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7. EE & C and Environment

- Crimate Change Mitigation -

省エネルギーと環境政策

Mr. Naoki MATSUO Ph.D. 松尾 直樹

Chair Senior Research Fellow Climate Experts

シニアリサーチフェロー 代表



Saving Energy and Climate -Kyoto and Sustainable Development—

Climate Experts

Advisory Service on Climate Strategies

Naoki Matsuo

Climate



n_matsuo@climate-experts.info







Contents of the Presentation

Scientific Aspects of Climate Change Natural Scientific Aspects How to Respond to the Issue Social Scientific Aspects International Framework Climate Change Mitigation Option Types **Domestic Policies and Measures** Co-benefits and Technology Transfer Lessons Learned from Japan's Experiences









Scientific Aspect of Climate Change (III) CO₂ Concentration Trend







Scientific Aspect of Climate Change (IV) Surface Temperature Trend







Scientific Aspect of Climate Change (V) **Surface Temperature Simulation**

2xCO₂

Surface Air Warming (°F)

20 25

15

10 rce: GFDL R15 Climate Model; CO2 transient experiments, years 401-500.

-5

0

5

Surface Air Warming (°F)







Scientific Aspect of Climate Change (VI) Impact of Climate Change (I)







Scientific Aspect of Climate Change (VII) Impact of Climate Change (

Cost of extreme weather events (inflation adjusted)



Losses, in thousand million US dollars









Scientific Aspect of Climate Change (IX) Large Inertia of the System

CO₂ concentration, temperature, and sea level continue to rise long after emissions are reduced









Scientific Aspect of Climate Change (XI) CO₂ Emissions Trend







How to Respond to the Issue (I) Causality of Climate Change

Economic growth Energy consumption CO₂ emissions (fossil fuel combustion) CO₂ concentration increase Absorption of infra-red radiation Global warming (storage of energy) Climate change (regional impacts) (Possible) big interference to society





How to Respond to the Issue (II) Development of Int'l Treaties







How to Respond to the Issue (III) UN Framework Convention on CC

Provide basis of international framework

185 countries (+EC) ratified.

Establishment of Important Concepts

- Common but Differentiated Responsibilities
- GHG Concentration (NOT Emissions) Stabilization as the Ultimate Objective
- Precautionary Principle
- Cost Effectiveness/Efficiency
- Sustainable Development

Commitments for all Parties

- Annex I Parties: (Non-binding) targets. National Communications.
 - Annex II Parties: New and additional financial resources
- Non-Annex I Parties: Submit national GHG inventory.

Information/facilitation oriented

- National Communications
 - GHG inventory, policies and measures,





How to Respond to the Issue (IV) National Communications

Annex I

- The 3rd Round is almost over
- Inventory (important for implementing Kyoto), Policies/Measures, Projections, Impacts/Vulnerability, Adaptation, AIJ/Non-Annex I Assistance, R&D, ...
- In-Depth Review

Non-Annex I

The 1st Round is on-going (91 Parties submitted)
Inventory preparation is most important





How to Respond to the Issue (V) GHG Inventory

Guidelines (http://www.ipcc-nggip.iges.or.jp/)

- IPCC 1996 Revised Guidelines for National GHG Inventories (3 volumes)
- Good Practice Guidance and Uncertainty Management in National GHG Inventories
- Common Reporting Format + Software (http://unfccc.int/resource/ghg/crf_v1.2.zip)

Network



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NAPIID (http://www.iges.or.jp/cc/napiid/NAPIID.htm)
 Network for Asia-Pacific to Improve GHG Inventory Database





How to Respond to the Issue (VI) Kyoto Protocol

Quantified Commitments for Annex B (I) Parties
 OECD Economies in Transition

- 5% GHGs emission reductions from 1990 level for 2008–12 *e.g.*, EU total: -8%, US: -7%, Japan: -6%, Russia: 0%
 Developing countries: No additional commitments
 - Start from developed countries—Common but differentiated responsibilities

Kyoto Mechanisms (market-based instruments)

- Emissions trading, Joint Implementation (JI), Clean Development Mechanism (CDM)
 Flexibility
 - (Bubble,) Banking, 6-gases, sink







How to Respond to the Issue (VIII) GHG Units—Kyoto Currencies

Every units has its own serial number and traceable.







How to Respond to the Issue (IX) Kyoto Mechanisms









How to Respond to the Issue (XI) CDM Now

- 1. Introduction of CDM to Kyoto Protocol as the "Bridge" between South and North 1997
- 2. Marrakech Accords + CDM Executive Board 2001
- 3. Detailed rule preparation [with 3 Panels] 2002-03
 - Accreditation of the Operational Entity (validator/verifier) 16 entities proposed. 1st OE to be designated at COP 9.
 - Small scale CDM
 - Definition, Indicative list of methodologies, Simplified procedures
 - PDD template (version 01)
- 4. Approval process started 2003
 - New methodology approval
 - 2 methodologies just approved (EB 10)
 - First CDM project will be registered in early 2004 (?)
 - Methodologies approval process: every 2 months
 - http://cdm.unfccc.int//





How to Respond to the Issue (XII) Role of CDM

- New Channel
 - Mutual understanding between South and North
 - Opportunity to realize benefits by emission reductions
 - Transfer of technology and money
 - New emerging market of GHG emission reductions
 - New business opportunities and compliance tool for Annex I
 - Also new businesses for non-Annex I companies
 - (emerging interest)
 - Issue remains...





How to Respond to the Issue (XIII) CDM Issue Mapping

- PDD Additionality/Baseline and Methodology
 - How to make the project as CDM?
- DNA Host country institution
 - How to invite foreign investment?
- Domestic incentives Investing country
 - Utilization of CER in domestic emissions trading scheme?
- Project selection
 - What types of project are promising?
 - Financing the project Carbon financing
 - Still unknown in the financial sector
 - Sustainability Public money utilization
 - Small-scale, community-based, ...





How to Respond to the Issue (XIV) CDM Project Cycle and Associated Risks

Project Design

· · · · · Designing the "additional" project?



New Methodology Approval

Validation

Project Implementation

Monitoring

Verification/Certification

CERs Issuance

CDM EB

Sold in the Market

0E

OF

Compliance Tool

- ···· Find out capable consultant?
- CDM EB
 - Registered as CDM without delay?(incl. host country's approval)
 - ···· Planned performance? Without delay?
 - · · · Is monitoring good enough?
 - · · · · · Planned amount of CERs issued?
 - ••••• Market price hover around?





How to Respond to the Issue (XV) CDM Project-Cycle – Validation

PDD Drafting (with New Methodology) Submit to CDM EB through OE Expert desk review + Public comments Meth Panel recommendation Judgement by CDM EB **B**: Resubmit to Meth Panel A-rated: Approved Validation by OE If existing methodology applicable Host country approval, local stakeholder/NGO/public comments Request for registration by OE (w/ validation report) Assessment by CDM EB (w/ host countries) Registration as CDM project by CDM EB





How to Respond to the Issue (XVI) Host Country's Institution

Designated National Authority (DNA)

- How to establish/maintain the DNA?
- How to reduce bureaucracy and enhance efficient decisionmaking?
- Risks associated with host country's CDM policy is crucial to invite CDM projects
 - e.g., many projects proposed in Latin American countries which already established their CDM policy and DNA
 - AIJ experiences are important
 - Clear process and criteria for approval process and supporting scheme





How to Respond to the Issue (XVII) How to Utilize Public Money in CDM

- Public funding for CDM projects is not to result in the diversion of ODA...
 - ODA utilization and Sustainability judged by the host country
 - Consultation between host/investors needed on needs/possibilities
 - Financing the project by ODA
 - Underlying part by ODA + additional reduction part (CDM part) by others
 - Screening the on-going/planned ODA projects and assess the possibility for additional GHG reductions
 - Sustainability-oriented project implementation and support (by packaging with other project)
 - Example: PV project in small island states
 - Redress the regional imbalance of CDM projects
 - Private participants focus on profitable geographical region
 - Supporting smooth implementation of CDM projects
 - Capacity building
 - Information clearinghouse role to match needs and seeds, etc...





How to Respond to the Issue (XVIII) Future of Kyoto Regime

Kyoto provides...

integration of business rationality and environmental integrity

Keeping Kyoto means to provide...

 certainty for private sectors to make forwardthinking strategy under carbon-constrained world

Kyoto mechanisms creates...

new value, which internalizes climate externality and develops a new market







How to Respond to the Issue (XX) Developing Countries' Participation

UNFCCC

Common but differentiated responsibilities

Concerns

- Limits to growth...
- Low-hanging fruits run out...

Opportunities

Full access to the Kyoto mechanisms

Solution (?)

- Recognition: utilizing negative cost options is necessary in the economic development
- Voluntary (intensity) target with some safety valve
- Amendment to the Convention





Climate Change Mitigation (I) GHGs Mitigation Option Types

Energy Conservation

- Energy efficient equipments, electricity generation, CHP,...
- Many negative cost (no-regret) options.

Fuel Switching

- Natural gas, renewables, nuclear.
- Carbon Sequestration
 - Forest conservation, reforestation, afforestation, ...
- Other GHGs reductions
- Technology R&D
- Selection of low carbon economy





Climate Change Mitigation (II) Technological Options by Sector

Buildings

 Energy saving (refrigerator, air-conditioner, fluorescent lamp, cooking oven, insulation, passive-solar design, DSM, ESCO,...)

Transportation

Public transportation, highly-efficient vehicles, infrastructure,...

Industry

Energy saving (industrial processes, motor, waste-heat recycle,...)

Energy Supply

CCGT, CHP (*incl.* fuel cell), hydro, wind, biomass, PV, IGCC, nuclear,...





Climate Change Mitigation (III) Technological Options (cont'd)

Waste

Landfill management, reuse/recycle,...

Agriculture

 Management of waste/fertilizer/rice paddy irrigation,.. renewable energies

Forestry

 Forest management technologies, reforestation/afforestation technologies,...





Climate Change Mitigation (IV) Marginal Abatement Cost Curve





(Source) ADB/GEF/UNEP, ALGAS Report "Viet Nam", 1998





Climate Change Mitigation (V) Domestic Policies and Measures

Categorization of measures

- Regulation, VA, or Market-Based Instruments?
- How Wide the Measure Covers?

How to put the right measure to right sector?

- What are the Merits & Demerits of Each Measure?
 - How to make "portfolio" of Measures?

How to incorporate other policy objectives?
 Identification of other policy objectives rather than C.C.





Climate Change Mitigation (VI) Coverage of Each Instrument

Small Coverage

- Efficiency standards, energy-saving subsidies, PR,...
- Specified option targeted. Government information intensive.

Mid Coverage

Fuel/electricity tax, voluntary agreement

Wide Coverage

- Carbon tax, domestic emissions trading
- Market selects low cost options in the coverage (less info needed)
- Others (non-climate oriented policy)
 - Structural change, energy market liberalization, tax reform,...

How to make portfolio/synergy of these instruments?





Climate Change Mitigation (VII) Advantages of Each Category

Regulation (Standards) and Subsidies

Targeted well-known specific promising technologies

Voluntary Approach

- Easier to accept
- Effectiveness depends on corporate culture and design

Tax on Energy

- Fuel tax: Targeted specific fuel/energy use
- Carbon tax: Wide coverage, least cost framework
- Domestic Emissions Trading
 - Wide coverage, LEAST cost framework, emissions CAP
 - Risk control measure in dynamic and liberalized market





Climate Change Mitigation (VIII) Regulations and Subsidies

Specification of Limited Option(s)
 Government Information Intensive

 Potential, Costs, Barriers, Technical conditions, ...

 Revenue Problem for Subsidies
 Bottom-Cut type and Top-Pull type (Regulation)







Climate Change Mitigation (IX) Portfolio and Interactions







Climate Change Mitigation (X) **Objective Mix related to Tax Taxation Policy Climate Policy** • Tax reform • GHGs emission limitation • Shift to indirect tax • Voluntary initiative • Revenue stability • Promoting energy saving • Social security issue • Tech. development, etc Greening tax system, etc **Energy Policy** Tax on **Industry Policy** Market liberalization Energy • Avoid too much burden • Energy security (C.C. tax) • Int'l competitiveness, etc Coal industry **Diplomatic Policy** • Renewables • Int'l policy harmonization • CHP, etc • Dialogue with OPEC • Development support, etc





Climate Change Mitigation (XI) Co-Benefits

Energy cost saving

Usually, energy saving is the *no-regret* (minus cost) option.

Local employment and economy

- New opportunities generated
- Local environment (pollution abatement)

• Air pollution abatement, bio-diversity, forest management,...

Energy security (self-sufficiency improvement)

Governmental tax raise (for energy tax)

How to maximize synergy with other socio-economic effects?





Climate Change Mitigation (XII) Institutional Barriers

Unstable macro-economic conditions Lack of commercial financial institutions Solution: Green financial products, e.g., small-grants facilities,... **Distorted/incomplete prices** Solution: Internalize externalities by e.g., removing subsidies,... Lack of proper infrastructure Misplaced incentives Lack of effective regulatory framework Lack of proper information Lifestyle, behaviors, custom, consumption pattern





Climate Change Mitigation (XIII) Barriers in Technology Transfer

Lack of information

Political/economical barriers

- Lack of capital
- High transaction costs
- Lack of full-cost pricing
- Trade and policy barriers, ...

Institutional limitations

- Insufficient legal protection
- Inadequate environmental codes and standards, ...
- Insufficient human capabilities





Climate Change Mitigation (XIV) Opportunities in Tech. Transfer

Building capacity

 Human capacity, organizational capacity, information assessment & monitoring capacity

Enabling environment for Technology Transfer

 Institutional, legal framework development to assist EST transfer

Mechanisms for Technology Transfer

National systems of technology innovation/diffusion
ODA, MDBs, UNFCCC (GEF/AIJ), Kyoto mechanisms





Climate Change Mitigation (XV) Digestion of Technologies

Steps of Technology 'Digestion':

- 1. Operation of transferred facilities/technologies
- 2. Broaden knowledge base of existing technologies
 - Access to information + Capacity for applications
- 3. Identify applicability of existing technologies
 - Optimize by integrating technologies to a "system"—tailored application to the conditions
- Capacity Buildings [necessity condition] —Coping with specific situations/barriers (beyond universal solution)

How?

- **Technical Training**
- Institutional Support





Climate Change Mitigation (XVI) Energy Manager System (Japan)

- Synthesizing Capacity Building and Energy Management (Rational Use of Energy)
 - Bottom-Up Capacity Building Programme
 - Mandatory for Energy-Intensive Factories
 - Examination and Licensing
 - Energy Planning and Periodical Reporting

This System has played a very important role for Japan to be one of the most energy efficient country

- Japan succeeded in decoupling GDP growth and energy increase
- Promoting technology development, maximizing the potential of low-cost energy saving options





Climate Change Mitigation (XVII) Why Japan's Efficiency is High?

High Energy Price

Imported fuels, high income, small land area

Technology-oriented Nation

Culture: Pursuing better performance...

 Technology-oriented governmental policy and supporting institutions

Energy Conservation Law

- Designated energy management factories and qualified energy managers system
- Top-runner approach for equipments standards
- Financial support (subsidies) for energy saving activities in industry







Climate Change Mitigation (XVIII) Energy Management Institution

Overview

- Qualified energy managers (heat and electricity)
 - Qualified as experts through exams and training

Designated energy management factories

- 1st Class (manufacture, energy supply, mining; >4,000)
 - Heat: >3,000 kl-oe/yr; Electricity: >12 GWh/yr
 - 70% coverage of energy consumption in manufacturing sector 2^{nd} Class (others; threshold = 1/2 of 1^{st} Class; >6,000)
- Performance report and mid-term plan (annually)
- Support by central/regional governmental offices
- History
 - Start (1947; recovery from damage of the World War II)
 - Strengthened (1979; Oil Crises) and (1999; Kyoto Protocol)





Climate Change Mitigation (XIX) Obligations

Standard/Target Value Setting (by type/scale)

- Air ratio (boiler, industrial furnace)
 - Waste gas temperature (boiler)
- Waste heat recovery rate (industrial furnace)
- Furnace wall outer surface temperature
- Power factor (motor, furnace, welding, rectifier)
- Efficiencies for totally enclosed motors

Overall Improvement Target (mid-term)

- 1% annual improvement of intensity for the factory
 - Including investment; economically/technically feasible

Inspection/follow-up by the Government

Instruction to draw detailed improvement plan





Climate Change Mitigation (XX) How to Manage Energy Use

- 1. Organizing energy management system
- 2. Target setting for energy saving
- 3. Grasping status-quo of energy use
- 4. Management of energy intensities
- 5. Preparing "Energy management manual"
 - Management rules; manual for key equipments; checksheet by equipment; report with self-grading
- 6. Drafting improvement plan
- 7. Implementing the plan
- 8. Review and assessment
- 9. Standardization and information sharing





Climate Change Mitigation (XXI) Actual Situation

Much more managers than required legally Example of an iron works] 106 (actual) / 7 (legal) Utility (boiler, power supply) ~ Manufacturing section Appropriate decision-making Distribution: All classes including executive officers Stringent compliance Annual reporting (>99%), management (91%), Periodic check (80%) System Proposal to corporate management side (92%) and instruction to employee side (97%) Request for the Government Support Technological information > Financial support





Climate Change Mitigation (XXII) Lessons Learned...

Government initiated self-capacity building Facilitative approach Promoting "rational" use of energy • Market: imperfect \Rightarrow more perfect Discovery of 'hidden' low cost options by thorough check Organizational response in a company Appropriate inputs to the corporate decision-making Wide-spread experts in many areas (sectors, low/high class) Top-down requirement: Keidanren's Voluntary Commitment Incentives and information disseminations

Competitive awards by the Government





Adaptation to Climate Change (I) What is Adaptation?

Measures to cope with extreme weather events

- Social infrastructure
 - against flood, typhoon, ...
- Crop species
 - against heat, draught, diseases, insects, ...
- Health
 - against vector-born diseases, heat waves, clean water supply, ...
- Bio-diversity

Adaptation measures are needed for vulnerable and poorer people...





Adaptation to Climate Change (II) (New) Funding Channels

Existing Funds

• GEF

Bi-/Multi-lateral channels

Special Climate Change Fund

LDC Fund

Adaptation Fund (Kyoto Protocol)

Kyoto Initiative (Japan)
 US\$ 4 billion (Dec.1997–Mar.2000)





Concluding Remarks

Climate Change Issue contains very difficult aspects to tackle internationally and domestically

- Linkage to energy consumption and economic growth
- South-North issue, equity, sustainable development
- Huge uncertainties
- International framework (IPCC & FCCC) has been developed
- Mitigation to climate change
 - Removing barriers to maximize potential is the key (info/skill)
 - Big opportunity to respond many aspects of sustainability
 - Saving Energy = Saving Money = Saving Environment
 - Portfolio of instruments and policy objectives
 - Not *whether*, but *how* ?