Energy Options and Co-Benefit: Beijing Case

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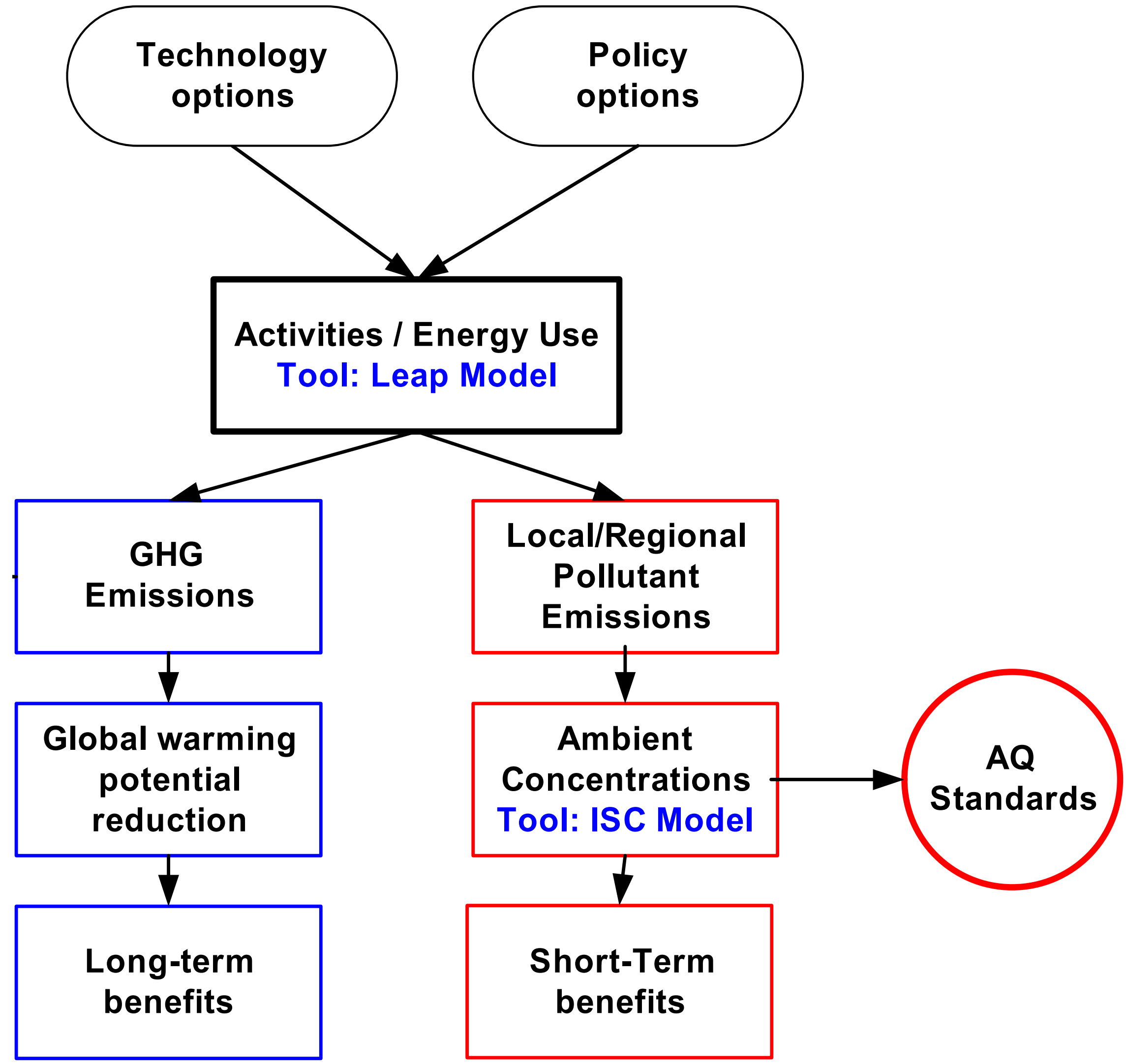
- Methodology
- Information of Base Year
- Scenario Design
- Scenario Analysis
- Conclusion

Methodology

Framework of IES Project



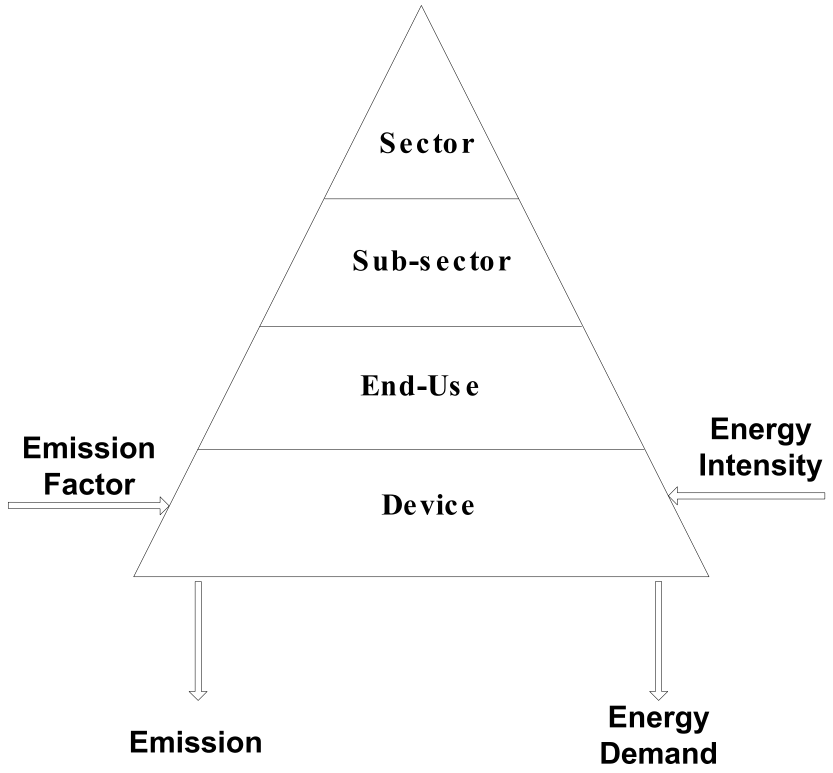
Methodological framework of Leap

- The problem is disaggregated into four active levels:

  1.Sector 2. Sub-sector

  3.End-use 4. Device

- Energy intensity and emission factors are associated with each device at the level 4
- Total energy demand and emission amount are calculated



Framework Sample of Leap: Lighting

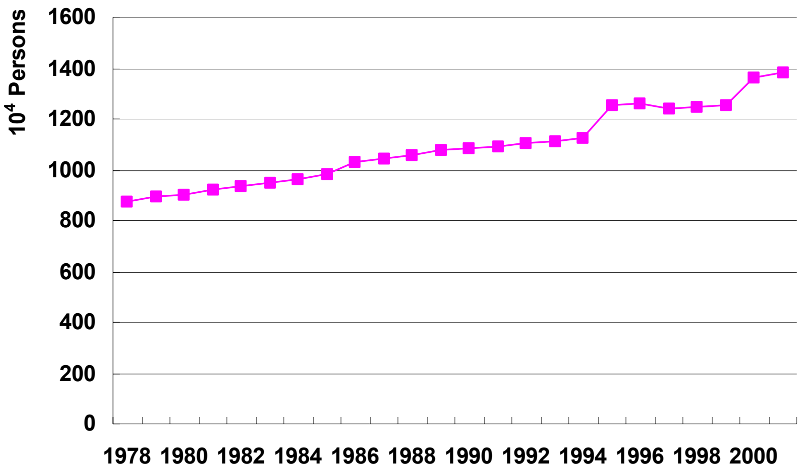
• Sector:	Resident
• Sub-sector:	Urban Resident
• End-use:	Lighting
• Device:	Incandescent, Fluorescent

Introduction of the ISC Model

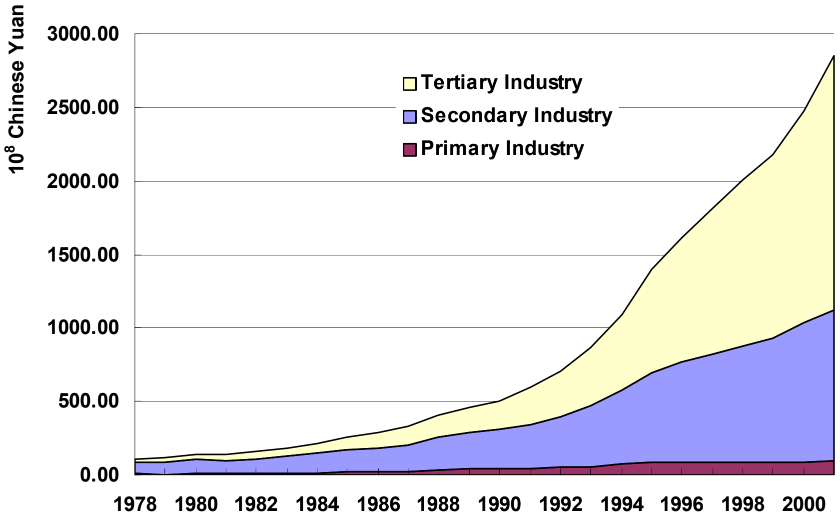
- Industrial Sources Complex Model
- Source
  - Point Sources, Area Sources,
    Volume Sources, Open-pit Sources
- Scale
  - Mid-scale: 50 km
- Concentration
  - h, day, month, quarter, year
- Process
  - air transportation, disperse, plume rise,
    dry and wet deposition, building washdown

Information of Base Year

Population and GDP Growth

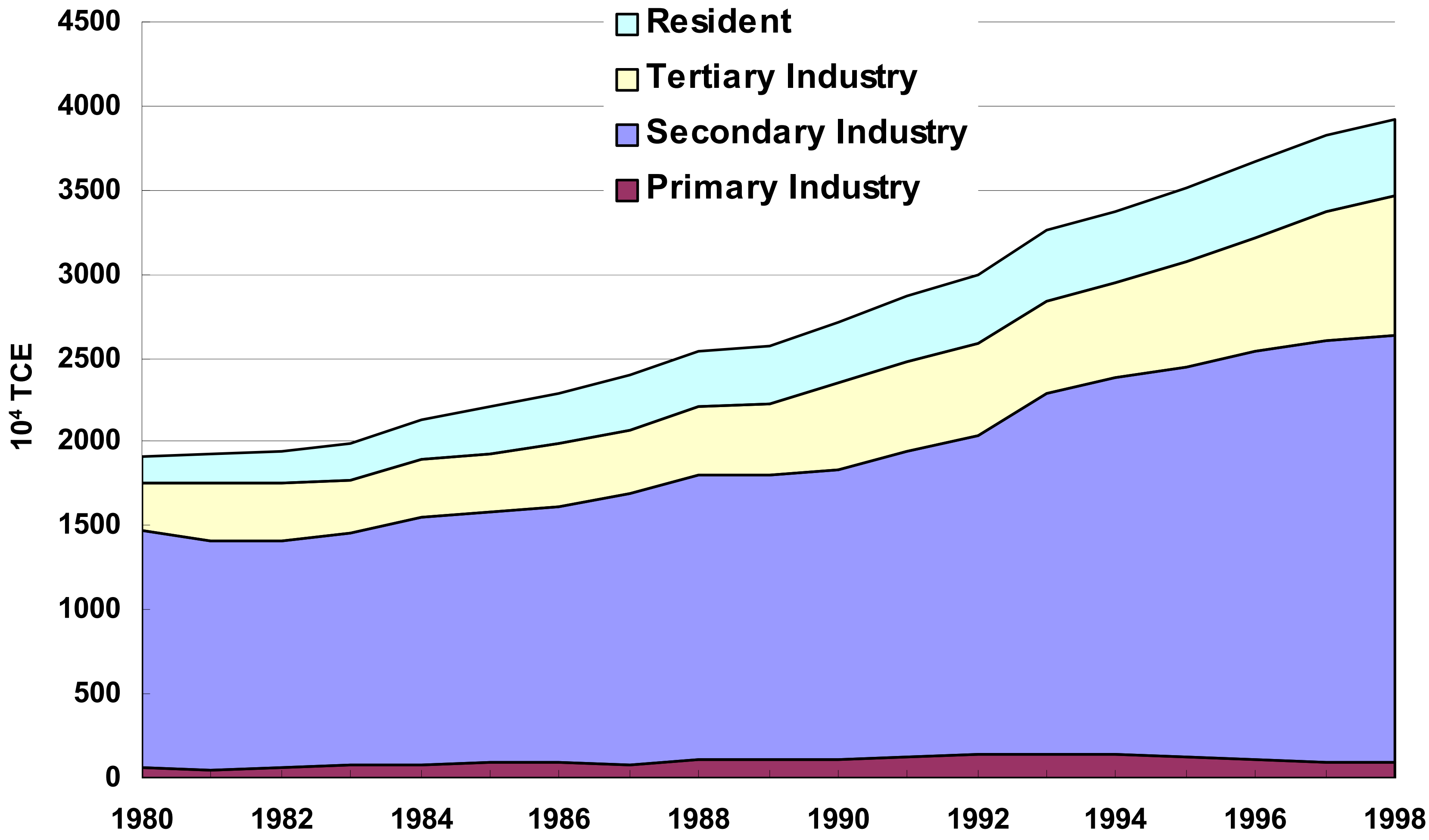


Population Growth

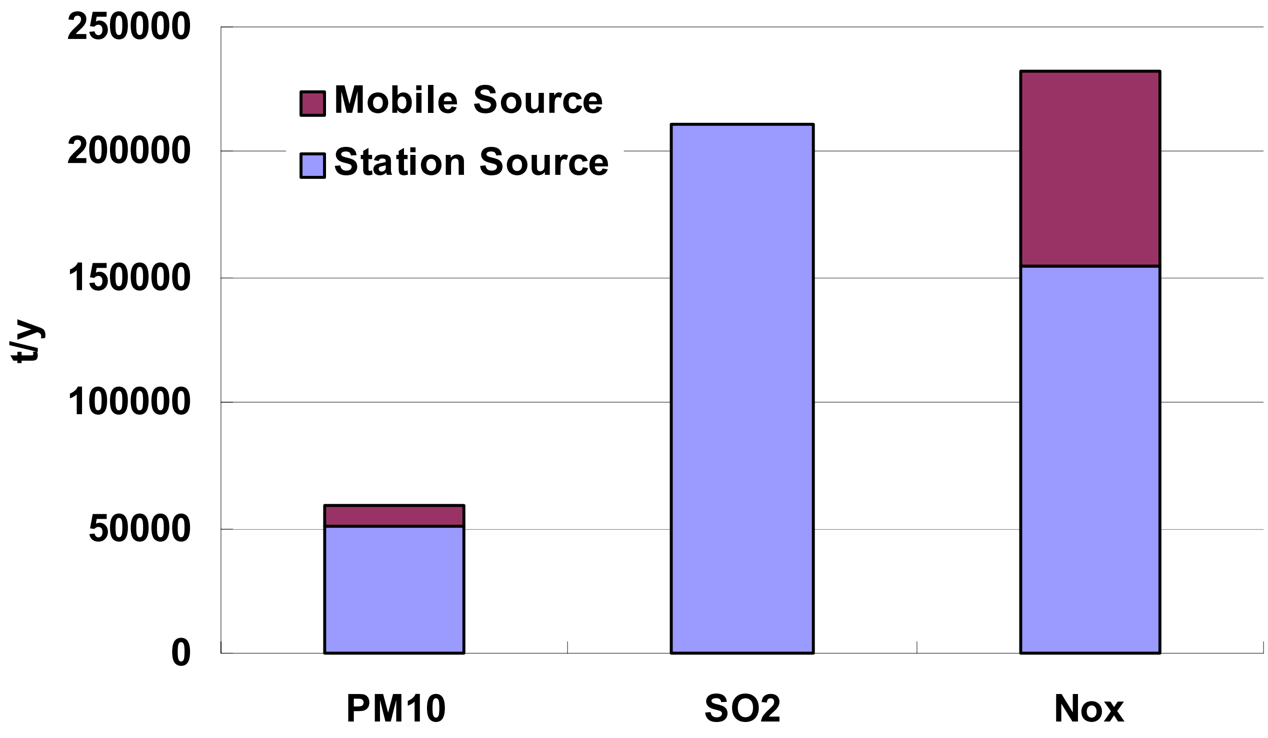


GDP Growth

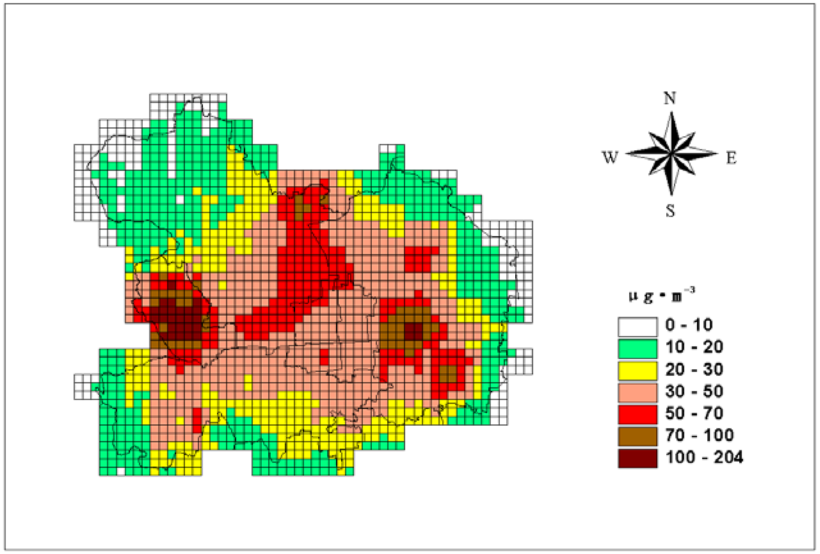
End-Use Energy Consumption by Sector



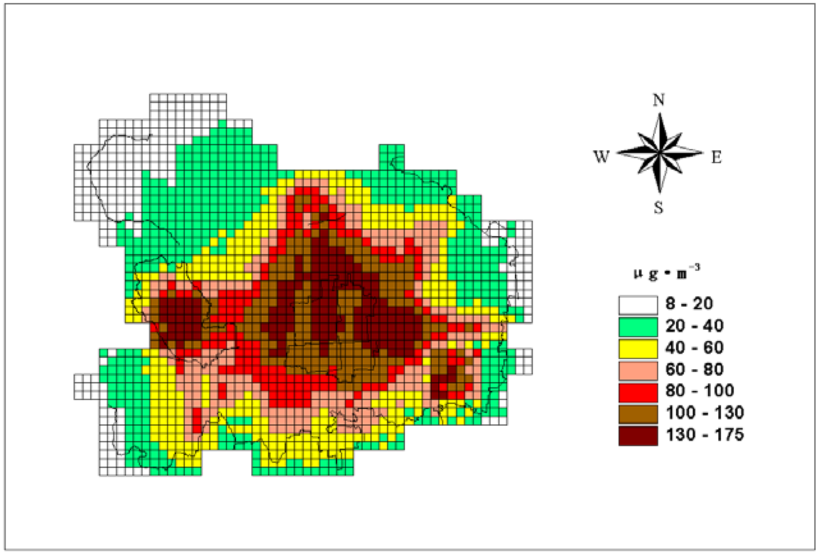
Energy Related Emissions, 1999



Concentration Distribution of SO_2 and NOx, 1999

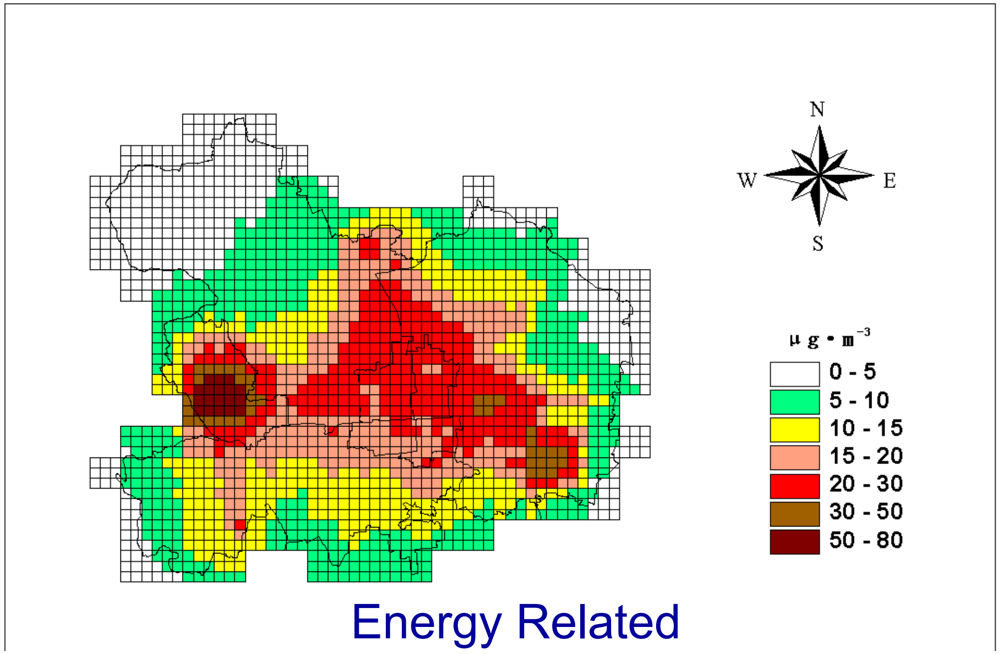


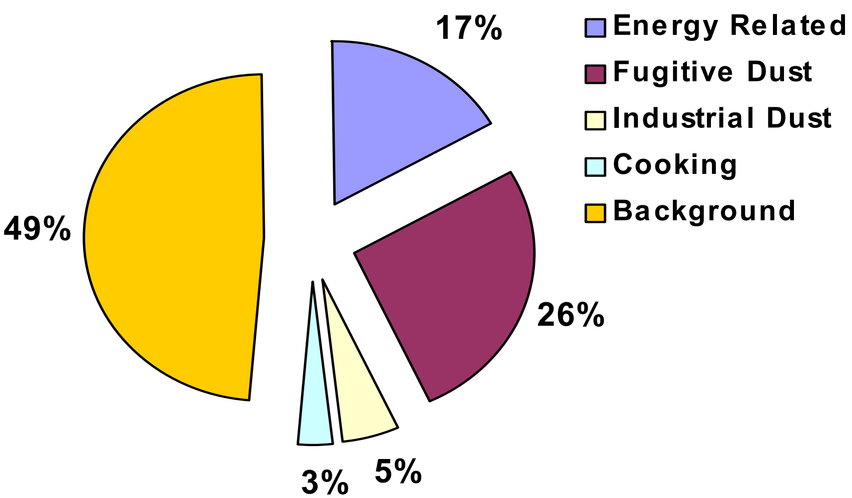
SO_2

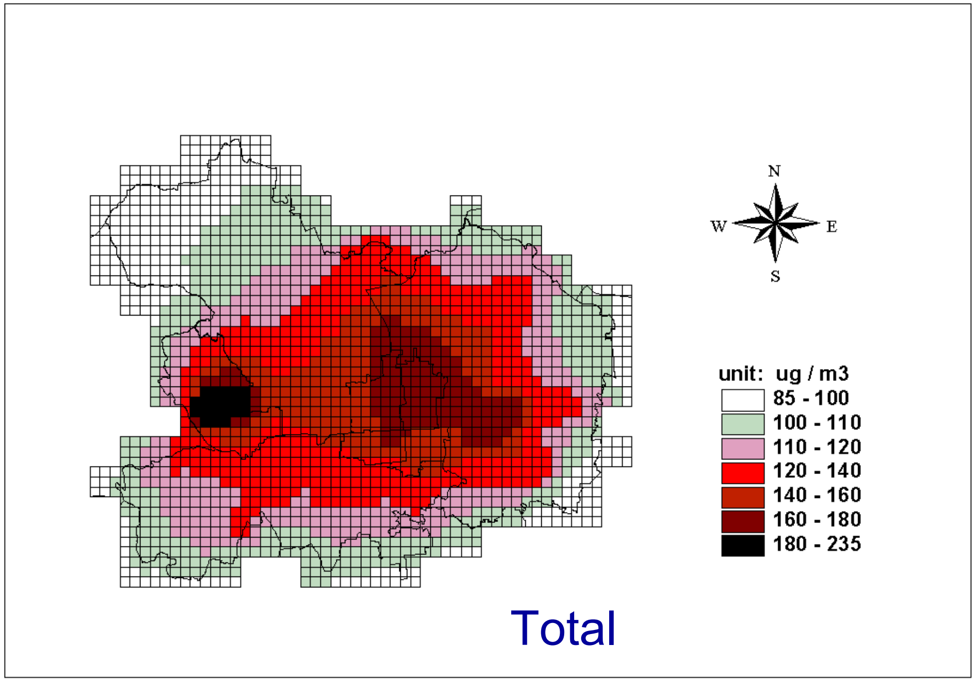


NOx

Concentration Distribution of PM10, 1999







Scenario Design

Scenario Definitions

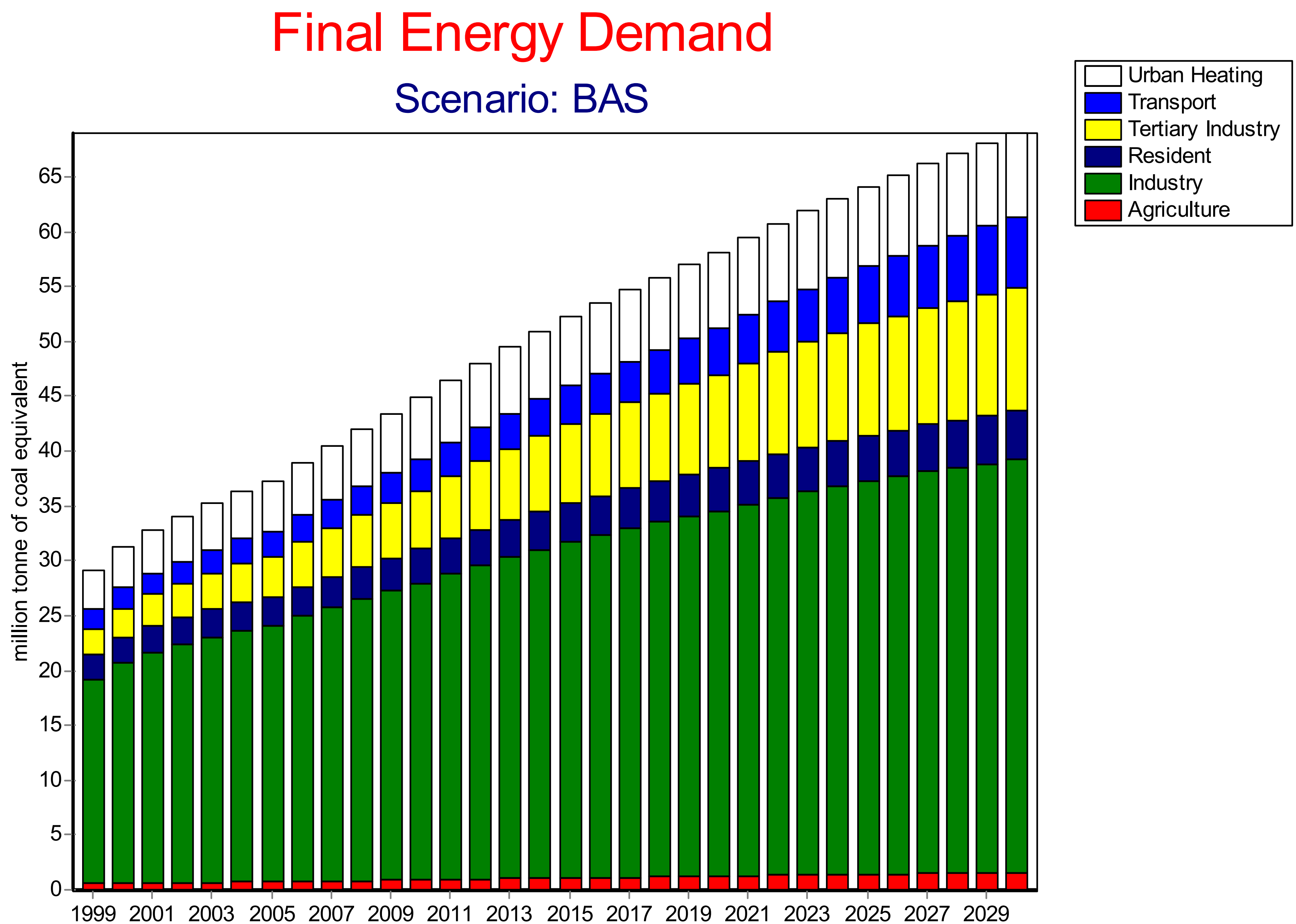
- Base Case (BAS)
  - No extra efforts
- Clean Energy Consumption (CEC)
  - Nature gas boilers, Gas fired power plants
- Industry Structure Transformation (IST)
  - Reduce steel products
  - Slow down the growth of cement industry
- Energy Efficiency Program (EEP)
  - Lighting, buildings, industry, vehicles
- Green Transportation (GRE)
  - Public transportation, CNG & LPG fuels
  - HEV & FCV, Stringent emission standards

Scenario Analysis

Scenario Definitions

- BAS *
- CEC+IST
- CEC+IST+EEP
- CEC+IST+EEP+GRE *

Base Case


Final Energy Demand
Scenario: BAS
Urban Heating
Transport
Tertiary Industry
Resident
Industry
Agriculture
million tonne of coal equivalent
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25
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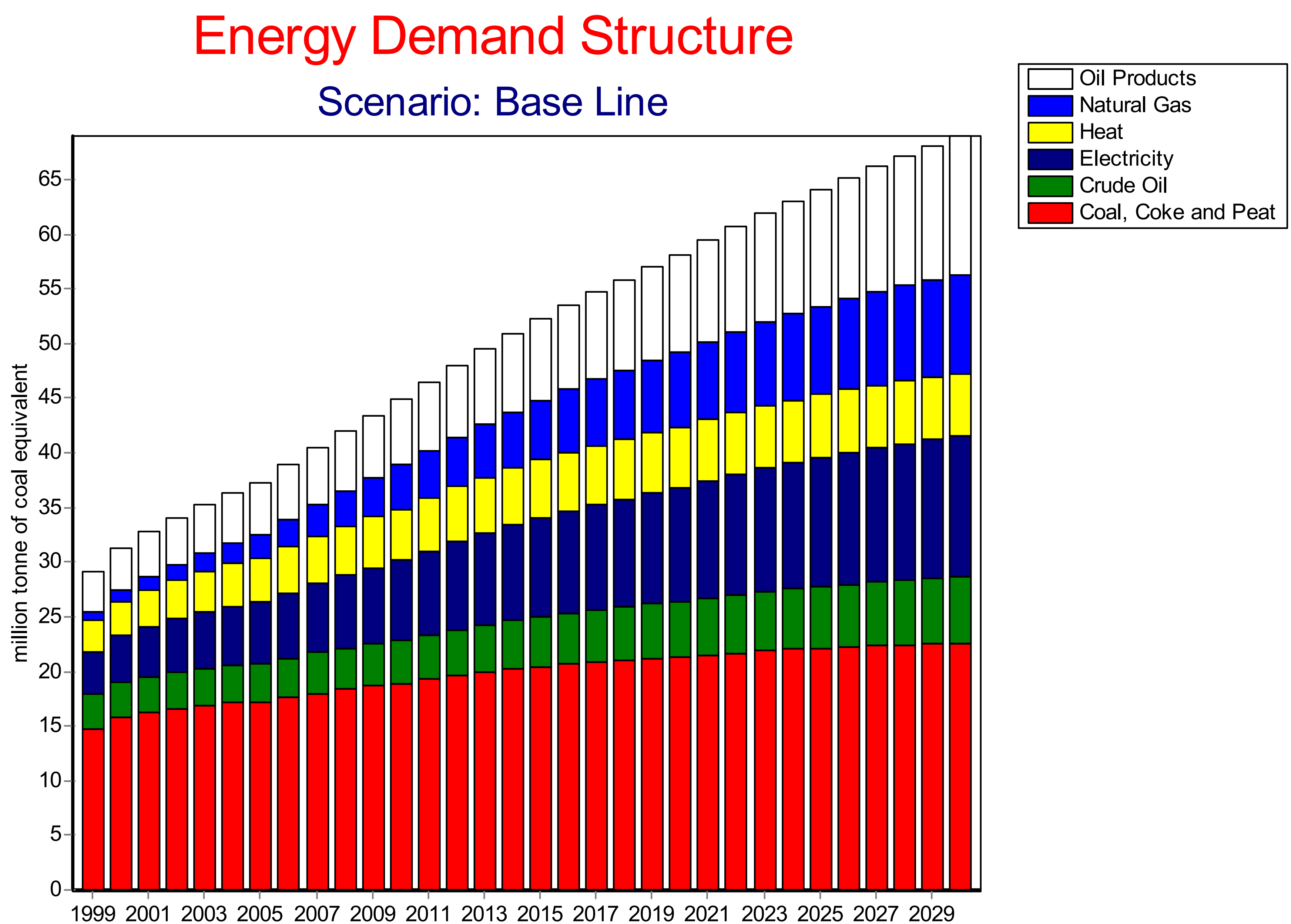

Energy Demand Structure
Scenario: Base Line
Oil Products
Natural Gas
Heat
Electricity
Crude Oil
Coal, Coke and Peat
million tonne of coal equivalent
0
5
10
15
20
25
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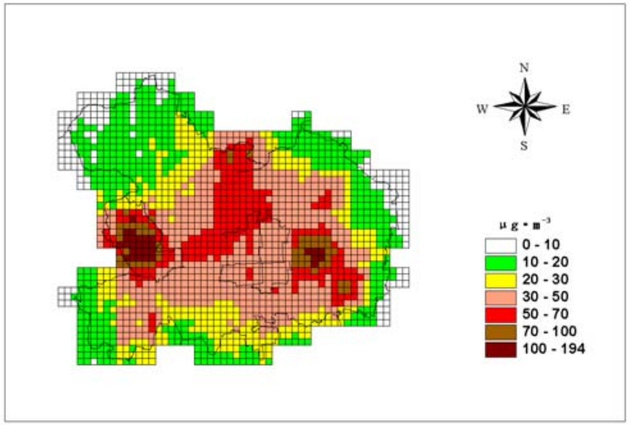
Concentration Distribution of SO_2, 2000-2030



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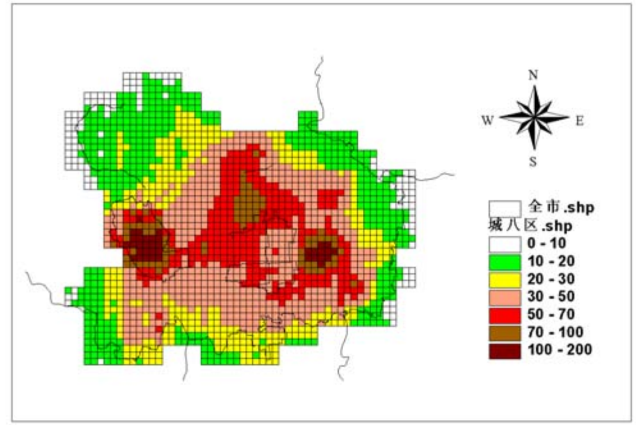
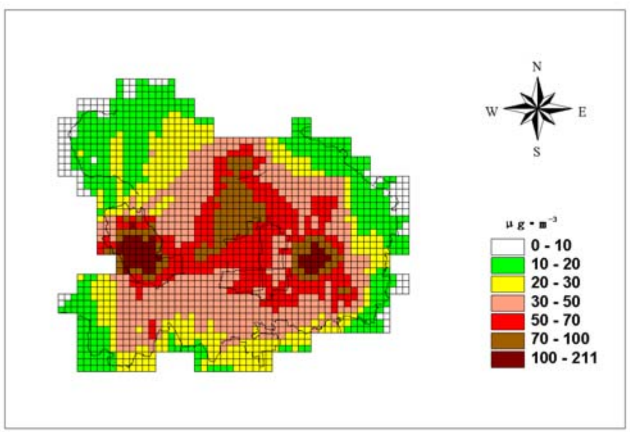
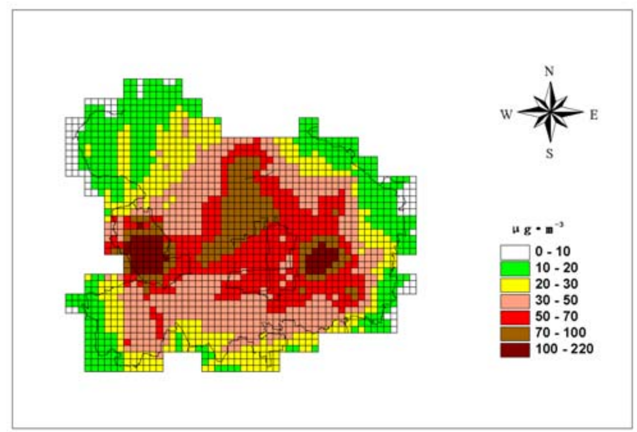


2010



2020



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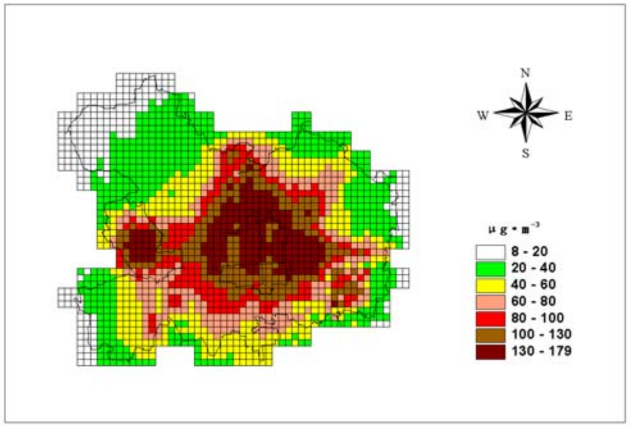
Concentration Distribution of NOx, 2000-2030



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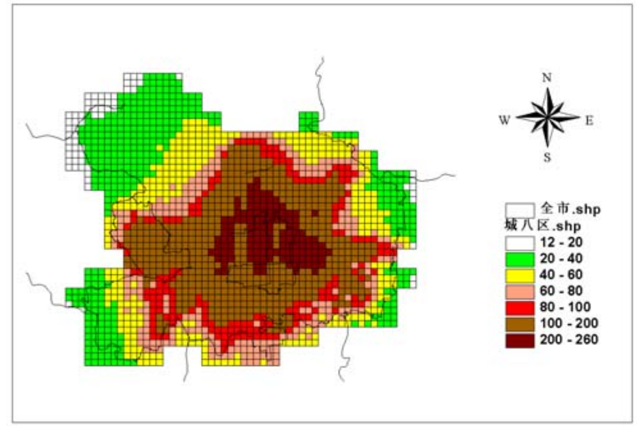

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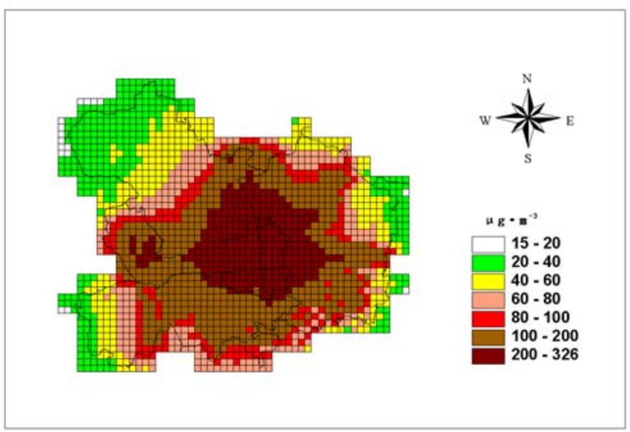

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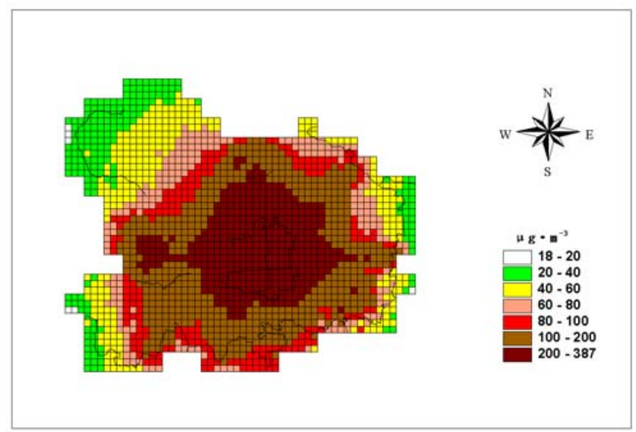

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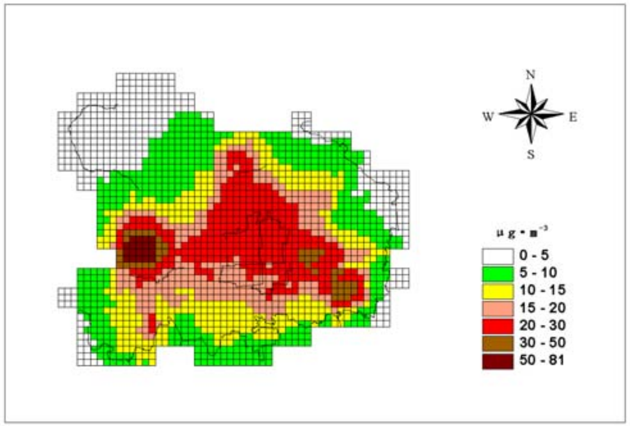
Concentration Distribution of PM10, 2000-2030 (Energy Related)



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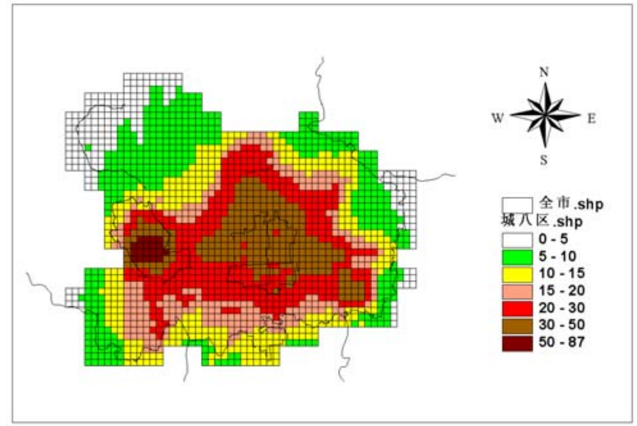

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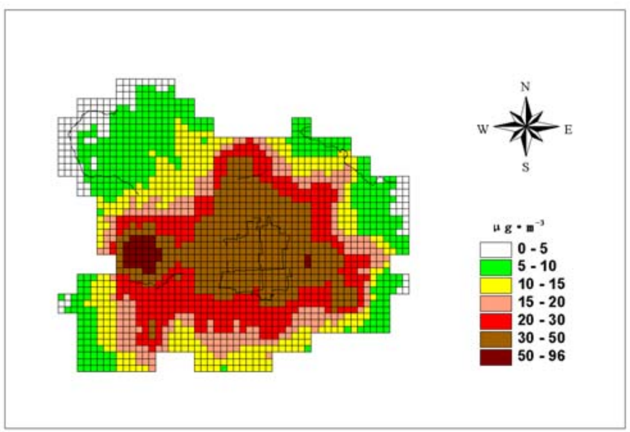

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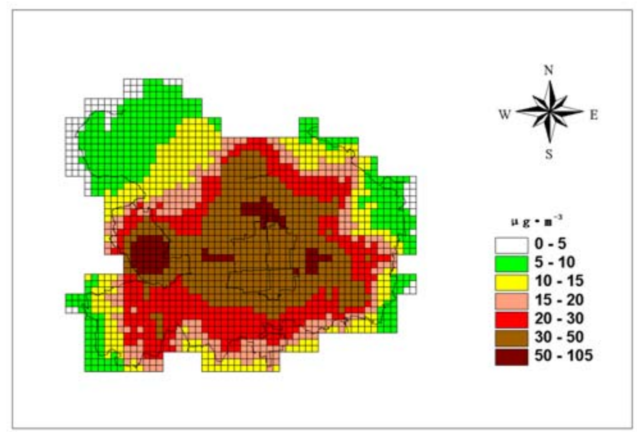

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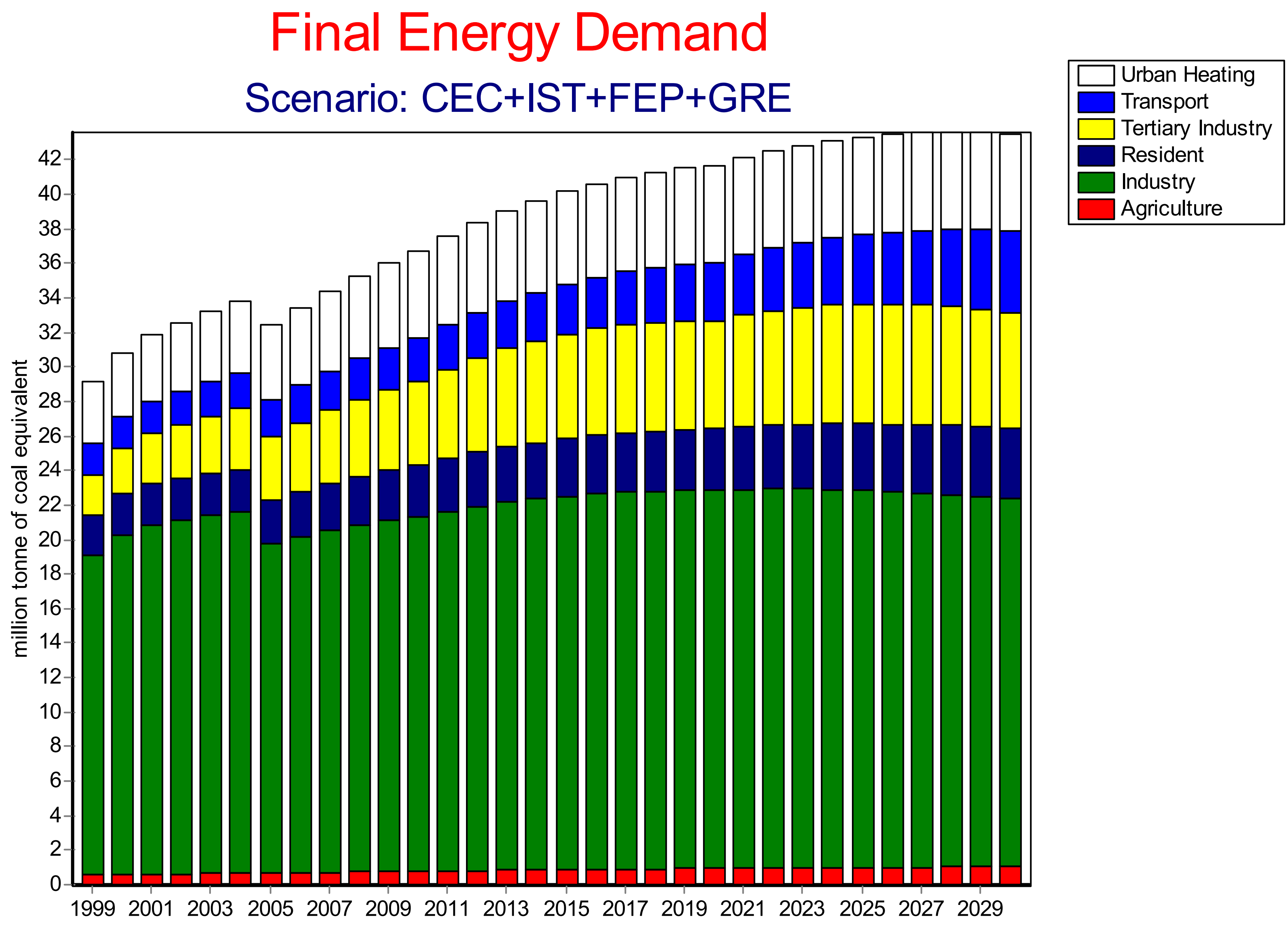
CEC+IST+FEP+GRE


Final Energy Demand
Scenario: CEC+IST+FEP+GRE
Urban Heating
Transport
Tertiary Industry
Resident
Industry
Agriculture
million tonne of coal equivalent
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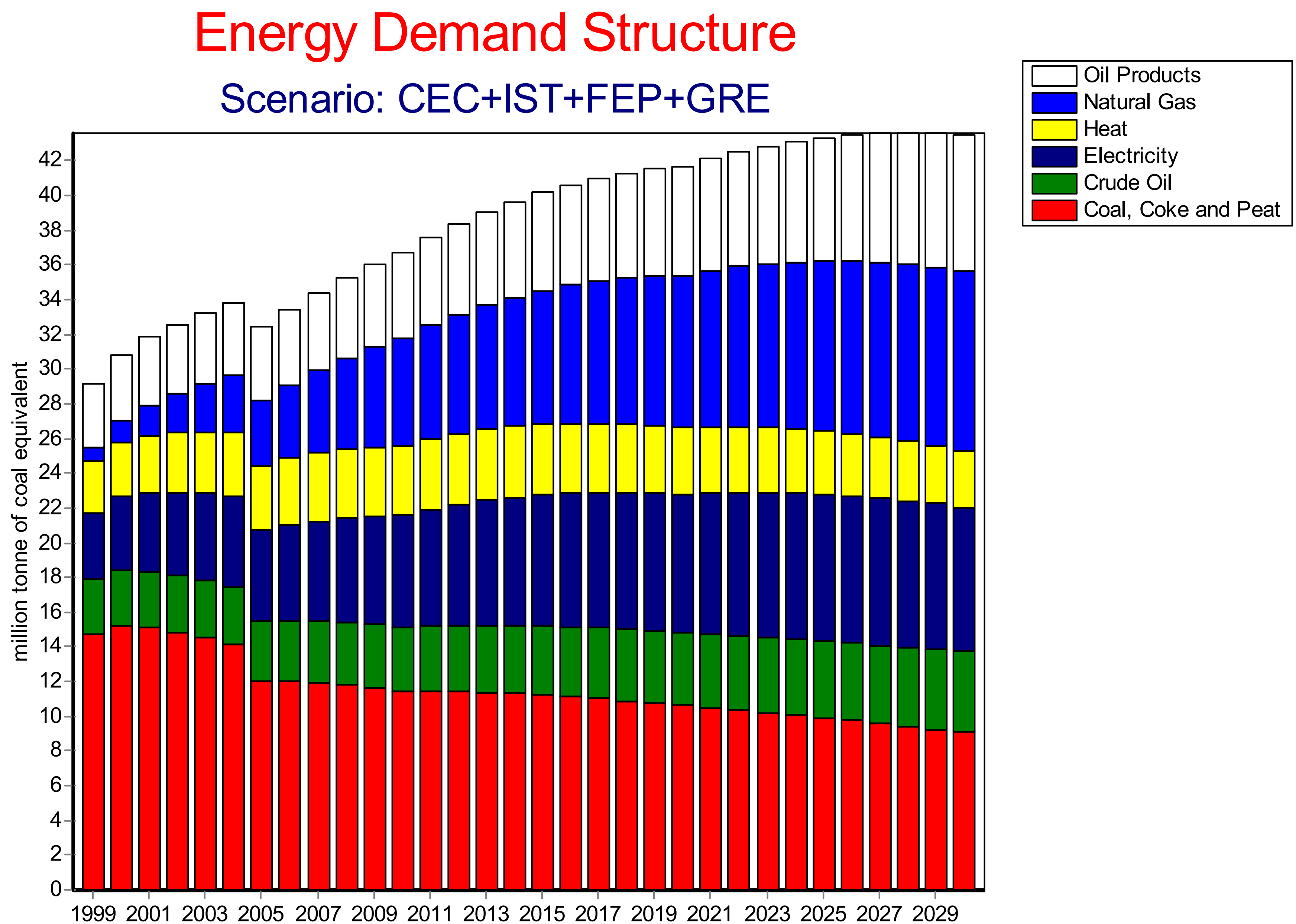

Energy Demand Structure
Scenario: CEC+IST+FEP+GRE
Oil Products
Natural Gas
Heat
Electricity
Crude Oil
Coal, Coke and Peat
million tonne of coal equivalent
0
2
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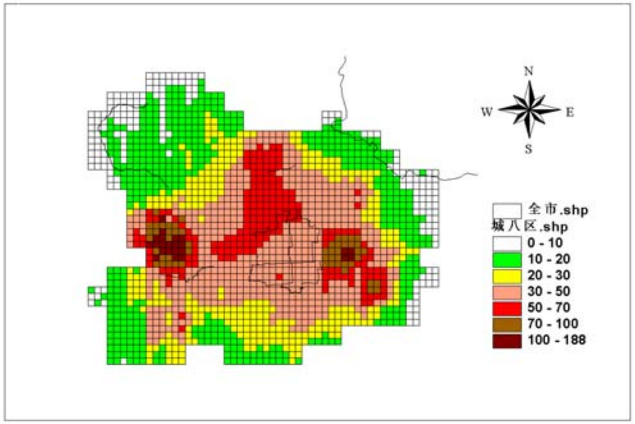
Concentration Distribution of SO_2, 2000-2030



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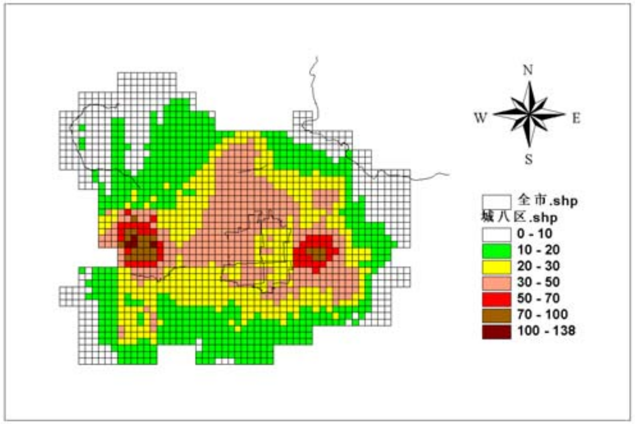

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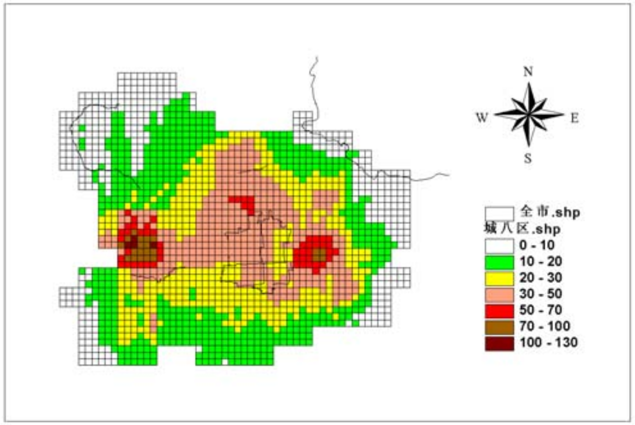

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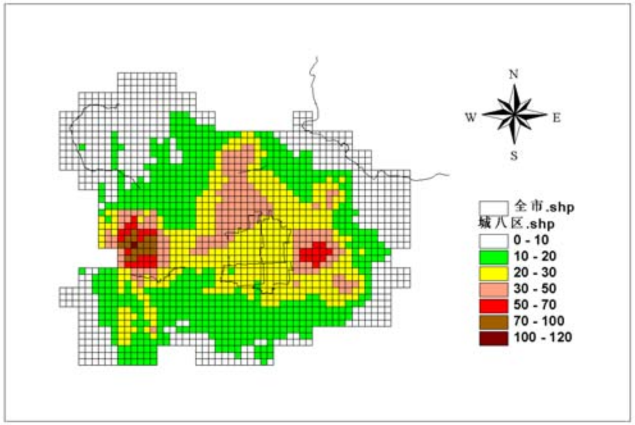

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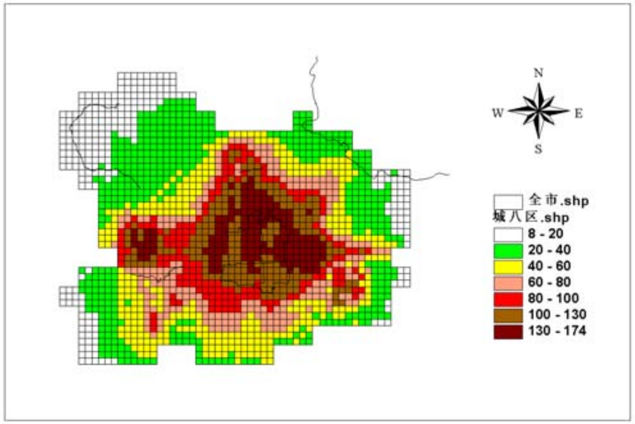
Concentration Distribution of NOx, 2000-2030



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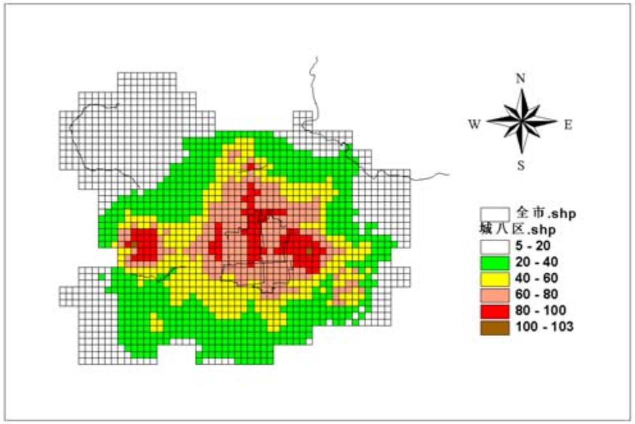

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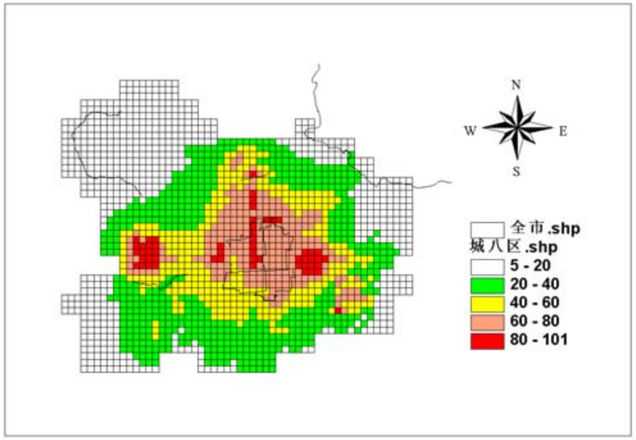

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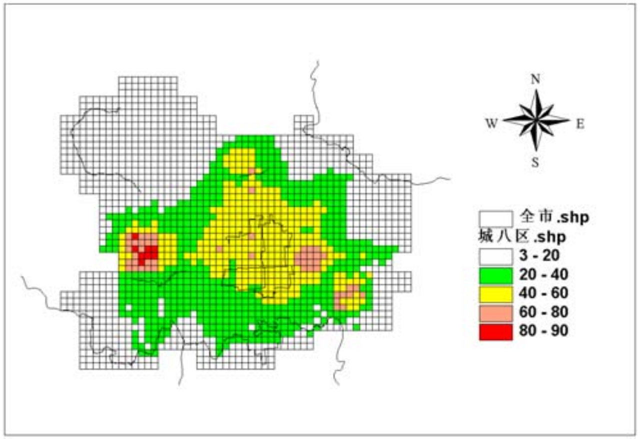

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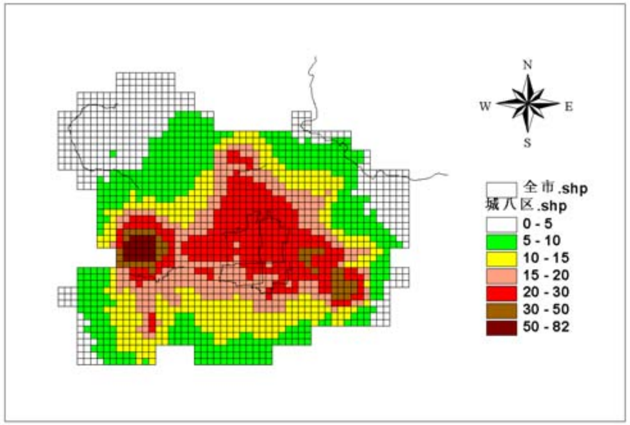
Concentration Distribution of PM10, 2000-2030 (Energy Related)



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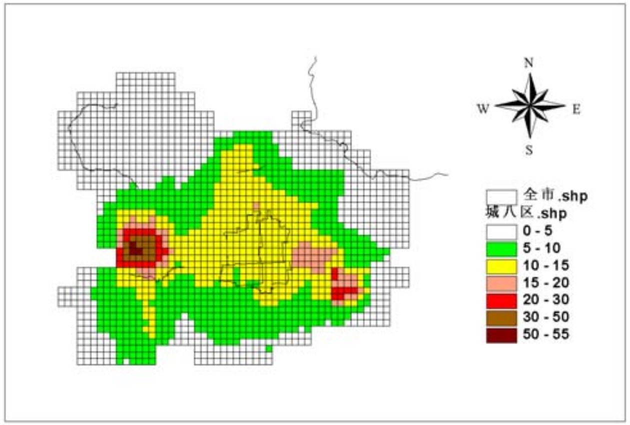

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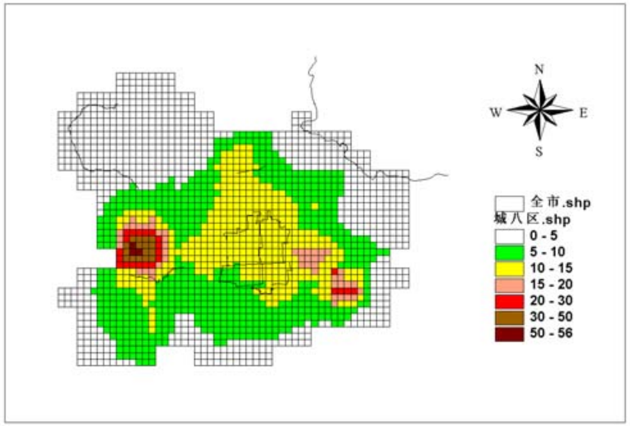

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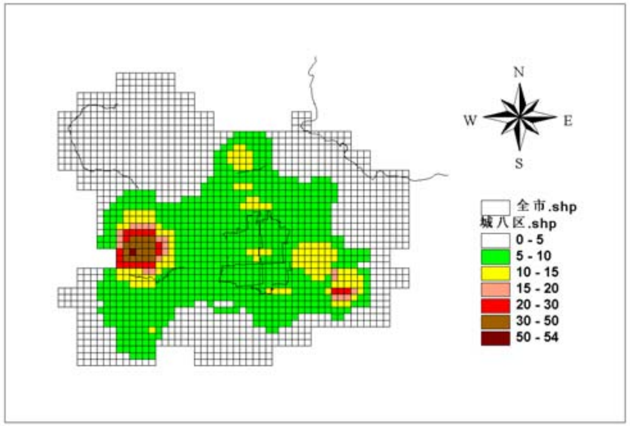

2030

Conclusions

Conclusions

- **Develop a set of Leap & ISC based methodology to calculate the environmental benefit under different energy options**
- **Design 4 types of scenarios according to different energy policies**

Conclusions

- SO_2 concentration could meet air quality standard after 2010 through CEC+IST policies
- NOx concentration could meet air quality standard after 2010 through CEC+IST+FEP+GRE policies
- To reduce PM10 concentration, energy policies, dust control and regional impact should be combined

Future Work

- Calculate GHG emissions
- Calculate health impacts of various energy policies
- Evaluate the cost-benefit
- National level work

Thanks!