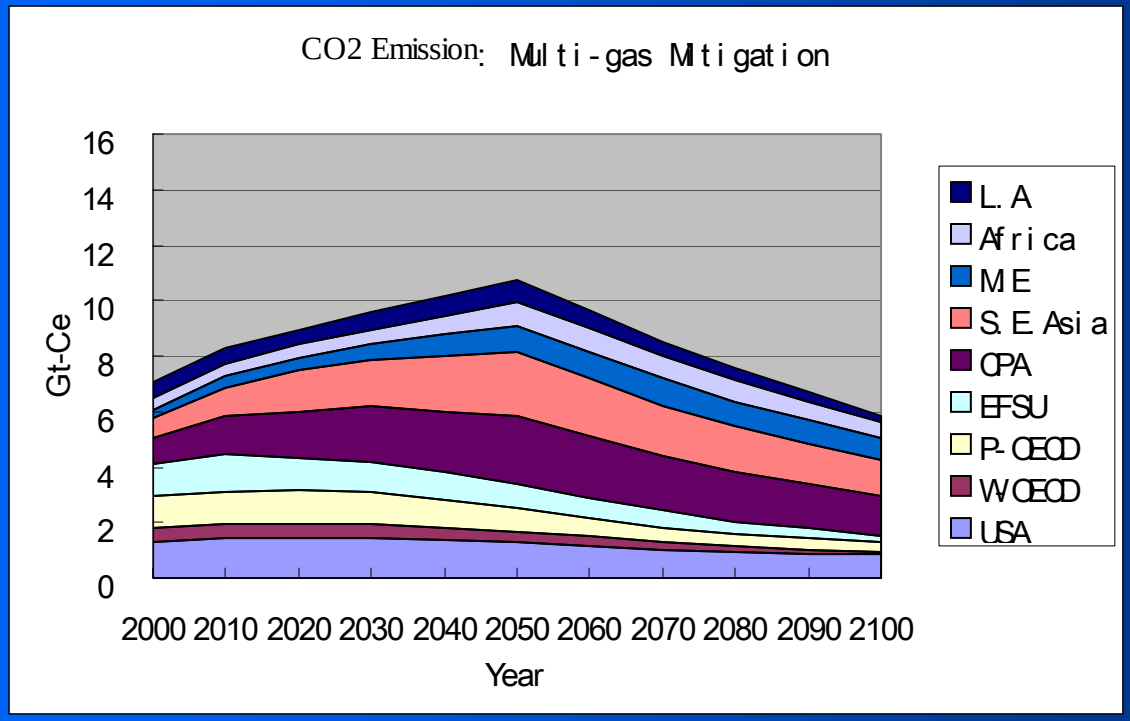
CO2 Emission: Multi-gas Mitigation
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Gt-Ce
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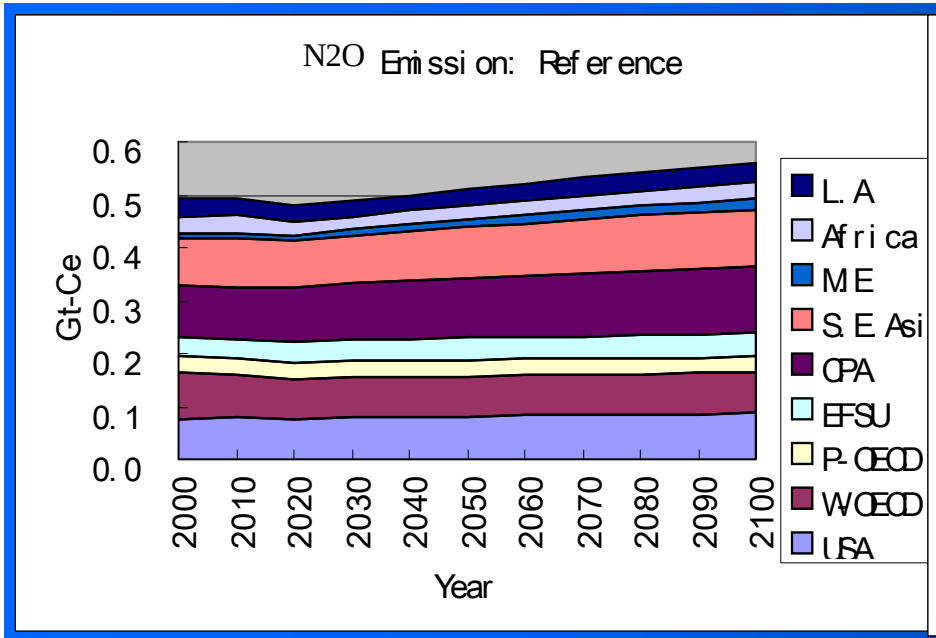
N2O Emission: Reference
Gt-Ce
0.6
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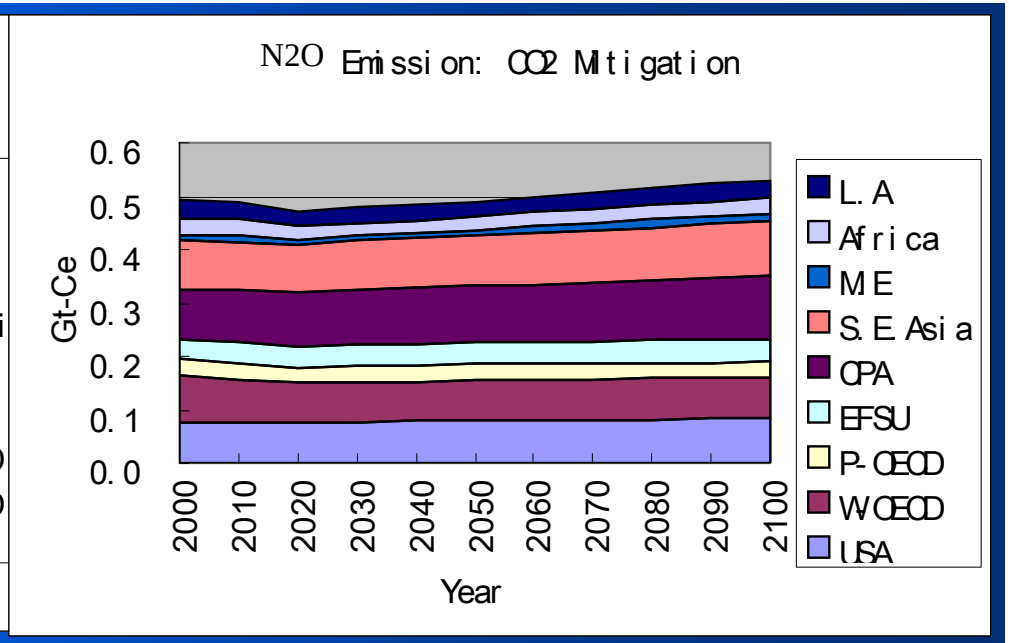
N2O Emission: CO2 Mitigation
Gt-Ce
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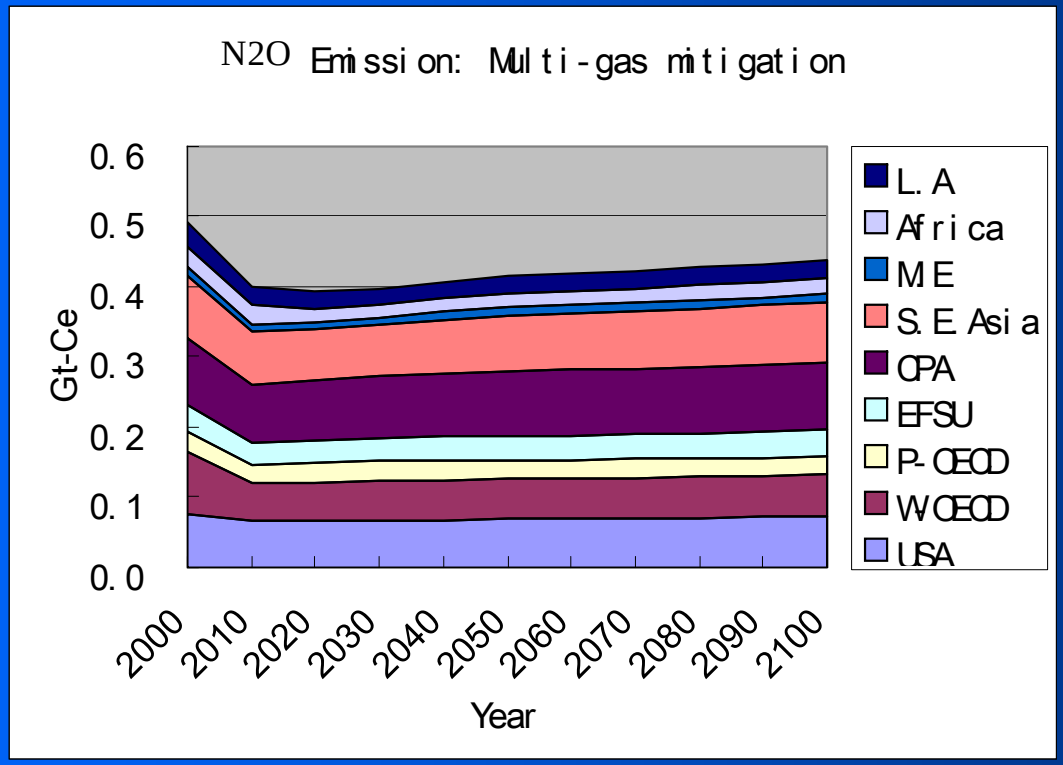
N2O Emission: Multi-gas mitigation
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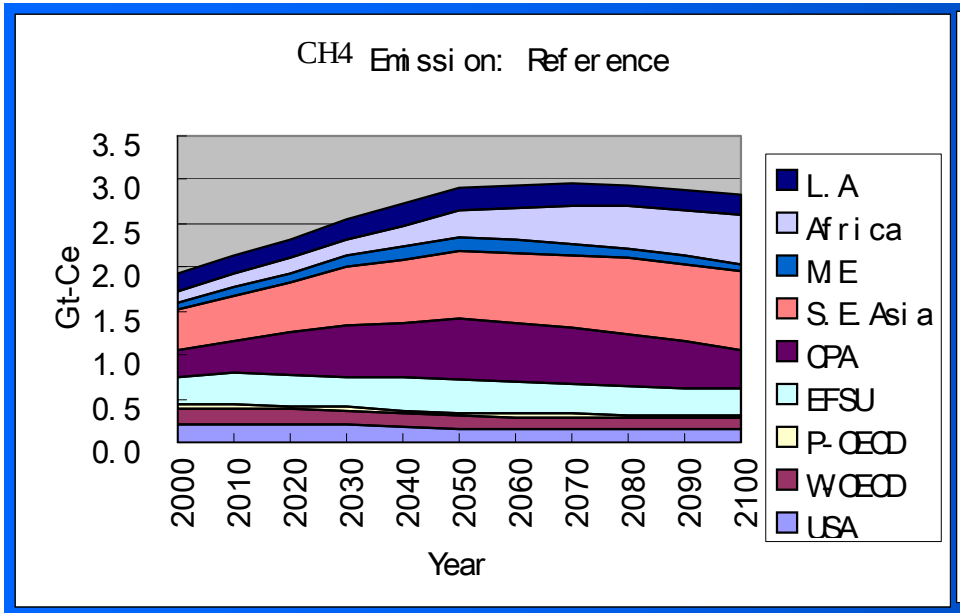
CH4 Emission: Reference
Gt-Ce
3.5
3.0
2.5
2.0
1.5
1.0
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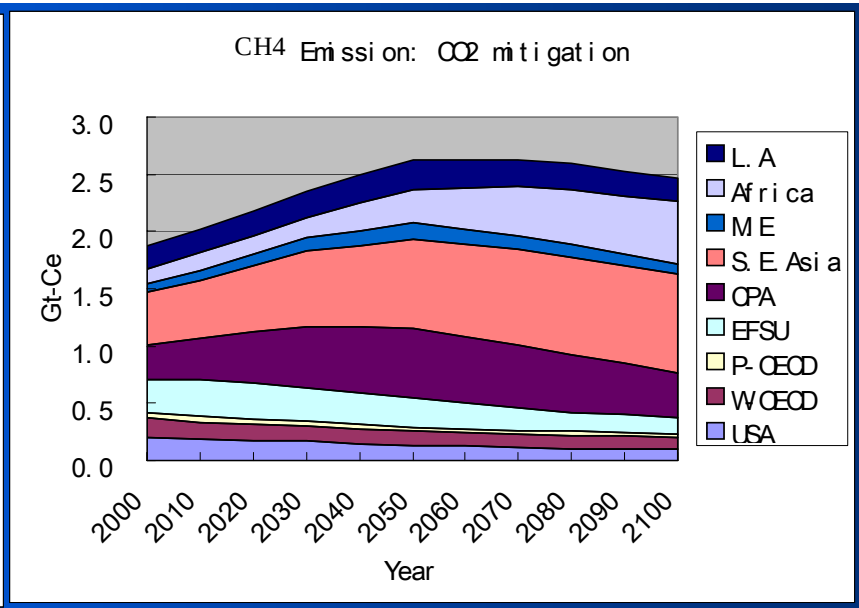
CH4 Emission: CO2 mitigation
Gt-Ce
3.0
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2.0
1.5
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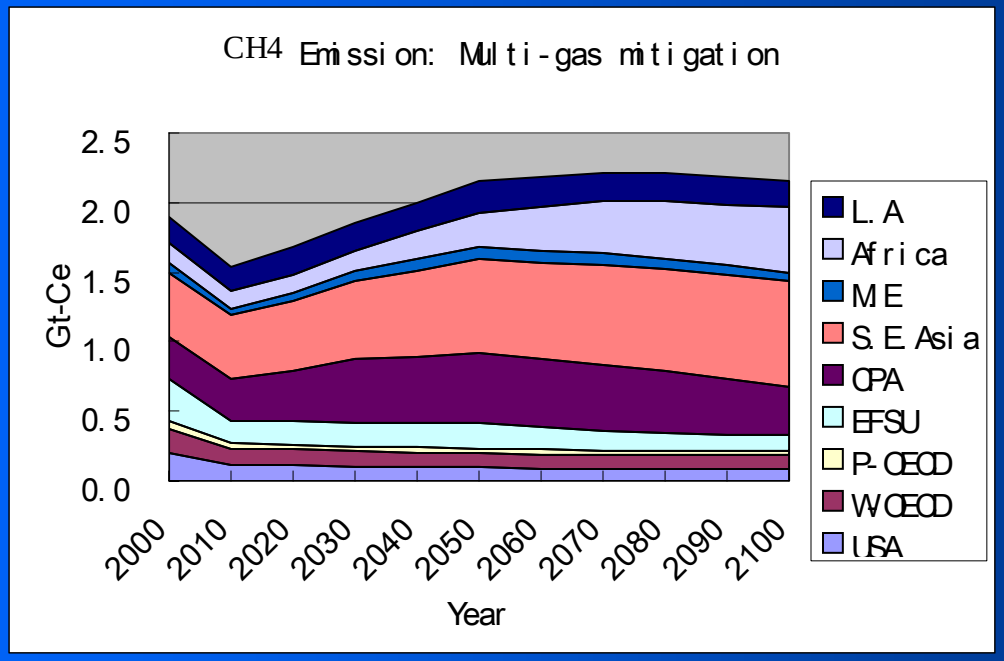
CH4 Emission: Multi-gas mitigation
Gt-Ce
2.5
2.0
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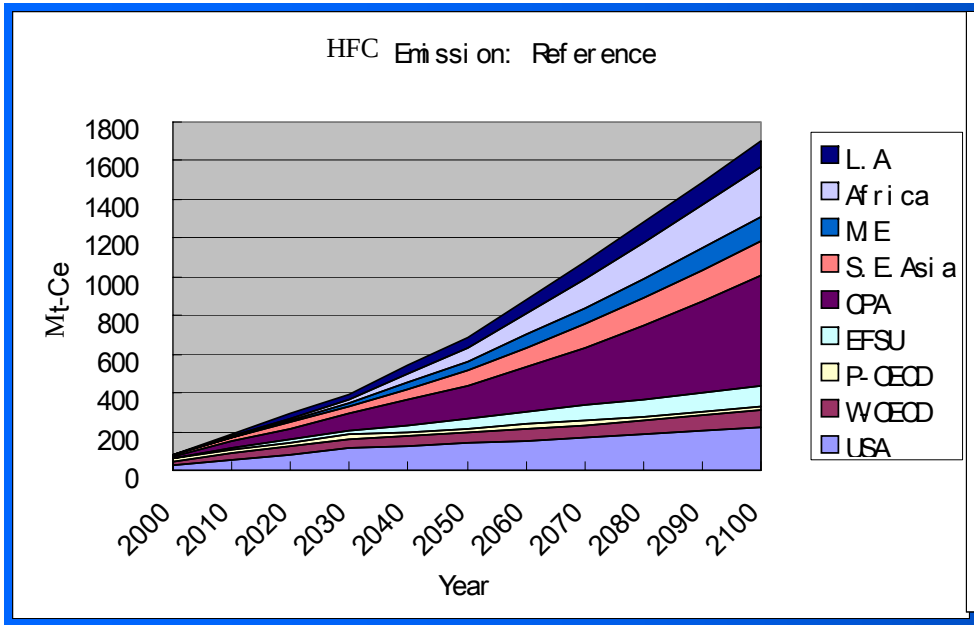
HFC Emission: Reference
Mt-Ce
1800
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1200
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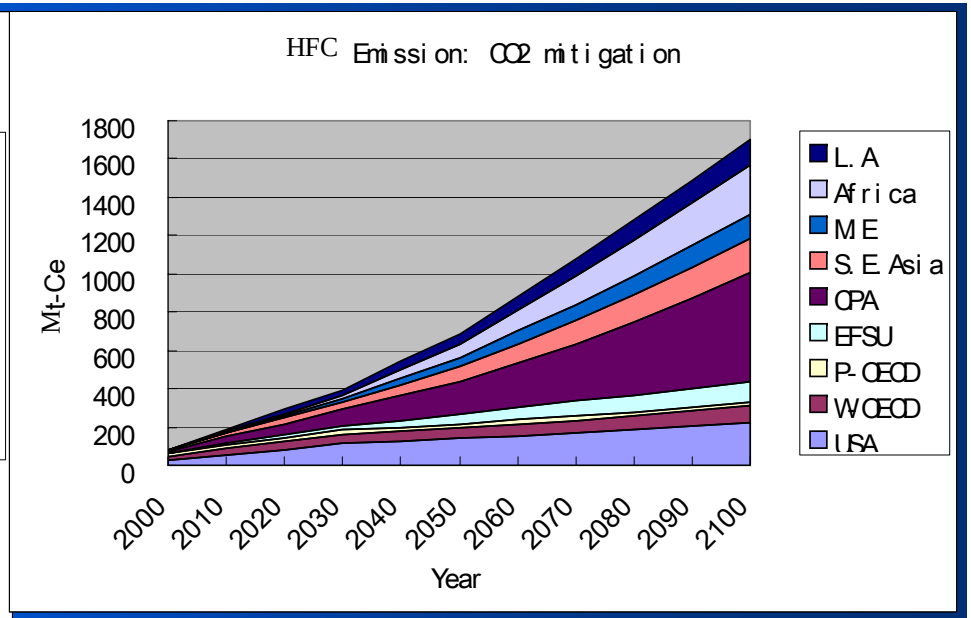
HFC Emission: CO2 mitigation
Mt-Ce
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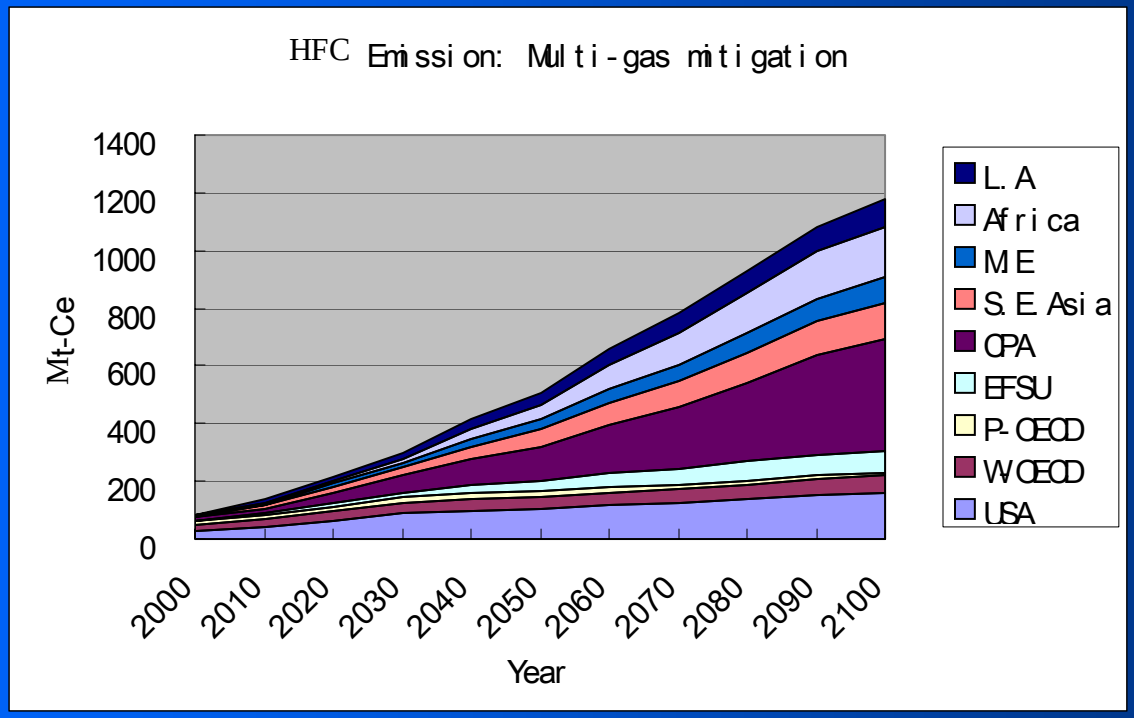
HFC Emission: Multi-gas mitigation
Mt-Ce
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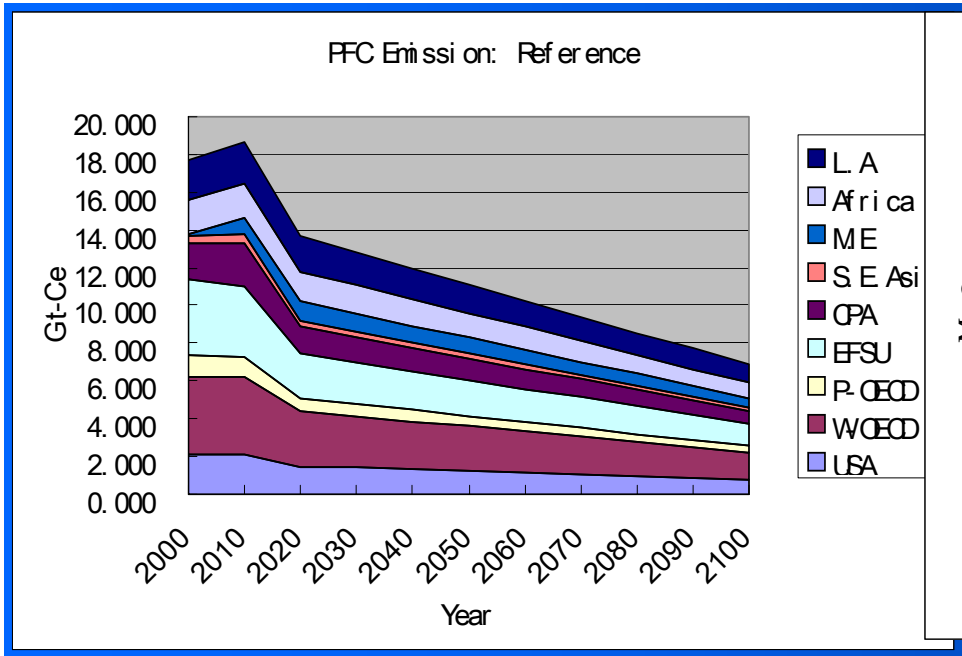
PFC Emission: Reference
Gt-Ce
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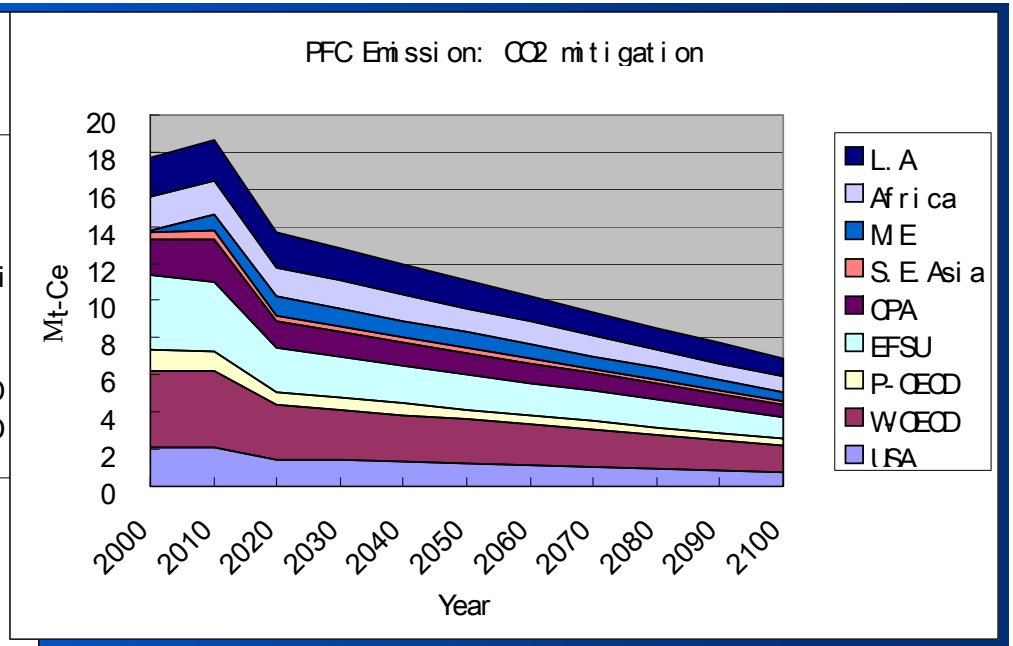
USA


PFC Emission: CO2 mitigation
Mt-Ce
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Year
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S.E.Asia
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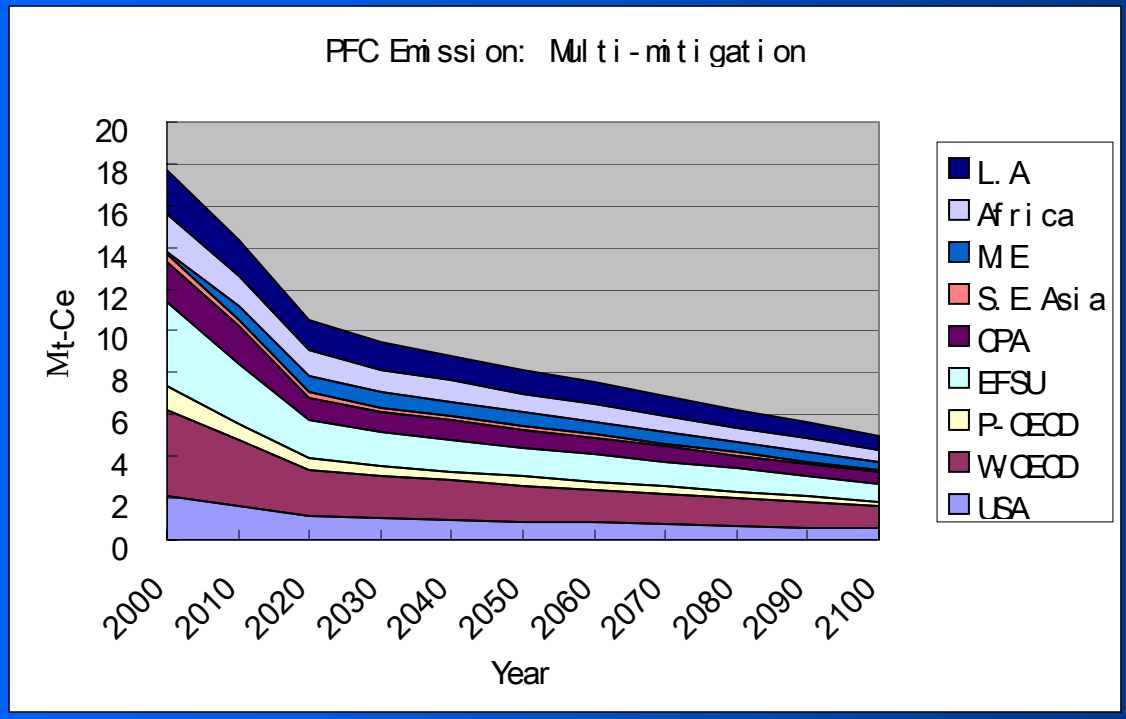
EFSU
P-OECD
W.OECD
USA


PFC Emission: Multi-mitigation
Mt-Ce
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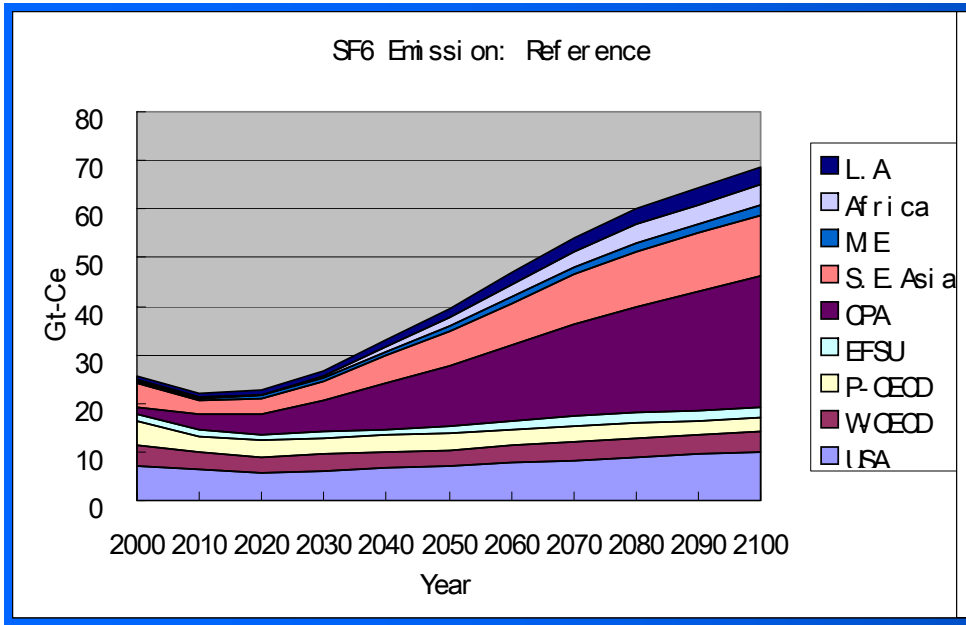
SF6 Emission: Reference
Gt-Ce
80
70
60
50
40
30
20
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2000 2010 2020 2030 2040 2050 2060 2070 2080 2090 2100
Year
L.A
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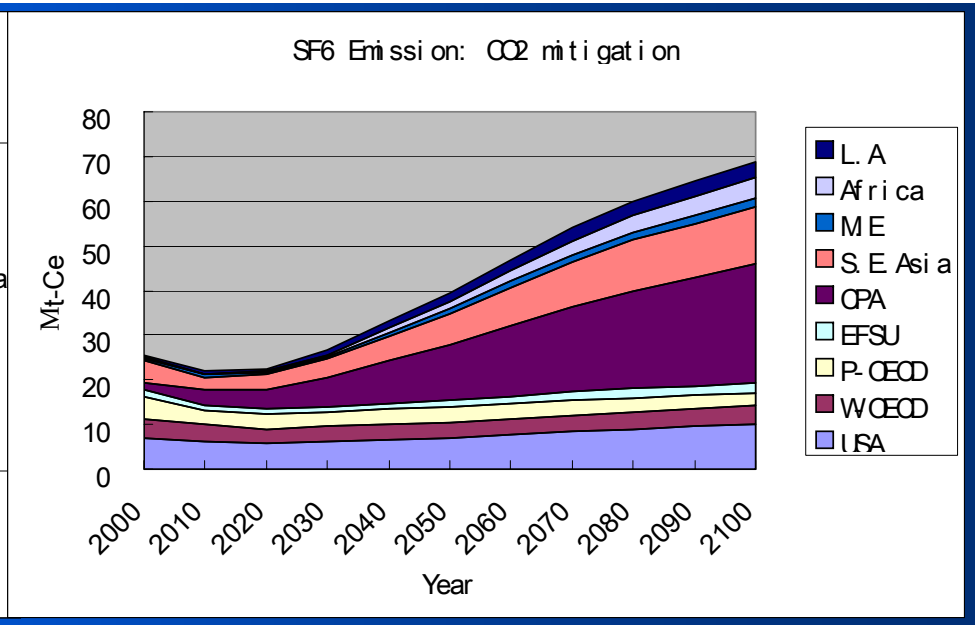
SF6 Emission: CO2 mitigation
Mt-Ce
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2000 2010 2020 2030 2040 2050 2060 2070 2080 2090 2100
Year
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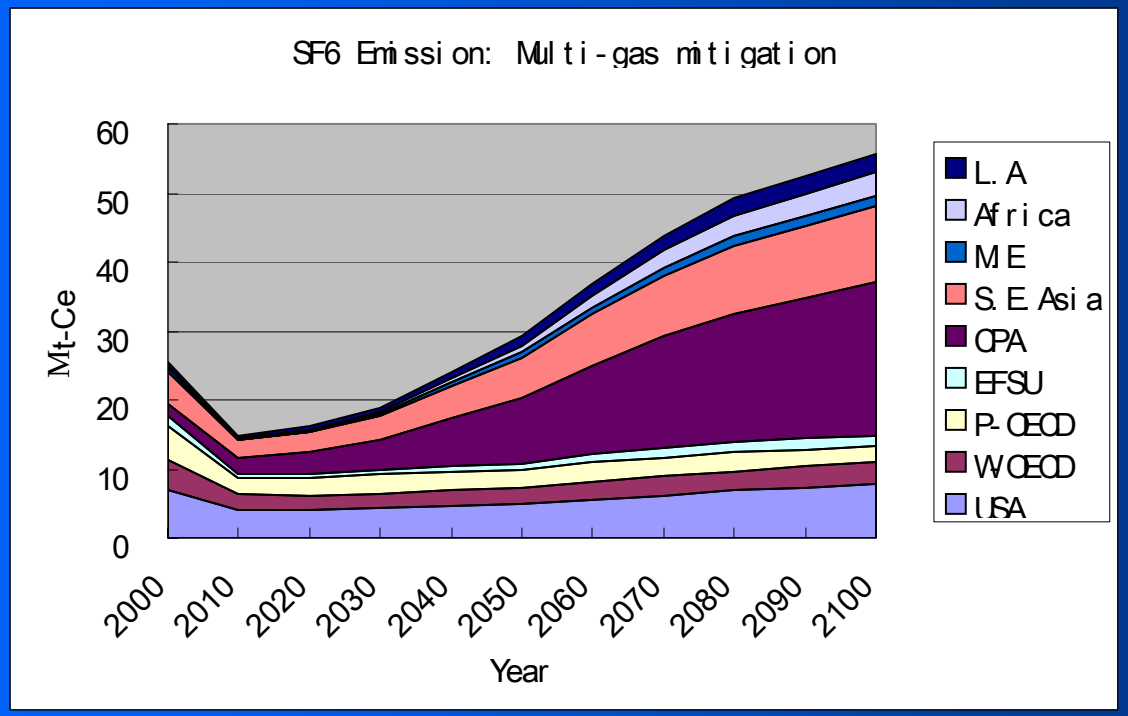
SF6 Emission: Multi-gas mitigation
Mt-Ce
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2000 2010 2020 2030 2040 2050 2060 2070 2080 2090 2100
Year
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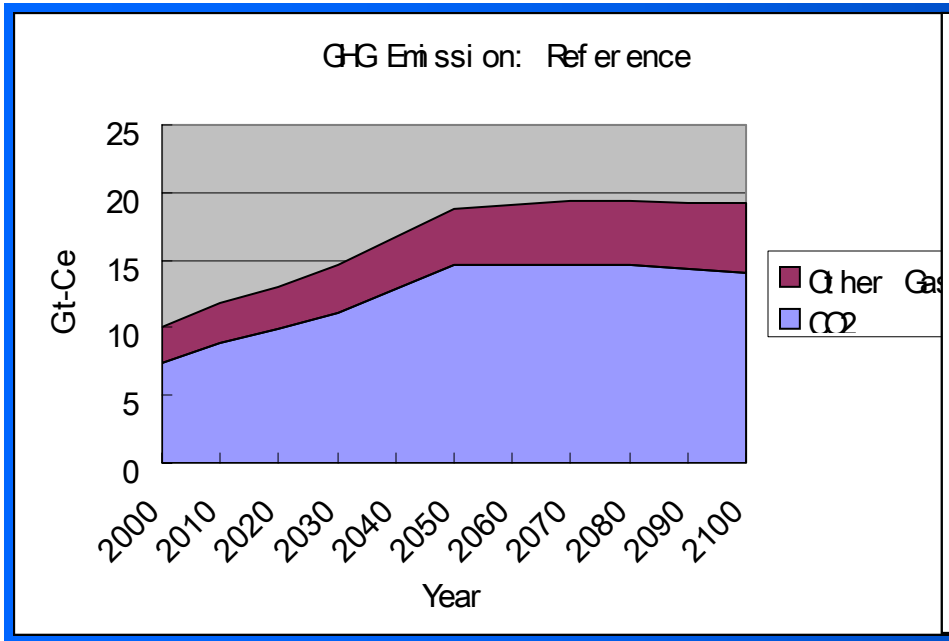
GHG Emission: Reference
25
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Gt-Ce
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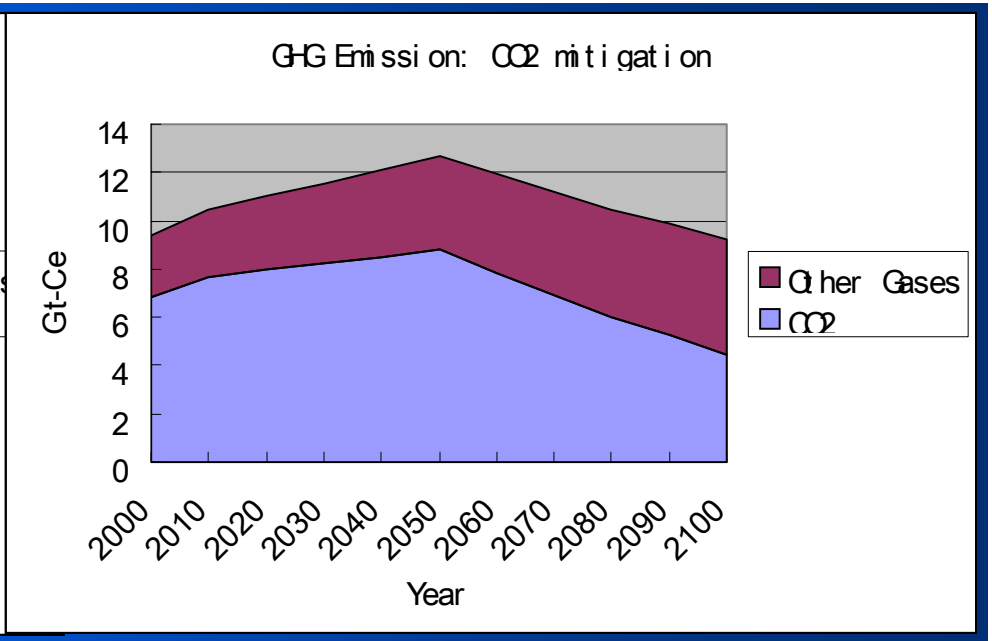
Year
Other Gas
CO2


GHG Emission: CO2 mitigation
14
12
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Gt-Ce
2000
2010
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2030
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2060
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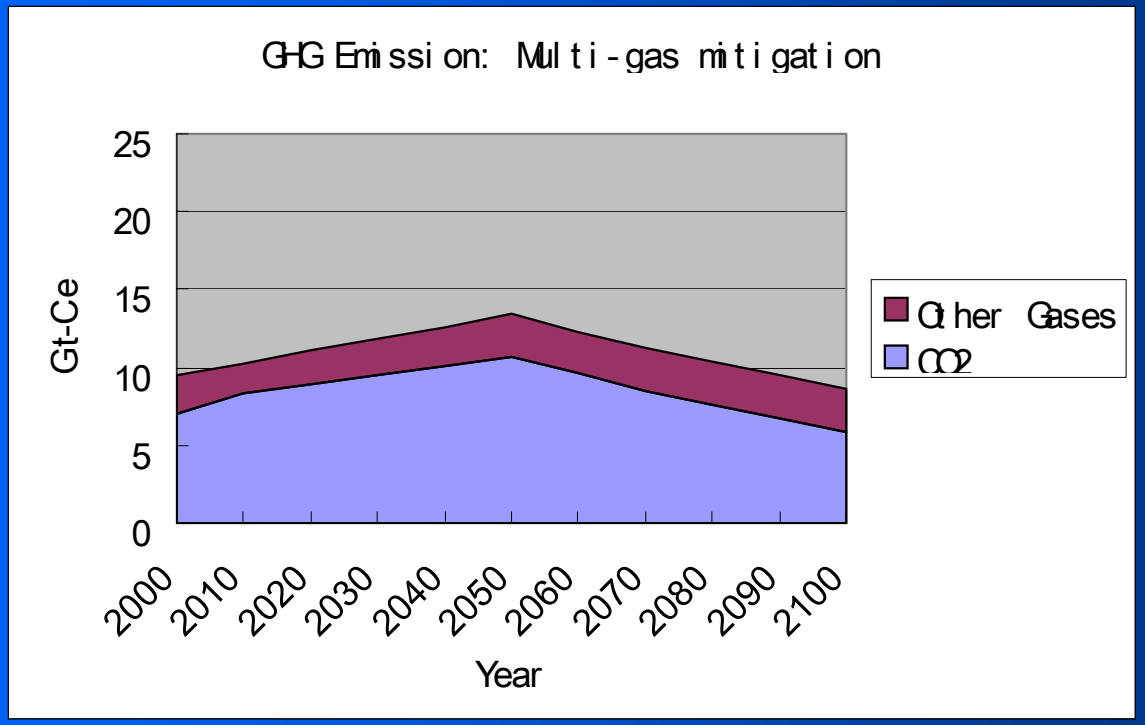
2100
Year
Other Gases
CO2


GHG Emission: Multi-gas mitigation
25
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Gt-Ce
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2030
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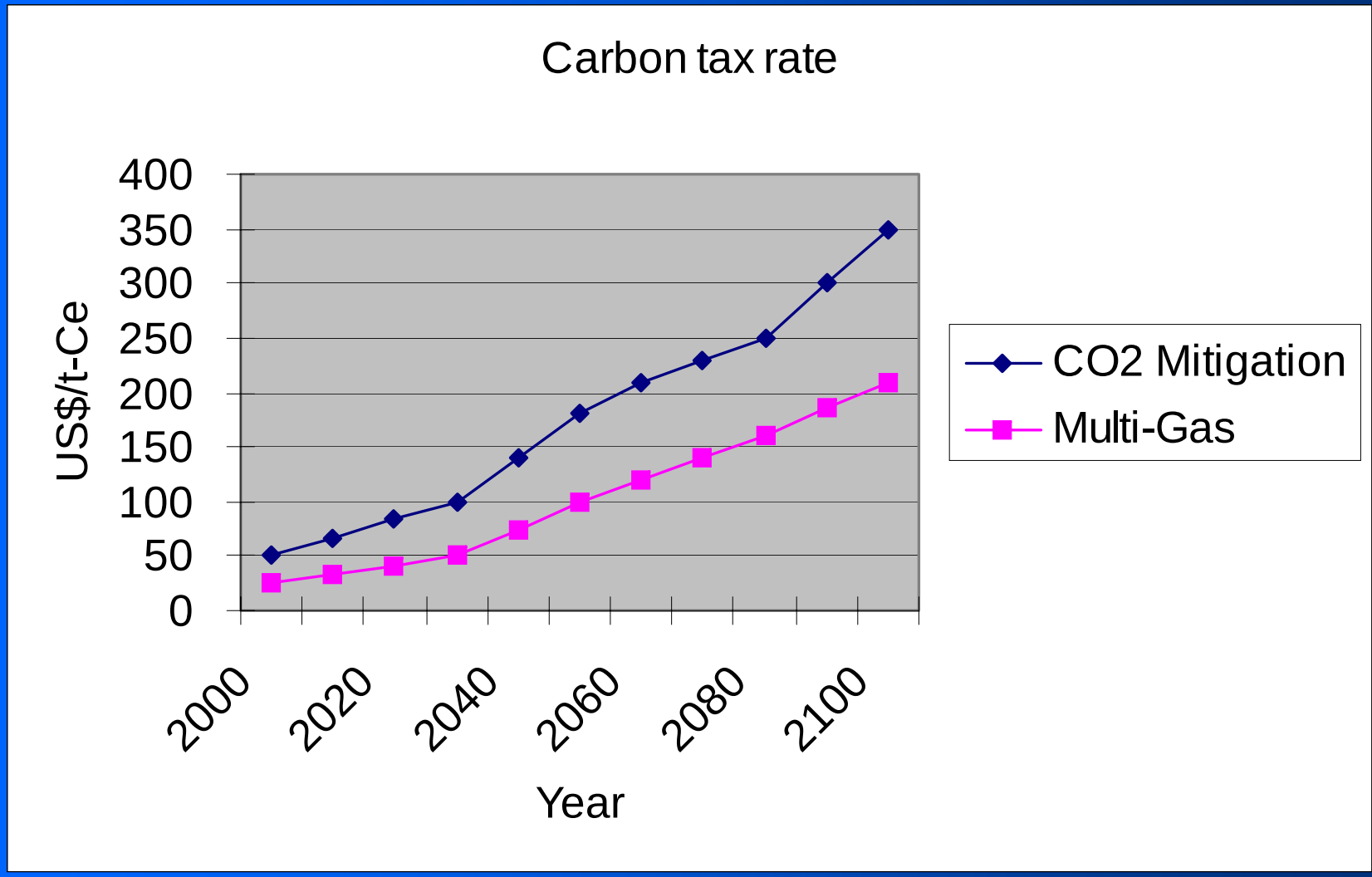
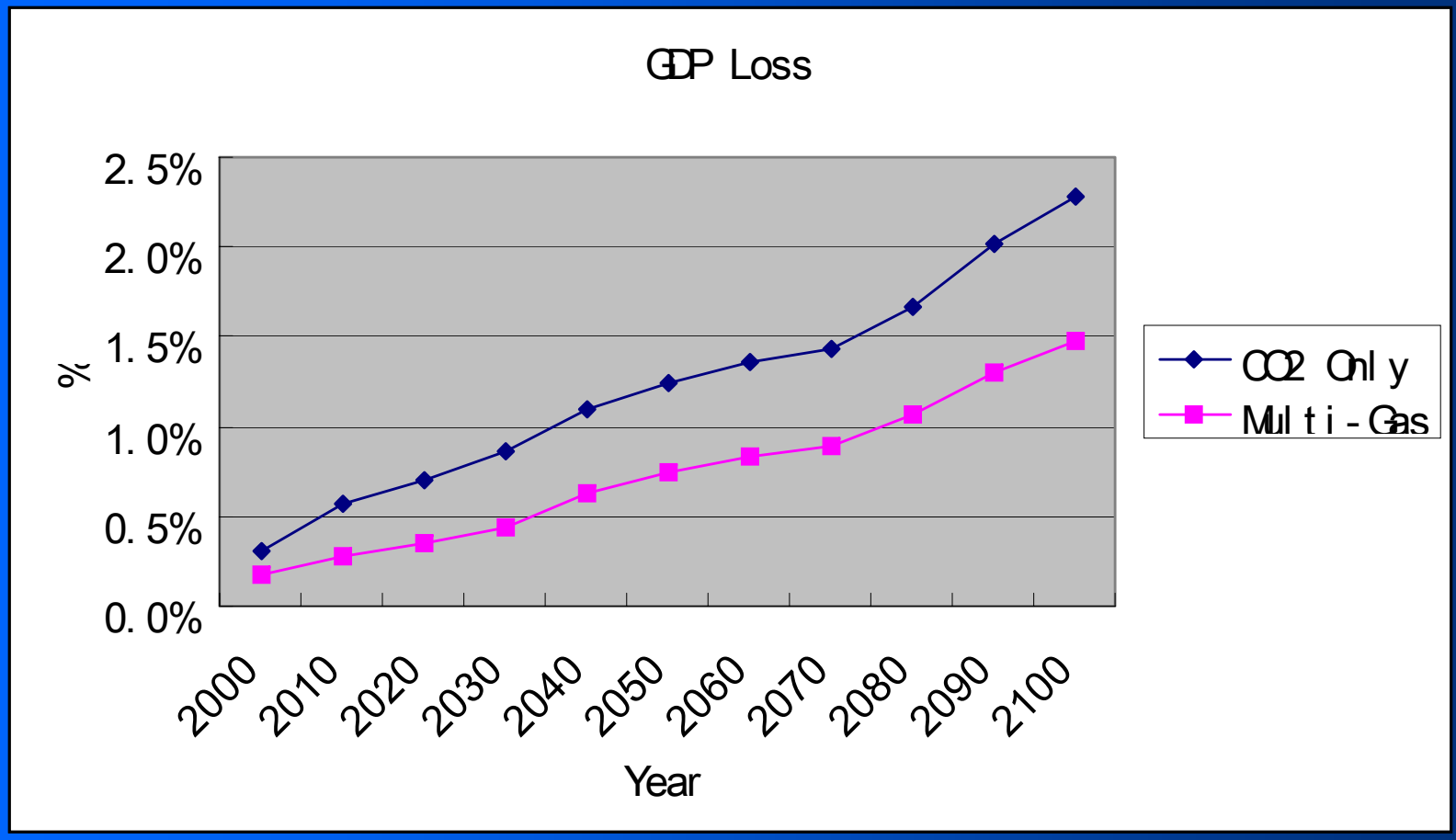
2090
2100
Year
Other Gases
CO2


Carbon tax rate
US$/t-Ce
400
350
300
250
200
150
100
50
0
2000
2020
2040
2060
2080
2100
Year
CO2 Mitigation
Multi-Gas


GDP Loss
2.5%
2.0%
1.5%
1.0%
0.5%
0.0%
%
2000
2010
2020
2030
2040
2050
2060
2070
2080
2090
2100
Year
CO2 Only
Multi-Gas

Multi-Gas Emission Scenario for China

- IPAC-AIM/Technology Model
- Up to 2030
- Detailed sector and technologies
- Worked with experts on coal industry, agriculture, and Montreal Protocol
- Data source:
    - Initial National Emission Inventory
    - Inventory for HFC, PFC and SF6
    - Agriculture
    - Landfill