Challenge of Low-Carbon City in Asia

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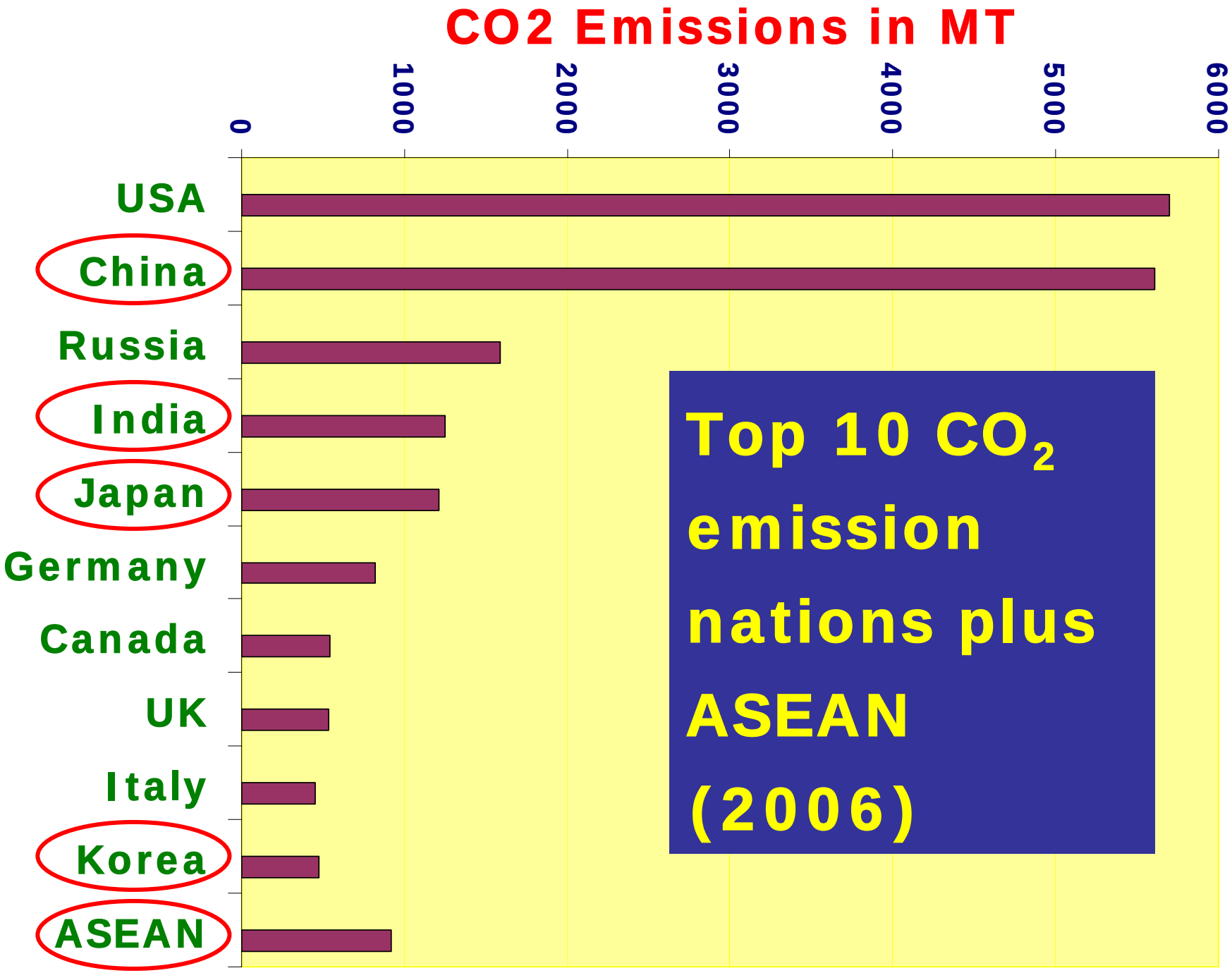
CO2 Emissions in MT
0
1000
2000
3000
4000
5000
6000
USA
China
Russia
India
Japan
Germany
Canada
UK
Italy
Korea
ASEAN
Top 10 CO_2 emission nations plus ASEAN (2006)

Threats to Asian cities :

- Coastal land loss (and cities?)
- Increased flooding
- Reducing water resources
- Resurgence of diseases
- Heat stress

Yet, Asian cities will continue to grow in size and economy, with increased demand for energy, food, mobility, & trading.

Opportunities for Asian cities :

- Capacity building -- Similar start lines in adaptation of new technologies
- International collaboration for combating common problems
- Carbon trading
- Improve energy security
- Economic and business opportunities
- Re-structuring to align with low-carbon economy, and improve living environment

Need for Climate Change Action

- Further climatic changes expected due to past greenhouse gas emissions.
- Reduce worldwide impacts on :
  - Coasts
  - Water supply
  - Ecosystems
  - Food supply
  - health

Challenges toward Low-Carbon City

Adaptation strategies & measures:

- Physical environmental impacts
- Social, economic and political changes

Mitigation strategies & measures:

- Increase energy efficiency
- Use less carbon-intensive fuels
- Capacity building

Challenges towards transforming into Low-Carbon City :

Case Study of Singapore City

Challenges towards Low-Carbon City

Objectives :

- **Environmental sustainability**
- **Economic competitiveness**
- **Energy security**

Challenges toward Low-Carbon City

Adaptation strategies & measures:

- **Physical environmental impacts**

  - **Flood control**
  - **Coastal property protection**
  - **Water supply**
  - **Accommodating extreme weather**
  - **Pandemics**

Adaptation strategies & measures:

Flood Control & Coastal Property Protection

- Since 1991, new reclamation projects must be built 125 cm above highest recorded tide level. This addresses IPCC AR4's worst scenario project of 59 cm sea level rise.
- Improve drainage infrastructure to reduce flood-prone areas.
- Marina Barrage (S$ 226 million)

Marina Barrage (Completed Nov 2008)

- Tidal barrier to keep out the tide to alleviate flooding in the low-lying parts of the city.
- The water body impounded behind the barrage is tapped for water supply purpose.

Marina Barrage

Adaptation strategies & measures:

Water Supply

- Singapore has no natural freshwater lakes. It primary source of water supply is rainfall.
- Four-Tap Strategy:
  - Imported from Malaysia
  - Water catchment reservoirs
  - NeWater (recycled water)
  - Desalination
- Including Marina Barrage (Singapore's 15th reservoir), rainfall catchment covers two-thirds of Singapore surface area.

Adaptation strategies & measures:

Extreme Weather (Heat wave, snowstorm, sandstorm, ….)

Heat Stress

- Comprehensive tree planting & greenery program – Vision of **Garden City**.
- **Streetscape Greenery Master Plan** for entire road network, including *Coastal Treatment* and *Forest Treatment*.
- **Building Treatments** – rooftop gardens, greenery walls, thermally friendly building materials, layout that improves ventilation and wind tunnel effect.

Adaptation strategies & measures:

Pandemics
(SARS, Bird Flu, …….)

- Prevention and control strategy
- Medical and epidemiological management
- Outbreak monitoring and assessment capability
- Public communications system and outreach mechanism

Challenges of Low-Carbon City

Adaptation strategies & measures:

- Social, economic and political changes

  - Education & awareness creation
  - Promoting low-carbon culture
  - Training & competency building

Adaptation strategies & measures:

- **Social, economic and political changes**

Education & awareness creation

- **Implications of global warming – school projects, seminars and exhibitions.**
- **Raising awareness of the public & businesses to stimulate energy efficient behavior and practices.**
- **Organized programs to inform companies and public of technologies or actions for energy savings.**

Adaptation strategies & measures:

- **Social, economic and political changes**

Promoting low-carbon culture

- Public exhibitions/programs on climate-change impacts and energy-efficient approaches.
- Promotion of low-carbon lifestyle and concepts
- Government agencies to take leading role in adopting low-carbon approaches to solve social and environmental problems.
- Enhancing social responsibility of individual contributions toward low-carbon society.

Adaptation strategies & measures:

Training & competency building

- Seminars/workshops to share knowledge, expertise and best practices for stakeholders.
- Certified Energy Manager Training Grant.
- Developed training curriculum and certification program for energy engineers/managers.
- Plan to require energy manager for large manufacturing and building facilities.
- Set up Energy Research Institute for energy policy research.

Mitigation strategies & measures:

Breakdown of CO_2 contribution in 2005 (Singapore)

	Power	Industry	Transport	Buildings	House-holds
Direct (Fossil Fuel)	48%	33%	17%	1%	1%
Indirect (Power)		21%	2%	15%	8%
Overall		54%	19%	16%	9%

Mitigation strategies & measures:

Increase energy efficiency -- *Industry*

- **Cogeneration (CHP – combined heat & power) and Trigeneration (CCHP - combined cooling, heating and power).**
- **Energy Audit Scheme – Fund major industrial consumers of energy to conduct energy audit and formulate plans to improve efficiency.**
  (87 companies have participated, expected to achieve annual cost savings of S$23.4 million, energy savings of 300,000 MWh, and 150 kt of CO_2 savings.)

Mitigation strategies & measures:

Increase energy efficiency -- *Transport*

- Managing vehicle usage and traffic congestion
- Improving and promoting use of public transport
- Improving fuel economy
- Promoting green vehicles
- Using energy efficient road construction and maintenance techniques
- Promoting recycling technologies

Mitigation strategies & measures:

Need for improvement –
Public transport & traffic congestion management

Mitigation strategies & measures:

Increase energy efficiency -- *Buildings*

- Promote green buildings. Life-cycle energy savings of 20 to 30% are possible.
- Green Mark Standards – from April 2008, new or retrofitted buildings must meet requirements on environmental sustainability.
- Financial incentives for energy efficient design & energy efficiency upgrading of existing buildings.
- Government taking the lead for public buildings

Mitigation strategies & measures:

Increase energy efficiency -- *Households*

- Mandatory energy labeling of appliances.
- Minimum energy performance standards for appliances.
- Electricity consumption tracking device

Mitigation strategies & measures:

Using Less Carbon-Intensive Fuels

- Use of natural gas instead of fuel oil to meet increasing energy demand before cost-competitive renewable energy is available.
- Support efforts in developing renewable energy from **biomass** and **solar energy**.
- Government driven R&D investment in developing **clean energy technology**.

Mitigation strategies & measures:

Capacity Building

- Research into clean and renewable energy, and energy-efficient technologies.
- Clean Energy Office to grow Clean Energy industry with emphasis on solar energy.
- Energy Technology R&D Program to coordinate and integrate clean energy efforts, especially on fuel cells, alternate fuels (biofuels and hydrogen), and solar PV technologies.
- Innovation for Environmental Sustainability Fund and Singapore Initiative on New Energy Technology for test-bedding clean technologies.

Conclusions

- Transforming into a low-carbon society is necessary to combat climate change caused by GHG emissions.
- Asian cities, cities in developing nations in particular, must prepare themselves in adopting appropriate adaptation and mitigation strategies/measures.
- The case study of Singapore City has demonstrated the issues involved and the forms of strategies/actions that might be necessary.