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Analyses of Technical Options for Mitigating Environmental Emissions from the Urban Transport System : A Case of Beijing

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Objectives of the project

1. to analyze the demand for urban transport services and associated energy demand and environmental emissions;
2. to analyze and select the technical options for energy efficiency improvement and mitigation of GHGs and other harmful emissions from the urban transport system; and
3. to identify and rank the barriers to the introduction of selected technical options to mitigate environmental emissions from the urban transport system.

Models used in the project

1. Long-range Energy Alternatives Planning System (LEAP)
2. Least-cost optimization Model
3. Analytical Hierarchical Process (AHP)

Methodological structure of LEAP

Energy Demand Scenario

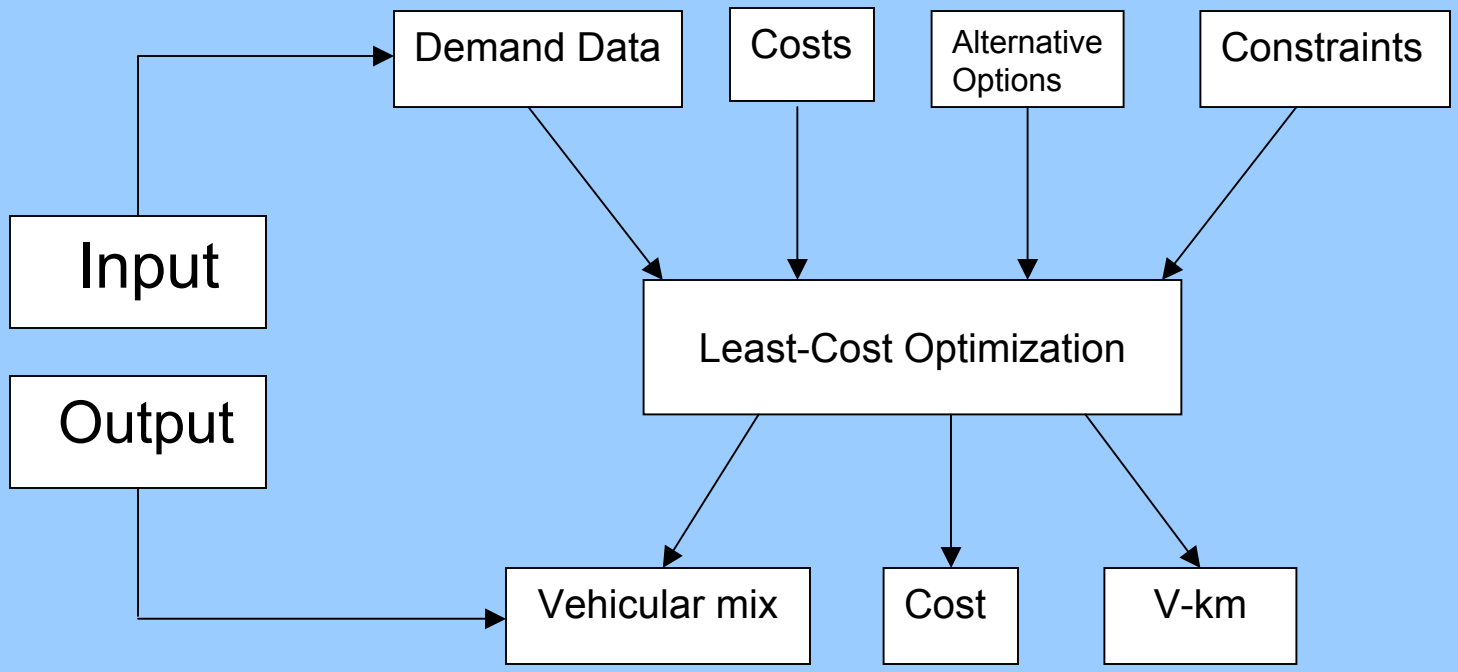
Branch Data

Sector	Sub-sector	End-use	Device	Energy Intensity		Energy Demand
Travel demand of Beijing (pkm)	Public Personal (%)	Modal split (%)	Vehicle space per passenger (veh./p)	Fuel efficiency of vehicles (GJ/km)	→	Output of energy demand (GJ)

Environmental Database — link

Sector	Sub-sector	End-use	Device	Emission factor		Emission
Travel demand	Public Personal	Modal split	Vehicle space	Emission factors of various pollutants (kg/MJ)	→	Output of Environmental emission(ton)

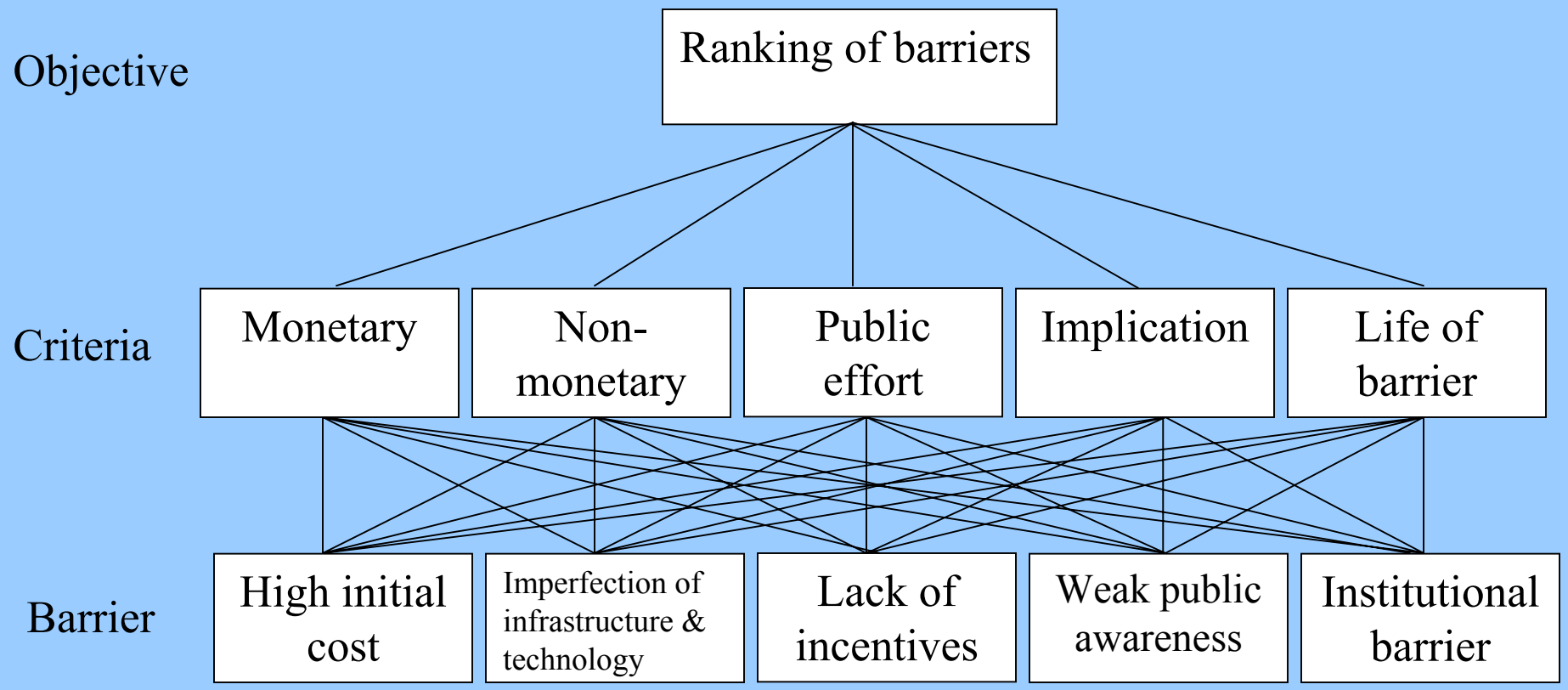
Least Optimization Model for Urban Transport System



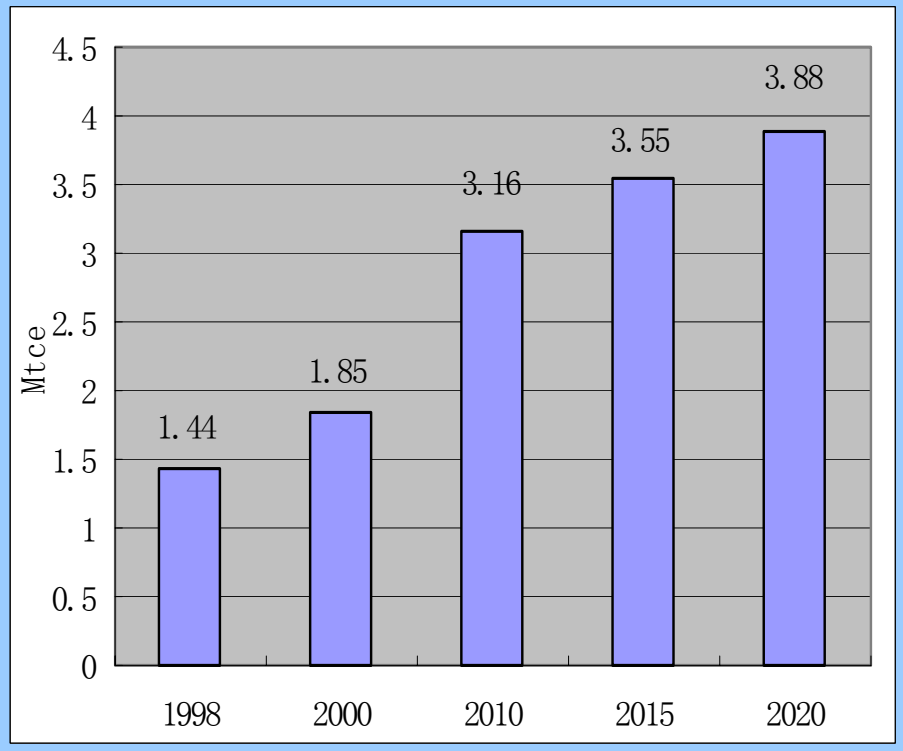
Least Optimization Model for Urban Transport System (cont.)

- Alternative Options:
  - Dual fueled cars and buses (LPG/gasoline)
  - Compressed Natural Gas (CNG) buses
  - Car-diesel (efficient car as in developed countries)
  - Electricity/Battery operated cars
  - Hybird electric cars
  - Rail-based Mass Rapid Transport System (MRTS)
- Constrains:
  - Travel demand constrain
  - Vehicle capability constrain
  - Vehicle stock
  - Resource Constrains
  - Emission Constrains: CO_2 emission

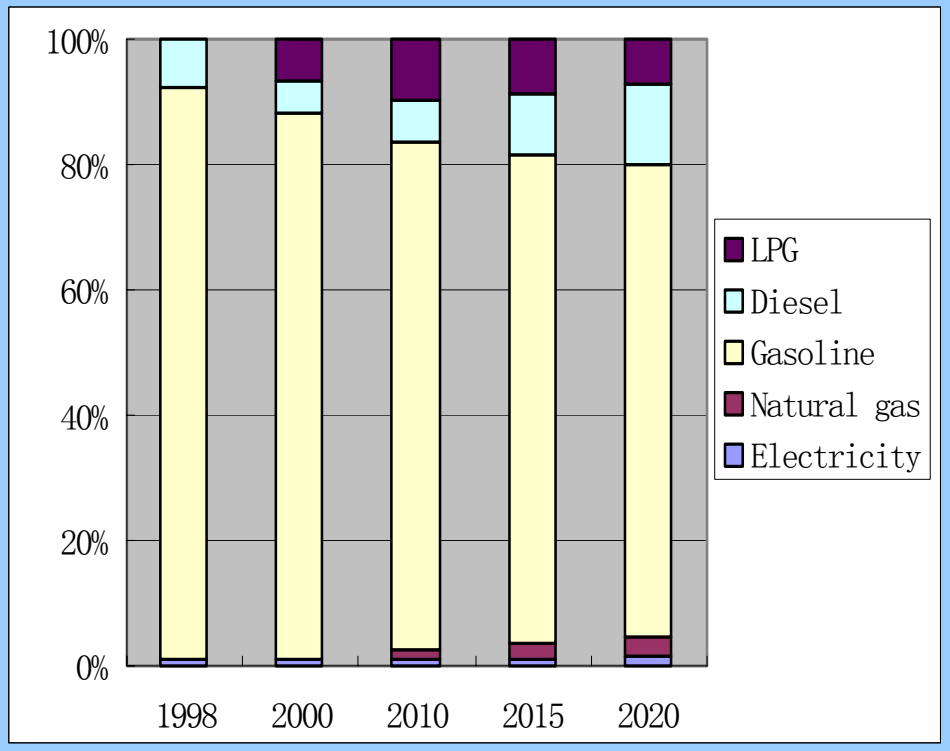
Analytical Hierarchical Process (AHP)



Output --- Energy Demand and energy mix of BJ urban transport system

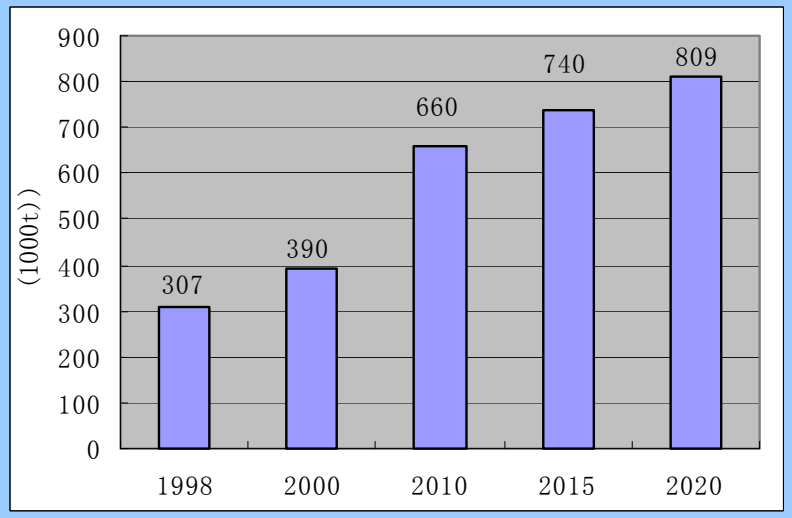


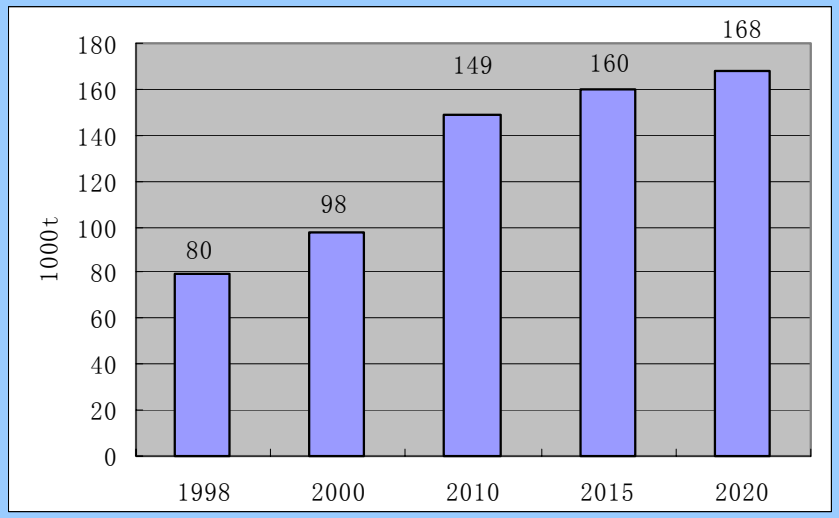
Energy demand

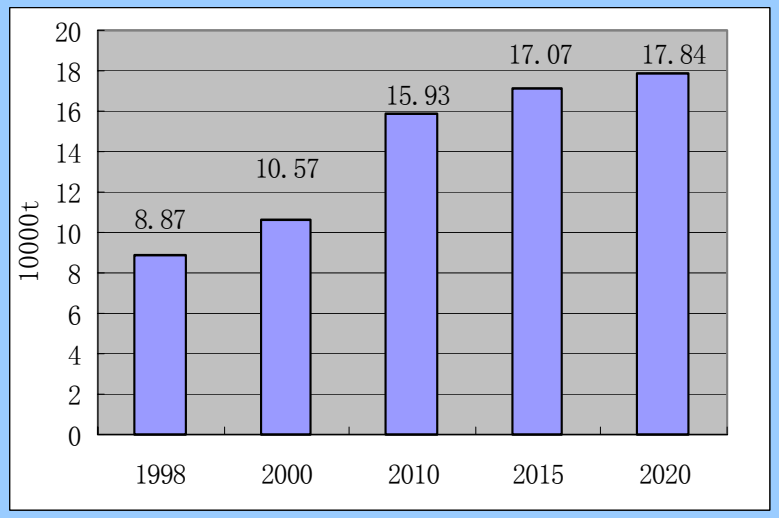


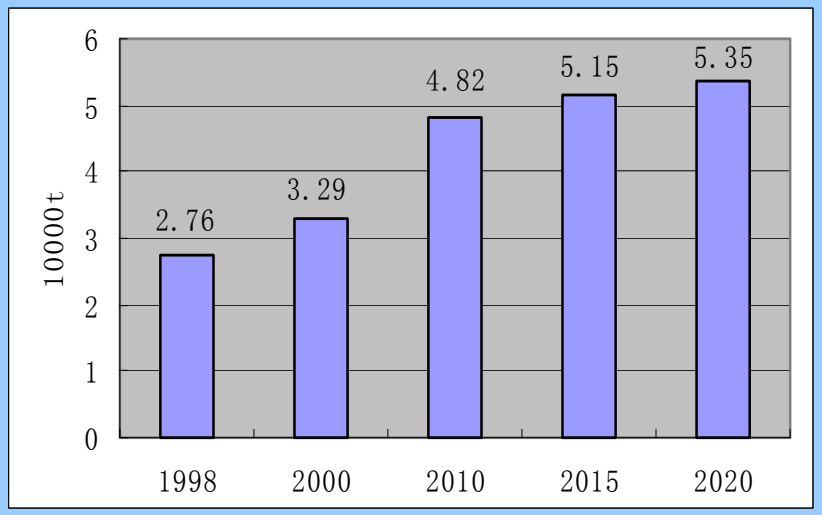
Energy Mix

Output --- Environmental emission (CO2,CO,HC,NOx)









Output ---Least cost vehicle mix model

- Baseline: Vehicular Mix without CO_2 Emission Reduction Targets
- Scenario 1: 10% reduction of CO_2 emission by all types of vehicles during the planning horizon (2001-2020), compared with baseline;
- Scenario 2: 20% reduction of CO_2 emission;
- Scenario 3: 30% reduction of CO_2 emission;
- Scenario 4: 40% reduction of CO_2 emission.