

# Asia's Growing Emissions of Carbon Dioxide from Energy Use

Presentation by [Toufiq A. Siddiqi](#)  
East-West Center and GEE-21, Honolulu  
at the International Energy Workshop,  
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# Overview of Presentation

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- Asia's Increasing Emissions of CO<sub>2</sub> from Energy Use
- Equity Considerations
- Implications for a Post-Kyoto Agreement
- A Possible Way Forward

# Some Findings of the New IPCC Report

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- “Warming of the climate system is **unequivocal**, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice and rising global average sea level.”
- “Observational evidence from **all continents and most oceans** shows that many natural systems are being affected by regional climate changes, particularly temperature increases.”

# Why the Developing Countries Also Need to Act Soon

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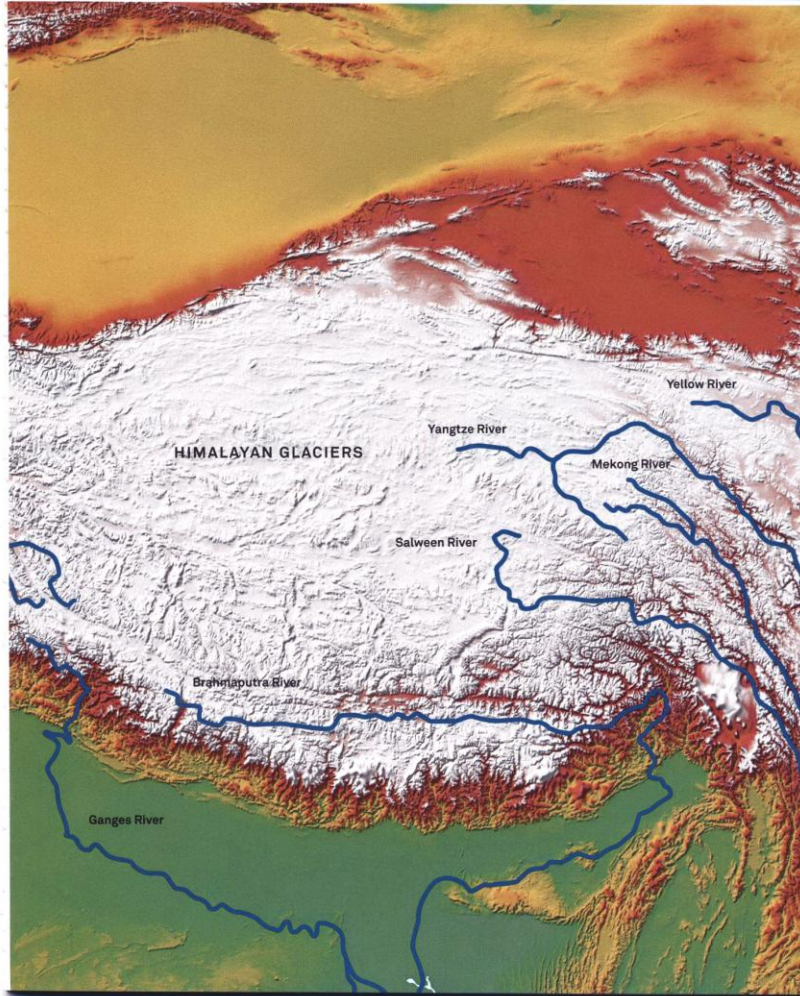
- Greenhouse gas emissions from each country affect all countries
- Four of the eight largest carbon dioxide emitting countries are in Asia
- More people will be adversely affected by climate change in the developing than in the developed countries
- Examples follow:

# Impacts of Climate Change for Asia include (I):

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- Decreased availability of freshwater, particularly in large river basins, is expected by the 2050s;
- Coastal areas, especially heavily populated mega-delta regions, will be at greatest risk due to increased flooding from the sea, and in some cases, from the rivers;
- Increased pressure on natural resources and the environment, in combination with rapid urbanization and industrialization.

# The Himalayan Glaciers are the source of many of Asia's largest rivers



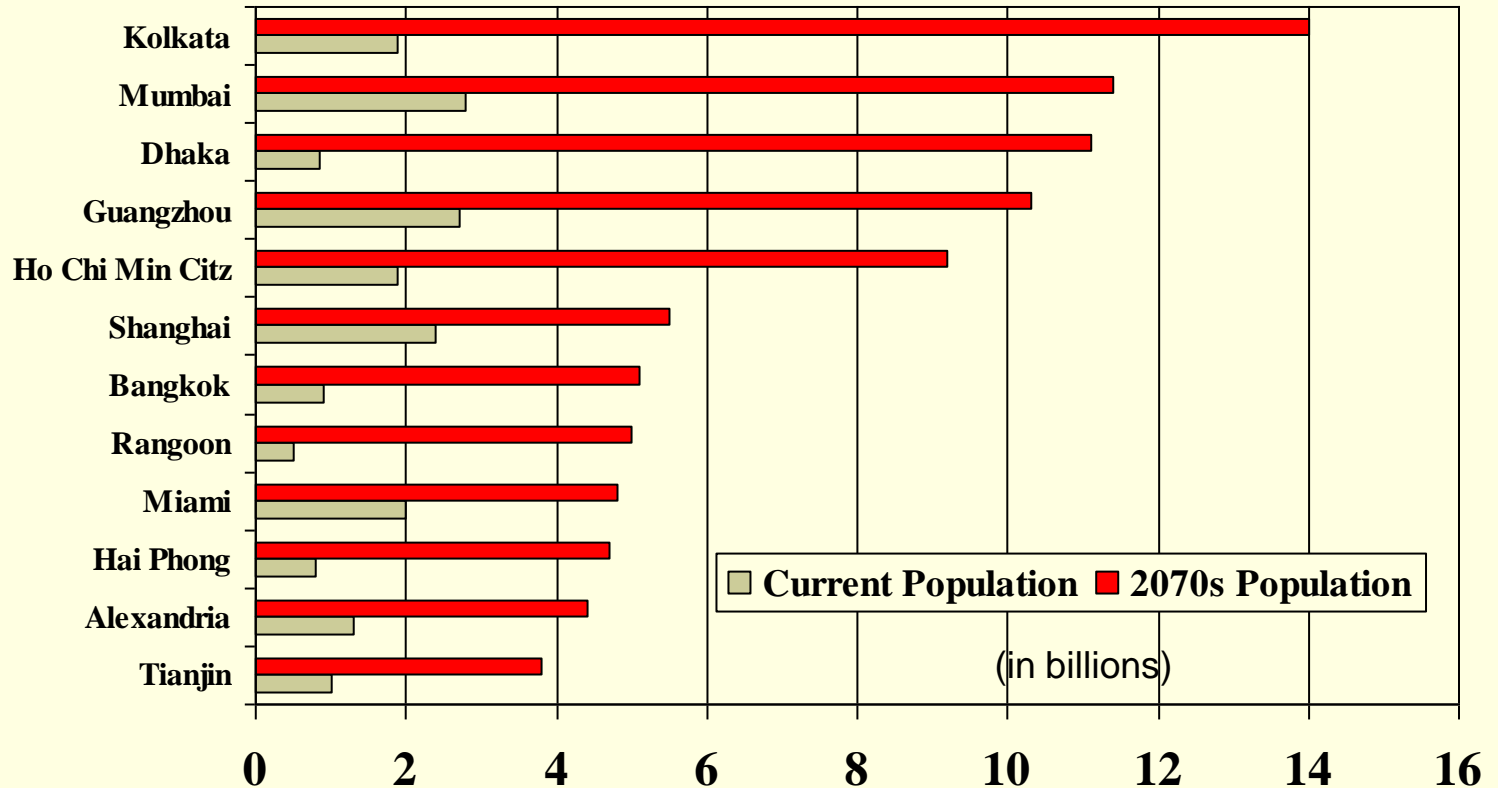
Source: An Inconvenient Truth (2006)

# Likely Impacts of Coastal Flooding on Asian Cities

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- The eight largest cities with populations likely to be exposed to coastal flooding by 2070 will be in Asia (shown in next chart)
- Ten of the 12 largest cities with economic assets likely to be exposed to coastal flooding by 2070 will be in Asia (shown in following chart)

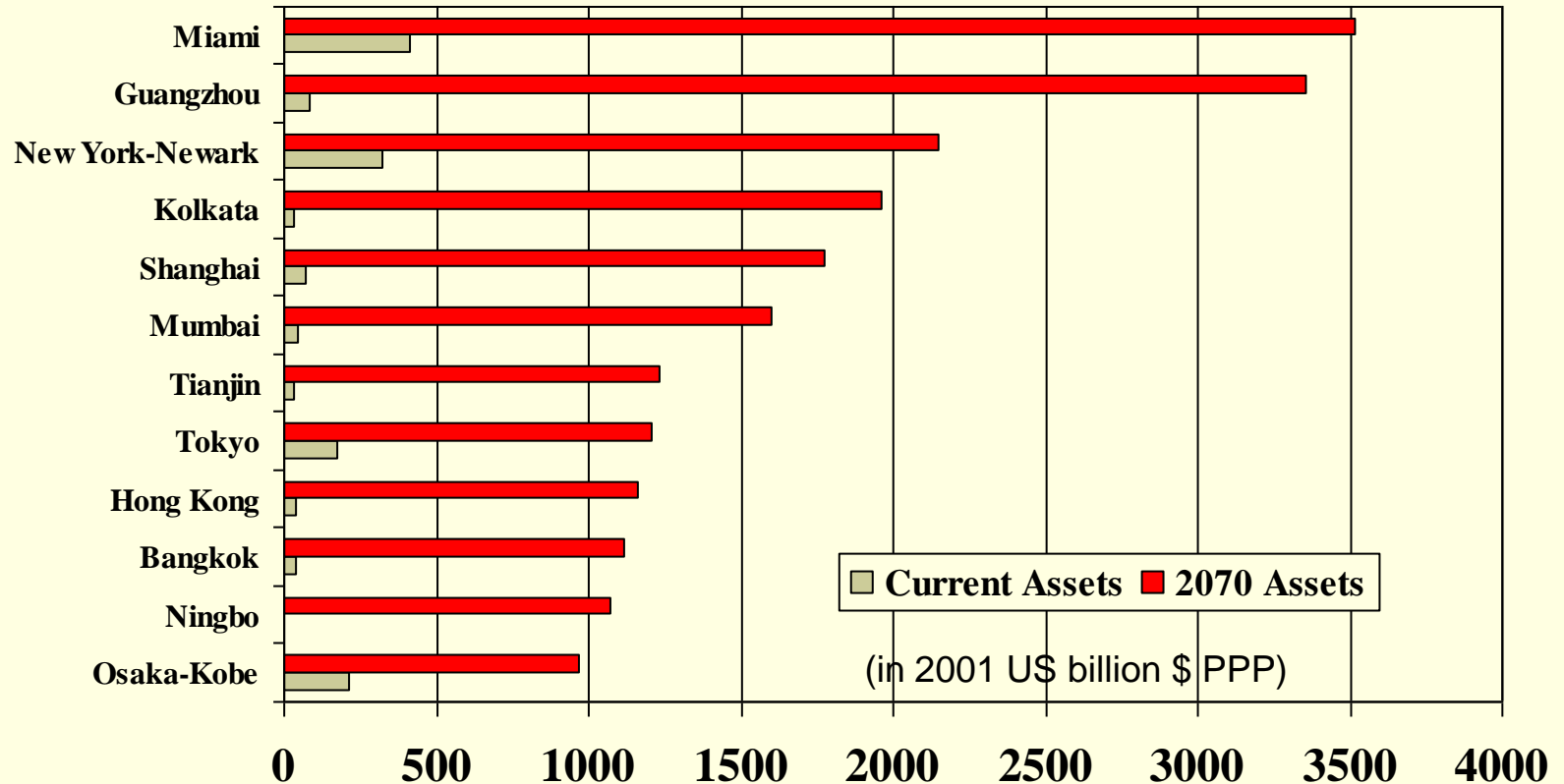
# Cities with Largest Populations Exposed to Coastal Flooding Now and in the 2070s\*



\*Data are from Nicholls et al (2007), OECD. Projections include effects of climate and socioeconomic change.

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# Cities with Largest Economic Assets Exposed to Coastal Flooding Now and in the 2070s\*



\*Data are from Nicholls et al (2007), OECD. Projections include effects of climate and socioeconomic change.

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# Impacts of Climate Change for Asia include (II):

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- Reduced agricultural yields in warmer regions due to heat stress;
- Increased frequency of heavy precipitation events can damage crops and cause soil erosion;
- Intense tropical cyclone activity can increase risk of death, injuries, and water-borne diseases;
- Increased incidence of very high sea level could result in salinization of irrigation water and fresh-water systems;
- Rise in endemic morbidity and mortality due to diarrhoeal diseases
- Substantial submergence of small islands.

# Beyond the Kyoto Protocol --I

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- Kyoto Protocol commitment period expires in 2012;
- Asian countries (Except Japan) were not required to reduce greenhouse gas emissions; only 35 industrialized countries have agreed to cap their emissions. The United States is the exception;
- Only about half of the Annex I countries have been able to meet their commitments.

# Beyond the Kyoto Protocol --II

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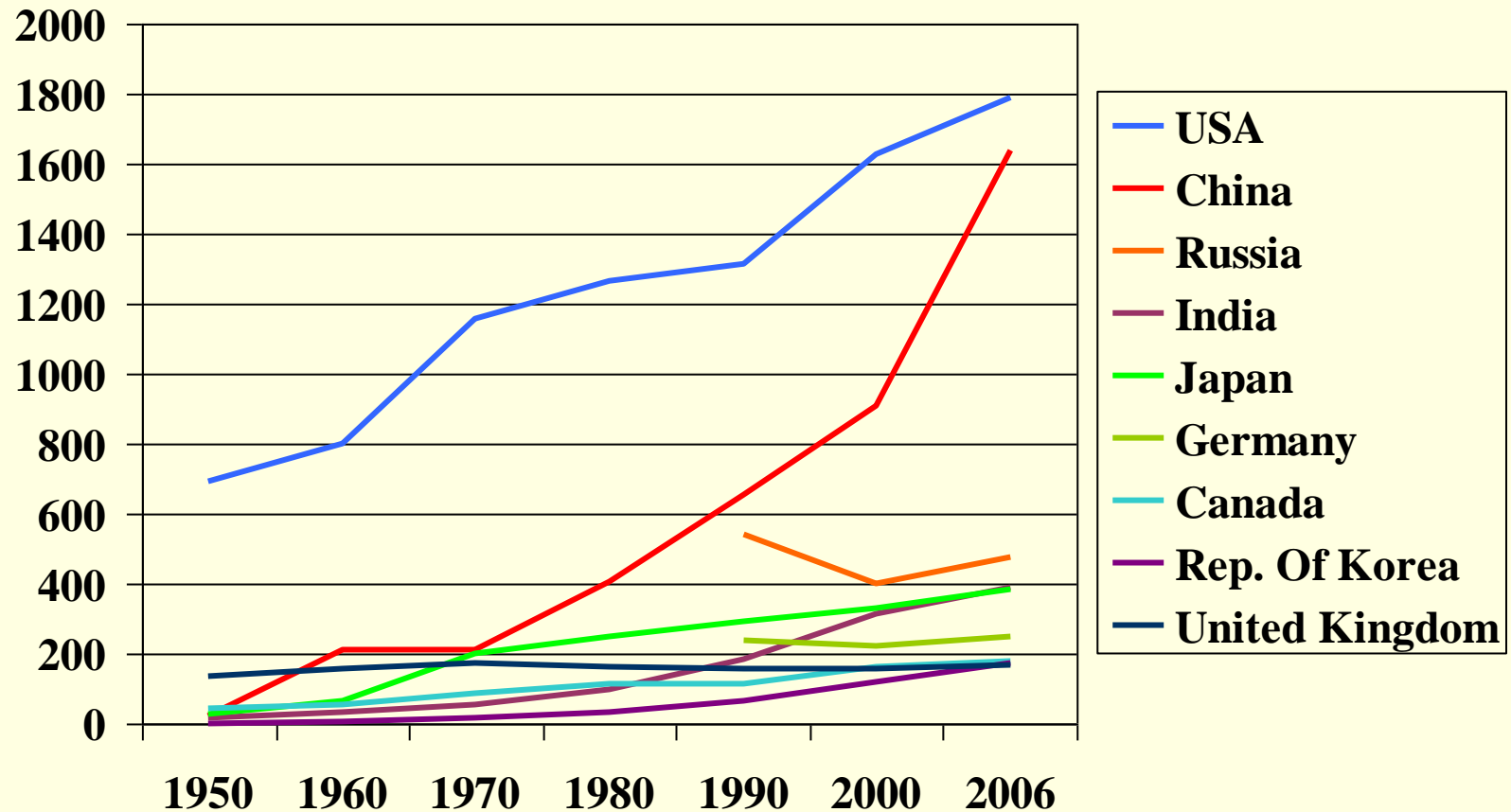
- The role of the Asia-Pacific region has changed considerably since the Kyoto Protocol was opened to signature in 1997;
- Asia's emissions of carbon dioxide from energy use now greatly exceed those from Europe or North America;
- Future Agreements to limit greenhouse gases will require more active involvement of the Asian countries.

# Increased Carbon Dioxide Emissions from Asian Countries

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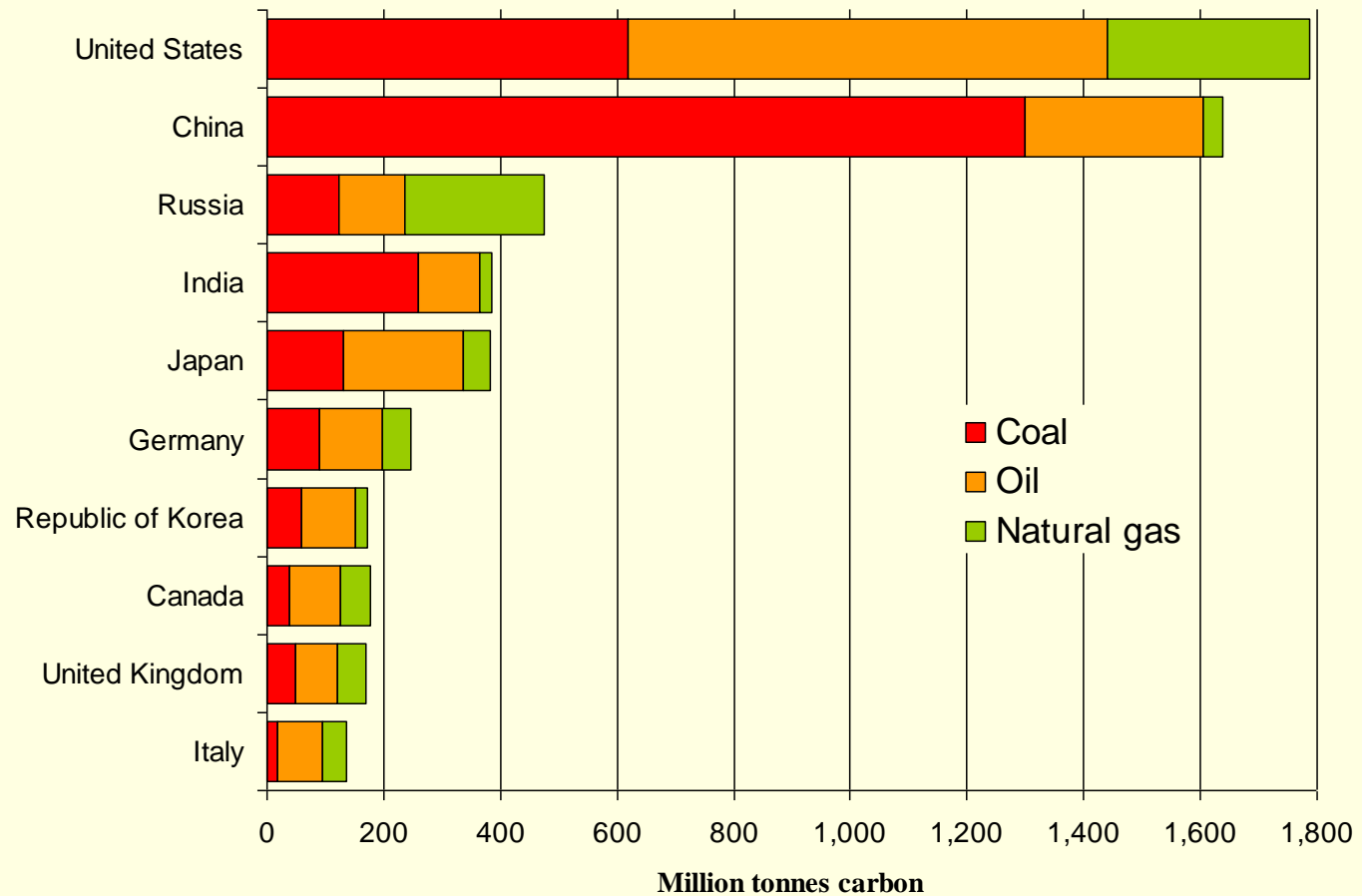
- Four of the top seven emitting countries in the world are in Asia (China, India, Japan, Republic of Korea). The trends shown in the next chart indicate that China could become the top emitter in 2008 or 2009
- Other top emitters in the region include Australia, Taiwan, Indonesia, and Thailand, as shown in the following slide.

# Trends in Carbon Dioxide Emissions from Fossil Fuels, Large Emitting Countries, 1950-2006



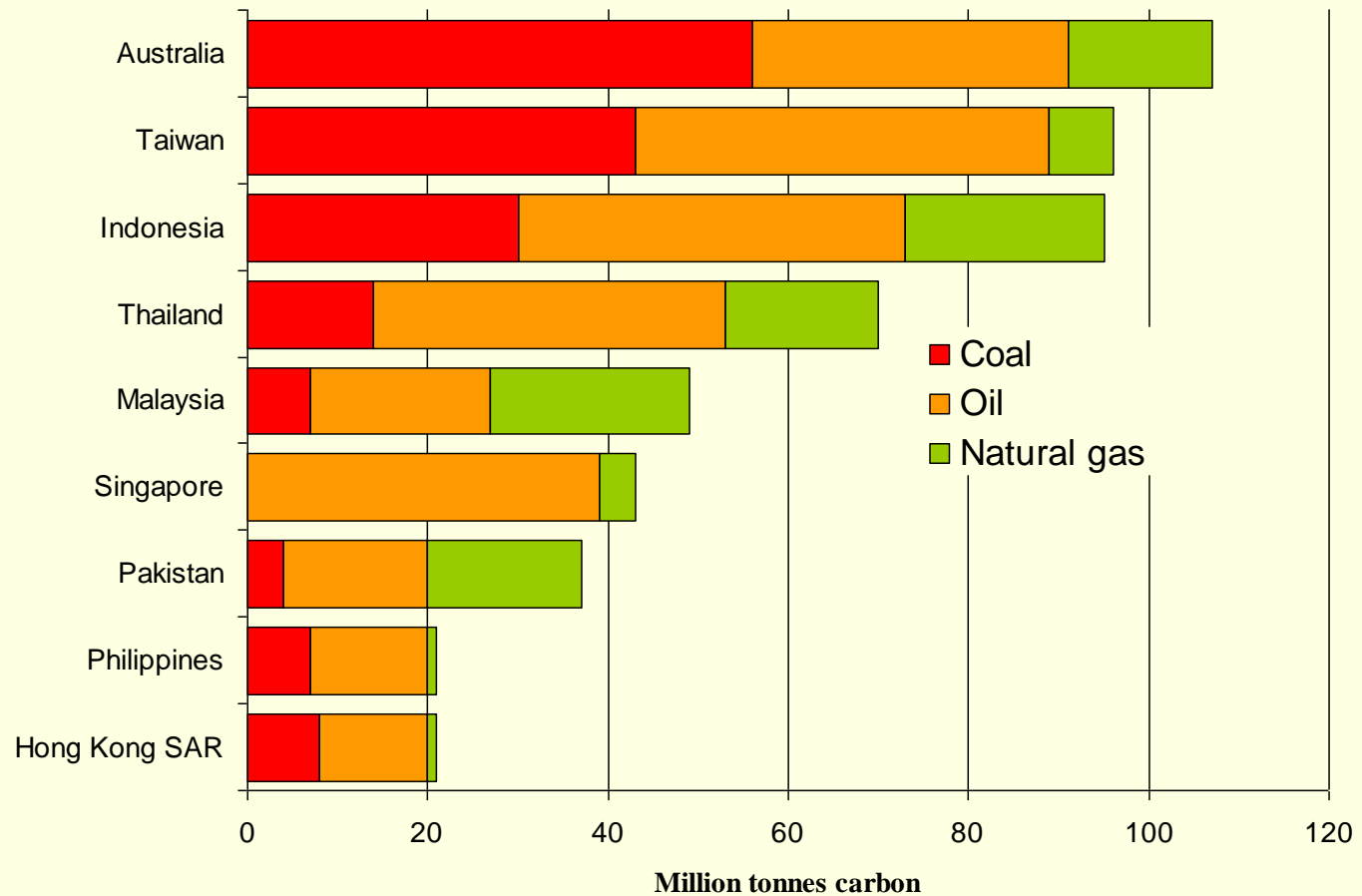
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# Total Carbon Dioxide Emissions from Fossil Fuels, Top 10 Emitting Countries, 2006



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# Other Major Carbon Dioxide Emitters from Fossil Fuel use in Asia and the Pacific, 2006



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# Asian countries other than China and India

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- The attention of the world during recent years has, with reason, focused on China and India. It is important to keep in mind that the population of the other Asian countries exceeds that of the European Union and of North America.
- The growth in emissions from the Asian countries other than China and India could exceed the reductions achieved in the EU countries. It is thus important to get their commitment also on a post-Kyoto Agreement.

# Important Issues in Finalizing a New Agreement

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- Most of the issues can be considered in a framework of equity:
  - Between countries
  - Within countries
  - Between generations
  
- We shall discuss each in turn

# Equity between Countries--I

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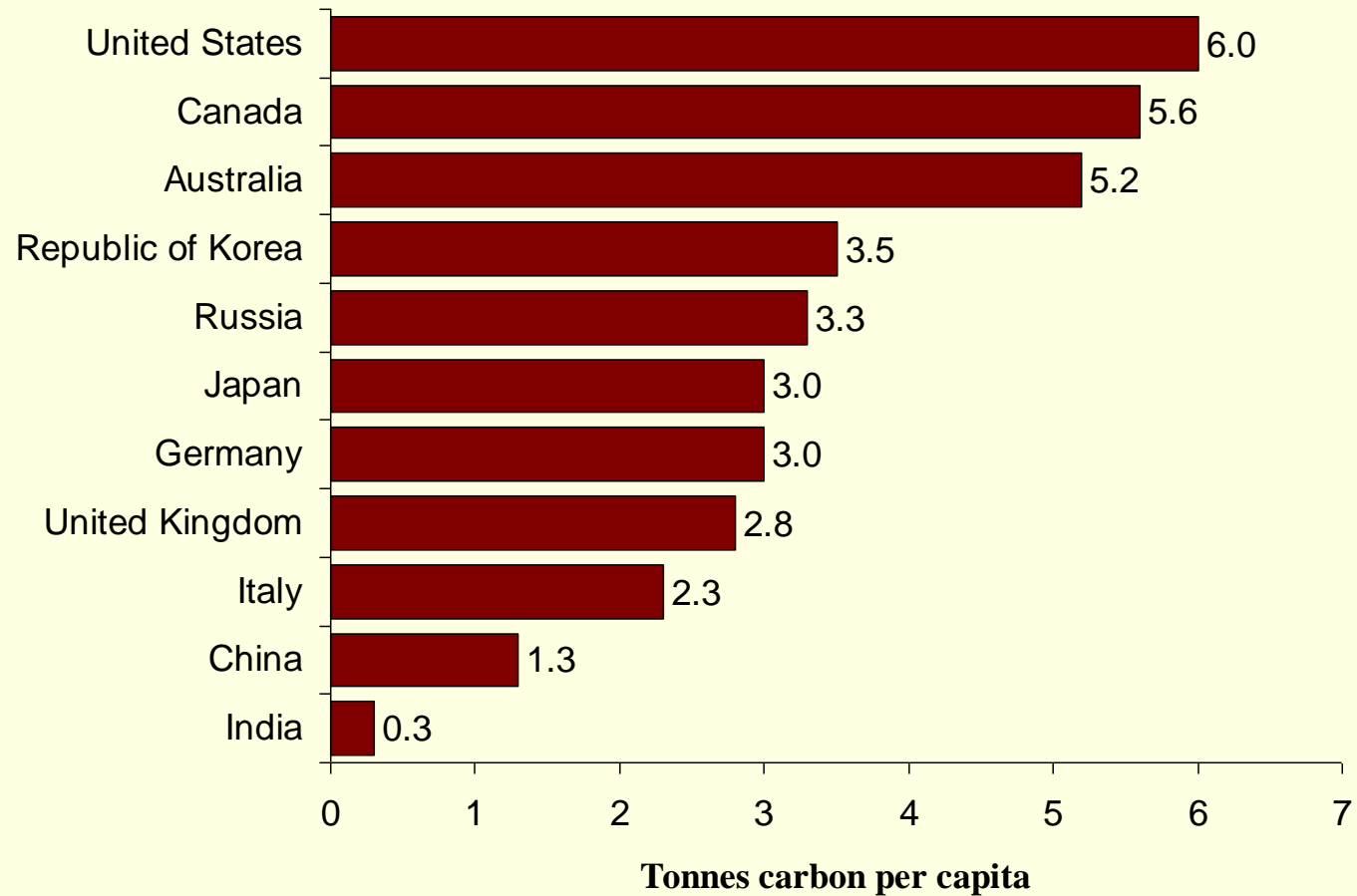
- The position of the United States, and some other countries, has been that it will not reduce emissions unless developing countries such as China and India also do so. If there are costs associated with tackling climate change, they should be borne by all countries, not just the industrialized ones.

# Equity between Countries--II

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- The position of the developing countries is that climate change is taking place because of the activities of the industrialized countries, and that they should thus be responsible for bearing the costs. Further, the emphasis should be on per capita emissions rather than total emissions; Per capita emissions of the USA, Canada, and Australia are about 4x China's and 15x India's (next slide).

# Per Capita emissions of carbon dioxide from fossil fuel combustion, same countries, 2006



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# Equity **within** Countries

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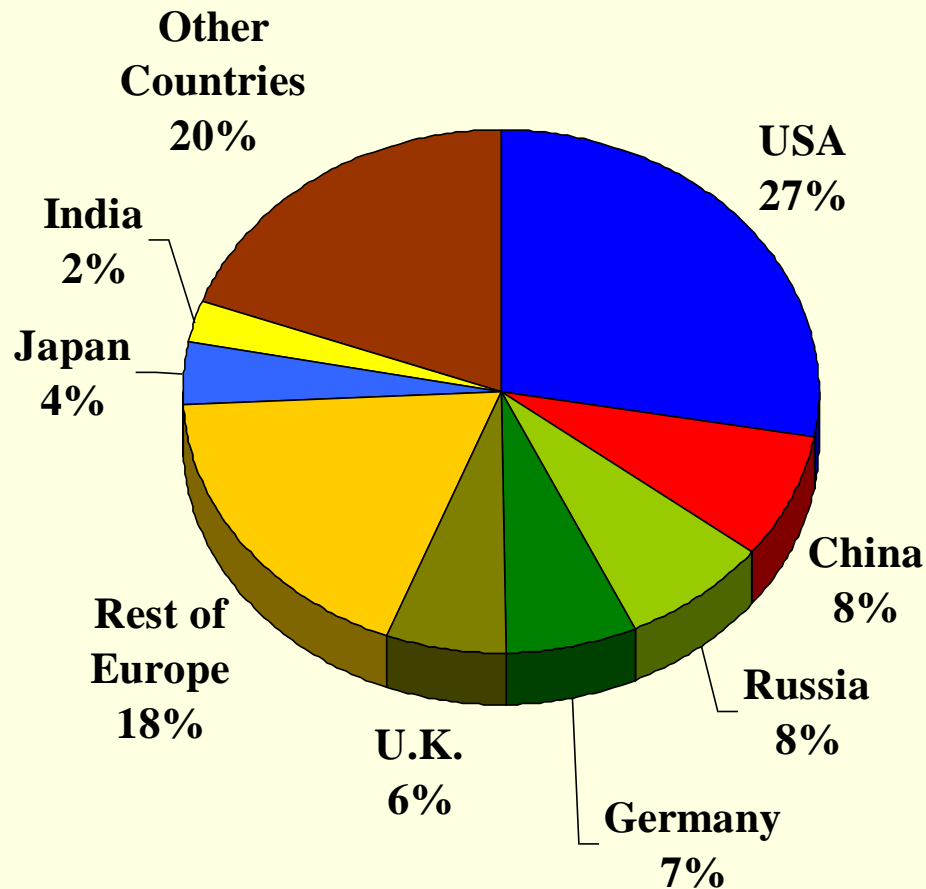
- The middle and upper classes in the developing countries use almost as much energy as their counterparts in the industrialized world;
- Closing the rich-poor gap in the developing countries will require greater use of energy by the latter;
- Emissions from the developing countries will thus grow for many more years, but efforts need to be made to reduce rate of increase.

# Equity between Generations

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- Accumulation of greenhouse gases from human activities has increased significantly since the industrial revolution
- Over a quarter of the total CO<sub>2</sub> emissions from fossil fuel use originated in the USA, 8% from China, 4% from Japan and 2% from India (next Chart)
- We inherited this situation from past and present generations, but need to leave a sustainable world for future generations

# Accumulated Emissions of Carbon Dioxide from fossil fuels, 1850-2005



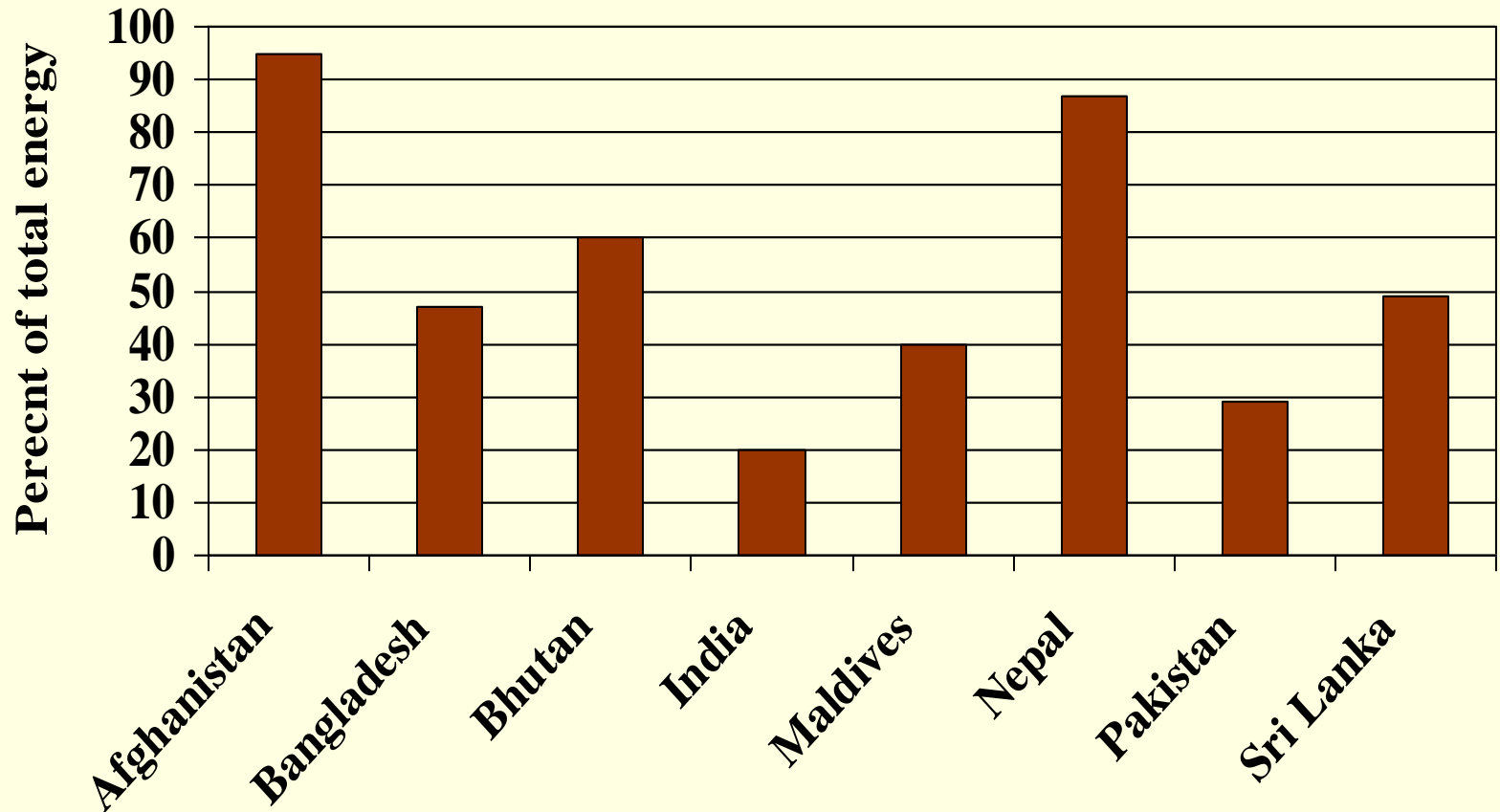
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# CO<sub>2</sub> Emissions from Land Use Changes and Biomass Combustion

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- During past century, forests in many Asian countries have been converted to agriculture and urban areas; Significant emissions of carbon dioxide accompany this process
- Biomass still provides a large amount of energy in many Asian countries; per unit of energy delivered, biomass combustion leads to higher Carbon dioxide emissions than fossil fuels.

# Share of total energy supplied by biomass in South Asia



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# An Approach to Address Equity Issues in the Next Climate Agreement

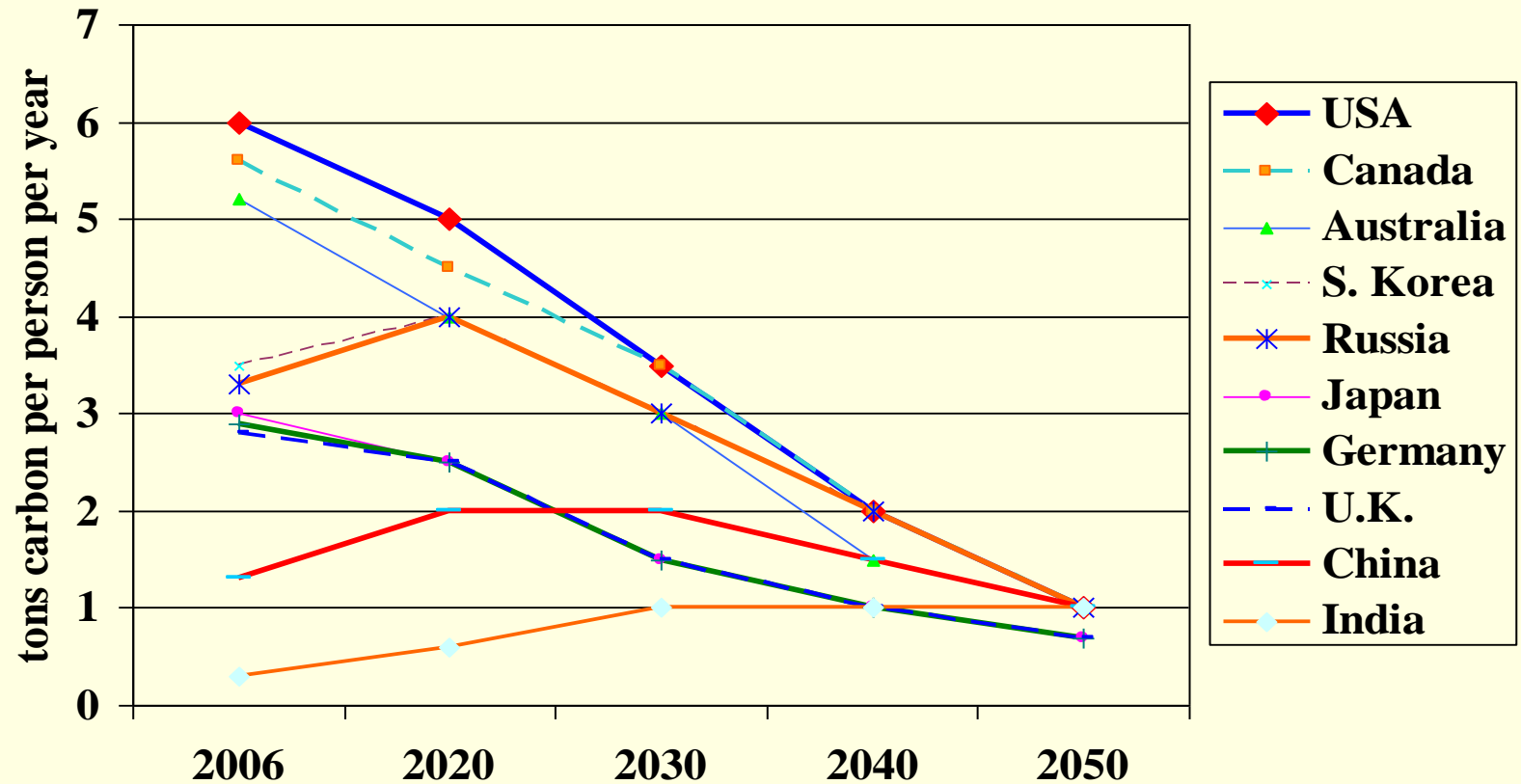
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- Need to consider current emission levels, historic emissions, and anticipated emissions
- Provide allowances for heating and cooling requirements
- Take size and climate of the country into consideration (for transportation and heating/cooling allowances)
- Use modified per capita targets, using 2000 or 2010 as population base.

## Indicative 2020-2050 Targets for Per Capita CO<sub>2</sub> Emission Levels for Larger Emitting Countries, Using Equity Considerations (in tonnes C per capita per year)

<u>Country</u>	<u>2006</u>	<u>2020</u>	<u>2030</u>	<u>2040</u>	<u>2050</u>
USA	6.0	5.0	3.5	2.0	1.0
Canada	5.6	4.5	3.5	2.0	1.0
Australia	5.2	4.0	3.0	1.5	1.0
Rep. of Korea	3.5	4.0	3.0	1.5	0.7
Russian Fedn.	3.3	4.0	3.0	2.0	1.0
Japan	3.0	2.5	1.5	1.0	0.7
Germany	3.0	2.5	1.5	1.0	0.7
U.K.	2.8	2.5	1.5	1.0	0.7
China	1.3	2.0	2.0	1.5	1.0
India	0.3	0.6	1.0	1.0	1.0

# Trends Reflecting Numbers in Previous Table



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# Weighing Costs and Benefits of Addressing Climate Change, as discussed in IPCC Reports (2007)

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- Combination of mitigation and adaptation will be required;
- Significant mitigation potential at \$20-80 per ton of CO<sub>2</sub>-equivalent by 2030 could lead to stabilization of greenhouse gases by 2100;
- Creation of international carbon market and Kyoto mechanisms such as CDM could help;
- Mitigation costs could result in global GDP reduction of 5.5% by 2050 to a gain of 1%. There are substantial costs for not acting.

# Economic estimates from the Nicholas Stern Review

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- Using the results from formal economic models, the Review estimates that if we don't act, the overall costs and risks of climate change will be equivalent to losing at least 5% of global GDP each year, now and forever. If a wider range of risks and impacts is taken into account, the estimates of damage could rise to 20% of GDP or more;
- In contrast, the costs of action – reducing greenhouse gas emissions to avoid the worst impacts of climate change – can be limited to around 1% of global GDP each year.

# Conclusions -- I

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- Need to incorporate issues of equity **between** countries, **within** countries, and **between generations** in the next Agreement
- Stabilization of global climate during this century requires reducing total emissions of greenhouse gases to well below a half of current emissions
- Main challenge of the current UNFCCC negotiations is to achieve overall reductions while meeting the needs of developing as well as industrialized countries.

# Conclusions -- II

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- One possible approach is to set differentiated intermediate goals for different countries. Factors such as current emissions, size of country, and heating and cooling requirements, could be taken into consideration;
- In the Asia-Pacific region, large challenges would be faced, particularly by China, Australia, Rep. of Korea, and Japan.
- A longer term goal would be to get below half a tonne of carbon equivalent per capita by 2070.