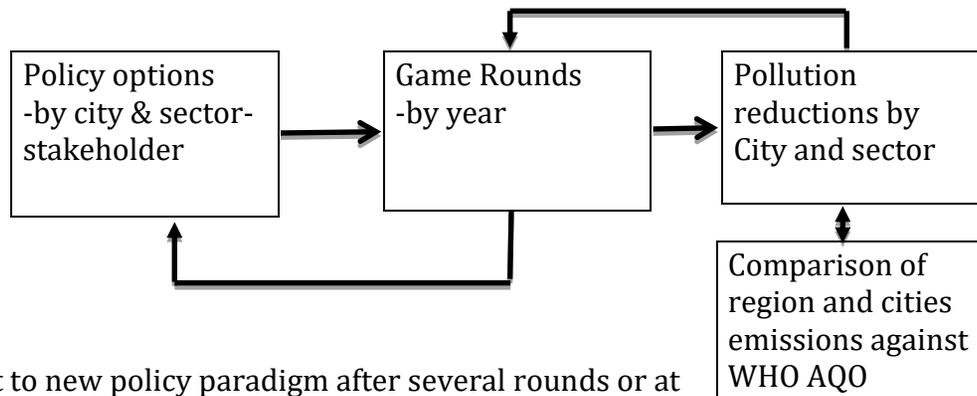


Gaming the Evolution of Cooperation on Regional Air Pollution Reduction

- Mutual monitoring of results
- Discussions among stakeholders



Create simple model(s) of influence on WHO AQOs if pollutant load is decreased?

- Shift to new policy paradigm after several rounds or at volition
- Indicators: Results from individual vs common policies

Background: students or other players introduced to dynamics of regional air pollution, governance structure, economic bases,

Objective

Examine evolution of collective regional air pollutant source reduction behaviour through iterated game where players are keyed by transparent monitoring of other players' efforts. Players will determine if existing and introduced policies chosen can advance towards **WHO air quality objectives**. The evolution will be driven by increasing transparency of efforts among stakeholders (cities [i.e. policy makers] and sector stakeholders). Game play depends on stakeholders using policies and seeing outcomes from own actions and that of others—spurring or hindering next plays.

Premise is that as PRD GDP increases, there should be at least a proportional decrease in pollution, and that the burden of this reduction should be equitably shared among cities and sectors. Players must be familiarized with regional consequences of local emissions. The degree of familiarization can vary with game usage/purpose.

Game Play

Players take the role of stakeholders and play several rounds moving through different scenarios such as:

- 1) existing policies;
- 2) autonomous collective policies;
- 3) strengthened national and/or regional policies; with and without transparency of monitoring and reporting

Stakeholders/Players

- 1) Policy makers at national, provincial and city level.
- 2) Representatives from supply and demand sides of major emission sources: electricity generators, manufacturing (large and SME), marine, commercial and private road vehicles.

Indicators

Indicators required for both regional and local (city) levels so that players can see whether collective efforts are having an effect and if individual cities are taking appropriate measures or are freeriding.

Progress towards WHO's air quality objectives will be used as the primary indicator of regional and city advances. Stakeholders will also be able to see how their city and sector compare to efforts in other cities by use of a modified pressure-

state-response indicator framework. This framework is constructed around the main sources of emissions in the PRD. Efficiency indicators will be produced where appropriate, allowing for normalized comparison across cities.

1) Pressures:

- a. Driving forces: thermal electricity production; commercial and private vehicles, marine vehicles, manufacturing industry, others.
- b. Emission volumes: NOX, SO2, VOC, RSP and PM emission totals produced by driving forces

2) State:

- a. SO2, NOX, RSPs, PM, ozone load in atmosphere
- b. WHO AQO level
- c. Impact on cost to economy and society e.g. health costs and other mitigation costs.

3) Response:

- a. Policy options: crosscutting (e.g. emissions taxes) and sector (BAT, standards, etc.)
- b. Policy measures: investments, tax incomes, etc.

Baselines

1) Pressures:

- a. history of power generation, vehicle, etc. increase.
- b. conversion to emission volumes, incorporating impacts from regulatory measures (i.e. changing emission factors appropriately); sector and city emission factors can be checked against several studies.

2) State:

- a) SO2, NOX, RSPs, PM, ozone load history from PRD monitoring system data
- b) Conversion for comparison to WHO AQO guidelines
- c) Conversion to monetized social costs

3) Response:

- a) Policy measures taken
- b) Investments made, taxes paid and other data if available

Computing demands

- 1) Link: policy measures→pressure reductions→emission factors → state/AQOs; required for sectors, cities and region
- 2) Flexibility to introduce new policy measures and above linkages