Current Status and Trend of Clean Development Mechanism for Bioenergy

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화학공학의 이론과 응용 제14권 제1호 2008년

Climate Change Convention

- Cap & Trade
  - Emission reduction has allocated to Annex 1
  - Annex 1 comply the allocation through Kyoto protocol

- Kyoto Protocol
  - Clean Development Mechanism
    - Between Annex I and Non-annex I country
  - Joint Implementation
    - Between Annex I countries
  - Emission Trading
    - Buyer & Seller
    - Emission Reduction Unit, Certified Emission Reduction

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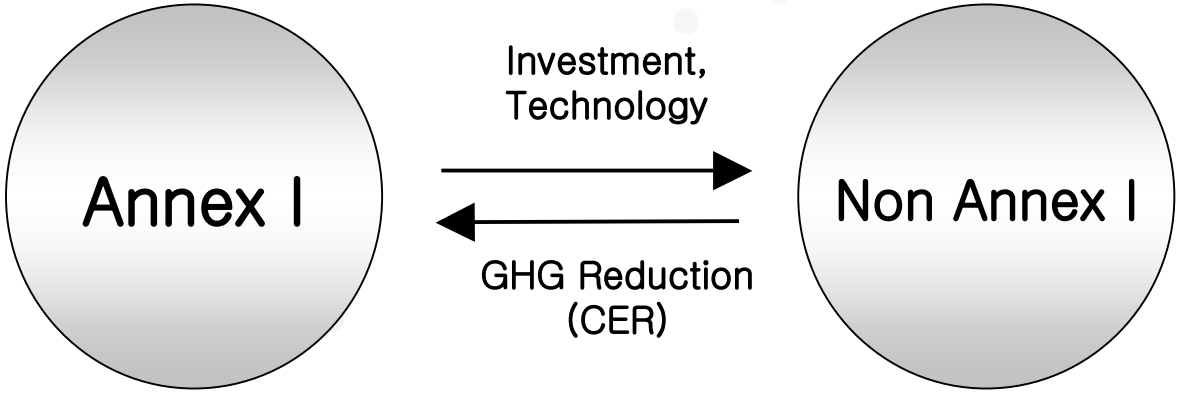
Clean Development Mechanism

- Annex I (Developed Country) conduct GHG reduction project in Non-Annex 1 (Developing country)
- The amount of reduction is shown as CER (Certified Emission Reduction)
- CER can be used for allocation compliance by purchasing



- ✓ Unilateral CDM project has been available since 2005 (EB meeting, 18th)
- ✓ Project activity should contribute to the **sustainable development** in Non-annex I country

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CDM Project Type

CDM Project by sectoral scope

	Sectoral Scope		Sectoral Scope
1	**Energy industries (renewable/non-renewable sources)**	9	Metal production
2	Energy distribution	10	Fugitive emissions from fuels (solid, oil and gas)
3	Energy demand	11	Fugitive emissions from production and consumption of halocarbons and SF6
4	Manufacturing industries	12	Solvents use
5	Chemical industry	13	**Waste handling and disposal**
6	Construction	14	Land-use, land-use change and forestry
7	Transport	15	Agriculture
8	Mining/mineral production		

CDM Project by scale (criterion for small scale)

Type I: Renewable energy project activities with a **maximum output capacity equivalent to up to 15 megawatts** (or an appropriate equivalent);

Type II: Energy efficiency improvement project activities which reduce energy consumption, on the supply and/or demand side, limited to those with a **maximum output of 60 GWh per year** (or an appropriate equivalent);

Type III: Other project activities limited to those that result in emission reductions of **less than or equal to 60 kt CO2 equivalent annually**

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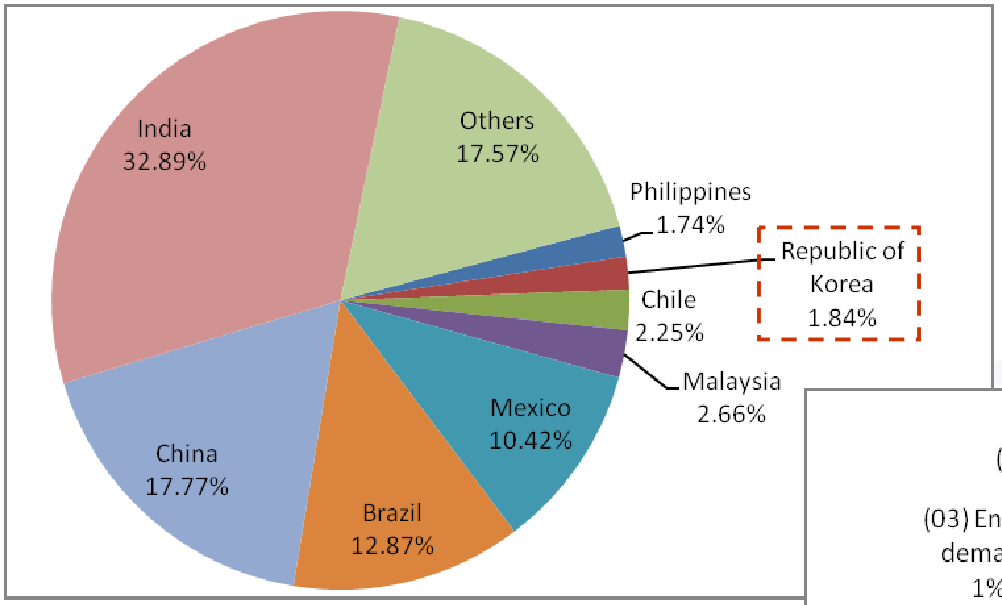
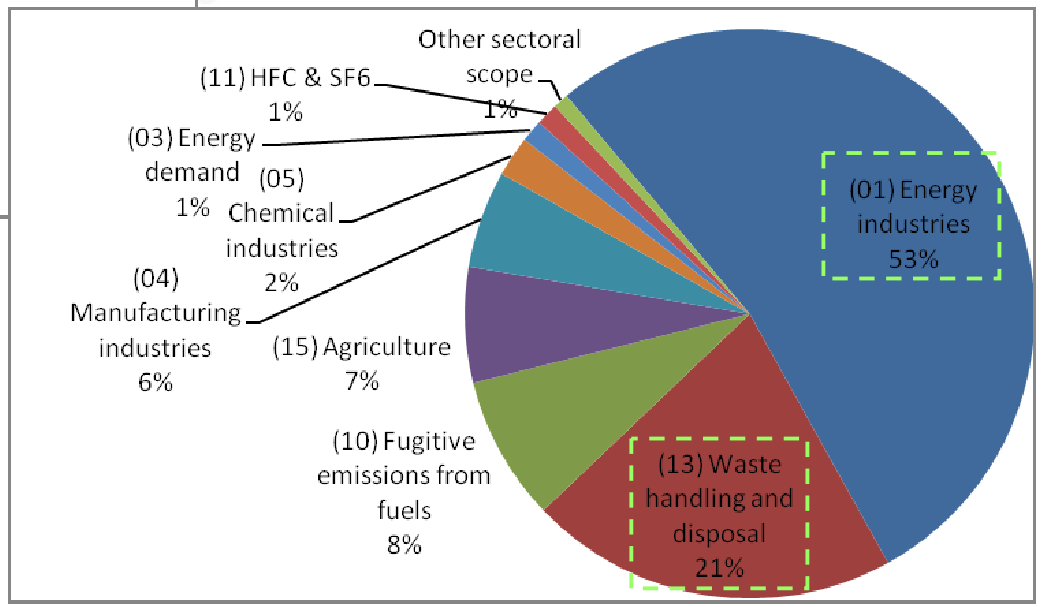
CDM Projects Status

Registered Project by host country



Total 979 projects

Registered Project by Sectoral Scope



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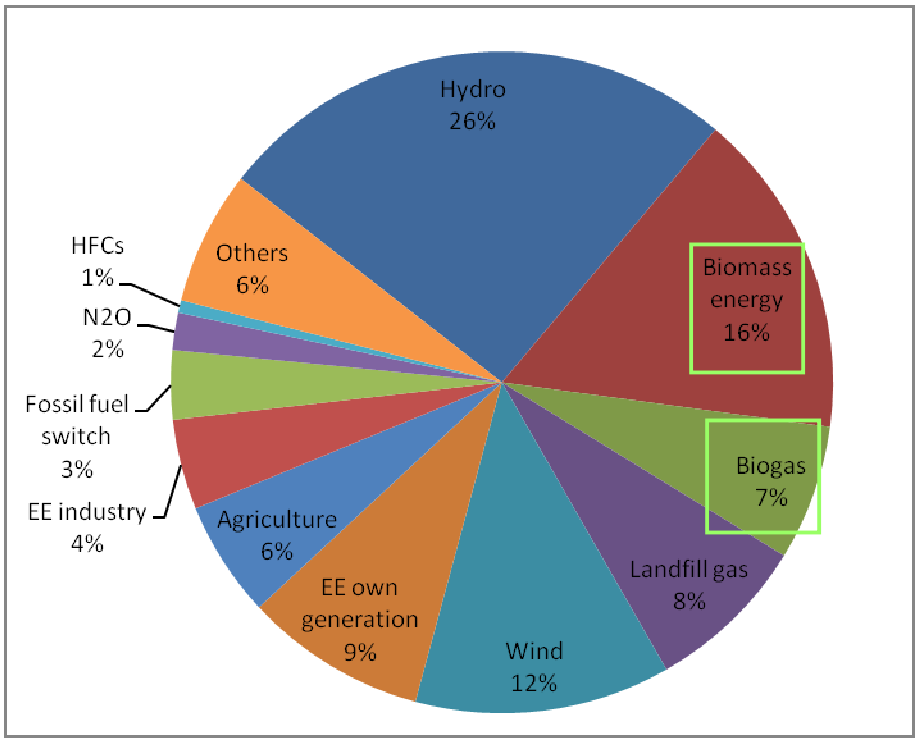
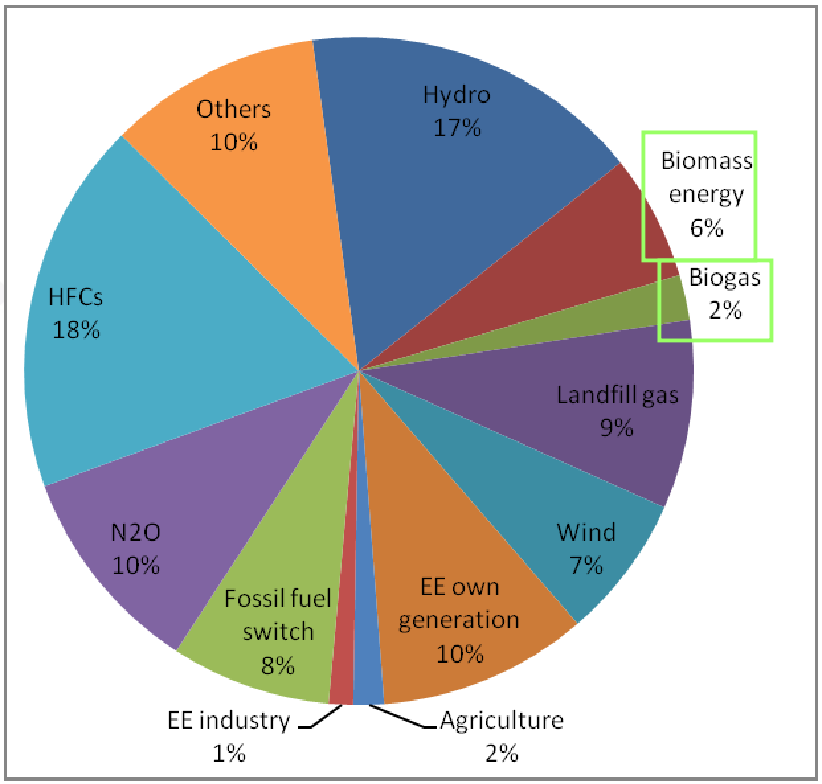
CDM Projects Status

Number of Projects by Type (total 3,274projects)



CERs by Type (total 4999,272tCO2eq/yr)



Others: Solar, Coal bed/mine methane, Cement, EE supply side, Fugitive, Reforestation, Geothermal, EE households, Transport, Energy distribution, EE service, Afforestation, PFCs, Tidal

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CDM Projects Status

Sub-types used in CDM projects	# of Project
Bagasse power	152
Palm oil solid waste	34
Agricultural residues : other kinds	131
Agricultural residues : rice husk	103
Agricultural residues : mustard crop	6
Agricultural residues : poultry litter	2
Black liquor	7
Irrigation	1
Forest residues: sawmill waste	17
Forest residues: other	24
Forest biomass	7

Sub-types used in CDM projects	# of Project
Industrial waste	2
Gasification of biomass	6
Biodiesel	4
Ethanol	0
Landfill flaring	81
Landfill power	78
Combustion of MSW	5
Gasification of MSW	2
Composting	78
Biogas flaring	195
Biogas power	182

Biomass CDM projects	No. of projects	
Country	Solid	Biogas
India	267	27
Brazil	87	48
Malaysia	24	25
China	30	11
Indonesia	15	8
Thailand	8	28
Philippines	8	42
Chile	7	9
Honduras	6	5
Sri Lanka	4	0
Argentina	6	1
Mexico	2	143
Ecuador	4	4
South Korea	2	0
Others	19	29
Total	489	380

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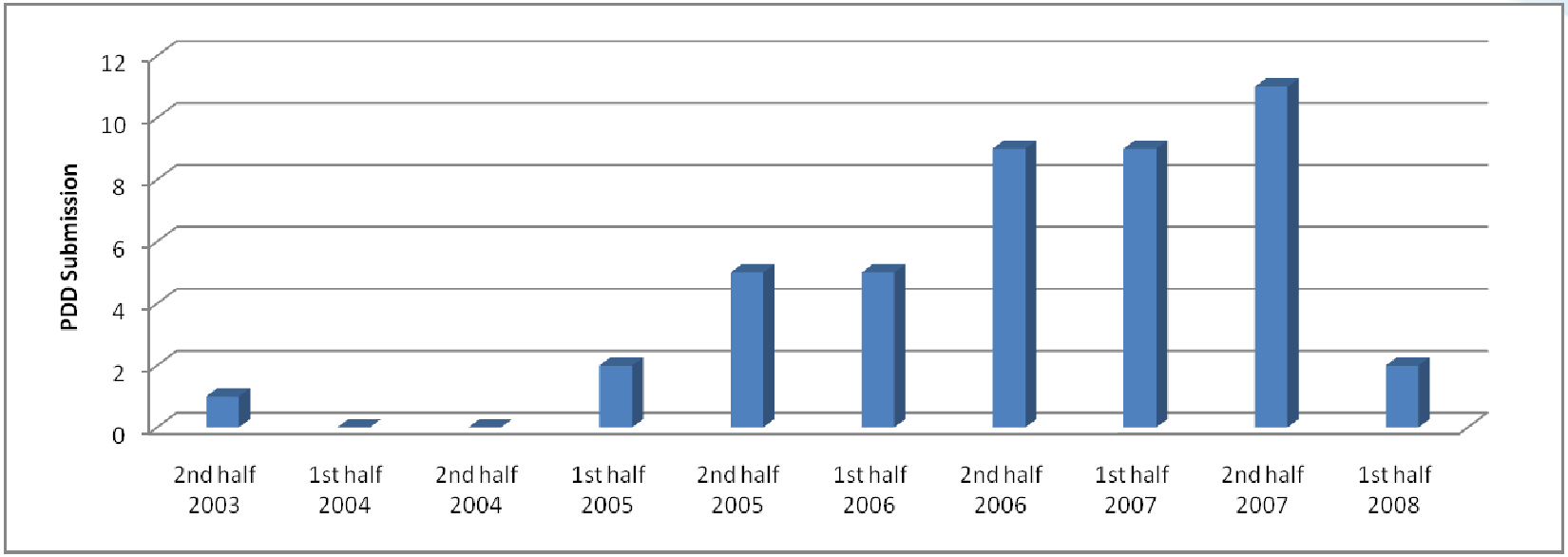
CDM Projects Status in Korea



Scope	Registered	At Validation (Req. Reg.)	Scope	Registered	At Validation (Req. Reg.)
Wind	4	4	Geothermal	0	1
Hydro	4	4(1)	HFC	1	0
Solar	1	4	N2O	3	1
Landfill Gas	2	5	Fossil fuel switch	1	2(1)
Tide	1	0	Energy Eff.	0	2
Biomass	0	2	EE own gen.	0	1

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Bioenergy & Biomass

- Bioenergy is the energy produced from **biomass**, which is generated from photosynthesis (plants) or organic materials consumption.

- Bioenergy Technology is **conversion technology** from biomass into heat and power.

- Biomass is non-fossilized and biodegradable organic material originating from plants, animals and microorganisms. This shall also include products, by-products, residues and waste from agriculture, forestry and related industries as well as the non-fossilized and biodegradable organic fractions of industrial and municipal wastes. Biomass also includes gases and liquids recovered from the decomposition of non-fossilized and biodegradable organic material.

- Biomass residues are defined as biomass that is a **by-product, residue or waste stream from agriculture, forestry and related industries**. This shall **not include** municipal waste or other wastes that contain **fossilized and/or non-biodegradable material** (small fractions of inert inorganic material like soil or sands may be included).

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Bioenergy Related Methodologies

	Biomass: (not applicable for non-renewable biomass)
AM7	Switch from coal/lignite to seasonal agro-biomass power
ACM3 (ver 7)	Emission reduction through partial substitution of fossil fuels with alternative fuels in cement manufacture
ACM6 (ver 6)	Grid-connected electricity from biomass residues (includes AM4 & AM15)
AM27 (ver 2.1)	Substitution of CO2 from fossil or mineral origin by CO2 from renewable resources in production of inorganic compounds
AM36 (ver 2)	Fuel switch from fossil fuels to biomass residues in boilers for heat generation
AM42	Grid-connected electricity generation using biomass from newly developed dedicated plantations
	Biofuels:
AM47 (ver 2)	Production of biodiesel based on waste oils and/or waste fats from biogenic origin for use as fuel
	Waste:
ACM1 (ver 8)	Landfill gas project activities
ACM14	Avoided methane emissions from wastewater treatment
AM25 (ver 10)	Avoided emissions from organic waste through alternative waste treatment processes
AM39 (ver 2)	Methane emissions reduction from organic waste water and bioorganic solid waste using co-composting
AM53	Biogenic methane injection to a natural gas distribution grid
AM57 (ver 2)	Avoided emissions from biomass wastes through use as feed stock in pulp and paper production
	Animal waste:
ACM10 (ver 3)	GHG emission reductions from manure management systems

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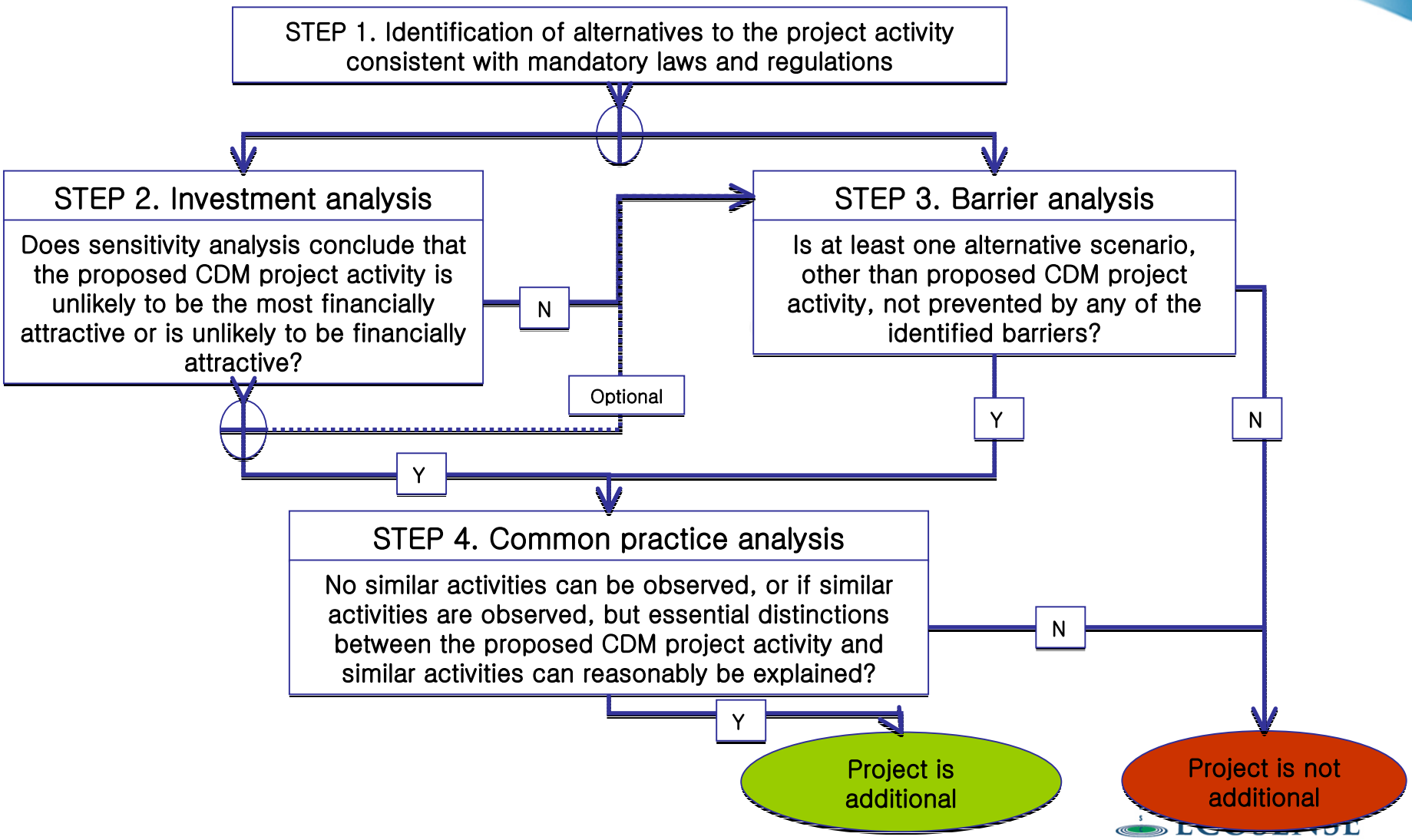
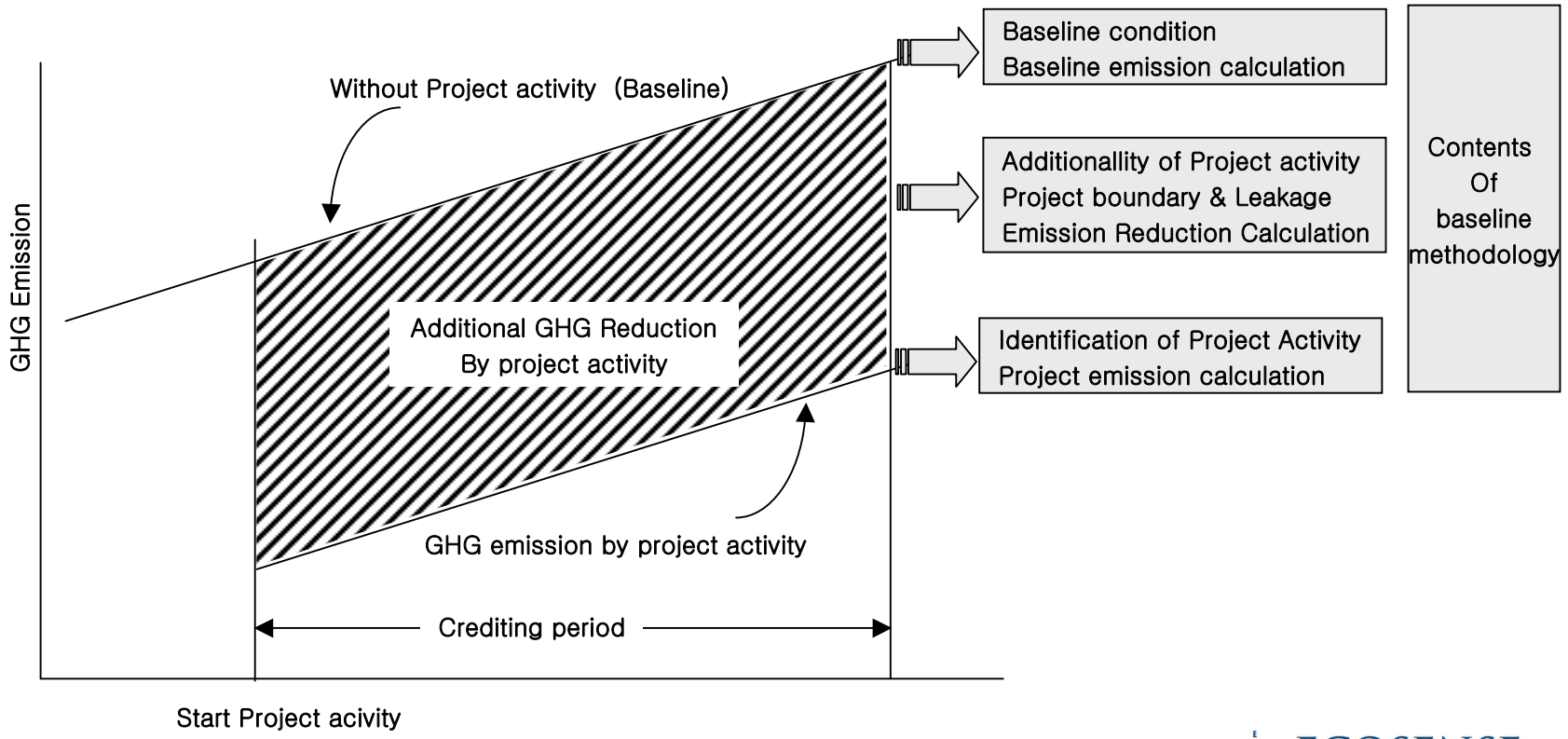
Additionality Criterion



Emission Reduction Calculation

Emission Reduction

Baseline Emission : GHG Emission without CDM activity (Business as usual)
Project Emission : GHG Emission as the result of CDM activity



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Project Design Document

A. General description of project activity	A.1 Title of the project activity A.2 Description of the project activity A.3 Project participants A.4 Technical description of the project activity
B. Application of a baseline and monitoring methodology	B.1 Title and reference of the approved baseline and monitoring methodology applied to the project activity B.2 Justification of the choice of the methodology and why it is applicable to the project activity B.3 Description of the sources and gases included in the project boundary B.4 Description of how the baseline scenario is identified and description of the identified baseline scenario B.5 Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the project activity B.6 Emission reductions B.7 Application of the monitoring methodology and description of the monitoring plan B.8 Date of completion of the application of the baseline and monitoring methodology and the name of responsible person/entity
C. Duration of the project activity/Crediting period	C.1 Duration of the project activity C.2 Choice of crediting period and related information
D. Environmental impacts	D.1 Documentation on the analysis of the environmental impacts, including trans boundary D.2 EIA result and related action
E. Stakeholders' comments	E.1 Brief description of how comments by local stakeholders have been invited and complied E.2 Summary if the comments received E.3 Report on how due account was taken of any comments received
Annex 1. Contact information on participants in the project activity	Annex 2. Information regarding public funding
Annex 3. Baseline information	Annex 4. Monitoring information

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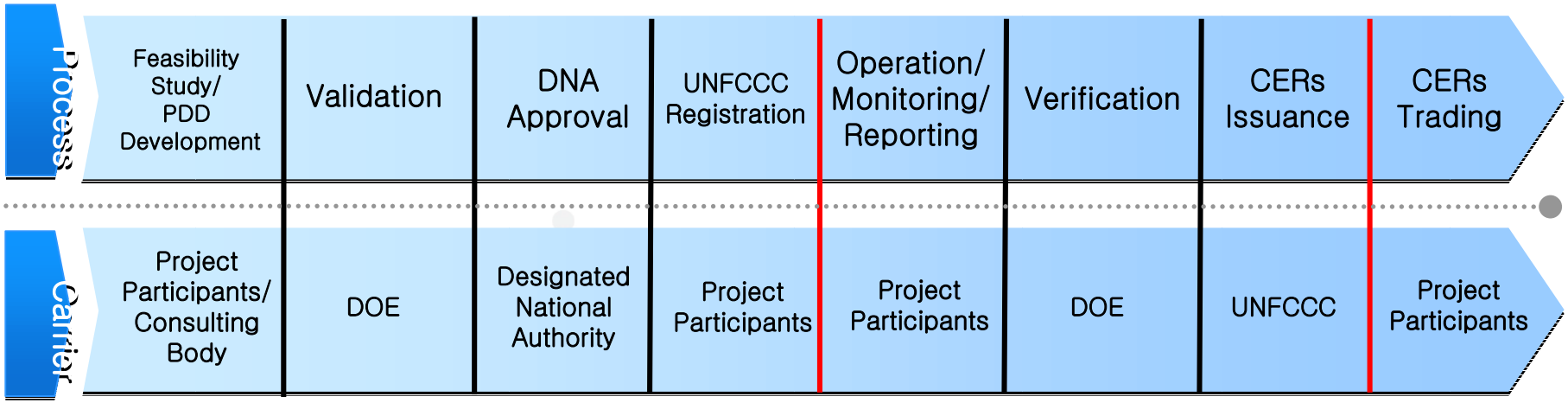
CDM Project Process & Contents

Divided by 3 processes

1. Validation & Registration of Project Design Document as CDM Project
2. CER issuance through monitoring & Verification
3. Benefit Creation through CERs Trading



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Examples

- Biomass
  - Deoband Bagasse Based Co-generation Power Project
  - A.T. Biopower Rice Husk Power Project
- Biogas
  - Granja Becker GHG Mitigation Project
  - Irani Wastewater Methane Avoidance Project
- Biofuel
  - Production of waste cooking oil based biodiesel for use as fuel
  - Bio-diesel from crude palm oil/ Jatropha oil/oil from any another oil crop for consumption as replacement of liquid fossil fuel

Some research report the bioenergy emit more GHG than fossil fuel

Production stage	Gasoline	Corn Ethanol	Biomass Ethanol
Make feedstock	11	72	29
Refine fuel	47	121	26
Vehicle operation	220	215	215
Carbon uptake credit	0	−188	−188
Land use change	0	316	336
Total GHG	278	536	418
Change vs. gasoline	–	93%	50%

Recited: Chemical week, Feb. 11/18 2008. Used with permission from Science/AAAS (Washington)

Sustainability ?

Increasing food price
Land use changes

The primary consideration for CDM project is Sustainable Development

The bioenergy related project can be CDM project if…

it is complied for the sustainable development of host country
then, how to approve it?

there are applicable methodology
then, how to choose the methodologies?
if not, how to develop the new methodology?

it reduces enough amount of GHG
then, how much it should be?

Thank you for your attention!

Any Questions or Comments??

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