

Potential and Feasibility for Programme of Activities in the Pacific Islands

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CDM capacity building workshop in Fiji, 3rd November 2011



Actually most of this presentation
also applies to Voluntary Carbon
Projects

A CDM Programme of Activities
can also be a

Voluntary Programme of Activities



Presentation Overview

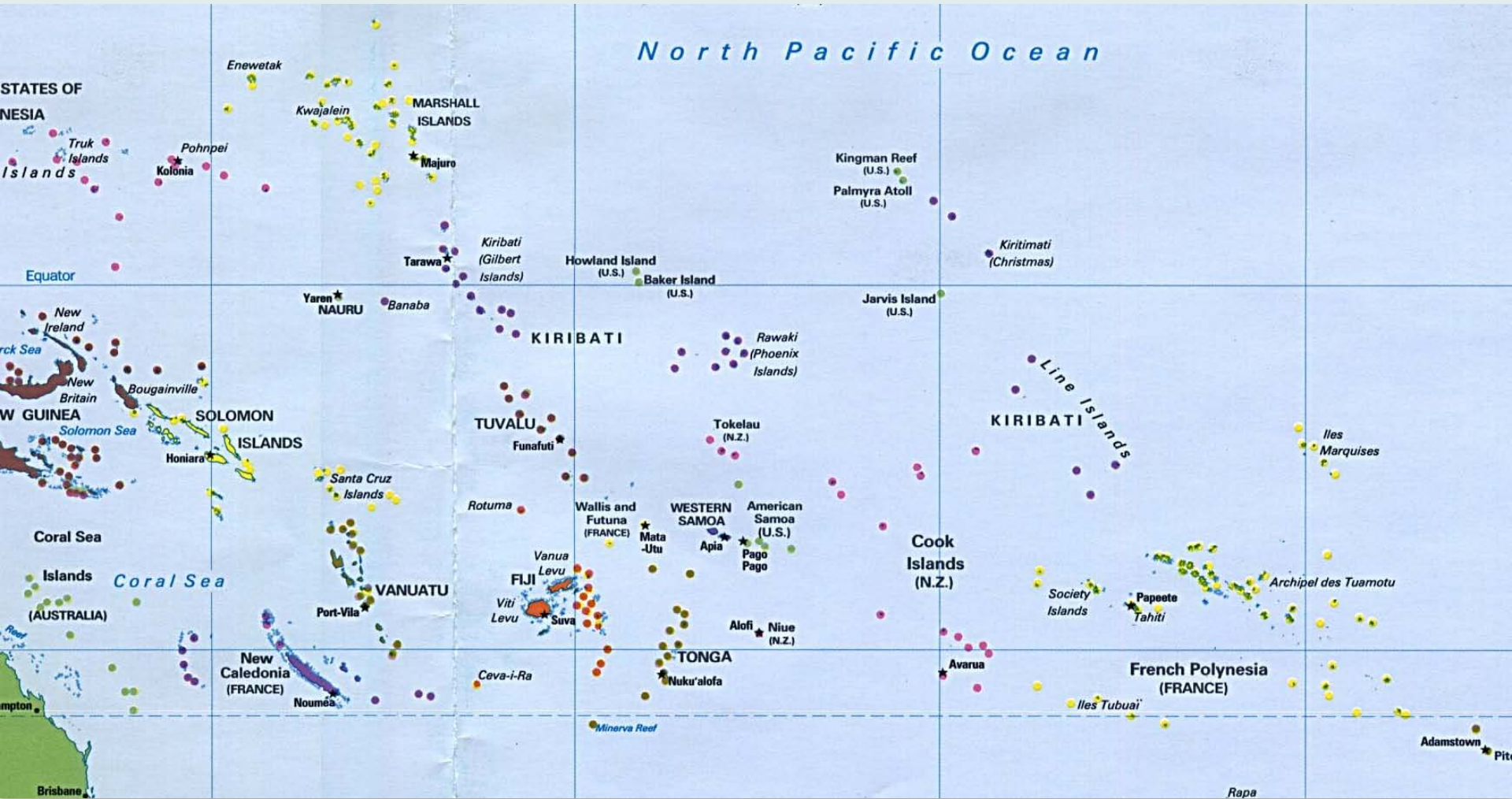
- **Overview of Programme of Activities approach**
 - What is the Programmatic Project Approach?
 - Main advantages
 - Applicability to the PICs
- **Opportunities in the Pacific**
 - Essentials for project development
 - High Potential Areas for PoAs in the PICs
- **Example: LED Street Lighting PoA**



Why Programmatic CDM?

- ACCESS: CDM Programme of Activities makes it easier for project developers to create
 - smaller projects in
 - dispersed locations in
 - smaller carbon markets



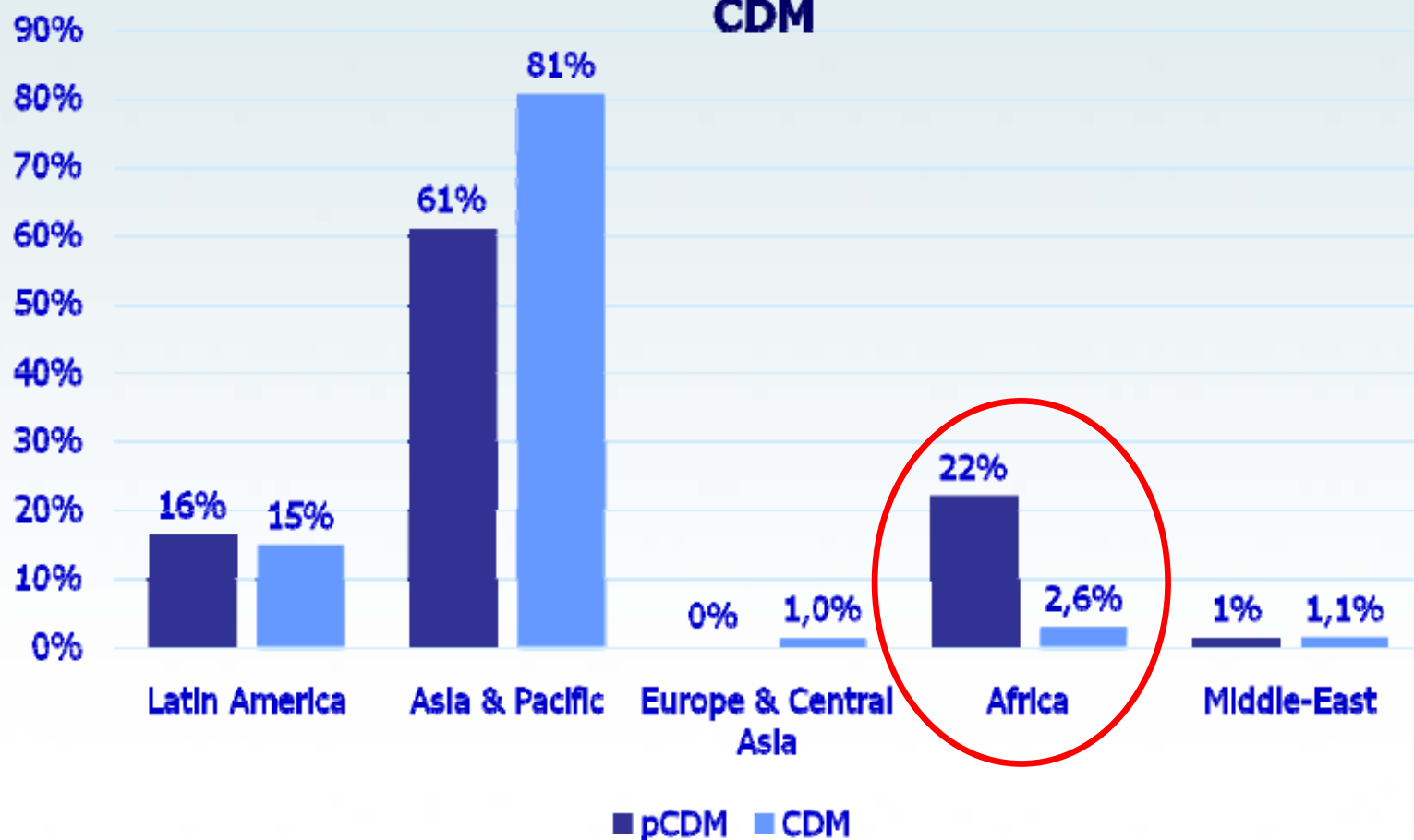


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Status of pCDM in the World

% comparison of regional distribution of pCDM and CDM



Source: CDM pipeline, June 2011



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Programme of Activities (PoA)

- Multiple activities under one “Programme”
- An unlimited number of “Activities” can be conducted under one PoA
 - In CDM an activity is called a CPA
(CDM Project Activity)
- Each “Activity” is treated as a individual CDM project; but “easier” to register once PoA has been validated and registered



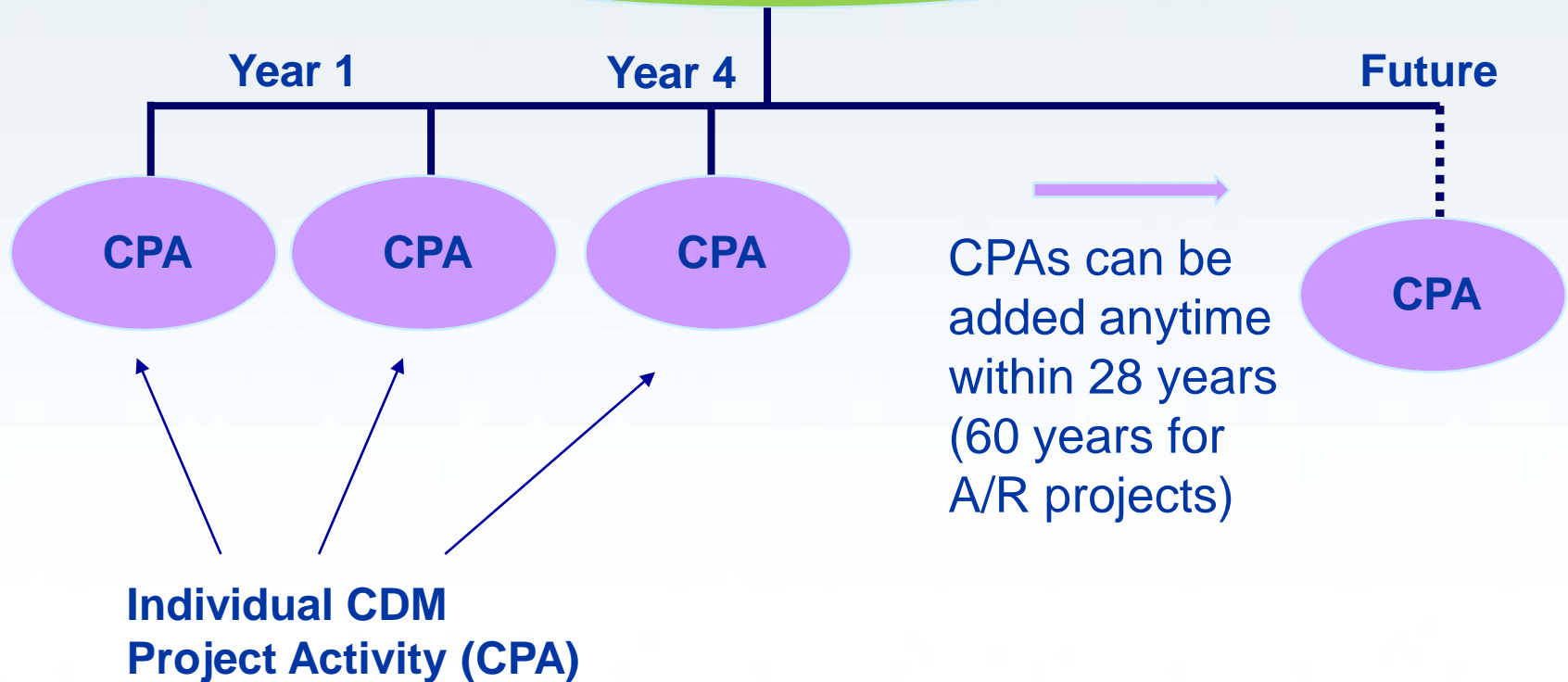
PoA advantages

- A CPA (activity or project) can be included in a registered PoA any time (within 28 years for RE, 60 years for forestry)
- One time registration fee – reduced transaction costs
- Lower risk for multiple projects
- Different project sizes allowed for CPAs
- More than one country can be included in the PoA – opportunity for the smaller PICs



Visualising Programmatic CDM

Registered CDM Programme of Activities (PoA) + 1 CPA



Bundling vs pCDM

Single CDM Project	Bundle of Projects	pCDM Projects
Single location	Many locations	Many locations across countries
Single project owner (e.g. 1 hydro plant)	Many project owners (e.g. 10 hydro plant)	Many project owners
1 project only	A number of activities submitted as 1 project (e.g. 10 hydro plants)	A number of activities submitted over the duration of a programme
A single crediting period (e.g. 7/10 years)	A single crediting period for all activities (e.g. 7/10 years)	Each project has its own crediting period
Project owner is known	All project owners are known	At least one project owner is known, rest included as they join



Still have to follow the CDM Project Cycle!

- PoA – PIN (Project developer)
 - PoA – PDD (Project developer)
 - *+ CPA template CPD-PDD*
 - Validation (DOE)
 - Registration (EB)
 - Verification (DOE)
 - Issuance of CERs (EB)
 - *Addition of CPA = validation of CPA*
-



PoA: an Opportunity for PICs

- Automatic additionality for smaller RE and EE projects – applies to each CPA
 - Type I: RE under 5MW
 - Type II: EE under 20 GWh a year
 - Type III: projects under 20,000 tCO₂/year
- Possible for one PoA to use many methodologies
 - If combination has already been used before
 - If not, permission can be requested
- Can involve many countries as long as each National DNA gives approval



What is going to be the first PoA in the Pacific?

- Probably a National PoA

- PNG Hydro?

- Fiji Energy Efficiency?

- What about a Multi-country PoA?



Opportunities for PoA in the Pacific



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Project Types

- Small / Mini / Micro-hydro
- Solar PV
- EE lights (LEDs or CFLs)
- EE in buildings
- Water and solid waste management and landfill
- Biomass
- Forestry



Renewables



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National PoA: Fiji Micro-scale hydro example



	First CPA - Fiji	- PNG	x 10
Baseline	Grid electricity	Same	Same
Methodology	AMS – I.D.	Same	Same
Technology	Run-of-river hydro	Same	Same
Capacity	500 kW	Same	10 x 500 = 5MW
MWh expected	2,190 MWh	Same	21,900
Emission factor	0.5095 tCO ₂ /MWh	0.75 tCO ₂ /MWh	Same
CERs / year	1,115	1,642	16,420
Est. revenue / yr	16,725 USD	24,630	246,300
As % of capex over 10 years	9%	14%	Same



National PoA - Fiji: Money matters

- Single 500kW hydro project:
 - CDM Transaction costs: 100,000 USD
 - 10 year CDM revenue @15/USD/CER: 167,000 USD

- Micro-hydro PoA with 10 CPAs:
 - CDM Transactions costs ~ 150,000 USD
 - 10 year CDM revenue: 2.4million USD



Solar PV for rural electrification

- Possible targets for CPAs:
 - Household systems
 - Institutional systems: schools, dispensaries, etc
- Private sector / public funding / micro-finance / end-user finance
- Replacing kerosene lamps - 2.8kgCO₂/l
- Replacing diesel for village electricity
- E.g. Fiji DoE solar rural electrification programme



Example: Solar Home Systems in the Solomon Islands

- Run by a private operator working with women in communities
- High social impact & community-based
- SHS from 10 Wp
- Replacing kerosene & diesel
- Could use Methodology: AMS-I.A
- Needs financing to expand the programme



PoA example: Regional solar off-grid PV

	Single Project = 64 households	Multiple projects in one country = 5,000 HH	Multiple projects in multiple countries = 25,000 HH
Baseline	Kerosene displacement	Same	Same
Methodology	AMS – I.A.	Same	Same
Technology	Solar Home System	Same	Same
Capacity	10.24kW	800kW	4MW
Fuel replaced	3072 gallons kerosene/year	240,000 gallons	1.2 million gallons
Emission factor	2.8 kgCO ₂ /l	Same	Same
CERs / year	32	2,540	12,700
Est. revenue / yr	640 USD	50,800 USD	254,000 USD
As % of capex over 10 years	6%	Same	Same

Other RE

- Grid-connected PV
- Biomass gasification
- Wind energy



Summary of RE resource potential

Country	Solar	Wind ^a	Biomass	Hydro	Geothermal	OTEC	Wave ^a
Cook Is	✓ ✓ ✓	✓ ✓	✓ ✓			✓ ✓	✓
FSM	✓ ✓	✓	✓ ✓	✓ ✓	✓ ✓	??	??
Fiji	✓ ✓	✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓	✓ ✓
Kiribati	✓ ✓ ✓	unlikely	✓			✓ ✓	??
Marshall Is.	✓ ✓ ✓	✓	✓			✓ ✓	??
Nauru	✓ ✓ ✓	unlikely	✓			✓ ✓	??
Niue	✓ ✓ ✓	✓ ✓	✓			??	??
Palau	✓ ✓ ✓	✓	✓ ✓			??	??
PNG	✓ ✓	✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓	??	??
Samoa	✓ ✓	✓ ✓	✓ ✓	✓ ✓	✓ ✓	??	??
Solomon Is.	✓ ✓	✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓	??	??
Tonga	✓ ✓ ✓	✓ ✓	✓			??	✓ ✓
Tuvalu	✓ ✓	unlikely	✓ ✓			??	??
Vanuatu	✓ ✓	✓ ✓	✓ ✓ ✓	✓ ✓ ✓	✓ ✓ ✓	??	??

Source: Adapted from Johnston, 1995



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Energy Efficiency



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What about CDM for the urban environment: CFLs

- Example: CFLs for residential applications
- Small-scale: must not exceed 60 GWh/yr
- Emissions reductions = Old bulb Wh – CFL Wh (- transmission losses, failure rate, etc.)
- Total lumen output of CFLs = lumen of the bulbs they are replacing
- Data on existing bulbs and replacement CFLs is needed e.g. Average life / annual failure rate
- Replaced bulbs - collected and destroyed
- Crediting period = life of CFLs max. 10 years



CFLs for households: numbers

	Single small-scale project e.g. Suva, Fiji	National PoA e.g. Suva, Lami, Sigatoka, Nadi, etc	Regional PoA: e.g. Port Moresby, Suva, Port Villa, Honiara, Apia, etc
Baseline	Incandescent bulbs	Same	Same
Methodology	AMS – II.J	Same	Same
Technology	CFL	Same	Same
Incandescent	60Wx3.5 = 210Wh/day	Same	Same
CFL	10Wx3.5 = 35 Wh/day	Same	Same
Emission reductions	~ 63 kWh /CFL/yr	Same	Same
No. of project CFLs	30,000	120,000	240,000
Emission factor	0.5095 tCO ₂ /MWh	Same	Depends (0.65)
CERs / year	960	3,800	9,800
Est. revenue / yr	14,000 USD	57,000 USD	147,000 USD

Combine EE measures in buildings

- **Methodology: AMS-II.E.**
- A single building, shop or residence, or group of similar buildings, such as a school, district or university.
- Efficient appliances, better insulation e.g. Air-con units, efficient refrigerators, efficient fans, etc.
- Replace existing equipment / installed in new facilities.
- Energy savings each project < 60 GWh per year.
- Must be possible to directly measure and record the energy use within the project boundary (e.g. electricity and/or fossil fuel consumption).
- Uses grid emission factor to calculate CERs
- Data needed for baseline / Monitoring + replaced equipment should be scrapped



EE and RE in Tourism

■ *Energy Efficiency in Hotels*

- Building / window adaptation to reduce solar heat gain
- Card activated room power controls
- Air conditioning upgrades
- Improving efficiency of lighting
- Installation of ceiling fans

■ *Renewable Energy*

- Solar hot water
- Rooftop solar PV systems



More ideas in Tourism

- Dive shops / tour operators EE:
 - Air conditioning
 - Lighting
 - Water heating
 - Compressors
 - Transport (boat motors) – two-stroke to four-stroke
 - Gasoline to diesel
- RE: Solar Water Heating for showers



Other EE

- LEDs for Government buildings
- EE in industry and commerce:
 - Fisheries – refrigeration / lighting
 - Food and beverage – boilers / lighting
 - Pumps
 - Air conditioning



High Potential Areas for CDM PoA??



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7 Important features of a CDM Programme of Activities



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1. Emissions reduction potential:

Some PoAs will have a greater fundamental potential for CER production than others. The selection of which PoA to pursue should take into account the maximum number of CERs that the proposed activity could produce.

- E.g. Hydro can produce more CERs than Solar



2.Coordinating Entity: A strong Coordinating Entity with both technical and financial capacity to coordinate the project is essential to the development of a PoA. The CE must also have a good relationship with project implementers so that the coordination and addition of new CPAs to the PoA can be managed, as well communicate with the EB and receive and distribute the benefits (CER revenue) of the PoA.



Responsibilities of the Managing Entity

- PoA-PDD and CPA-PDD
- LoA from host(s) and Annex I countries
- Communication with UNFCCC EB
- Coordinating CPAs joining the PoA (CPA implementers do not necessarily have to be project participants)
- Manage validation and verification
- Manage issuance and distribution of CERs
- **Who can be an ME? Any public or private entity**



3. Existing studies and data: The existence of previous studies identifying energy production or consumption, historical data or the emission reduction potential of possible projects can be a basis to identify a good PoA. This is a significant step in recognizing PoAs with relevant emission reduction potential. Furthermore, it can also help to facilitate and accelerate the initial stages of a PoA by identifying relevant stakeholders.



4. Methodology: An approved methodology can save a lot of time and avoid risk. If the project uses a technology or process that has not yet been approved by the UNFCCC EB then the PoA development will have added risk. A PoA opportunity will be more straight forward to implement if using an existing methodology, preferably one already used by other CDM projects which have been registered and have CERs issued.



5. Proven technology / technical capacity / familiarity with technology: Has this technology already been implemented successfully in the Pacific? Is there enough existing technical capacity / familiarity with the technology in the target country(ies) to undertake the proposed PoA? This is in terms of the applicable technology, not in terms of CDM PoA capacity.

- E.g. Has landfill methane technology been used before?



6. Institutional and regulatory

environment: It is important to know whether there are any existing institutional or regulatory barriers which could impede or support the development of a PoA.

- E.g. Is there a DNA / Has the DNA stopped functioning?
- E.g. Is there a regulation allowing IPPs to connect to the grid?



7.Replicability: Is the project replicable so that many projects can be added to the PoA over time? And can the project be replicated in some or all of the PICs?

- In the case of (most) PICs it is important that there is potential for many more activities to be added into the PoA over time, as each activity by itself may not produce a big number of CERs but if it has a high replicability then the potential CERs that can be accessed increases greatly.

■ E.g. Energy efficiency



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Criteria	Solar Off-grid	Hydro off-grid	Landfill methane	Energy efficiency in buildings
Emission Reduction (2)				
Coordinating Entity (2)				
Methodology (1)				
Technology / Tech Capacity (2)				
Inst. & Regulatory (1)				
Replicability (1)				
Existing data (1)				
SCORE out of 10				

So what does a PoA look like?

There are many different possible set-ups...



National Grid-connected RE PoA

Credit Buyer

CERs
CER revenue

Coordinating Entity = E.g. Government utility

Loan
Repayments

Finance Institutions

Monitoring

CPAs = RE IPPs
CPA n

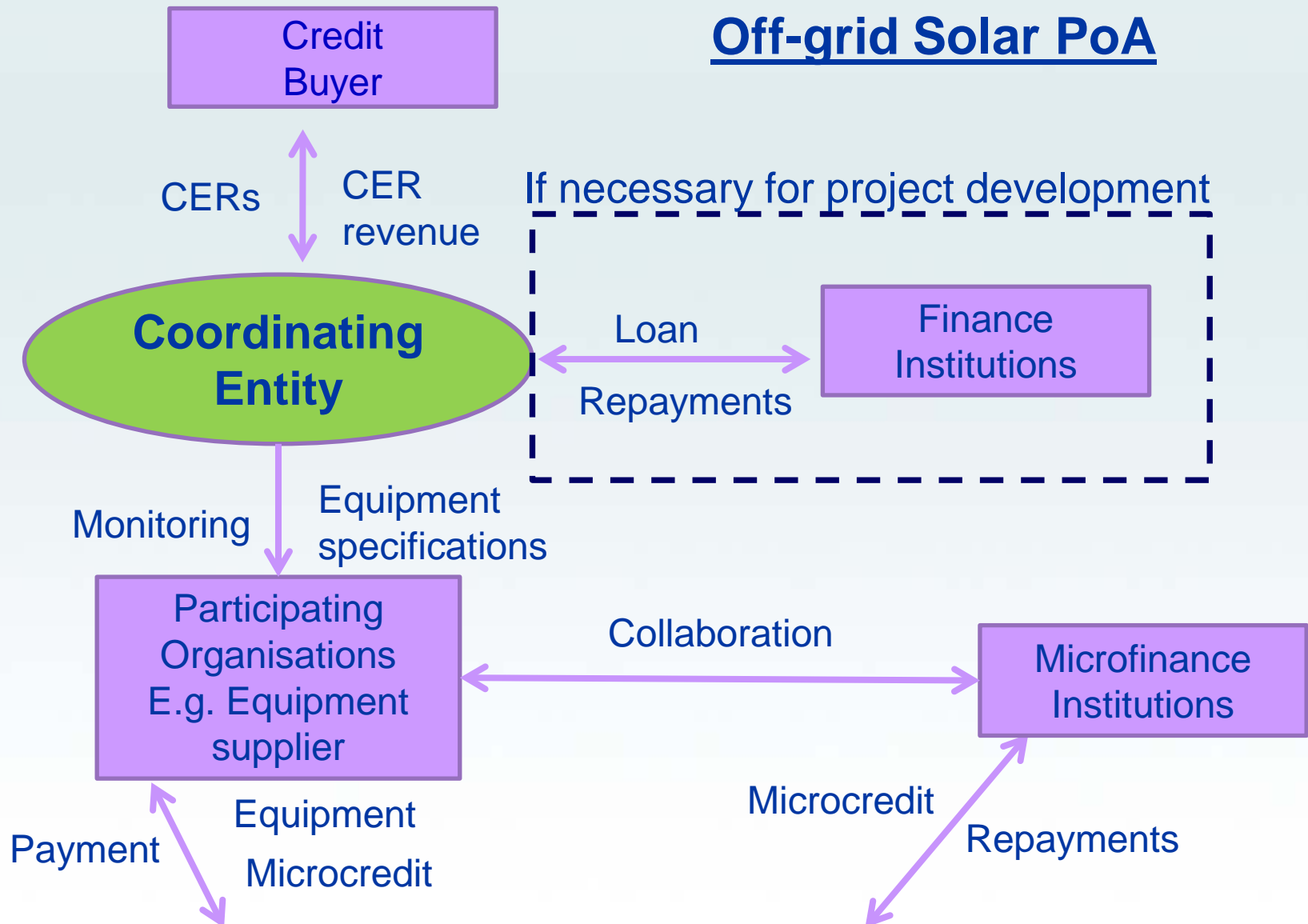
CPAs = individual RE power projects of the utility (solar, wind, hydro, etc.)

CPA 1 - Hydro

CPA 2 - Solar

CPA n

Off-grid Solar PoA



CPAs = individual households, schools, etc or groups of households

CPA 1

CPA 2

CPA n

How can DNAs / CROP agencies / the present CDM capacity building project help?

1. Assist countries to compile historical energy consumption data (e.g. diesel / kerosene) to be available to project developers so they are able to establish a baseline
2. Establish the Grid Emission Factor (E.F.) for each country
3. Provide technical assistance to projects developers or assist them to find / fund the Technical Assistance they need



Support needed for PoA development

- Support for:
 - Bringing potential actors together (facilitator)
 - Setting up the organisational framework
 - Gathering the necessary data
 - Performing feasibility studies
 - Finding the necessary financial support
 - The actual implementation (e.g. monitoring)
- Publishing PINs will not suffice to realize the PoAs



Example of a Multi-country PoA for the Pacific

LED STREET LIGHTING



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Why LED Street Lighting?

- Street lighting – a public service valued by citizens
- LEDs – a mature technology with proven implementation in the Pacific (RMI and Tonga)
- Reduce electricity bills for utilities and city councils
- Reduce diesel imports / improve balance of payments for countries



Advantages as PIC PoA

- Micro-scale CPAs that do not need to prove additionality
- Applicable to all PICs regardless of size
- Can be a CDM for PICs with DNA and Gold Standard micro project for those without
- Everyone involved wins:
 - CE / city and town councils / utilities / government / each citizen



Estimation of CERs from the RMI LED Street Lighting project

Emissions calculation	Old lamps	New LED lamps
Number of bulbs	800	500 + 189 = 689
Power	175 W x 800 = 140,000 W	500x50W+189x30W= 30,670 W
Hours usage	10 hours per day	10 hours per day
Energy usage	511 MWh per year	112 MWh per year
Emission factor	0.8 tCO ₂ / MWh	
CERs generated	$(511 - 112) \times 0.8 = 319$ tCO ₂ per year = 319 CERs	

If we can replace 5000 LED per CPA that equates to approx. 2500 CERs per year



Technical viability

- Two recent small-scale LED projects in the PICs – RMI and Tonga
- RMI - 50W and 30W LEDs successfully replaced 689 175W street lights
 - High efficiency –higher lighting levels for less electrical energy.
 - High power factor near unity – less distribution losses.
 - Longer lasting/high quality materials and construction



Technical Specs

- Light color - 2,700k (warm white)
- Improved light deployment on road surface - effective light angle of 150°
- Light output greater than 7,500 lumens
- Luminous efficacy >80 lumen/Watt
- Power factor greater than 0.95 and a power supply efficiency greater than 90%
- Minimum life of 50,000 hours
- Weather resistance to IP 65, hence reducing internal fitting corrosion



Results

- RMI – LED street lights functioning well as of December 2010
- Tonga - old and new lights were tested and the findings were that the LED light reduced power consumption by 35.3% and running costs by 41.4%



Lessons learnt from pilots

- The exact wattage of the lamps removed and replaced must be accurately recorded
- The kWh meters used must be calibrated
- Energy consumption needs to be recorded prior to the fittings being changed
- Supplies must be checked to ensure compliance with technical specifications



CDM aspects

- Baseline – diesel generation for most PICs
- Emission factor will be needed for Fiji, Samoa and (maybe) Vanuatu
- AMS-II.C, which has been successfully used for two registered CDM projects or
- June 2011 a new methodology for street lighting projects, AMS-II.L



First estimate of CPAs

- Boundary for a CPA = town or city

Country	Urban Centre
Fiji	Suva
	Nasinu
	Nausori
	Lami
	Sigatoka
	Nadi
	Lautoka
	Ba
Samoa	Apia
Solomon Islands	Honiara
Tonga	Nuku'alofa
Vanuatu	Port Vila



Cost components of the project

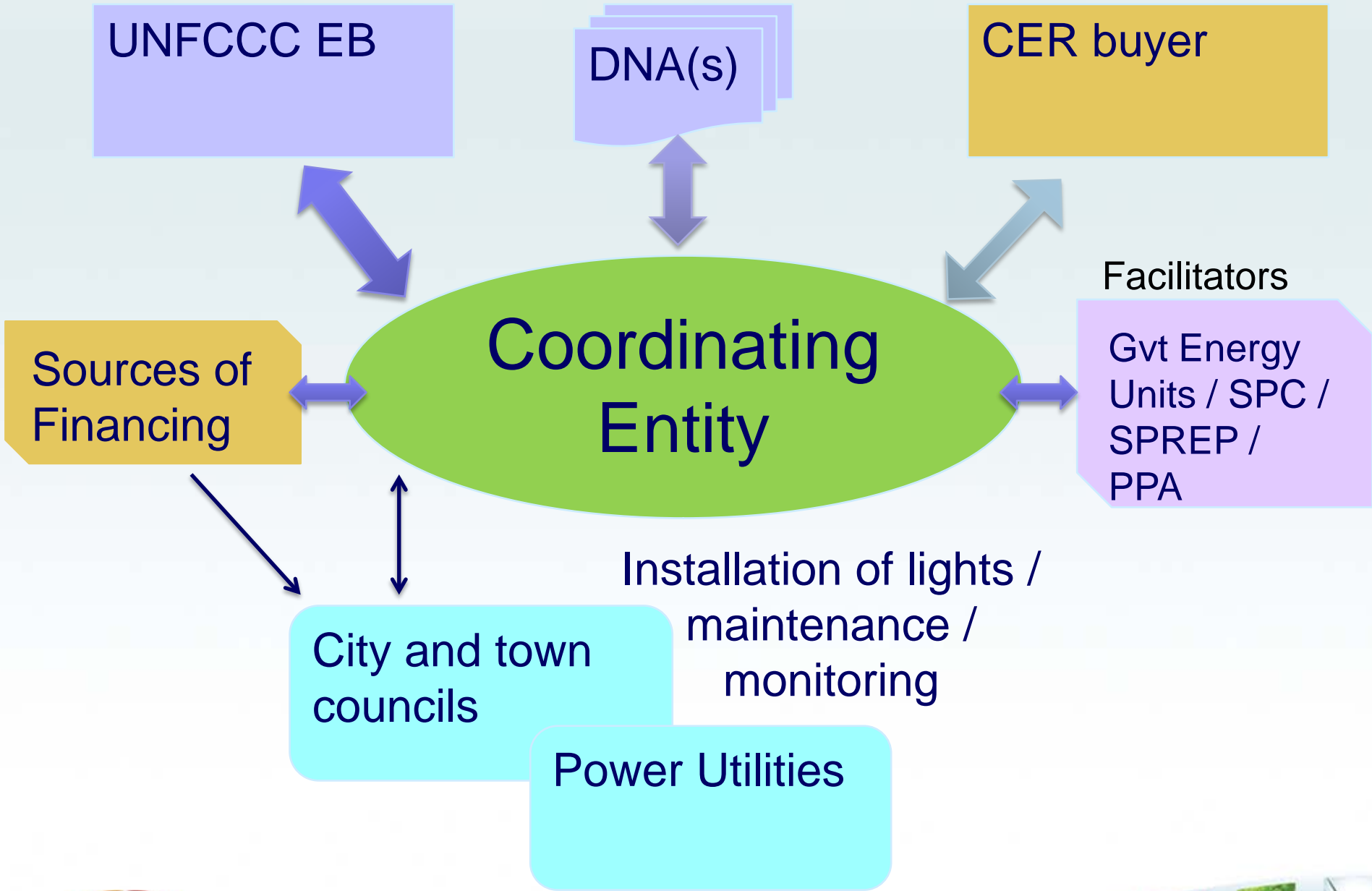
- Normal LED retrofitting costs:
 - LED lights and fittings & installation materials
 - Installation labour costs
 - Installation transport and fuels costs
- Costs of the CDM PoA
 - Set-up and establishment of PoA
 - Preparation of PIN, CPA-DD and PoA-PDD
 - Validation by DOE
 - Registration - at reduced cost (free?)
 - Monitoring and reporting costs



Proposed Coordinating Entity: IUCN

- A regional NGO
- With experience in the energy sector and regional programme management
- Who have implemented an LED Street Lighting scheme
- With appropriate human and financial resources
- And a worldwide network to call upon for assistance





Coordinating funding

- PDD = UNEP Risoe Centre
- Validation = UNFCCC Fund? Gold Standard Validation Fund?
- Registration = reduced or free
- Equipment
 - ADB PEEP Phase II?
 - Co-financed by utilities/city councils/Govt?
- Installation – utilities?
- Monitoring – Utilities



How does our project score?

- Emission reduction? Medium to Low
- Replicability / potential CPAs 
- Existing data
- Coordinating Entity 
- Methodology 
- Technology / tech capacity 
- Institutional & Regulatory 



Just at the start of development

- Ideas and feedback welcome
- Need to decide what will happen to revenue from CERs
- Standard LED equipment to be purchased should be agreed
- Collect data for PDD
- Contract and agreements, etc...
- But we have made a start!



Useful methodologies to look up

- Off-grid RE for end-users: AMS-I.A.
- Grid-connect RE: AMS-I.D.
- Landfill: AMS-III.G.
- Transport – plant oil biofuel: AMS-III.T.
- EE lighting (CFLs): AMS-II.J.
- EE in buildings: AMS-II.E.
- Mangroves: AR-AM0014
- **SEE METHODOLOGY BOOKLET from UNFCCC**



Additional information available

- A Primer on CDM Programme of Activities, URC, CD4CDM project, November 2009, www.cd4cdm.org
- CDM Procedures:
<http://cdm.unfccc.int/Reference/Procedures/index.html>
- Forms related to PoA:
http://cdm.unfccc.int/Reference/PDDs_Forms/PoA/index.html
- Booklet on Methodologies:
<http://cdm.unfccc.int/methodologies/documentation/index.html>

