### ENV-Linkages (OECD, Korea Environment Institute)

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# **Key Design Characteristics**

- Participating Model: ENV-Linkages
- Model Type: CGE
- Participating Modelers for KEI version: Yong Gun KIM, Jong Soo LIM, Dae Chul Chang, Ki Bok Chang, SuDuk Kim
- Time Step: One year
- Time Frame: 2000 2050
- Solution Type: Dynamic Recursive
- Equilibrium Type: Market Equilibrium
- Underlying Computing Framework: GAMS

## Inputs and Outputs

#### Key inputs

- Demographics: population by region
- Economic: labor productivity, price and income elasticities
- Resources: Forestry, Fishery, Fossil Fuel, Mineral
- Technology: Nested CES

#### Key outputs

- Economic: GDP, consumption, production, price by region and by sector
- Energy: Production, Consumption, Trade
- Agriculture: Production, Consumption, Trade, Land use
- Emissions: CO2 emission by region and by sector
- Climate: under development

## Regional Scope & Other Detail

- Regional Details:
  - Regional Scope: Global
  - Number of Sub-Regions: Aggregation flexible up to 113 regions according to GTAP 7
  - Asian Regions: Korea, China, Japan, etc. (24 regions)
- Other Details:
  - Energy Demand Sectors: Aggregation flexible up to 57 sectors according to GTAP 7
  - Energy Supply Sectors: Coal, Oil, Gas, Electricity, Gas manufacturing and distribution, petroleum and coal product

### **Asian Baselines**

#### • Baselines for regions except Korea:

- OECD (ECO & ENV directorate)'s projections on GDP, labor productivity, population, participation rate, sectoral productivity
- Energy and Emission Baselines from IEA and US EIA

#### • Baselines for Korea :

- GDP, Labor productivity, Participation rate: Korea Development Institute (KDI)
- Energy and CO2 emission: Korea Energy Economics Institute (KEEI)
- Population: Korea Statistics Office

### **Previous Works**

#### OECD Environmental Outlook 2030 (2008)

- Economic impacts from carbon taxes
- Economic impacts from tariff reductions and agricultural subsidy removal
- Economic impacts of international GHG regulation and emissions trading (KEI, 2008)
  - Economic impacts from regional CO2 constraint (via carbon taxes), international emissions trading, differentiation of commitment
- Economic impacts of National GHG target scenarios (KEI, 2009)

### **Previous Work**

- Economic impacts of international GHG regulation and emissions trading (KEI, 2008)
  - Economic International emissions trading reduces real GDP losses in all regions
    - Promote transition to low-carbon energy sources
    - Domestic emissions trading (with free allocations) could increase global GDP and GDP increase in developing countries tend to be higher than in developed countries.
  - Mitigation commitment by OECD countries without non-OECD participation may harm OECD economies, particularly Korea.
  - Diversity of economic situations, such as potential impacts from mitigation policy, need to be understood to better coordinate international negotiations.
    - Russia and Middle East is particularly vulnerable to international CO2 regulation

### **Current Research Plan**

- Modeling Feedstock Energy Input
  - Modeling Coal use in Steel sector and Oil use in Refinery sector as non-substitutable intermediate inputs
  - Need international data on feedstock use compatible with emissions data provided by GTAP team
- Disaggregation of Household Energy Consumption
  - Construct energy consumption structure reflecting transportation (private vs public) and other energy consumptions such as heating/cooling, lighting
- Modeling of Induced Technological Change
- Analyzing Double Dividend
  - With estimating labor supply and saving elasticity