Contribution to the Asian Modeling Exercise

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What is the AME?

- Asian Modeling Exercise
- Model comparison project
- Final goals
  - Asian scenarios toward low carbon society
    - Policy options and their costs in Asia
  - Input outcomes to AR5
- The first round
  - Workshop in Beijing, 23-25 March
  - Goals
    - Understanding base year data
    - Understanding baselines
    - Understanding the impact of policies

Participants

1. Regional models

	ORGANIZATION	COUNTRY
1	Asian Institute of Technology	Thailand
2	AJOU University	Korea
3	CGIAR	Indonesia
4	Energy Research Institute	China
5	IIM	India
6	Korea Energy Institute	Korea
7	National Institute of Technology	India
8	NIES	Japan
9	Princeton University	USA
10	Tokyo University of Science	Japan
11	Tsinghua University	China
12	University of the Philippines	Philippines
13	University Technology Malaysia	Malaysia

We join the global model subgroup using AIM/CGE [Global].

2. Global models

	ORGANIZATION	COUNTRY
1	ABARE	Australia
2	EPRI	USA
3	European Commission (GEM-E3)	EU
4	European Commission (POLES)	EU
5	FEEM	Italy
6	IIASA	Austria
7	IAE	Japan
8	KANLO	Canada
9	MIT	USA
10	NCAR	USA
11	NIES	Japan
12	PBL	Netherlands
13	PIK	Germany
14	PNNL (GCAM)	USA
15	PNNL (SGM)	USA
16	RITE	Japan
17	Tokyo University of Science	Japan
18	VTT	Finland
19	World Bank	USA

AIM/CGE [global]

- A global dynamic CGE model
  - 9 Asian regions
    - China, Indonesia, India, Japan, Korea, Thailand, East Asia, South East Asia, South Asia
  - Other 15 regions
- GTAP 6 Database
- Energy
  - Coal, oil, gas, oil products, electricity, biomass
  - Electric power
    - Fossil fuels, biomass, nuclear, renewable…
    - CCS
- Abatement of GHG emissions
  - The incentive of GHG abatement is only the emission cost.
    - GHG emissions as input goods
    - The cost of GHG emissions reduce demand for emissions.
  - Exogenous GHG price (tax) & endogenous emissions
  - Exogenous emissions (emission constraint) & endogenous GHG price

AIM/CGE [global]

- Recursive dynamic model
  - 2001-2100
  - Capital accumulation
    - The level of investment is determined so that the economy can produce exogenous GDP growth path. (*The Acceleration Principle*)
    - Putty clay approach
      - Existing capital stocks are immobile between sectors.
      - The level of capital stock in each sector is adjusted only by new investment.
  - Labor (population)
    - The labor endowment is also given. (The UN population prospects)
  - Technological progress
    - Exogenous
    - Endogenous for capital newly installed

Energy efficiency improvement (EEI)

- The EEI is one of the important factors which have a large impacts on emissions and abatement costs.
- Technological progress in energy input

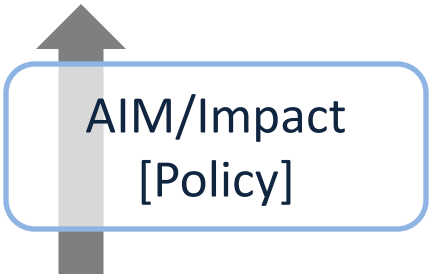
$$Output_{i,t} = F\left(Labor_{i,t}, Capital_{i,t}, Materials_{i,t}, eei_{i,t} \cdot Energy_{i,t}\right)$$

- 2001-2020
  - AIM/Enduse [global]
- 2030-2100
  - Developed countries: 0.3%/year
  - Transition economies: 1%/year
  - Developing countries: 1%/year

Simulation scenarios

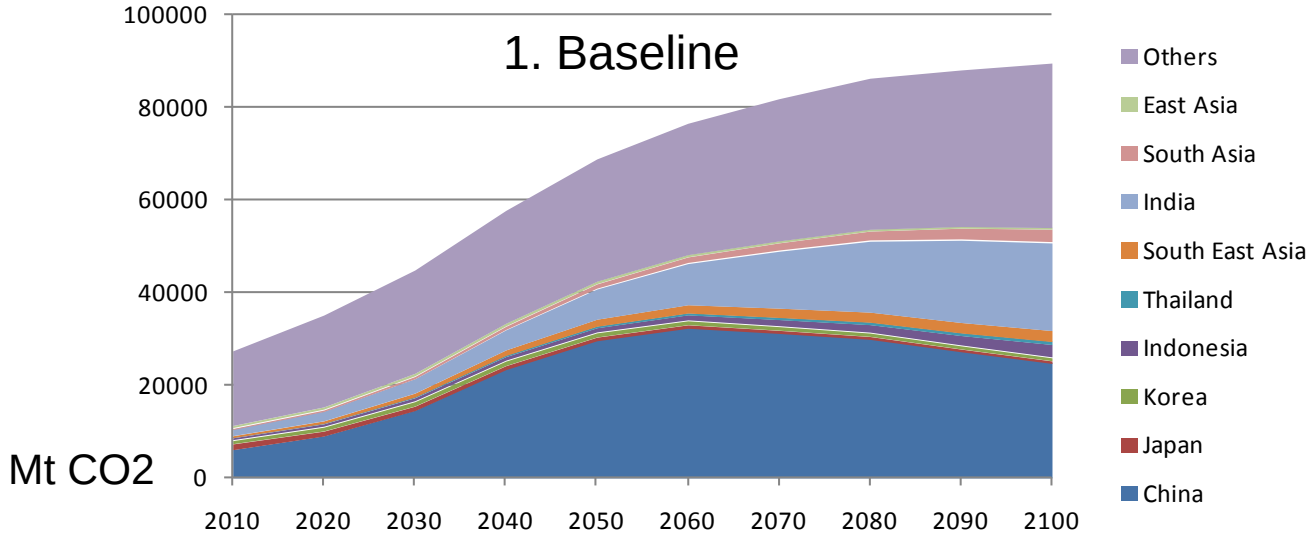
	1. Baseline	2. Price path	3. Concentration target (550 CO_2-e)
2000	No policy	No policy	No policy
2010	Kyoto target	Kyoto target	Kyoto target
2020-2100	No policy	GHG tax (Exogenous GHG price)	Emission constraint* (Endogenous GHG price)

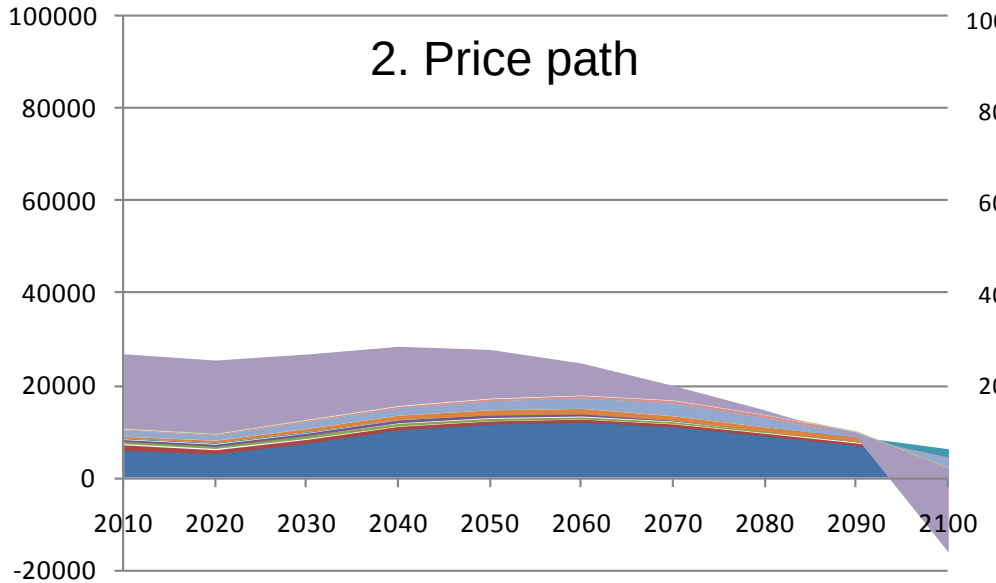
The price path begins at 30$/t-$CO_2$ in 2020.
5% per year increase for 2030-2050,
3% per year increase for 2060-2100.

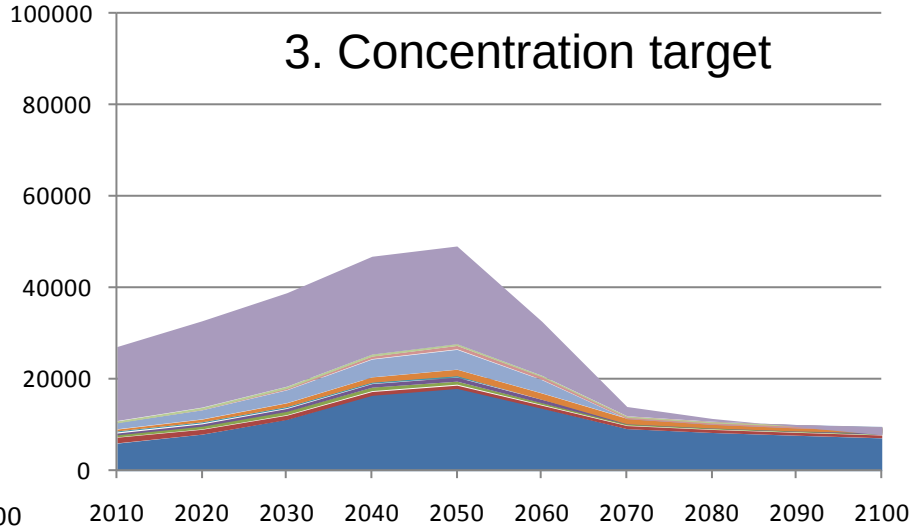


The AIM/CGE [global] considers only GHG emissions as a flow. We use the emission path which satisfies the constraint of 550 CO_2-e concentration calculated by AIM/Impact [Policy].

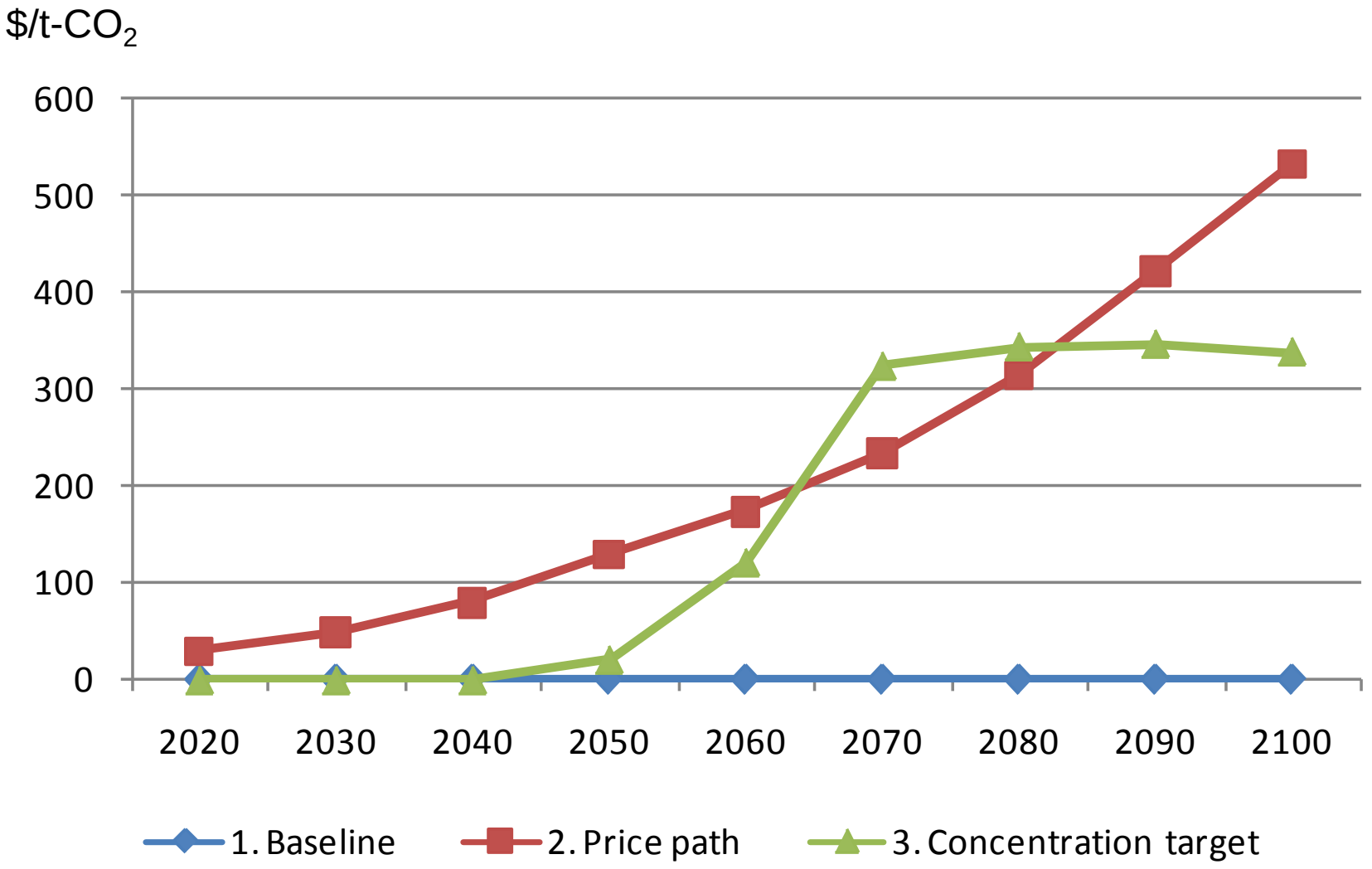
CO_2 emissions



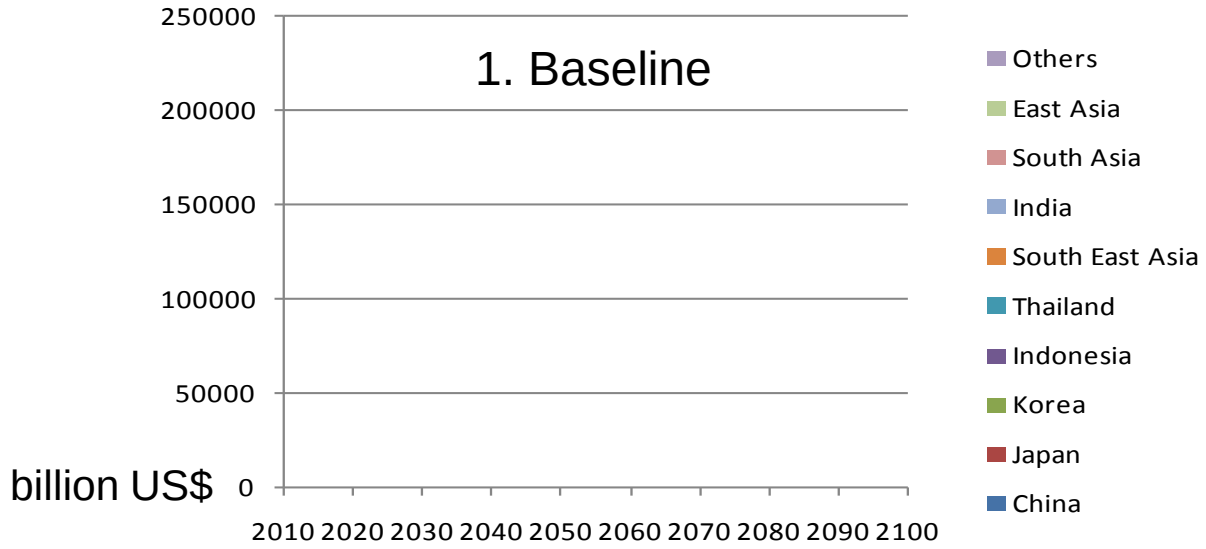


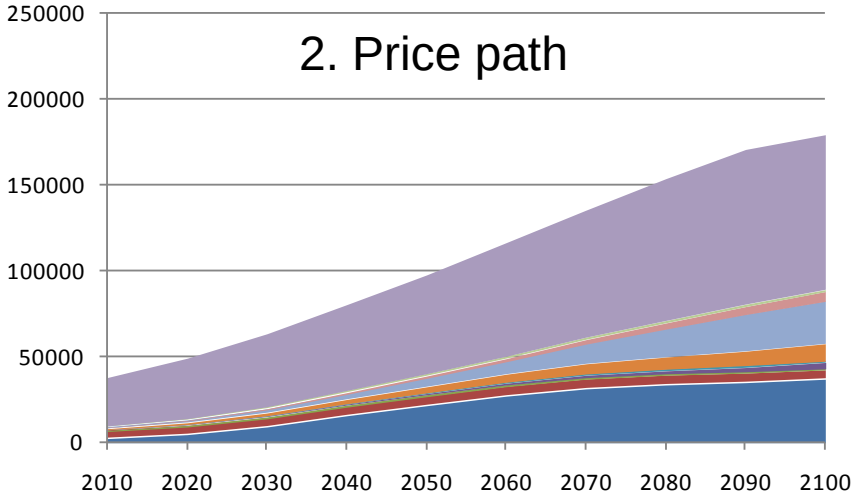


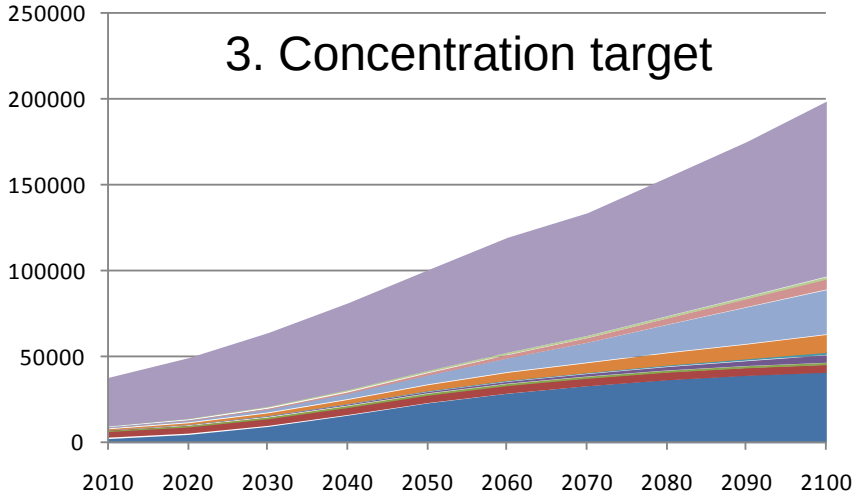
CO_2 abatement cost



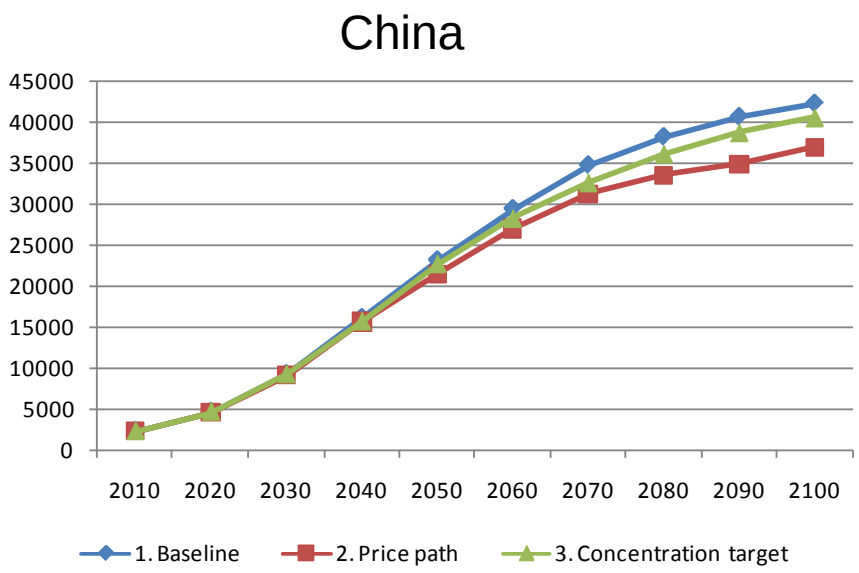
GDP growth

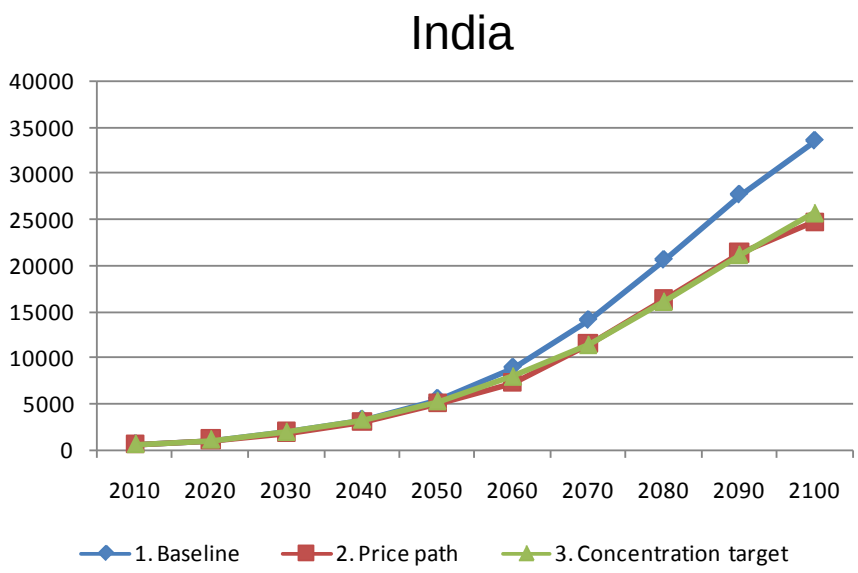

1. Baseline
billion US$
250000
200000
150000
100000
50000
0
2010 2020 2030 2040 2050 2060 2070 2080 2090 2100
Others
East Asia
South Asia
India
South East Asia
Thailand
Indonesia
Korea
Japan
China


2. Price path
250000
200000
150000
100000
50000
0
2010 2020 2030 2040 2050 2060 2070 2080 2090 2100

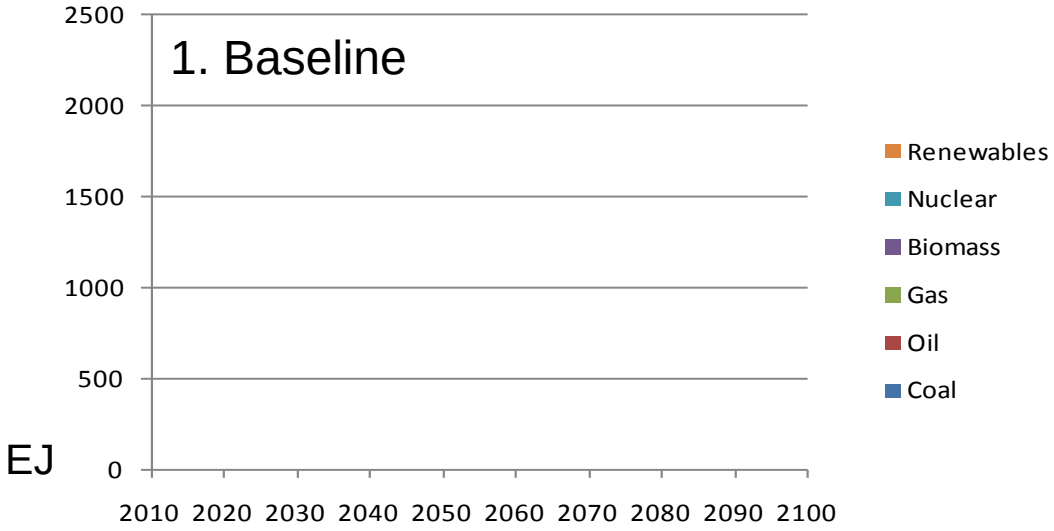

3. Concentration target
250000
200000
150000
100000
50000
0
2010 2020 2030 2040 2050 2060 2070 2080 2090 2100

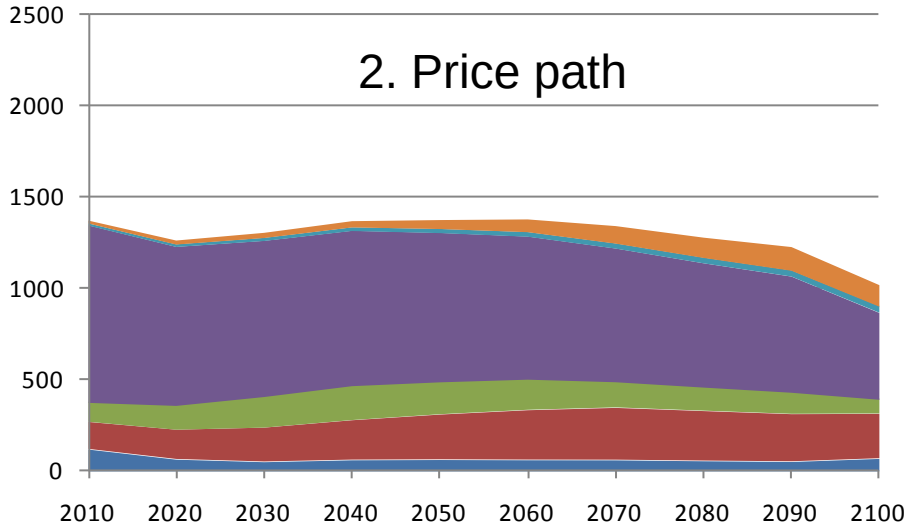
GDP growth (China and India)

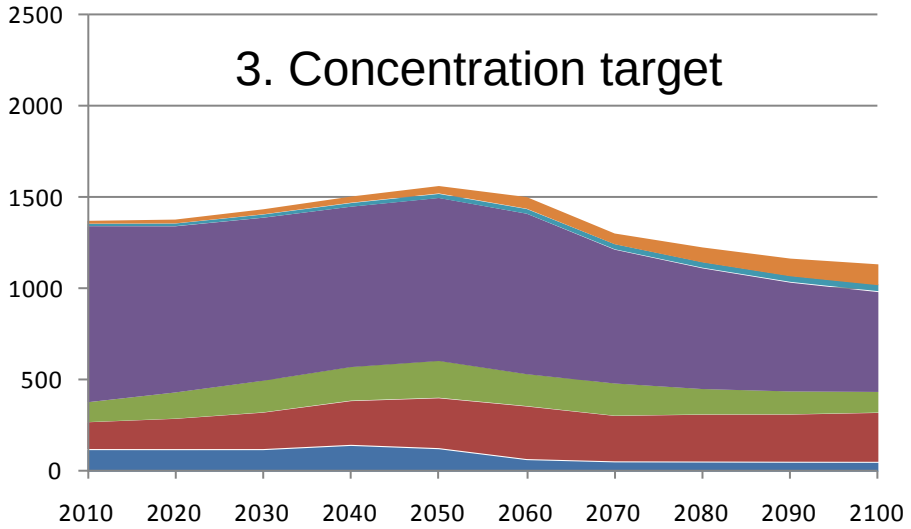




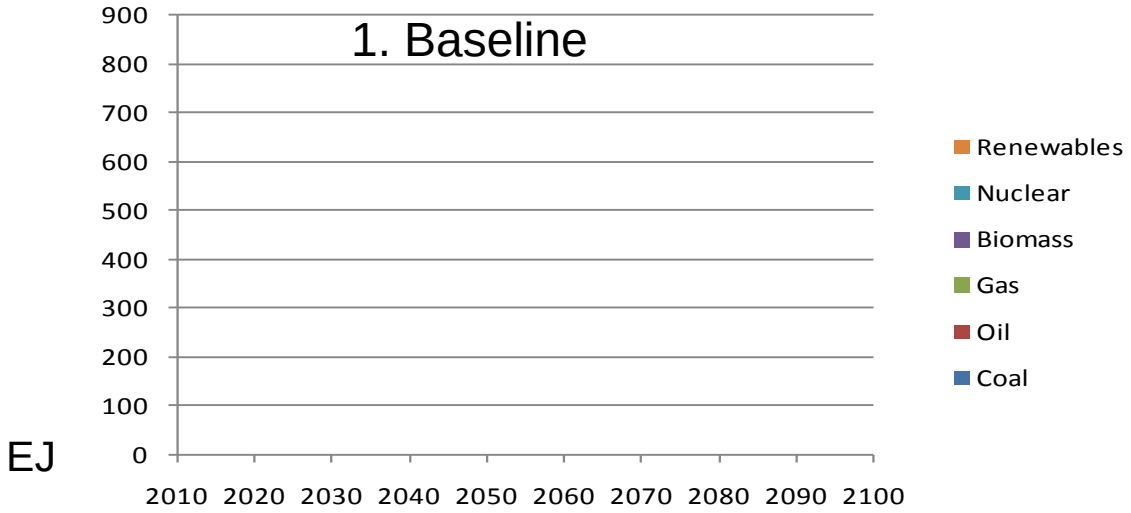
Primary energy (World)

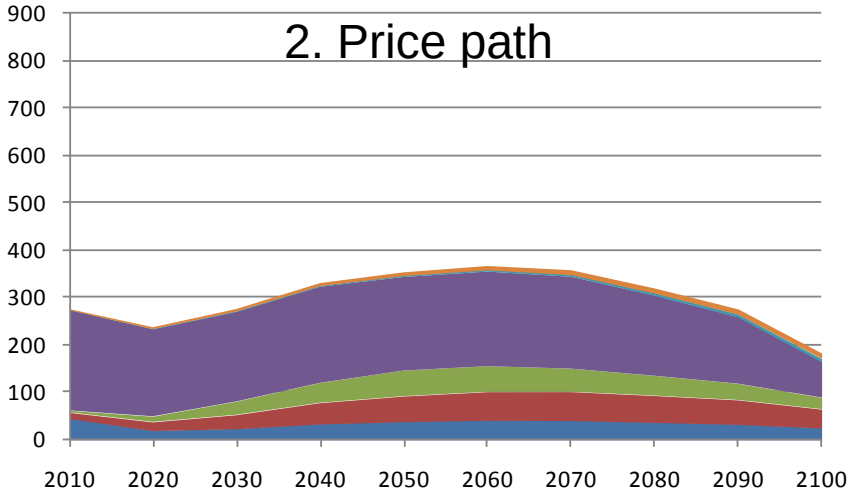


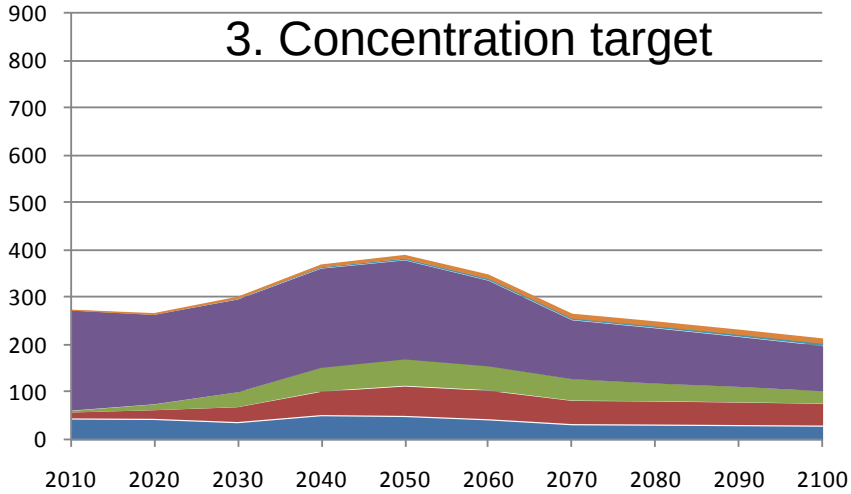




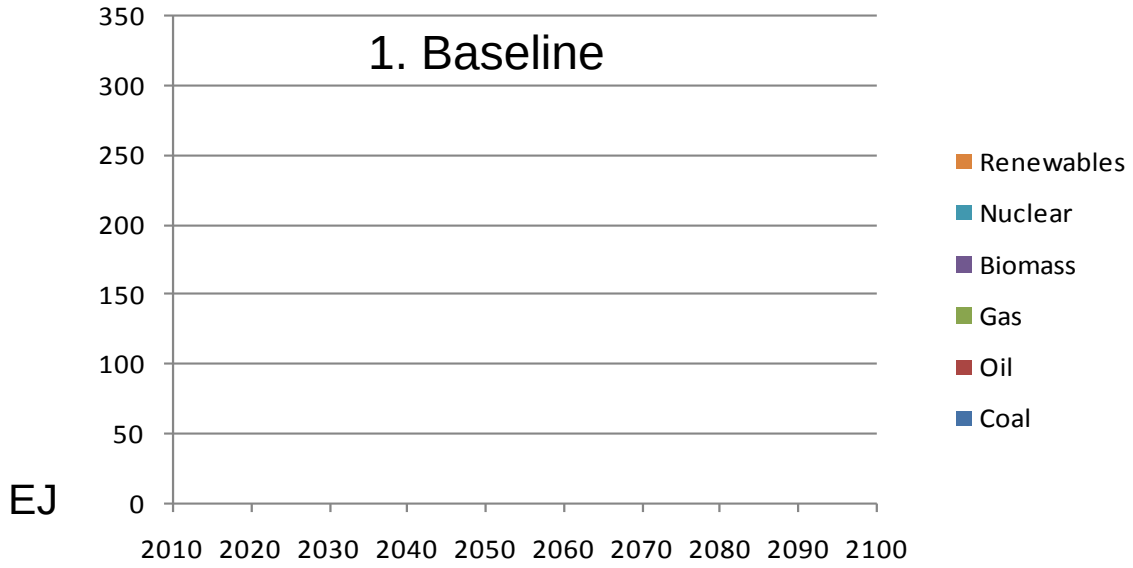
Primary energy (China)

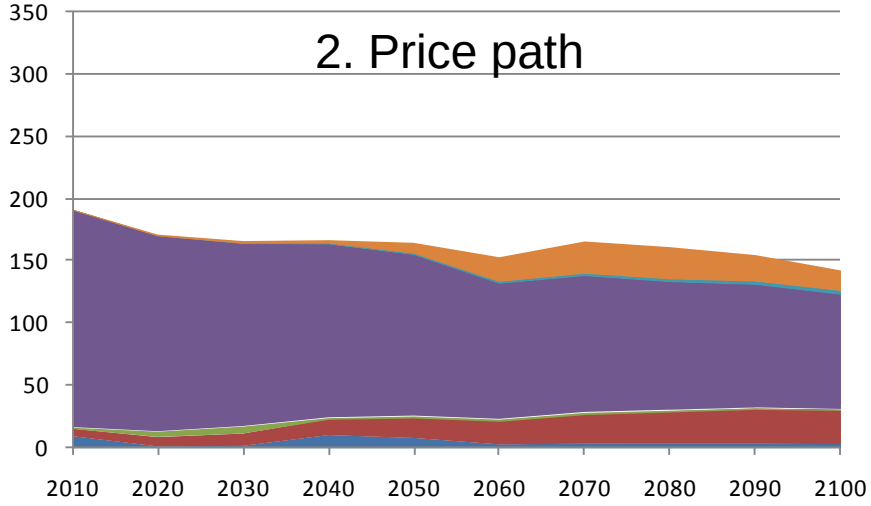


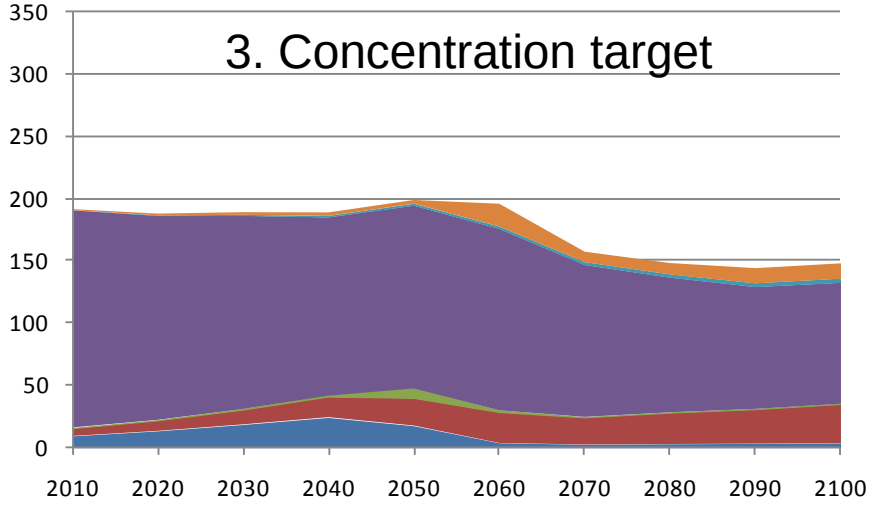




Primary energy (India)







Summary

- Preliminary result
- Need Information on policy plan of Asian countries
  - Energy policy
    - Renewable, nuclear