

Capacity Building for Development and Implementation of Carbon Finance Projects in Pakistan

Project Launch Meeting

Islamabad Club

January 22, 2009



The Kyoto Protocol

- Entered into force 16 February 2005
- Developed countries must reduce carbon emissions by 5.2% from 1990 levels by 2008 – 2012 (1st Commitment Period; 2nd & 3rd periods to follow).
- A number of flexible mechanisms were agreed to:
 - International Emissions Trading
 - Joint Implementation (JI)
 - Clean Development Mechanism (CDM)

Clean Development Mechanism

- Dual objectives
 - lower the overall cost of reducing GHG emissions
 - while also supporting sustainable development initiatives within developing countries.

What does the CDM aim to achieve?

A transfer of finances and contribution to sustainable development in the Host Country

Flow of Finances

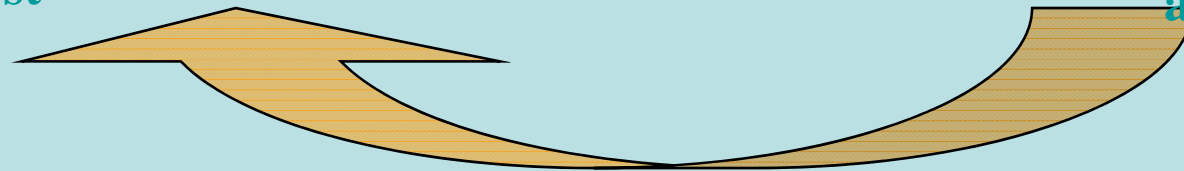
**Industrialized
Country**
with high
abatement cost



Annex I Country

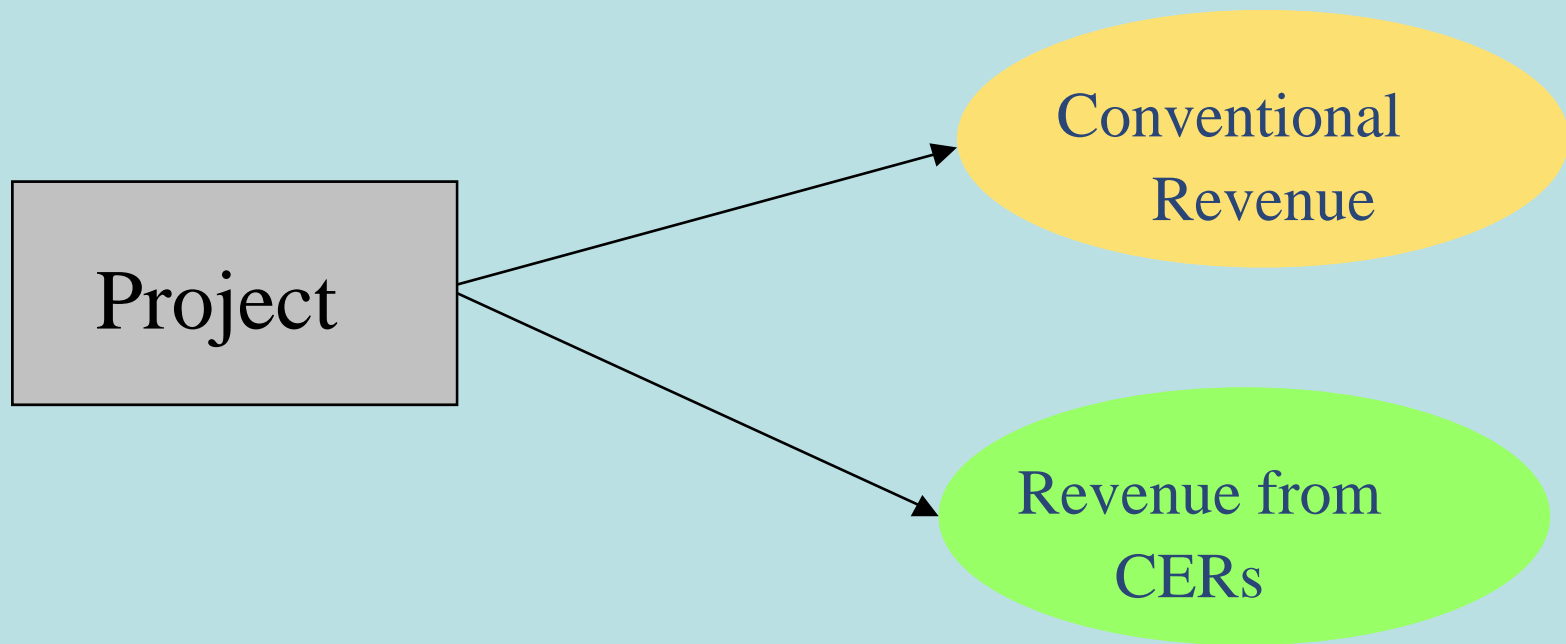
Host Country (Pakistan)

**Developing
Country**
with low
abatement cost



Flow of Credits

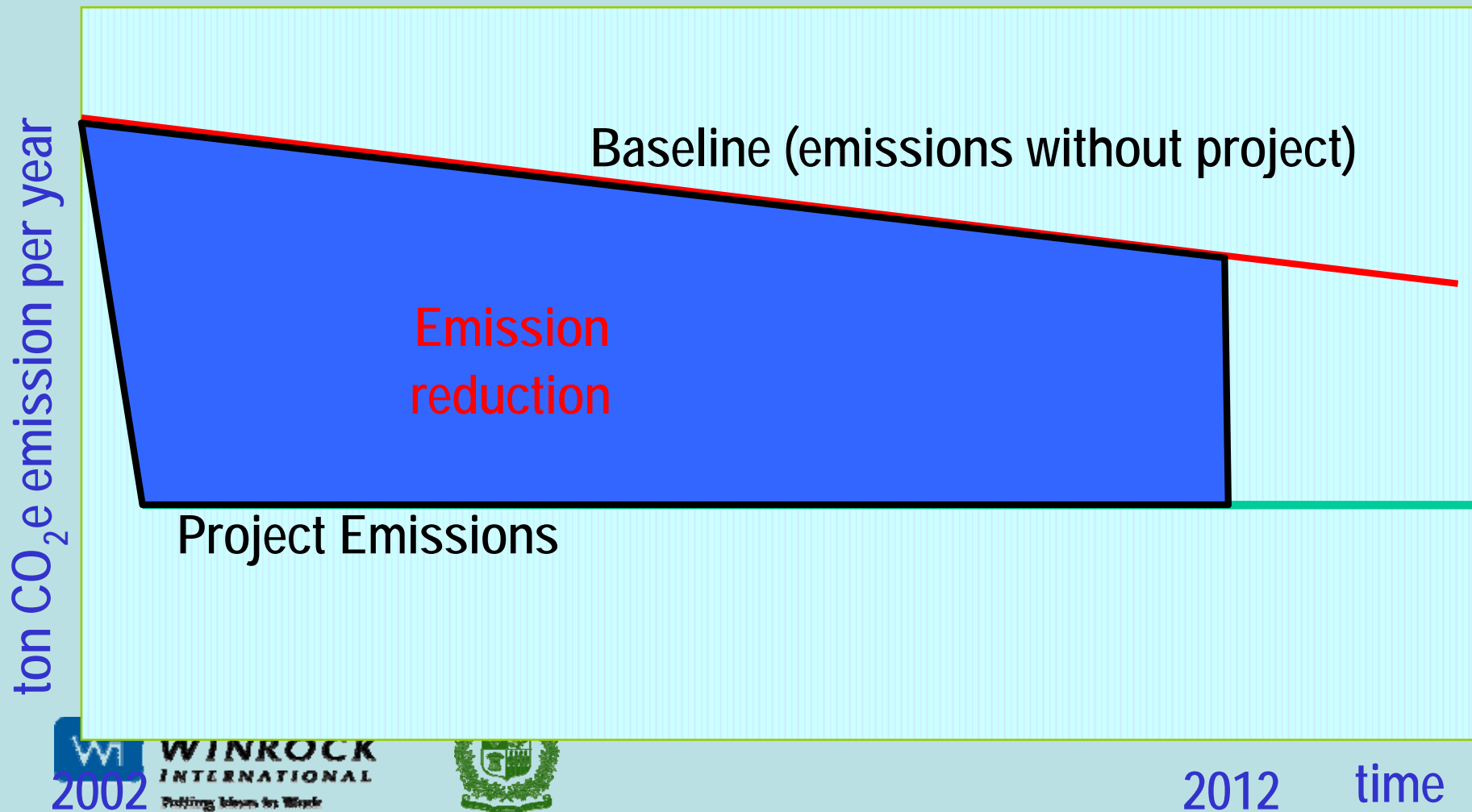
What does it mean for projects?



What Makes an Attractive CDM project?

- Project which reduces GHG emissions into the atmosphere below the baseline situation, e.g.
 - Energy efficiency measures that reduce energy use e.g. efficient lamps, waste heat recovery, improved insulation in boilers;
 - Renewable energy projects – wind, solar, hydro (reduce emissions in generation mix or replace diesel/kerosene off-grid);
 - Capture methane from landfills, or compost organic waste and reduce methane production;
 - Reforest or afforest barren areas to sequester carbon.

Baseline



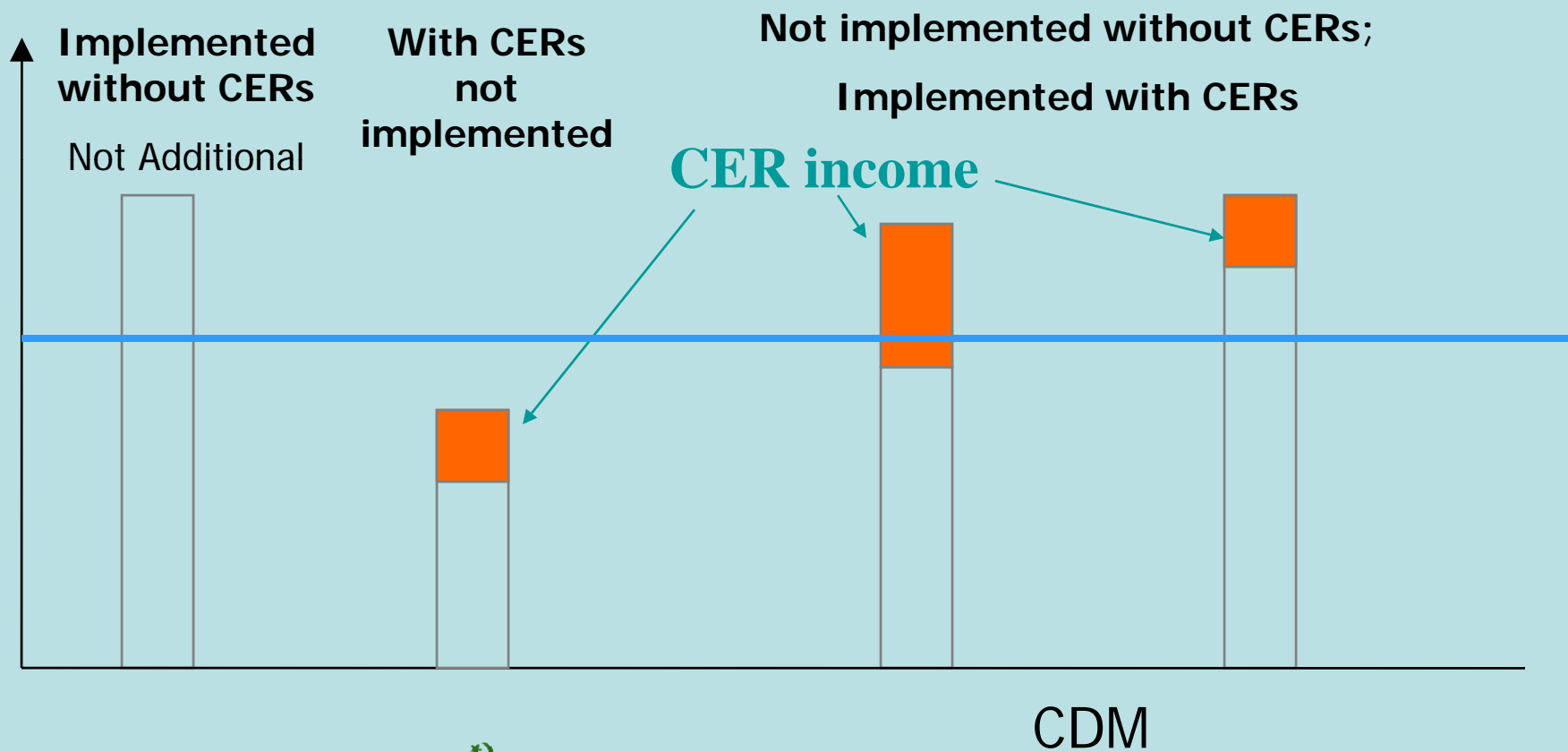
Monitoring

- Clear Monitoring and Verification Plan is needed to record and verify annual emission reductions from project interventions. e.g.
- Record of fuel use before and after,
- Meter readings at wind or hydro plant,
- Sample surveys of households showing, usage of CFLs and numbers of hours used,
- Total land reforested and maintaining forest.

What Makes an Attractive CDM project?

- Project must be **additional!**
The project would not go ahead without the additional carbon revenue
- CDM is not designed to reward all projects which reduce GHG emissions – **only those which would not be implemented without carbon revenue.**
- CDM is designed to make feasible those low-carbon projects which are currently not the norm in the particular market and which are not attracting adequate investment.

Additional Value From 'Clean' Projects



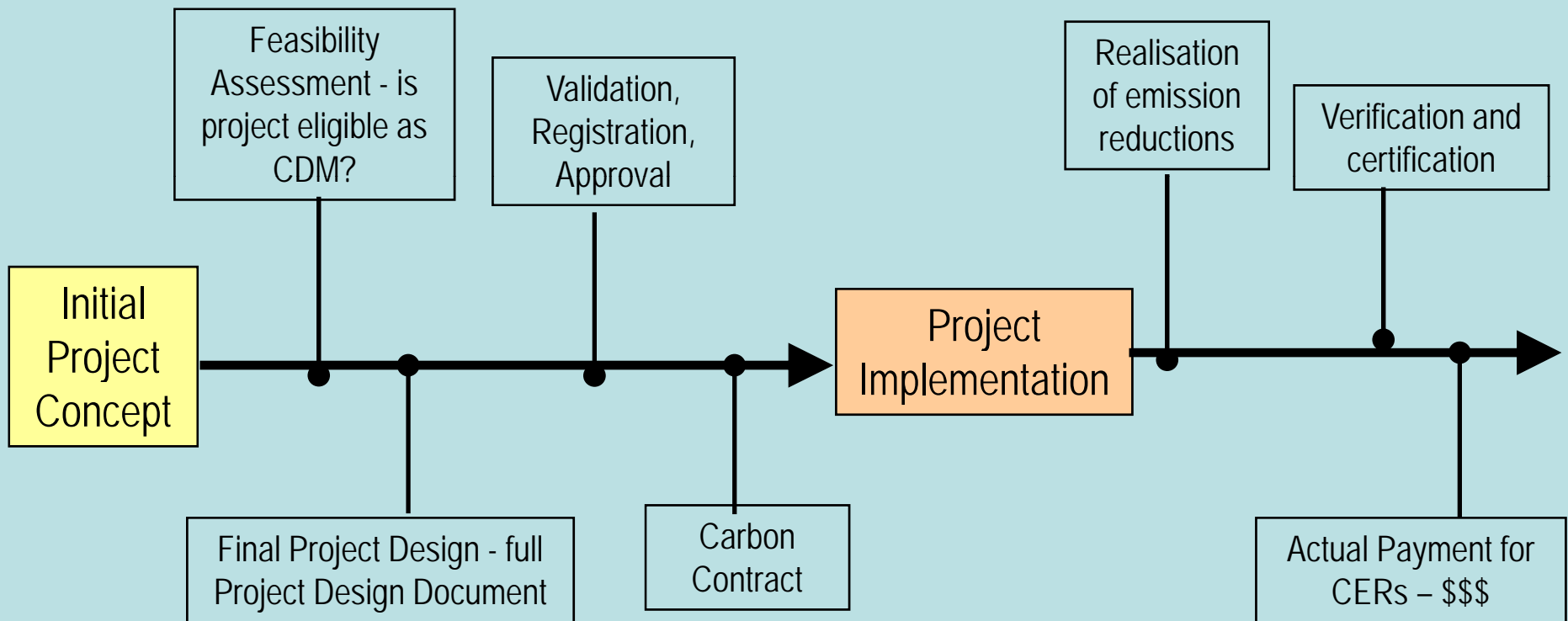
Arguments to Demonstrate Additionality

- A lower than acceptable project IRR would be pushed over the 'Hurdle Rate' with CERs (EE projects, methane capture),
- Financing gap will be covered by investor or bank which will only invest with security of repayment from carbon finance,
- Carbon finance would mitigate regulatory risks in a new sector or the risks of introducing a new technology (e.g. wind energy).
- Carbon finance can be used to monitor, carry out quality control, and increase awareness in projects like Improved Cook Stoves.

CDM Project Approval

- **Project Proponent** develops PDD and asks **Host Country** for Approval of CDM project
- Project Proponent submits Project Design Document to **Validator** (Operating Entity)
- (In case of New Baseline methodology: **Validator** submits Baseline Methodology to Methodology Panel of the **CDM Executive Board**)
- **Validator** evaluates Project Design Document and submits it for approval to **CDM Executive Board**
- **CDM Executive Board** registers project activity as a CDM project

Project Cycle - timeline



What Makes an Attractive CDM project?

- Project must be large enough to make it worth the transaction costs,
 - At least 50,000 ERs per year,
- Upfront costs can range from \$50K to > \$150K to prepare the PDD, Validate, and Register a project.

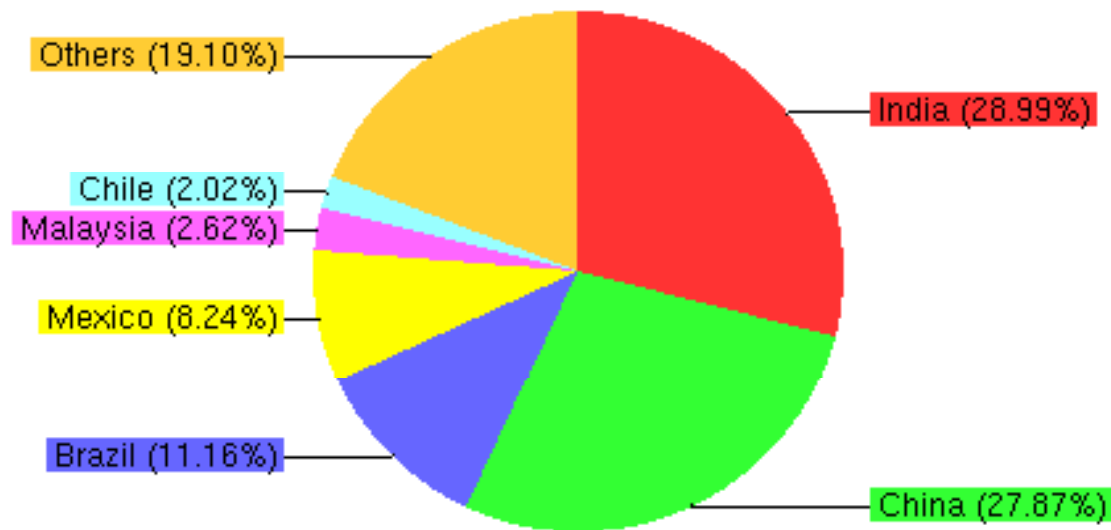
Registered CDM Projects & Pipeline

CDM Statistics

	Annual Average CERs*	Expected CERs until end of 2012**
CDM project pipeline: > 4200		
of which:	N/A	> 2,900,000,000
--- 1335 are registered	247,240,906	> 1,410,000,000
--- 108 are requesting registration	16,169,953	> 60,000,000

CDM Project activities globally

Registered project activities by host party. Total: 1,335



Registered Project Activities by Sector

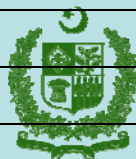
(as of Jan 20, 2009)

Sectoral Scope	Registered Projects
Energy industries (renewable - / non-renewable sources)	971
Waste handling and disposal	311
Fugitive emissions from fuels (solid, oil and gas)	121
Agriculture	92
Manufacturing industries	83
Chemical industries	42
Fugitive emissions from production and consumption of halocarbons and sulphur hexafluoride	18
Energy demand	18
Mining/mineral production	15
Metal production	3
Transport	2
Afforestation and reforestation	1
Energy Distribution	0
Construction	0
Solvent Use	0



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Approved Methodologies by Scope (150)

Scope	Number Of Methodologies* (Large-scale (AM, AR-AM) , Small-scale (AMS, AR-AMS) , Consolidated (ACM))
Energy industries (renewable - / non-renewable sources) (1)	40
Energy distribution (2)	2
Energy demand (3)	12
Manufacturing industries (4)	23
Chemical industries (5)	14
Construction (6)	0
Transport (7)	5
Mining/mineral production (8)	1
Metal production (9)	6
Fugitive emissions from fuels (solid, oil and gas) (10)	7
Fugitive emissions from production and consumption of halocarbons and sulphur hexafluoride (11)	5
Solvent use (12)	0
Waste handling and disposal (13)	14
Afforestation and reforestation (14)	16
Agriculture (15)	5



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Growing Market

	2005		2006		2007		2008	
	Tons (Mil)	Euros (Mil)	Tons (Mil)	Euros (Mil)	Tons (Mil)	Euros (Mil)	Tons (Mil)	Euros (Mil)
EU ETS	362	7,218	1,017	18,143	1,643	28,133	2,550	46,450
CDM	401	2,038	563	3,920	947	11,737	1,230	14,715
JI	28	96	21	95	38	326	58	402

CDM Capacity Building Project

**Implemented by Ministry of
Environment**

World Bank funded

Consultants: Winrock International



CDM Capacity Building Project Objectives

- Increase Pakistan's contribution to climate change mitigation through a robust pipeline of high quality carbon finance projects,
- Build capacity within Pakistan to continue to add to this pipeline with good quality CDM projects.

**Project Pipeline Development
is the most effective way to invigorate
carbon finance activities in Pakistan**

Main Activities

- Task 1:
 1. Project Opportunity Analysis,
 2. Outreach activities (development of training and marketing materials),
 3. Training on design of PDD (baseline and monitoring methodology, additionality, social benefits, risk mitigation).

Main Activities - Project Pipeline

- Task 2:
 - Identify Project Opportunities
 - Preparation of 20 Project Idea Notes/ Carbon Finance Document (PINs/CFD) to submit to World Bank Carbon Funds,
- Task 3: Preparation of 4 Project Design Documents (PDD) for accepted PINs

Time Frame

- Project Duration: 18 months
 - August 1, 2008 to March 30, 2009 – Task 1
 - February 1, 2009 to January 31, 2010 – Tasks 2 and 3

Training Activities-1

- Training of preparation of Project Idea Notes (PINS). Two sessions with 25 to 30 participants each.
- Training on preparation of Project Design Documents for wind, hydro and solar energy. One session with 30 - 50 participants.
- Training of preparation of Project Design Document for boiler efficiency, waste heat recovery and gas flaring. One session with 50 - 70 participants.

Training Activities-2

- Training on preparation of Project Design Documents for production of biogas and ethanol production and composting. One session 30 - 50 participants.
- Training of Project Design Document of afforestation and agriculture methods. One session with 30 - 50 participants.

Inception Report

- Opportunity Analysis by sector
 - Based on
 - Near term prospects for investment and specific projects being developed,
 - Available appropriate methodologies within CDM.

High Potential Areas

- **Industrial Energy efficiency and energy substitution:**
 - Brick manufacturing, vehicle transport, oil & gas, textile industry, fertilizer, cement, oil & steel, glass.
- **Power Sector & Renewable energy:**
 - Hydropower, wind, biomass cogeneration, T&D Losses, domestic and municipal EE, combined cycle power plants, solar PV.
- **Solid waste management and methane capture:**
 - Land-fill methane capture, composting, wastewater treatment, biogas.
- **Fertilizers and other chemical industries;**
 - Catalytic N₂O Abatement, nitric acid, waste heat recovery.
- **Land use, agriculture and forestry.**
 - Afforestation/reforestation.

Energy Sector

Saeed H Kazmi

Zehra Abbas

1. Municipal Energy Efficiency

- In 2006-7 municipal sector consumed 4,760 GWh
- **Baseline emissions:** 2.4 MTons of CO₂/yr
- **Abatement potential:** 0.476 MTons of CO₂/yr
- **Barriers:**
 - Lack of awareness among government decision makers and architect community
 - Lack of laws for enforcing construction of energy efficient buildings
 - Government has severe cash shortage
 - Lack of political will

2. Off Grid Micro/Mini Hydro

- 3 clusters of 15 MW each are expected to go up
- **Baseline emissions** based on 45 MW diesel generation: 276 ktons CO₂ per year
- **Abatement potential:** 276 ktons CO₂ per year
- **Investment barrier:** total requirement of over US \$54 million; currently no grant is available from international donors
- **Technology barrier:** need for more efficient turbines and electronic load controllers

3. Grid Connected Micro/Mini/Small Hydro

- 644 sites of less than 50 MW identified in NWFP, NA, AJK and Punjab with a total potential of 1,767 MW
- Total yearly generation: 11 TWh
- **Baseline emissions** (using grid baseline of 0.5 kg CO₂/kwh): 5.6 Mtons of CO₂
- **Abatement potential**: 5.6 Mtons of CO₂ per year
- **Barrier Analysis**
 - No up front feed-in tariff announced by NEPRA for small projects so developers are not keen to carry out any feasibility studies

4. Grid Connected Large Hydro

- 182 sites for a total potential of 25 GW identified in NWFP, AJK and NA by PPIB
- 157 TWh capacity per year
- **Baseline Emissions:** 56 Mtons of CO₂
- **Abatement Potential:** 56 Mtons of CO₂/yr
- **Barrier Analysis**
 - Policy barrier: WAPDA, the power purchaser, has not offered commercially viable tariff
 - Investment barrier: scarcity of capital and high capital cost due to high country risk

5. Bagasse Co-generation

- 76 sugar mills in the country with reportedly 760 MW (on an average 10 MW per factory) of cogeneration capacity, 6 months out of a year
- **Baseline emissions** (assuming grid baseline of 0.5 kg CO₂/kwh): 1.66 Mtons of CO₂ /yr
- **Abatement potential:** 1.66 Mtons of CO₂ /yr
- **Policy Barrier**
 - Lack of clear policy about purchase of power by utility companies from co-generators.
 - No clear feed-in tariff for power generated from sugar cogeneration

6. Solar Home Systems & Water Pumps

- Over 7,000 unelectrified villages in Sindh and Balochistan, and 400 in FATA using kerosene oil for home lighting
- 2000 solar pumps needed
- **Annual Baseline Emissions**
 - From use of diesel water pumping = 3,125 tons of CO₂
 - From use of kerosene oil for home lighting = 47,302 tons of CO₂
 - Combined = 50,427 tons of CO₂
- **Abatement potential** 50,427 tons of CO₂ per annum
- **Investment barrier** very high cost of solar systems

7.CNG Busses

- Government wants to introduce 8,000 CNG buses in 10 large urban centres in the country.
- Baseline emission of diesel per bus = 44 tCO₂ per year
- Project emission of CNG per bus = 41 tCO₂ per year
- Abatement Potential of 8,000 buses: 24,000 tCO₂ per year
- **Investment Barrier**
 - Total cost: Pak Rs 40 billion required in foreign exchange
- **Fuel Availability Barrier:** natural gas in short supply

8. Combined Cycle Power Generation

- Expected electricity production by CCPP technology in 2010: 23,431 GWh
- **Baseline Emission** from natural gas:
 - 11.7 million tCO₂ 2010 onwards
- Projected emissions from CCPP:
 - 7.7 million tCO₂ 2010 onwards
- **Abatement Potential**
 - Year 2010 onwards: 4 million tCO₂/yr
- **Investment Barrier:** low IRR, poor financial health of companies
- **Technology Barrier:** severe lack of experts

9. Reduction in Transmission and Distribution Losses

- Total electricity production (2006-7) was 98,384 GWh.
- Electricity T&D losses average 25% for WAPDA and 37% for KESC, giving a weighted average of 26% for the country.
- **Baseline Emissions:** 49.2 million tons of CO₂ per year
- **Abatement Potential:** 4 million tons of CO₂ per year
- **Investment Barrier:**
 - Very old T&D infrastructure
 - Need for significant capital infusion to improve the infrastructure

10. Domestic Energy Efficiency

- In 2006-7 total electricity consumption: 72,712 GWh
- Total home consumption: 33,335 GWh
- Baseline Emissions: 20 million tons of CO₂
- Abatement Potential: 3.6 million tons of CO₂ per year
- Barrier Analysis:
 - Availability of high efficiency appliances in the market is rather limited due to:
 - Lack of energy efficiency standards and labelling requirements
 - Low level of consumer awareness on cost effectiveness of alternatives

11. Wind Energy

- Baseline Emissions: 49 million tons of CO₂
- Abatement Potential: 12 million tons of CO₂ per year
- Barrier Analysis:
 - Absence of bankable wind data sources
 - Absence of basic infrastructure (roads etc.)
 - Current upfront feed-in tariff offered by NEPRA is considered to be too low
 - Lack of access to project financing from local banks

Summary: RE Abatement Potential

- Small Hydro (Off-grid Micro/Mini Hydro) (45 MW) 0.276
- Grid Connected Mini Hydro (1,815 MW) 5.56
- Large Hydro (25,641 MW) 56.15
- Bagasse Cogeneration (760 MW) 1.66
- Solar Home Systems 0.05
- Domestic Energy Efficiency 3.6
- Reduction in transmission & distribution losses 4.0
- Combined Cycle Power Plant 4.0
- CNG Buses 0.024
- Municipal Energy Efficiency 0.47
- Wind Energy 12

Industrial Sector

Saad Malik

Industry Wise Baseline Emissions

<i>Abatement Sectors</i>	<i>CO₂ Baseline Emissions (Million Tons/ year)</i>
Transportation	47.75
Oil and Gas Sector	46.05
Cement Industry	23.8
Brick Manufacturing	20.0
Glass Industry	12.92
Textile Industry	12.53
Fertilizer Industry	10.58
Food and Beverages	2.5
Inorganic Chemicals	2.38

Promising Energy Efficient Options for Industry

- Waste Heat Recovery
- Improved Boiler Efficiency
- Fuel Substitution
- Process Changes

Promising Energy Efficient Options for Industry

<i>Abatement Sector</i>	<i>Abatement Option</i>	<i>CO₂ Emissions Abated (Million Tons/ year)</i>
Brick Manufacturing	Vertical Shaft Brick Kiln (VSBK) Technology	10.0
Textile Industry	Improve EE levels in humidification towers through application of variable frequency drive in linen manufacturing process	1.0
	Improve EE of steam generation and power consumption at Polyester Manufacturing Units	0.16
	Partial Replacement of Fossil fuels with Rice Husk	1.99
	Switch over from high Carbon Intensive Fuels to Landfill Gas as boiler fuel	0.23

Promising Energy Efficient Options for Industry

Fertilizer industry	Reducing Heat loss into atmosphere along with flue gases by utilizing it for preheating of combustion air of service boiler	0.011
	Effective utilization of waste heat by installing vacuum pre-concentrator in urea section	0.17
	Modification of CO ₂ removal system of Ammonia Plant to reduce steam consumption	0.28
	Fuel Switch over from high Carbon Intensive Fuels to Natural Gas	0.73
	Installation of additional urea trays in urea reactors	0.017
	Installation of Plate type Heat Exchanger for preheating combustion air of primary reformer and reducing heat loss to atmosphere through flue gases	0.006
	Catalytic N ₂ O Destruction tail gas of Nitric Acid Plant	3.3

Promising Energy Efficient Options for Industry

Oil and Gas	Recovery of associated gas to be otherwise flared at oil-gas processing plant	6.11
	Installation of energy efficient vacuum creating system in the vacuum distillation column of petroleum refinery	0.22
	Waste heat recovery from exhaust flue gases of Process Gas Compressors (PGCs)	0.16
	GHG emission reductions through pre-heat train optimization in the Crude Distillation Unit (CDU) and Vacuum Distillation Unit (VDU)	0.1

Promising Energy Efficient Options for Industry

Cement	Partial Replacement of Fossil fuels with alternative fuels (rice husk, coconut waste, biomass, shredded plastics and rubbers)	1.49
	Switching of Fossil Fuels	0.37
	Replacement of ball mills with vertical mills during grinding	0.2
	Up gradation of preheater tower	0.34
	Substitution of Clinker with Fly Ash in Portland Pozzolana Cement	1.46
	Up-gradation of clinker cooler	0.24
	Increase in share of slag in Portland Slag Cement	0.31

Industry wise Total Abatement Potentials

<i>Abatement Sectors</i>	<i>Potential for CO₂ Abatement (Million Tons/ year)</i>
Brick Manufacturing	10.0
Transportation	8.8
Oil and Gas Sector	6.53
Textile Industry	5.62
Fertilizer Industry	5.03
Cement Industry	4.71
Iron and Steel Industry	1.78
Glass Industry	0.88
Inorganic Chemicals	0.3

Barriers Facing Industrial Sectors

- Technological Barrier
 - Sophisticated Operation
 - Technical expertise required for troubleshooting and maintenance needs
- Investment Barrier
 - Large Capital investment required
 - Innovative technology more expensive
 - High risk due to uncertainty on return on investment

Barriers Faced by Industrial Sectors

- Barrier due to Prevailing Practices
 - Conservative nature of the industry
 - Slow rate of diffusion of technology
 - Uncertainty regarding reliability and success of new technology
- Barrier due to Uncertainty of Fuel Supply
 - Shortage of fossil fuels, in particular, Natural Gas in the country
 - Major barrier for all fuel switching activities in the country

Waste Management

Saadat Ali

Baseline Emissions

- Municipal Solid Waste includes household garbage and rubbish, street sweeping, construction and demolition debris, sanitation residues, and non hazardous refuse.
- ALGAS study estimated methane release equivalent of 4.22m tons of CO₂e per year during 1989-90.
- Presently, total solid waste generation is 78,000 tons/day and there is no sanitary landfill.
- The present baseline methane release is equivalent to 6.51m tons of CO₂e per year.

Volume of Waste Generated in ten major cities

City	Population 2008 in millions	Waste Generated tons/day*
Karachi	12.22	7,489
Lahore	6.67	4,091
Faisalabad	2.61	1,597
Rawalpindi	1.85	1,136
Multan	1.56	955
Hyderabad	1.52	930
Gujranwala	1.48	908
Peshawar	1.30	798
Islamabad	1.05	646
Quetta	0.74	452
G. Total	31.00	19,000

GHG Abatement potential- sanitary landfills in ten major cities

- Potential for GHG abatement by establishing sanitary landfills in ten major cities.
- Assuming that 60% of the solid waste generated by these cities will go to sanitary landfills.
- The abatement potential of methane release by establishment of sanitary landfills in ten major cities is equivalent to 2.04 m tons of CO₂e per year.

GHG Abatement potential- composting plants in ten major cities

- Potential for GHG abatement by establishing composting plants in ten major cities.
- Assuming that 40% of the solid waste generated in these cities will go to composting plants.
- The abatement potential of release of methane by establishment of composting plants in ten major cities is equivalent to 1.70 m tons of CO₂e per year.

GHG Abatement Potential Commercial and Industrial Wastewater

- ALGAS study estimated methane release equivalent of 0.390 m tons of CO₂e per year during 1989-90.
- Presently, there are very few commercial and industrial wastewater treatment plants.
- With proper treatment and assuming that 20% of this baseline emissions can be abated.
- The abatement potential of release of methane by establishment of commercial and wastewater treatment plants is equivalent to 1.63 m tons of CO₂e per year.

Barrier Analysis

- **Lack of funds:** Municipalities lack financial resources to establish sanitary landfills, composting and wastewater treatment plants.
- **Lack of public private partnership:** Few success stories mainly in collection and composting. Generally there are lack of incentives to private sector on their equity.
- **Lack of awareness about CDM potential**
- **Lack of enforcement of environmental regulations** pertaining to discharge of effluent by industrial units into water bodies

Potential Partners

- City Districts Governments of Karachi, Lahore, Faisalabad, Rawalpindi, Multan, Hyderabad, Gujranwala, Peshawar and Quetta.
- Capital Development Authority, Islamabad
- Bahria Town, Defence Housing Authorities of Islamabad, Lahore and Karachi
- Industrial Units

GHG Abatement Potential-On farm Biogas

- There are 57 million cattle and buffaloes which provide sufficient raw material production of domestic biogas.
- Farm level biogas can reduce emissions from better management of manure and from substituting for fossil fuel energy.
- A feasibility study carried out by Winrock International, SNV and UNDP in 2007 showed that there is a potential for 5 million farm level biogas plants in Pakistan. This has potential to reduce around 15 million tons of CO₂e each year.

Industrial Ethanol Production – Baseline emissions

- Ethanol can replace petrol in vehicles.
- The baseline emissions will be the emissions from equivalent amount of petrol which will not be used.
- Potential ethanol in country of over 500 million liters a year.
- Presently there are 13 distilleries, most linked to sugar factories, in Pakistan with a production capacity of 143 million litres of ethyl alcohol per annum – most is exported to Europe.
- This would result in abatement of 0.22 m tons of CO₂e per year if used locally.

Summary

Solid Waste Management, methane capture and biomass energy

Abatement Sectors	Emissions Abated (Million Tons/ year)
Sanitary landfills	2.04 m
Composting plants	1.70 m
Commercial and industrial wastewater	1.63 m
On farm biogas	15.00 m
Ethanol production	0.23 m
G TOTAL	20.6 m

Forestry Sector

Zehra Abbas

Baseline Emissions

- Afforestation, Reforestation 20mil tCO₂

Abatement Potential

- Afforestation:
 - 29.7 tC/ha for agroforestry, 54.6 tC/ha for commercial plantations and 7.5 tC/ha for plantations on farm lands
- Reforestation:
 - Sequestration: coniferous forests 39 tCO₂/ha, riverian forests 33 tCO₂/ha.

Barrier Analysis

- High life cycle cost for initiatives that would yield high carbon sequestration rates.
- Lack of awareness regarding appropriate species
- Capacity constraint of forest staff in new technologies and monitoring skills
- State owned forests, local communities not interested in conservation. Communities can not be involved in forest management in a meaningful manner.
- Lack of precise historical data on the forest and vegetative cover

Training Schedule

PDD Trainings

- *Energy Efficiency*
 - EE in the domestic and industrial sectors:
 - boiler efficiency, heat recovery and fuel substitution
 - EE in the power production and transportation sectors:
 - Transmission/distribution losses
 - Demand side management
 - Reduction of fugitive emissions in the power and natural gas transmission networks.

PDD Trainings

- *Renewable Energy*
 - High potential areas: large hydro projects, wind power, grid connected small hydro, and bagasse cogeneration.
 - Lower Potential Areas: off grid solar and mini hydro projects.

PDD Trainings

- *Waste Management*
 - Composting
 - Methane Capture-land fills
 - Methane Capture-waste water treatment systems.

PDD Trainings

- Forestry
 - The area so far not covered is Reduced Emission from Deforestation and Degradation (REDD)
 - PDD Training will be conducted in this area

Schedule

Event	2009											
	Jan				Feb				March			
	W1	W2	W3	W4	W1	W2	W3	W4	W1	W2	W3	W4
Inception Report	-	X										
Stakeholder/Inception Mtg PIN Trng			X									
Energy Efficiency PDD Training LHR								X				
Waste Management PDD Training LHR								X				
Renewable Energy PDD Training KHI									X			
Energy Efficiency PDD Training KHI									X			
Renewable Energy and Forestry REDD PDD Training ISB												X

PDD Trainings in Lahore

- **Energy Efficiency PDD Training**

- Industry sectors focus on boiler efficiency and waste heat recovery.
- Textile, Fertilizer, Brick, Iron & steel, Cement, Food and Beverages and Petrochemical industries. Additional sectors: power and gas sector efficiencies.

- **Waste Management PDD Training**

- Solid Waste Management: composting, waste water treatment, and methane capture from landfills.
- Methane and fuel alcohol production from the sugar industry and other agro-industries.

Thank You

