EVALUATING & QUANTIFYING:

Carbon Sequestering, GHG Emission Reduction, Fossil Fuel Replacement Capacity, Carbon Credits

Through:

A COMMUNITY DEVELOPMENT PROJECT IN PUNJAB, INDIA

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The Problem

- In Punjab, India, there is a seasonal creek/rivulet flowing between Beas and Satluj rivers.
- This creek has been called Kali Bein.
- Kali Bein has a very important place in the Sikh history.
- It is along this rivulet, that Guru Nanak Dev Ji, the founder of Sikhism, spent his younger days and also attainted ‘enlightenment’.
- He dived into the Bein one day and resurfaced after three days and then uttered the words ‘Japji’.
- These words have since formed the basis of the evolvement of the ‘Guru Granth Sahib’ the holy book of sikh religion.

The Problem

- The last four hundred years have seen total neglect of the Bein.
- On top of the neglect is callous discharge of waste water of
- eight towns and
- nearly fifty villages.

The Problem

- Earthizenz has been involved in the deliberations of the technical committee set up to coordinate and finalize the details of the various project activities to be taken up under the main project
- Earthizenz has been given the task of identifying the elements where CDM can be applied.
- Earthizenz will also define the small scale CDM projects and sub bundles consisting of various project activities.

The Package of Solutions

- Clearing a belt on both sides of the rivulets and greening it with trees and hedges and grass: Forestation, Vetiver hedges : Vetiver to protect the young trees from erosion.
- Providing an eco friendly pathway for pedestrians on both sides of the banks: stabilized earth blocks.
- Suitably stabilizing the banks: Vetiver
- Treating the solids and liquids of villages:
- wherever land is available: only with vetiver,
- wherever land is not available, biomethanation followed by polishing with vetiver:
- using the harvested Vetiver again as a feedstock in the biomethanation reactor.

The Package of Solutions

- Treating the liquid and solid wastes of the towns in a self sustaining programme.
- Treating and maintaining the village ponds: major role of vetiver
- Creating water bodies and converting them to tourism spots out of the treated water prevented from going into rivulet and left over after utilizing for irrigation.

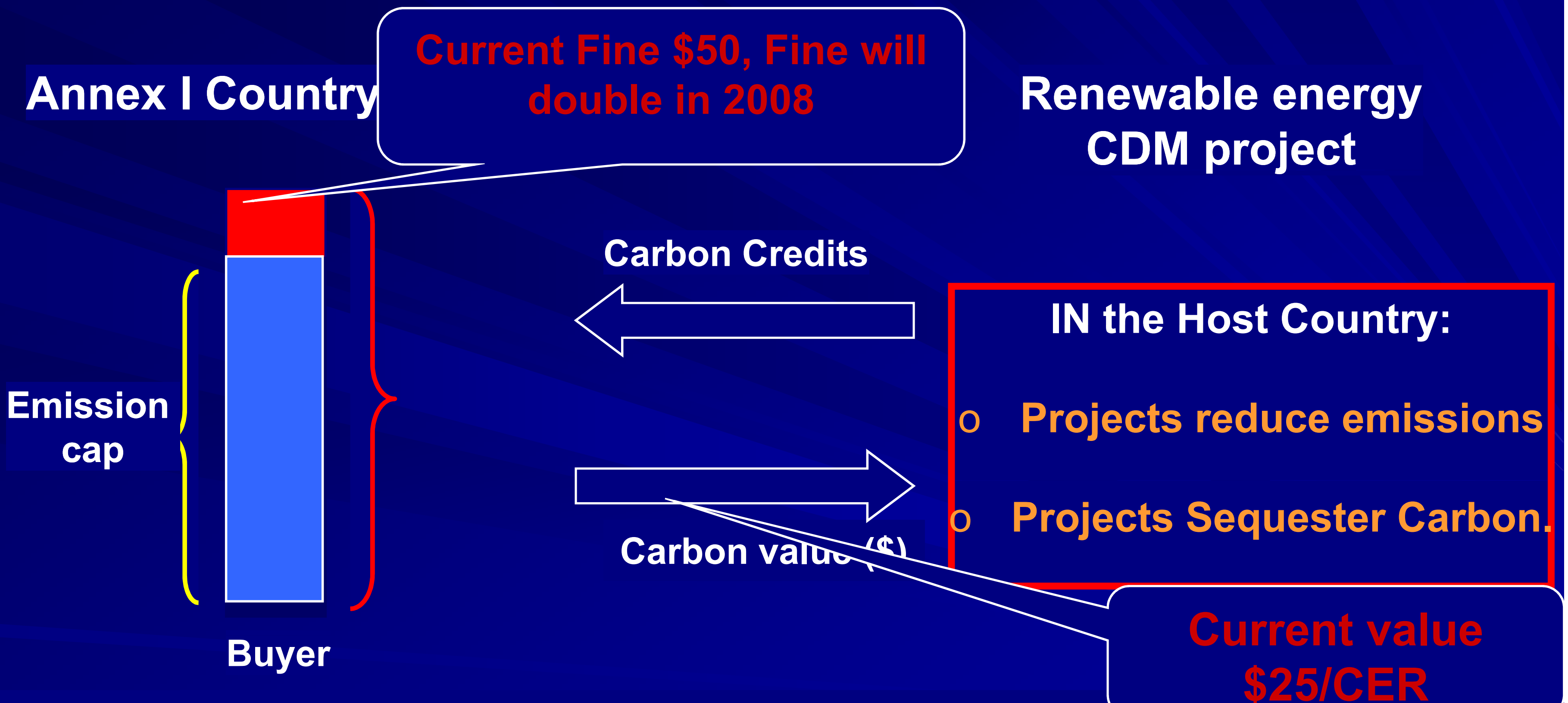
What is a Community Development Project?

- Resulting in overall development of Community
- Direct involvement of the community
- Preferably involving link up of inter dependent activities
- Project should mitigate climate change
- Should be self sustaining

What is Kyoto Protocol?

- **Binding emission targets for** industrialised **countries (called Annex I Countries)**
- **Voluntary participation of developing countries (called Non-Annex I countries, e.g. India)**

How is CDM relevant for such Projects?



By selling the carbon credits – CERs from a GHG reduction/ Carbon sequestering project to a buyer additional cash flow can be realised for projects.

Relevant Green House Gases

1) Carbon Dioxide

   Global Warming Potential 1*

2) Methane

   Global Warming Potential 21*

3) Nitrous Oxide

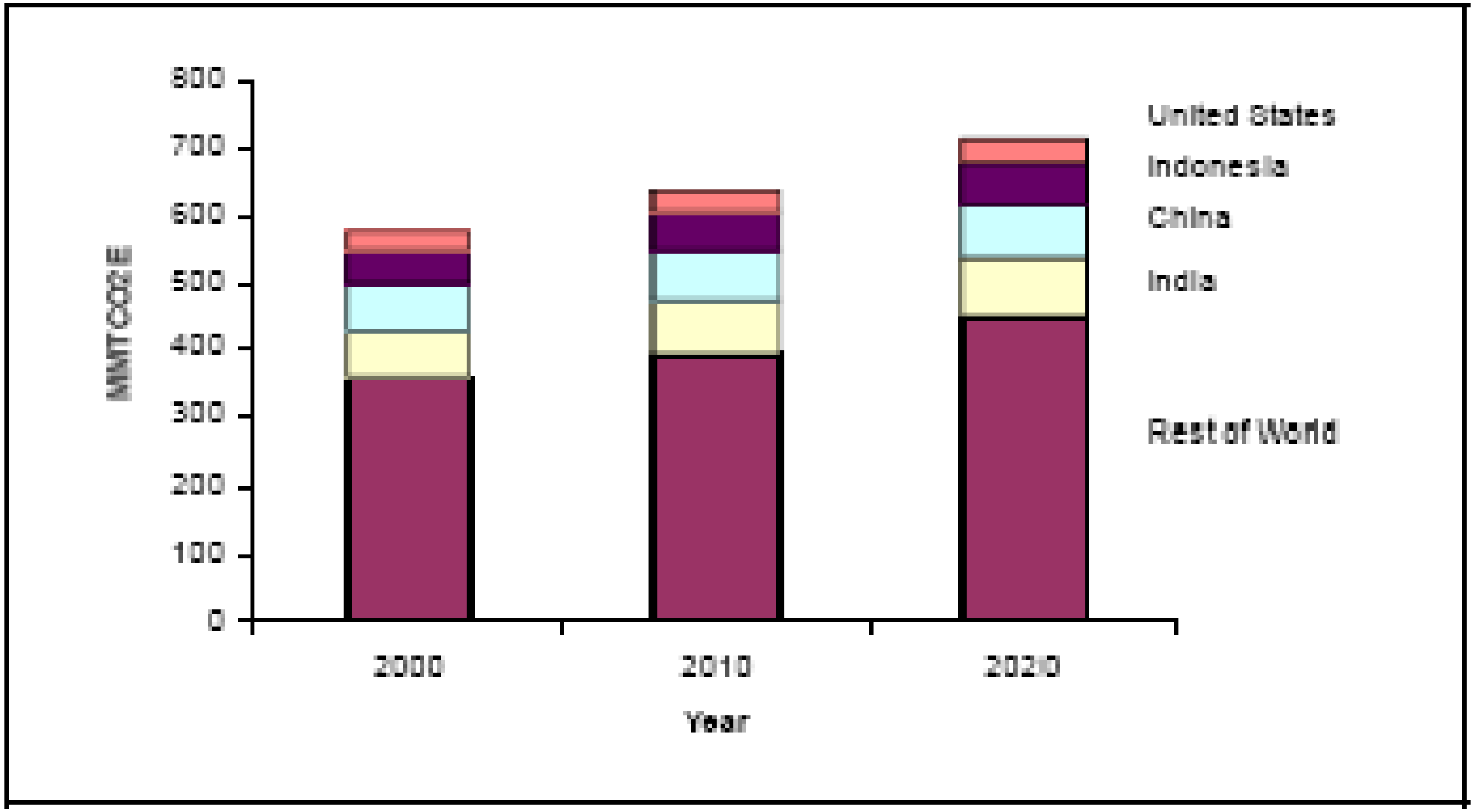
   Global Warming Potential 310*

* tCO_2e

*Times Carbon dioxide

Methane From Wastewater

Exhibit 4-1. Wastewater Methane Emissions and Projected Emissions by Country



Source: EPA, 2005.

Methane From Wastewater

Exhibit 4-3. Methane Emissions from Wastewater by Country: 1990–2000 (MMTCO2E)

Country	1990	1995	2000
China	64.9	68.8	72.0
India	56.9	62.4	67.9
Cambodia	56.8	60.0	62.8
Indonesia	40.7	44.5	48.3
United States	24.1	26.7	28.4
Brazil	18.0	19.3	20.7
Mexico	10.0	11.0	14.6
Iran	12.0	13.1	14.1
Bangladesh	10.4	11.7	13.0
Russian Federation	9.4	9.4	9.3
Nigeria	6.8	7.9	9.0
Pakistan	6.9	7.8	8.9
Viet Nam	6.7	7.4	8.0
Turkey	5.7	6.3	6.8
Jordan	6.2	6.3	6.5

Source: EPA, 2005.

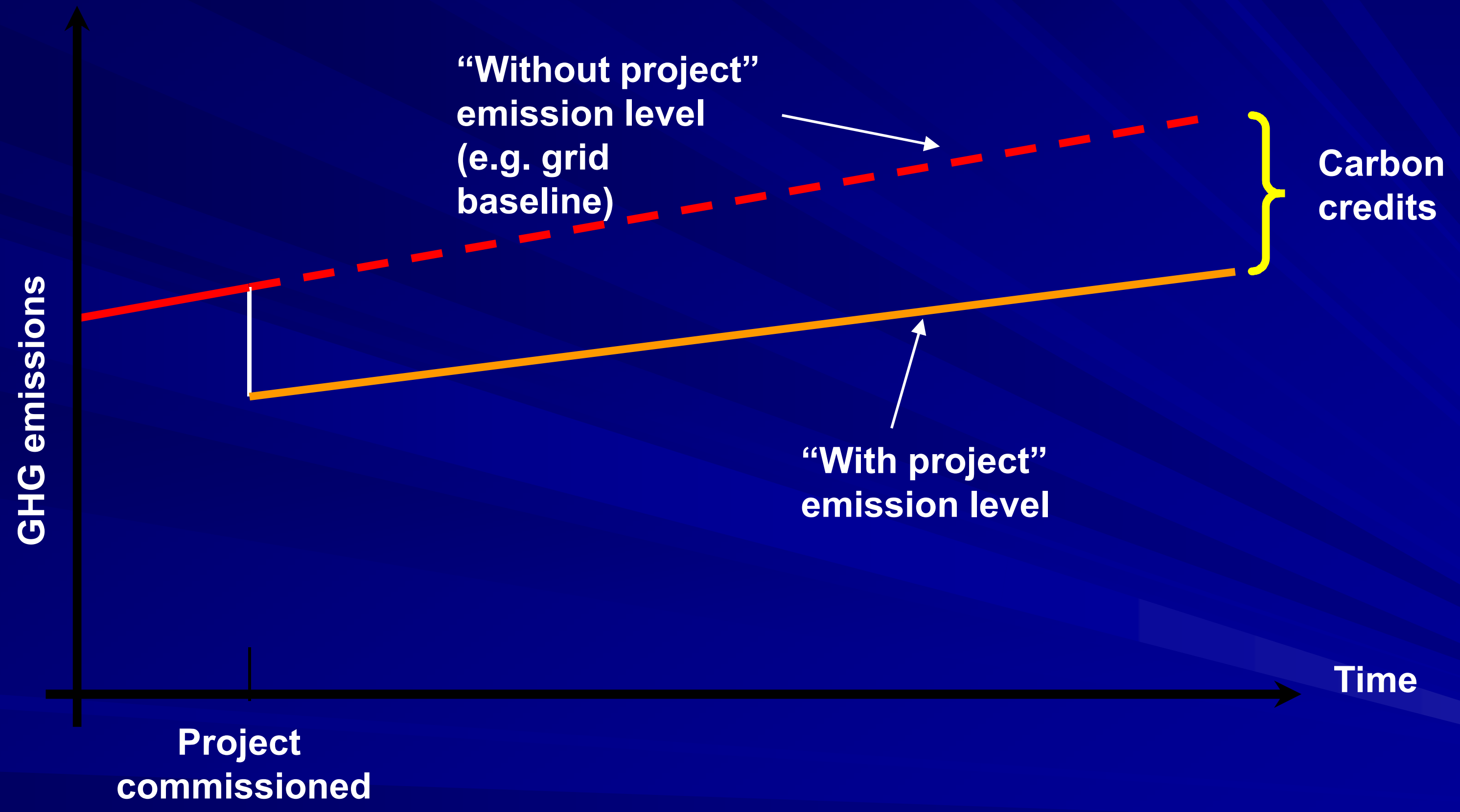
Nitrous Oxide From Wastewater

Exhibit 4-4. N_2O Emissions from Wastewater by Country: 1990–2000 (MMTCO2E)

Country	1990	1995	2000
China	16.7	17.6	18.4
India	8.5	9.4	10.2
US	6.7	7.4	8.1
Indonesia	2.0	2.2	2.4
Brazil	2.0	2.2	2.4
Russian Federation	2.2	2.2	2.2
Japan	2.0	2.0	2.0
Pakistan	1.2	1.3	1.5
Mexico	1.3	1.4	1.5
Germany	1.3	1.4	1.4
Nigeria	0.9	1.1	1.2
France	1.1	1.2	1.2
Bangladesh	0.9	1.0	1.1
Turkey	0.9	1.0	1.1
Italy	1.1	1.1	1.1

Source: EPA, 2005.

The concept of Baselines



- "The *baseline* for a CDM project activity is the scenario that reasonably represents the anthropogenic emissions by sources of greenhouse gases that *would occur in the absence of the proposed project activity.*"

Selling CERs: Risks!

- If the Project does not take off or does not deliver
- Risks can be carried by the buyer or the seller. Examples:
  - -Buyer can take on the entire expected CERs or parts
- -Penalties in case CERs do not accrue

- Price of CERs and risk go hand in hand

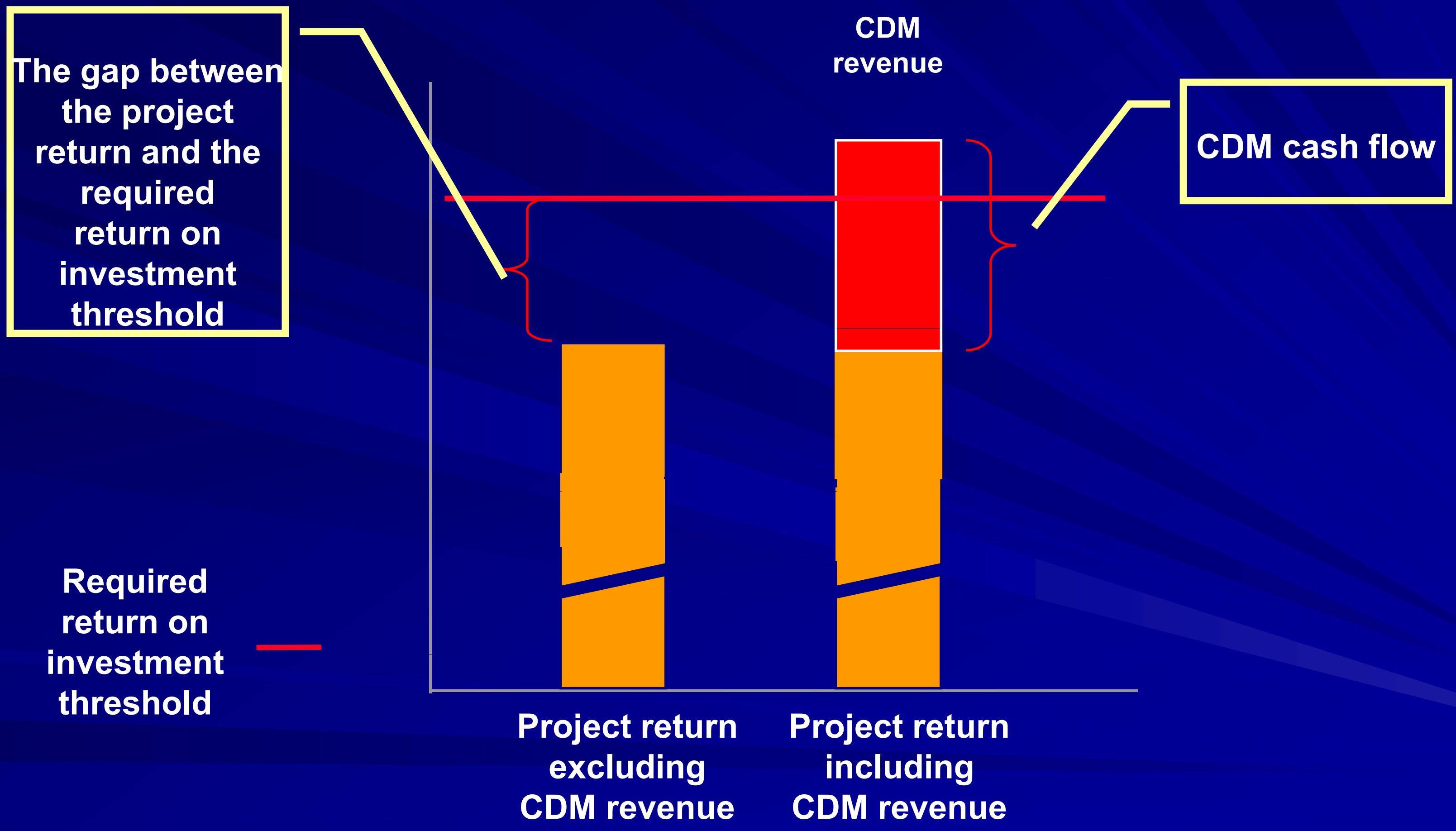
Value of Carbon Credits

- A sale of CERs made after issuance , fetches the highest price (currently $25, and expected to treble)
- But then the risk is all of the project developer.
- Advance against CERs: penalties for non-deliverance
- Advance sale of CERs: all risks and cost to the buyer's account. Value goes down.

Concept of VERs

- VER is a verified emission reduction. Many Annex one companies trade in VERs.
- These are mutual arrangements between buyers and sellers.
- They are verified by Designated Operational entities in the Host country.
- Later approved by the host country.
- They need not go to the CDM Executive Board for approval. These have the minimum risks as well as the minimum costs.
- These can be beneficial for very small projects.

Additionality



Additionality Test

- Need to prove the project would not have happened without CDM
- Some steps in the test:
- 1. Initial Project Stage: Proof of CDM influencing decision
- -> Key for all projects stared before registration
- 2. Investment or barrier analysis

- *Projects that lack sufficient proof of additionality become rejected by the CDM EB.*

Methodology Criteria

- A Methodology is the method for estimating carbon emissions from a technology/project
- If a methodology exists, this simplifies the CDM process.
- In the present case, methodologies exist. Methodology for Biomethanation of MSW (Lucknow, India) is approved by the CDM Board.
- Small Scale Methodology for untreated wastewater stream has now been added to the approved list.
- Methane capture and power generation methodologies always existed.

Small Scale CDM Projects: Spl. Provisions

- Simplified Methodologies;
- No change in project cycle – ‘Fast track’;
- Single OE for validation and verification;
- Simplified PDD;
- Administrative levy halved.
- **All these only influences limited share of transaction cost**

Transaction Cost

Baseline Study- 18k;

- Validation - 28k;
- Registration- 5k;
- Negotiation- 18k;
- Verification- 20k;
- Certification -1k
- Total ~ 90k

All Figure in USD

(Source : UNFCCC Sec)

Bundling of Small Scale CDM & A/R CDM Project Activities

Why Bundle SSC Projects?

- High Transaction Costs
- Low CER Prices 4-5 $/ ton;
- Low CER generation;
- Adverse environment for SSC projects

What is a CDM bundle?

- Bringing together of several small-scale CDM projects,
- Without the loss of distinctive characteristics of each activity.
- Can be arranged as one or more “sub-bundles” with each activity retaining its distinctive characteristics,
  - technology/measure,
  - location,
  - application of simplified baseline methodology.
- Project activities within a sub-bundle are of the same type.
- Sum of output capacity of activities in a sub-bundle must not exceed the maximum output capacity of its type

i: renewable energy
ii: energy efficiency
iii: other

General Bundling Principles

- Should be indicated when requesting registration.
- Once project activity is part of a bundle for a particular project cycle stage, it cannot be “de-bundled” for that stage.
- Bundle composition cannot change over time.
- Activities bundle cannot be taken out or added after registration.

General Bundling Principles

- Same crediting period for all activities.
- Should be demonstrated that bundle will remain under the limit for that type, every year during the crediting period.
- If bundle goes beyond its limits, maximum claimable ERs is capped at level for that type
  - That is, excess ERs generated will not be eligible.

Principles – Homogenous Bundles

Same type, same category, same technology/measure

- Same baseline may be used under some conditions
- One DOE can validate.
- Common monitoring plan for the bundle, one monitoring report
  - Conditions for sampling
- Same length and starting date of crediting period
- One verification report.
- One issuance – same time, for same period, 1 serial number for all projects (the bundle).
- Sum of all activities should be as per SSC limits.
- Must use SSC methodologies.

Principles – Heterogeneous Bundles

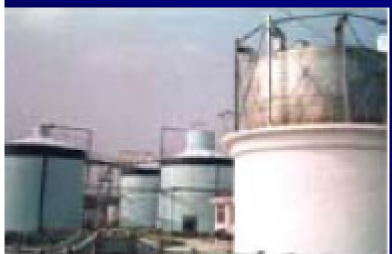
(a) Same type, same category but different technology
(b) Same type, different category, different technology
(c) Different types

- Same baseline may be used under some conditions
- One DOE can validate.
- Different monitoring plans, separate monitoring reports.
- Same crediting period for all activities.
- One verification report, one issuance, one serial number.
- ***Sum of all activities???***
- Must use SSC methodologies.

SSC Bundles, SSC Limits

Type I (Ren. Energy): Maximum output capacity of 15 MW (or an appropriate equivalent);

Type II (Energy Efficiency.): Maximum output of 60 GWh per year (or an appropriate equivalent);



Type III: (Others) emission reductions of less than or equal to 60 kt CO_2 equivalent annually.

Advantages of Bundling

- Can save costs, depending on case.
- 1 DOE for validation and verification
- Sampling allowed in monitoring plan.
- 1 PDD collects all small project activities.
- Single entity can act on everyone's behalf.
- Good way for small, rural, scattered projects to access carbon finance.

Example: **Nepal Micro Hydro**
Program: Installation of MH stations range 3 – 100kW
Up to 15MW
~ 750 plants covered in 1 PDD
Govt. of Nepal on behalf of all MH operators

Limitations of Bundling

- Can also raise costs.
- What if # of project activities amount to greater than SSC limits?
  1. **Make large-scale bundle, with regular methodologies, if available**
  2. **Parse into different PDDs**

     - how many PDDs will this produce?
- Ex-ante identification of project activities
  - **Sites? Villages? Municipalities? Districts?**

Example: **Nepal Biogas**

Program: Installation of 162,000 – 200,000 biogas plants.

1 PDD covers ~9000 average sized plants

PDD writing + validation + verification yr1= $30K

Plus $10K per year verification x # of years

Not withstanding modality repetition per PDD!

Example:
Vertical Shaft Brick Kiln India

Energy Consumption in Brick Production

Clamps	=	4.5 to 8.0 MJ / Brick
Movable Chimney (BTK)	=	4.2 MJ / Brick
VSBK	=	1.80 MJ/ Brick

Example:
Vertical Shaft Brick Kiln India

- Improve thermal performance of brick manufacturing through VSBK implementation
- Intention is to set up 127 VSBK plants, in 2-3 years;
- SSC threshold is 60 GWh per year;
- Bundles 14, 28, 21 VSBK plants which is 22.87 GWh_{th} per year (contracted for equivalent of 6 bundles, based on 45 GWh_{th})
- Methodology "*Energy efficiency and fuel switching measures for industrial facilities*" AMS II.d

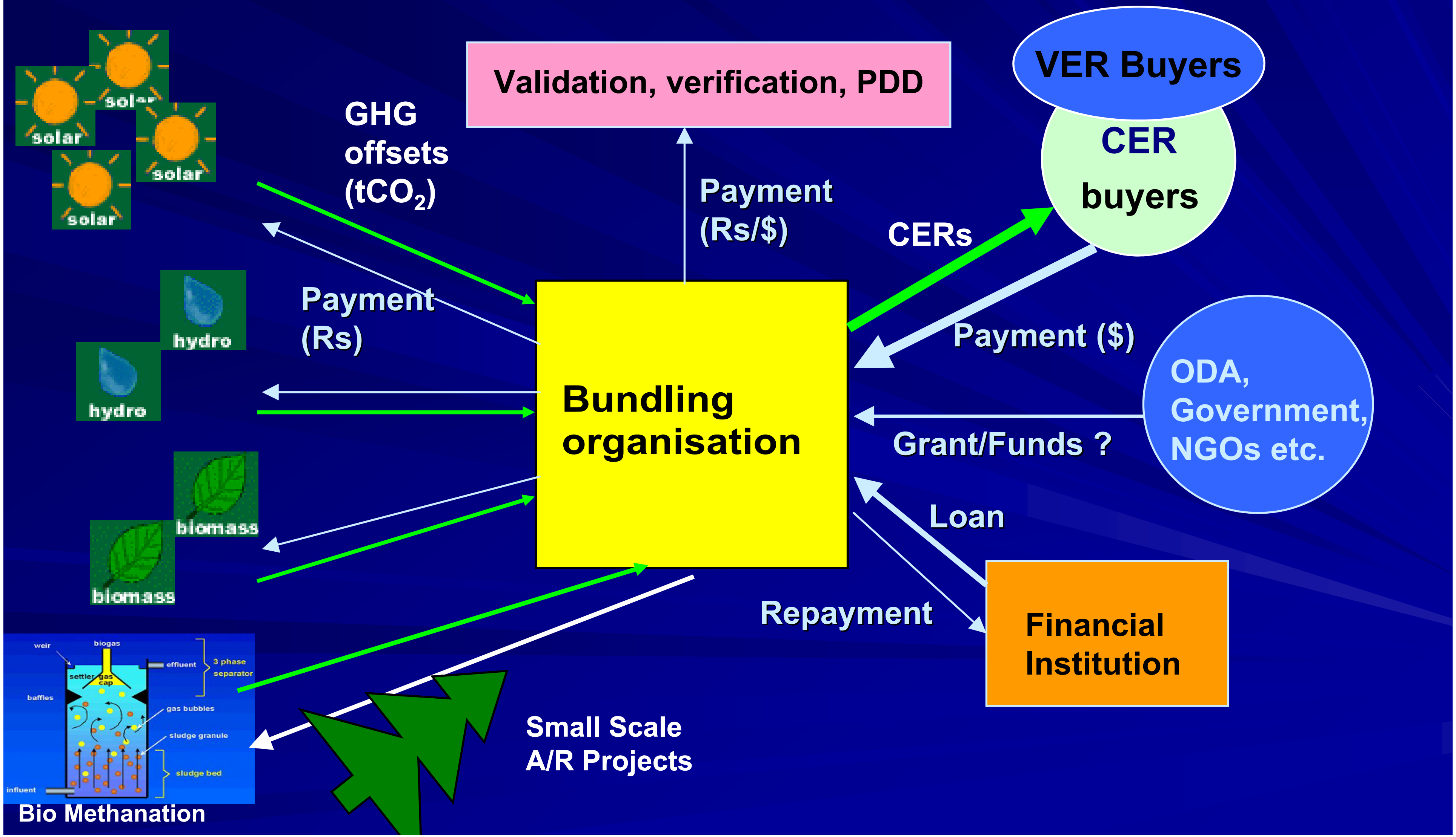
FaL-G Block & Blocks India

(Bundling of Micro Manufacturers)

The project will bundle about 200 very small sector units and replace clay bricks with Fal-G brick production, with expected carbon emission reductions of 100,000 tons a year.

Sl. No.	Parameters	Values
1	Plant Capacity	2-6 million bricks/year
2	Land area required	0.5 acre (minimum)
3	Capital Investment	Rs. 1.2 – 1.5 Million (US$ 28,000–35,000 approx.)
4	Workers involved	12-15 persons/shift (machine specific)
5	Power Requirement	15-25 kW (machine specific)
6	Emission Reductions to be generated	About 690 tons CO_2/yr (for a 2 million capacity plant)
7	Net profit	Rs. 0.2-0.3 Mil/yr (without carbon credit)

Example – implementation arrangement with bundling agency + bundled project



Approved Small Scales CDM Methodologies

Reference	Methodologies Title
AMS-I.A.	Electricity generation by the user
AMS-I.B.	Mechanical energy for the user with or without electrical energy
AMS-I.C.	Thermal energy for the user with or without electricity
AMS-I.D.	Grid connected renewable electricity generation
AMS-II.A.	Supply side energy efficiency improvements – transmission and distribution
AMS-II.B.	Supply side energy efficiency improvements – generation

Approved Small Scales CDM Methodologies

AMS-II.C.	Demand-side energy efficiency activities for specific technologies
AMS-II.D.	Energy efficiency and fuel switching measures for industrial facilities
AMS-II.E.	Energy efficiency and fuel switching measures for buildings
AMS-II.F.	Energy efficiency and fuel switching measures for agricultural facilities and activities
AMS-III.A.	Agriculture
AMS-III.B.	Switching fossil fuels
AMS-III.C.	Emission reductions by low-greenhouse gas emitting vehicles

Approved Small Scales CDM Methodologies

AMS-III.D.	Methane recovery in agricultural and agro industrial activities
AMS-III.E.	Avoidance of methane production from biomass decay through controlled combustion
AMS-III.F.	Avoidance of methane production from decay of biomass through composting
AMS-III.G.	Landfill methane recovery
AMS-III.H.	Methane recovery in wastewater treatment
AMS-III.I.	Avoidance of methane production in wastewater treatment through replacement of anaerobic lagoons by aerobic systems

Approved Small Scales CDM Methodologies

AMS-III.J.	Avoidance of fossil fuel combustion for carbon dioxide production to be used as raw material for industrial processes
AMS-III.K.	Avoidance of methane release from charcoal production by shifting from pit method to mechanized charcoaling process
AMS-III.L.	Avoidance of methane production from biomass decay through controlled pyrolysis
AMS-III.M.	Reduction in consumption of electricity by recovering soda from paper manufacturing process
AMS-III.N.	Avoidance of HFC emissions in rigid Poly Urethane Foam (PUF) manufacturing

Wastewater Treatment with Vetiver

Total Treatment with Vetiver:

- **Methane:** We hope to prove that by using vetiver, we are preventing the methane from escaping to the atmosphere, which would have been the case under the BAU scenario. Methane having a GWP of 21 CO2e.
- **Nitrous Oxide Emission Prevention:** Keeping in view the Nitrogen uptake capacity of Vetiver, we presume that whatever Nitrous Oxide that goes into the atmosphere in the BAU scenario.
- The GWP of N2O is 310. This needs tobe studied so that quantification can be done.

Secondary Treatment with Vetiver:

- **Residual Methane Removal:** This is an important aspect while calculating Carbon Credits. Residual Methane removal by Vetiver needs to be researched.
- **Nitrous Oxide Removal:** As discussed above.

Application of Vetiver

Treatment of Anaerobic Ponds:

- Reshape deep ponds into shallow ponds and have Vetiver on their slopes and grow vetiver suspended in floats.

- This will prevent methogens from forming.

Application of Vetiver to the Project

Afforestation & Reforestation:

- It is planned to have a green belt all along the 160Km long river. Vetiver will be a part of this greening which would essentially have trees too.
- **Bank Stabilisation with Vetiver:** The Carbon Sequestering Capacity of Vetiver will help evaluate Carbon Credits. We expect to get some data on this aspect of Vetiver at this workshop.

Some Project Cases in the Carbon Market

Source: World Bank

Potential Municipal Solid Waste (MSW) CDM Project
Municipal Solid Waste: methane emissions

Baseline:

MSW are:

•Open dumping

•Disposal in unmanaged sites, or

•Managed / sanitary landfills (w/o flaring)

With additionality

Project Scenario:

Project Scenario:

•Landfill Gas collection system *(methane gas recovery)* with/without electricity generation

•Composting *(methane emission avoidance)*

Transitions from baseline to project scenario Transitions from baseline to project scenario with these technological alternatives can reduce methane

***Potential safeguard: arsenic issue**

MSW Case study: LFG Recovery China: Tianjin Shuangkou LFG Collection and Utilization Project

- Methodology: ACM0001 + AMS I.D
- Baseline: Disposal of MSW at managed sanitary landfill
- Additionality: Investment analysis
- Project scenario: Landfill gas recovery and utilization (1265kW x 3)
- Project detail:
  - Capital Cost: $ 5 million
  - Private sector: BOT contract (15 years)
- Sanitary landfill constructed under a WB loan in 1999, started operation April

  2001, 1.6 million tons of waste in place
- Waste disposal rate: 1300 tons/d

ERs estimates (2008-2012)

- From methane emission recovery: 460 k tons CO2e
- From grid-electricity displacement: 65 k tons CO2e

Feasibility: IRR without ER 3%; with ER 18%)

MSW Case study: Composting Malaysia: Kota Kinabalu MSW sorting & composting plant

- Methodology: AM0025
- Baseline: Disposal of MSW at moderately managed sanitary landfill
- Additionality: Investment analysis, technological barrier
- Project scenario: Avoidance of methane generation by windrow composting.
- Project detail:

- Capital cost: $ 8.8 million
- Constructed and operated by private sector (15 yrs concession contract)
- Capacity: 500 t/d
- Start operation: June 2007

ERs estimates (2008-2012): 750 k tons CO_2e
Feasibility: IRR without ER 3%; with ER 40%

Potential Sewage Sludge (SS) CDM Project

Sewage sludge: methane emission

Baseline:

Sewage sludge treatment/disposal methods:
- **Open lagoon**
- **Dewatered and landfilled (either in managed or unmanaged disposal sites)**

With additionality

Project Scenario:
Sewage sludge treatment systems:

•Covered lagoon *(methane recovery)* with/without biogas utilization

•Bio-digestor *(methane extraction)* with/without biogas utilization: electricity, heat generation, drying sludge, flaring, and with/without sludge utilization

•Composting *(methane avoidance)*

SS Case study: Covered Lagoons Bolivia Santa Cruz Wastewater Methane Capture Project

- Methodology: Small scale AMS III.H (<60 k tons CO2e/yr)
- Baseline: open lagoons generating methane through anaerobic digestion of wastewater and sewage sludge
- Additionality: financial barrier
- Project scenario: methane recovery through covering anaerobic ponds with HDPE sheets, and flaring.
- Project detail:
- - Capital cost: $1.8 million
- - Public private partnership (concession area)
- - Capacity: 64,000 m3/d upgraded to 154,000 m3/d by 2012
- - Start operation: Early 2008

Sultanpur Lodh??

ERs estimates (2008-2012): 175 ktCO2e
Feasibility (IRR without ER: -%, with ER: 14%)

SS case study: Bio-Digester

China: Jinin Municipal Wastewater Sludge Digestion Treatment Project

- Methodology: NM189 + AMS I.D
- Baseline: Disposal of dewatered sludge at managed sanitary landfill
- Additionality: Investment analysis; Financial barriers
- Project scenario: Wastewater Sludge Digestion Treatment with electricity generation 564kW x 2
- Project detail:

  - Capital investment: financed by a KfW loan

  - Municipality owned state enterprise owns and operates the facility

  - Capacity: 150,000 m3/day; Raw sludge inlet 1000 ton/day, Digested sludge: 50 ton/day

Mohali???

ERs estimates (2008-2012)

- - From methane extraction: **140 k tons CO2e**
- - From grid-electricity displacement: **13 k tons CO2e**
- **Feasibility: IRR without ER 6.8%; with ER 12.3%**

Potential Animal Manure Waste (AMW) CDM Project

Animal manure: methane and N2O emissions

Baseline:

Manure storage methods:
Solid, dry, liquid, pits, deep litter, open anaerobic lagoon

With additionality

Project Scenario:

Manure treatment systems:

- **Covered lagoon** ***(methane recovery)*** **with/without biogas utilization**
- **Bio-digestor** ***(methane extraction)*** **with/without biogas utilization (i.e. electricity/heat generation; drying sludge, flaring), and with/without sludge utilization**
- **Combustion of manure** ***(methane avoidance)***
- **Co-composting**

Transitions between these alternatives can reduce methane and N2O emissions. reduce methane and N2O emissions**.**

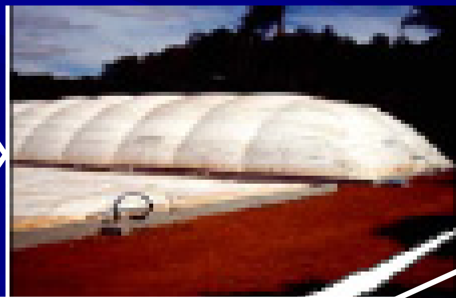
****Potential safeguard: arsenic issue***

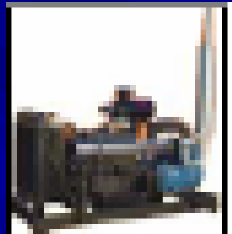
AMW: Covered Lagoons

Pre-Project Activity Condition
Open Air Logon

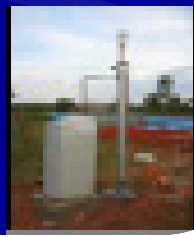
Pre-Project Activity Condition
Anaerobic Digester with Flare

Pre-Project Activity Condition
Open Air Logon





& or other renewable energy equipment



Pre-Project Activity Condition
Anaerobic Digestor with Co-gen Flare

Open Lagoon to Ambient Temperature Anaerobic Digester with Co-Gen & Flare

Case Study: Kishengarh : Total Waste Management& Elec Gen

The Waste consists of:

❑ Kitchen waste from a population of 20000	= 2 tons/day
❑ Cow dung from 500 cattle	= 6 tons/day
❑ Fruit and vegetable market waste	= 12 tons/day
❑ Wastewater from 20000 population @100lpd	= 2 mld /day
The net methane capture/annum	= 164.5 Tons
Certified Emission Reduction eligibility	= 2961tCO_2e/ann.

Translated into money this comes to Rs. 40,00,000/annum

Case Study: Kishengarh : Total Waste Management

- The methane calculated above is capable of generating 100 KW (0.1MW) in a day running 24 hours.
- At 80% efficiency, this =700 MWh per annum
- Emission of replaced electy. = mixed cycle = 0.4tCO_2/MWh
- Carbon Credit =280 tCO_2
- At current CER rate this comes to Rs. 3,50,000 per annum.
- Revenue from Sale of Electricity @ Rs.2/- per unit, leaving 30 units per day for self consumption.

  = Rs. 10, 08,000 per Annum
- Revenue from Sale of 2 t of Organic Fertilizer @ Rs. 2/-

  = Rs. 14, 60,000 per Annum

Case Study: Kishengarh : Total Waste Management

Total Projected project cost	= Rs. 400 Lacs
Loan Amount (Say)	= Rs. 200 Lacs
Total Revenues Generated	= Rs. 68.18 Lacs/Annum
Less Estimated O&M Cost	= Rs. 24.00 Lacs/Annum
Net Revenue before Interest	= Rs. 44.18 Lacs/Annum
Interest on Loan	= Rs. 16.00 Lacs/Annum
Net Revenue Earned	= Rs. 28.18 Lacs/Annum
Return on Investment	= 7.05 %

CDM Impact: Only Wastewater Treatment 1500 Villages

A total of 1500 villages are proposed to be modernised in Punjab.

Assume an average population of 2000 per village.

Total affected population	=	2000*1500=30, 00, 000
Sewage Generation @ 120LPD	=	360 MLD
Projected Biogas recovery/ day	=	40.50 Mt.
Methane Recovery/day @70%	=	28.35 Mt.
Methane Recovery/Annum	=	10,348 MT
Global warming potential of methane	=	21t CO2 equivalent
CO2 emitted while Flaring/t methane	=	3 MT
Net Global Warming Factor	=	(21-3)=18t CO2e
No. of CERs earned/annum	=	1,86,264
Value of these @ $25/CER	=	$ 46,56,600
	=	Rs. 23.28 crores
Earning potential over 10 years	=	Rs. 233 crores
Earning from 75 villages along Bein	=	Rs. 11.65 crores

CDM Impact: Combined Wastewater & Wet Garbage Treatment 1500 Villages W/O Electricity Gen.

Assume per capita wet garbage	= 0.100 Kg/day
Wet Garbage Generated/village	= 200 Kg/Day
Assume average of 500 cattle	
Cow dung in one village	= 6000 Kgs/Day
Total Degradable Solids	= 6200 Kgs/Day
Expected Biogas Capture	= 170 Kgs/Day
Methane Capture @ 70%	= 120 Kgs/Day
Methane Captured: 1500 villages	= 180 MT/ Day
CER Potential/day @21	= 3780 t CO2e
Annual CER Potential	= 13,80,000 tCO2e
Revenue @ $25/CER/ annum	= $ 3,45,00,000/
Revenue in Rupees/Annum for wet garbage	= Rs. 172.5 Crores
Total Revenue (wastewater + solids)	= Rs. 195.8 Crores
Revenue in 10 years	= Rs. 1958 Crores
Revinue from 75 villages around the Bein	= Rs. 98 Crores

Case Study: Solid and Liquid Waste Management: Nawanshahar

We were asked by DC Nawanshahar to suggest solid and liquid waste management for Nawanshahar.

Untreated Sewage is currently flowing into the bein.

Solids are being dumped outside the village.

We proposed:

1) Collection of kitchen waste vegetable market waste, and dairy waste from Banga, Rahon and Nawanshahar at proposed STP site and set up a methanation plant there using the wastewater.

2) Treatment of sewage of Nawanshahar by the UASB technology and capturing Methane.

3) Removing the Hydrogen Sulphide gas from the Methane.

4) HARNESSING the Methane to generate electricity.

Cost of project & Revenue

Projected Cost of Project 8 MLD Sewage and 30 TPD Organic solid Waste: 700 lacs.

Land required: 5 acres (Cost of acquisition not included)

Net annual methane recovery	**= 412.5 MT**
CER Potential	**=7424 tCO2e**
Annual Revenue from CDM (Methane)	**= Rs. 92,80,000**

The methane calculated above is capable of generating 250 KW (0.25 MW) in a day running 24 hours.

At 80% efficiency, this	**=1750 MWh per annum**
Emission factor of replaced electy. = mixed cycle	**= $0.4tCO_2$/MWh**
Carbon Credit (Electricity Gen)	**=700 tCO_2**
Annual Revenue (Electricity Gen)	**=Rs. 8,75,000**
Sale of Electricity @6000 units/day	**= Rs. 35,00,000**
Annual rev.from 5 t fertilizer/ day @ Rs. 2000/t	**=Rs. 36,50,000**
Total Revenue/Annum	**= Rs. 1,73,05,000**

Return on Investment: Nawanshahar

Total Projected project cost = Rs. 800 Lacs

Loan Amount (Say) = Rs. 600 Lacs

Total Revenues Generated = Rs. 173.05 Lacs/Annum

Less Estimated O&M Cost = Rs. 75.00 Lacs/Annum

Net Revenue before Interest = Rs. 166.05 Lacs/Annum

Interest on Loan = Rs. 48.00 Lacs/Annum

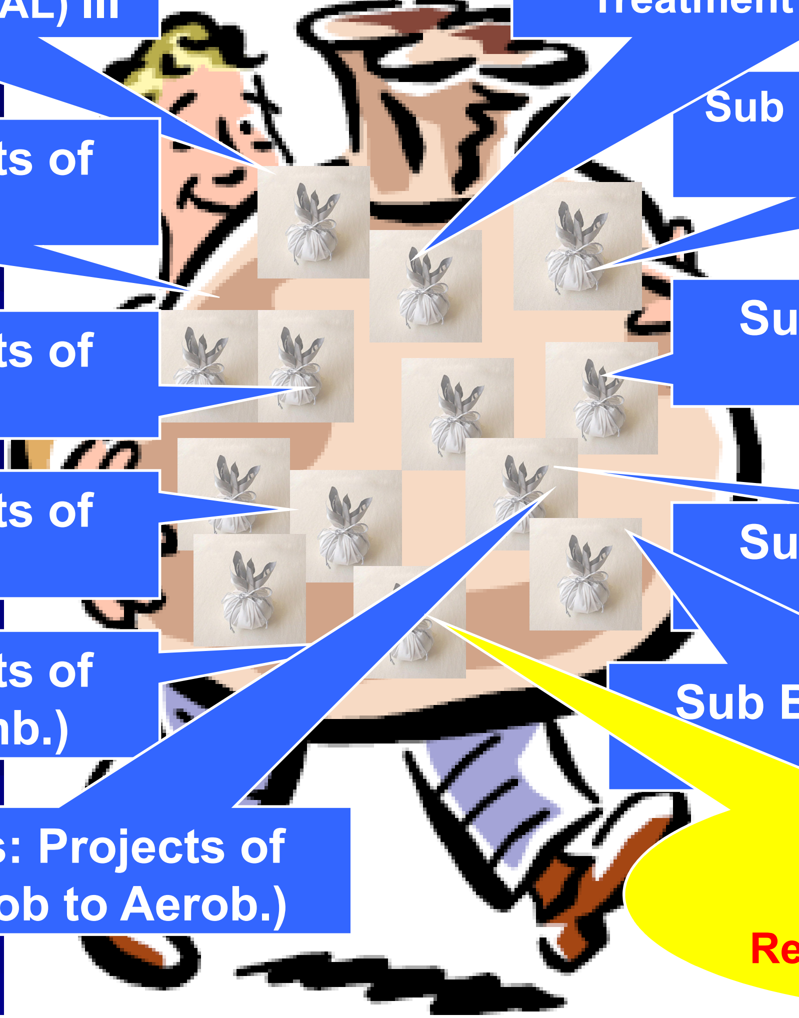
Net Revenue Earned = Rs. 120.05 Lacs/Annum

Return on Investment = 15 %

The Holy Bein : A Bundled CDM Community Project

How?

Sub Bundles in the Bundle



Sub Bundle of Wastwater Treatment Projects (RURAL) III H

Sub Bundles of Wastwater Treatment Projects (Urban)

Sub Bundles: Projects of Type I A

Sub Bundles: Projects of Type III B

Sub Bundles: Projects of Type I C

Sub Bundles: Projects of Type III G

Sub Bundles: Projects of Type III F

Sub Bundles: Projects of Type I D

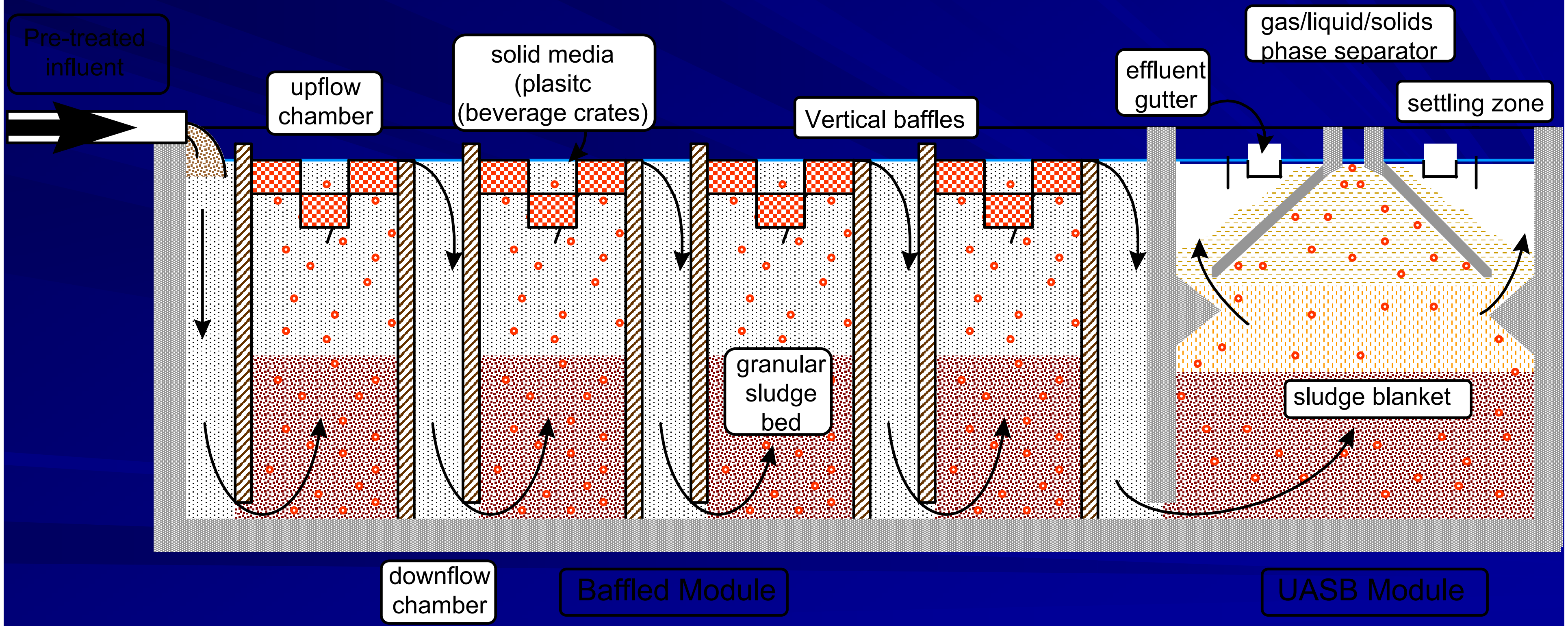
Sub Bundles: Projects of Type IIIE (Cont. Comb.)

Sub Bundles: Projects of Type III B

Sub Bundles: Projects of Type III Aaerob to Aerob.)

Sub Bundle of Afforestation and Reforestation projects

Modified Septic Tank/ Reactor for Primary Treatment



Hydroponic Treatment /Vetiver Wetlands

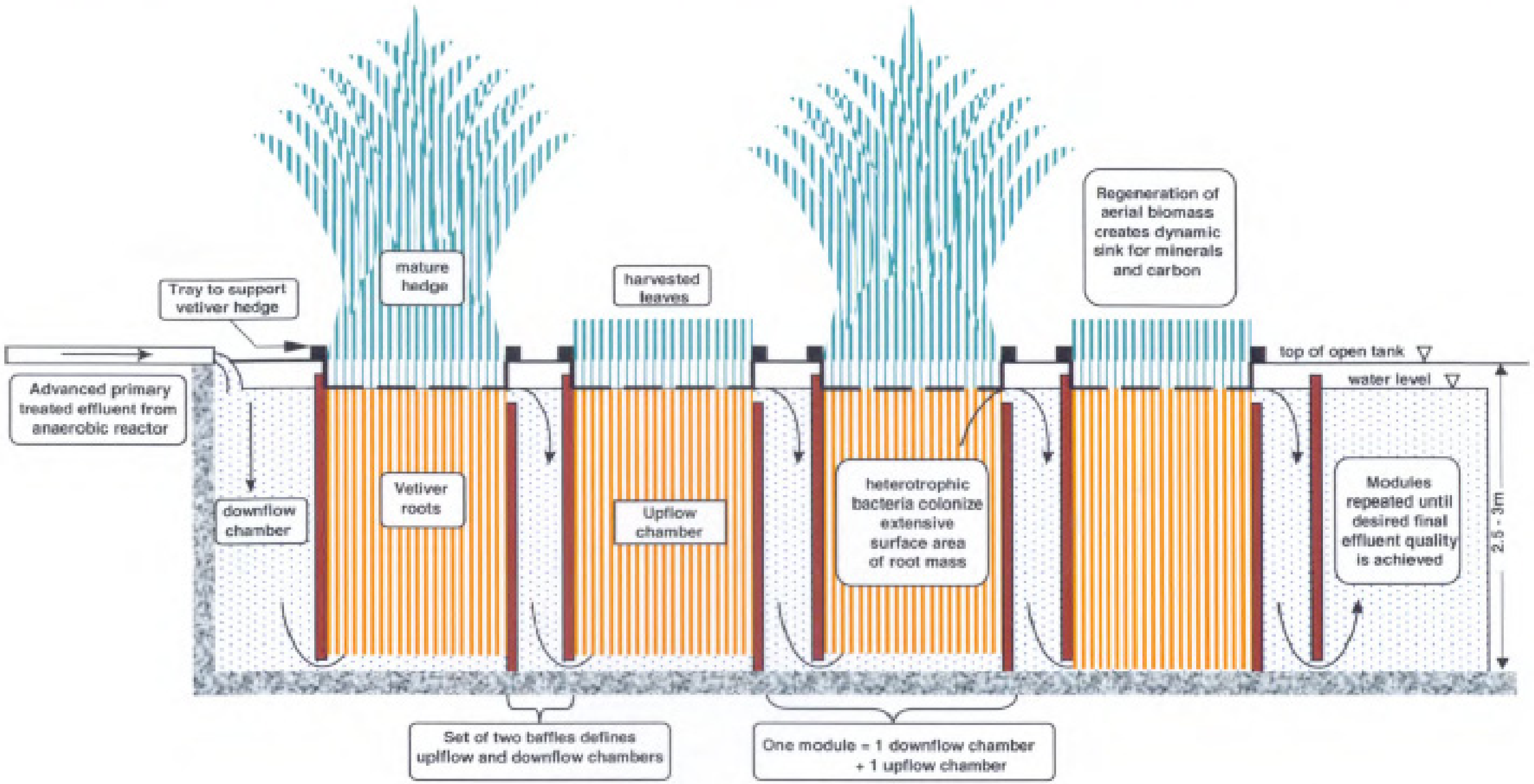
(Secondary /tertiary treatment)

Treating piggery effluent in Vietnam

Source INVN

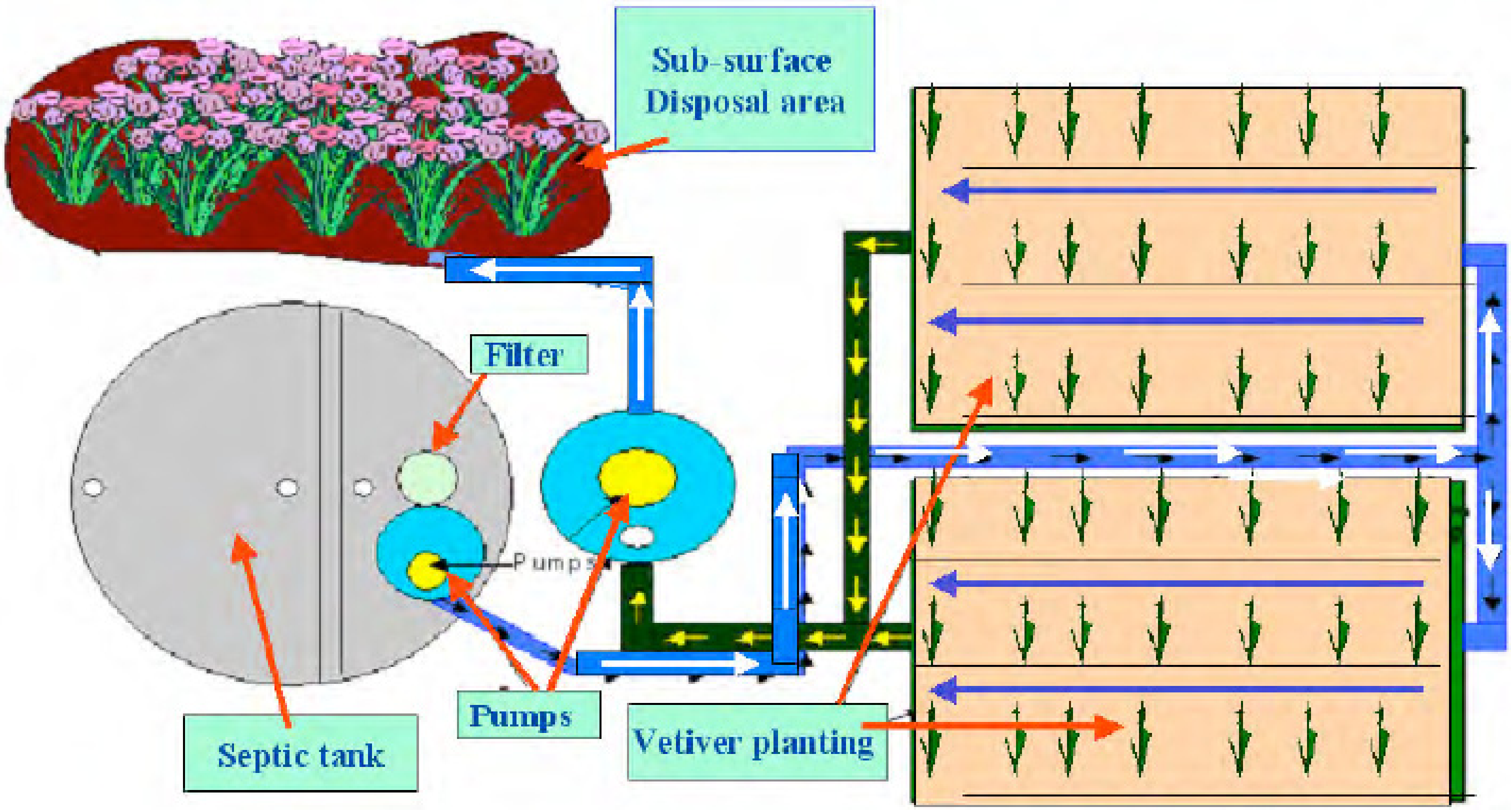

Source INVN

Schematic drawing of proposed vetiver hydroponics module to polish household effluent



Treating domestic effluent

Diagrammatic layout of a domestic disposal system



Source INVN

Treating flowing Bein

Source INVN

Floating Vetver Pontoons

Conclusion

- There is a vast scope of CDM application to a range of projects across the spectrum.
- Applicability to new Housing complexes is Significant
- Methane recovery and Waste to Energy projects can transform.
- This is not possible with the interdepartmental opinion process.
- The answer is formation of a CDM Board with the inclusion of professionals.
- SPV required for speedy and necessary application