

# CDM Training Program Final Examination

15 July 2011

Prepared by: JICA Expert Team

Name: \_\_\_\_\_

Organization: \_\_\_\_\_

<b>TOTAL SCORE:</b>	／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)

$$KgCO_2 / kWh = tCO_2 / \boxed{A} \quad 1MWh = \boxed{B} GWh$$

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

[4 points: 2 points each]

(3)

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

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.

$$\boxed{\text{GHG Emission Reduction (tCO}_2\text{)}} = \boxed{\text{Amount of Electricity (MWh)}} \times \boxed{\text{Grid Emission Factor (E/F)}} - \boxed{\text{Project/Leakage Emission (tCO}_2\text{)}}$$

Unit check of the above equation:  $tCO_2 = MWh \times \frac{\boxed{E}}{\boxed{F}} - tCO_2$

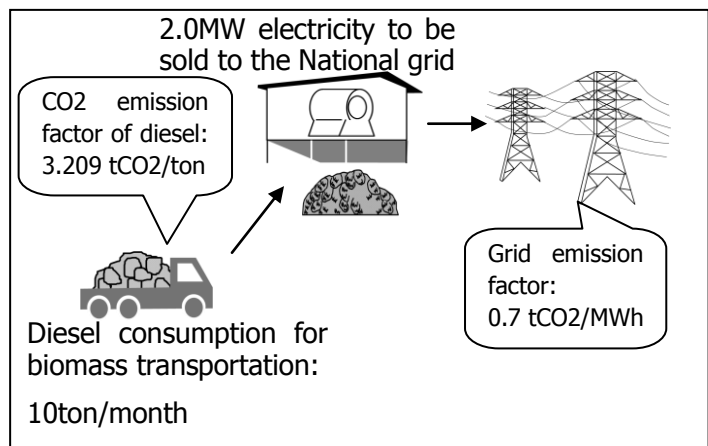
[ ]	E: MWh	F: tCO <sub>2</sub>
[ ]	E: tCO <sub>2</sub>	F: MWh
[ ]	E: ton_fuel	F: tCO <sub>2</sub>
[ ]	E: tCO <sub>2</sub>	F: ton_fuel

[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 [tCO <sub>2</sub> /MWh]	0.70
Diesel required for transportation of biomass [ton/month]	10
Emission factor of fossil fuel [tCO <sub>2</sub> /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]



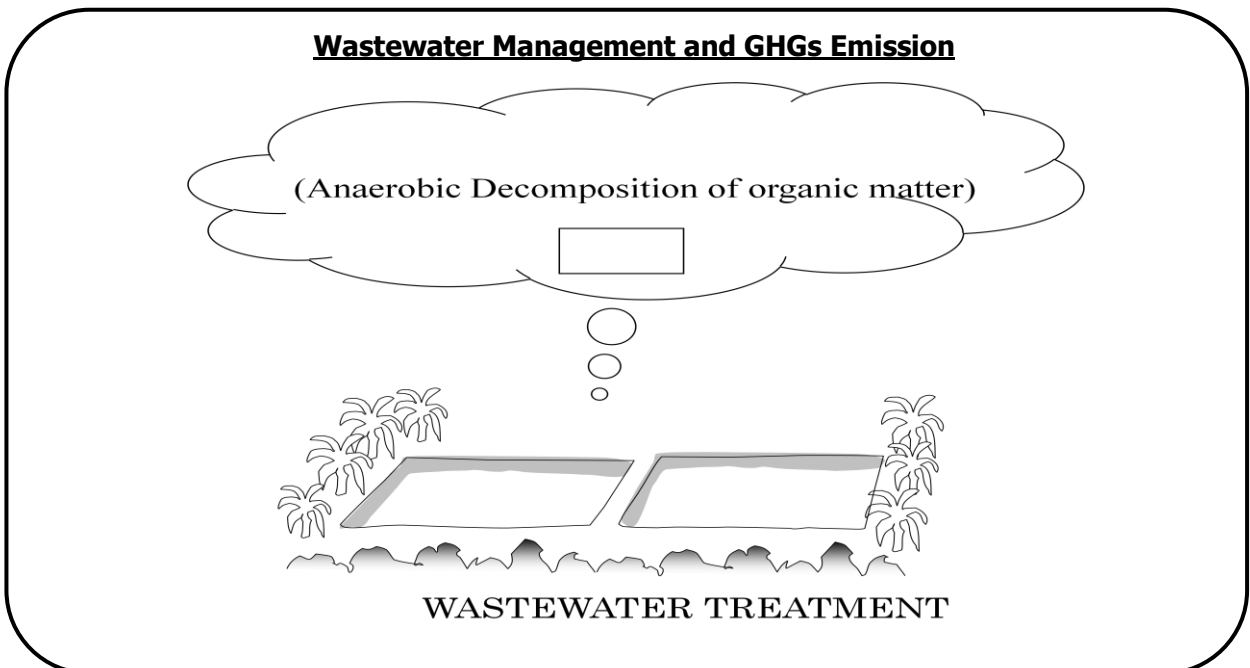
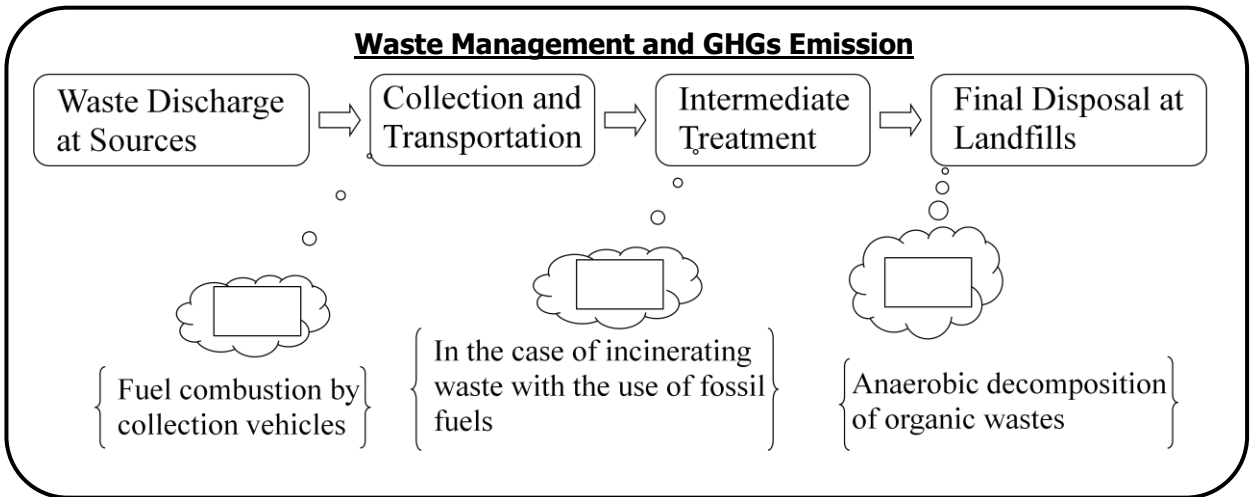
- (4) How much fossil fuel is required for biomass transportation annually?
- (5) How much GHG is emitted annually through fossil fuel consumption by the project activity (transport of biomass)? [Project emissions]
- (6) How much GHG emission is reduced annually by the project activity? [Emission reduction]

ANSWER	
(1)	[hours/year]
(2)	[MWh/year]
(3)	[tCO <sub>2</sub> /year]
(4)	[ton/year]
(5)	[tCO <sub>2</sub> /year]
(6)	[tCO <sub>2</sub> /year]

**[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<sub>4</sub> emission reduction in waste/wastewater management process. Fill the blank columns with the appropriate methods of emission reduction. [4 points: 1point each]

CH <sub>4</sub> emission source	Emission Reduction Methods	
Solid Waste/Wastewater Management	CH <sub>4</sub> capture	① <input type="text"/>
		② <input type="text"/>
		③ <input type="text"/>
	CH <sub>4</sub> emission avoidance/reduction by aerobic treatment of organic matter (Example: ④ <input type="text"/> )	

[Q3] The sentences below explains the CH<sub>4</sub> emission from waste and key parameters in estimating the amount of CH<sub>4</sub> from waste. Fill in the blanks with appropriate word(s). [2 points: 1point each]

**CH<sub>4</sub> emission from waste**

- CH<sub>4</sub> 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<sub>4</sub> generated is oxidized in the cover of solid waste disposal (CH<sub>4</sub> oxidation by methanotrophic micro-organisms in cover soil.).

**Key Parameter in CH<sub>4</sub> 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<sub>4</sub> 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<sub>4</sub>) 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<sub>4</sub> emission (in CO<sub>2</sub> equivalent) from waste landfill

$$\begin{aligned} \text{CH}_4 \text{ emission (in tonneCO}_2\text{e)} \\ &= 5.67 \times \text{MCF} \times (\text{Total amount of DOCs decayed in the first year}) \end{aligned}$$

(Please use the blank below for your calculation)

Answer	Tonne CO <sub>2</sub> equivalent
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### [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 tCO<sub>2</sub>/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 CO<sub>2</sub> 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.

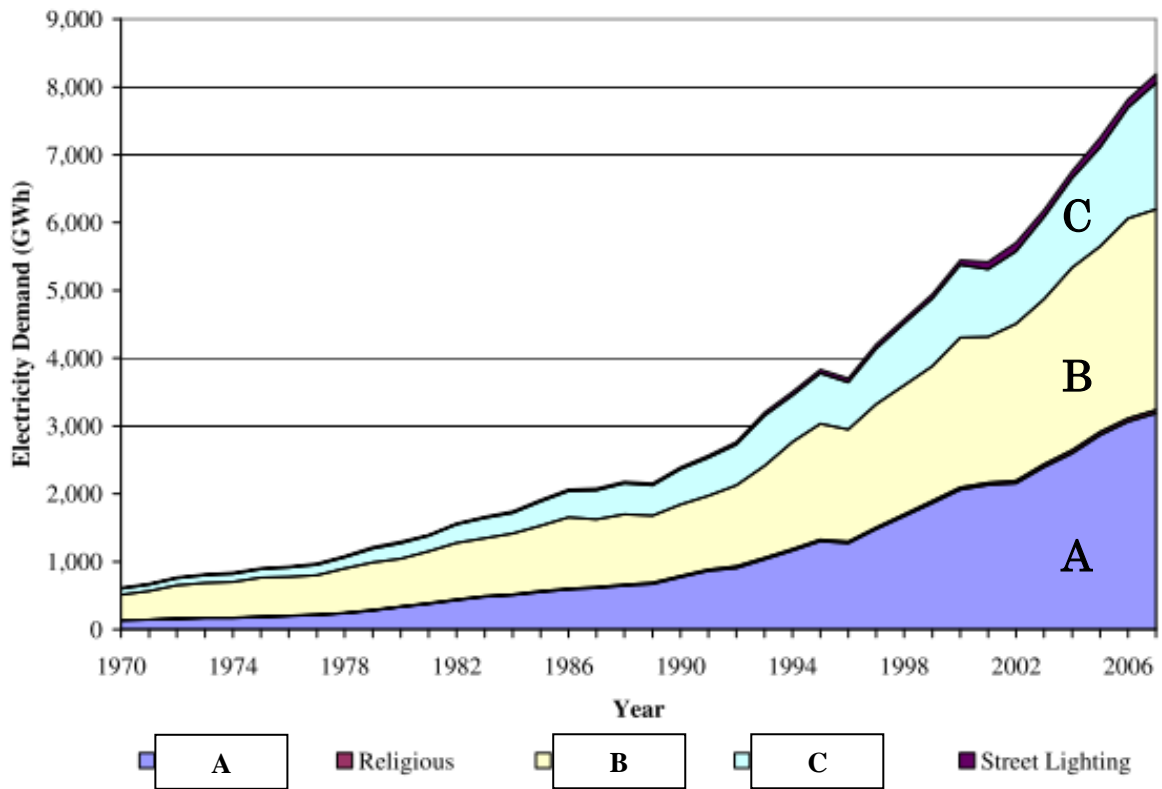
2-D: Calculate amount of CO2 reductions by changing fuel from furnace oil to natural gas.

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
- ②
- ③

**Industrial  
Domestic  
Commercial**

ANSWER	
A	
B	
C	

*[3 points: 1 point each]*

## [4] Afforestation Reforestation

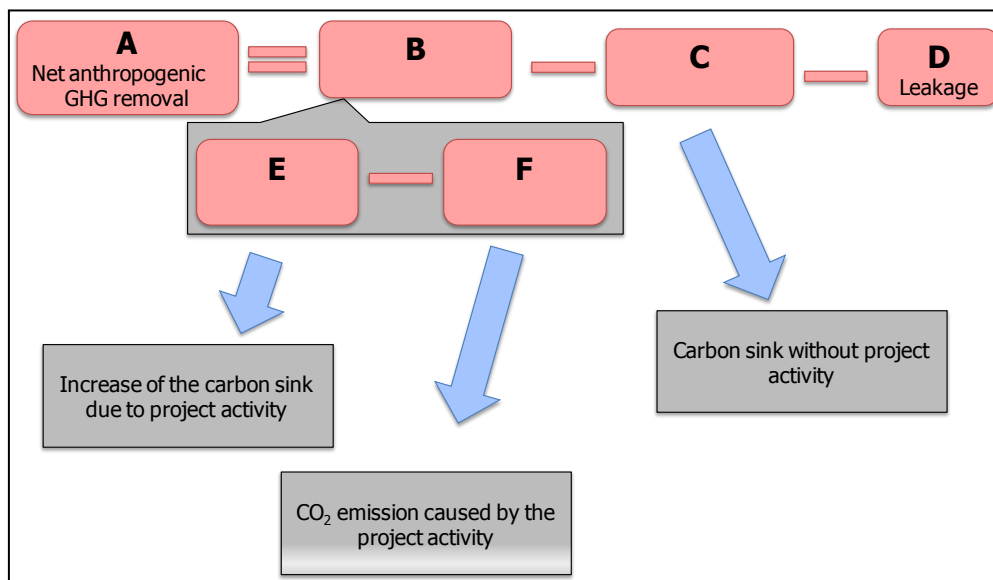
Marks: /20

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

<input type="checkbox"/>	Biomass power generation project using forest residues
<input type="checkbox"/>	Natural regeneration of trees without any human intervention
<input type="checkbox"/>	Tree planting activities in the ex-farming land
<input type="checkbox"/>	Status quo conservation and tree planting activities inside the national nature reserve
<input type="checkbox"/>	Reforestation of the degraded grazing land
<input type="checkbox"/>	Assisted natural regeneration of the degraded land with the help of the local farmers
<input type="checkbox"/>	Carbon Capture and Storage in the ex-oil field
<input type="checkbox"/>	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]*



<input type="checkbox"/>	<b>A</b> Net Anthropogenic GHG removal
<input type="checkbox"/>	<b>D</b> Leakage
<input type="checkbox"/>	Baseline GHG removal by sink
<input type="checkbox"/>	Actual net GHG removal by sink
<input type="checkbox"/>	Total GHG removal by the project
<input type="checkbox"/>	Project Emission

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

<input type="checkbox"/>	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.
<input type="checkbox"/>	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.
<input type="checkbox"/>	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.
<input type="checkbox"/>	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]

<input type="checkbox"/>	(A) The credit can be used to offset the national emission reduction commitments (B) The credit can only be used for voluntary purposes
<input type="checkbox"/>	(A) The credit has an expiry date (B) The credit do not have any expiry date
<input type="checkbox"/>	(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.
<input type="checkbox"/>	(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	<ul style="list-style-type: none"> <li>• Certain percentage of carbon credit must be transferred to the buffer account.</li> </ul>
A/R VCS project (using carbon pooling approach)	<ul style="list-style-type: none"> <li>• The credit will be issued depending on how much forest has been prevented from deforestation in comparison with the reference scenario.</li> </ul>
REDD project	<ul style="list-style-type: none"> <li>• 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.</li> </ul>
Voluntary Forestry Project	<ul style="list-style-type: none"> <li>• The carbon credit will expire during the end of the project or the end of the commitment period.</li> </ul>

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

Marks:

/20

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

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

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

<input type="checkbox"/>	Crediting period of all registered CDM projects will be expired at the end of the first commitment period of the Kyoto Protocol.
<input type="checkbox"/>	CDM Executive Board will dissolve at the end of the first commitment period of the Kyoto Protocol.
<input type="checkbox"/>	Certified Emission Reduction (CER) will be generated and issued after 2012.
<input type="checkbox"/>	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]*

<input type="checkbox"/>	Correct
<input type="checkbox"/>	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.

<input type="checkbox"/>	Correct
<input type="checkbox"/>	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.

<input type="checkbox"/>	Correct
<input type="checkbox"/>	Incorrect

