

Climate Change: What's It All About?

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Ottawa, 28 February 2008

OVERVIEW

- International process & institutions
- Science, impacts & responses (economics)
- Politics
- Emission trends
- Current state of play
- Possible future scenarios

International Process

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MANY PLAYERS

- Intergovernmental Panel on Climate Change (IPCC)
- UN Framework Convention on Climate Change (UNFCCC)
- UN General Assembly
- Other UN specialized agencies
- Organization for Economic Cooperation & Development and International Energy Agency

IPCC

- Intergovernmental Panel on Climate Change (IPCC) established in 1988
- Under auspices of UN Environment Program & World Meteorological Org.
- Three Working Groups: Science (I), Impacts & Adaptation (II), Mitigation & Cross-cutting Issues (III)
- Assessment Reports in 1990, 1995, 2001 & 2007

UNFCCC & KYOTO PROTOCOL

- UN Framework Convention on Climate Change negotiated in 1991-92 & signed at Earth Summit meeting in Rio de Janeiro
- First meeting of Parties (COP-1) in Berlin began work on subsidiary treaty, which was completed at COP-3 in Kyoto in Dec. 1997
- Protocol entered into force in early 2002, after ratification by 55 countries accounting for 55% of industrialized country emissions

KYOTO TARGETS - 1

- Industrialized countries listed in Protocol Annex B pledged to limit total greenhouse gas (GHG) emissions to certain levels relative to 1990 (or other base year) by 2008-2012
- Domestic actions can be supplemented by credits from flexibility mechanisms: joint implementation (JI), Clean Development Mechanism (CDM) and emission trading

KYOTO TARGETS - 2

- Negotiations focused on flat-rate targets until final session
- EU proposed 15% reduction for all but then differentiated by internal burden-sharing
- Others finally rejected single target not taking account of national circumstances
- Differentiation in Annex B reflects politics rather than real differences in conditions

KYOTO TARGETS - 3

- EU-15 & many eastern European countries later joining EU, -8% below 1990 levels
- US, -7% below 1990 levels
- Canada & Japan, -6% below 1990 levels
- Russia & Ukraine, 0% (1990 levels)
- Others: Hungary (-6% of 1985-87), Poland (-6% of 1988), Romania, New Zealand (0%), Norway (+1%), Australia (+8%), Iceland (+10%)

MONTREAL-BALI PROCESS

- 2 (or 3) track process agreed at COP-11 on how post-2012 regime will be developed
- Kyoto target process (Art. 3.9) trying to see if there is any convergence on targets
- Convention dialogue broader & more flexible
- Protocol Art. 9 review going nowhere
- Bali Action Plan (COP-13) pledges to try to get agreement by 2009, with everyone's wish list on the table

OTHER PLAYERS

- UN Environment Program & other UN specialized agencies
- UN Economic Commission for Europe
- OECD/IEA
- Environmental groups
- Industry groups

Science, Impacts & Responses

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IPCC 4th REPORT (AR-4)

- Global warming trend confirmed
- “90% confidence” that humans are the main cause of warming trend
- Majority of impacts will be negative (& some will be irreversible)
- Many options for limiting emissions at low or at least acceptable costs
- Benefits of mitigation exceed costs

CAVEATS - 1

- Attribution to human GHGs based mostly on matching observations with computer model projections
- Many inconsistencies among model results
- Models very weak on natural variability
- Unable to reproduce or explain longer-term climate patterns
- Weak inclusion of clouds (visible aspect of GHG accounting about 97% of greenhouse effect)

CAVEATS - 2

- Solar variability limited to direct effects of 11-year sunspot cycle
- High correlation over millennia between climate patterns & both solar & cosmic radiation
- Indirect effects of radiation not understood or included in models

POSSIBLE MECHANISM

- Impact of solar wind is modulated by counter-effect of cosmic radiation
- Combined effect is changes in ion balance in upper atmosphere
- Ion mix affects cloud formation, which can have either cooling or warming impact
- Since neither radiation nor cloud dynamics are understood, models are adjusted to compensate for absence of these factors

ECONOMICS

- Many studies tilt toward certain desired results by choices of assumptions & methodologies
- Cost-benefit trade-off can be especially sensitive to choice of discount rate
- Assumptions on technologies & costs are also very important
- Energy economics often poorly understood

ENERGY MYTHS: GDP LINK

Myth (no link between energy & GDP):

- Energy use and GDP growth have been “decoupled”
- It is now possible to grow the economy without increasing energy use (or emitting CO₂)

ENERGY MYTHS: GDP LINK

Response:

- Modest economic growth with a decline in energy use is generally due to major structural changes
- The manufacturing sector contribution to GDP must be accompanied by energy consumption (and CO₂ emissions)
- If you want to make things, you have to use energy

ENERGY MYTHS: NO-REGRETS

Myth (many free options available):

- A large number of “no-regrets” measures exist for conserving energy or improving energy use efficiency
- These can easily be implemented at almost no cost or even a profit

ENERGY MYTHS: NO-REGRETS

Response:

- Most easy “no-regrets” have been available for many years, and still have not been exploited
- Many factors influence decisions regarding investments in energy efficiency or conservation
- These include limited capital availability, other more attractive investment opportunities, and non-economic considerations

ENERGY MYTHS: STANDARDS

Myth (benefits of strict standards):

- Industries will benefit from stringent emissions targets
- Such targets will enable them to become much more energy-efficient, and therefore more competitive

ENERGY MYTHS: STANDARDS

Response: A half-truth

- The impact depends on
 - magnitude & timing of required investments
 - whether other competitors will also be required to make comparable investments
- The right dosage and timing may cure the patient but the wrong dosage or timing could be fatal

ENERGY MYTHS: TECHNOLOGY

Myth (benefits of technology forcing):

- Strict targets will send a strong signal to industry and others that will stimulate research, resulting in the development of new technologies
- These technologies will enable the targets to be met easily and can also be exported to other countries at a profit

ENERGY MYTHS: PER CAPITA

Myth (low emissions/capita = efficiency):

- High per capita emissions or high emissions per unit of GDP indicate inefficiency and waste
- It should be very easy for some countries to achieve huge emission reductions at low cost or even a savings.

ENERGY MYTHS: PER CAPITA

Response:

- The emissions profile of a country primarily reflects such factors as available energy mix, the resource base and resulting economic structure, geographical size, population density and growth, and climate
- High per-capita countries may be efficient and low per-capita countries may be inefficient

ENERGY MYTHS: SIMILARITY

Myth (countries are more or less alike):

- The potential for emission reductions has been demonstrated in some countries and/or sectors and thus can be generalized across all countries and sectors
- If there are differences between countries or sectors, these differences result from inefficiencies and so countries or sectors should not suffer much

ENERGY MYTHS: SIMILARITY

Response:

- Differences between countries, sectors and even individual companies are real and reflect many different factors
- Structural differences, nature of technological infrastructure, timing of capital stock turnover, climate, population, etc., all affect emissions

ENERGY MYTHS: JOBS

Myth (job gains will more than offset losses):

- Job losses due to changing the energy mix and related infrastructure will be offset by increased employment building the new infrastructure
- New job creation will often be in high-technology industries and thus will be a net gain for the overall economy

ENERGY MYTHS: JOBS

Response:

- Job losses and gains are often highly regional and may cause very large regional hardships
- Coal miners will not, in general, become solar cell makers or solid oxide fuel cell fabricators
- Secondary employment impacts can be even larger, where communities depend on large energy facilities

Politics

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DEBATE IS TILTED

- Media has not presented objective picture
- Al Gore, Hollywood, Nobel Prize, etc.
- In secular societies, environment is increasingly the new religion
- Climate change gets mixed up with other political issues (Iraq, capital punishment, etc.)
- Anti-US & anti-Bush feelings affect attitudes on climate change response

MEDIA DOES POOR JOB

- Bad news always gets more play than good news (“man bites dog” effect)
- General “dumbing down” of public also has effect in poor or wrong explanations
- Many with green ideals have pursued careers in the media as a more effective means of influencing public environmental attitudes & behavior

PUBLIC IS SPLIT

- Divide between left & right has grown in political process (especially in US) & in general public
- Left generally supports strong government intervention to protect environment
- Right tends to support business but doesn't want to look anti-environment
- Real debate has not yet begun

IDEOLOGY/RELIGION

- In secular Europe & the two US coasts, many turn to environment to fill the gap left by lack of an emotionally held belief system
- Intensity of rhetoric reveals more is involved than intellectual differences
- Climate skeptics are denounced as evil “heretics”

ALL ISSUES AFFECTED

- Climate is only one of many issues on which people are polarized
- Anti-Bush reactions mask deeper anti-US feelings, especially post Cold War
- Climate, Iraq, capital punishment, abortion, gays, etc., all become political litmus tests
- Al Gore denounced the US climate policy in 1992 as “immoral and obscene”

SCIENCE “CONSENSUS” - 1

- Science is always an open question, contrary to claims by Al Gore & others that “the science is settled”
- “Scientific consensus” is an oxymoron
- Attempts to close off scientific debate are politically motivated, designed to exclude “inconvenient” scientific research results

SCIENCE “CONSENSUS” - 2

- The “majority of scientists” - actually a very small subset: a majority of those scientists involved in scientific aspects of the IPCC work on science, impacts & economics
- Subject attracts those already interested & inclined to believe humans are at fault
- Research funding process recognizes & rewards those who find there is a problem

SCIENCE “CONSENSUS” - 3

- A number of scientist-advocates have pushed alarmist research results not fully verified by scientific community
- “Post-normal” science argues that scientific results should be guided not only by the scientific method but also by “politics, ethics and spirituality” (Mike Hulme, March 2007)
- If results conflict with societal values, then they should be “modified”

Emission Trends

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WHY EMISSIONS INCREASE

- Economic growth
- Population growth
- Rising lifestyle expectations
- Rising electricity demand
- Rising natural gas prices
- Rising transport demand

INFLUENCES ON EMISSIONS

- Physical characteristics (size, location, geography, climate, etc.)
- Demographic factors (population, population density, population growth, etc.)
- Energy & non-energy resource endowments
- Energy supply mix (carbon intensity)
- Industrial structure (energy intensity)
- Age of capital stock & replacement costs
- Level of energy efficiency already achieved in 1990
- Import & export patterns
- Level of economic development (GDP per capita)
- GDP growth outlook

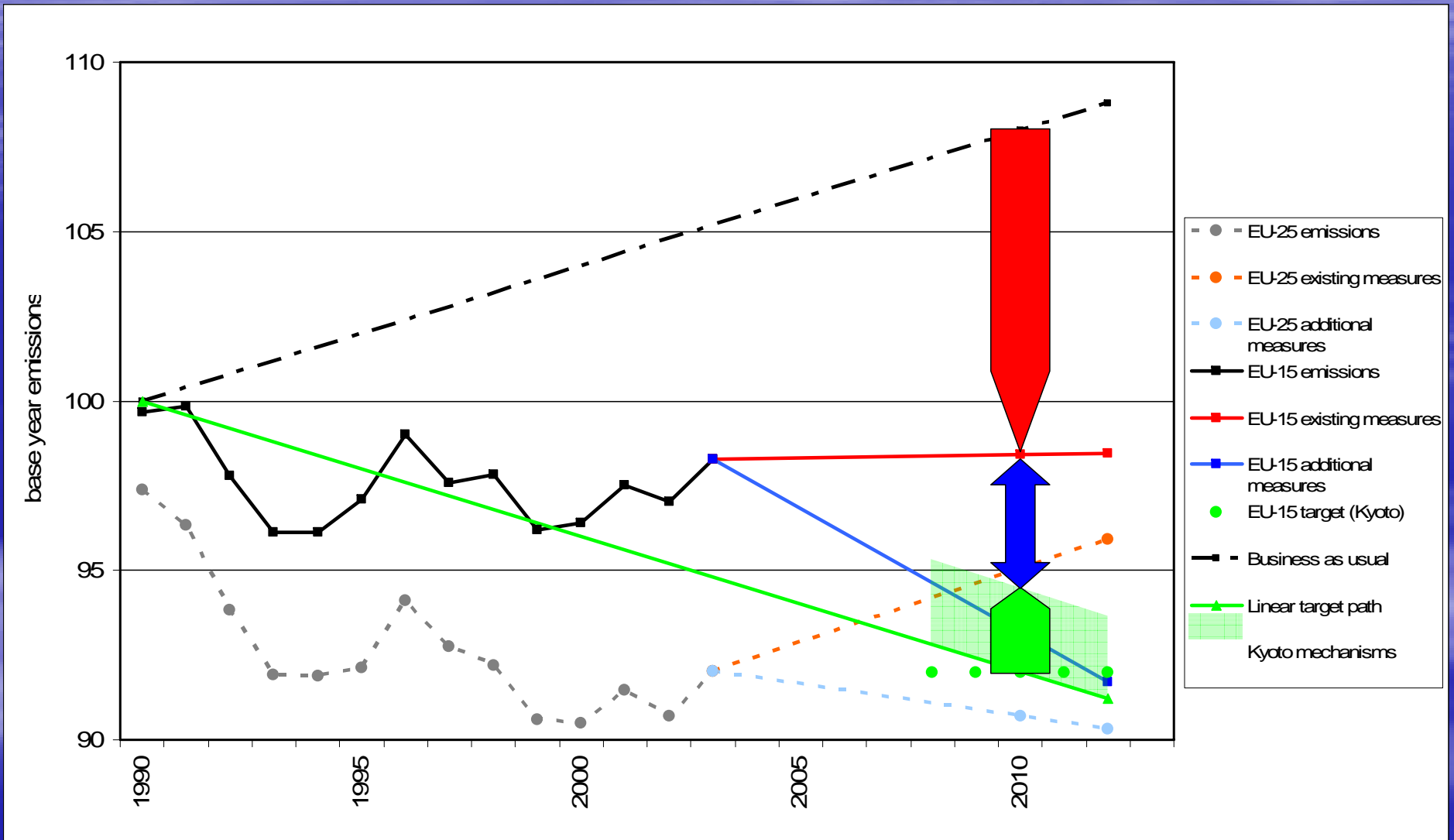
EU-15 CO2 TRENDS

COUNTRY	2005	% VS 1990	2000 VS 1990	2005 % VS 2000
Austria	77.18	+33.6	+10.3	+21.1
Belgium	111.70	+2.7	+9.4	-7.5
Denmark	47.51	-6.2	-1.0	-5.2
Finland	55.42	+0.8	-1.5	+2.3
France	388.38	+9.3	+6.7	+2.4
Germany	813.48	-15.9	-14.2	-2.1
Greece	95.67	+35.5	+24.3	+9.0
Ireland	43.77	+41.6	+33.9	+5.8
Italy	454.00	+14.0	+6.9	+6.6
Luxembourg	11.35	+7.7	-23.0	+39.8
Netherlands	182.95	+15.7	+9.8	+5.4
Portugal	63.01	+59.1	+51.5	+5.0
Spain	341.75	+64.8	+37.7	+19.7
Sweden	50.95	-4.5	+0.4	-4.9
UK	529.89	-5.0	-6.4	+1.5
EU-15	3,267.01	+4.8	+1.0	+3.7

CEIT SURPLUS FADING

COUNTRY	2005	% VS BASE	2000 VS BASE	2005 % VS 2000
Czech Republic	118.12	-23.3	-23.3	+0.0
Hungary	57.88	-69.8	-70.9	+3.8
Poland	295.81	-32.3	-32.9	+1.0
Slovakia	38.30	-32.8	-34.2	+2.2
Bulgaria	46.12	-44.0	-48.9	+9.5
Romania	90.96	-51.6	-54.0	+5.2
EU-27	3,975.85	-3.1	-6.3	+3.5
Belarus	60.71	-43.8	-48.7	+9.6
Russia	1,543.76	-29.5	-30.8	+2.0
Ukraine	296.82	-56.4	-58.0	+3.9

EU view of target progress



COMMENTS

- BAU should include effects of non-climate measures: UK energy market restructuring, German reunification, landfill directive
- Effects of these have mostly faded and emissions have risen since 1999
- Gap is much larger than indicated and additional measures are unlikely to close it

OTHER OECD RISING

- Non-EU OECD countries have experienced higher emission growth than the EU or CEIT, due to various factors (economy, population, etc.)
- Most of these countries would have great trouble considering emission targets for after 2012 that would be stricter than those for 2008-2012

NON-EU OECD IS UP

COUNTRY	2005	% VS 1990	2000 VS 1990	2005 % VS 2000
Australia	376.78	+45.1	+30.7	+11.0
Canada	548.59	+27.9	+23.6	+3.5
Iceland	2.21	+16.3	+13.7	+2.3
Japan	1,214.19	+14.8	+10.8	+3.6
New Zealand	34.88	+62.9	+51.2	+7.7
Norway	37.00	+28.9	+18.8	+8.5
Switzerland	44.98	+8.9	+2.2	+6.6
United States	5,816.96	+19.9	+17.5	+2.0

CANADA'S EMISSIONS - 1

- 2005 electricity & heat (utilities): +31.3% vs. 1990, -5.2% vs. 2000; coal +18.3% vs. 1990, -12.2% vs. 2000; gas +419.7% vs. 1990, +9.5% since 2000
- 2005 non-utility heat & power: +78.7% vs. 1990, +1.7% vs. 2000
- 2005 other energy (oil & gas production & processing): +53.1% vs. 1990, +18.2% vs. 2000
- 2005 manufacturing & construction: +6.4% vs. 1990, -3.7% vs. 2000

CANADA'S EMISSIONS - 2

- 2005 transport: +28.9% vs. 1990, +7.3% vs. 2000; road transport +28.6% vs. 1990, +7.9% vs. 2000; international air transport: -5.6% vs. 1990, -17.2% vs. 2000
- 2005 other sectors: +30.3% vs. 1990, +7.7% vs. 2000; oil +38.3% vs. 1990, 19.9% vs. 2000; natural gas +24.8% vs. 1990, -0.4% vs. 2000

CANADA'S EMISSIONS - 3

- Many reasons for changing emission patterns, including economic & population growth, climate & weather (as distinguished from climate)
- Resource-rich country with resource-intensive economy
- Limits on further development of hydro (& nuclear?)
- Sparsely populated with long travel distances

G-77/CHINA SOARING

- Rapid economic & population growth feeds high emission growth rates
- Many other factors affect emissions as well
- Differences in national circumstances among developing countries are even wider than among industrialized countries
- Emission trends underline importance of bringing all major emitters into regime

LEADING G-77 EMITTERS

COUNTRY	2005	% VS 1990	2000 VS 1990	2005 % VS 2000
China	5,059.87	+127.3	+37.1	+65.7
India	1,147.76	+95.5	+65.0	+18.5
Korea	448.91	+97.6	+87.0	+5.7
Iran	407.08	+132.2	+73.9	+33.6
Mexico	389.42	+32.8	+21.9	+9.0
Indonesia	340.98	+140.8	+89.9	+26.8
South Africa	330.34	+29.7	+17.2	+10.7
Brazil	329.28	+70.9	+58.3	+7.9
Saudi Arabia	319.68	+100.7	+56.4	+28.3
Taiwan	261.28	+129.6	+88.9	+21.5
Turkey	218.93	+70.2	+57.5	+8.1
Thailand	214.29	+172.7	+100.9	+35.8
Kazakhstan	154.74	-33.6	-49.9	+32.4
Egypt	147.60	+86.4	+38.5	+34.6
Venezuela	142.31	+35.4	+22.1	+10.9

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EMISSION OUTLOOK

- Most industrialized countries will miss Kyoto targets
- Inertia of infrastructure & consumer behavior will feed near term increases
- 2020 High Scenario: moderate economic growth, slow technology development
- 2020 Low Scenario: weak economic growth, more nuclear, new transport technology

Current State of Play

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WHAT NEXT?

- Emissions are rising in almost all countries and most will miss Kyoto targets
- EU proposal for 2 deg C limit on global temperature rise limits target flexibility
- US talks mostly of technology development
- Developing countries want adaptation help but no emission targets
- “Dialogue” is concurrent monologues

BATTLE IS ON

- EU will push its target proposal based on Kyoto approach, IPCC AR4 and Stern Report
- G8+5 meeting in July will be a critical test of conflicting approaches
- EU believes US will come on board now that Democrats control Congress and Supreme Court says EPA must act
- Canada's attitude at G8 could be important

KEY POINTS - 1

- US will not agree to EU approach because targets are totally unrealistic and harmful
- EPA has broad flexibility in responding to Court decision and can take a number of reasonable actions other than setting targets
- Democratic control of Congress, and maybe White House, does not mean US will jump precipitously toward targets

KEY POINTS - 2

- Countries are not compelled to ratify treaties that are seen to be counter to national interests
- Big countries (US, Russia, China, India, Brazil) can and will resist international political pressure to ratify
- Any effective climate agreement must include the big countries

KEY POINTS - 3

- When real negotiations begin, weaknesses in scientific and economic analysis will be shown
- EU credibility likely to be questioned when it is clear it will need large use of Kyoto mechanisms

KEY POINTS - 4

- Costs of targets are not trivial, as experience in EU and California will demonstrate
- Countries will look for approach that addresses these points and includes big countries

Possible Future Scenarios

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POST-2012 APPROACH

- Economic and political stakes are higher than any other environmental agreement
- Only comparable agreements are trade agreements
- Bottom-up approach is needed, as in trade negotiations, to assure countries agree and can deliver results (ratify and implement)

TRAIN-WRECK SCENARIO

- EU is unlikely to pull back from its target-based approach because too much political capital is at stake
- Negotiations will intensify & become nastier until a stalemate in 2009 produces failure
- Much finger-pointing will follow
- Picking up the pieces will be difficult

BOTTOM-UP APPROACH

- Essence of approach is that each country decides its own mixture of commitments and measures to implement them, in accordance with national circumstances
- US, Russia, China and India are very unlikely to agree to any other approach that does not provide this flexibility
- Canada should support these countries in such an approach to avoid future unrealistic targets

DOMESTIC PROCESS

- Countries need to assess domestic technical, economic and political feasibility of commitments in parallel with negotiations
- Major stakeholders must be consulted throughout process
- Negotiators should understand what domestic actions will be required, what they will cost, in economic, social and political terms, and who will have to pay

DOMESTIC COMMITMENTS

- Emission targets (for those countries where targets are acceptable and workable)
- Policies & measures to reduce emissions
- Technology research and development
- Scientific research and observation
- Public education and awareness

INTERNATIONAL COMMITMENTS

- Financial assistance for mitigation projects
- JI & CDM are included in “lifeboat”
- Climate-friendly investment facilitation
- Technology transfer facilitation
- Joint technology development
- Capacity building
- Financial and technical assistance for adaptation

TECHNOLOGY

- Commitments should cover different time frames (and generations of technologies)
- 5-15 years, based on existing technologies
- 15-30 years, based on technologies identified but not yet commercially proven
- 30-50 years, based on technologies known only in theoretical terms (if at all) but guided by longer-term objectives

DETAILS ON APPROACH

- “A Possible Way Forward on Climate Change,” in *Mitigation and Adaptation Strategies for Global Change*, Volume 9, pp. 295-309, Kluwer Academic Publishers (2004)
- *Climate Change: GHG Emissions Outlook and Response Options*, Volume 1, Chapter 6 (2005)

SUMMARY

- Real process for post 2012 not yet begun
- Negotiations need to take full account of differences in national circumstances
- Top-down target approach cannot do this
- Process of assessing technical, economic & political feasibility must be from bottom up
- Final results should be seen as balanced and fair by all countries

CANADA'S ROLE

- Canada needs to find middle ground between EU top-down approach and US technology-based approach
- Actions to limit emissions should be taken, but should be integrated with other priorities in accordance with national circumstances
- A “bottom-up” approach could be developed in cooperation with US, Russia, China, India and others (e.g., ASEAN countries)