Recap of Waste Management/Handling CDM Project

8 July 2011

Satoshi Sugimoto
JICA Expert Team

1. Waste Management and GHGs Emission

Waste Discharge at Sources

Collection and Transportation

Intermediate Treatment

Final Disposal at Landfills

CO_2

Fuel combustion by collection vehicles

CO_2

In the case of incinerating waste with the use of fossil fuels

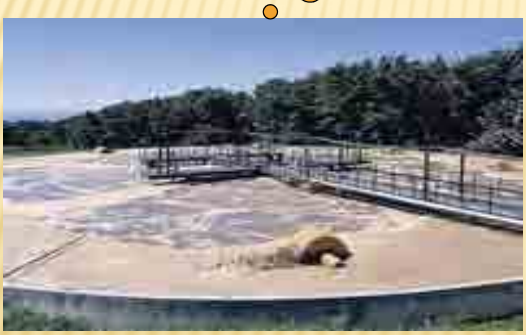
CH_4

Anaerobic decomposition of organic wastes

2. Wastewater Management and GHGs Emission

CH_4

(Anaerobic Decomposition of organic matter)



Domestic Wastewater

Agricultural Wastewater

3. CDM Project Prototypes

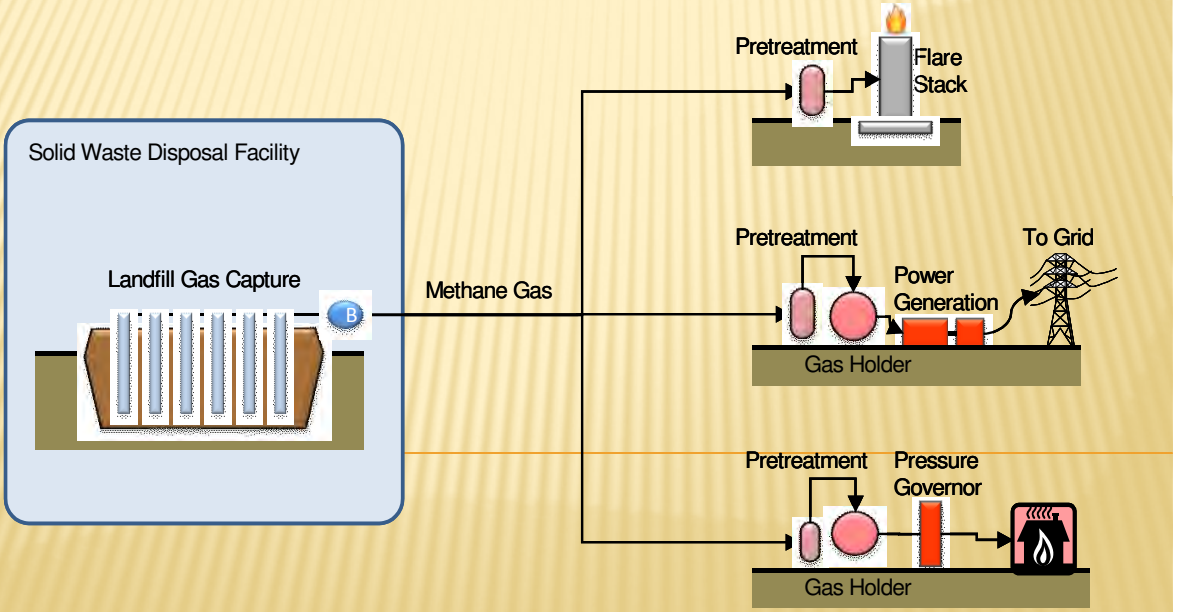
GHG emission source	Emission Reduction Methods	
Solid Waste/ Wastewater	CH_4 Capture	Flaring (Burning)
		Direct Heat Use
		Power Generation
	CH_4 Emission Avoidance/Reduction by Aerobic Treatment of Organic Matter	

Composting

Applicable GHGs emission reduction methods are basically same for solid waste and wastewater treatment.

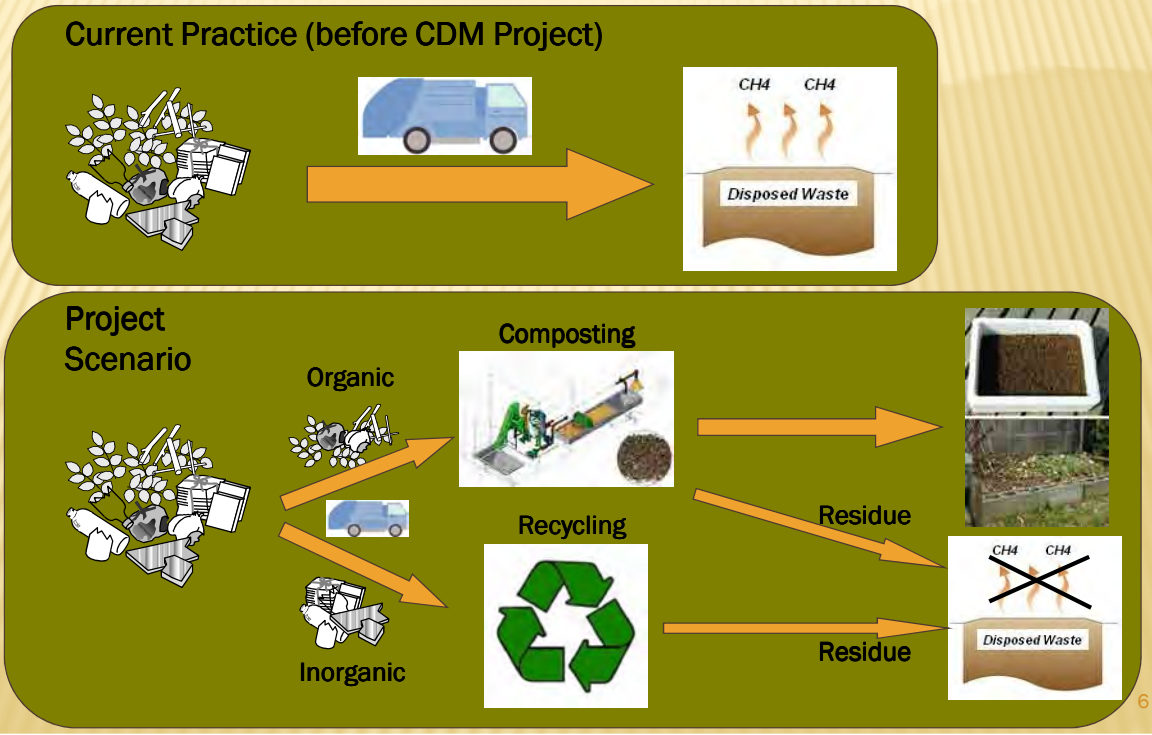
3. CDM Project Prototypes

(1) Methane capture from waste landfill



3. CDM Project Prototypes

(2) Methane avoidance by composting of organic matter in solid waste



4. Key parameters in CH_4 emission from waste

CH_4 emission from waste

- CH_4 is generated as a result of **degradation of** ① organic materials under ② anaerobic **conditions**.
- **The time required for the waste to decay (half-life) is different among the types of waste**.
- **Part of CH_4 generated is oxidized** in the cover of solid waste disposal (CH_4 oxidation by methanotrophic micro-organisms in cover soils).

Key Parameter in CH_4 emission

- Degradable ① organic materials (Degradable Organic Carbon: DOC) in waste.
- Degree of ② anaerobic condition in waste (Methane Correction Factor: MCF).
- The time required for the waste to decay (decay rate)

5. Exercise: Estimation CH_4 emission from SWDS

Question	Estimate the amount of CH_4 emission from the solid waste disposal site in accordance with the steps below.

STEP 1: Estimate the amount of waste disposed by types of waste based on the data given below.

Waste amount and composition

Items	Preconditions	
The amount of waste disposed		100,000 tons/year
Waste composition by types (% by weight)	Paper/Cardboard	15%
	Textiles	3%
	Food waste	25%
	Wood	5%
	Garden and park waste	15%
	Inert waste	37%

5. Exercise: Estimation CH_4 emission from SWDS

STEP 1: Estimate the amount of waste disposed by types of waste based on the data given below.

Answer (Amount of Waste by Types)

Type of Waste	Amount (tonnes/year)
Paper/Cardboard	15,000
Textiles	3,000
Food Waste	25,000
Wood	5,000
Garden and Park Waste	15,000
Inert Waste	37,000

5. Exercise: Estimation CH_4 emission from SWDS

STEP 2: Estimate the total amount of DOCs (Degradable Organic Carbons) decayed in the first year by using the estimation results made in STEP 1 and the data given below.

Type of Waste	Content of DOCs in the Waste (% on weight basis)	Decay rate of DOCs in the first year (%)
Paper/cardboard	40%	6.8%
Textiles	24%	6.8%
Food Waste	15%	33.0%
Wood	43%	3.4%
Garden/park waste	20%	15.6%
Inert waste	0%	0%

5. Exercise: Estimation CH_4 emission from SWDS

STEP 2: Estimate the total amount of DOCs (Degradable Organic Carbons) decayed in the first year by using the estimation results made in STEP 1 and the data given below.

Answer (Total Amount of DOCs decayed in the first year

Type of Waste	Amount of DOCs decayed in the first year (tonnes/year)
Paper/Cardboard	408
Textiles	48
Food Waste	1,237
Wood	73
Garden and Park Waste	468
Inert Waste	0
Total amount of DOCs decayed in the first year	2,234

(Round down at decimal point.)

5. Exercise: Estimation CH_4 emission from SWDS

STEP 3: Estimate the amount of CH_4 released to the atmosphere in the first year if all the waste above is disposed at the unmanaged landfill with 7m depth, using the estimation result above and the data given below.

Equation for estimating the CH_4 emission (in CO_2 equivalent) from waste landfill

CH_4 emission (in tonneCO_2e)

= 5.67×MCF×(Total amount of DOCs decayed in the first year)

MCF: Methane correction factor (to determine the fraction of methane that are actually released to the atmosphere without oxidization, depending upon the type of landfills)

Type waste landfill	MCF
Managed- anaerobic	1.0
Managed-semi-aerobic	0.5
Unmanaged-deep (>5m waste) and/or high waste table	0.8
Unmanaged shallow (<5 m waste)	0.4
Uncategorized waste disposal	0.6

5. Exercise: Estimation CH_4 emission from SWDS

ANSWER	10,133 Tonnes CO_2e

(Round down at decimal point.)

Follow-up Seminar
Energy Saving & Fuel Change

JICA Expert Team

8 July, 2011

Contents

- Review examples of project cases of
  - Fuel Change
  - Energy Efficiency

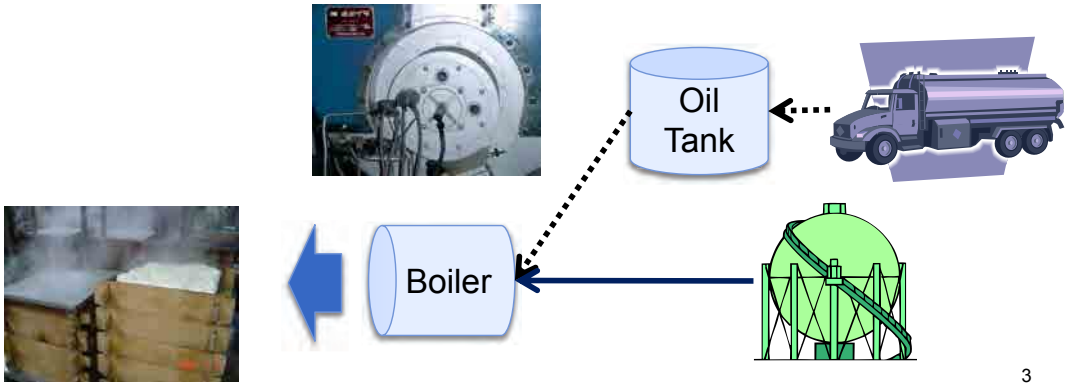
- Objective
  - Understand the measurement & calculation of energy saving projects

Project A: Boiler Fuel Change

The food factory runs 1.5 t of boiler to provide utility steam of the plant to cook and sterilization.

The boiler runs from 6AM to 6PM including start up time. The facility runs 264 days last year.

The project changes fuel of the boiler from furnace oil to natural gas to save fuel costs. According to the invoice, the facility bought 1,752 kl of furnace oil last year.



Project A: Boiler Fuel Change

Calculate CO2 Emissions of before and after the project

Items	Value	Unit
Emission Factor		
Furnace Oil	3.084	tCO2/kl
Natural Gas	2.108	kgCO2/Nm3
Heat Value		
Furnace oil	39.85	GJ/kl
Natural Gas	46.10	MJ/Nm3

Project A: Calculation Steps

1. CO2 Emissions from furnace oil consumption

   1,752 (kl) x 3.084 (tCO2/kl)

   = 5,403.17 (tCO2)

2. Amount of Natural Gas required to alternate Furnace Oil.

 2-1. Heat energy supplied by furnace oil.

   1,752 (kl) x 39.85 (GJ/kl)

   = 69,817.2 (GJ)

 2-2. Required natural gas to supply same heat energy as furnace oil.

   69,817.2 (GJ) ÷ 46.10 (MJ/Nm^3)

   = 69,817.2 x 10^3 (MJ) ÷ 46.10 (MJ/Nm^3)

   = 1,514.47 x10^3 (Nm^3)

 2-3. CO2 emissions from natural gas consumption

   1,514.47 x 10^3(Nm^3) x 2.108 (kgCO2/Nm^3)

   = 3,192.50 x 10^3 (kgCO2)

   = 3,192.50 (tCO2)

3. Reduction Amount

   5,403.17(tCO2) – 3,192.50 (tCO2) = 2,210.67(tCO2)

Project B: LED Lighting Application

Light Emitting Diode (LED) is a lighting devices to alternate traditional lamps.

LED gives more concentrated lighting than conventional lighting and needs less electricity to provide the same luminance. Project replace old halogen lamps in factory and warehouse space to LED.

The factory and warehouse operates is the same working hours, starts at 6AM and close at 6PM with 264 working days a year. Emission coefficient of electricity is 0.686 tCO2/MWh.

Elec. Power of Hg lamp	400	W
Number of Hg lamp	137	Units

Elec. Power of LED lamp	118	W
Number of LED	83	Units

Project B: Calculation Steps

1. Calculate Hg lump's electricity consumption & CO2 Emissions.

   400 (W/unit) x 137 (units) x 12 (hours/day) x 264 (days)
   = 173,606,400 (Wh/year)
   = 173,606.4 (kWh/year)
   173,606.4 (kWh/year) x 0.686 (tCO2/MWh)
   = 173.61 (MWh/yaer) x 0.686 (tCO2/MWh)
   = 119.1 (tCO2/year)

2. Calculate LED lump's electricity consumption & CO2 Emissions

   118 (W/unit) x 83 (units) x 12 (hours/day) x 264 (days)
   = 31,027,392 (Wh/year)
   = 31,027.4 (kWh/year)
   31,027.4 (kWh/year) x 0.686 (tCO2/MWh)
   = 31.03 (MWh/year) x 0.686 (tCO2/MWh)
   = 21.29 (tCO2/year)

3. Calculate reductions and savings.

   Electricity Saving is;
   173,606.4 (kWh/year) – 31.027.4(kWh/year)
   = 142,579 (kWh)
   119.1(tCO2/year) -21.29 (tCO2/year)
   =97.81 (tCO2)

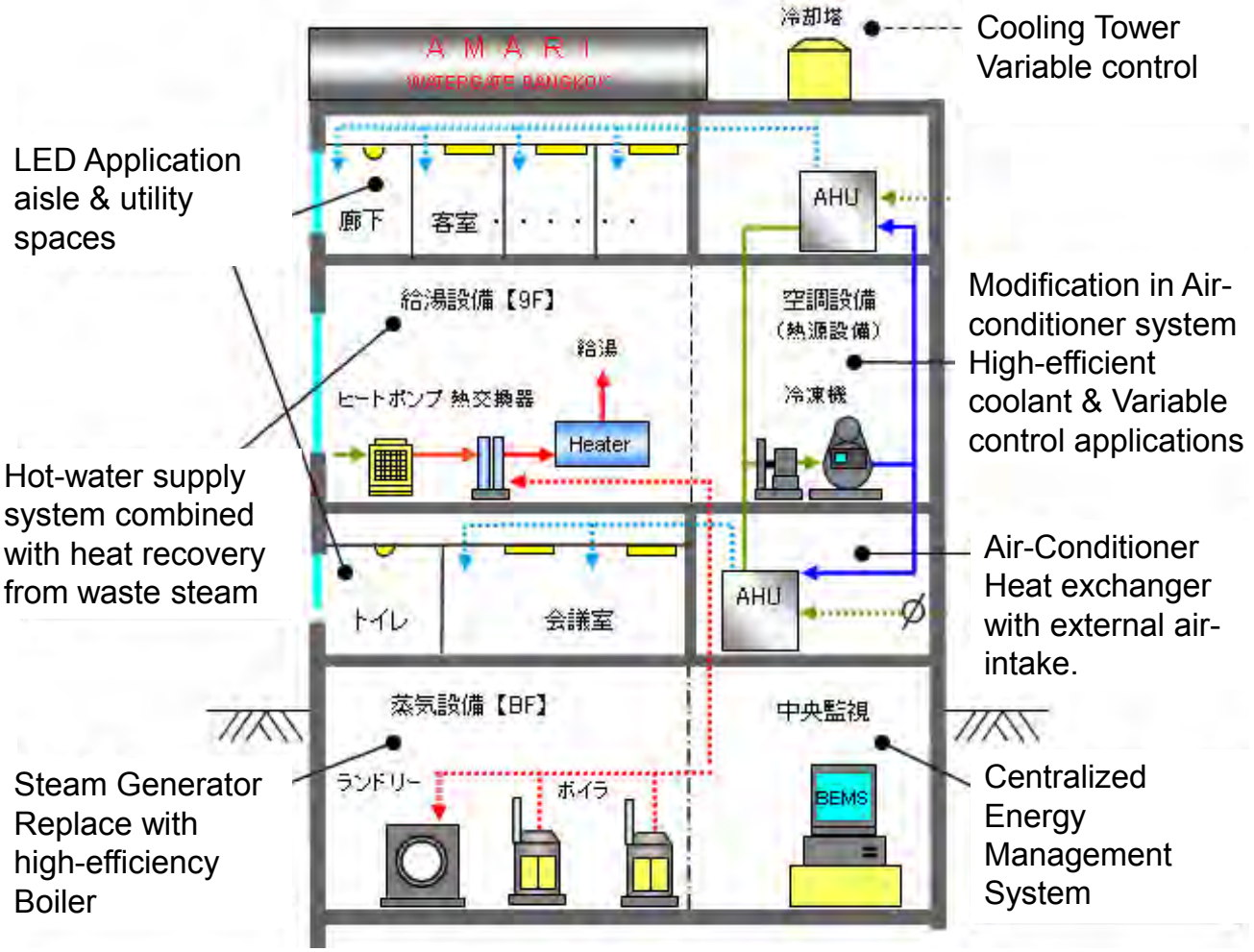


Figure 3.8- Hydro/Thermal/Non-conventional Energy Share in the National Grid

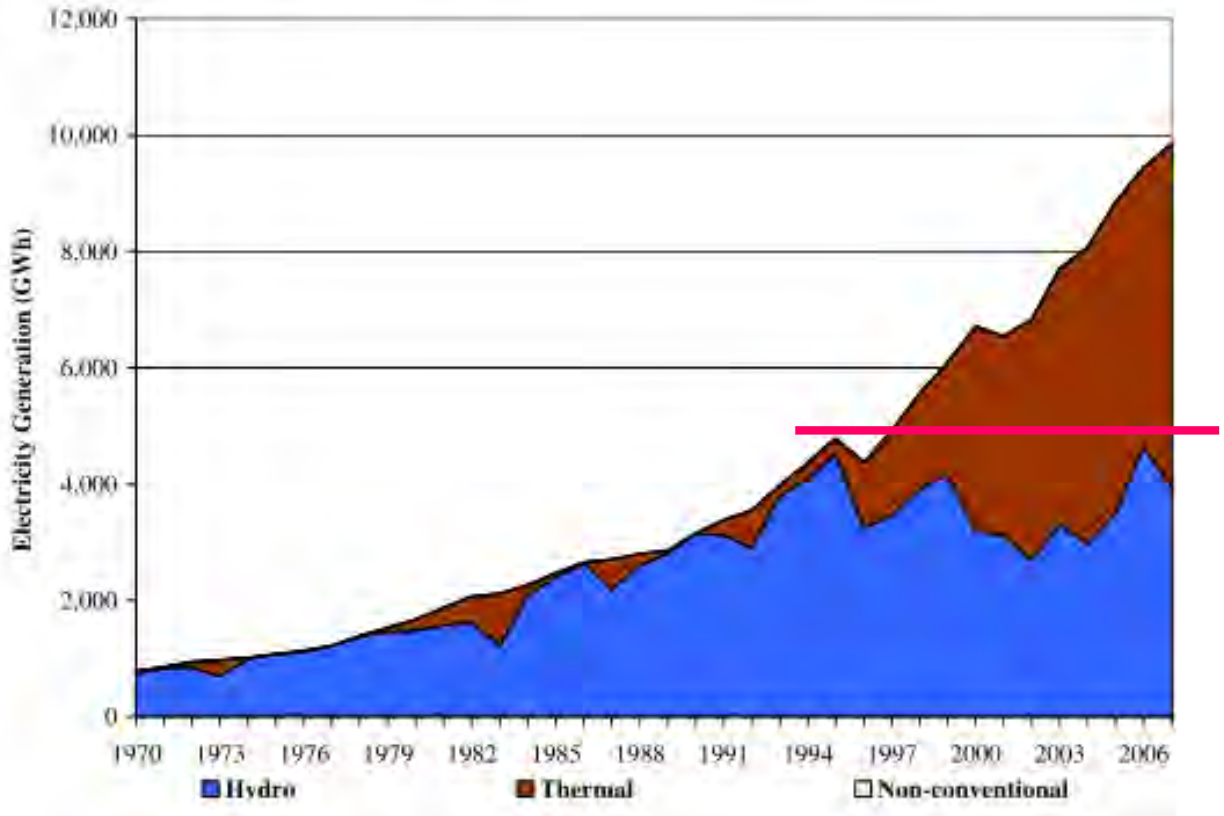
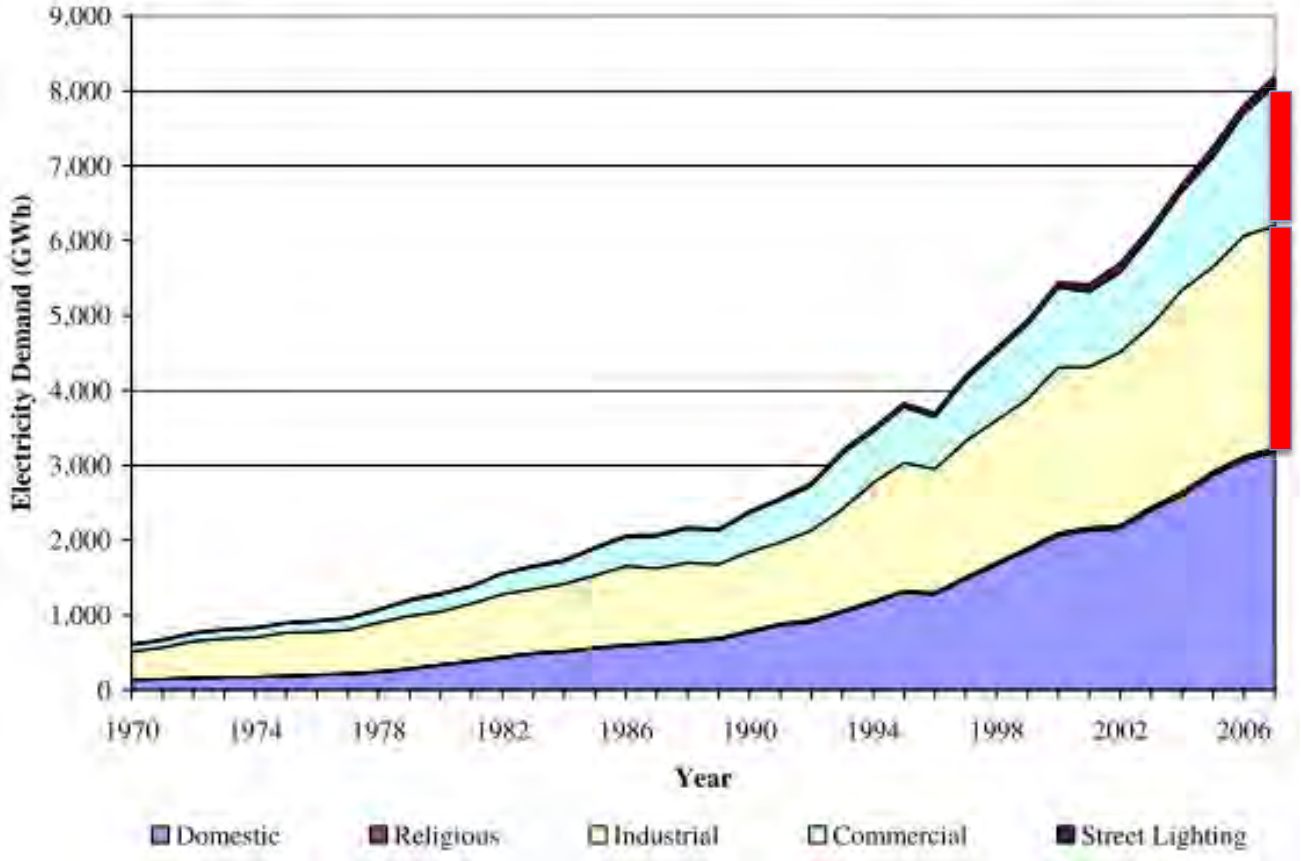


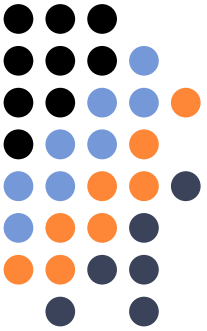
Figure 5.4 – Electricity Demand by Consumer Category



Afforestation Reforestation Review Session

8th July 2011

JICA Expert Team
Shiro Chikamatsu



Objectives of the Seminar

- To review the concept of non-permanence
- To further understand the mechanism of l-CER and t-CER
- To review the concept of credit pooling approach
- To further understand the application of the credit pooling approach to forestry credit projects

Non-Permanence: Review

- Trees stocks carbon (thus it is a carbon sink).
- Once the tree is combusted or rotten, CO_2 and methane are released to the atmosphere.

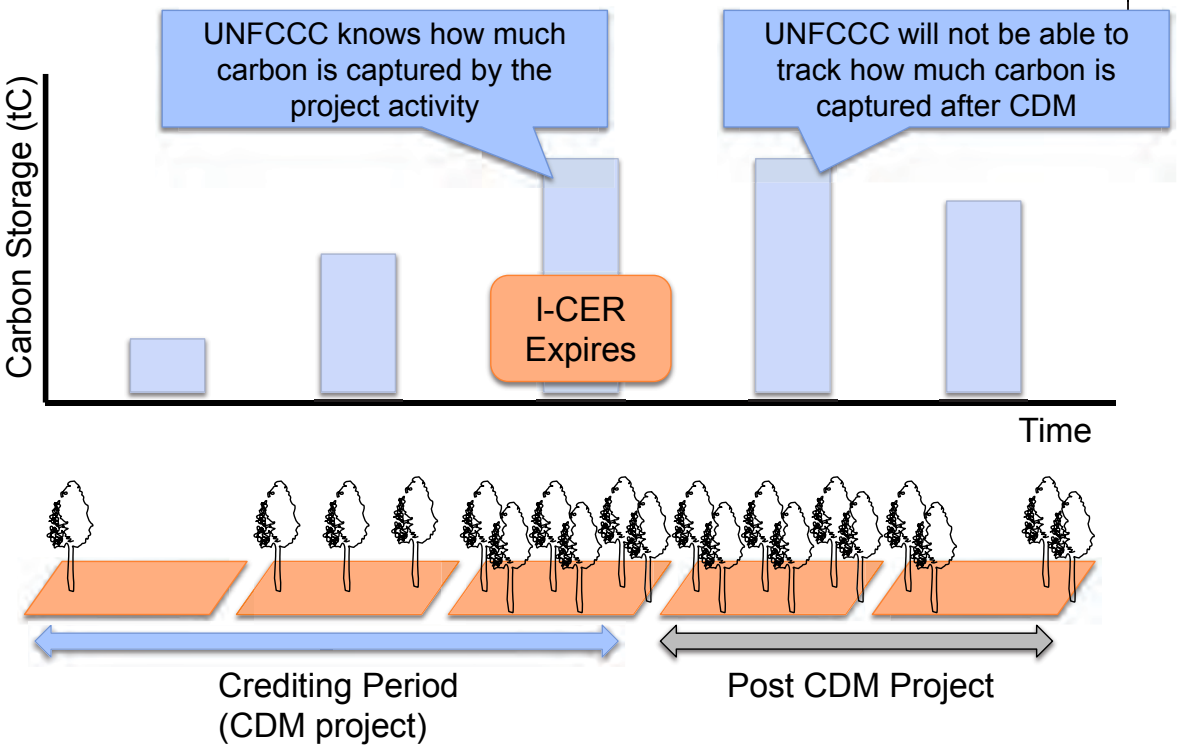
Carbon credit generated from A/R CDM activities are different from the other CDM projects. **They are time limited credits.**
l-CER: expires at the end of the crediting period (end of project)
t-CER: expires during every commitment period (end of Kyoto Protocol)

l-CER in Detail

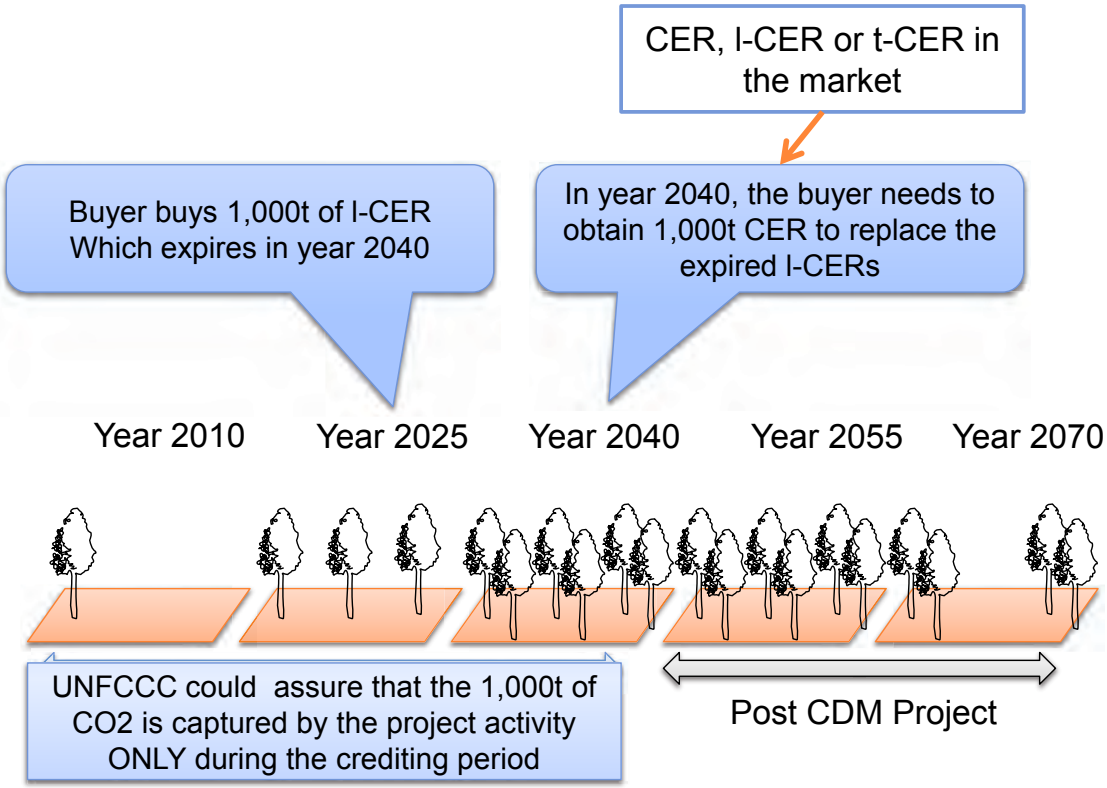
Due to the non-permanent nature of A/R CDM projects, the sequestered carbon may be released into the atmosphere during and after the CDM project activity. UNFCCC could monitor such activities only during the crediting period of the project and not after the end of the crediting period.

Unlike the conventional CERs, t-CER expires once the A/R CDM project ends.

l-CER in Detail



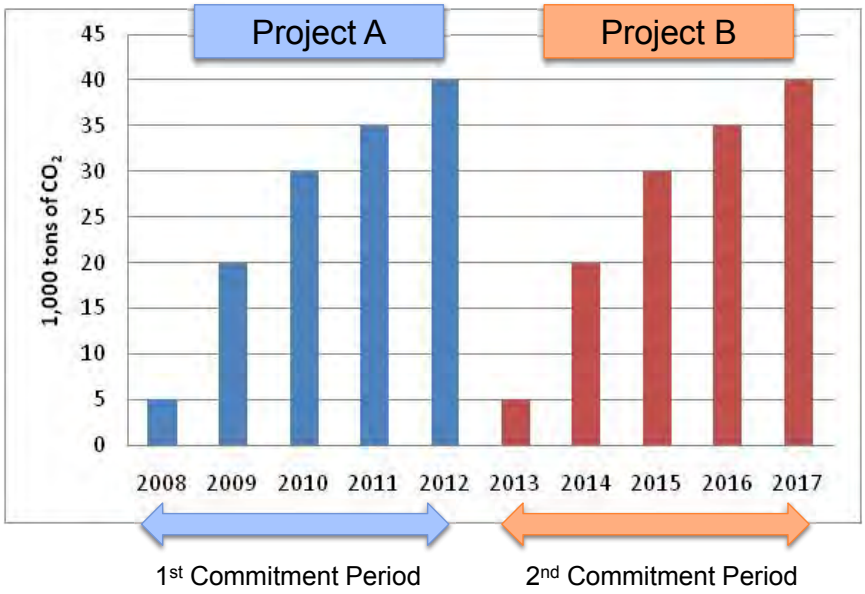
l-CER in Detail: Buyers Perspective



t-CER

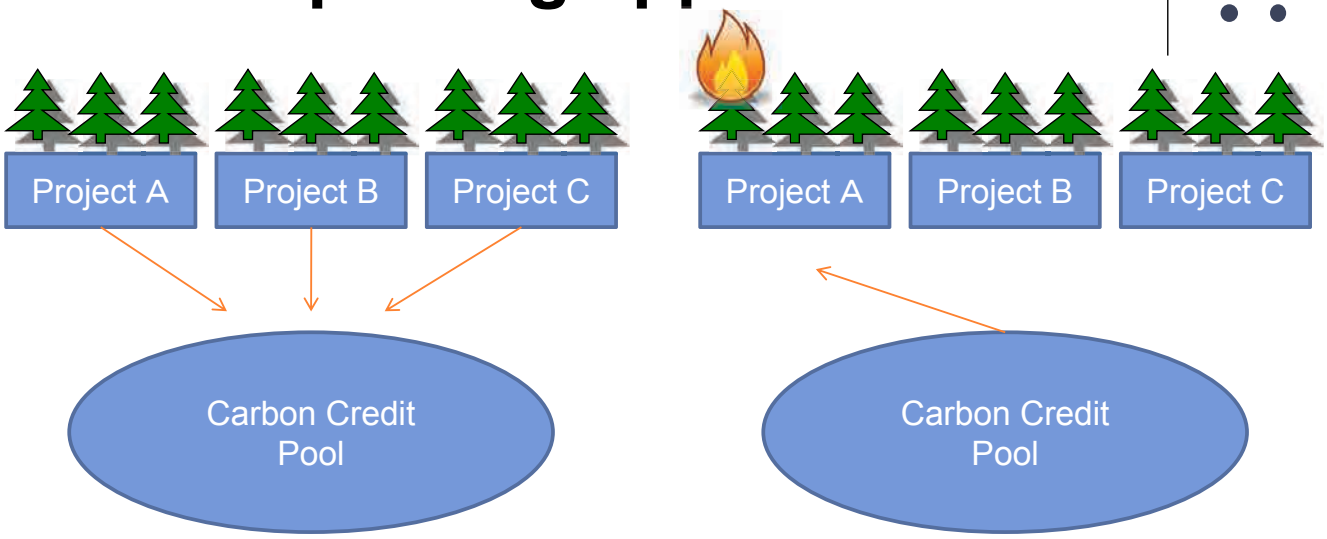
→l-CER expires during the end of the crediting period (end of CDM)

→t-CER will expire during the end of the commitment period



t-CER is effective only during the single commitment period

Credit pooling approach

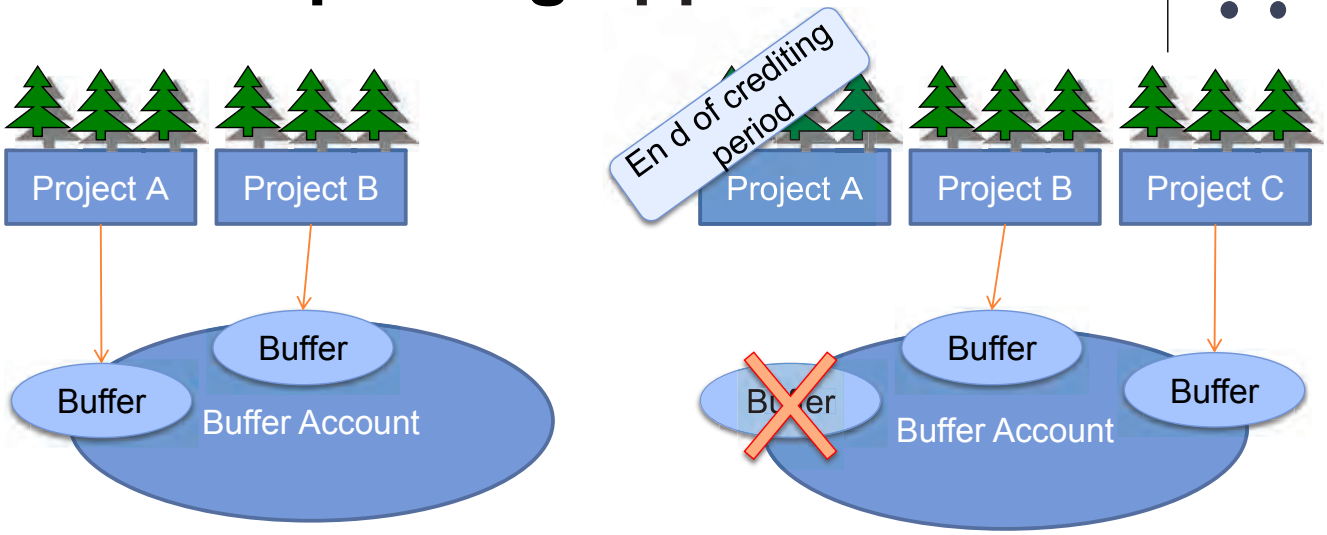


Portion of the carbon credit from each projects are pooled to a specific fund

If the CO_2 is emitted from one of the project the carbon credit from the pool could be utilized to offset the loss

As long as the carbon credit pool is managed correctly, the carbon credit from these projects, could be treated as “permanent ”.

Credit pooling approach: VCS



Voluntary Carbon Standard use the Credit Pooling Approach:
"The VCS will periodically review the minimum buffer values to ensure that a positive and safe balance of buffer credits is held in the VCS registry at all times" (VCS Guidance for Agriculture, Forestry and Other Land Use Projects)
→**As long as there is a continuous flow of new projects the buffer account is maintained**

Outcomes of COP16/CMP6 and related UN Climate Change Conferences

The Second CDM Training Programme

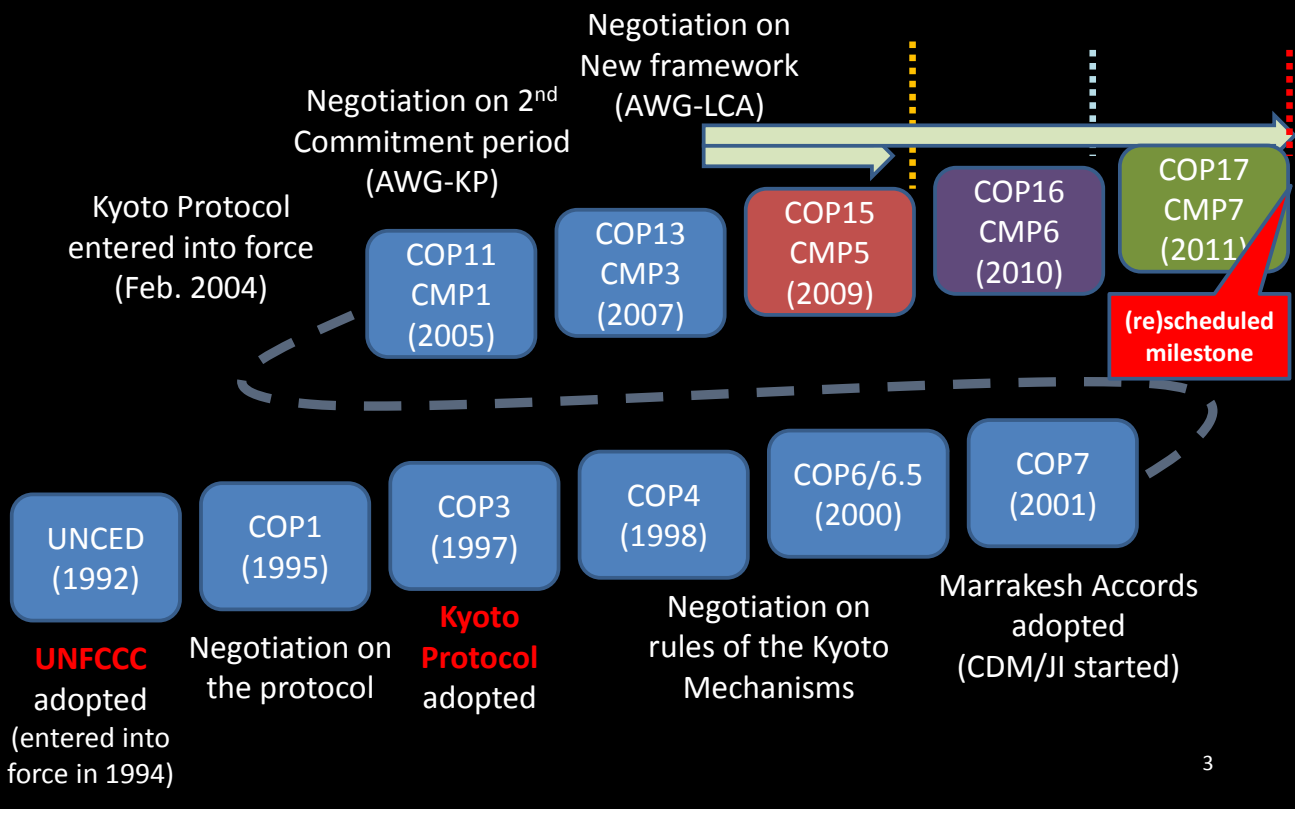
Friday, 8 July 2011

Satoshi Iemoto, JICA Expert Team

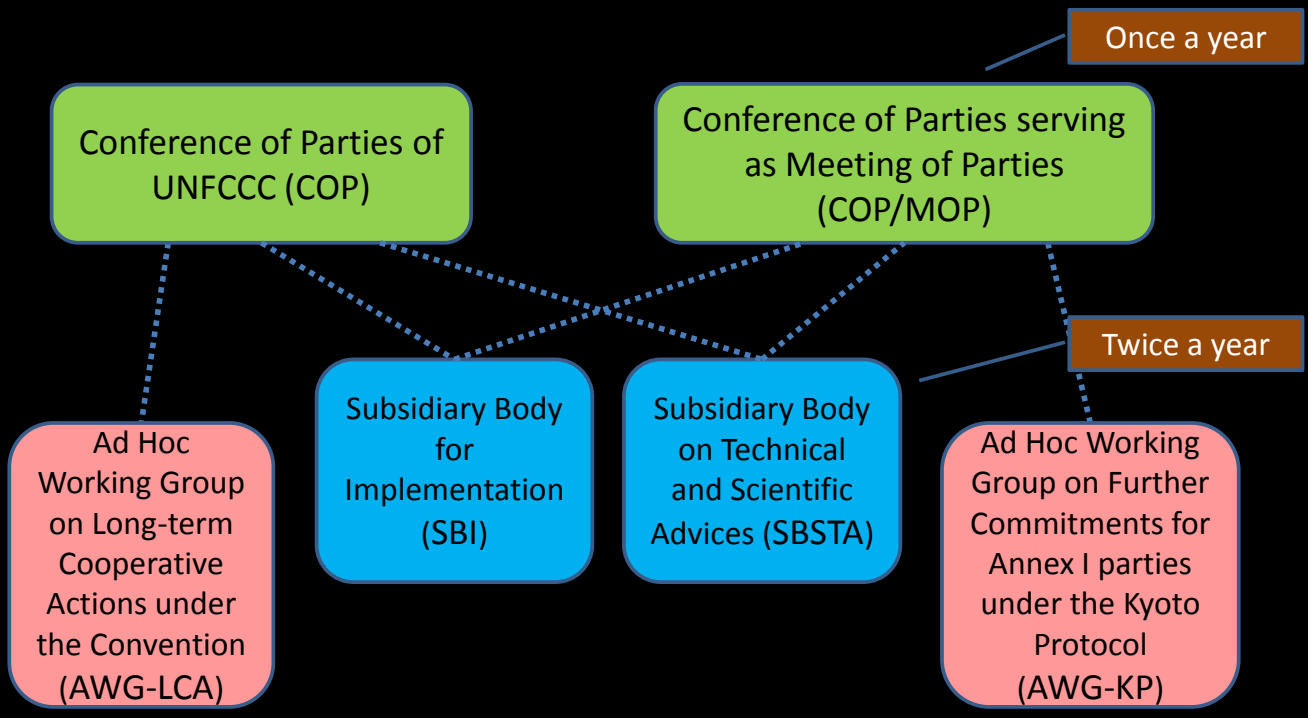
Contents of presentation

- Background information on Climate Change negotiations
- Outcomes of COP16/CMP6
- Outcomes of related UN Climate Change Conferences (AWGs)
- Expected future framework (post Kyoto)
- Submission on New Market-based Mechanism
- Japan's Initiative on Bilateral Offset Credit Mechanism (BOCM)

Brief history of Climate Change Negotiations



Relationship between COP and AWG



Negotiation Blocs

Sri Lanka

Non Annex I

G77 & China

China, India,
Asian Countries

LDCs
Bangladesh, Nepal, Ethiopia, Yemen,etc.

Oil Exporters
Saudi Arabia, UAE, Qatar, etc.

Africa
South Africa, Tanzania, Ghana, Uganda, etc.

Latin America & Caribbean
Brazil, Argentina, etc.

SIDS (AOSIS)
Tuvalu, Samoa, Fiji, Jamaica, PNG, etc.

Annex I

EU

Umbrella

KP ratification
Japan, NZ, Russia, Norway, Ukraine, Kazakhstan, Australia Canada

Non Parties
USA

Environmental Integrity Group
Switzerland, Mexico, Rep of Korea etc.

* Depending on Issues, Countries changes their groups.

UNFCCC meeting schedule in 2009-11

Date	Meeting	Venue
Dec. 2009	COP15/CMP5	Copenhagen, Denmark
Apr. 2010	AWG-KP11/LCA9	Bonn, Germany
Jun. 2010	SB32/AWG-KP12/LCA10	Bonn, Germany
Aug. 2010	AWG-KP13/LCA11	Bonn, Germany
Oct. 2010	AWG-KP14/LCA12	Tianjin, China
Dec. 2010	COP16/CMP6	Cancun, Mexico
Apr. 2011	AWG-KP16/LCA14	Bangkok, Thailand
Jun. 2011	SB34/AWG-KP16/LCA14 (part2)	Bonn, Germany
Oct. 2011	AWG-KP16/LCA14 (part3)	Panama city, Panama
Dec. 2011	COP17/CMP7	Durban, South Africa

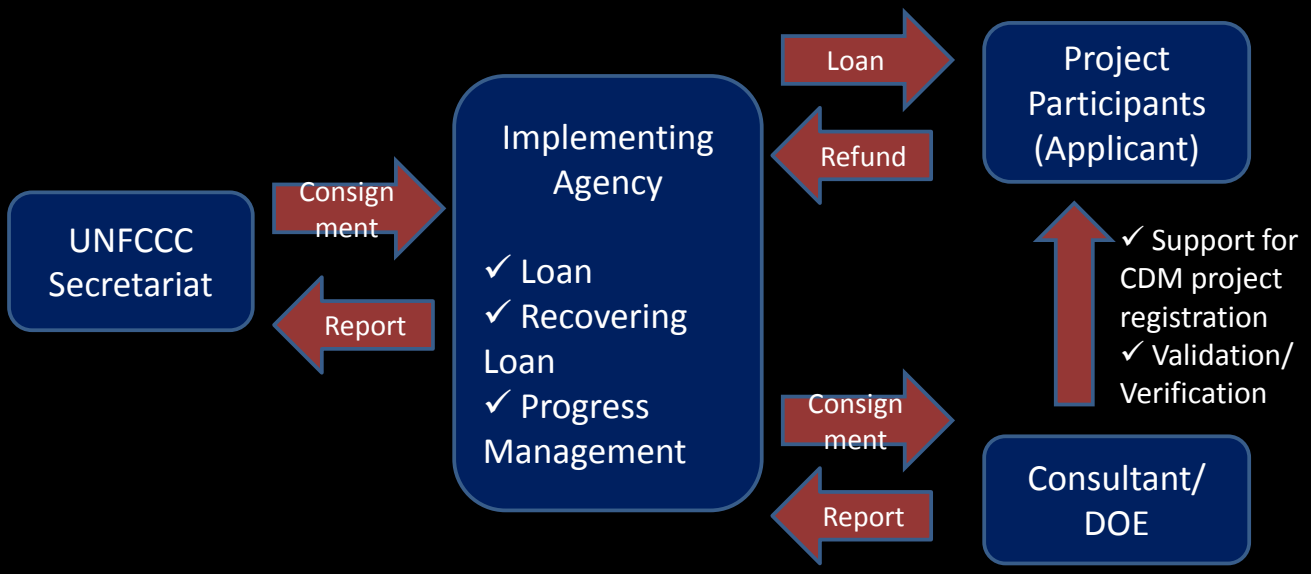
Discussion of CDM issues at CMP6

- CDM matters
  - Appeal Process → Continue to discuss
  - Loan Scheme → Agreed
  - Standardized Baseline → Agreed
  - Eligibility of CCS → Agreed
- Market Mechanism for after 2013
  - Mechanisms under Kyoto Protocol → Continue to discuss
  - Mechanisms under UNFCCC → Agreed to establish

CDM Loan Scheme

- Loan coverage: From PDD development to 1st CER issuance (incl. validation and 1st verification cost)
- Eligibility (Host country): Fewer than 10 registered project countries as of 1 January (each year)
- Eligibility (Project): 15,000 CO2t/year (7,500 CO2t/year for LDC/SIDS)
- Conditions: Free of interests, Reimbursement will start after 1st CER issuance

CDM Loan Scheme (cont.)

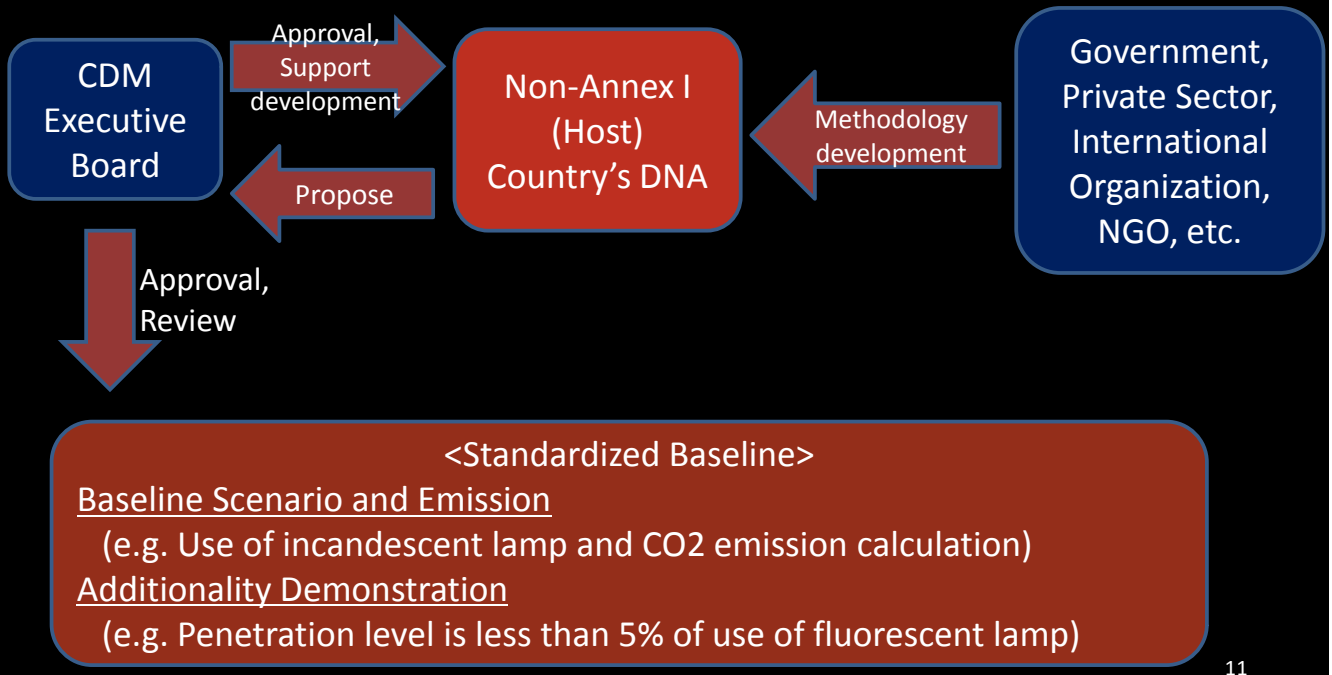


* Implementing Agency is not yet consigned/ designated. (World Bank and regional development banks (ADB, etc) are leading candidates.)

Standardized baseline

- Define baseline and additionality demonstration as one methodology
- Proposal will submit to CDM-EB through host country's DNA
- Reduce the cost for methodology development, improve objectivity and predictability

Standardized baseline (cont.)



Appeal process

- Further guidance relating to the CDM (decision -/CP.16):
  - 18. *Requests* the SBI to make recommendation to CMP for appeal against EB decisions;
  - 19. *Invites* Parties, intergovernmental organizations and admitted observer organizations to submit to the secretariat, by 28 March 2011, their views on this matter;

→ Still under discussion

(Which organization will be a body for appeal process (aside from CDM-EB/UNFCCC Secretariat)???)

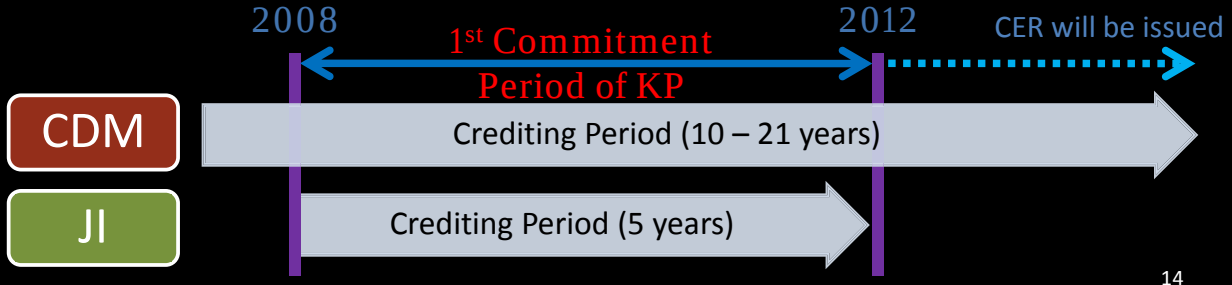
Carbon Capture and Storage (CCS)

- Carbon dioxide capture and storage in geological formations as CDM project activities (decision -/CP.16):
  - 1. *Decides* the CCS is eligible as project activities under the CDM…
  - 2. *Requests* the SBSTA35 to elaborate modalities and procedures for inclusion of CCS as project activities under the CDM…
  - 3. *Decides* that the modalities and procedures…the following issues:
  - ✓ Selection of storage site, monitoring plan, criteria for site selection, boundaries, risk and safety assessment, short-, medium- and long-term liability for leakage, etc.

→ PP have to wait for the outcome of above issues. (Not yet to ready for registration by CDM-EB.)

Continuation of Market Mechanism

- No parties against continuation of CDM at CMP6. (Many parties supported continuation of CDM after 2013.)
- CER will be generated and issued after 2013.
- Generation of ERU (JI) limited from 2008 to 2013.



Discussion at AWG-KP and AWG-LCA

AWG-KP

- CDM options (draft)
  - Nuclear, Co-benefit, Utilize CERs from limited number of parties (LDCs, SIDS, etc.), Discount of CERs, etc.
- JI options (draft)
  - Nuclear, Co-benefit, etc.
- Others (draft)
  - Carry-over, Charging to AAU and RMU, New Market Mechanisms, Complementarity

Not agreed
(remain conflict of opinions)

AWG-LCA

- Consider establishment of Kyoto Mechanism at COP17
- Current scheme (CDM, JI and IET) will utilize for future
- Further consideration of Market Mechanisms

Agreed

Treatment of Market Mechanism issues at AWG-LCA

COP decision (decision -/CP.16):

- 80. *Decides* to consider the establishment, at COP17 of one or more market-based mechanisms to enhance the cost-effectiveness of, and to promote, mitigation actions, …
- 81. Requests the AWG-LCA to elaborate the mechanism or mechanisms referred to in para 49 (NAMA by NAI), with a view to recommending a draft decision or decisions to the COP for consideration at COP17;

Treatment of Market Mechanism issues at AWG-LCA (cont.)

COP decision (decision -/CP.16):

- 82. *Invites* Parties and accredited observer organizations to submit the secretariat, by 21 February 2011, their views on matters referred to in para 81 above;
- 83. *Undertakes*, in developing and implementing the mechanism or mechanisms referred to in para 80, to maintain and build upon existing mechanisms, including those established under the Kyoto Protocol;

Scenarios for Market Mechanisms (2013-)

Scenario 1	Scenario 2	Scenario 3
AWG-KP **Emission Cap** + CDM+JI+IET	**AWG-KP +** **AWG-LCA** **Emission Cap** + **Pledge & Review** (CDM+JI+IET+ New Market Mechanism)	**AWG-LCA** Pledge & Review + New Market Mechanism + modified CDM+JI+IET

(Above scenarios are made by IGES)

- ✓CDM will continue at any scenario.
- ✓New Market Mechanisms includes NAMA, SCM, REDD+, etc.
- ✓JI and IET will available with Emission Cap (If no Emission Cap, JI and IET doesn't work)
- ✓Management of Unit (CER, ERU, AAU, etc.) will continue after 2013.

Topics for further negotiations

CDM

- Request for further improvement of management and regional distribution issues
- Delayed process, unclear EB's decision-making and further confidence building measures are keys to improve current situation

JI

- Unclear of JI management after 2013

Topics for further negotiations

Market Mechanism after 2013

- "Cancun Agreement" clarified the direction
- Expand Market Mechanism through "Bilateral Crediting Mechanism(BOCM)", "Sectoral Crediting Mechanism" etc.
- Still several Parties (Bolivia, Venezuela, Cuba, etc.) against for market mechanism issue

Background of Bangkok AWG

AWG-LCA14/AWG-KP16 (3-8 April 2011 @Bangkok)

- First UNFCCC negotiation meeting after the COP16@Cancun (Dec. 2010).
- Expected for materialize the “Cancun Agreement” and negotiate for further agreement.
- Bangkok AWG meeting planned to decide the workload of first half of the year 2011.
- COP17 is the deadline for agreement of new framework after 2013 (if no agreement at COP17, we’ll face the “gap” (no commitment) between 1st and new/2nd Commitment period).

Outcome of Bangkok AWG

- AMG-LCA14
  - Annex I: Start negotiation based on “Cancun Agreement”
  - NAI: Start negotiation based on “Bali Action Plan”
  - They couldn’t negotiate the issues. Only agreed for agenda items for next AWG session.

Outcome of Bangkok AWG

- AMG-KP16
  - NAI: Annex I should agree on set up 2nd Commitment period of KP (after 2013). NAI Parties requested to deliver the political will at COP17.
  - Japan and other AI Parties repeated their position.
    - Cannot accept 2nd Commitment Period. Establish a new legally-binding framework impartiality and effectiveness (with participation of all major economies).

Outcome of Bangkok AWG

- Pre-sessional Workshops
  - Workshop on assumptions and conditions related to the attachment of quantified economy-wide emission reduction targets by developed country Parties
  - Workshop on nationally appropriate mitigation actions submitted by developing country Parties, underlying assumptions, and any support needed for implementation of these actions
  - Expert workshop on the Technology Mechanism

Outcome of Bangkok AWG

- Pre-sessional Workshops (cont.)
  - Parties delivered presentation of views and policies for their target/action (based on the request by "Copenhagen Accord" for explain their position to other countries. Not for negotiation).
  - 17 Parties delivered presentation of emission reduction target (developed country)
  - 12 Parties delivered presentation of NAMA (developing country)

  All presentation materials are available at :
  http://unfccc.int/meetings/awg/items/5928.php

Background of Bonn SB/AWG

SBI34/SBSTA34 and AWG-LCA14/AWG-KP16 (part2) (6-17 June 2011 @Bonn)

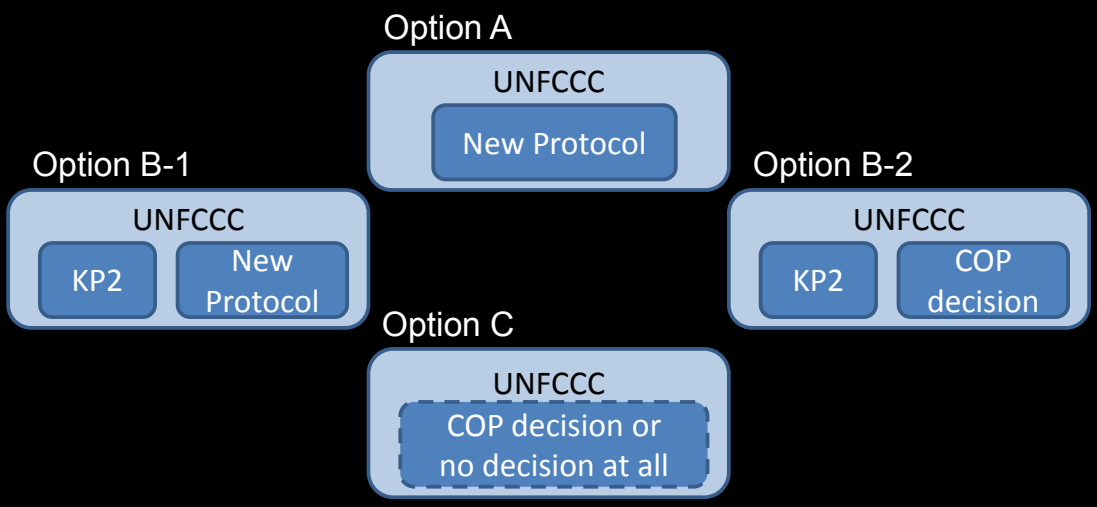
- 2nd official UNFCCC negotiation meeting in 2011.
- Expected for improve the negotiation from Bangkok's AWG session and materialize the "Cancun Agreement" and negotiate for further agreement.

Outcome of Bonn SB/AWG

- Didn't improve the situation from Bangkok AWG
  - Annex I and NAI Parties remain divided over the negotiation process
  - Bolivia strongly opposed the adoption of agenda (Bolivia taking an opposite standpoint for Cancun Agreement)
  - Substantive negotiation was stuck
  - Took time for unify the negotiation position among negotiation bloc (especially "G77 and China")

→ AWG-LCA14/KP16 will continue to October session, "Part3" at Panama

Options for future framework



- Option A: Ideal but difficult and takes time
- Option B-1: Not easy and take time
- Option B-2: Internationality and legality are issues
- Option C: Possibility to become a chaotic situation

(Above options are made by IGES)

Options for Internationally-binding regime

- A regime of "Internationally-bindedness for all major economies with the Common But Differentiated Responsibility Principle" such as:
  - Developed countries: numerical target based on the Cancun Agreement with some consequences of non-compliance
  - Emerging countries: numerical international target based on the Cancun Agreements without any consequences of non-compliance (Unilateral Declaration)

(Above options are made by IGES)

Submission on New Market-based Mechanisms

- Based on the decision at COP16, invited Parties to submit their views on matters relating to the establishment of one or more market-based mechanisms to enhance the cost-effectiveness of, and to promote, mitigation actions
- The following 19 Parties submitted
  - Australia, Bangladesh, Bolivia, China, Colombia, Ecuador, AOSIS, EU, Japan, New Zealand, Norway, Papua New Guinea, Peru, Republic of Korea, Saudi Arabia, Singapore, Switzerland, Turkey and Venezuela

(Full documents are downloadable from http://unfccc.int/resource/docs/2011/awglca14/eng/misc02.pdf)

Submission on New Market-based Mechanisms

- EU
  - Voluntary participation supported by the promotion of fair and equitable access for all Parties
  - Complementing other means of support for nationally appropriate mitigation actions by developing county Parties
  - Stimulating mitigation action across broad segments of the economy
  - Safeguarding environmental integrity
  - Ensuring a net decrease and/or avoidance of global greenhouse gas emissions

(Full documents are downloadable from http://unfccc.int/resource/docs/2011/awglca14/eng/misc02.pdf)

Submission on New Market-based Mechanisms

- Japan
  - Efficient and facilitative nature
  - Technology neutrality
  - Ensuring flexibility to accommodate each country's circumstances and ensuring transparency
  - Ensuring the environmental integrity
  - Synergy with the existing market-based mechanisms

(Full documents are downloadable from http://unfccc.int/resource/docs/2011/awglca14/eng/misc02.pdf)

Submission on New Market-based Mechanisms

- China
  - The possible market-based mechanism to be established under the Convention aims to help developed country Parties
  - The precondition for the establishment of market-based mechanism is that the developed country Parties that are not Parties to the Protocol undertake internationally legally binding economy-wide emission reduction commitments after 2012
  - Emission reduction commitments of the developed country Parties shall be achieved mainly through domestic efforts and the market-based mechanism could only play a complementary role
  - All developing country Parties should have equal access to the possible market-based mechanism to be established, and necessary capacity building activities should be provided
  - The utilization of any market-based mechanisms to be established under the Convention should not lead to double counting

(Full documents are downloadable from http://unfccc.int/resource/docs/2011/awglca14/eng/misc02.pdf)

Submission on New Market-based Mechanisms

- Bangladesh
  - To allow supplementary of GHG emission reductions through market-based mechanisms up to maximum 20% of national commitments; the remaining 80% has to be reduced domestically
  - To make future market-based mechanisms as free of distortions and more efficient, the experience of various market-based mechanisms under the existing Kyoto and other emissions trading schemes need to be critically reviewed by a committee under the SBI
  - Existing CDM functioning needs to be reformed and expanded;
    - Moving beyond project-based CDM and upscale programmatic CDM that will provide credits for a number of small-scale projects distributed over time and space
    - Introducing Policy-based CDM: Parties may receive credits from implementing policies and measures that reduce emissions and are additional to base-levels
  - The distribution of existing registered CDM projects are highly skewed in favor of a very few countries. To address such spatial inequity, measures should be taken for capacity-building in LDCs and SIDS for them to effectively take part in CDM activities with a certain quota being kept for such countries

(Full documents are downloadable from http://unfccc.int/resource/docs/2011/awglca14/eng/misc02.pdf)

Japan's Initiative on CC issues

- Adaptation
  - Global and Regional Adaptation Network
  - Support to UNFCCC Workshops
- Mitigation
  - Bilateral Offset Credit Mechanism (BOCM)
  - Co-benefit Approach
  - Workshop on Greenhouse Gas Inventories in Asia (WGIA)

Japan's Bilateral Offset Credit Mechanism (BOCM)

- Background
  - Current CDM should be improved
    - lengthy procedures
    - limited project types
    - too costly
  - CDM will remain important
    - Rich experiences of GHG reduction project
    - Established many rules and procedures by CDM-EB

→ Japanese gov't will try to utilize both CDM and BOCM (not only BOCM)

Japan's Bilateral Offset Credit Mechanism (BOCM)

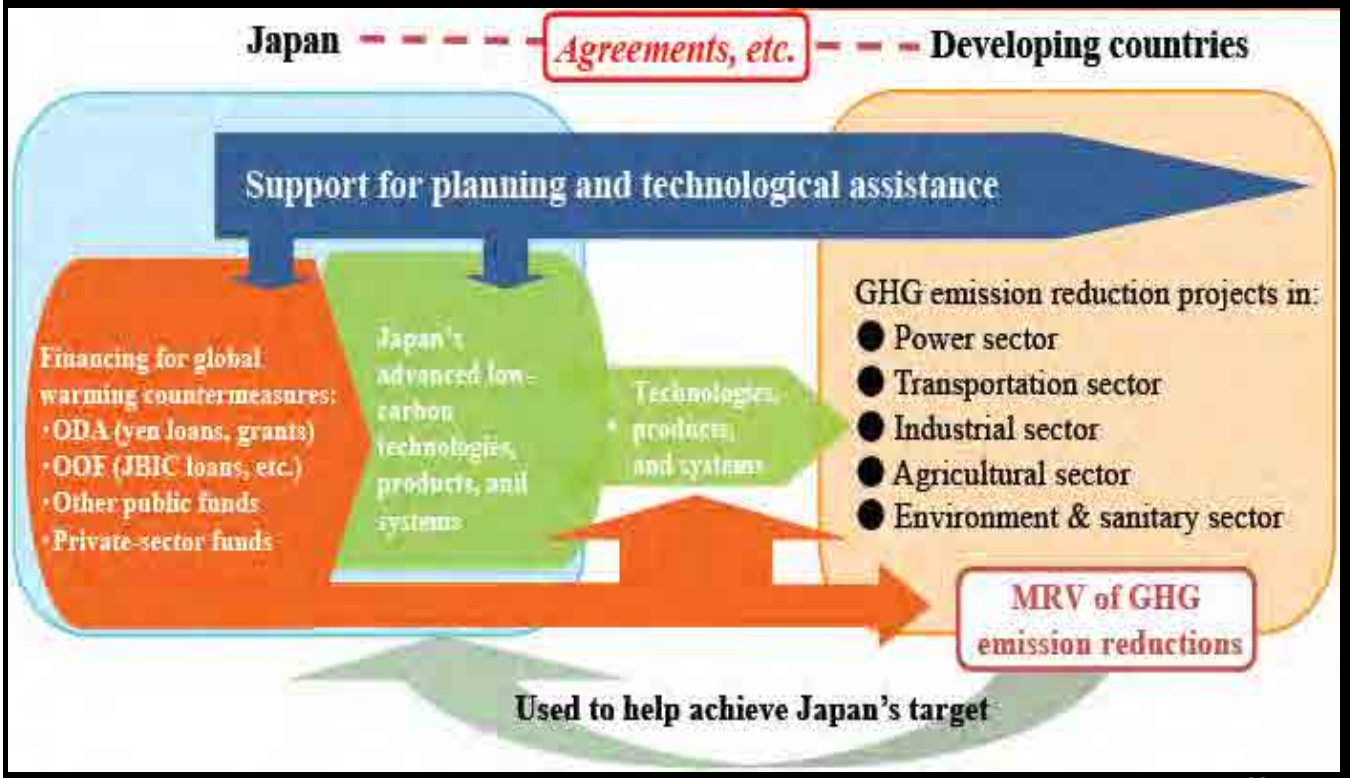
[Requirement]

- Be consistent with post 2012 framework
  - GHG reductions with environmental integrity and quantifiable evaluation
  - Able to conduct MRV under international standards

[Aim]

- Establish 'win-win' relations between developed and developing countries through promotion of technology transfer and emission credits

Image of a Bilateral Offset Credit Mechanism (BOCM)



Progress in International Negotiations

- Cancun Agreements (COP16 Decisions)

✓ It was agreed that the Conference of the Parties (COP) "decides to consider the establishment, at its seventeenth session, one or more market-based mechanisms".

- High-Level Agreements on Bilateral Cooperation

✓ India: "The two Prime Ministers reaffirmed the importance of strengthening bilateral discussions on climate change on various occasions, including a possible establishment of a framework of comprehensive bilateral cooperation."

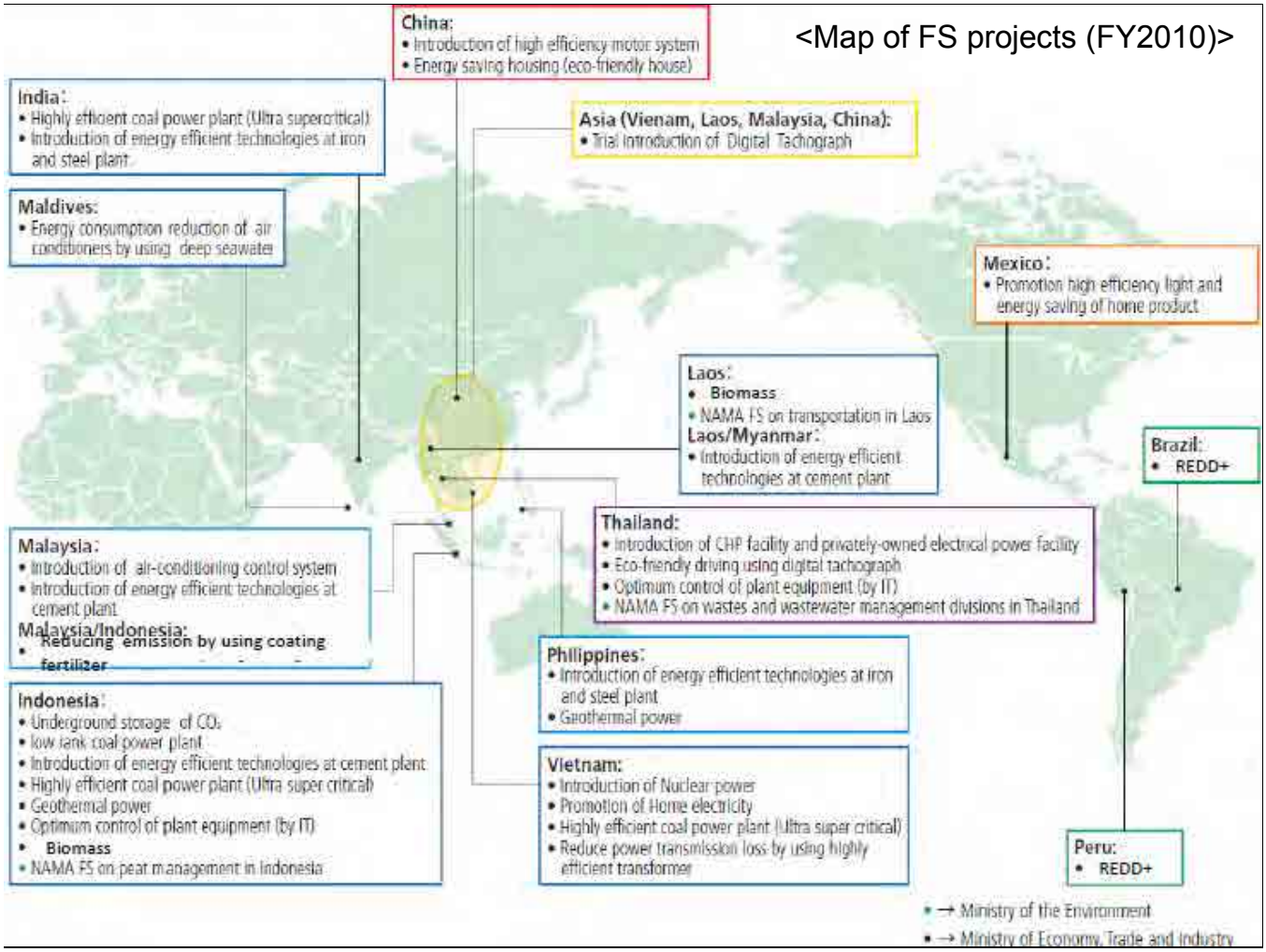
✓ Vietnam: "The two sides agreed to task relevant agencies of the two countries to exchange views for the realization of these objectives* including the potential establishment of a bilateral offset credit mechanism". (*Making the environment and economy compatible, thereby addressing the climate change issues while achieving sustainable growth.)

- Multilateral Agreement

✓ Japan and Mekong region countries agreed to "promote the development of bilateral offset mechanisms"

Feasibility Studies for Bilateral Offset Credit Mechanism (BOCM)

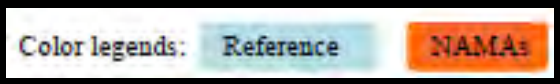
- Japanese gov't (METI and MOE) have started to fund feasibility studies since FY2010
- The studies are conducted by Japanese private companies in cooperation with organizations in developing countries with a view to exploring and designing possible joint GHG reduction projects and bilateral offset credit mechanism
- Total budget: 10mil USD (FY2010), 3bil USD (FY2011)
- Purpose:
  - To explore and design possible joint GHG reduction projects in such sectors as power, steel, cement, electric appliances
  - To develop appropriate measurement and monitoring methodologies of GHG and to estimate GHG emission reduction potential
  - To evaluate financial aspects of projects, including the use of offset credits generated from GHG reduction projects

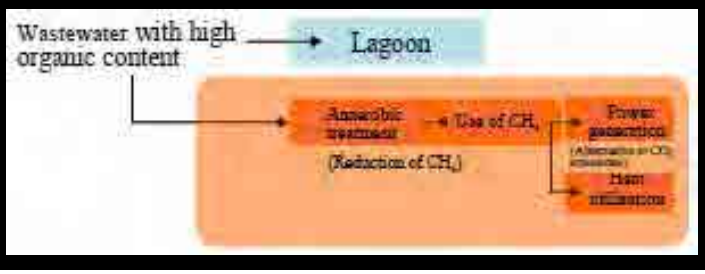


[NAMA-FS Case example]
Waste and Wastewater Management in Thailand

- Actions
  - Introduce Japanese waste and wastewater management technologies to Thailand to help reduce GHG emission
    - Reduce methane gas emission from urban waste landfills by introducing a semi-aerobic landfill system
    - Use composting technology to turn organic waste into fertilizer and avoid methane gas emissions
    - Collect methane gas from the anaerobic treatment of waste with high organic content, and use the gas and heat for power generation and other purposes as substitutes for fossil fuel
- Estimated emission reduction
  - 6.5 to 11.5 million tCO2 between 2011-2020
- Host country counterpart
  - Thailand Greenhouse Gas Management Organization (TGO)
  - Bangkok Metropolitan Administration (BMA)

[NAMA-FS Case example]
Waste and Wastewater Management in Thailand





[NAMA-FS Case example]
Transportation Management in Laos

- Actions
  - Identifying specific projects that are likely to reduce GHG emissions and estimating the amount of emission reductions with respect to the Urban Transport Master Plan (road networks, public transportation systems, and traffic management) in Vientiane
  - Master Plan outline
    - Reduce travel distance by improving road networks
    - Decreasing the number of vehicles by enhancing public transportation systems (BRT, LRT, etc.)
    - Implementing effective traffic management (parking restrictions, traffic volume control, etc.)
- Estimated emission reduction
  - Approx. 440,000tCO2 between 2012-2020
- Host country counterpart
  - Ministry of Public Works and Transport (MPWT)
  - Water Resources and Environment Administration (WREA)

[NAMA-FS Case example]
Transportation Management in Laos

Current status of traffic conditions in Laos

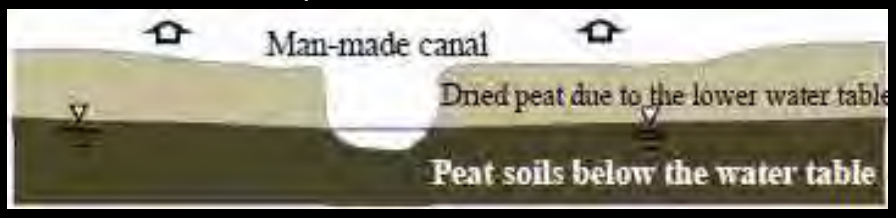
Public transportation systems in other country

[NAMA-FS Case example]
Peatland Management in Indonesia

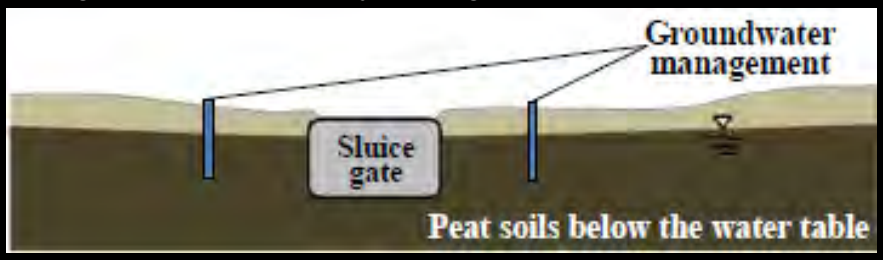
- Actions
  - Designating approx. 10,000ha of peatland in Jambi province on Sumatra Island, Indonesia, as the target area. This FS calls for building sluice gates (or utilizing existing ones) in the existing man-made canals thereby controlling and raising the ground water table to increase moisture content in peat soils. The construction of canals has caused the drying out of peat swamps, leading to an increase in CO2 emissions from aerobic biodegradation of dried peat soils. Thus, rewetting dried peat soils works to mitigate CO2 emissions by inhibiting biodegradation and preventing forest fires.
- Estimated emission reduction
  - 455,000tCO2 per year
- Host country counterpart
  - Ministry of Public Works (PU)
  - Provincial Government of Jambi
  - Jambi University

[NAMA-FS Case example]
Peatland Management in Indonesia

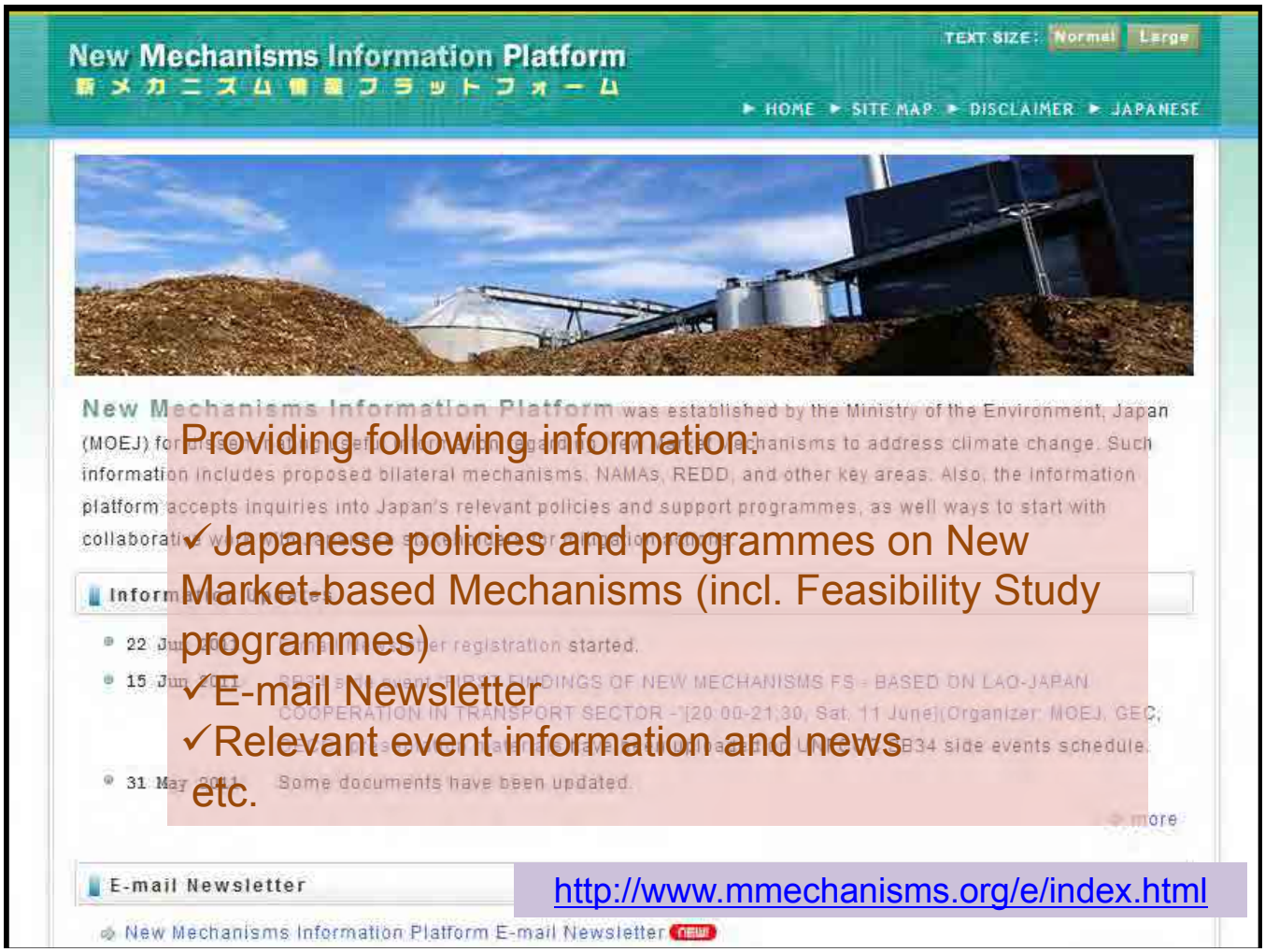
[Before improvement]
CO2 emissions from peatland



[After improvement]
Curving CO2 emissions by raising the water table



Reducing CO2 emissions by raising the water table within peat soils



Providing following information:

- ✓Japanese policies and programmes on New Market-based Mechanisms (incl. Feasibility Study programmes)
- ✓E-mail Newsletter
- ✓Relevant event information and news etc.

http://www.mmechanisms.org/e/index.html

Thank you for your attention

Satoshi Iemoto

JICA Expert Team/ Senior Researcher,

Overseas Environmental Cooperation Center, Japan (OECC)

iemoto@oecc.or.jp

New Mechanisms Information Platform URL:

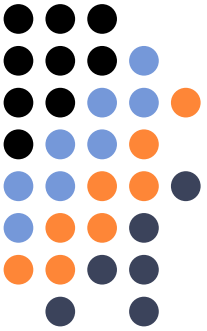
http://www.mmechanisms.org/e/index.html

Status and Outlook of Global Carbon Market

Presentation prepared for JICA training program in Sri Lanka

July 15, 2011

JICA Expert Team



Content & Objective

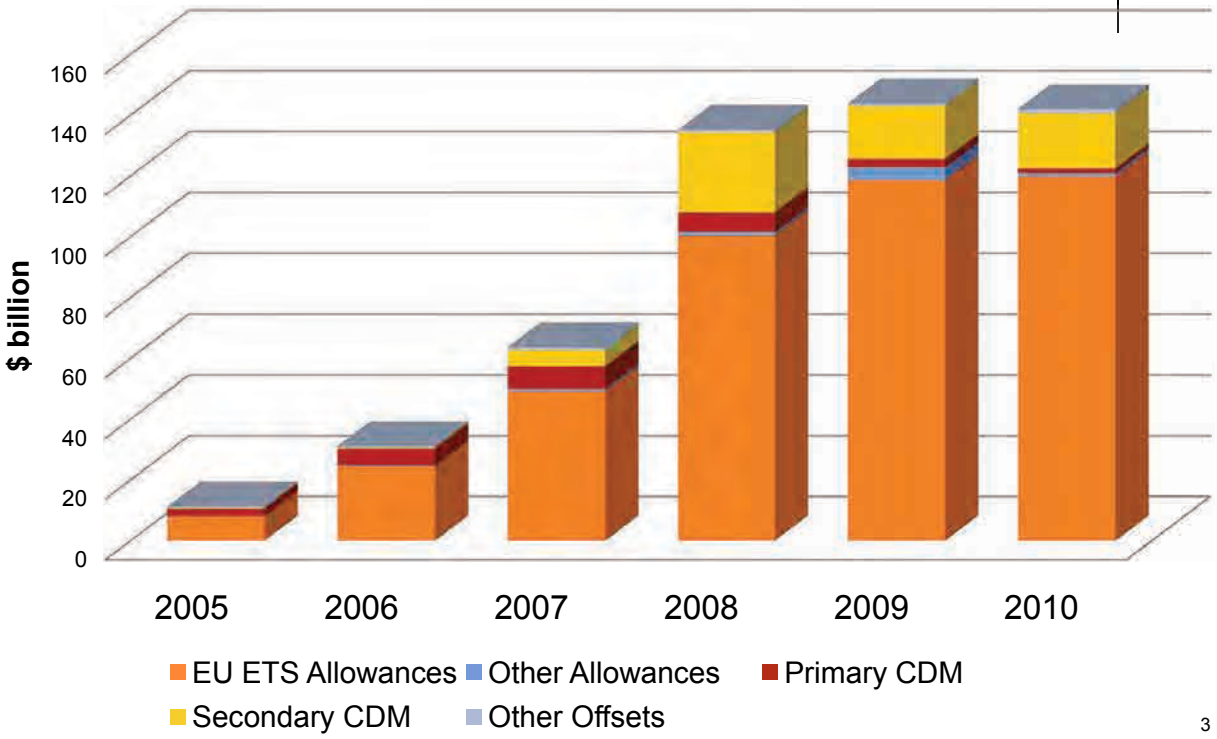
Status and Outlook of Carbon market

- Demand
- Supply
- “Carbon Credit Pricing 101”
- Environment of “Environment” markets

Objectives

- Understand “big-picture” of carbon and energy market
- Provide clues to understand driving forces of carbon price’s move

Carbon Market Status
Recovery & Uncertainty



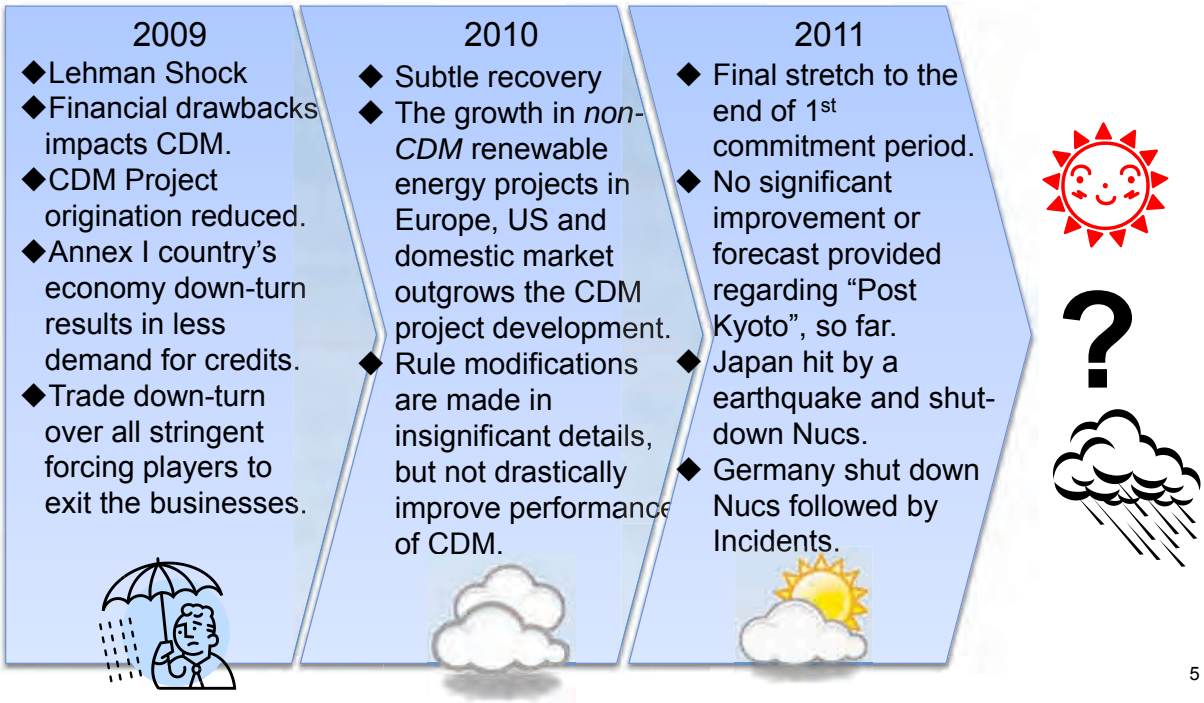
Source: "Status and Trends of the Carbon Market 2010" Table 3

Who's buying?

		Potential Demand	Contracted CERs and ERUs		AAUs	Residual Demand
			nominal	adjusted for performance		
		MtCO2e	MtCO2e	MtCO2e	MtCO2e	MtCO2e
		a		b	c	d = a - (b+c)
EU						
	Government (EU-15)	315	270	132 (48.9%)	54	129
	Private Sector (EU ETS)	750	1,598	751 (47.0%)	0	-1
Japan						
	Government	100	34	21 (61.8%)	76	3
	Private Sector	200	338	159 (47.0%)	115	-74
Rest of Annex B						
	Government	22	34	21 (61.8%)	1	1
	Private Sector	5	3	1 (33.3%)	0	4

Source: Status and Trends of the Carbon Market 2010, The World Bank, Table 6

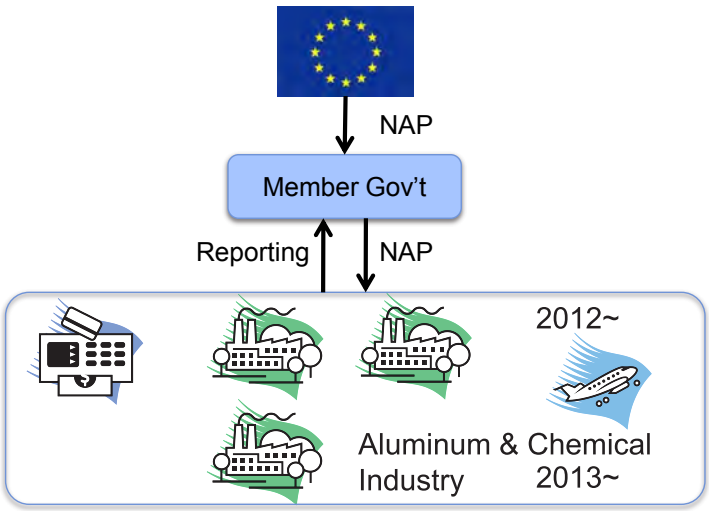
Carbon Market Status



	Extension of Kyoto Protocol		Comments
Japan Russia Canada	No	Participation of major emitting nations (especially USA and China) is required to achieve meaningful emission reduction.	If the Kyoto protocol is extended, only 27% of the global GHG emission is under the legally binding emission target.
EU Australia New Zealand	Yes Conditional	Extension of the Kyoto protocol and development of another protocol for USA, China and India which will run in parallel.	If we can not reach an agreement now, then there will be a period at which even the developed nations has no legally binding emission target.
USA	Yes	Democrats lost against the Republicans in the mid-term election → Obama administration is unable to agree on legally binding emission target.	USA will not participate in the Kyoto Protocol 2nd commitment period. Voluntary approach is appropriate.
China, India and & Non-Annex 1 Countries	Yes	Continuation of the Kyoto Protocol. Non-Annex 1 parties will have no legally binding targets. All countries will plan its emission reduction plans.	The Principle of "Common But Differentiated Responsibilities(CBDR)" must be adhered.

Demand Side: Europe

- In the middle of EU-ETS Phase 2
- Phase 2 period continues up to 2012
- Phase 3 sets as 2013 – 2020.



EU-ETS allows participants to use CERs to attain its allowance limits. However, the amount of CER adopted is limited to 6%.

The quality of CER used in the scheme also restricted.

◆Hydro: <10MW, WDC check requires if it is larger.

◆No more industrial gas origin credits approved for EU-ETS

Demand Side: Japan

Before 3.11

- Government announced its procurement program had target amount of credits, particularly from GIS, through NEDO and other program..

After 3.11

- 64% of Nuclear Power stations stop its operations.
- Obvious downturn of economy, GDP negative growth expected for 2011.
- Japan may not able to attain target of Kyoto P target

Origin	Amount
Slovakia	15 Mil t
Ukraine	30 Mil t
Czech	40 Mil t

Uncertainty 1

Does Japan maintain Kyoto target "by all means"?

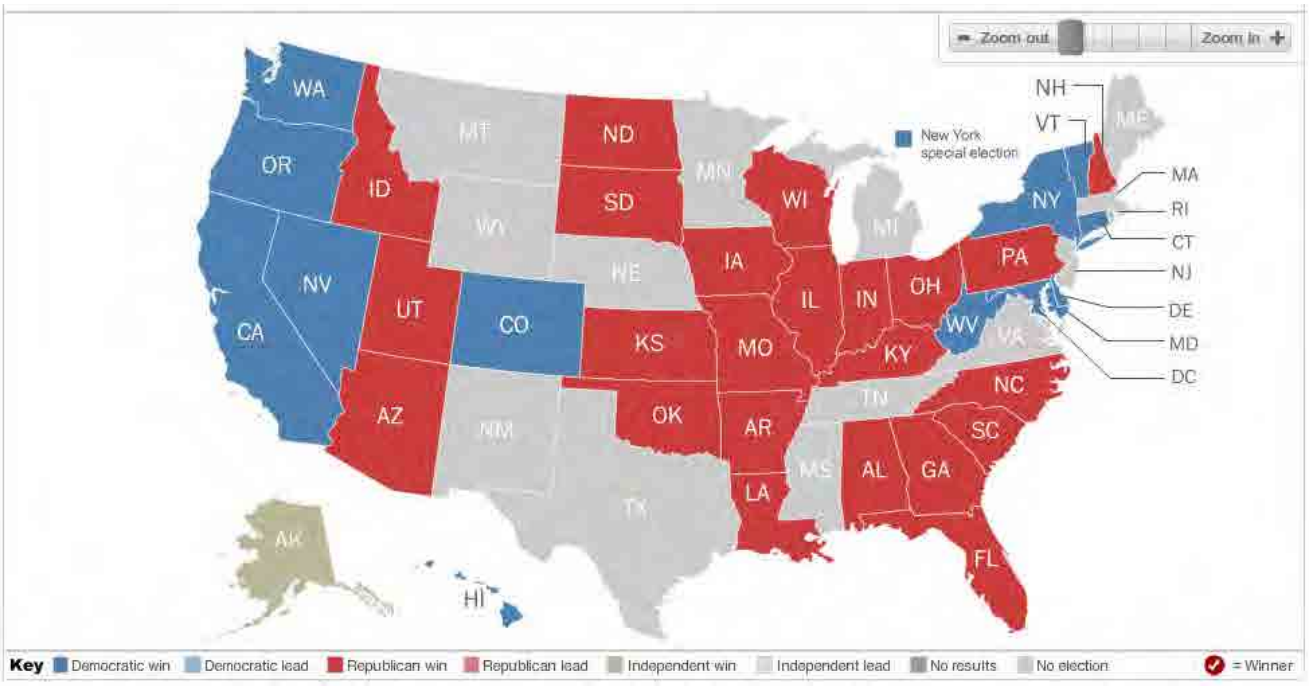
Uncertainty 2

How does economic downturn and loss of power affect emissions?

Uncertainty 3

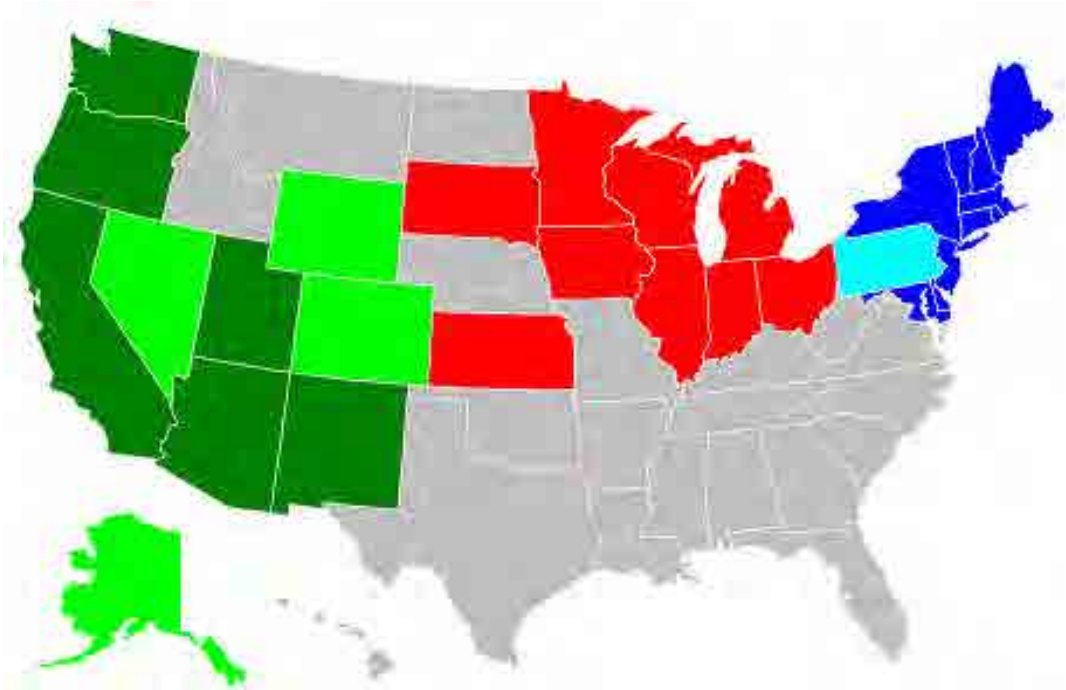
Does contracted GIS project implemented successfully?

Blue = Democratic Party Lead, Red = Republican Party Lead

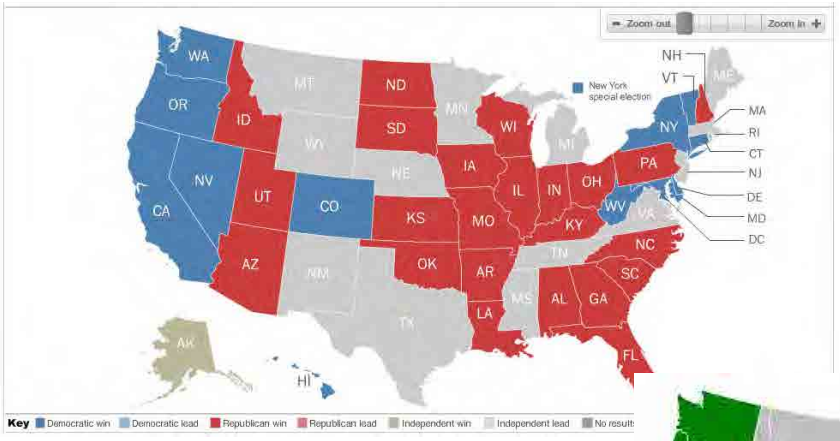


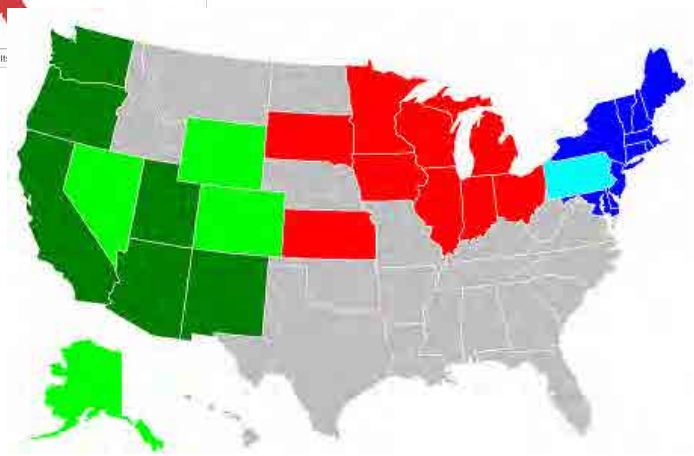
Source: Washington Post Website

Blue = Regional Greenhouse Gas Initiative
Red = Midwestern GHG reduction Accord
Green = Western Regional Climate Action Initiative



Source: No Right Turn website:
http://norightturn.blogspot.com/2007/11/climate-change-working-around-bush.html





US is also prepared at the state level to cut emissions, regardless ideological differences.

Demand Side: USA, Australia

USA

Likelihood of ETS implementation

- US economy's recovery
- Recovery of president's leadership

Republican States even start to consider introduction of ETS

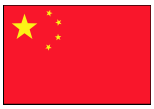
- Texas
- Florida
- Colorado
- Utah

The demand for project-based reduction efforts tend to focus on Latin American countries and not in Asia or Africa.

Australia

- Girrard Administration announced an introduction of cap & trade scheme from July 2012.
- The credit priced at A$23(LKR2,720) per ton of CO2.
- The carbon emission cuts 5% from 2000 by 2020.
- Targets are set for
  - ◆Stationary combustion
  - ◆Waste
  - ◆Rail
  - ◆Domestic aviation
  - ◆Shipping
  - ◆Off-road transport
  - ◆Industrial process
  - ◆Fugitive emissions

Supply Side: China & India



- Chinese CDM projects are overflowed in the market
- Markets are become more selective to choose Chinese projects in terms of project size, seeking other verification to prove project integrity
- Within China, there are domestic markets established to trade credits for the sake of investment.

- Unilateral CDM project owners are started to sell their credits but the contracts only up to 2012.
- Domestic energy saving efforts are implemented in parallel.
- Performance, Achieve and Trade (PAT) scheme examined by BEE(Bureau of Energy Efficiency).
  - PAT allocates a cap for 700+ industry facilities in India.
  - Energy reduction certificate will issue from 2014.

Not many people believes the two countries remain as a “supplier” of credits.

Supply Side: CDM or New CDM?

Some projects currently explored offers large amount of credit to deteriorate market balance. Would these projects development is a positive or negative??

	Registered	CER (ktCER)	% yield	Average CER (ktCER/year)
REDD	---	---	---	400~1,000
CCS	---	---	---	1,000
HFC	18	266,642	109%	14,813
Hydro	274	35,584	86%	129
Biomass	138	17,476	86%	126
LFG	59	13,352	38%	226

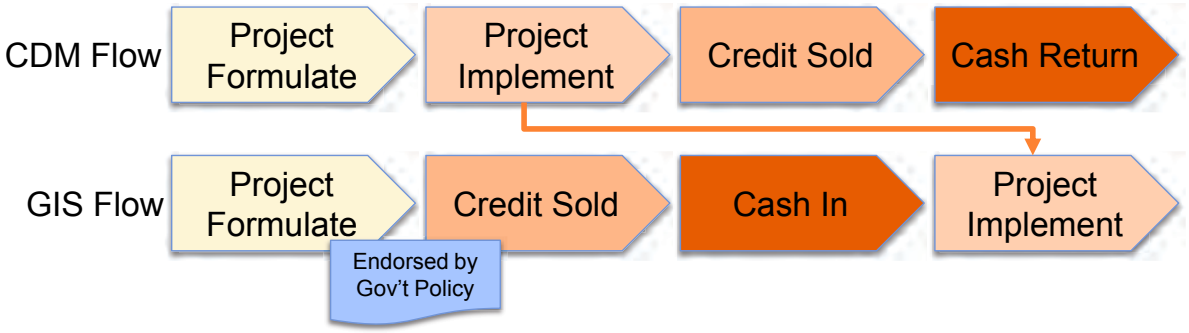
Source: UNEP Resoe Centre

Large amount of credit inflow distort current market balance and plunge CER price to the bottom.

Supply Side:
GIS, Bi-lateral Offset Mechanism & More

GIS (Green Investment Scheme)

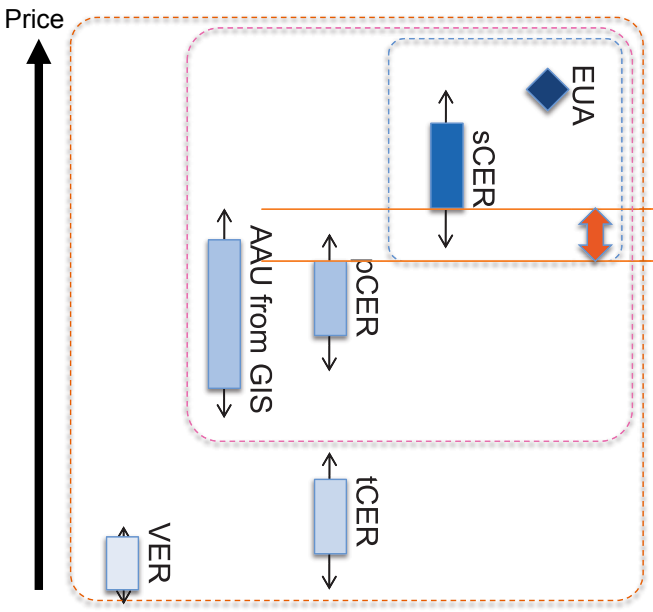
- International Emission Trading outlined under Kyoto Protocol between developed nations.
- Trade surplus allowances called “Hot-Air”.
- Japan purchased credit through GIS 135 Mil tones. (275 Mil tons from CDM).



Bilateral offsetting mechanism

- Project implemented under bilateral agreement can yield credits
- The projects has to be “MRV”ed to yield credits.
- Projects not covered by CDM can implemented through BOM.

Price Differences of Credits



BlueNext

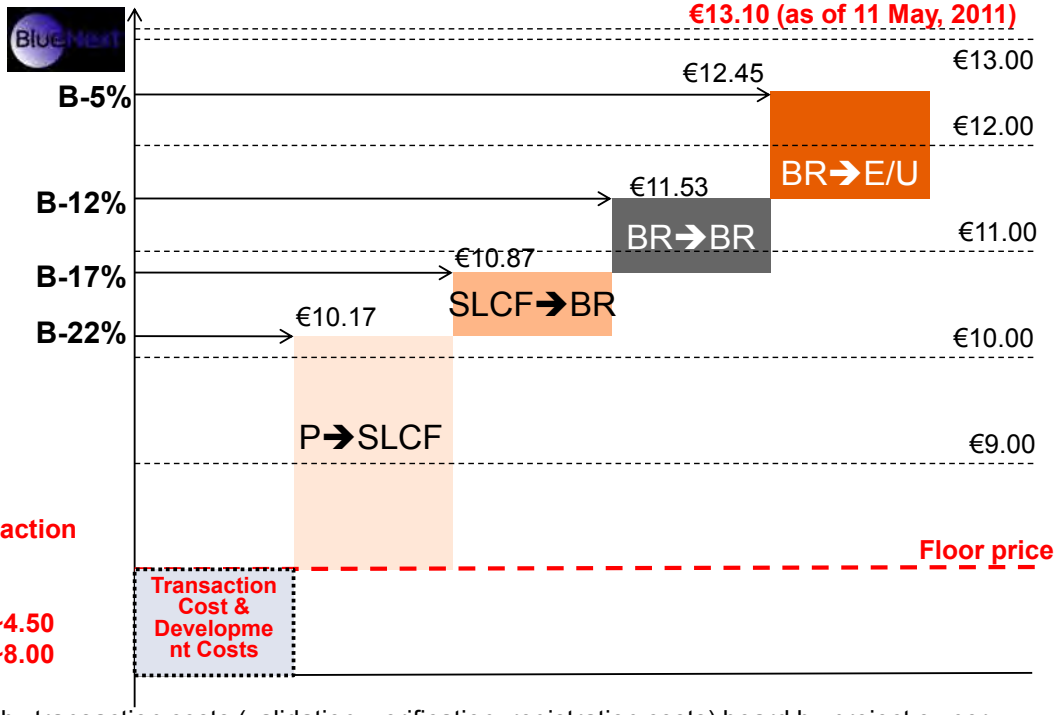
	price €/T	volume T	updated
SPOT			
EUA 08-12	11.96	515 000	11-07
CER	10.10	10 000	11-07
GREEN CER	10.15	115 000	11-07
ERU	10.00	0	11-07

Source: http://www.bluenext.eu/

EU-ETS	Phase II (-2012)		Phase III (-2020)	
	EUA	sCER	EUA	sCER
Barclays	13.5-24	12-18	35	20
Deutche B	25	n.a.	48	n.a.
Orbeo	18.8	15.9	30.1	n.a.

Source: World Bank 2010, Table 5

Carbon Price Structure (Example)



Floor Price
Aimed to cover transaction costs when market collapsed.
Floating: EUR 3.00~4.50
Fixed: EUR 6.00~8.00

a) Whereby transaction costs (validation, verification, registration costs) beard by project owner, the purchasing price are usually increase to compensate the expenses.
b) All payments are pay-on-delivery basis, no advance payment envisaged.
c) Detailed conditions are stipulated in ERPA.

VER: Alternative Market?

◆VER market does not go well due to lack of demand.
◆Compliance buyers are not interested in VERs, because one cannot use it for fulfilling their reduction target.
◆Demands are largely in USA, but VERs are generated within US boundary to fulfill CSR.

	Volume (M tCO2)	Value (US$ Mil)	Price
pCER	211	2678	€8.95 $12.69
JI	26	354	€9.60 $13.62
Voluntary Market	46	338	€5.18 $7.35

⇨ VER price stick in lower range.

CCX Daily Transactions

Updated 05/25/11

Trade Date	Vintage	Qty (contracts)	Price $/mt	Type of Transaction	CFI Delivered	Country
05/18/11	2005	20	$2.00	OTC	Forestry Offset	USA
05/16/11	2003	866	$0.08	OTC	Allowance	
05/10/11	2008	50	$1.50	OTC	Forestry Offset	USA
05/10/11	2008	28	$1.50	OTC	Forestry Offset	USA
05/10/11	2008	11	$1.50	OTC	Forestry Offset	USA
05/10/11	2007	6	$1.50	OTC	Forestry Offset	USA
05/10/11	2006	6	$1.50	OTC	Forestry Offset	USA
03/03/11	2003	358	$0.05	OTC	Allowance	
03/03/11	2004	357	$0.05	OTC	Allowance	
03/03/11	2005	358	$0.05	OTC	Allowance	
03/03/11	2006	357	$0.05	OTC	Allowance	
03/03/11	2008	1,770	$0.05	OTC	Allowance	
03/03/11	2009	9	$0.05	OTC	Allowance	
03/03/11	2010	555	$0.05	OTC	Allowance	
02/14/11	2010	1	$2.75	OTC	Organic Waste Disposal Methane Offset	USA
02/03/11	2007	200	$0.10	OTC	Renewable Energy Offset	USA
02/01/11	2008	20	$0.60	OTC	Renewable Energy Offset	Brazil
02/01/11	2008	9	$0.80	OTC	Agricultural Methane Offsets	USA
01/18/11	2007	150	$0.25	Platform	Landfill Methane Offset	USA

Is Carbon Market Sustainable?

- **Global Clean Energy Investment Reached Record $243 Billion in 2010**
- Global EV number 2009 684,000 units, 2020 3,750,000 units
- Lithum battery market
  - 2010 JPY 0.4 bil 2020 JPY 313 Bil

- Could carbon market outstrip these innovation?
- How could it be co-exist?

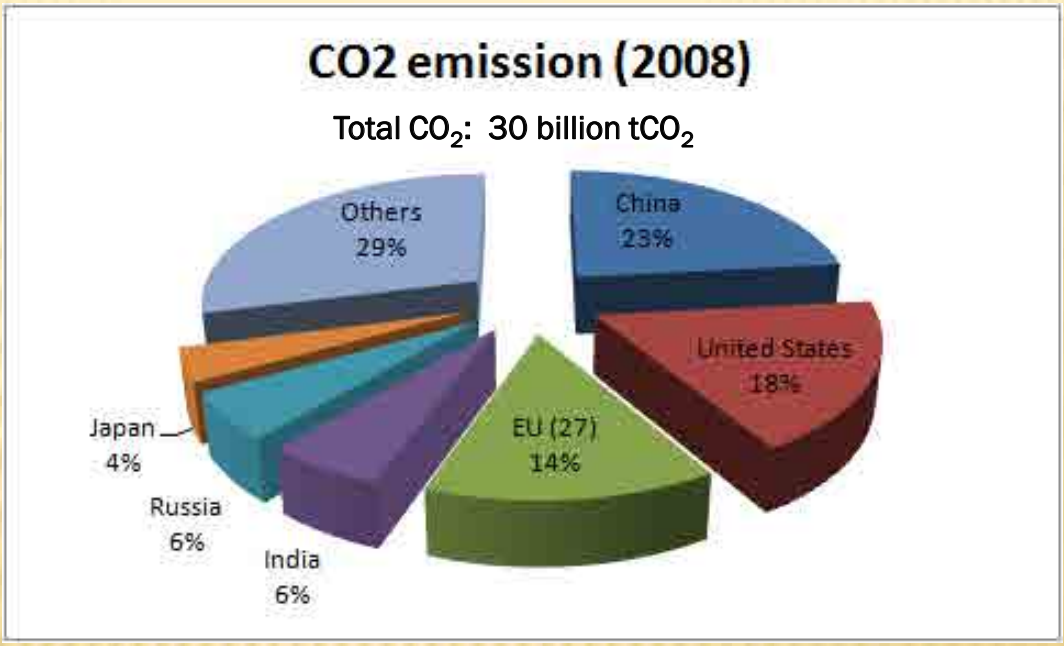
Climate Change Mitigation Polices and their Implications for Developing Countries

15 July 2011

Satoshi Sugimoto
JICA Expert Team

Contents

1. Overview of Country-Wise GHGs Emission



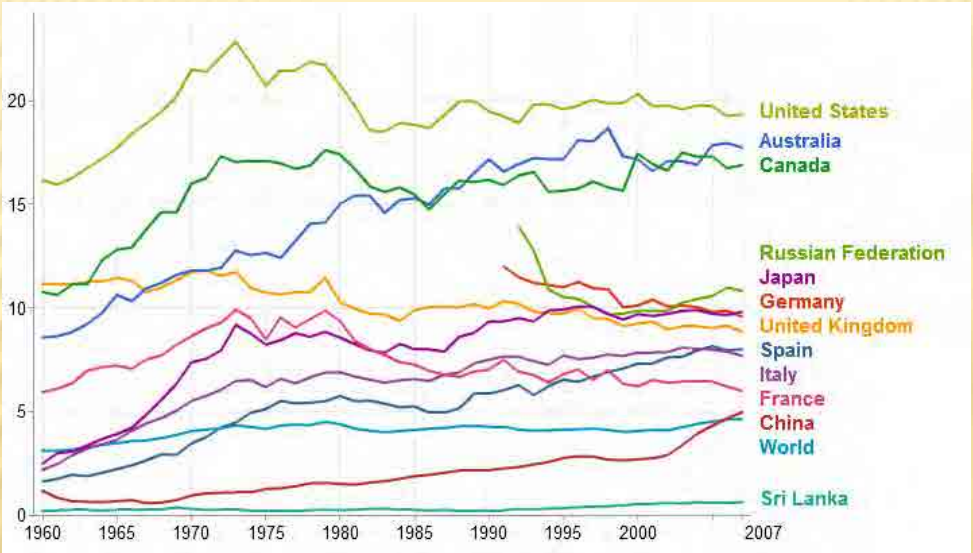
Remark: Human-produced, direct emissions of carbon dioxide only.

Source: United Nations Statistics Division, Millennium Development Goals indicators

Sri Lanka (2008): 11.7 million tCO_2 (0.04% of the Total CO_2)

1. Overview of Country-Wise GHGs Emission

Trend of Per Capita CO_2 Emission by Countries (Unit: tCO_2/person)



Source: World Bank, World Development Indicator (2011)

USA	19.3
Australia	17.7
Canada	16.9
Russian Fed.	10.8
Japan	9.8
Germany	9.6
UK	8.8
Spain	8.0
Italy	7.7
France	6.0
China	5.0
Sri Lanka	**0.6**
World	**4.6**

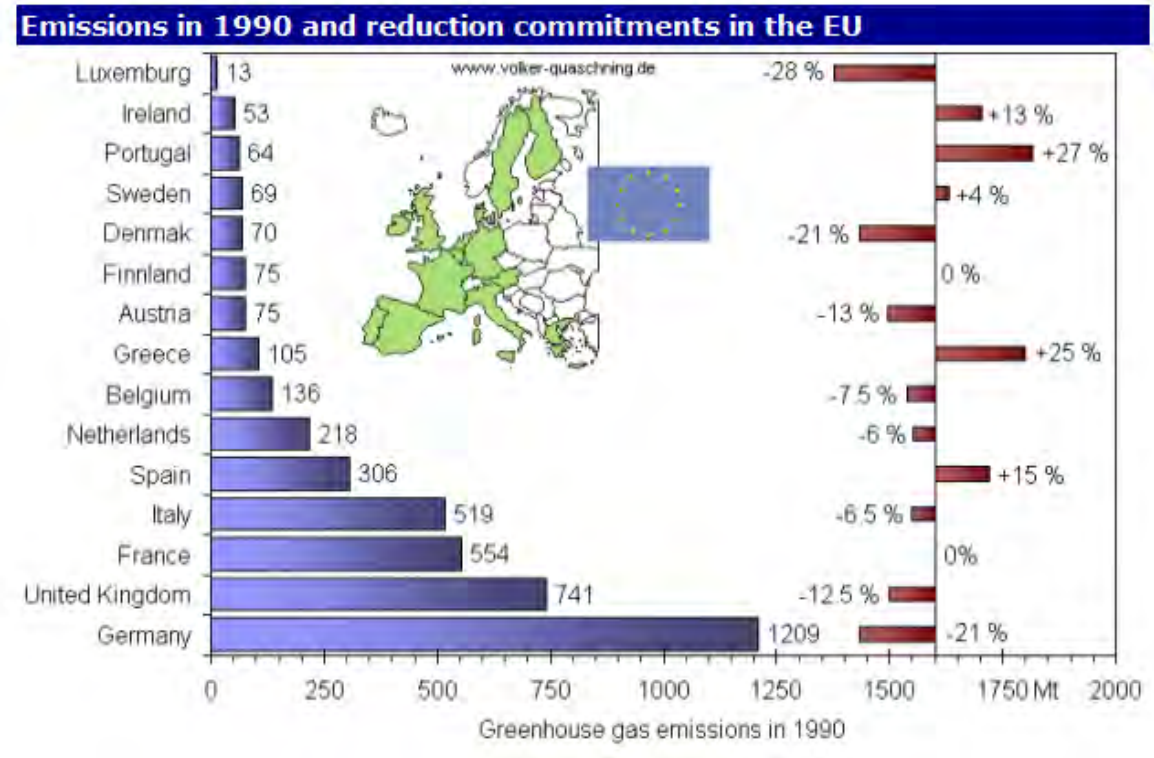
1. Overview of Country-Wise GHGs Emission

Reduction commitments of the Kyoto protocol and emissions development

Party	Reduction commitments	Emissions 1990 in Mt	Emissions 2000 in Mt	Emissions 2008 in Mt	Change 1990-2008
EU	-8 %	4 245	4 114	3 970	-6.5 %
Liechtenstein, Monaco, Switzerland	-8 %	53	52	54	+0.5 %
Bulgaria, Czech Republic, Estonia, Latvia, Lithunia, Romania, Slovakia, Slovenia	-8 %	814	469	487	-40.2 %
USA	-7 %	6 112	7 008	6 925	+13.3 %
Japan	-6 %	1 269	1 344	1 282	+1.0 %
Canada	-6 %	592	717	734	+24.1 %
Poland, Hungary	-6 %	679	467	469	-30.9 %
Croatia	-5 %	31	26	31	-0.9 %
New Zealand	0 %	61	70	75	+22.8 %
Russian Federation	0 %	3 322	2 025	2 230	-32.9 %
Ukraine	0 %	928	393	428	-53.9 %
Belarus	0 %	140	79	91	-35.1 %
Norway	+1 %	50	53	54	+8.0 %
Australia	+8 %	418	496	550	+31.4%
Iceland	+10 %	3	4	5	+42.9 %
Total	**-5,2 %**	**18 717**	**17 318**	**17 383**	**-7.1 %**

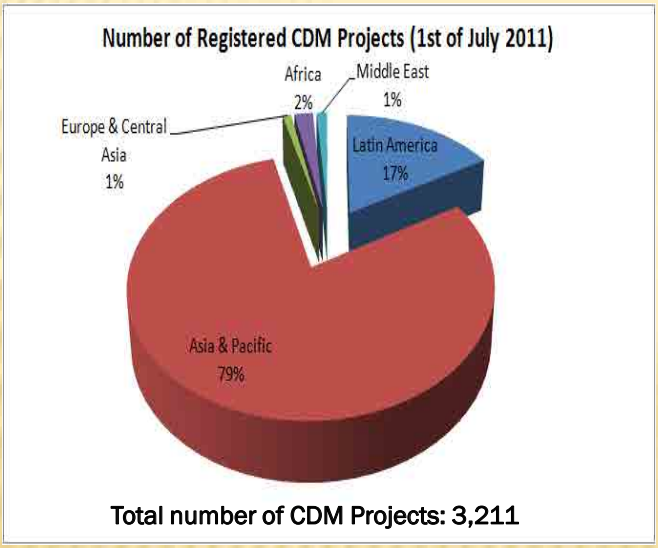
Source: UNFCCC, these values refer to carbon dioxide equivalents excluding land-use change and forestry

1. Overview of Country-Wise GHGs Emission

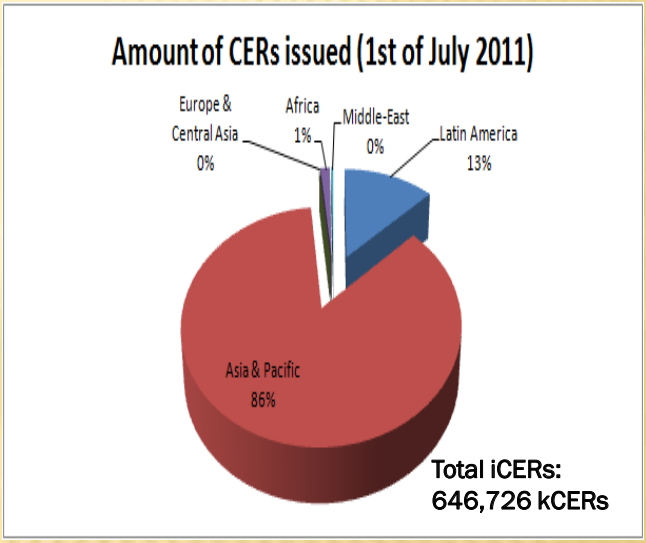


2. CDM Projects by Countries

Regional Distribution of CDM Projects (host countries)



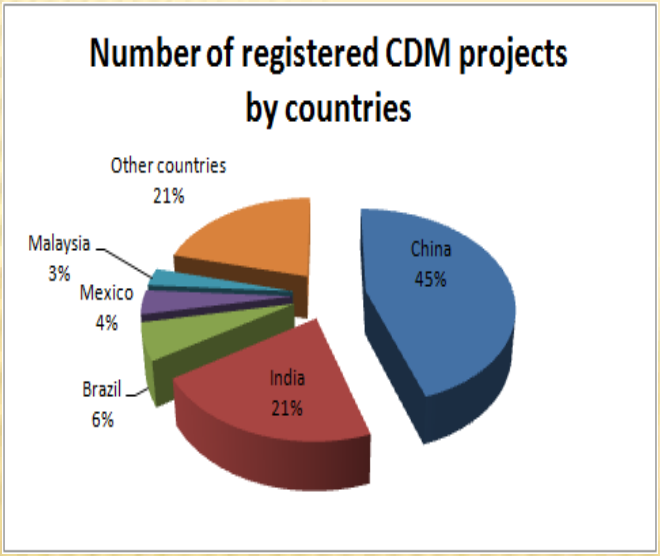
Total number of CDM Projects: 3,211

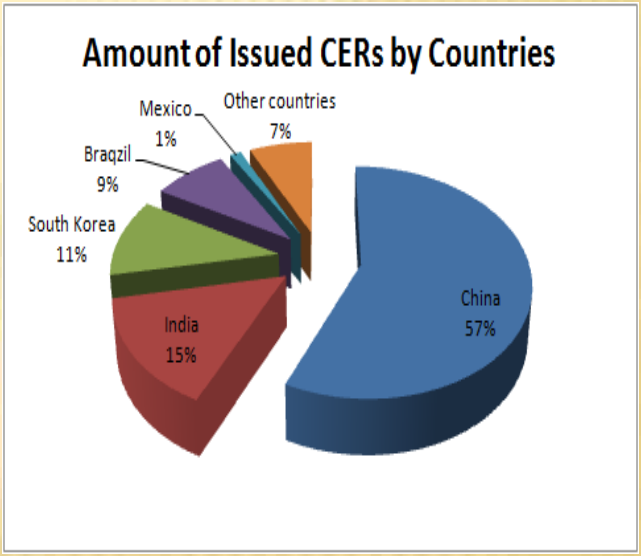


Total iCERs: 646,726 kCERs

2. CDM Projects by Countries

Number of Registered CDM Projects by Countries





3. Key Climate Change Mitigation Policies and Their Implications for Developing Countries

① Border Carbon Adjustment (BCA) Measures

What is BCA ?

To impose a tariff or an obligation to purchase carbon credits - on imports from other countries that use less stringent emissions practices.

Why ?

- To avoid carbon leakage.
- To level the playing field between the domestic industries under the stringent carbon emission control and foreign competitors under less stringent carbon emission control.
- To leverage the participation of developing countries in binding schemes or to adopt comparable measures to offset emissions by their own industries.

3. Key Climate Change Mitigation Policies and Their Implications for Developing Countries

① Border Carbon Adjustment (BCA) Measures

What is the implications of BCA measures for developing countries

- The goods and services to be exported to the countries with stringent carbon emission control regulations from the countries with no or less stringent ones will be obliged to pay tariff or buy carbon allowance.
- As a result, the competitiveness of the goods and services in the international trade market will be weakened.
- Developing countries may be forced to take concrete climate change mitigation actions (GHGs emission reduction measures) in spite of the principle of the “common but differentiated responsibilities” provided in the UNFCCC.

3. Key Climate Change Mitigation Policies and Their Implications for Developing Countries

② Climate change-related standards and labels

Energy efficiency standards, eco-labels, carbon footprint

(Potential implications)
Developing countries may be forced to take additional cost and measures to comply with the above standards and requirement of the countries of their export destination.

Carbon Standard in agriculture: Food miles

(Potential implications)
Export of agricultural products to the foreign countries may suffer disadvantage in terms of carbon footprint due to the transport mileage (Competitiveness with domestically produced agricultural products will be weakened.)

③ Bilateral Offset Credit Mechanism

GHG reductions in developing countries - implemented by provision of advanced technologies and/or products from developed countries with bilateral agreements - are evaluated and certified as emission reduction credits to offset the emissions of the developed countries.

<Requirement>
Be consistent with post 2012 framework
- GHG reductions with environmental integrity and quantifiable evaluation
- Able to conduct MRV under international standards

<Aim>
Establish 'win-win' relations between developed and developing countries through promotion of technology transfer and emission credits

CDM Training Program Final Examination

15 July 2011

Prepared by: JICA Expert Team

Name: _____

Organization: _____

TOTAL SCORE:	／100
Renewable energy	／20
Waste handling	／20
Energy Efficiency & Fuel switch	／20
Forest	／20
UNFCCC negotiation	／20

[1] Renewable Energy

Marks: ／20

[Q1] Select the appropriate option to fill the blank columns.

(1) (2)

$KgCO_2 / kWh = tCO_2 /$ **A** $\quad 1MWh =$ **B** GWh

A		B	
[ ]	MWh	[ ]	1,000
[ ]	GWh	[ ]	0.1
[ ]	TJ	[ ]	0.001

[4 points: 2 points each]

(3)

$100kW \times 500hours = 50{,}000$ **C** $= 50$ **D**

C		D	
[ ]	kWh	[ ]	kWh
[ ]	MWh	[ ]	MWh
[ ]	GWh	[ ]	GWh

[2 points: 1 point each]

(4) The following equation is a basic formula to calculate GHG emission reduction for the project which displace fuel by renewable energy.

GHG Emission Reduction (tCO2) = Amount of Electricity (MWh) × Grid Emission Factor (E ／ F) — Project/Leakage Emission (tCO2)

Unit check of the above equation: $tCO2 = MWh \times \frac{\text{E}}{\text{F}} - tCO2$

[ ]	E: MWh	F: tCO2
[ ]	E: tCO2	F: MWh
[ ]	E: ton_fuel	F: tCO2
[ ]	E: tCO2	F: ton_fuel

[2 points]

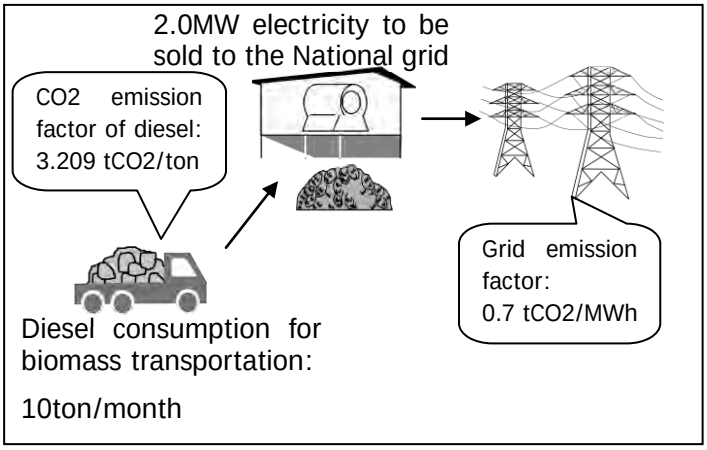
[Q2] Company B plans to generate power using saw dust for the purpose of selling the electricity to the grid. This project will reduce GHG emissions through replacing the grid electricity by renewable electricity. The details of the project are as follows:

Item	Figure
Actual generation capacity of the power plant [MW]	2.0
Daily operating hours [hours]	20
Monthly operating days [days/month]	25
Seasonal operation:	Constant throughout the year
Grid emission factor [tCO2/MWh]	0.70
Diesel required for transportation of biomass [ton/month]	10
Emission factor of fossil fuel [tCO2/ton]	Diesel oil: 3.209

(1) How many hours does the plant operate annually?

(2) How much electricity to be sold to the grid annually? (100% of electricity generated is sold to the grid.)

(3) How much GHG emission is reduced annually by selling the electricity to the grid? [Baseline emissions]



(4) How much fossil fuel is required for biomass transportation annually?

(5) How much GHG is emitted annually through fossil fuel consumption by the project activity (transport of biomass)? [Project emissions]

(6) How much GHG emission is reduced annually by the project activity? [Emission reduction]

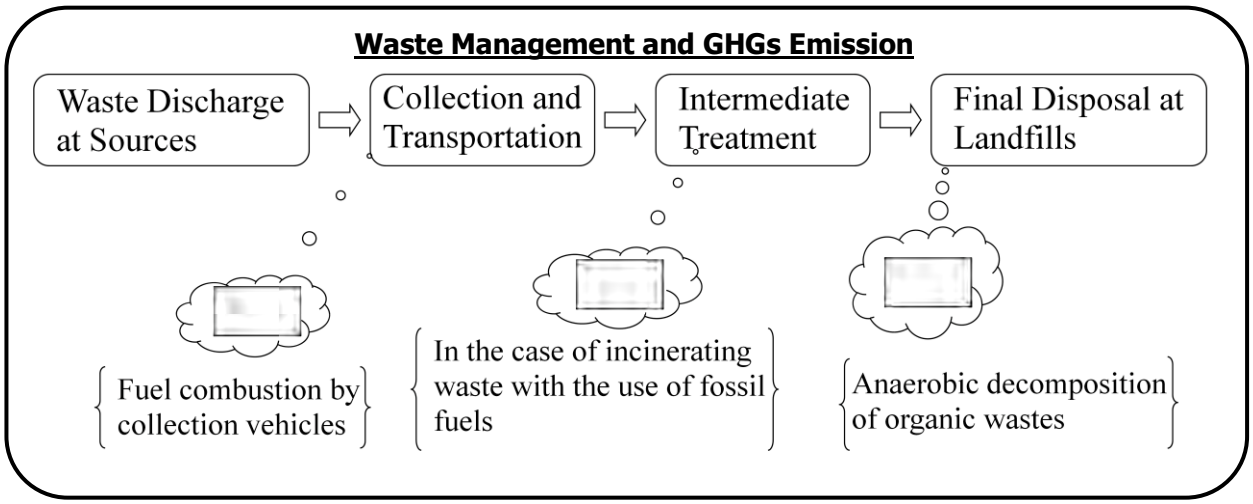
ANSWER	
(1)	[hours/year]
(2)	[MWh/year]
(3)	[tCO2/year]
(4)	[ton/year]
(5)	[tCO2/year]
(6)	[tCO2/year]

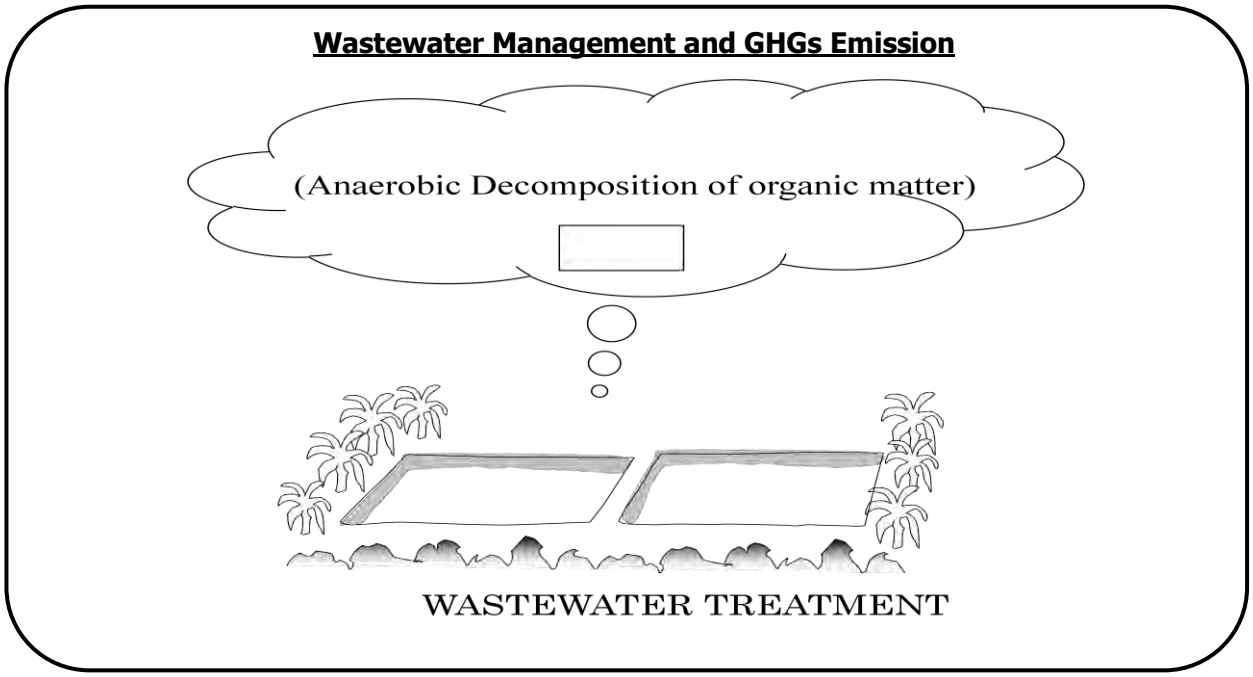
[12 points: 2 points each]

[2] Waste Management/Handling CDM Project

Marks: ／20

[Q1] The figures below show the main sources of GHGs in waste and wastewater management processes. Fill the blank boxes in the figures below with the main GHGs emitted from each source. *[4 points: 1point each]*





[Q2] The table below outlines the basic methods of CH_4 emission reduction in waste/wastewater management process. Fill the blank columns with the appropriate methods of emission reduction. *[4 points: 1point each]*

CH_4 emission source	Emission Reduction Methods	
Solid Waste/Wastewater Management	CH_4 capture	①
		②
		③
	CH_4 emission avoidance/reduction by aerobic treatment of organic matter (Example: ④)	

[Q3] The sentences below explains the CH_4 emission from waste and key parameters in estimating the amount of CH_4 from waste. Fill in the blanks with appropriate word(s). *[2 points: 1point each]*

CH_4 emission from waste

- CH_4 is generated as a result of degradation of ① under ② condition.
- The time required for the waste to decay (half-life) is different among the types of waste.
- Part of CH_4 generated is oxidized in the cover of solid waste disposal (CH_4 oxidation by methanotrophic micro-organisms in cover soil.).

Key Parameter in CH_4 emission

- Degradable ① in waste.
- Degree of ② condition in waste (Methane Correction Factor: MCF)
- The time required for the waste to decay (decay rate)

[Q4] Estimate the amount of CH_4 emission from the waste management under the preconditions mentioned below *[10 points]*.

PRECONDITIONS

(1) Waste Amount and Composition

Items	Preconditions	
The amount of waste disposed		100,000 tons/year
Waste composition by types (% by weight)	Paper/cardboard	10%
	Textiles	5%
	Food waste	20%
	Wood	5%
	Garden and park waste	20%
	Inert waste	40%

(2) Final Disposal (Landfill) method: unmanaged landfill with 3m depth.

(3) Content of Degradable Organic Compounds (DOCs) and decay rate of DOCs by types of waste

Type of Waste	Content of DOCs in the waste (% on weight basis)	Decay rate of DOCs in the first year (% on weight basis)
Paper/cardboard	40%	6.8%
Textiles	24%	6.8%
Food waste	15%	33.0%
Wood	43%	3.4%
Garden/park waste	20%	15.6%
Inert waste	0%	0%

(4) Methane (CH_4) Correction Factor (MCF) by types of landfills

Type of landfills	MCF
Managed anaerobic	1.0
Managed semi-anaerobic	0.5
Unmanaged deep (>5m waste) and/or high waste table	0.8
Unmanaged shallow (<5m waste)	0.4
Uncategorized waste disposal	0.6

ESTIMATION METHODS

Equation for estimating the CH_4 emission (in CO_2 equivalent) from waste landfill

CH_4 emission (in tonne CO_2e)

= 5.67 × MCF × (Total amount of DOCs decayed in the first year)

(Please use the blank below for your calculation)

Answer	Tonne CO_2 equivalent

[3] Energy Efficiency & Fuel Switch

Marks: ／20

[Q1] A food factory is changing halogen lamps in the factory and its warehouse to LED. The facility operates from 6AM and close at 6PM with 264 working days a year. Emission coefficient of electricity is 0.686 tCO2/MWh.

Specifications of an halogen lump and LED lumps are given as follows;

Items	Value	Unit
Halogen lump		
Power Consumption	400	W
Number of units	137	Units
LED lump		
Power Consumption	118	W
Number of units	83	Units

1-A: Calculate electricity consumption of halogen lamps.

1-B: Calculate electricity consumption of LED lamps.

1-C: Calculate CO2 reduction amount by changing from halogen to LED.

ANSWER	
1-A	
1-B	
1-C	

[7 points: 2points for 1-A, 1-B, 3points for 1-C]

[Q2] The food factory runs 1.5 t of boiler to provide utility steam of the plant to cook and sterilization. The boiler runs from 6AM to 6PM including start up time. The facility runs 264 days last year. The project changes fuel of the boiler from furnace oil to natural gas to save fuel costs. According to the invoice, the facility bought 1,752 kl of furnace oil last year.

Items	Value	Unit
Emission Factor		
Furnace Oil	3.084	tCO2/kl
Natural Gas	2.108	kgCO2/Nm3
Heat Value		
Furnace Oil	39.85	GJ/kl
Natural Gas	46.10	MJ/Nm3

2-A: Calculate CO2 emissions from furnace oil consumption

2-B: Calculate an amount of natural gas to alternate furnace oil.

2-C: Calculate CO2 Emissions from an amount of natural gas derived from 2-B.

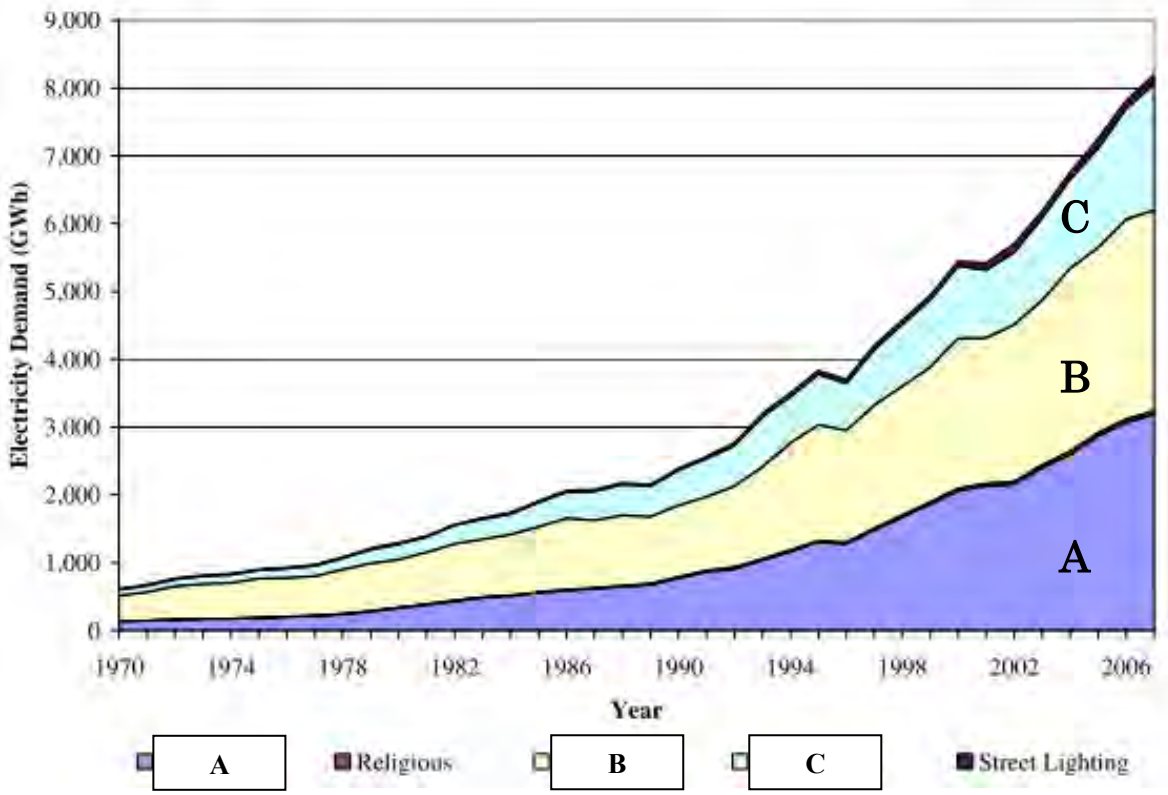
2-D: Calculate amount of CO2 reductions by changing fuel from furnace oil to natural gas.

ANSWER	
2-A	
2-B	
2-C	
2-D	

[10 points: 2 points for 2-A~2-C, 4 points for 2-D]

[Q3] Choose an appropriate category to represent proportions of the graph.

Figure 5.4 – Electricity Demand by Consumer Category



Choices:

① **Industrial**
② **Domestic**
③ **Commercial**

ANSWER	
A	
B	
C	

[3 points: 1 point each]

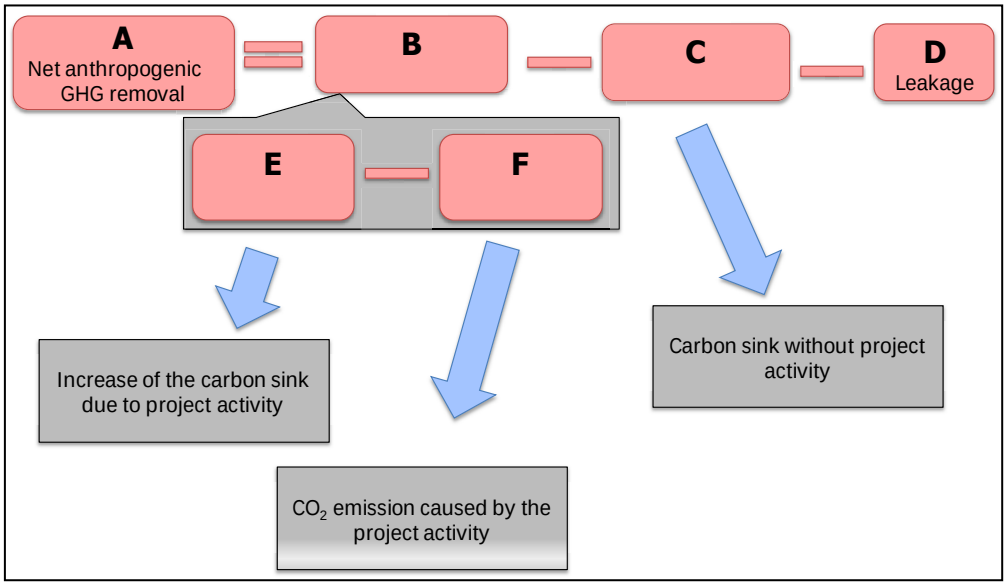
[4] Afforestation Reforestation	Marks: ／20

[Q1] Select four projects that are Afforestation/Reforestation CDM from the following list of climate change mitigation projects. *[4 points: 1point each]*

[ ]	Biomass power generation project using forest residues
[ ]	Natural regeneration of trees without any human intervention
[ ]	Tree planting activities in the ex-farming land
[ ]	Status quo conservation and tree planting activities inside the national nature reserve
[ ]	Reforestation of the degraded grazing land
[ ]	Assisted natural regeneration of the degraded land with the help of the local farmers
[ ]	Carbon Capture and Storage in the ex-oil field
[ ]	Small Scale Cooperative Forestry Activity

[Q2] Following is the formula for the Afforestation/Reforestation carbon sink calculation. Fill in the correct alphabet to the table below containing the missing terms of the formula.

[4 points: 1point each]



[**A**]	Net Anthropogenic GHG removal
[**D**]	Leakage
[ ]	Baseline GHG removal by sink
[ ]	Actual net GHG removal by sink
[ ]	Total GHG removal by the project
[ ]	Project Emission

[Q3] Select one correct description of the "non-permanence issue" of the Afforestation/ Reforestation CDM *[4 points]*

[ ]	It is considered to be generally more expensive and time consuming to monitor the activities of A/R CDM projects in comparison with energy-based CDM projects. This may be solved in the near future with the development of the remote sensing technology.
[ ]	Forest captures carbon, but it may be released once there is a forest fire, or if trees decay. Therefore there is no guarantee that the carbon will be stored inside the forest.
[ ]	The crediting period of the A/R CDM project is 30 years or 20years×2. With the current uncertainty of the post Kyoto agreement, it is difficult to conduct such long term projects.
[ ]	CER price always fluctuates. Therefore there is no guarantee that the price of the CER price will stay the same for the next 5 years, making it difficult to predict the revenue gained from the A/R CDM activities.

[Q4] Select either (A) or (B) which is the correct statement of the Afforestation/Reforestation CDM carbon credit (l-CER and t-CER) *[4 points: 1point each]*

[ ]	(A) The credit can be used to offset the national emission reduction commitments (B) The credit can only be used for voluntary purposes
[ ]	(A) The credit has an expiry date (B) The credit do not have any expiry date
[ ]	(A) The credit buyer needs to obtain equivalent amount of CER upon end of the crediting period or end of the commitment period. (B) There is no need for the credit buyer to obtain equivalent amount of CER upon end of the crediting period or end of the commitment period.
[ ]	(A) The credit will be issued after 2012 even without post Kyoto agreement (B) The credit will not be issued after 2012 unless there is a post Kyoto agreement

[Q5] <A> is different types of forest related climate change mitigation projects. Please draw lines to connect "Project" <A> with correct "Description of its carbon credit" <B>

[4 points: 1point each]

<A>: Project		<B>: Description of the carbon credit
A/R CDM project	• •	Certain percentage of carbon credit must be transferred to the buffer account.
A/R VCS project (using carbon pooling approach)	• •	The credit will be issued depending on how much forest has been prevented from deforestation in comparison with the reference scenario.
REDD project	• •	The credit cannot be used for the Annex I commitment for now and most likely in the future as well. However the credits are often bought for the purpose of CSR or good will.
Voluntary Forestry Project	• •	The carbon credit will expire during the end of the project or the end of the commitment period.

[5] Outcomes of COP/MOP and Post 2012 issues

Marks: ／20

[Q1] Check the CORRECT description (1 answer) about CDM Loan Scheme. *[4 points]*

[ ]	CDM Loan Scheme agreed at the COP/MOP5 in Copenhagen, Denmark.
[ ]	Eligible for all Non-Annex I Parties, including LDCs and SIDS.
[ ]	Eligible only for fewer than 10 registered CDM project countries.
[ ]	Loan will cover for validation fee only.

[Q2] Check the CORRECT description (1 answer) about CDM after 2012. *[4 points]*

[ ]	Crediting period of all registered CDM projects will be expired at the end of the first commitment period of the Kyoto Protocol.
[ ]	CDM Executive Board will dissolve at the end of the first commitment period of the Kyoto Protocol.
[ ]	Certified Emission Reduction (CER) will be generated and issued after 2012.
[ ]	Certified Emission Reduction (CER) will be utilized for second commitment period of the Kyoto Protocol.

[Q3] Select 'Correct' or 'Incorrect' in the box for the following statement:

[Q3-1] There are several scenarios for Market Mechanism after 2012 presented by researchers and policy makers. CDM will not utilize at the most of the scenarios. *[12 points: 4points each]*

[ ]	Correct
[ ]	Incorrect

[Q3-2] Bangladesh, China and other developing country Parties submitted their views and opinions on New Market-based Mechanisms as follows:
Emission reduction commitments of the developed country Parties shall be achieved mainly through domestic actions. And Market-based Mechanisms could only play a supplementary role to achieve their commitments.

[ ]	Correct
[ ]	Incorrect

[Q3-3] The Government of Japan is promoting so-called "Bilateral Offset Credit Mechanism (BOCM)" to be introduced as a new financial assistance mechanism after 2012. Japan plans to provide technical and financial assistance to Non-Annex I countries entirely through this new scheme, not through CDM.

[ ]	Correct
[ ]	Incorrect