

Capacity building for the Clean Development Mechanism (CDM) First National Workshop in Botswana, 23-24 February 2011 and Sector Workshop on Energy, 25 February 2011, half day

## Overview of potential CDM projects in Botswana

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# OUTLINE

- GENERAL TERRAIN, DEVELOPMENT, POLICY AND LEGAL FRAMEWORK
- RESOURCE BASE/ DEMAND OPPORTUNITIES
- EVOLUTION OF CDM IN BOTSWANA
- PAST PERFORMANCE
- POTENTIAL CDM AREAS
- CONSTRAINED BY
  - METHODOLOGIES,
  - INVESTMENT,
  - GEF,
  - CAPACITY

# Development/policy/legal frameworks

- **DEVELOPMENT IMPERATIVES**
- **WANTING TO DIVERSIFY THE ECONOMY**  
(identifying new engines of growth)
- **POVERTY REDUCTION STRATEGIES**
- **HIGH ELECTRICITY IMPORTS IN A REGION WITH NO EXCESS POWER**
- **BOTSWANA HAS AN AMBITIOUS TARGET OF ELECTRIFICATION CONNECTIVITY OF 80% BY 2016 from a current 55%**

# POLICY AND LEGAL FRAMEWORK

- ENERGY POLICY-solar emphasis- centre of excellence
- INDUSTRIAL DEVELOPMENT POLICY-productivity, efficient export-proping manufacturing
- PRIVATIZATION POLICY-attract investors, efficiency, productivity, entrepreneur development
- SMME POLICY- grow SMMEs
- Agricultural policy-making agric a business- livestock, dairy and crop/horticulture
- CEDA- financing citizen ventures
- S &T policy-small and large processing and manufacture, local.new and innovative techs, centres of excellence, science parks, incubators
- Botswana has a draft Meteorological Bill, which was passed as an ACT of Parliament. The ACT empowers the DMS to implement the Kyoto Protocol. Using the mandate given to it by the ACT, the DNA now is the process of drafting regulations, which will guide its operations. A specific strategy for CDM/carbon financing strategies is however not yet in place.
- The national Department of Energy is still exploring the possibility of making some of its energy Initiatives CDM projects and to that end; the department is planning to draw-up a program of action for registering them as CDM projects.

# RESOURCE BASE AND DEMAND OPPORTUNITIES

# RESOURCE BASE

- Large coal endowments that present a high emission baseline particularly in the energy sector. The associated coal bed methane will also offer low carbon options where coal is displaced by CBM.
  - **LARGE RESOURCE BASE ~200 BILLION TONNES**
  - **UNTAPPED RESOURCE CURRENTLY (900,000 T MINED NOW- 5 BILLION TONNES MINEABLE AT Morupule alone.**
  - **CBM 190 TCF- LARGEST gas DISCOVERY IN REGION**
- Solar energy endowment that presents opportunities for renewable energy applications Solar -2200 kWh/m<sup>2</sup>/yr (Europe 1000)
- Biomass- over 65% of Net energy supply 9.2 million tonnes fuelwood species
- . Botswana is vast country, although semi arid to arid, with careful choice of vegetation species, can offer space for afforestation, biofuels and reduction of emissions from deforestation and forest degradation (REDD)
- Being a cattle country, that can offer opportunities for CH<sub>4</sub> reduction ~3million cattle
- Waste sector, although driven by a small population can have some interesting opportunities
- Wind <3m/s speed- only water pumping

# ENERGY DEMAND OPPORTUNITIES

- Large mining industry that can offer energy efficiency opportunities
- Highly motorized transport system that can also offer opportunities for transport related GHG emission reductions. Oil and gas- all imports 90% petrol & diesel-99% in transport
- SME, Buildings, households EE opportunities to think about.



# EVOLUTION OF CDM IN BOTSWANA

# Past climate change projects

- UNEP funded Mitigation studies 1995
- GEF funded projects-
  - Enabling Activities-1999
  - NC 2000-2001
  - NMT PDFA 2004
  - PV Barrier PDFB
- USIJ project development- no funding-1998
- CDM capacity building initiatives- SHELL Foundation/MEPC, 2000;
- EU-SENERGY CAPSSA, 2001-2003.
- CDM Synergy CB Sub Sahara- 2003-2004

2002-2003	CDM Capacity Building Amongst the Private Sector in Southern Africa (CDM CAPSSA)	<p><b>EC CONTRACT NUMBER:</b></p> <p>4.1041/D/01-006-SI2.327940 Synergy</p> <p><b>PROGRAMME</b></p> <p>DG Energy and Transport, European Commission</p> <p>IER Stuttgart (Germany), June 26 2002</p> <p>in collaboration with:</p> <p>Baker &amp; McKenzie (UK), ECON (Paris), ESD (UK), CEEEZ (Zambia), EECG (Botswana), ERI (S. Africa), MNRE (Swaziland) SCEE (Zimbabwe) SAD-Elec-South Africa.</p>	<p>Targeted at Private sector for project development, institutional and financial support</p> <p>Awareness raising on CDM</p> <p>Project activities spanned all sectors and all project sizes but more for energy</p>	<p><b>EU-Energy Synergy</b></p> <p><b>CONTRACT NUMBER:</b></p> <p>4.1041/D/01-006-SI2.327940</p> <p>Synergy</p> <p><b>PROGRAMME</b></p> <p>DG Energy and Transport, European Commission</p>
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2003-2004	<p>CDM for Sustainable Africa Capacity Building for Clean Development Mechanism in Sub-Saharan African Countries</p> <p>Niger (Sahelian Countries), Botswana, Mozambique, South Africa, and Zambia</p>	<p><b><u>European Partners:</u></b></p> <ul style="list-style-type: none"> <li>- IST - Instituto Superior Técnico of the Technical University of Lisbon, the project Co-ordinator, established in Lisbon, Portugal.</li> <li>- CINAR Ltd. - United Kingdom.</li> <li>- TNO Environment, Energy and Process Innovation – Netherlands.</li> <li>- ITC - Instituto Tecnológico de Canaria, S.A – Spain.</li> <li>- COGEN Europe - The European Association for the Promotion of Cogeneration –Belgium.</li> <li>WBP - Wissenschaftliche Betreuung von Forschungsprojekten - Germany.</li> <li>- CIRPS - Inter-University Research Centre on Sustainable Development, University of Rome, La Sapienza – Italy.</li> </ul> <p><b><u>Sub-Saharan African partners:</u></b></p> <ul style="list-style-type: none"> <li>- ARC - AGRHYMET Regional Centre – Niger.</li> <li>- CSIR – Council for Scientific and Industrial Research - South Africa.</li> <li>- CEEEZ - Centre for Energy, Environment and Engineering Zambia Ltd – Zambia.</li> <li>- EECG Consultants (PTY) Ltd. - Energy, Environment, Computer and Geophysical Applications – Botswana.</li> <li>- CEISA - Center for Studies in Industrial, Safety and Environment Issues – Mozambique.</li> </ul>	<p>Seminars targeted at Governments and potential project proponents</p> <p>Involved project development mostly to PIN level for all sectors</p>	<p>EU Energy Synergy</p> <p><b>Contract nº.</b></p> <p><b>7.623/D/02-001</b></p>
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Period	Project Title	Project partners or organizations involved and Roles	Sector focus Size of project Private or public	Reports produced and where located
2010-2013	for the Clean Development Mechanism (CDM):  A component of the UNEP-European Union Partnership on “ related to Multilateral Environmental Agreements in African, Caribbean and Pacific Countries”	UNEP and EC	Institutional and project development support	Still to start
2009	Workshop promoting Climate Technology and Carbon Market Partnerships	Botswana Innovation Hub; Lund University; SIDA; Export Radet; Sten Stenbeck; Karl-Erik Grevendahl; Development	The objective was to share knowledge and facilitate business and partnership opportunities. The organisers’ ambition was to create opportunities for an increase in climate technology investments and carbon market activities, which could contribute to Botswana’s climate change mitigation, sustainable development and economic growth.	<a href="http://www.bih.co.bw">www.bih.co.bw</a>
2007	CCS- AFRICA PROJECT ECN 3004436- Sharing knowledge and experiences on CDM and CCS	ECN, EECG and ENDA with support from Norwegian Government, STATOIL, SHELL, Department for Business Enterprise and Regulatory Reforms of UK.	Large and small CDM project development approaches, and CCS in general and as a potential CDM project activity	Workshop report  <a href="http://www.ecn.nl/docs/library/report/2007/e07079.pdf">http://www.ecn.nl/docs/library/report/2007/e07079.pdf</a>
2007	Formulation of CDM Projects the Carbon Finance Assist Programme of the World Bank.	World Bank  Government of Botswana	DNA and all sectors- all project sizes	Internal reports

# PAST PERFORMANCE

# CDM POTENTIAL- CDM CAPSSA & CDM SUBSHARAN AFRICA

- BMC- ABATOIR WASTE-METHANE RECOVERY TO SUBSTITUTE COAL AT BMC AND ALSO LPG/FUELWOOD IN HOUSEHOLDS
- BCL- ENERGY EFFICIENCY
- LANDFILL GAS FROM LANDFILLS IN BOTSWANA FOR ELECTRICITY GENERATION
- JATROPHA-BIODIESEL FOR WATER PUMPING
- COAL BED METHANE SUBSTITUTING COAL IN ELECTRICITY GENERATION
- SOLAR THERMAL PLANT HYBRID WITH COAL GASIFICATION AT S/PHIKWE

## ***Some of the active Project proponents that have been mentioned 2010***

<b>Name of organization</b>	<b>Area of project activities</b>	<b>Sector</b>
Botswana Power Corporation / Re – BPC Lesedi (Pty) Ltd	Solar home systems, solar water heaters and cook-stoves	•Residential
Solarpower	Solar Thermal power generation	•Power sector
BCL	Energy efficiency	•Industry- Mining
Botswana Meat Commission (BMC)	Methane from abattoir waste	•Industry - Food
Debswana	<ul style="list-style-type: none"> <li>• Energy efficiency</li> <li>• Power generation methane for coal</li> </ul>	<ul style="list-style-type: none"> <li>•Industry-Mining sector</li> <li>•Power sector</li> </ul>
Future Fuels	Biogas for power generation	•Power sector
G4 Consulting Engineer	Landfill gas-waste gas to energy-power generation	•Power sector
Power (Pty) Ltd	Solar Tower for power generation	•Power sector
Kalahari Energy	<ul style="list-style-type: none"> <li>• Coal Bed Methane Gas to power generation</li> <li>• Fuel substitution.</li> </ul>	<ul style="list-style-type: none"> <li>•Power sector</li> <li>•Industry</li> </ul>
EAD	<ul style="list-style-type: none"> <li>• Biodiesel</li> <li>• Solar power plant</li> <li>• Biogas project</li> <li>• Energy Efficiency</li> </ul>	<ul style="list-style-type: none"> <li>•Transport</li> <li>•Power sector</li> <li>•Power Sector</li> <li>•Commercial and Industry</li> </ul>



# Level of development

Substitution of 9,480,000 litres of Light Furnace Oil with Coal Bed Methane	Under development	Not known	Being developed
Landfill gas for thermal and electricity generation	PIN	3900kt CO <sub>2</sub> /year	
Energy Efficiency Through Automation of mineral grinding Process	PIN	of 18 kt CO <sub>2</sub> , year	
Bio-diesel from Jatropha- substituting diesel in water pumping and national fleet	PIN	Water pumping engines estimated at 39 000 18,000 tonnes per year CO <sub>2</sub> ,	Considering methodology to use and trying to decide project boundaries and measurement and verification method
Solar Thermal Electricity Plant substituting coal based electricity	PIN	1MW from coal estimated at 6624 18,000 tonnes per year CO <sub>2</sub> ,	
Methane recovery from abattoir waste and substitution of Diesel in incinerators with biogas.	PIN	16465.36 tonnes per year CO <sub>2</sub> , for Lobatse and Francistown bundled	2007-2008

Potential projects in the CDM project pipeline

Project name	Status	Type/ total CERs <b>For forestry: to 2025</b> <b>Others: 10 year period</b>	Needs
Biogas for power generation	Under development	1MW plant	Feed in tariff to grid and Power Purchase Agreement (PPA)
Energy efficiency in the diamond mining industry	Under development	20% electricity reduction per tonne of ore processed 20% fuel reduction per tonne of ore delivered	Needs an energy Audit to establish baseline data.
Fuel substitution- diesel and coal bed methane for coal	Under development	For 90MW plant	Feed in tariff to grid and Power Purchase Agreement (PPA)
Programme of activities for solar home systems and cook stoves	Under PDD development	200kt CO <sub>2</sub> /yr	Finance to register the program.
Solar Tower for 120MW	Under development	140kt CO <sub>2</sub> /year	Feed in tariff to grid and Power Purchase Agreement (PPA)
Centralized Landfill gas project	Under development	Size not known yet	
Coal Bed Methane substituting coal in electricity production	PIN	Coal based emissions for an initially 180MW Power Plant but to be upgraded to 600MW.  1,218 kt CO <sub>2</sub> /yr to 4,062 kt CO <sub>2</sub> /yr	Feed in tariff to grid and Power Purchase Agreement (PPA)  About Signed power purchase agreement with Botswana Power Corporation

# LESSONS

- LACK OF 'STRONG' PROJECT PROPONENTS. PP find the whole CDM process laborious and too cumbersome and are discouraged before they are able complete the process
- Misconception that CDM can raise investment capital.
- Limited awareness about CDM amongst government and the private sector in TERMS OF WHAT IS INVOLVED ..
- **Lack of capital amongst project proponents for both feasibility and investment- seems to be the biggest obstacle to taking CDM projects forward.**
- Lack of readily available official baseline information (e.g. emission factors and baseline forestry) causing frustration amongst project developers.
- Lack of coordination amongst government departments and the private sector on issues related to CDM has resulted in the country losing on the opportunity to register some potential CDM project that have been or are now being implemented.
- The project proponents are not aware of technical experts within the country that can assist them with project development. This could be mitigated against if the DNA held a register of approved experts within the country

# NEEDS AREA

- COMPLETE CDM SUSTAINABLE DEVELOPMENT CRITERIA
- PROJECT DEVELOPMENT CAPACITY-identification, techno-economic analysis ( e.g. METHODOLOGIES AND PDD).
- CDM PROJECT APPRAISSALCAPACITY BY DNA & NGOs
- ACCESSING FEASIBILITY FUNDING FOR CDM PROJECTS
- DEDICATED DNA FOR CDM
- LEGAL FRAMEWORK FOR INCLUDING CDM IN NATIONAL ACTIONS AND PROGRAMMES (done)

# POTENTIAL PROJECTS- spreading the net

Sector	Project activity or programme	Expected GHG potential if known or can be estimated	For CDM or VER	Appropriate methodologies
Small scale renewables (grid and off-grid),	Solar PV home systems-PoA  Solar water heaters-PoA	It's estimated that 47,000 households connected to the grid use electric boilers for water. Estimated to have total potential savings of 119,000kt/CO2 equivalent	BPC Lesedi Considering VER	AMS-I.A.  ACM0002
Landfill gas-fired power- to Biomass Energy Strategy for Botswana 2009 ( BEST)	7GWh/year for coal generated electricity	3900kt/CO2 equivalent	CDM/VER	ACM0001  ACM0002  AMS-III.G.
Biomass power and cogeneration (residues and dedicated plantations)-Refer to BEST.	Manure-1.1GWh/year of coal equivalent electricity  Municipal liquid waste biogas 876,000m <sup>3</sup> /year  Cook stoves- PoA  Gasification of invasive species and MSW- 5GWh of coal equivalent	617kt/CO2 equivalent  200kt/CO2 equivalent  5840kt/CO2 equivalent	CDM/VER	AM0036  AM0073-manure  AM0075 &0080 Biogas  AM0085-residues  ACM0006-residues  ACM0010 manure  ACM0002- grid connection
Industrial Energy Efficiency	Reducing power losses within a company's supply system through a process of network waste reduction. Savings of between 5% to 34%  retrofitting of lighting and motors has a potential of saving between 2% to 22%.  Start-up schedules, peak demand control, operating hours management and switching off loads  Fuels switch and energy efficiency in brick manufacture	Potential still to be estimated	CDM/VER	AM0060  AMS-II.C.  AMS-II.J.  AMS-III.Z.  AM0046

Waste heat recovery (Steam for cogeneration)	BCL, BMC, Breweries	Qty not known	CDM/VER	AM0017 & 0024 ACM0012-steam
Energy Efficiency in the Mining Sector- See DANIDA BEE Incentives project Report	BCL, Orapa, Jwaneng, Bot Ash, Tati Nickel, Mopani Gold	20% improvement in Energy efficiency will has potential for reduction in GHG equivalent to:-  170,000kt/CO2 equivalent	CDM/VER	AM0018  AM0044  AM0054
Commercial and residential energy efficiency. See DANIDA BEE Incentives project Report	Building energy audits and efficiency programs-PoA	Energy Efficiency in Residential Sector GHG reduction:- 234,000kt/CO2 equivalent  Energy Efficiency in Commercial sector GHG reduction potential:- 150,000kt/CO2 equivalent	CDM/VER	AMS-II.J.
gas-fired power	>600MW based on coal bed methane	700kt/CO2 equivalent	CDM/VER	ACM0008
fossil fuel switching,	Coal Bed Methane in industry  Coal Bed Methane use to substitute 9.5million litres per year of light oil at Morupule Power Station	Not known	CDM/VER	AM0056  ACM0008  ACM0009  ACM0011



transportation and fuels efficiency	5% ethanol and 10% biodiesel substitution in transport sector	20million litres ethanol by 2017 56million litres biodiesel by 2017	CDM/VER	ACM0017 AMS-III.B. AMS-III.T.
public transport development	Non Motorized transport  Introduction of low emission vehicles to fleet	Not known	CDM/VER	AMS-III.C. AMS-III.S. AMS-III.AA.
Grid loss reductions,		Not known-low losses anywhere <7%	CDM/VER	
REDD	Community forestry projects	Not known	CDM/VER	AR-AM0002 AR-AM0004

# REDD+

- There may be GHG abatement potential through REDD+
- In what way and when these potentials can be tapped, however, remains unclear for the time being: this is because **REDD+ so far is a building block under the Bali Action Plan**, which Parties to the UN Convention on Climate Change are still negotiating.
- If a decision on REDD+ was taken, the question whether and when project based forestry activities on a sub-national level would be awarded carbon credits, is again wide open **as preparatory tasks such as formulating REDD strategies, developing reference scenarios and establishing MRV systems are under development.**
- This will take **time and require substantial financial contributions** of Annex I countries

# Regional potential

- REGIONAL GEF IDEA STILL ON THE CARDS

# CONSTRAINTS

**Table 2: Investments into CDM Projects by CDM Sector**

Project Type	Total Investment Costs (in mio. USD)	Total CERs (over 10yr)	Abatement Cost (in USD/CER) (over 10 yr)	Share in Africa (in %)
HFCs	73	816.964.660	0,09	-
N <sub>2</sub> O Abatement	468	478.599.719	0,98	7%
Wind	509	392.630.564	1,30	1%
Coal Bed CH <sub>4</sub>	555	140.772.760	3,94	0%
LFG	1.392	283.308.151	4,91	9%
CH <sub>4</sub> Avoidance	660	123.415.395	5,35	1%
Fugitive	903	88.306.983	10,22	13%
PFCs and SF <sub>6</sub>	363	32.590.810	11,13	0%
Forests	65	4.633.620	13,99	30% / 36%
EE Own Gen.	3.853	234.809.897	16,41	1%
Energy Dist.	12	665.060	17,83	0%
Biomass Energy	3.552	170.385.205	20,85	3%
Geothermal	546	18.347.300	29,76	13%
EE Households	113	3.333.490	33,82	13%
Fossil Fuel Switch	9.267	268.609.620	34,50	9%
Hydro	21.946	625.781.507	35,07	1%
EE Industry	744	16.679.538	44,62	1%
EE Supply Side	2.830	36.837.233	76,84	3%

# FINANCING

- CONSTRAINED BY BOTH INVESTMENT AND FEASIBILITY FINANCING
- a) Facilitating CDM project proponent's access to finance, and/or
- b) Exploring so far not fully tapped CDM potentials having a comparably low abatement costs through innovative concepts.

# GRID EMISSION FACTOR

- Consequently the GEF is an important factor delineating the overall opportunities for:
  - Grid connected renewable energy projects such as CSP- and biomass to electricity projects, and
  - Demand side energy efficiency projects (i.e. reducing consumption of electricity provided by the national grid) such as Compact Fluorescent Lamp distribution projects/programs.

# Institutional capacity

- PREVIOUS SUPPORT TO DNA IN PAST PROJECTS AND DNA FORUM

## RULES AND PROCEDURES UNDER PREPARATION

- NOT YET no projects have come as far as validation or registration in the country yet. DNA capacity not yet fully tested.
- Capacity for CDM's regulatory and market development;
- broaden participation and public awareness and;
- WEBSITE



### CDM SERVICE PROVIDERS

Name of organization/expert	Core competence	Contact Details
African Carbon Exchange	Support for biodiversity/REDD projects development advice on Carbon markets	Mr David Lesolle Mobile +267-72857121
StenStenbeck Consultancy and Training	Advising, training and capacity building on CDM & VER Find carbon merchants and investors. Assit in the development of Project Design Documents (PDD) Support Registration of CDM/VER projects	Sten Stenbeck Cell ph (): +267 744 35 159 Ph (): +46 (0)8 559 255 31 Skype: sten.stenbeck
Afrivestment(Pty)Ltd  c/o  Main mall	Project development up to PDD  Policy advice  Institutional support	Mathogonolo Victor Sebate  msebate@yahoo.com  (267)71203480
EECG Consultants (Pty) Ltd	DNA support ( preparation of rules and procedures; preparation of resource materials that PP can use e.g. grid emission factors)  Project/programme identification and development (PIN, PDD, methodologies development and reviews for validation and registration).  Seeking financiers for PDD development and carbon buyers.	Dr Peter P. Zhou  Tel +267-3910127  : +267-71693104  <a href="mailto:pzhou@global.bw">pzhou@global.bw</a> ; <a href="mailto:pzhou@eecg.co.bw">pzhou@eecg.co.bw</a>

# PROJECT PROPONENT CAPACITY

- WITHOUT PP CAPACITY NO CDM!