CDM Typology

26 AUG 2010, Ai Kawamura JICA Expert Team

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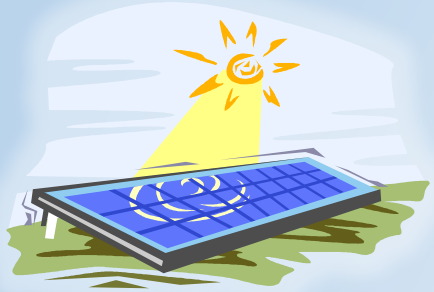
1. CDM Typology by Project Type

1-1. CDM Typology by Project Type (Outline)

- By Project Type

Emission Reduction Project

- Renewable energy project
- Destruction of high global warming potential GHGs (Biogas recovery, Compost etc)
- Energy efficiency etc..



Afforestation/Reforestation Project (sink/removal)

- By Scheme

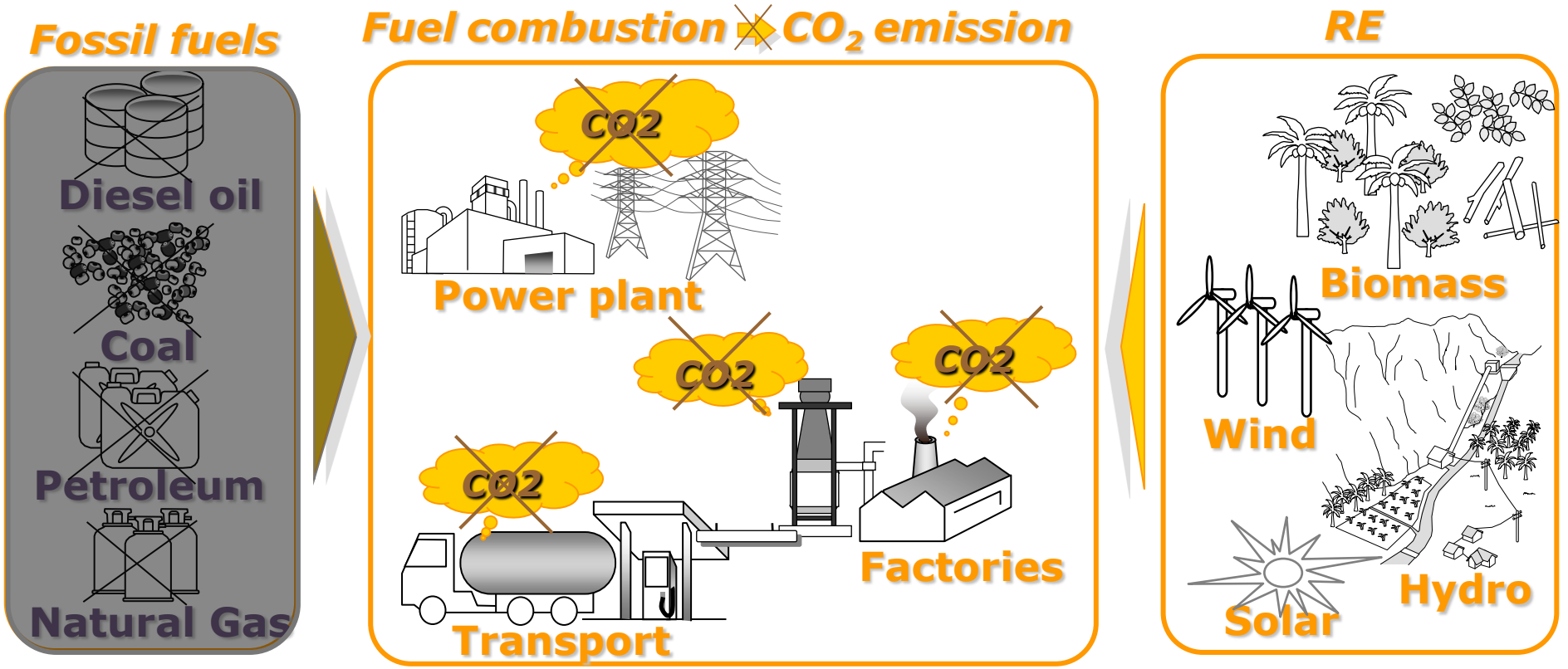
Large Scale CDM

Small Scale CDM

Programmatic CDM

1-1. CDM Typology by Project Type (Renewable Energy[RE])

- RE CDM projects reduce GHG emissions by reducing the use of fossil fuel.
- If the RE is supplied to the grid, it would reduce the "emission factor" of the grid.
- Includes wind, hydro, solar, biomass, geothermal, tidal power projects, and etc.

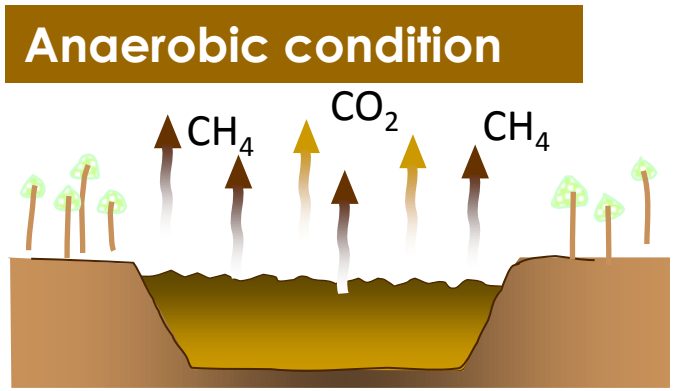


1-1. CDM Typology by Project Type (Destruction of High Global Warming Potential GHGs)

- 1 ton of HFC, N_2O and CH_4 have higher global warming potential than 1 ton of CO_2
- Therefore destruction of these gases will result in GHG emissions reduction.
- Examples: HFC destruction, N_2O destruction, landfill gas flaring, composting, and etc.

Greenhouse Gas	GWP
Carbon dioxide (CO_2)	1
Methane (CH_4)	21
Nitrous oxide (N_2O)	310
Hydro-fluorocarbons (HFCs)	150–11,700
Perfluorocarbons (PFCs)	6,500–9,200
Sulphur hexafluoride (SF_6)	23,900

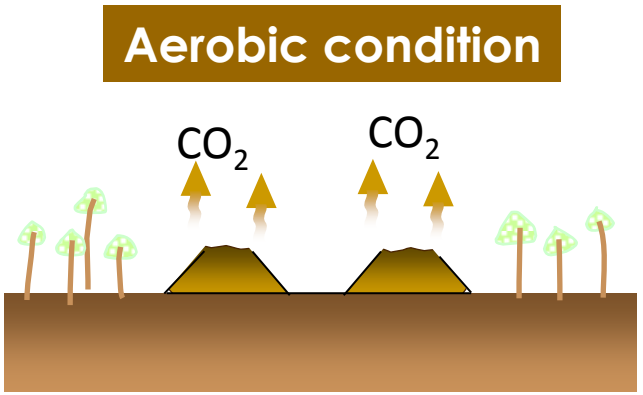
Baseline Scenario (Landfill site)



Fermentation induced by anaerobic condition
Methane(CH_4) and carbon dioxide (CO_2) to be generated

CO2 Reduction

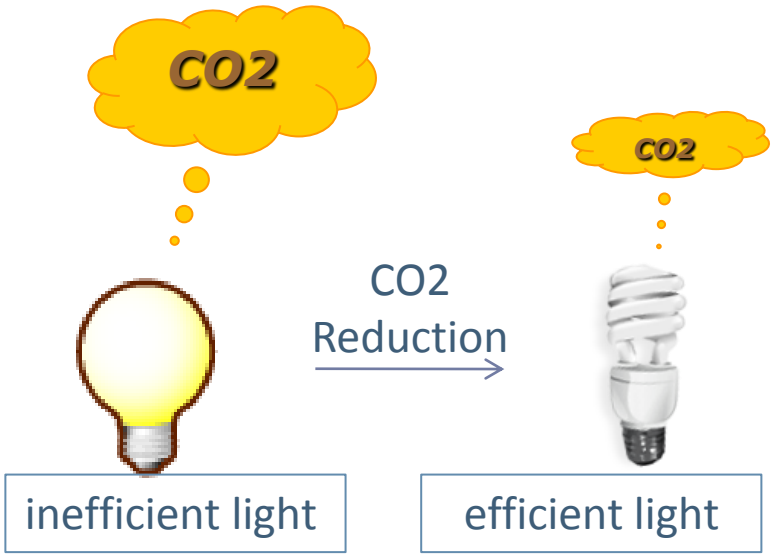
Project Scenario (Composting)



Fermentation inhibited due to aerobic condition
Only carbon dioxide (CO_2) to be generated

1-1. CDM Typology by Project Type (Efficient Use of Fossil Fuel)

- Energy Efficiency:
  - If less fuel is required to travel the same distance, energy efficiency is achieved.
  - If less electricity is used to light the room (with same brightness), energy efficiency is achieved
  - If heat is recovered to generate electricity, energy efficiency is achieved.
- Example of energy efficiency projects include: cogeneration projects, Compact Fluorescent Lamps (CFL) installation projects, combined cycle power plant projects, steel mill waste heat recovery projects, and etc.



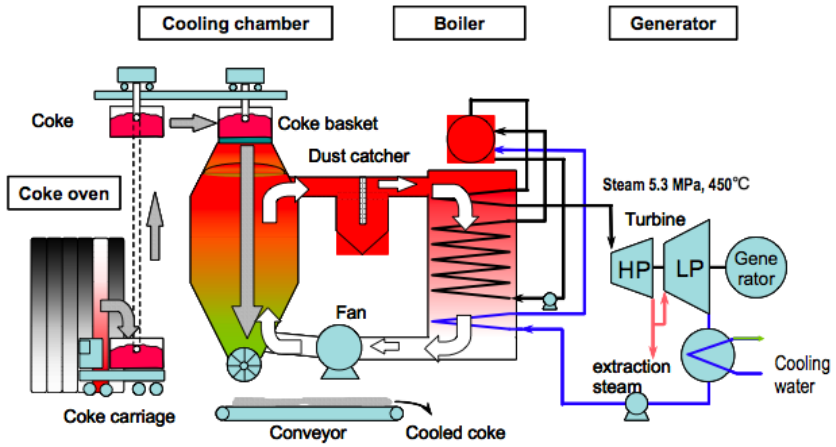


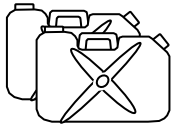
Figure 1: Diagram of coke dry quenching equipment

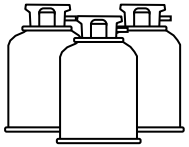
1-1.CDM Typology by Project Type (Switch to Low Carbon Intensity Fossil Fuel)

- Coal emits more CO_2 than natural gas to produce equivalent amount of energy.
- Fuel switch from coal to natural gas will reduce CO_2 emissions.
- Example includes fuel switch from diesel powered boiler to natural gas boiler.


Coal


Diesel oil


Petroleum


Natural Gas

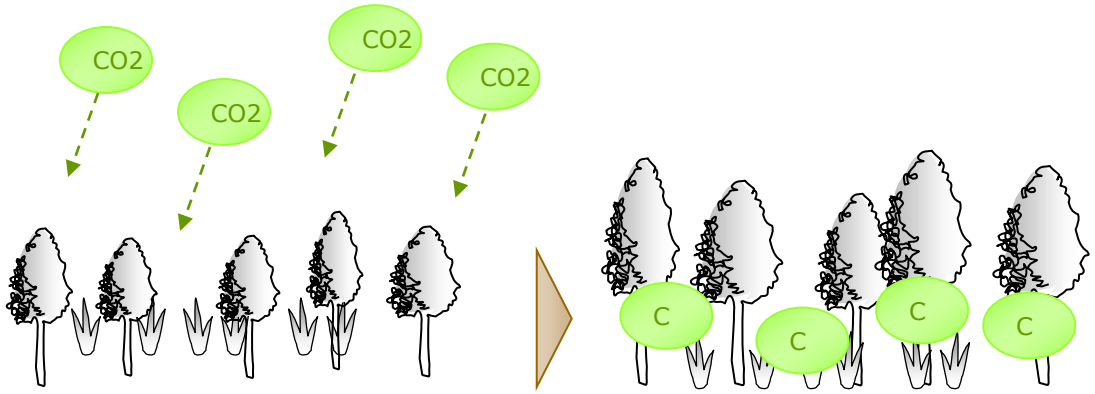
IPCC Default CO_2 emission factor for combustion

Fuel type	kgC/GJ	tCO_2/GJ
Lignite (Coal)	27.6	0.0755
Diesel Oil	20.2	0.0741
Motor Gasoline	18.9	0.0693
Liquefied Petroleum Gas	17.2	0.0631
Natural Gas	15.3	0.0561

Source: 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 2, Chapter 1, Table 1.4

1-1.CDM Typology by Project Type (Carbon Sink)

- CO_2 is absorbed by the trees
- Trees fix the carbon during its growth, thus prevent emission of CO_2 to the atmosphere.
- Once the tree is combusted, CO_2 is released to the atmosphere. (permanence issue)
- Sustainable long term management of the forest is necessary for the carbon sink project.



1-1. CDM Typology by Project Type (Summary)

Emissions Reduction

Main Category	Subcategory	Registered projects	%of total	CER by 2010	%of total
Renewable energy (to replace fossil fuel)	Hydro	622	28.0%	230,037	12.7%
	Biomass	307	13.8%	119,811	6.6%
	Wind Power	359	16.2%	150,544	8.3%
	Other renewable energy	30	1.4%	12,433	0.7%
Destruction of high global warming potential GHG	Methane gas destruction	509	22.9%	282,970	15.6%
	N_2O destruction	62	2.8%	246,917	13.6%
	HFC/PFC/SF_6 destruction	27	1.2%	480,203	26.4%
Efficient use of fossil fuel	Energy Efficiency	172	7.7%	180,018	9.9%
	Transportation	3	0.1%	1,978	0.1%
Switch to low carbon intensive fossil fuel	Fuel Switch	45	2.0%	110,288	6.1%
Carbon sink	Afforestation / Reforestation	15	0.7%	2,449	0.1%

1-2. Registered CDM Projects in Sri Lanka

Project Name	Project Type
Magal Ganga Small Hydropower Project (9,9 MW)	Hydro
Hapugastenne and Hulu Ganga Small Hydropower Projects	Hydro
Small Hydropower Projects at Alupola and Badulu Oya.	Hydro
Sanquhar and Delta Small Hydro Power Projects	Hydro
Adavikanda, Kuruwita Division Mini Hydro Power Project	Hydro
Coconut shell charcoaling and power generation at Badalgama, Sri Lanka	Biomass energy
10 MW Biomass Power Generation Project - Tokyo Cement, Trincomalee	Biomass energy

Registered on 24 Aug 2010

Currently only hydro and biomass projects are registered as CDM, but there may be other opportunities as well.

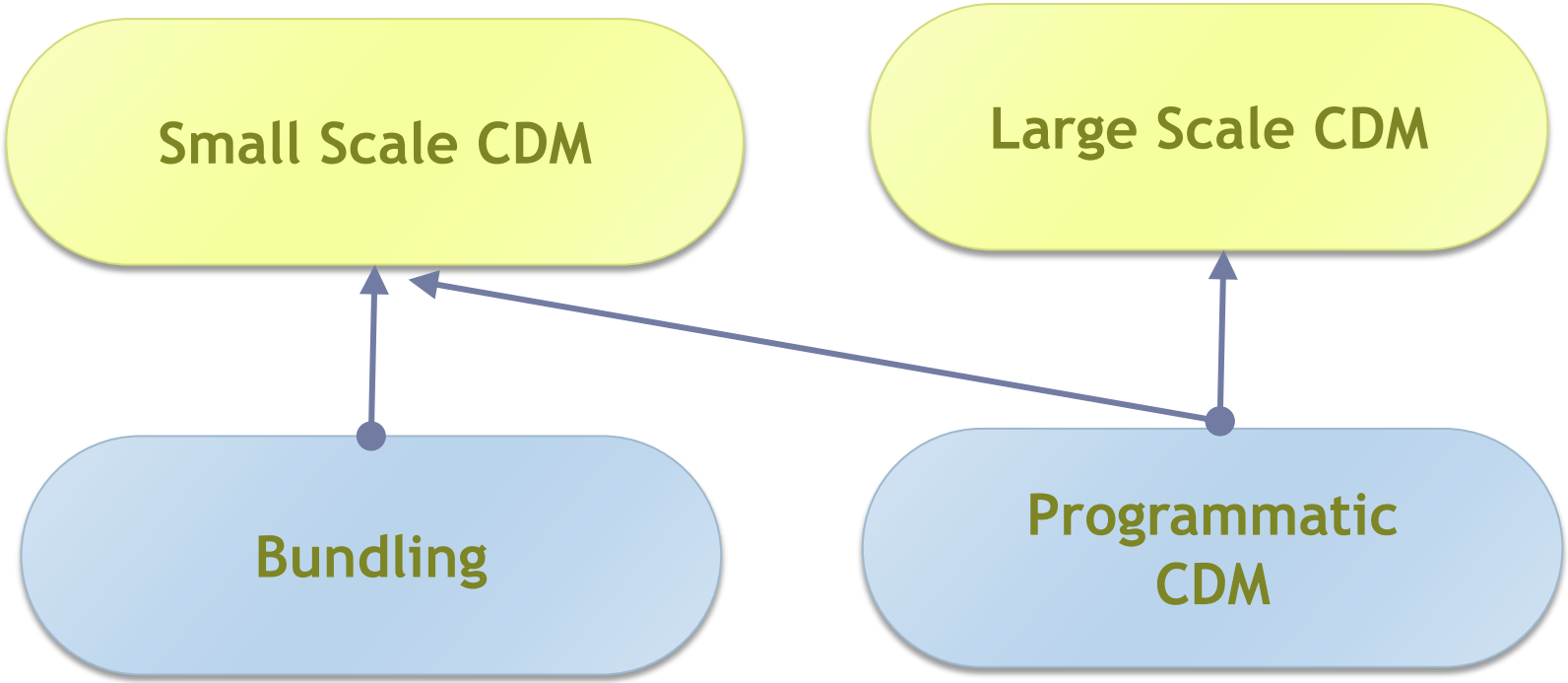
1-3. Other Emission Reduction Projects NOT Eligible for CDM

- Nuclear power plant project
  - CO_2 emission is close to zero
  - But pose environmental issues such as radioactive waste
- Carbon Capture and Storage (CCS) project
  - CO_2 will be stored underground
  - Carbon sink project
  - Unproven technology (especially its long-term effects)
  - It may be approved as a CDM project in the future (Post Kyoto)
- Waste plastics as a fuel
  - Use plastic waste to make fuel pellets or even convert it into oil
  - Plastic waste is not considered as renewable energy
  - It actually does not contribute towards GHG emissions reduction
  - However, if it is a fuel switch project that result in lower carbon intensity it could be considered as a CDM project.

2. CDM Typology by Scheme

CDM Typology by Scheme

- By Scheme



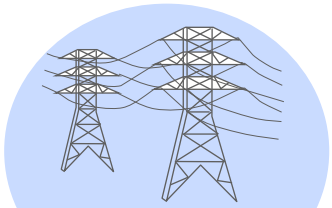
2-1. Small Scale(SSC) CDM

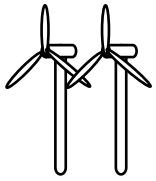
2-1-1. Definition of SSC Projects (Emission Reduction)(1)

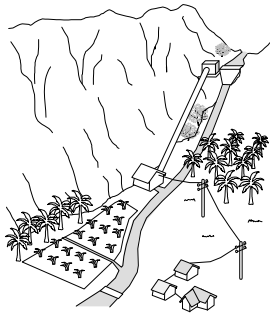
- **Type 1: Renewable energy project**

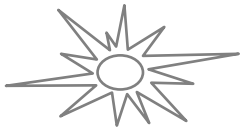
- Size limit:
  Maximum output capacity of 15 MW for electricity, 45 MWth for thermal
- Definition of maximum "output":
  Installed/rated capacity indicated by the manufacturer of the equipment/plant (not the actual load factor of the plant)
- Definition of "MW" (Mega watt):

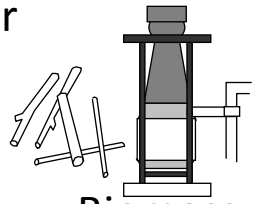
MW is a unit of energy. CDM-EB defined "MW" as "MWe"(electric energy value) and agreed to use the calculation 1MWe=3MWth.

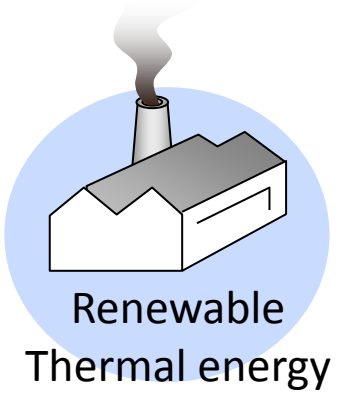

Renewable electricity


Wind


Mini-hydro


Solar


Biomass


Renewable Thermal energy

2-1-1. Definition of SSC Projects (Emission Reduction)(2)

- **Type 2: Improvements in energy efficiency**

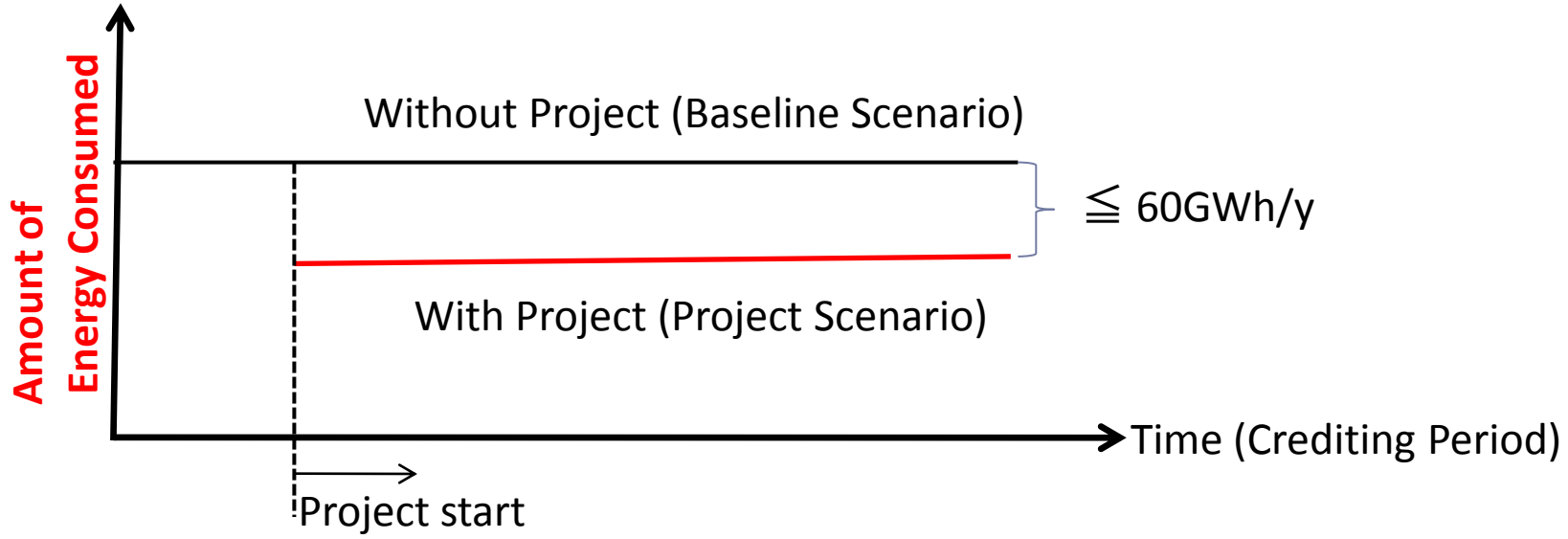
☐ Size limit:

A maximum improvement of 60 GWh /year (or an appropriate equivalent)

(Example) 15MW*4,000 hour operation /year =60,000MWh (= 60GWh)

MWh = Capacity of the plant(MW) x Number of operation hours(h) , 1GWh=1,000MWh

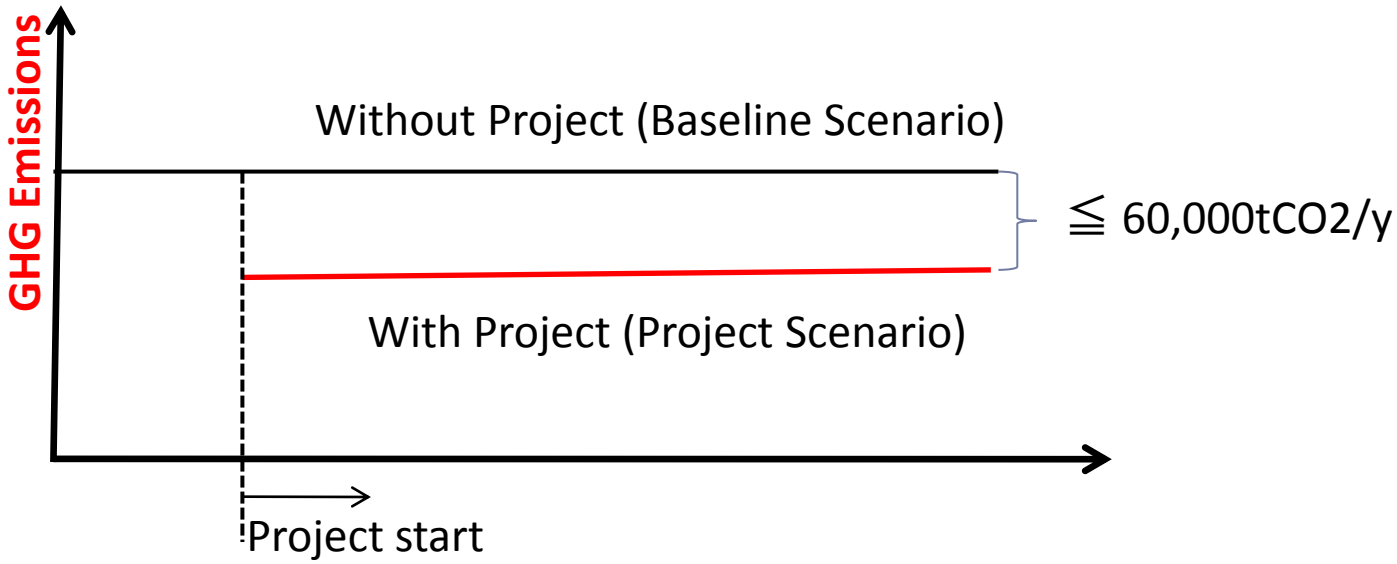
☐ Site emission reduction to be in place: Demand side and/or supply side



2-1-1. Definition of SSC Projects (Emission Reduction)(3)

- **Type3: Other activities**

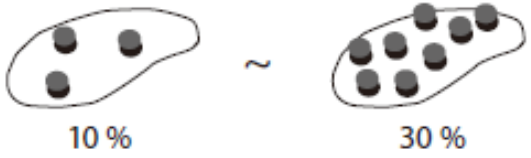
  - Size limit:
    Resulting in emission reductions ≦ 60,000 tCO2/y
  - Example of projects:
    Biogas collection(solid waste, wastewater), composting, transport etc



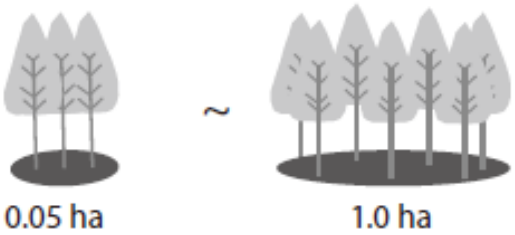
2-1-1. Definition of SSC Projects (A/R: Forestry Sector)

- Size limit:
  Resulting in net GHG removals by sinks < 16,000 tCO2/y
- Other applicability SSC A/R project:
  Developed or implemented by low-income communities and individuals as determined by the host Party
- Participation Requirement for A/R CDM project
  DNA needs to determine threshold of forest definition within the following range of each indicator.

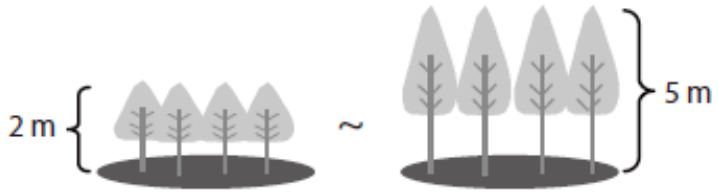
(a) Tree crown cover: 10 - 30 %



(b) Land area value: 0.05 - 1ha



(c) Tree height: 2 - 5 m



2-1-2. Advantages of SSC Projects (1)

- **"Simplified Modalities and Procedures for Small-scale CDM Project Activities"**

(1) Simplified documents and procedures:

Simplified PDD format	Simplified Baseline Methodologies	Simplified Monitoring Plans

(2) Additionality can be established by proving one of the following barriers (There are cases, where only one barrier is not considered strong enough):

Investment barrier:	Other barriers: Institutional barriers, Limited information, Managerial resources, Organizational capacity, Financial resources, Capacity to absorb new technologies
Technological barrier:	
Barrier due to prevailing practice:	

2-1-2. Advantages of SSC Projects (2)

- "Simplified Modalities and Procedures for Small-scale CDM Project Activities"(continued)

  (3) Project activities may be bundled at each step in the project cycle (PDD, validation, registration, monitoring, verification and certification)

  (4) The same DOE can undertake validation, verification and certification. (For Large scale CDM, one DOE cannot conduct)

- Other benefits

  Shortening of the period after the date of receipt of the request for registration (8weeks→4weeks), unless there is a request for review for the proposed CDM project activity. etc

"Time" and "Cost" are saved compared to Large-scale CDM Project

2-1-3. Bundling of SSC Projects(1)

- **The total size of the SSC CDM projects not exceeding the maximum size for the SSC CDM project, more than one SSC CDM projects can be bundled.**

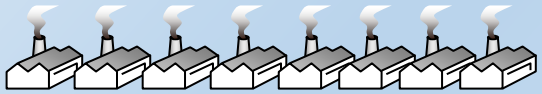
Type 1: Renewable Energy (Max 15MW)

Bundled as one SSC CDM project

Total 13MW
<15MW

Type 2: Energy Efficiency (Max 60GWh/y)

Bundled as one SSC CDM project

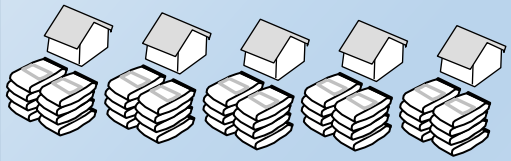


Energy saving 5GWh/y* 10 factories

Total
50GWh
<60GWh

Type 3: Other projects (Max 60,000tCO2/y)

Bundled as one SSC CDM project



Total 15,000tCO2
< 60,000tCO2/y

Compost: emission reduction of 3,000tCO2/y * 5 projects

2-1-3. Bundling of SSC Projects(2)

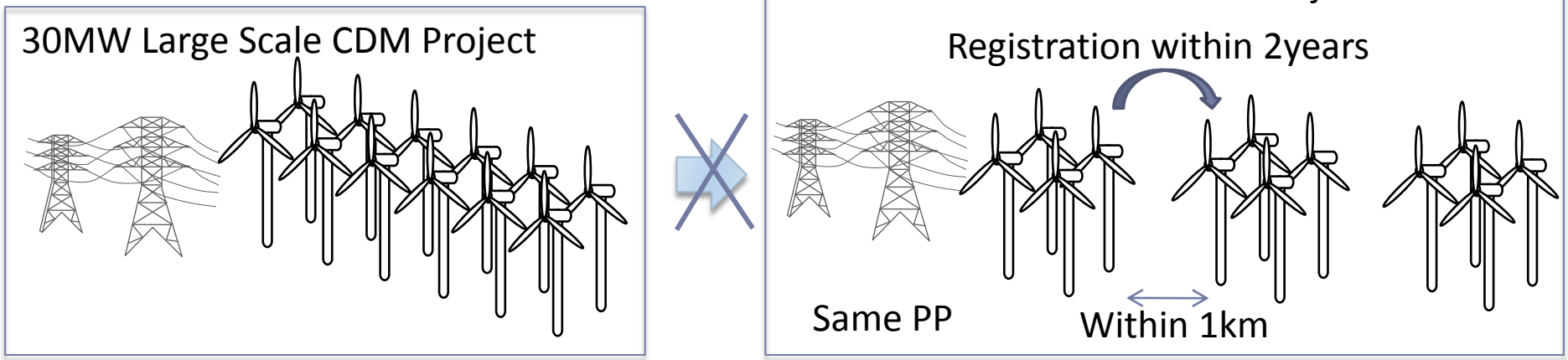
- **Advantage of bundling SSC CDM project**
  - **Validation, Registration procedures, Verification procedures can be done in a single submission to the CDM-EB**
  - **Pay only one registration fee depending on the expected amount of CER to be obtained.**
  - **Better chances for small scale project to identify CER buyers**

Time & Cost Saving

- **Challenges of bundling SSC CDM project**
  - **Little flexibility after registration**
  - **Difficulty of project development timeframe adjustment (when project participants are different)**
  - **Failure of one project will affect all other bundled projects**

2-1-4. De-bundling of Large Scale Projects

- **A large scale CDM project cannot be de-bundled into more than one SSC projects.**



[Conditions of De-bundling] If the following conditions are all met, the project will be regarded as "de-bundling" of large scale project.

- With the same project participants;
- In the same project category and technology/measure;
- Registered within the previous 2 years; and
- Project boundary is within 1 km of the project boundary of the proposed small-scale activity at the closest point.

2.2. Programmatic CDM

2-2-1. Backgdound of Programmatic CDM(pCDM)

■ Background

Individual (conventional) CDM

- Project by project approach

site, PDD, validation, verification …
every step is single project base

- Huge administration cost and time for formulating a CDM project

Difficult to formulate small to medium projects

Bundle of small-scale projects

- Limit of the total size of the bundled projects:
(15MW for renewable power(45MW for thermal), 60Gwh for energy efficiency, 60,000tCER/yr for other projects)
- A very strict implementation schedule

- Limit of expansion
- Challenges in bundling the projects conducted by different owners
- Project cannot be added after registration (little flexibility)

Many potential projects remain undeveloped (especially small projects)

Great expectations for Programmatic CDM to expand the opportunities of CDM

2-2-2. Important Terms of pCDM

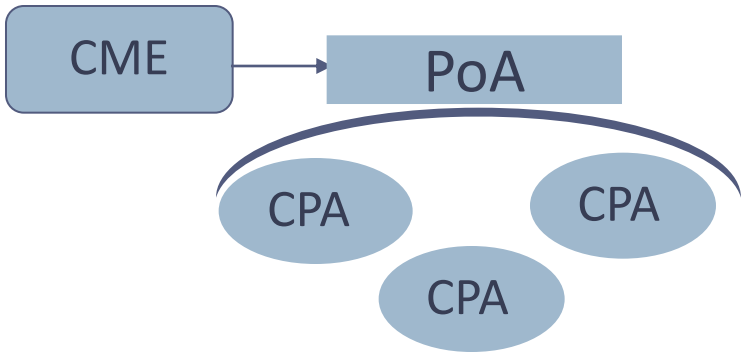
- **Programme of Activity (PoA) :** [Framework level]

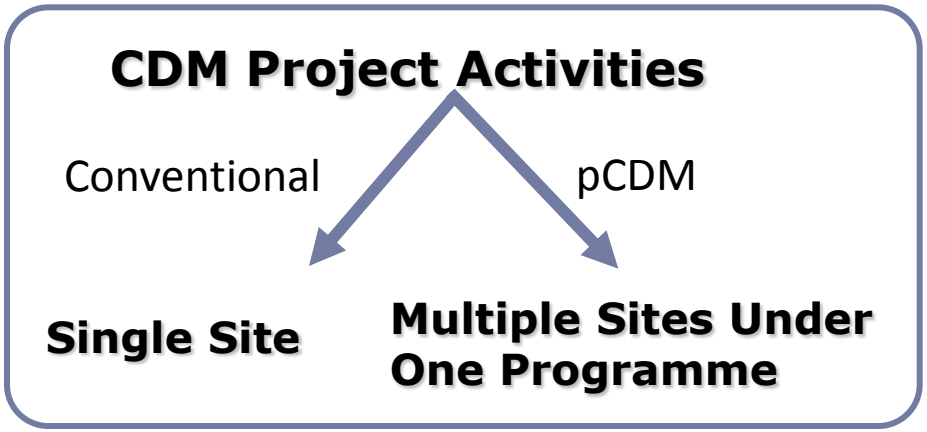
A framework to implement CDM project activities (CPA) under the PoA

- **CDM Project Activities (CPA)**: [Operational level]

Individual CDM projects implemented under the PoA

- **Coordinating/Managing Entity (CME):** A private or public entity in charge of:
  - communication with CDM Executive Board
  - coordinating of the PoA framework
  - management of the monitored data
  - Ensuring no double counting



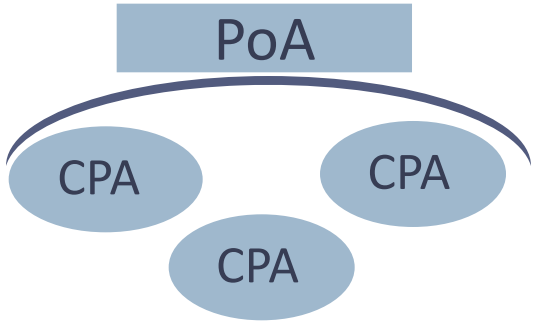


2-2-3. Features & Requirement of pCDM

Features of Programmatic CDM

- PoA can start with only one CPA
- Boundary can be beyond one country
- CPAs can be added:
  - at any time during PoA period
  - by anybody within the PoA boundary
  - with no limit in number
  - without project registration procedures (consistency/integrity)

- No limitation of the number of CPAs included in a PoA (28years)



Requirement for pCDM

A. PoA Level

- PoA is not applicable for "mandated policy/measure" unless the PoA leads to greater enforcement
- Determination of a coordinating entity

B. CPA Level

- Same Baseline Methodology
- Same Technology to reduce GHG emission

2-2-4. Comparison of Project Formulation Procedures

Conventional — Project by project

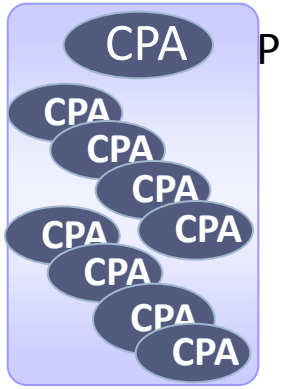
PJ → PDD → Validation → Registration → Implementation → Verification → CER

Bundling — By group

PJ
PJ
PJ

PDD → Validation → Registration → Implementation → Verification → CER

PoA — Framework for expansion



PDD → Validation → Registration → Implementation → Verification → CER

CPAs can be added:
at any time during PoA period
by anybody within the PoA boundary
with no limit in number
without project registration procedures

CDM development cost & registration risk for project participants is lowered

2-2-5. Potential Programmatic CDM by Type(1)

- 4 projects have been registered
- 48 projects are at validation stage (1 August 2010)

Title of Project	Country	Date of Registration	Project type
Methane capture and combustion from Animal Waste Management System (AWMS) of the 3S Program farms of the Sadia Institute	Brazil	29-Oct-09	Methane avoidance from Manure
CUIDEMOS Mexico (Campana De Uso Intelegente De Energia Mexico) – Smart Use of Energy Mexico	Mexico	31-Jul-09	Energy Efficiency at household (Lighting)
CFL lighting scheme – “Bachat Lamp Yojana”	India	29-Apr-10	Energy Efficiency at household (Lighting)
Uganda Municipan Waste Compost Programme	Uganda	12-Apr-10	Compost

2-2-5. Potential Programmatic CDM by Type(2)

- Potential Characteristics/Sectors of pCDM

Community/Plant Base(small - medium)

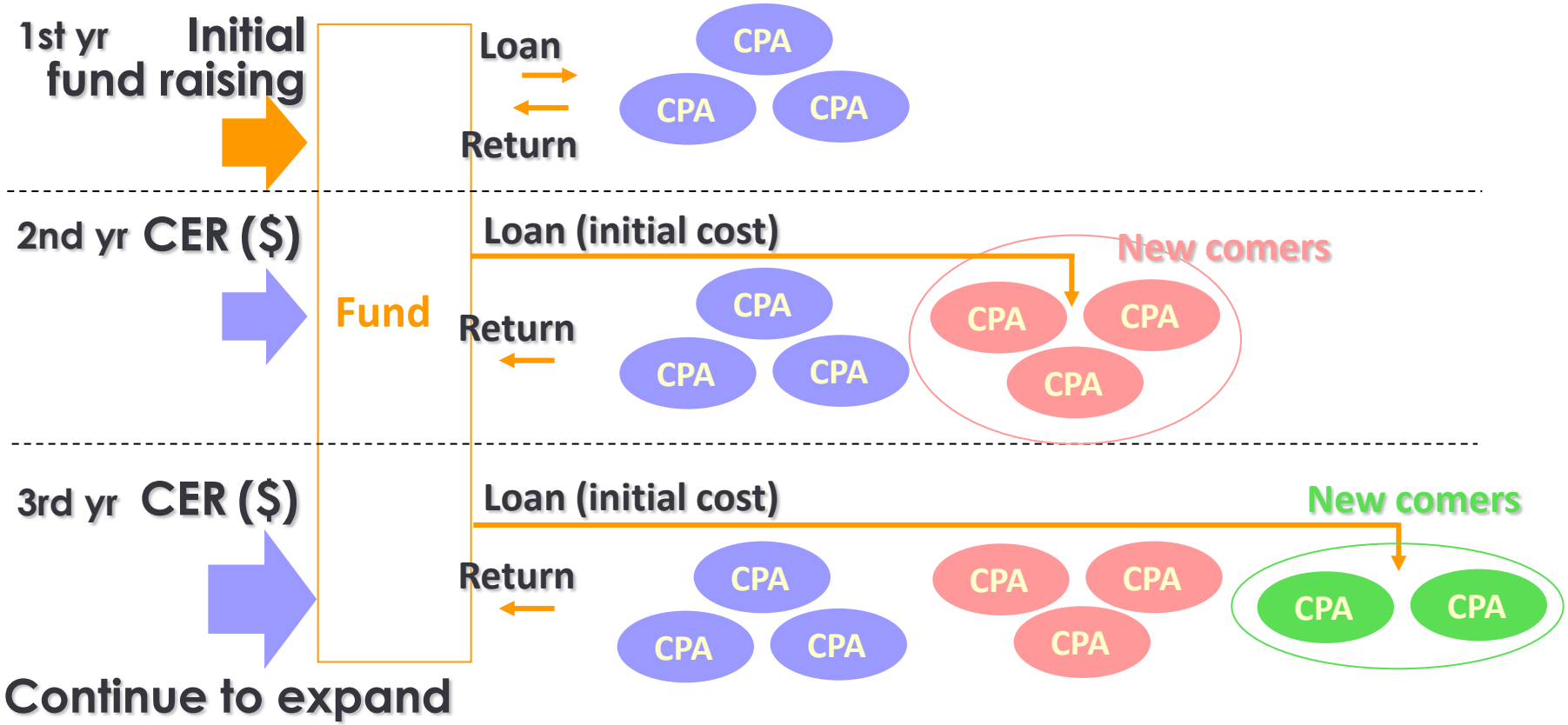
- Hydro power
- Biomass electricity/ heat generation
- Biogas collection from:
  - organic industrial waste water
  - animal waste
  - municipal waste (landfill)
- Community compost etc

Product Base (very small)

- Energy efficient lamp
- Solar energy etc

2-2-6. An Example of pCDM Utilizing "Fund Scheme"

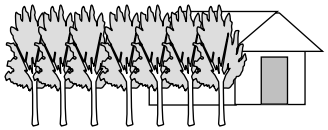
Establishing the Fund (with initial investment) by CME to provide initial cost for the new CPAs with CER sales and return from each CPA, activities can be largely expanded.



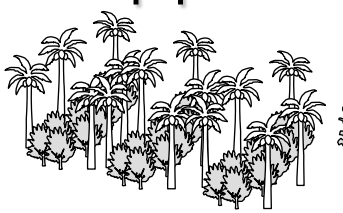
2-2-7. An Example of pCDM In Pipeline
(Gliricidia Fire Wood Thermal Fuel Switch pCDM)

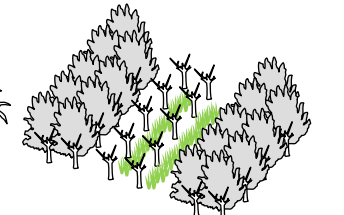
Wood supply side

Currently available unused wood



For future expansion, newly develop plantation

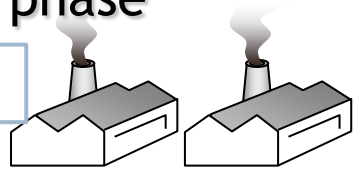




User side

First phase

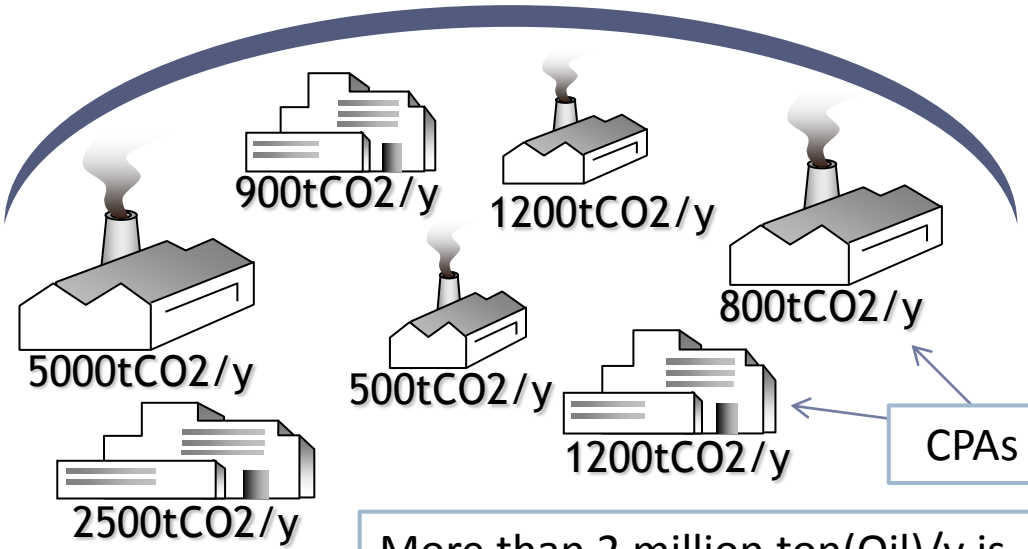
CPAs



Register the Program

CME: BEASL

Second phase



CPAs

More than 2 million ton(Oil)/y is consumed by Industry in Sri Lanka

2-2-8. Challenges of pCDM

- High cost of project development (for registration)
- Longer time required to be registered compared to conventional CDM
- Structural formulation is very important:
  - Selection of CME
  - distribution method of CERs to CPAs etc
- Uncertainty regarding procedures such as validation, verification etc

Once the program is registered, it will benefit small scale projects in Sri Lanka very much.

3. Baseline Methodology & Applicability of Projects

3-1. METHODOLOGIES

Baseline and Monitoring Methodologies

"Baseline methodology " :

- defines the method of identifying the baseline scenario (scenario without CDM),
- describes the calculation method of baseline emissions and project emissions.

"Monitoring methodology":

- is the means to gather the data required to calculate emission reductions from the proposed CDM project, &
- sets out how project proponents should develop and implement a monitoring plan.

	Emission Reduction CDM	A/R CDM
Large Scale	• Approved Large Scale Methodologies (71) • Approved Consolidated Methodologies (17)	• Approved Large Scale Methodologies (8)
Small Scale	• Small-scales Methodology Type I : Renewable energy project (8) Type II : Energy efficiency improvement project (11) Type III: Other project activities(36)	• Approved small scale A/R methodologies (6)

*Number of methodologies are as of 25 Aug. 2010

3-2. List of Small Scale Methodologies

- **More than one methodologies can be combined for one project activity**

Meth. No.	*Scope*	*Title of the Methodology*	*Ver. No.*
TYPE I – RENEWABLE ENERGY PROJECTS			
AMS-I.A.	1	Electricity generation by the user	13
AMS-I.B.	1	Mechanical energy for the user with or without electrical energy	10
AMS-I.C.	1	Thermal energy for the user with or without electrical energy	15
AMS-I.D.	1	Grid connected renewable electricity generation	15
AMS-I.E.	1	Switch from Non-Renewable Biomass for Thermal Applications by the User	1
TYPE II – ENERGY EFFICIENCY IMPROVEMENT PROJECTS			
AMS-II.A.	2	Supply side energy efficiency improvements - transmission and distribution	10
AMS-II.B.	1	Supply side energy efficiency improvements – generation	9
AMS-II.C.	3	Demand-side energy efficiency activities for specific technologies	13
AMS-II.D.	4	Energy efficiency and fuel switching measures for industrial facilities	11
AMS-II.E.	3	Energy efficiency and fuel switching measures for buildings	10
AMS-II.F.	3	Energy efficiency and fuel switching measures for agricultural facilities and activities	9
AMS-II.G.	3	Energy Efficiency Measures in Thermal Applications of Non-Renewable Biomass	1
AMS-II.H.	4	Energy efficiency measures through centralization of utility provisions of an industrial facility	1
AMS-II.I.	4	Efficient utilization of waste energy in industrial facilities	1
AMS-II.J.	3	Demand-side activities for efficient lighting technologies	3

3-2. List of Small Scale Methodologies

Meth. No.	Scope	Title of the Methodology	Ver. No.
TYPE III – OTHER PROJECT ACTIVITIES			
AMS-III.A.	15	Urea offset by inoculant application in soybean-corn rotations on acidic soils on existing cropland	2
AMS-III.B.	1	Switching fossil fuels	14
AMS-III.C.	7	Emission reductions by low-greenhouse gas emitting vehicles	11
AMS-III.D.	15	Methane recovery in animal manure management systems	15
AMS-III.E.	13	Avoidance of methane production from decay of biomass through controlled combustion, gasification or mechanical/ thermal treatment	16
AMS-III.F.	13	Avoidance of methane emissions through controlled biological treatment of biomass	8
AMS-III.G.	13	Landfill methane recovery	6
AMS-III.H.	13	Methane recovery in wastewater treatment	13
AMS-III.I.	13	Avoidance of methane production in wastewater treatment through replacement of anaerobic lagoons by aerobic systems	8
AMS-III.J.	5	Avoidance of fossil fuel combustion for carbon dioxide production to be used as raw material for industrial processes	3
AMS-III.K.	4	Avoidance of methane release from charcoal production by shifting from pit method to mechanized charcoaling process	4
AMS-III.L.	13	Avoidance of methane production from biomass decay through controlled pyrolysis	2
AMS-III.M.	5	Reduction in consumption of electricity by recovering soda from paper manufacturing process	2
AMS-III.N.	4	Avoidance of HFC emissions in rigid Poly Urethane Foam (PUF) manufacturing	3
AMS-III.O.	5	Hydrogen production using methane extracted from biogas	1

3-2. List of Small Scale Methodologies

Meth. No.	Scope	Title of the Methodology	Ver. No.
AMS-III.P.	4	Recovery and utilization of waste gas in refinery facilities	1
AMS-III.Q.	4	Waste gas based energy systems	2
AMS-III.R.	15	Methane recovery in agricultural activities at household/small farm level	1
AMS-III.S.	7	Introduction of low-emission vehicles to commercial vehicle fleets	1
AMS-III.T.	7	Plant oil production and use for transport applications	1
AMS-III.U.	7	Cable Cars for Mass Rapid Transit System (MRTS)	1
AMS-III.V.	4	Decrease of coke consumption in blast furnace by installing dust/sludge recycling system in steel works	1
AMS-III.W.	10	Methane capture and destruction in non-hydrocarbon mining activities	1
AMS-III.X.	3, 11	Energy Efficiency and HFC-134a Recovery in Residential Refrigerators	1
AMS-III.Y.	13	Methane avoidance through separation of solids from wastewater or manure treatment systems	2
AMS-III.Z.	4	Fuel Switch, process improvement and energy efficiency in brick manufacture	2
AMS-III.AA.	7	Transportation Energy Efficiency Activities using Retrofit Technologies	1
AMS-III.AB.	11	Avoidance of HFC emissions in Standalone Commercial Refrigeration Cabinets	1
AMS-III.AC.	5	Electricity and/or heat generation using fuel cell	1

3-2. List of Small Scale Methodologies

Meth. No.	Scope	Title of the Methodology	Ver. No.
AMS-III.AD.	4	Emission reductions in hydraulic lime production	1
AMS-III.AE.	3	Energy efficiency and renewable energy measures in new residential buildings	1
AMS-III.AF.	13	Avoidance of methane emissions through excavating and composting of partially decayed municipal solid waste (MSW)	1
AMS-III.AG.	1	Switching from high carbon intensive grid electricity to low carbon intensive fossil fuel	1
AMS-III.AH.	1	Shift from high carbon intensive fuel mix ratio to low carbon intensive fuel mix ratio	1

Meth.Nov	Title of Methodology
AMS-III.AI.	Emission reductions through recovery of spent sulphuric acid
AMS-III.AJ.	Recovery and recycling of materials from solid wastes
AMS-III.AK.	Biodiesel production and use for transport applications
AMS-III.AL.	Conversion from single cycle to combined cycle power generation

3-3. How to Identify the Applicability of the Potential Projects

- **Identification using the list of methodologies:**
  Select the suitable "baseline and monitoring methodology" based on the applicability conditions of methodologies.
  (http://cdm. unfccc.int/methodologies/index.html)

- **Search similar type of CDM projects from UNFCCC website:**
  PDDs of similar projects gives concrete image of the CDM projects. Projects can be searched by Categories, Methodologies, Host/Investing countries from the UNFCCC CDM project database.
  (http://cdm.unfccc.int/Projects/projsearch.html)

- **Consult with JICA Expert Team**

Useful Links

- CD4CDM (http://www.cd4cdm.org/)
  - CDM database is available from the “CDM pipeline”
- UNFCCC methodologies section (http://cdm.unfccc.int/methodologies/index.html)
  - Have all the available methodologies
- UNFCCC Project search (http://cdm.unfccc.int/Projects/projsearch.html)
- Kyoto Mechanisms Information Platform (http://www.kyomecha.org/e/index.html)
  - Japanese CDM information website
  - “CDM in Charts” is particularly useful document for CDM developers

Thank You