Time Series Estimation and Projection of GHG Emissions

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National total GHG emission

Year of estimation

Million Tons CO2 equivalent

- Waste
- Forestry and Landuse change
- Agriculture
- Industrial Process
- Energy

1990: Report from TEI
1994: Initial national communication
1998: National Strategic Studies
2003: ERM report
GHG Emission by sector 2003

- Energy: 193,200
- Industrial: 3,188 (%: 24)
- Agriculture: 50,221 (%: 8)
- Land use change:
- Wastes: 26870 (%: 0)
Emission from energy sub-categories

- Energy and Transformation industry
- Industry, mining and construction
- Transport
- Others

1990: Report from TEI
1994: Initial national communication
1998: National Strategic Studies
2003: ERM report
Time series estimations: Energy sector

- Method applied
  - IPCC 1996 revised GL

- Data used in estimation
  - Statistical report from Ministry of Energy
  - GDP form Office of National Economics and Social Development Board
# GHG Emission from Energy sector

## Three major sub-categories

<table>
<thead>
<tr>
<th>Electricity</th>
<th>Industry</th>
<th>Transportation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermal power plant</td>
<td>Food and beverages</td>
<td>Road transport</td>
</tr>
<tr>
<td>Combined cycle power plant</td>
<td>Textiles</td>
<td>Rail transport</td>
</tr>
<tr>
<td>Gas turbine power plant</td>
<td>Wood and furniture</td>
<td>Air transport</td>
</tr>
<tr>
<td>Diesel power plant</td>
<td>Paper</td>
<td>Water transport</td>
</tr>
<tr>
<td>Cogeneration power plant</td>
<td>Chemical</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Basic Metal</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fabricated metal</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Other (Unclassified)</td>
<td></td>
</tr>
<tr>
<td></td>
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<td></td>
</tr>
</tbody>
</table>
Time series emission from energy sub-categories
Activity data from Ministry of Energy

![Chart showing CO2 equivalent emissions from different sources from 2000 to 2004. The chart indicates that Transportation has the highest CO2 emissions, followed by Industry and then Electricity.](image-url)
Emission from energy sub-categories CAIT data

![Bar chart showing emission from energy sub-categories for different years. The chart is labeled with CO2 equivalent on the y-axis and years from 2000 to 2003 on the x-axis. The data is categorized into four sections: Electricity and Heating, Manufacturing, Transportation, and others.]
Analysis of emission by sub-categories
Heavy oil
Natural gas
Lignite
Heavy oil

Thousand tons of CO2 from energy and transformation from 1994-2004

10,000 20,000 30,000 40,000 50,000 60,000 70,000 80,000

ปริมาณการปล่อยก๊าซเรือนกระจก
(พันตันของคาร์บอนไดออกไซด์)

2537 2538 2539 2540 2541 2542 2543 2544 2545 2546 2547
Thousand tons of CO2 from Industry from 1994-2004
Thousand tons of CO2 from Transport from 1994-2004
Projection of emission

- **Estimate GHG emission of energy sector (past-present)**: Using data on energy consumption from “Thailand Energy Situation (DEDE)” since 1994-2004

- **Forecast GHG emission from energy sector**: using correlation GDP growth rate and population to fuel consumption in future
GHGs emission under base case (BAU)
GHGs emission under policy and planning

Department of Alternative Energy Development and Efficiency (DEDE)
## Policy and plan of DEDE Study

<table>
<thead>
<tr>
<th></th>
<th>Energy reducing (Ktoe)</th>
<th>GHG emission reducing (Mt CO₂ equivalent)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Renewable Energy at 2011 (RE)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electricity</td>
<td>1,169</td>
<td>2.7</td>
</tr>
<tr>
<td>Industry</td>
<td>1,650</td>
<td>5.3</td>
</tr>
<tr>
<td>Transportation</td>
<td>2,484</td>
<td>7.5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>5,303</strong></td>
<td><strong>15.5</strong></td>
</tr>
</tbody>
</table>

| **GHG emission under scenario DEDE in 2011** | 222 (Mt CO₂ equivalent) |
| **GHG emission under BAU in 2011**           | 235.5 (Mt CO₂ equivalent) |
DEDE Study

GHG emissions all sectors in the BAU and DEDE-policy scenario

Energy and transformation

GHG emissions and reduction of energy sectoro (Electricity)

GHG emissions all sectors in the BAU and DEDE-policy study (Industry)

Industry

GHG emissions all sectors in the BAU and DEDE-policy study (Transportation)

Transportation
DEDE Study

RE = Renewable Energy
GHGs emission under policy and plan of Energy Policy and Planning Office (EPPO)
## Policy and plan of EPPO Study

<table>
<thead>
<tr>
<th></th>
<th>Energy reducing (Ktoe)</th>
<th>GHG emission reducing 2011 (Mt CO₂ equivalent)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Renewable Energy at 2011 (RE)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electricity</td>
<td>741</td>
<td>1.7</td>
</tr>
<tr>
<td>Industry</td>
<td>453</td>
<td>1.4</td>
</tr>
<tr>
<td>Transportation</td>
<td>2,074</td>
<td>6.3</td>
</tr>
<tr>
<td><strong>Energy Efficiency at 2011 (EE)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Industry</td>
<td>3,411</td>
<td>9.0</td>
</tr>
<tr>
<td>Transportation</td>
<td>6,269</td>
<td>19.2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>12,948</strong></td>
<td><strong>37.6</strong></td>
</tr>
<tr>
<td>GHG emission under scenario of EPPO in 2011</td>
<td>200(Mt CO₂ equivalent)</td>
<td></td>
</tr>
<tr>
<td>GHG Emission BAU in 2011</td>
<td>237.6 (Mt CO₂ equivalent)</td>
<td></td>
</tr>
</tbody>
</table>
EPPO Study

GHG emissions all sectors in the BAU and EPPO scenario

GHG emissions all sectors in the BAU and EPPO scenario (Electricity)

GHG emissions all sectors in the BAU and EPPO study (Industry)

GHG emissions all sectors in the BAU and EPPO study (Transportation)
EPPO Study

RE = Renewable Energy  EE = Energy Efficiency

RE: Electricity
• Solar
• Wine

RE: Industry
• Biomass
• Biogas
• Waste

RE: Transportation
• Ethanol
• Biodiesel

EE: Industry
• Tax exemption
• Soft loan promotion

EE: Transportation
• Mass transit
• Rail way and water way promotion
• Promote Logistic Depot
• Networking
• Tax measure
• Traffic management
• Increase car efficiency
DEDE: 6.6% reduction (2011)
RE only

EPPO: 16.0% reduction (2011)
RE and extremely plan for EE
Comparison to LEAP model

21 percent reduction in year 2015

Contribution of energy saving and renewable energy substitution in CO2 mitigation
Conclusion

- Time series estimation help analysis historical activities of the country and to see trend in the future
- Use only one national data source (most reliable) to avoid confusing and controversy
- Historical tracking of data is important
Acknowledgement

- Energy policy project supported by EPPO and TRF
- GHG mitigation option project supported by TRF
Thank you and Kop khun Ka