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KOREA ECONOMIC RESEARCH INSTITUTE FORUM

기후변화와 우리산업의 대응방안

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Asia-Pacific
Economic Cooperation

**Asia Pacific Energy
Research Centre**



기후변화와 우리 산업의 대응방안

한국 경제 연구원
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What is Global Warming?

지구온난화와 기후 변화의 이해



Green House Effect



Some solar radiation is reflected by the earth and the atmosphere.

Solar radiation passes through the clear atmosphere.

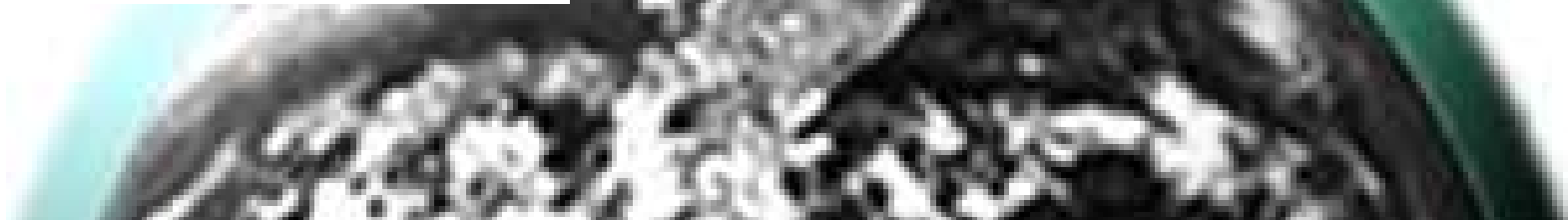


Most radiation is absorbed by the earth's surface and warms it.

Some of the infrared radiation passes through the atmosphere, and some is absorbed and re-emitted in all directions by greenhouse gas molecules. The effect of this is to warm the earth's surface and the lower atmosphere.



Infrared radiation is emitted from the earth's surface.





On Climate Change Science and Difficulties to Cope with Global Warming

과학적 사실과 문제해결의 어려움



Some negative views on climate change science

❖ There is no credible scientific evidence that the earth is warming.

- **The temperature record from weather stations is misleading** because the record is influenced by local conditions rather than global.
- **Sea level measurements are biased.** Stations for measuring sea levels are located close to ports, for which local factors give a greater impact.
- **IPCC's future projections are "scenarios"**, which is based on experts' judgment and knowledge, rather than scientific evidence.
 - Gray (2002) says that no model has ever predicted future climate sequence.
- IPCC reports have **not assessed increased GHG emissions and their effects on climate.**



Difficulties in addressing Climate Change

- ❖ **Economic development/growth**
 - Derived demand for energy consumption
 - Changes in lifestyle – political and social issues

- ❖ **“Tragedy of Commons”**
 - If property rights are well defined there will be no problem with production externalities, but otherwise the outcome of economic interaction will undoubtedly involve inefficiency



기후변화 협약과 교토의정서





기후변화에 대한 국제적 논의의 역사

- 1987: Toronto conference (The World Commission on Environment and Development) - Reduce CO₂ emission 20% below the 1988 level in 2005
- 1988: Worst drought and record high temperature in the US
- 1988: Establishment of IPCC (WMO and UNEP)
- 1989: Norwijk Conference: No regret policy, soft target, CO₂ equivalent concept.
- 1990: IPCC First Assessment Report - the global mean temperature would rise by 0.3°C every 10 years.
 - Bergen Declaration: Stabilization at 2000
 - UN resolution 45/212 - Establishment of INC (Intergovernmental Negotiating Committee)
- 1992: Rio Summit: UN Framework Convention on Climate Change adopted
- 1995: COP 1 at Berlin, Germany - Berlin Mandate - strictly for the North
- 1997: COP 3 at Kyoto - Kyoto Protocol



역사 (2)

- 1998: COP 4 at Buenos Aires - Buenos Aires Plan of Action adopted
- 1999: COP 5 at Bonn
- 2000: COP 6 at the Hague – No agreement was made
- 2001: COP 6 bis at Bonn – Bonn Agreement
- 2001: COP 7 at Marrakech – Marrakech Accord
- 2002: COP 8 at New Delhi – Delhi Declaration adopted
- 2003: COP 9 at Milan
- 2004: COP 10 at Buenos Aires
- 2007: COP 13 at Bali – Bali Roadmap



UNFCCC (기후변화 협약)

■ Rio Summit in 1992

- **Objective:** “Stabilization of GHG concentration”

- **Principles**

- 1) “Common but differentiated responsibility with respective capabilities”
- 2) “Precautionary measures”
- 3) “sustainable development”

- **Commitment:**

- “aim of returning ,....., to 1990 levels”, “by the end of the present decade” - soft target for Annex 1 parties
- Inventory and reporting: National communication for All parties



Kyoto Protocol (교토 의정서)

■ Kyoto in 1997

- Objective: Ultimate objective of convention
- Commitment:
 - On average -5.2% GHG emission reduction in terms of 1990 level between 2008 - 2012 among Annex B parties
- New features
 - A basket of 6 gases
 - Inclusion of sinks
 - Flexibility Mechanism: Bubble, JI, CDM, ET : Introduction of economic instruments



Outcomes of COP13

❖ Bali Roadmap

- To begin discussion on the post-Kyoto regime (after 2013) for the next two years. – participation of the US in the process
- AWG (Ad hoc working group) was created for negotiation

❖ Kyoto Mechanisms

- Parties confirmed the importance of Kyoto Mechanisms for meeting the emissions reduction target, and discussed the operational details of CDM, methodological issues relating to LULUCF and format for registering emissions credit.

❖ Support for Developing Countries

- Parties discussed about development and transfer of technologies, capacity building and financial mechanism and agreed on priorities, and programs.

❖ Reporting and Research



현재의 위치

Where are we?



Where are we?

- ❖ Still unresolved, same old issues in the Negotiation
 - **Equity issue**
 - **Developing country compensation** (Article 4.8 and 4.9 of the convention): Historical responsibility and emissions entitlement
 - **Developing country participation**
 - **US participation**
 - **Transparency:** monitoring, reporting and review
 - **Flexible mechanism:** rules, modalities and guidelines – still very small contribution: about 200 million CER
 - **Enforcement - compliance and non-compliance**



❖ **Principles of UNFCCC**

- 1) "Common but differentiated responsibility with respective capabilities"
- 2) "Precautionary measures"
- 3) "sustainable development"

❖ **Equity issue**

❖ **Developing country containment**

❖ **US participation**

❖ **Non-compliance penalty**

❖ **Quality of carbon-offset**

- Monitoring and measurement
- Quality of statistics

❖ **Implementation/enforcement in the world scale**

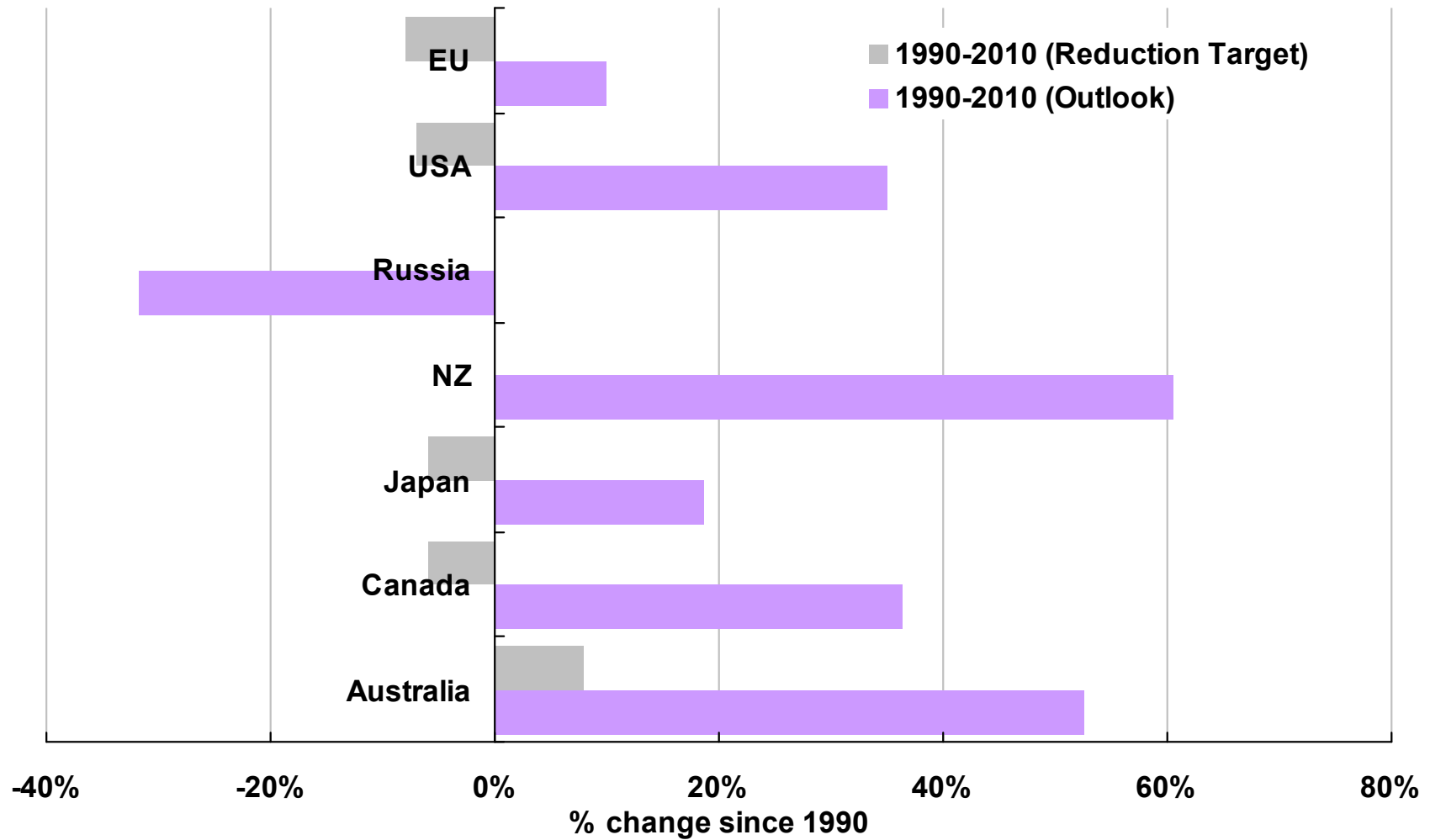
❖ **Procedural Issue**

❖ **Top-down approach may not work locally**

- Target and Time Table vs Policy and Measures



Bleak Future of Meeting the Target



(Source) APEC data is from APERC (2006), "APEC Energy Demand and Supply Outlook 2006", and EU data is from IEA (2007), "World Energy Outlook 2007".



청정개발체제 (CDM)





Flexibility Mechanism

❖ Why do we need them?

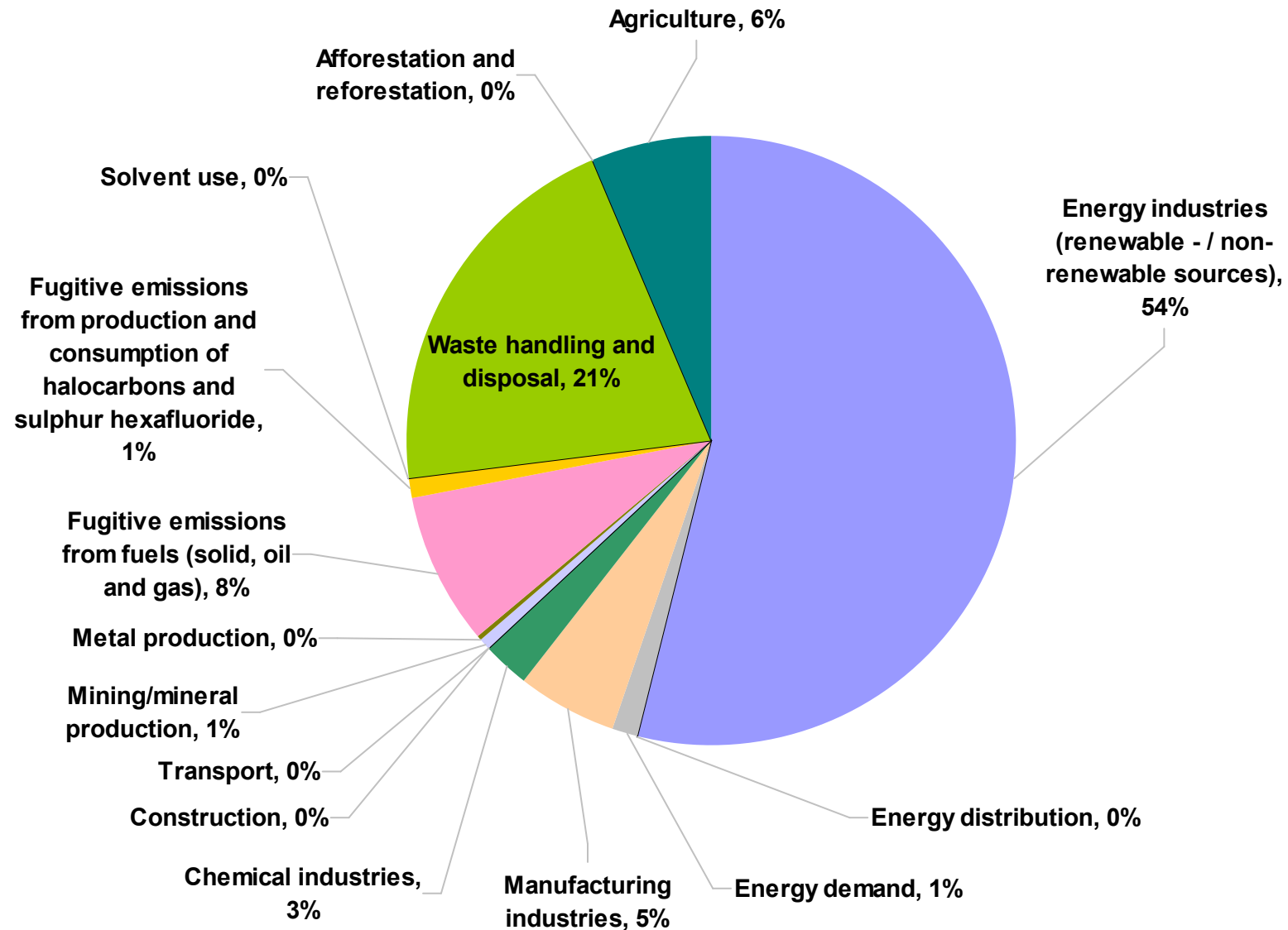
- Assign economic value to GHG emission reduction internationally
- Market principle : Cost reduction
- Private sector participation
- Participation by developing countries
- Enhance cooperation in technology development and diffusion

❖ Current status

- CDM: USD 60 billion
- JI
- Emissions trading: limited to EU and USD 60 billion industry as of 2007



CDM Projects by Scope

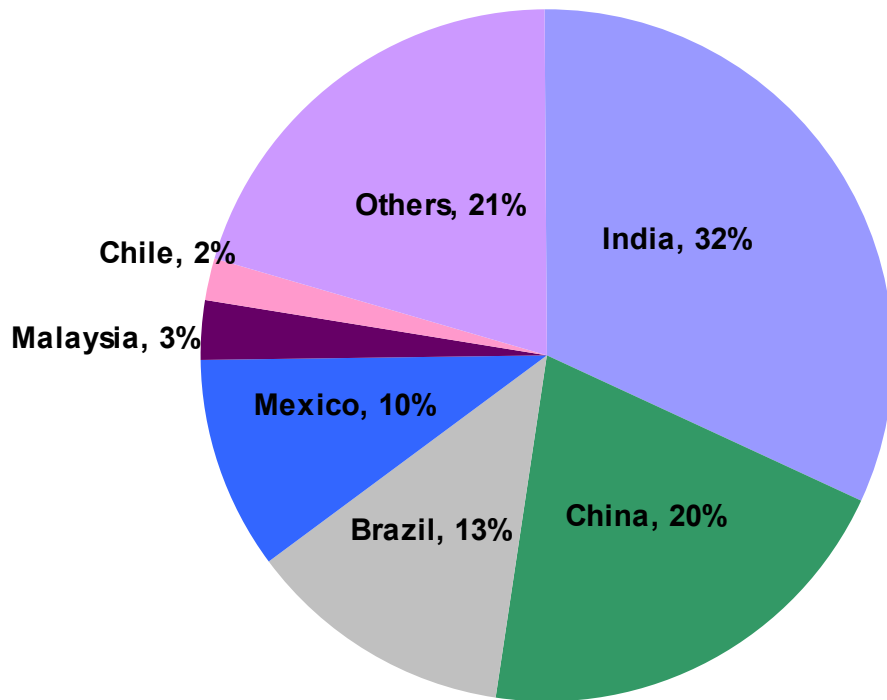


(Source) Data from UNFCCC (2008)

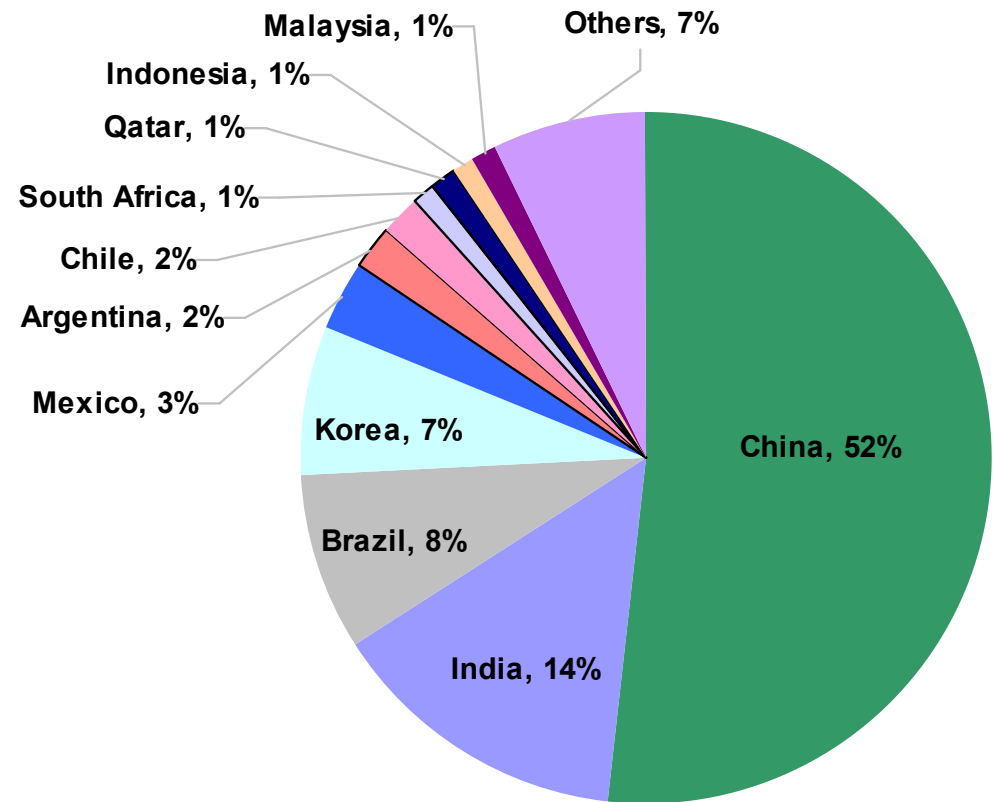


CDM Projects by Host

Registered project by host



Expected CERs per year by host





Expected CO2 emission reduction

	Annual Average CERs	Expected CERs until end of 2012
CDM project pipeline: > 3000	N/A	> 2,700,000,000
of which:		
--- 1056 are registered	214,482,027	> 1,270,000,000
--- 54 are requesting registration	9,937,897	> 40,000,000

(Source) Data from UNFCCC (2008)

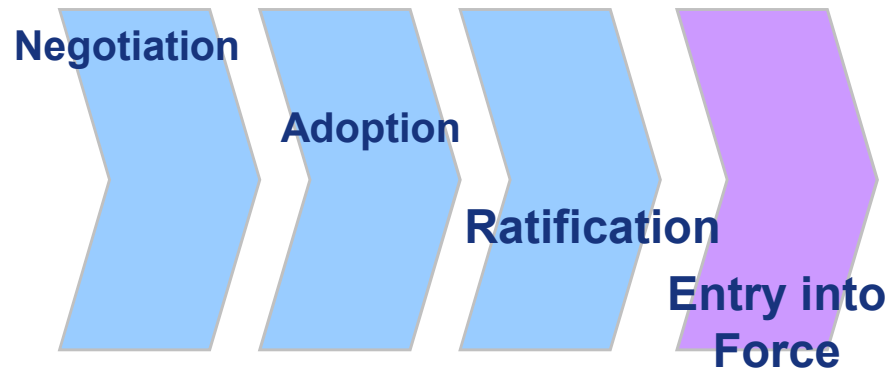


기후변화 협약의 국제적 논의 전망

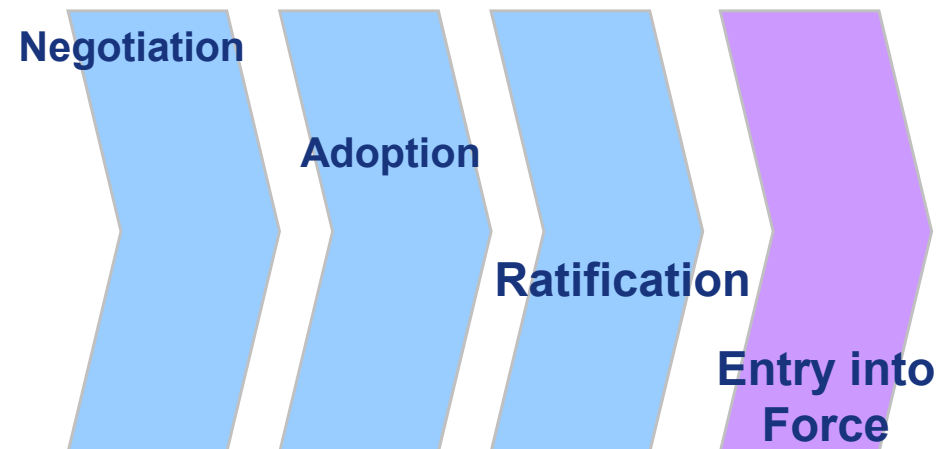


International Agreement: A Process

Convention



Protocol






Country Positions at AGBM8

Issue	Aust.	Canada	EU	Japan	New Z.	Norway	Switz.	USA	G77 & China
Common policies and measures (P&M's)	no	no	yes	no	no	-	yes	no	no
P&M's to suit national circumstances	yes	yes	no	yes	yes	-	no	yes	yes
Include all GHG	yes	yes	no	no	yes	no	no	yes	no
Flat rate QELROS	no	no	yes	no	no	no	no	no	yes
Differentiated targets (QELROS)	yes	yes	no	yes	no	yes	yes	no	no
Net emissions (sources minus sinks)	yes	yes	no	yes	no	yes	no	yes	no
Single year budget period	no	no	no	no	no	no	yes	no	yes
Demonstrable progress by 2005	no	no	yes	no	no	no	no	no	yes
EU bubble	no	no	yes	no	no	no	no	no	-
Emissions trading	-	yes	-	yes	yes	yes	no	yes	no
AIJ/Joint Implementation	yes	yes	no	yes	yes	yes	yes	yes	no
Limitations on trading and AIJ/JI	no	no	yes	yes	-	-	yes	no	yes
Evolution into Annex 1	yes	yes	no	-	yes	-	-	yes	no
Legally binding commitments	no	yes	yes	yes	yes	yes	yes	yes	yes
Developing country compensation	no	no	no	no	no	no	no	no	yes
Consensus decision making	yes	yes	-	-	yes	yes	yes	-	yes



US Perspective

❖ **Multilateral Negotiation vs Bilateral Negotiation**

- US prefers bilateral negotiation
- US has not ratified some international environmental conventions that had entered into force.
 - **Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal**
 - **Convention on Biological Diversity**
 - **Kyoto Protocol to the United Nations Framework Convention on Climate Change**

❖ **US initiatives on environment**

- Alternative to the Kyoto Protocol: Asia Pacific Partnership on Clean Development and Climate (APPCDC)

❖ **US is not “one country”.**

- Coordination among the states would be impossible.



America's Climate Change Security Act of 2007 (미 상원의 Lieberman-Warner bill)

- 미 상원 최초의 기후변화관련 법안
- **Capping greenhouse emissions:** The bill would impose emission limits on electric utility, transportation, and manufacturing industries.
 - Between 2005 and 2012: The bill caps emissions at 5200 million metric tons of CO2 equivalent, the estimated levels during 2005.
 - Between 2012 and 2020: Further reductions of 2 percent per year should result in a 15% reduction below 2005 levels
 - Between 2020 and 2050: Emissions should be reduced by 70% by 2050.
- **Transition assistance:** To smooth the way for companies and individuals, the Lieberman-Warner bill includes financial incentives for reducing emissions
 - Low- and middle-income families: The legislation calls for \$350 billion in assistance for low- and middle-income families through 2030. The money would come from programs such as the Low Income Weatherization Assistance Program.
 - Modernization assistance: The legislation provides \$500 billion through 2030 for investments in zero- and low-carbon technologies.
- 상원 통과에 실패 (2008년 6월 3일) by 48-36 (60 required for being enacted regardless the Republican opposition)



Obama and McCain on Climate Change

OBAMA

- ❖ Cap and Trade
- ❖ More aggressive P&M
- ❖ Targets:
 - 50% energy efficiency by 2030
 - 80% reduction of GHG by 2050 below 1990 level
 - 25% renewable by 2025
- ❖ Investment in clean energy future
- ❖ Re-engage with UNFCCC

McCain

- ❖ Mandatory Limit on GHG emission
- ❖ Cap and Trade
- ❖ Targets:
 - 60% reduction of GHG by 2050 below 1990
- ❖ Ceiling on Carbon-offset price and unlimited carbon-offset trading and allowances
- ❖ China and India
- ❖ No detailed action plan but emphasis on adaptation



미국, 중국 및 일본의 공식적인 입장

- Xie Zhenhua (Deputy Head of NDRC, China)
 - "A breakthrough on technology development and transfer talk will decide whether the whole negotiation on Bali roadmap was successful or not."
- Paula Dobriansky (Undersecretary, State Department, USA)
 - Meaningful participation from all major economies
 - technological revolution
 - preventing deforestation
- **Mr. Yasuo Fukuda**
 - 低炭素社会へ轉換
 - **By 2050, 60~80% below the current emission**
 - **How?**
 - **Technology development and diffusion**
 - **Fiscal policies: tax**
 - **CO2 labelling (carbon footprint)**
 - **地産地消** —protection of local agriculture and forestry



협상에 대한 전망





Questionable future of Kyoto Protocol

- ❖ Negotiation is not easy: there is no “rule of procedure”
 - It took 5 years to Kyoto from Adoption to Enter-into-force
 - **Only consensus is acceptable: “at the age of diffusion”**
- ❖ Too many issues are at stake - Long list of work plan with conflicting issues
 - **Bleak Future of Meeting the Target**
 - **Flexibility Mechanisms**
 - “Nothing happens unless the issue becomes institutionalized”
Joseph F. Coates
 - **Developing Country Issues**
 - Evolution
 - Voluntary Commitment
 - Technology divide is worsening
 - **Absence of the US, business community, financial community**
 - CER as an international currency

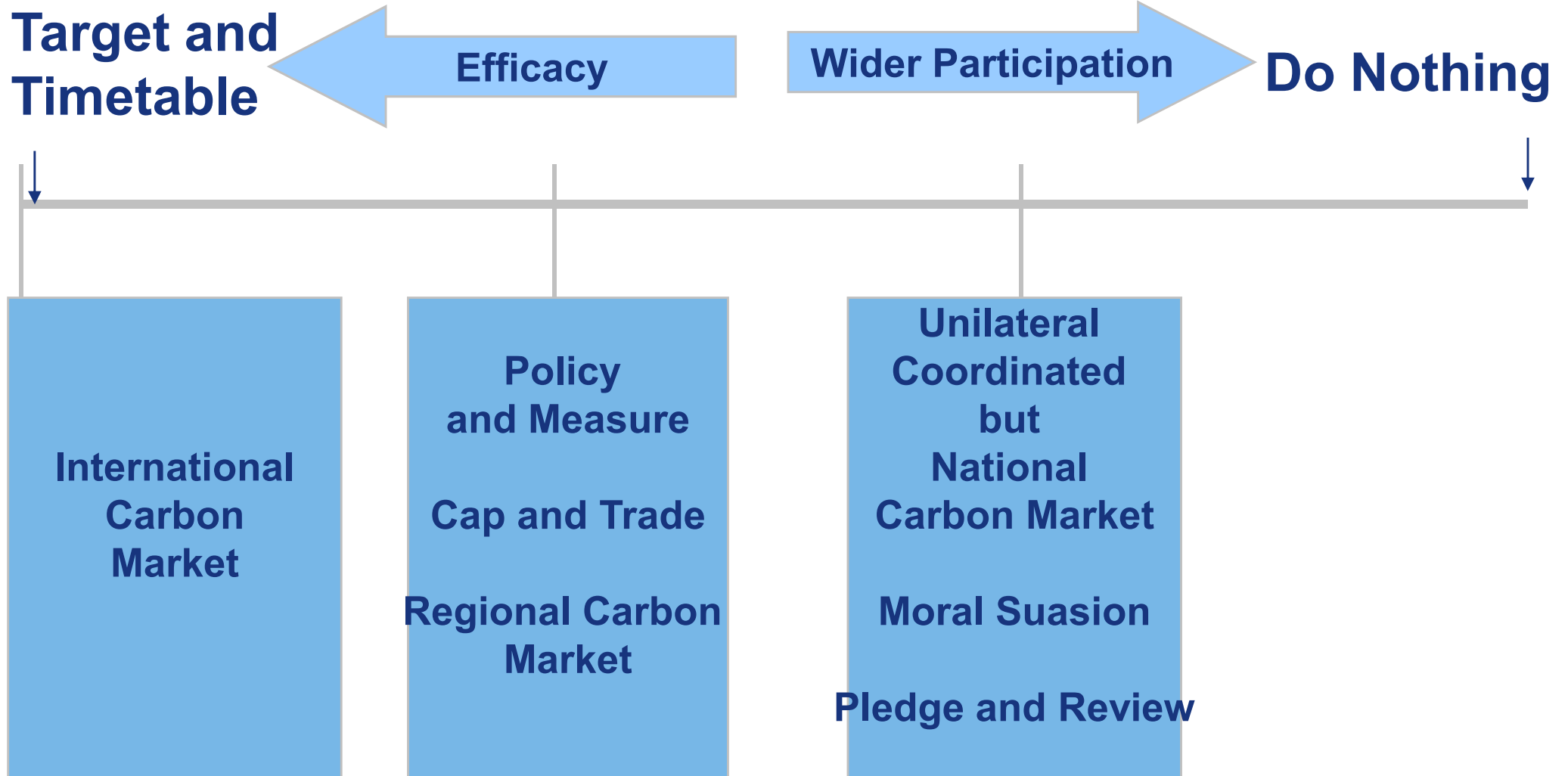


Bali roadmap 의 주요 내용

- Long-term goal
 - Review of Article 9 of the Protocol
- Participation of all parties (191 countries) with flexibility
 - MRV and nationally appropriate ... commitments
 - Developing countries: Tech'y, financing, capacity building
- REDD
- Sector specific action
- Market mechanism
- Adaptation fund



3 Different Approaches





Way forward for Kyoto Protocol

- ❖ **Adoption of New Protocol at Copenhagen in 2009**
 - Broader Participation – Danish Government
 - Article 9
- ❖ **Revision of Kyoto Protocol like Montreal Protocol: 3 Amendments**



한국의 위치

- 미국의 입장에서는 행동통일을 위하고
- 멕시코, 스위스 같은 나라는 우리의 대응에 주목하고 있음
- **EU**는 선진국과 같은 타겟을 받기를 원하고
- 일본은 자국과 같은 정도의 의무부담을 간절히 원함
 - 일본은 알게 모르게 한국을 끌어드리려는 욕구가 아주 강함
 - (AP7의 두차례 회의에서 한국측 의사 타진)
- 개도국은 무상의 기술이전을 원하고 ‘
- 중국은 별 관심없음



국내 동향

- ❖ 지구 환경보호와 우리의 선도적 역할을 주장하는 분들의 “감축 목표” 설정 노력
 - 어느 나라가 감축 목표를 설정하라고 한 적이 있나?
 - 2012년 이후 논의의 근거?
 - 미국과 중국의 협조없는 의정서의 이행이 가능한가?
 - 우리가 우리 스스로 발목을 잡는 타겟을 정하는 것이 우리 국익에 무엇이 도움이 되는가?
- => 사회적 합의를 위한 SOCIAL TECHNOLOGY 부재



Four success factors for an international agreement

- ❖ Senior level commitment
- ❖ Resources: money
- ❖ Strategic vision
- ❖ Effective coordination and cooperation



산업계의 대응





Responses of International Business Community to the Kyoto Protocol: Power Companies

American Electric Power (AEP)

Carbon Sequestration Project in Bolivia

AEP forms a partnership with the government of Bolivia, the Nature Conservancy, the Friends of Nature Foundation to implement a carbon sequestration project in Bolivia. This is the world largest sequestration project that could offset 5-7 million tonnes of carbon over 30 years.

GHG Emissions Trading

AEP is a founding member of the Chicago Climate Exchange, the first U.S. Voluntary cap and trade programme for GHG emissions.

AEP expects to meet its reduction commitment through a broad portfolio of actions, including power plant efficiency improvements, renewable generation, off-system greenhouse gas reduction projects, reforestation and the purchase of emission credits from the Exchange.

Tokyo Electric Power Company (TEPCO)

JI: Australian Afforestation Project

TEPCO has invested in an afforestation project in New South Wales in Australia, which will result in sequestration of 100,000 tonnes of CO₂ a year for 30 years.

CDM: Chilean Methane Recovery Project

TEPCO signed an agreement with Agrosuper, a Chilean food processing company, on a methane recovery CDM project. TEPCO will purchase carbon credits of about 2 million CO₂ tonnes.

Japan GHG Reduction Fund

TEPCO is a member of the Japan GHG Reduction Fund - an organisation that offer financial support to GHG emissions reduction project. TEPCO expects to acquire 1.4 million tonnes of CO₂ credits.

World Bank Carbon Funds/BioCarbon Fund

TEPCO is a partner to the World Bank's Prototype Carbon Fund (PCF) and BioCarbon Fund (BioCF), through both of which TEPCO plans to acquire carbon credits for about 2 million tons of CO₂.



Responses of International Business Community to the Kyoto Protocol: Oil Majors

BP

Emissions Trading

Bp has been a part of UK Emissions Trading Scheme since its inauguration in 2002.

Bp was successful in meeting the target to reduce CO2 emissions by 10% (2001–2002) well in advance of the original schedule, and voluntarily offers further CO2 emissions reduction target.

Energy Efficiency Improvement

A five-year \$350m energy efficiency programme was launched in 2004.

Efforts to improve energy efficiency – throughout their supply chain – has reduced their energy consumption from 1.36billion GJ in 2003 to 1.34 billion GJ in 2004 while their output increased by 15 times (2003–2004).

Cogeneration

Bp aims to use cogeneration system across their business segment. In the end of 2004, bp's installed capacity of cogeneration system was 4,100 MW, and save about 6 million tonnes of CO2

Royal Dutch/Shell

Emissions Trading

Royal Dutch/Shell Group developed and used a pilot international emissions trading system (STEPS) to gain experience and understanding. The system was implemented between 2000 and 2002.

The system allowed trading among a number of Group entities located in Annex1 countries.

Environmental Products Trading Business (EPTB)

Shell Group has established an Environmental Products Trading Business (EPTB).

EPTB is active in 14 emissions trading markets around world: e.g. UK CO2, NL Nox, US SO2, EU Emissions Market, Swedish Elcerts, Australia RECS, and Texas RECS.

CDM

EPTB is also actively developing a CDM business for the Group: e.g. Malaysia, India, Nigeria, Argentina and China

Exxon Mobil

Energy Efficiency

ExxonMobil is committed to reduce the amount of energy it consumes. In 2004, it has reduced energy consumption – throughout its refining and chemical – by 3% compared with the previous year.

Cogeneration

ExxonMobil now has an interest in 85 installations located at more than 30 refineries, chemical plants, and natural gas processing plants worldwide. ExxonMobil's cogeneration capacity, fueled primarily by clean-burning natural gas, enables a reduction in greenhouse gas emissions of 9 million metric tons per year versus traditional methods.

Technology

Through partnerships with manufacturers like Toyota and Caterpillar, ExxonMobil is working on fuel and engine systems that could dramatically improve energy efficiency and reduce emissions.



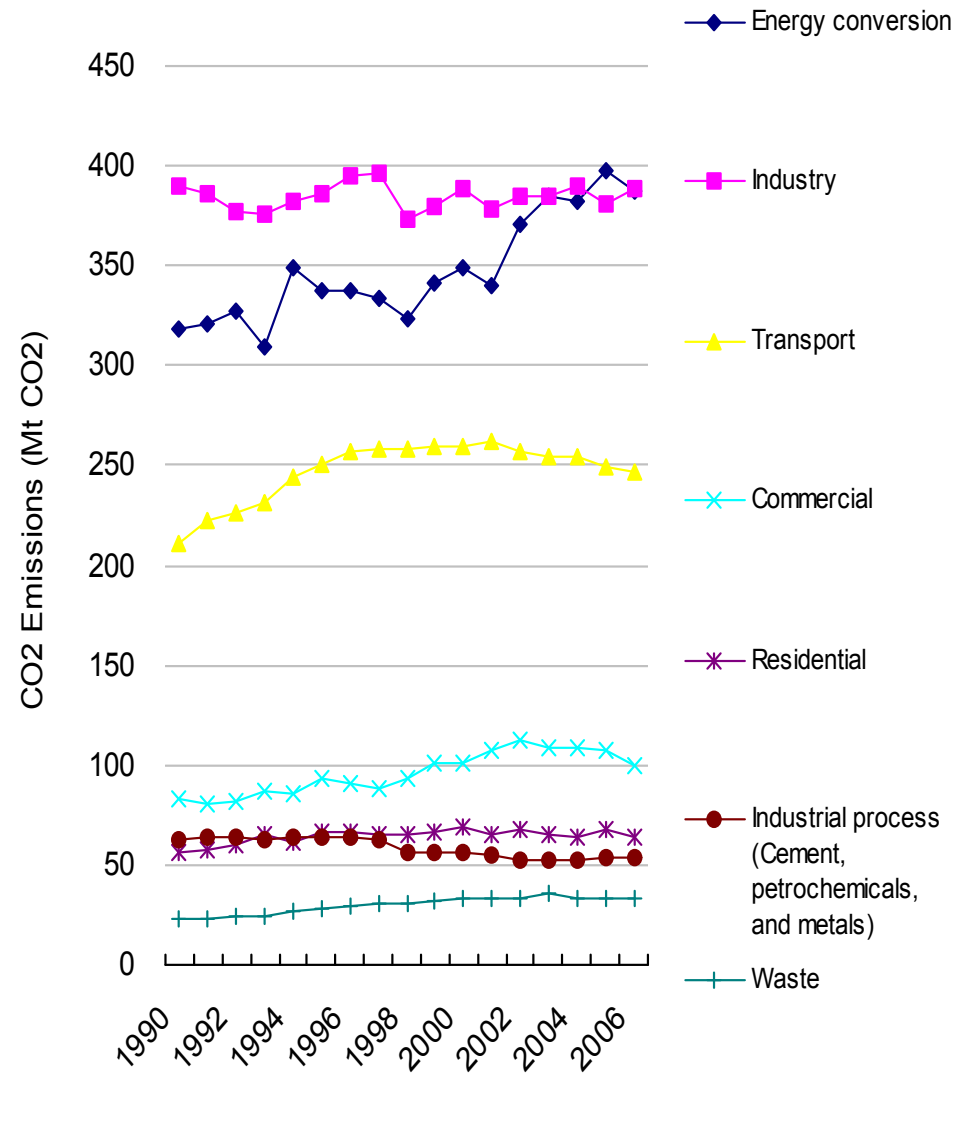
An Overview of Carbon Finance Vehicle

Name	Fund Manger/Equity Provider	Fund Size
Prototype Carbon Fund	World Bank	USD 180 million
Community Development Carbon Fund		USD 40-100 million
Bio Carbon Fund		USD 40-100 million
ERUPT	The Netherland	EUR 32 million + α
CERUPT		EUR 78 million
The Netherlands CDM Facility		EUR 35 million
IFC Netherland Facility	IFC	EUR 44 million
Italian Carbon Fund	World Bank	USD 80 milion
G-G Cap	Natwource	USD 20-40 million
Kfw Carbon Fund	Kfw	EUR 50 million
Japan Carbon Finance	JBIC/DBJ and Japanese Private Companies	USD 180 million



Japan's industry towards meeting the Kyoto Target

- ❖ Nippon Keidanren (Japanese Business Federation) implements voluntary action plan to reduce CO2 emissions
- ❖ Ministry of Environment considers to introduce a nation-wide emissions trading market by 2012
 - **Cap-and-trade**





우리 산업계의 대응 방안

- 동종의 외국 산업계와 연계하여 기후변화 협약 및 교토의정서의 논의 동향의 정확한 파악과 공동 대응체계 구축
- 달성가능한 목표치 제시
- 산업계가 수용가능한 옵션과 로드맵과 그에 따른 비용에 대한 철저한 분석과 검증
- 산업간의 공동대응 체계를 구축하여 (Bubble) low cost option을 찾는 노력의 경주
 - 에너지 관리공단과의 공조



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