bon Energy Development and Poverty Reduction i n Sub-Saharan Africa – Opportunities and Barriers

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Presentation Outline

- Definition of some concepts
- The Energy-Poverty-Environment Nexus
- Sub-Saharan Africa in Focus
  - The Energy and Poverty Situation
  - The Case For and Against Low-Carbon Development
- Opportunities and Potential for Low-Carbon Energy Development in Sub-Saharan Africa
- Key Barriers
- Recommendations

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nition of Key Concepts

- Low-Carbon Development – what is it?
  - A development pathway that promote/espouses sustainable growth, which helps reduce GHG emissions and environmental pollution
  - It is a new development paradigm that creates new growth engines and jobs with green technologies and clean energy
- Energy sector is critical to the achievement of low - carbon economic growth because it is the highest emitter of GHGs

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The Energy-Poverty-Environment Nexus

- Energy essential to economic and social development and to improving the quality of life – energy critical to achievement of MDGs, especially poverty alleviation (MDG1)
- Meanwhile, the production, generation, distribution and use of energy occasion substantial amounts of GHGs causing climate change, thereby impinging on achievement of MDG 7 – environmental sustainability
- Outcome – a daunting but solvable conundrum

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Poverty-Environment Nexus (2)

- A road down the current path of energy system development is not compatible with the ideals of sustainable development
- Should economic development be sacrificed on the "altar" of environmental sustainability?
- NO! Maintaining environmental integrity is compatible with economic growth but ONLY when fundamental changes are made to the way energy is produced and used
- The choice therefore is not between development and environment but between low carbon and high carbon growth paths

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verty-Environment Nexus (3)

- The Critical Challenge: how to expand energy services while simultaneously addressing associated adverse impacts

- Pursuing Low-Carbon Energy Development Strategies (aka **3-D** Energy revolution) is the way forward

  - **Decreasing** energy demand while **Decarbonising** and **Decentralising** energy supply

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Some Basic Facts

Geographical area in Africa below the Saharan Desert

Divided in 4 Economic Zones: East, West, Central and Southern Africa and comprising 48 countries

Total Land Area: 2,455million hectares

Total Population: 800million (2007 estimates), expected to grow to 1.5 billion in 2050

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Poorest Region in World

- Only region in the world where abject poverty (living on less than $1 a day) has increased over the past 20 years (42% to 49%).
- 32 of 48 poorest nations in the world are located in this region
- GDP (2006) = $744billion representing
  - 28% of China's GDP
  - 69% of Brazil's
  - 80% of India's
- Only two countries - Nigeria & South Africa account for 56% of GDP
- Average GDP per capita is **$1,856** (Real GDP per capita is **$624**) compared to **$7,400** in Latin America and **$2,856** in South East Asia
- Life Expectancy = 46.1 years
- Literacy Rate = 61.3%
- One of the few regions not making any progress on the MDGs

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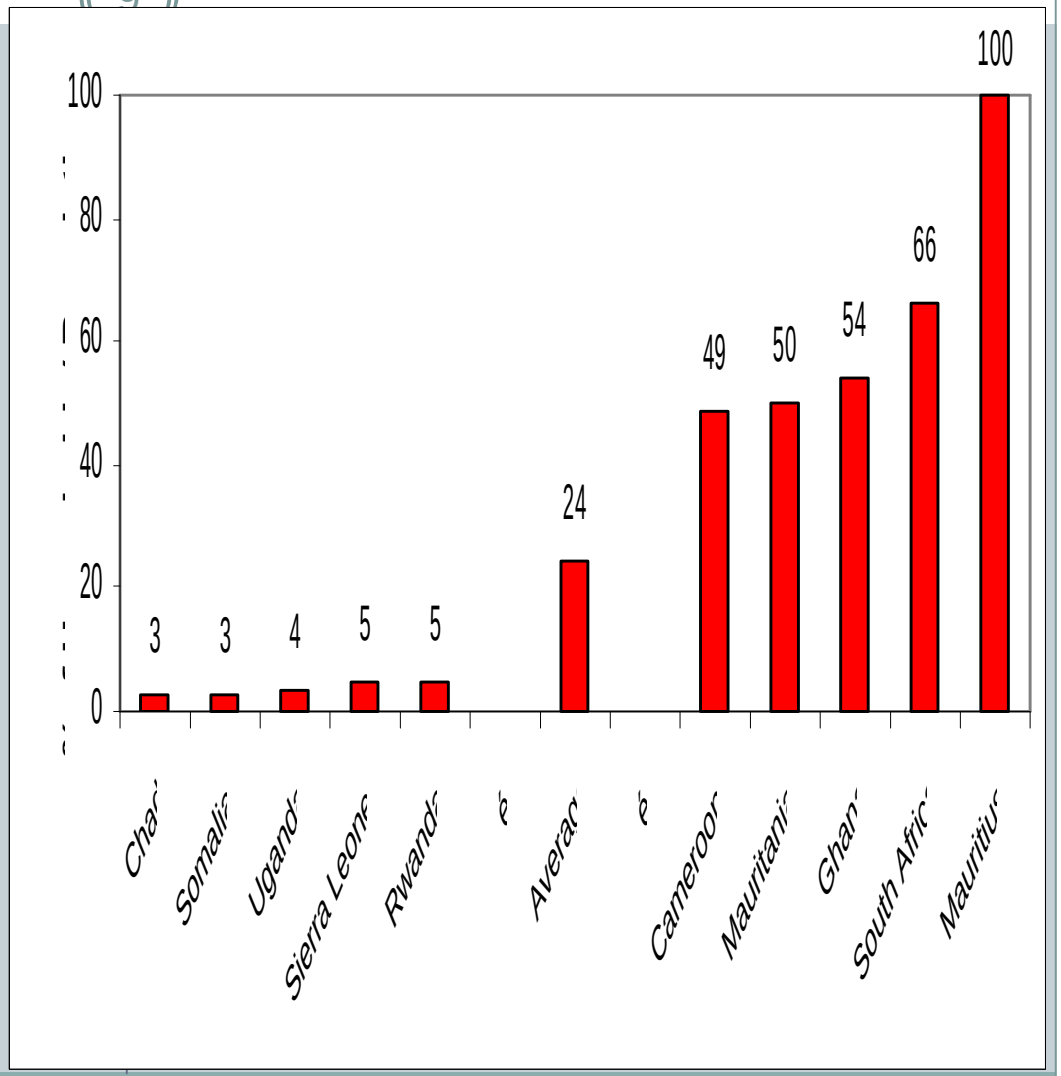
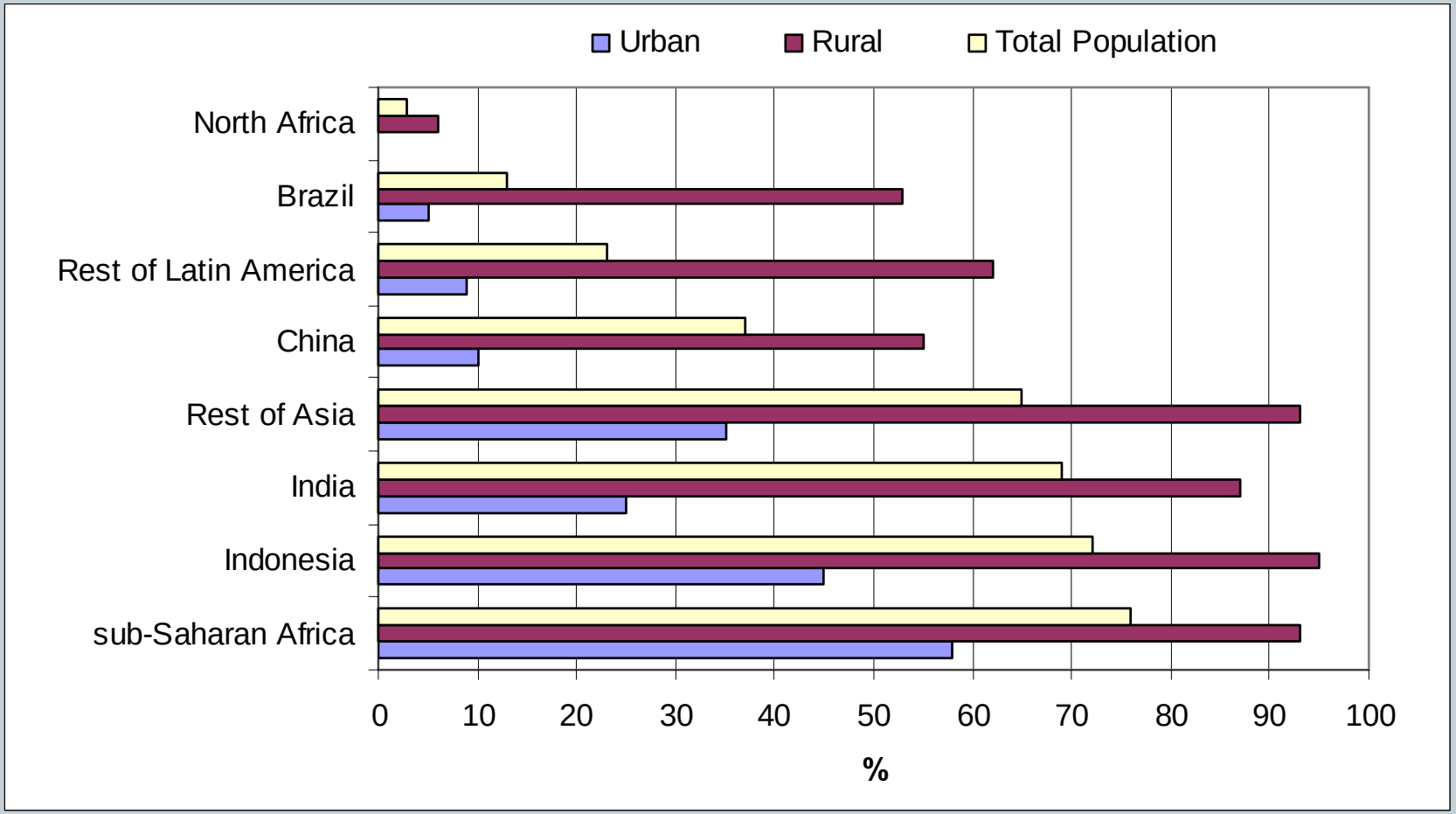
st and Most Unlit Region



Source: World Bank, 2004

ce on Biomass Fuel for Cooking



Source: IEA, 2006

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SA Countries Pursue Low-Carbon Energy Development?

- The Case Against
  - Developing Countries are low per capita consumers of energy as well as low CO_2 emitters
  - Large-scale development of low carbon infrastructure needs large scale investments
  - These additional investments if they are to come from public sector funds will redirect and crowd out investment for other development goals – health, education, etc
- The Case For
  - Share of GHG emissions from developing countries expected to increase from 39% today to 52% by 2030 (IEA) [China alone responsible for 29% though]
  - Developing countries are most vulnerable to the adverse effects of climate change
  - Cost-effective technological solutions abound to facilitate the achievement of economic development and clean environment at the same time

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tunities for LCED in SSA

- Large capacity constraints engender leap-frogging into low-carbon energy economies without the problem of stranded cost
- "Proliferation" of innovative financing mechanisms such as CDM, Carbon Finance (CF) products and Climate Investment Funds (CIF)
- Development of CDM Methodological Framework – 1 of the more 108 approved methodology (May 2008) related to the energy sector
- Availability of required resources and facilities

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M Potential of SSA (1)

- Power
  - Generation from Fossils
    - Conversion of single cycle thermal plants to combined cycles
    - CHP for Industry
  - Generation from RE
    - CHP in Sugar Mills
    - Agricultural Residue
    - Forest and Wood Processing Residue
    - Typha Australis
    - Jatropha Biofuel
    - Hydroelectricity
    - PV in insolated Rural Areas
    - Landfill Gas
  - Transmission and Distribution
    - Grid-loss reduction
  - Consumption and Use
    - Non-lighting electricity for industry
    - Switch to CFLs
    - Energy-saving hhold appliances
- Fuels for Industry
  - Production
    - Flared Gas Recovery
    - Coal Mine Methane
    - Waste gases in Oil Refinery
  - Thermal Use and Consumption
    - Improved Steam System
    - Reduced clinker in cement manu.
- Fuel for Vehicles
    - Biodiesel from Jatropha
    - Shift to Bus Rapid Transit (BRT)
- Woodfuels for Households
  - Improved Charcoal Production

22 Technologies could be adopted and 3,22 7 Projects Developed in 44 countries

M Potentials of SSA (2)

	Technology	No. of Projects	Project Emissions Reduction ($mtCO_2/yr$)	Electricity Generation (GWh/yr)	Total Investment Cost (billions US$)
1	Second-cycle additions to open-cycle gas turbine plants	204	36.1	51,912	7.1
2	CHP for Industry	373	72.9	156,314	17.8
3	CHP in Sugar Mills	67	2.4	3,489	1.0
4	Agric. Residue	553	140.8	216,842	38.5
5	Forest Residue	321	62.6	98,414	17.5
6	Wood –Processing Residues	406	20.3	31,987	5.7
7.	Typhas australis	40	3.1	4,675	0.8
8.	Jatropha Biofuel	555	176.8	218,767	53.6

Source: World Bank, 2008

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M Potentials of SSA (3)

	Technology	No. of Projects	Project Emissions Reduction ($mtCO_2/yr$)	Electricity Generation (GWh/yr)	Total Investment Cost (billions US$)
9	Hydro Electricity	26	25.2	35,961	9.4
10	Landfill Gas	3	0.9	49	0.0
11	Grid Loss Reduction	20	1.1	31,974	-
12	Non-lighting Electricity for Industry (motors, etc)	20	1.5	5,837	-
13	Energy-saving Hh appliances	30	7.4	11,131	-
14	Switch to CFLs	49	13.3	17,269	4.8
15	Flared-Gas Recovery	55	91.8	353,409	-
16	Coal Mine Methane	555	176.8	218,767	53.6

Source: World Bank, 2008

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CDM Potentials of SSA (4)

	Technology	No. of Projects	Project Emissions Reduction ($mtCO_2/yr$)	Electricity Generation (GWh/yr)	Total Investment Cost (billions US$)
17	Waste Gases in Crude Oil Refineries	26	4.3	5,777	0.9
18	Improved Steam System	211	36.6	-	-
19	Reduced Clinker use in Cement Manufacturing	46	2.8	-	0.1
20	Shift to Bus Rapid Transit	63	12.4	-	-
21	Biodiesel from Jatropha	60	3.2	-	-
22	Improved Charcoal Production	68	22.5	-	0.2
23	Reduced Methane Leakage in Pipelines	13	0.1		-
	TOTAL	**3,227**	**740.7**	**1,244,618**	**157.6**

Source: World Bank, 2008

ynthesis Results (1)

- 170 GW of addition power generation capacity to be added if fully implemented
  - More than 2x the current regional installed capacity
- Additional energy to be added (both electric and thermal) is 4x current regional production
- Estimated capital investment cost for 2,755 projects is ~US$158 billion but could tip US$ 200 million if the capital cost of remaining projects (flared gas, associated gas recovery) are estimated and added
- 740 million tCO_2/year
  - > current GHG emissions (680 million tCO_2/yr)
  - Technical potential of additional energy larger than current regional demand Ÿ future demand growth could be met without additional GHG emission under a BAU scenario
- US$ 7.4 billion per annum could be earned by the region at an assumed price of US$10 per tCO_2
- Potentially win-win situation for SSA countries

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ynthesis Results (2)

Project Category	Emission Reduction Potential (%)	Added Power Gen. Capacity (%)
Biomass	64	43
Existing Facilities	19	27
Fossil Fuel Related	28	53

Source: World Bank, 2008

- 64% of emission reduction potential to be derived from biomass
  - ½ of which wasted biomass (bargasse, agric and agro-industrial residues, typha and forest and wood residue) while 34% from Jatropha plantations for biodiesel
- 53% of additional capacity from improved fossil fuels
  - 27% from improved energy efficiency
  - 26% from recovery of associated and flared gas

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ential in the Midst of Abundant Opportunities and Dire Need

- In spite of the substantial opportunities and huge theoretical potential, SSA countries are missing out relative to other parts of the developing world where exponential growths are being experienced in the number of similar projects
  - Only 53% out of 3,902 CDM Projects located in SSA (more than 80% located in two countries – South Africa and Nigeria)
  - Only 2.1% share (90) in CDM Pipeline Projects compared to Brazil's 345 and Mexico's 199
  - 9 times smaller than its share of GHG emissions
  - More room for improvement
- Why is SSA appearing to be 'marginalised'?

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rriers to LCED in SSA (1)

- Regulatory Gaps and Logistical bottlenecks – absence of key elements of workable regulatory framework
  - Non existent purchase tariff
  - Poorly designed Power Purchase Agreements
  - Regulatory restraints on wheeling of excess power
- Lack of transmission and distribution infrastructure to bring power to demand/load centres and dispersed nature of primary resources
  - Pose dual logistical challenge: how to bring resource to transformation facilities and generated power back to demand centres or bulk supply points

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rriers to LCED in SSA (2)

- Dearth of technical knowledge and information sharing, capacity and effective communication, including necessary background data and inventory of potential energy sources
- Lack of local technical capacity to operate and maintain mature, clean energy technologies
- Low capacity to adapt technologies to local resources compared to other developing countries

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rriers to LCED in SSA (3)

- Lack of investment and financing capacity for all capital intensive projects Ÿ more investment capital required for clean energy technologies thereby aggravating the need
- Uncertainty regarding post-Kyoto regime (1st Commitment period of up to 2012) Ÿ restrict monetisation of clean energy projects beyond 2012
- Others

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Recommendations

- Regulatory and Logistical gaps blocking clean energy systems access to the market need to be plugged
- Appropriate planning and policies need to be instituted
- Technical information on mature and clean energy technologies must be properly and effectively disseminated
- Technical assistance and R&D needs to be provided
- Local expertise and institutional procedures needs to be developed
- Earmarked climate investment funds are absolutely crucial
- Others

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Conclusions

- The CDM and other climate related financing mechanisms certainlt present opportunities to SSA country to alter the wa y energy is produced and utilised
- There may be (in fact are) inherent administrative and procedura l challenges to be grappled with in accessing these mechanisms but the fact that some countries in other developing regions have be en able to draw on them suggests that we can also explo re them
- It may be late in the day given that the end of the 1st Commitment period is in sight but it is always better late than never
- At the very least future energy planning could and should take advantage of technological options made available through the CD M methodological frameworks in grafting out sustainable energy futures
- Adding additional generation capacity is always a ch allenge due to chronic lack of investment funds but whenever the opportunities arise clean and efficient options should be endorsed.

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Thanks for your attention.

Comments and views welcome

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