Carbon Finance Opportunities for CAREC (Case Study of cross border CDM trade between India and Bhutan)

Presentation by Rey Guarin
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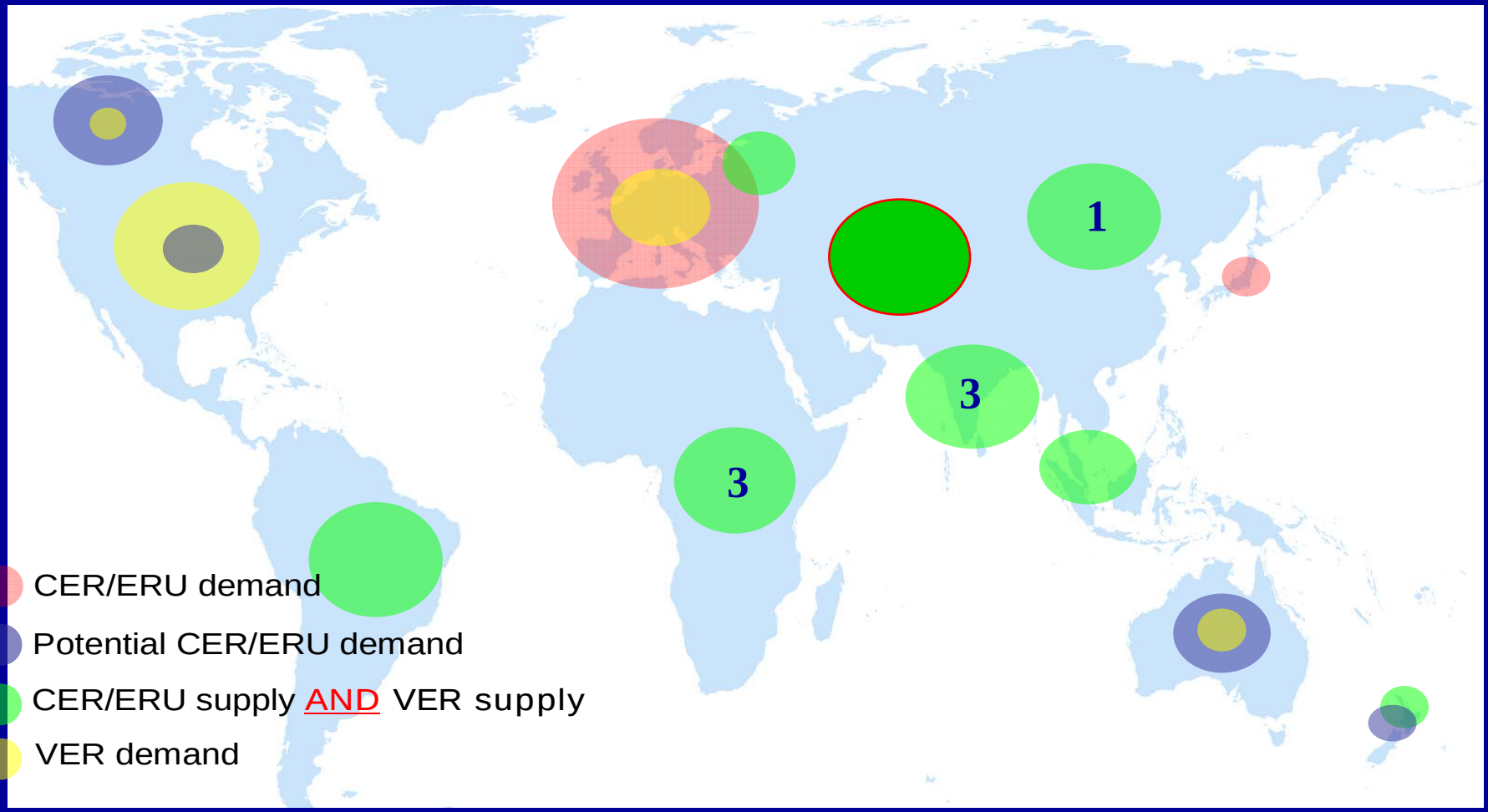
for the
CAREC Energy Sector
Coordinating Committee Meeting

Baku, Azerbaijan
May 24, 2011

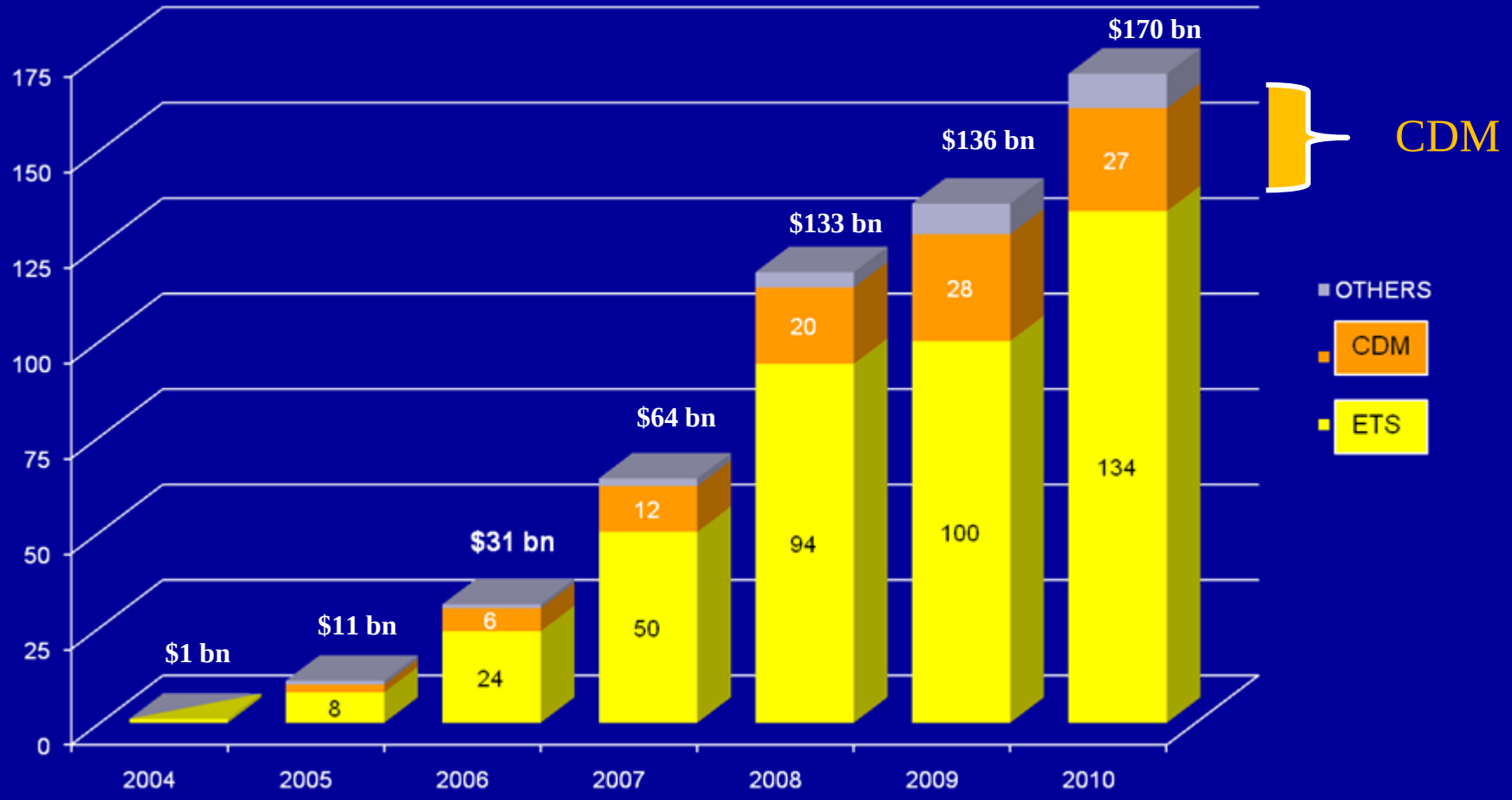
State of the Carbon Markets

Special Focus on
Central and West Asia
(As of May 2011)

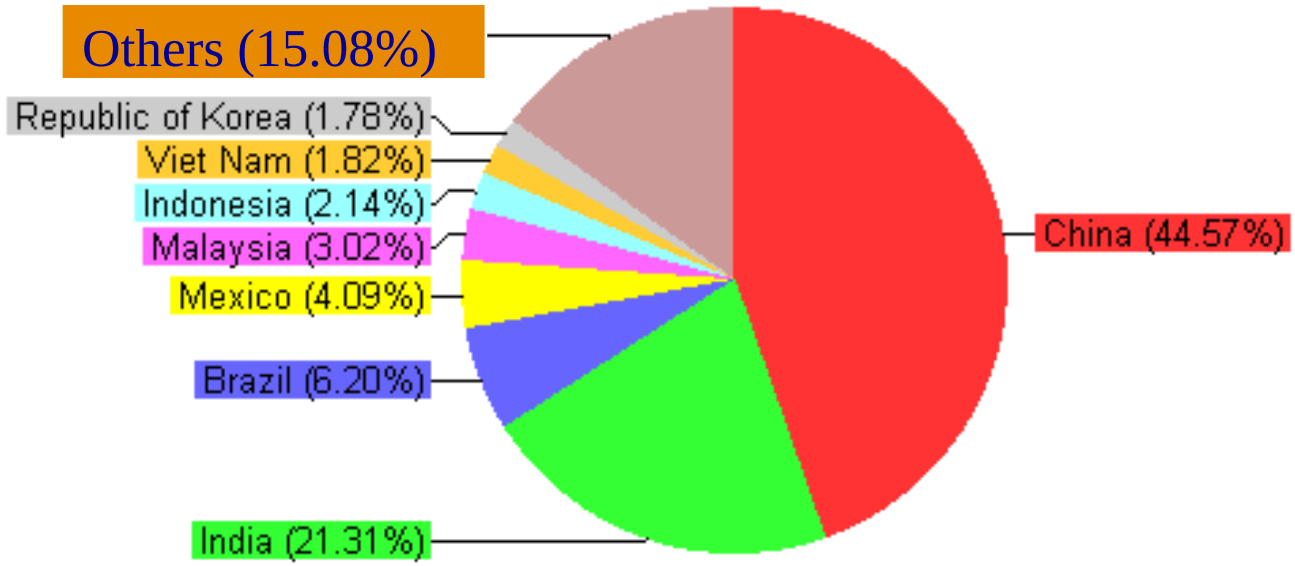
Global Carbon Markets
Demand & Supply



Global Carbon Markets (2004 – 2010)

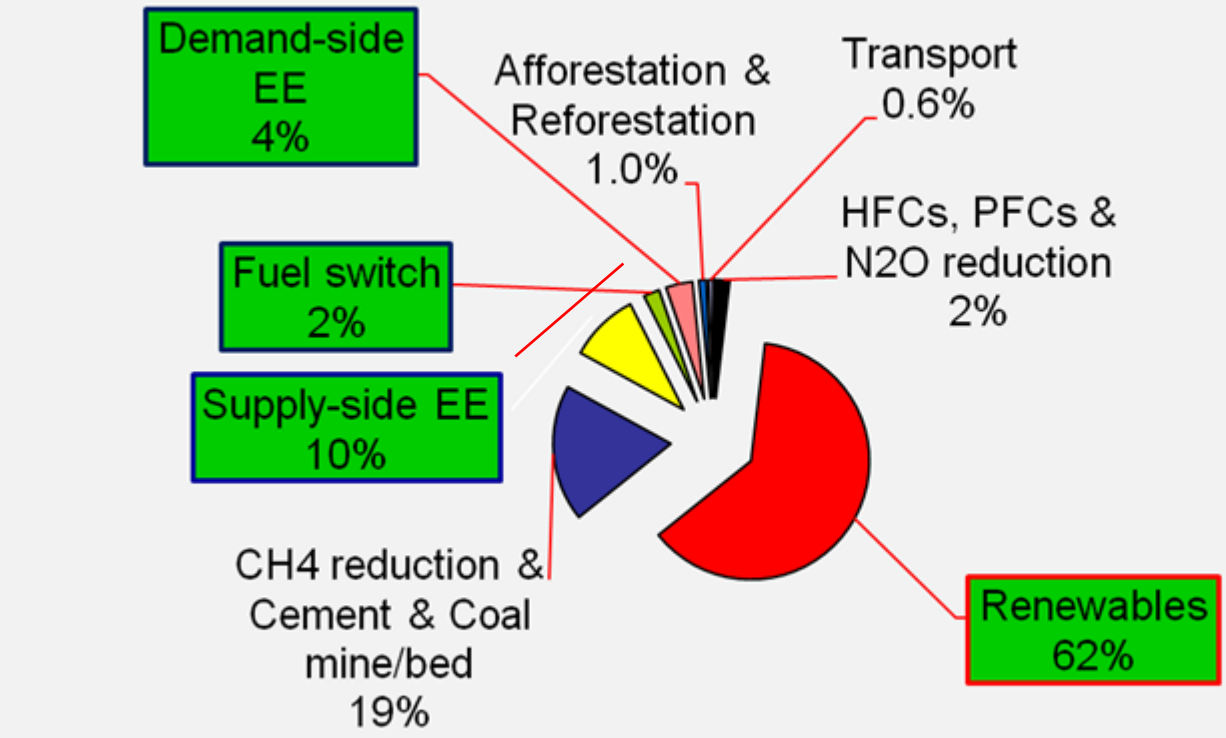


Registered project activities by host party. Total: 3,083

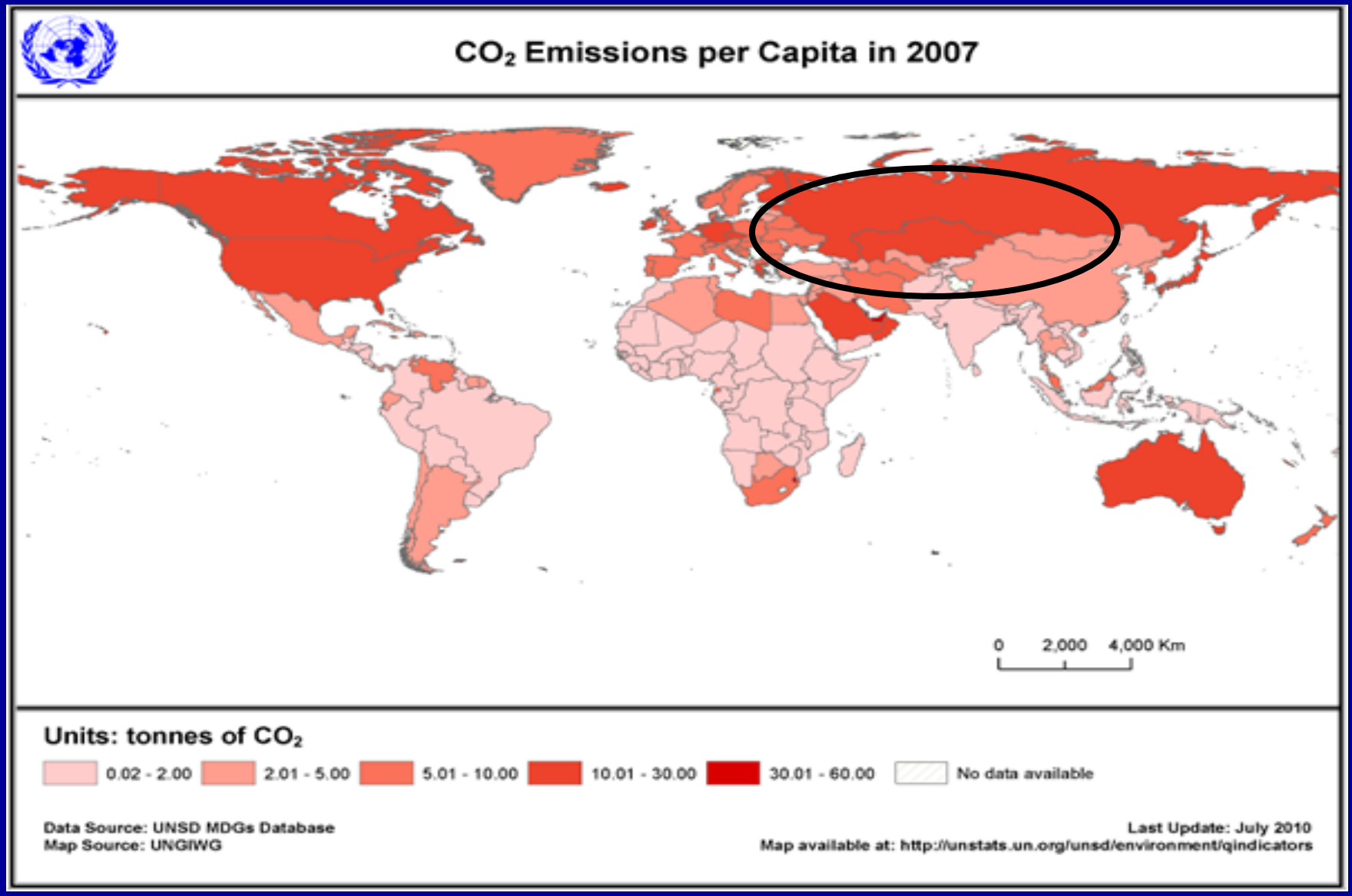


http://cdm.unfccc.int (c) 11.05.2011 14:54

Number (%) of CDM projects in each category



EE – Energy Efficiency

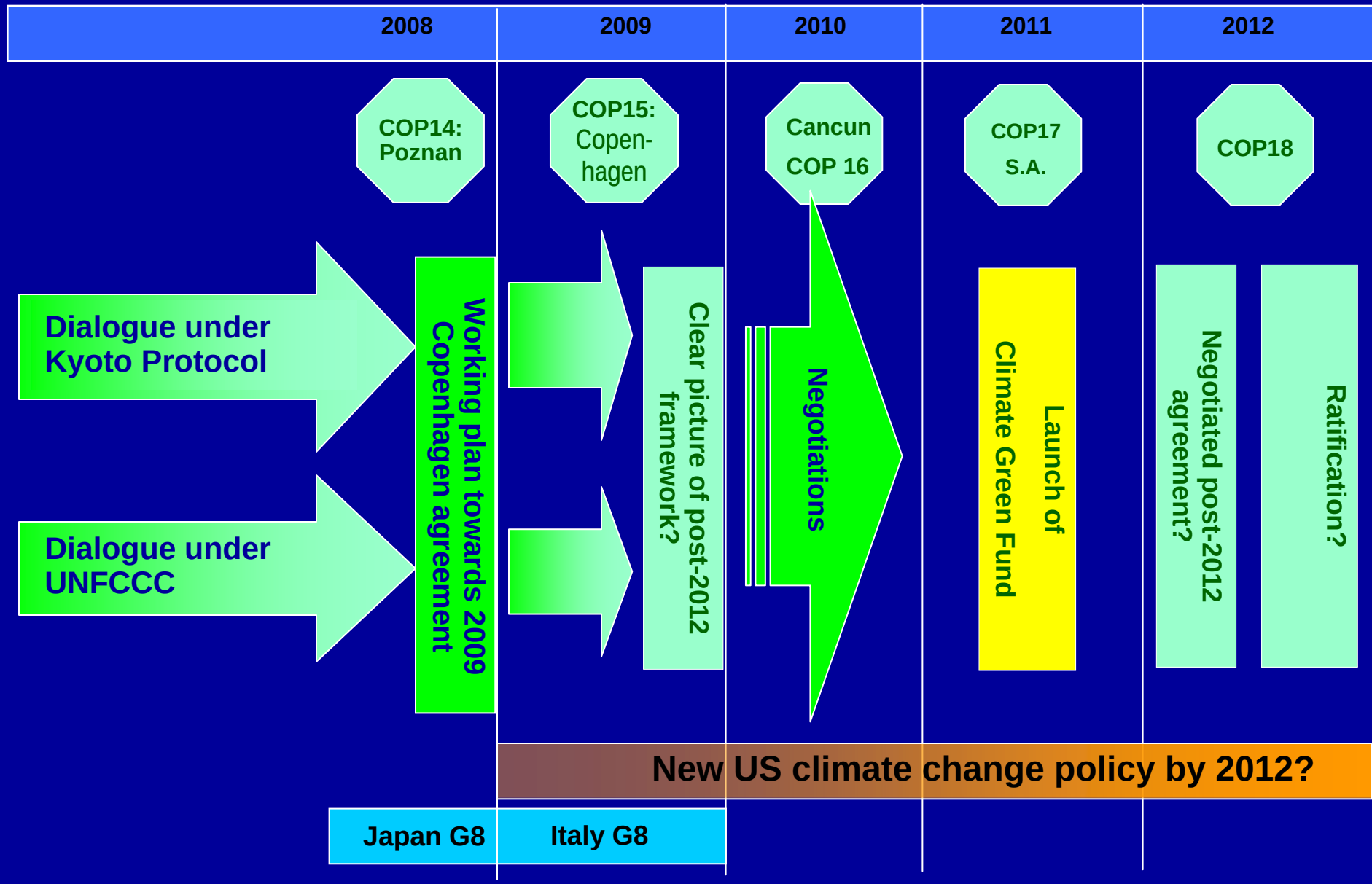

CO_2 Emissions per Capita in 2007
0 2,000 4,000 Km
Units: tonnes of CO_2
0.02 - 2.00
2.01 - 5.00
5.01 - 10.00
10.01 - 30.00
30.01 - 60.00
No data available
Data Source: UNSD MDGs Database
Map Source: UNGIWG
Last Update: July 2010
Map available at: http://unstats.un.org/unsd/environment/qindicators

Emissions data as of July 2010 UN stats

Countries	Co2 emissions (in mm tons)	C02 emissions/ capita	Co2 emissions/ km area	Change since 1990 baseline (tons)
Azerbaijan	31.77	3.68	366.92	-29.03*
Afghanistan	0.71	0,03	1,1	-73.3
China	6538.7	4.92	681.3	165.7
Mongolia	10.58	4.05	6.77	5.4
Kazakhstan	227.39	14,76	83.45	-94.61*
Kyrgyzstan	6.08	1.14	30.41	???
Pakistan	156.39	0.90	196.45	128.1
Tajikistan	7.23	1.07	50.51	-17.77*
Turkmenistan	45.81	9.2	93.85	???
Uzbekistan	116.06	4.32	259.48	???

* National Communications

Global Negotiation Timeline



Post 2012 Global Carbon Market

Bullish Factors for the CDM Market

- Ongoing post 2012 purchases in the market by investors
- Low CER supply delivery forecasts
- Establishment of Green Climate Fund ($20B/year finance)
- Establishment of Regional and Domestic carbon trading scheme: import of CERs?
- Potential 30% Reduction targets from EU (up from 20% commitment)

Bearish Factors for the CDM Market

- Over-supply of EUA /CERs due to banking provisions and carried over to 3rd phase
- Eco recession; slow economic growth from EU

  (C02 Emissions falling by 10% to 20% from BaU projections)
- No Climate Commitment from US due to upcoming US Elections in 2012

Carbon Finance Case Study

(Part 2)

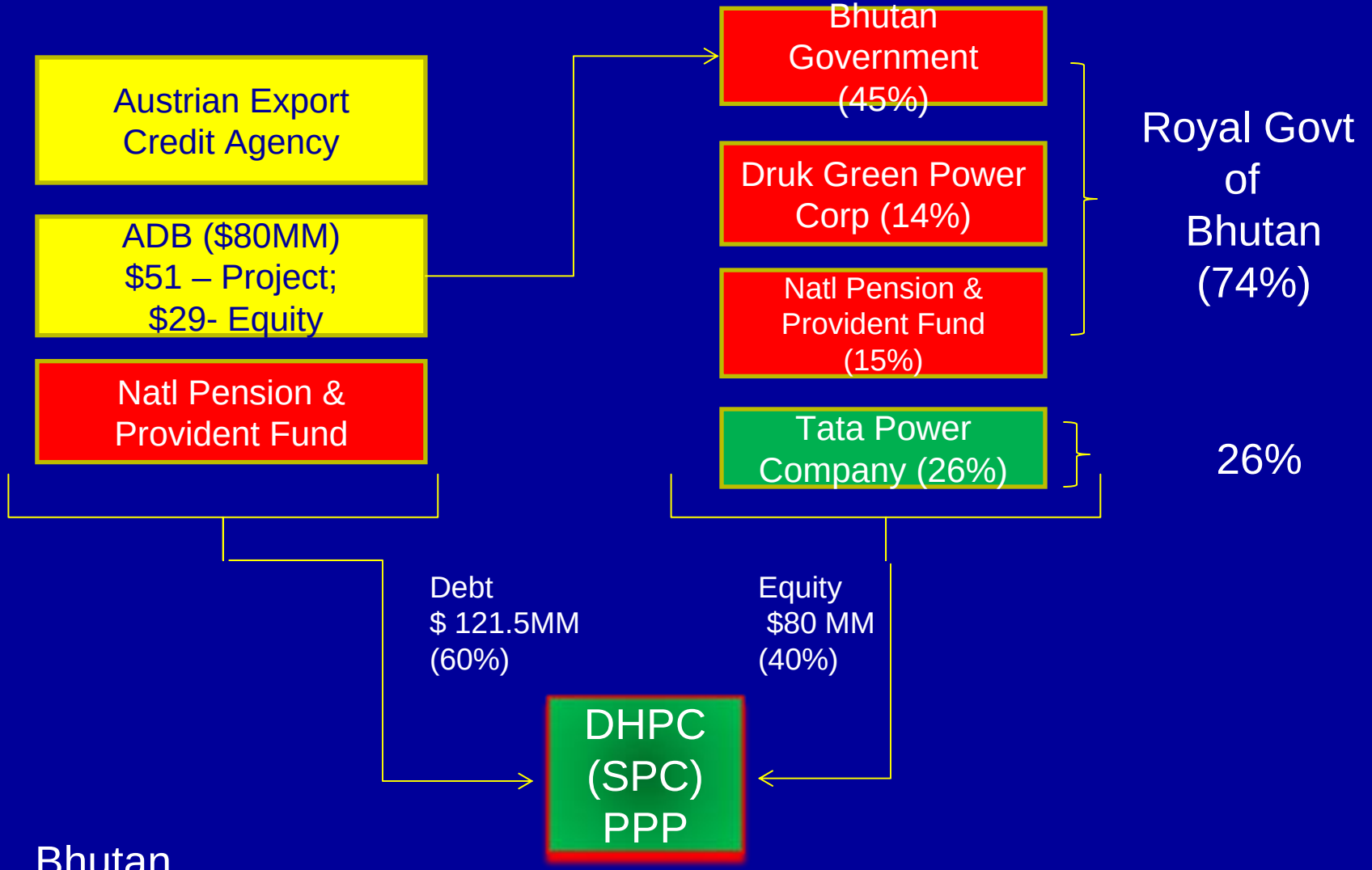
Dagacchu hydro Power Project: Technical Features

- Installed Capacity: 57 MW x 2 (114 MW
- Mean Annual Energy Production: 500GWh
- Net Dependable Energy: 90% at 360Gwh
- Type of Development: Run-of-the-river
- Type of Turbine Pelton
- Catchment Area: 676 square km
- Design Flow (Maximum): 50 cubic meters / sec
- Gross Head: 304 m
- Project completion date: March 2013 (estimate)
- Transmission Line for Power Evac: 220Kv
- Power Density: 3257 W/sqm
- Economic Life: 30 years
- EIRR 13.8%
- FIRR 10.16%
- Electricity to the regional grid consisting of Bhutan and the Eastern region of India.

Dagachhu hydro Power Project: CDM Features

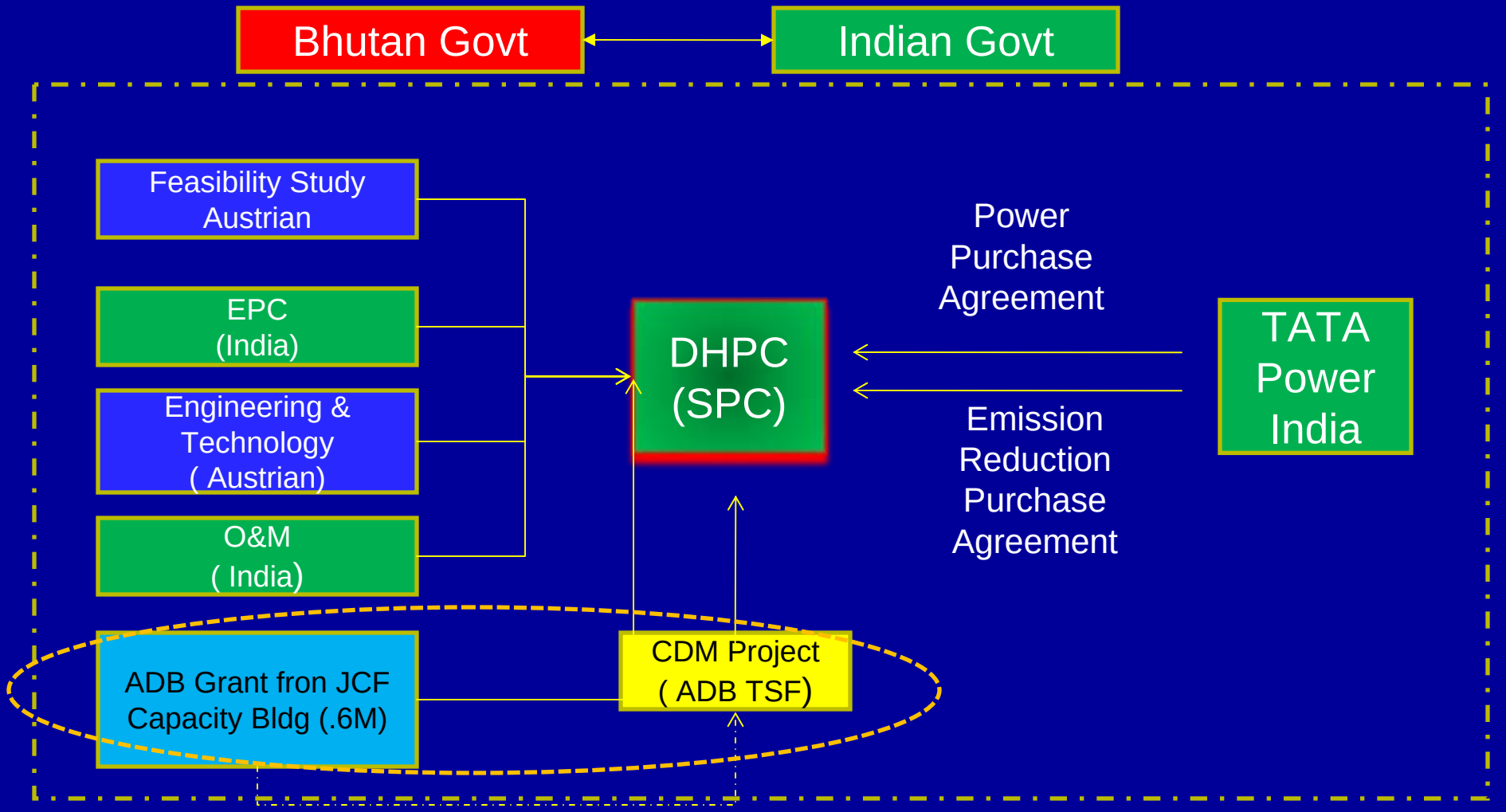
- Host parties: Bhutan and India
- First trans-boundary CDM project
- Registration Date: February 26, 2010
- Methodology: ACM 0002 V
- GHG reducing measure: Grid connected renewable energy based power generation
- Emission Reduction estimate: 498,998 tCO_2 per year
- Crediting system: 7 years (renewable)
- Fossil fuel displaced in India: Diesel Gensets
- CER Price: Euro 10 for first 2 years
  Euro 5 for remaining 28 years
- Emission Reduction Purchaser Agreement (ERPA) Signing 2008

Dagachhu Finance Structure



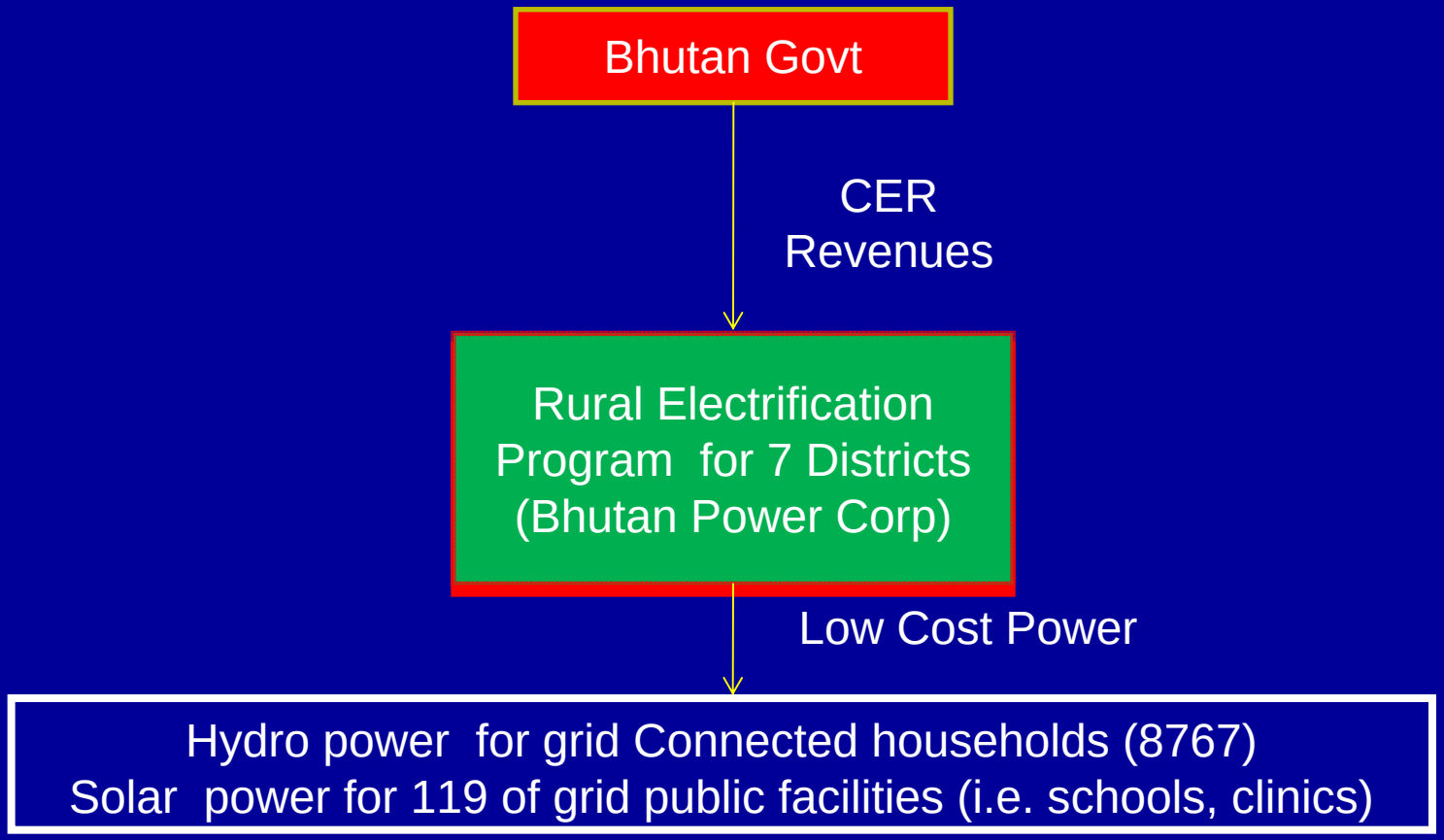
- Bhutan
- Indian
- Financial institutions

Dagachhu Deal Structure



ADB Supported the CDM Project Development Aspect

Dagachhu CER Revenue Application



CER revenues subsidize rural electrification program

% contribution of CER revenues on total Revenues		
	1st 10 years	2nd 10 years
Average CER Revenues (MM Nu)	197	160
% contribution to Total Revenues	15%	11%

Project IRR with Electricity Price at Nu 2.35 / Kwh by 2012		
IRR without CDM	8.79%	(Below required WACC*)
IRR with CDM	10.16%	(Above required WACC)
Benchmark WACC	9.40%	

Electricity Price needed to cover WACC 9.44%		
without CDM	2.50 Nu/Kwh	(6.38% more than baseprice*)
with CDM	2.16 Nu/Kwh	(8.08% less than baseprice)
Baseprice	2.35 Nu/Kwh	

With CDM revenues, investment viability is enhanced

CDM impact based on Sensitivity Analysis: Electricity Prices need to meet WACC of 9.44%

Project Component	Without CDM	% Change from 2.35 Baseprice	With CDM	% Change from 2.35 baseprice
Investment Cost (+5%)	2.37	0.85	2.02	-14
Investment Cost (-5%)	2.64	12.34	2.29	-3
O&M costs (+5%)	2.48	5.53	2.14	-9
O&M Costs (-5%)	2.52	7.23	2.18	-7
Generation Costs (+5%)	2.39	1.7	2.05	-13
Generation Costs (-5%)	2.63	11.91	2.28	-3

With CDM revenues, Tarrif rate risks are mitigated

CDM Impact on project given required electricity price at Nu2.35 Kwh and WACC of 9.44%

Project Component	Electricity Price (Nu/Kwh)	% Change from 2.35Nu/Kwh
Without CDM	2.5	6%
With CDM	2.16	(8%)

Impact on project if NPV=0 and WACC = Benchmark

Project Component	Without CDM	In Nu (MM)
Investment Cost	(5.7%)	465.12
O&M Costs	(37.8%)	53.6
Generation	7.1%	35.5 GWh

CDM Revenues are material

Summary of Key Factors

- ✓ Grid infrastructure between India and Bhutan
- ✓ Government Bilateral Agreements
- ✓ Public Private Partnership Model
- ✓ Evidence Based Data for bankable Feasibility Study
- ✓ Project Finance Structure
- ✓ Stakeholder support and participation

- ✓ CDM Project Component
  - Prior Consideration of CDM
  - Methodology
  - Use of India's Fossil fuel baseline
  - Long Term purchase of CERs by TATA
  - Use of Royalties for Electrification projects in Rural Areas

Other samples on how CER revenues impact Project IRR

Impact on Project Finance – example 1
Replacement of Incandescent Bulbs with CFL

Emissions and carbon financing		
	Annual CERs	CERs for 7 Years
Emission Reduction (tC02e)	213,817	1,496,719
Potential revenue		
$5/ton	$ 1,069,085	$ 7,483,595
$10/ton	$ 2,138,172	$ 14,967,190
$15/ton	$3,207,255	$ 22,450,785
$20/ton	$4,276,340	$ 29,934,380
Indicative project financing plan (with pricing examples)		
	$ 5/ton	$ 10/ton
Total Investment Cost	$48,000,000	$48,000,000
Financing Sources		
- Government budget	$ 7,761,478	$ 2,522,956
- ADB loan	$35,000,000	$35,000,000
- **Future Carbon Fund (FCF)**	**$ 5,238,517**	**$10,477,033**
(e.g. buying 70% of CERs)		
% contribution of carbon finance	**10.9%**	**21.8%**

Impact on Project Finance – example 2
Run of River Hydro Power Plant

Emissions and carbon financing		
	Annual CERs	CERs for 7 Years
Emission Reduction (tC02e)	134,811	943,677
Potential revenue		
$5/ton	$ 674,055	$ 4,718,385
$10/ton	$ 1,348,110	$ 9,436,770
$15/ton	$ 2,022,165	$ 14,155,155
$20/ton	$ 2,696,220	$ 18,873,540
Indicative project financing plan (with pricing examples)		
	$ 5/ton	$ 10/ton
Total Investment Cost	$49,090,000	$49,090,000
Financing Sources		
- Government and others	$ 23,551,211	$ 20,012,422
- ADB loan	$ 22,000,000	$22,000,000
- **Future Carbon Fund (FCF)**	**$ 3,538,789**	**$7,077,578**
(e.g. buying 75% of CERs)		
% contribution of carbon finance	**7.2%**	**14.4%**

Impact on Project Finance – example 3
Wind Power Project

Emissions and carbon financing		
	Annual CERs	CERs for 7 Years
Emission Reduction (tC02e)	63,794	446,558
Potential revenue		
$5/ton	$ 674,055	$ 2,232,790
$10/ton	$ 1,348,110	$ 4,465,580
$15/ton	$ 2,022,165	$ 6,698,370
$20/ton	$ 2,696,220	$ 8,931,160
Indicative project financing plan (with pricing examples)		
	$ 5/ton	$ 10/ton
Total Investment Cost	$ 55,422,222	$55,422,222
Financing Sources		
- Equity	$ 14,952,073	$ 13,277,481
- ADB loan	$ 38,795,556	$ 38,795,556
- **Future Carbon Fund (FCF) (e.g. buying 75% of CERs)**	**$ 1,674,593**	**$ 3,349,185**
% contribution of carbon finance	3%	**6%**

Impact on Project Finance on ADB Financed Projects

Project Type	Project Cost (in USD)	CER potential (2013-2020)	Financing contribution (% to total Project Cost)			
			5$/ton	$10/ton	$15/ton	$20/ton
HPP Run of River	49,090,000	134,811	5.49%	10.98%	16.48%	21.97%
Wind	55,422,222	63,794	2.30%	4.60%	6.91%	9.21%
Geothermal heating	24,000,000	117,422	9.79%	19.57%	29.36%	39.14%
CFL Ligthing Program	48,000,000	213,817	8.91%	17.82%	26.73%	35.64%
IGCC Project	300,000,000	345,791	2.31%	4.61%	6.92%	9.22%
Biomass (rice husk) Power Plant	172,000,000	420,000	4.88%	9.77%	14.65%	19.53%
Nat Gas Pipeline Rehabilitation	80,000,000	656,754	16.42%	32.84%	49.26%	65.68%

DEVELOPING AND PACKAGING A CDM MITIGATION PROJECT (KEY POINTS TO CONSIDER)

(Part 3)

Developing and Packaging CDM Mitigation Project (7 Key Points)

1) Selecting CDM Project
2) Developing Baseline Data
3) Demonstrating Additionality
4) Optimizing CDM Mitigation Project
5) Financing for CDM Project Components
6) Relying on evidence based info
7) Availing of CDM Expertise

Selecting CDM Project

PROJECT FOCUS:

A) PIONEERING (first of its kind)

B) HAS BARRIERS to implementation

C) EXPLICITLY STATES CDM twin goals

D) Has SIZE and SCALABILITY

Developing Baseline Data

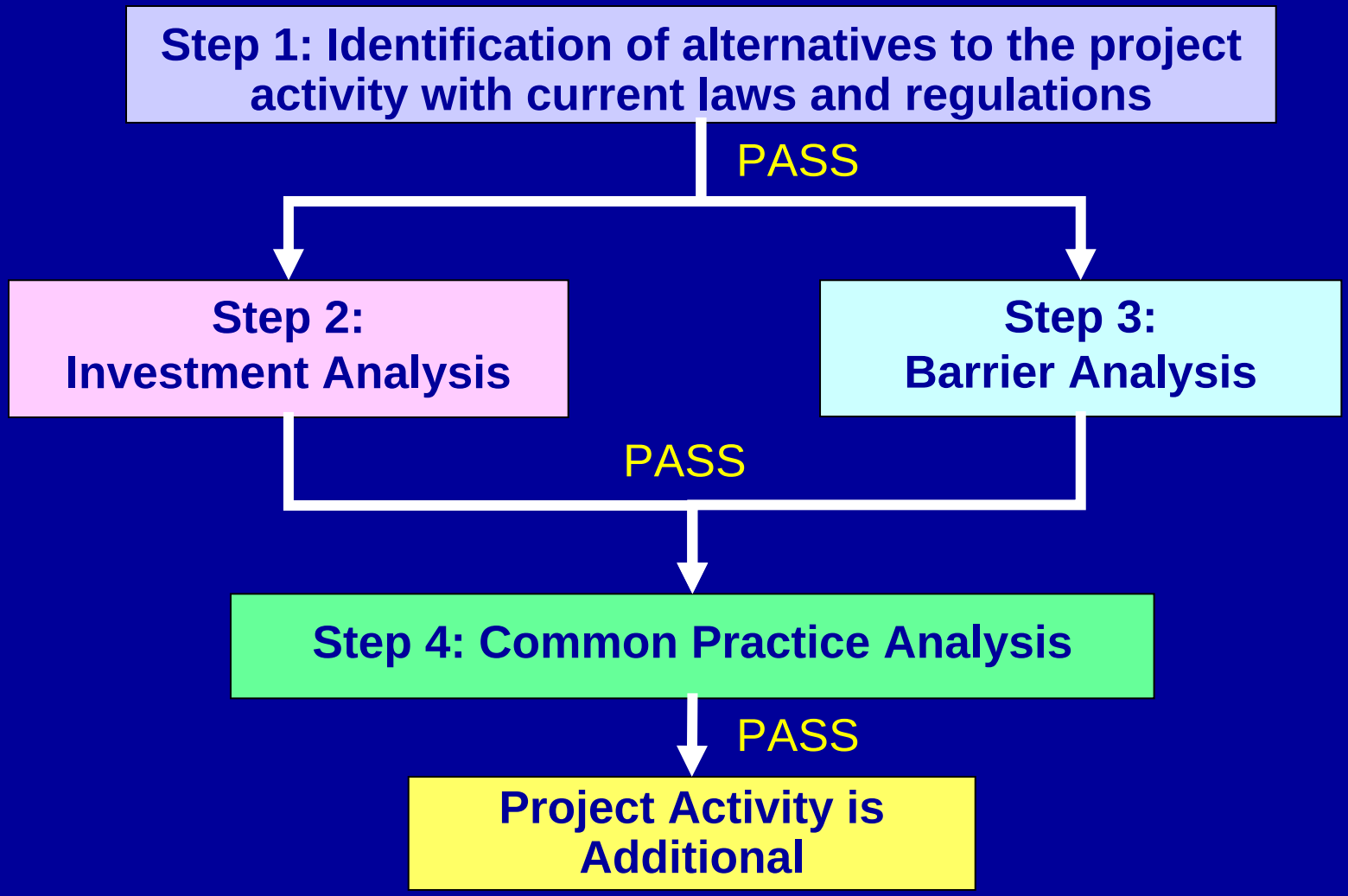
A) COMPARE CDM vs. Business as Usual (BaU) cases

B) ESTABLISH GHG baselines & projections

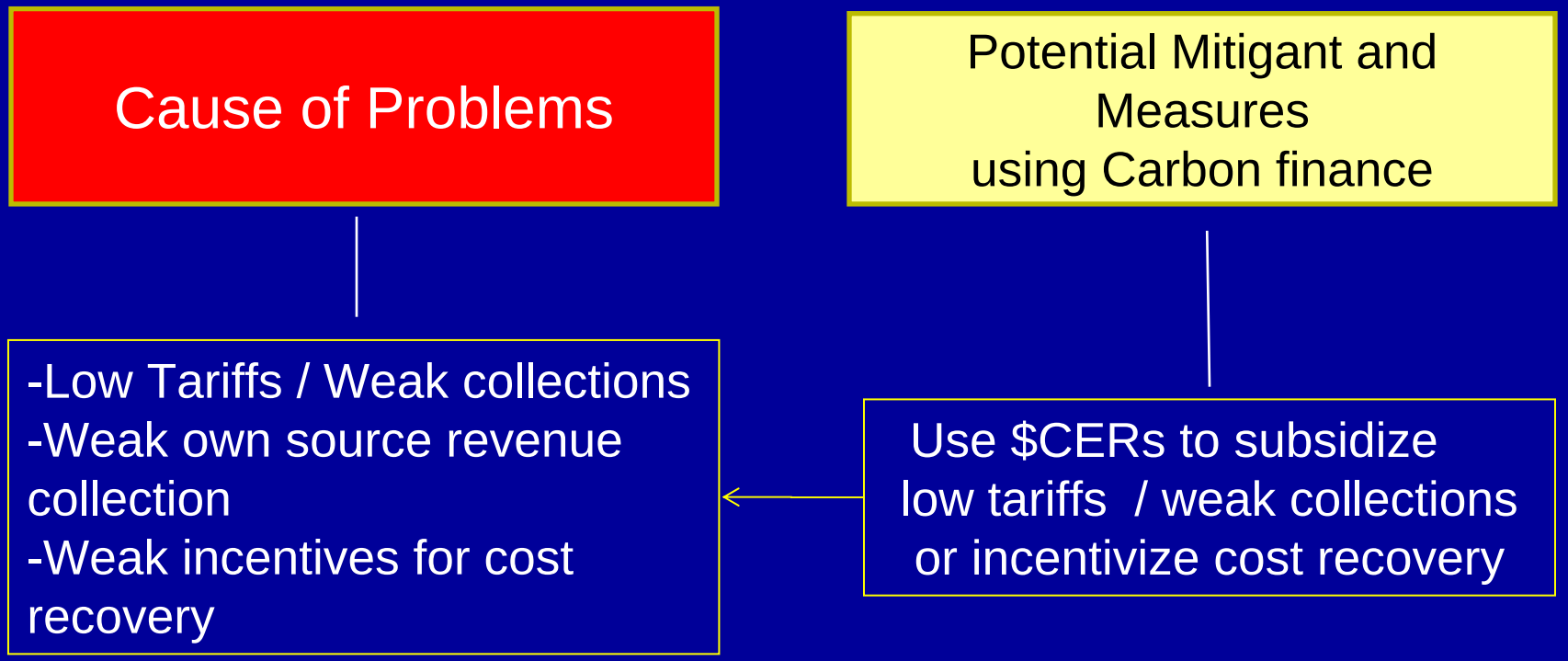
C) QUANTIFY Sustainable Development

D) CONDUCT Life Cycle Assessment

Demonstrating Additionality



Optimizing CDM Mitigation Project



Application of CERs sales proceeds depends on Price and Volume Considerations

CDM Related Financing

Internal (indicative)

Clean Energy Financing Partnership Facility (CEFPF)
$95m with $250 target

Asia-Pacific Carbon Fund (APCF) $152m
Available = $20M

Future Carbon Fund (FCF)
$115M

Other grant-financing, ADF, JSF, TASF
$100m (2008)

External: UNFCCC/GEF (indicative)

Country	Climate Change Mitigation ($MM)	(Flexible Funds)
AFG	2.0	n.a.
AZE	7.01	n.a
PRC	149.6	
KAZ	16.64	
KGZ	2.0	4.55
MON	3.02	
PAK	13.56	
TAJ	2	3.94
TKM	5.72	
UZB	13.67	
Total	**67.13**	**8.49**

Other External

Green Climate Fund (~ $20B/ year by 2012)

Asia Solar Energy Initiative (Trust Fund of $50MM)

Scaling-up Renewable Energy for Low-income Countries Program (SCF-SREP)

What We Need: Project Idea Note

1. Type of Mitigation Project
2. Project Brief Description (how are GHGs mitigated)
3. Project Sponsor
4. Tons of CO2 equivalent (tCO2e) avoided
5. Alternatives to Project if Proposed Mitigation Project does not happen
6. Baseline Scenario Description
7. Financing Amount Needed
8. Project Start Date

Thank You

Rey Guarin
Carbon Market Specialist

List of Acronyms

- ACM – Approved Consolidated Methodology
- COP – Conference of Parties
- CDM – Clean Development Mechanism
- CER – Certified of Emissions Reductions
- CFL – Compact Flourescent Lamp
- CH4 – Methane
- C02 – Carbon dioxide
- GHG – Greenhouse Gases
- EIRR – Economic internal Rate of Return
- EPC - Engineering, Procrurement & Construction
- ERU – Emission Reductions Unit
- ETS – Emission Trading System
- Financial Internal Rate of Return
- HFC – Hydroflourocarbon
- HPP - Hydro Power Plant
- IGCC – Integrated Gasification Combined Cycle
- IRR – Internal Rate of Return
- NPV – Net Present Value
- O&M – Operations & Management
- PFC – Perfloroucarbon
- PPP – Public Private Partnership
- SPC – Special Purpose Vehicle
- tC02e – tons of C02 Equivalent
- UNFCCC – United Nations on Climate Change Convention
- VER – Verified Emissions Reduction
- WACC Weighted Average Cost of Capital