



Low Carbon Energy Development

John Christensen
Director, UNEP Risoe Centre

*Climate Task Force meeting
23 March 2010*





Outline of presentation

- Improving energy access for the poor still a global challenge
- What would it take to get universal access
- Why a low carbon development focus
- Technologies are on the market
- A few examples from UNEP
- Climate change context
 - Water & Energy nexus
 - Linking mitigation and adaptation
- Time to act is NOW – UN SG recommendation



Energy Access and the Poor

- Close to 50% of the world's population is poor (< US\$ 2.00 per day)
- Bulk of poor rely on traditional biomass (estimated global total = 2.4 billion)
- About 1.5 billion of the poor without electricity & clean/modern energy

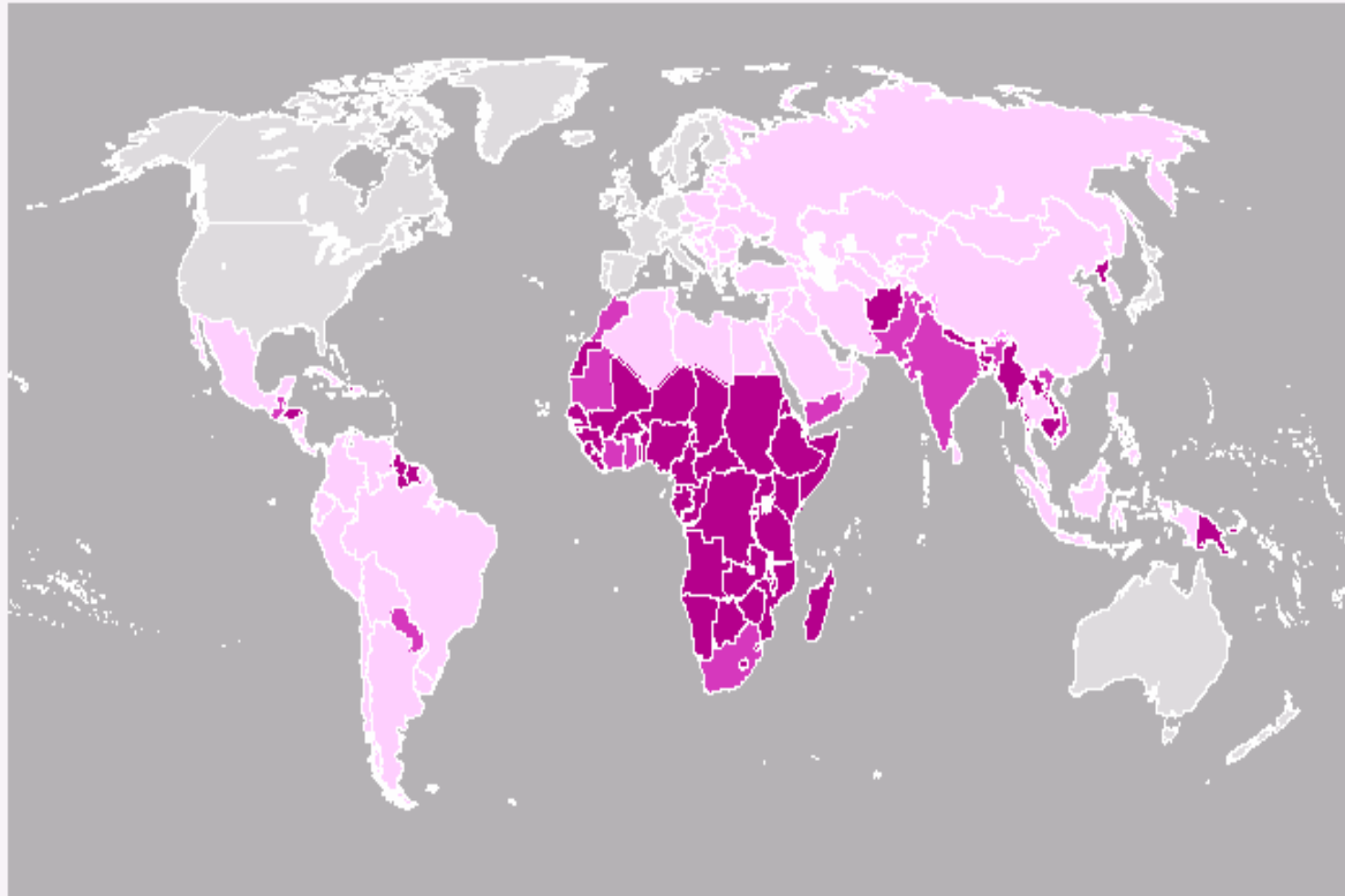


Myth	Reality
The poor do not consider access to energy a priority	The poor may not use the term “energy” but they often spend far more time and effort obtaining energy services compared to the richer section of the population. They spend a substantial proportion of their household income on energy for basic survival activities that is cooking, keeping warm, and so on.
Access to electricity, grid or decentralized, will solve all the energy service needs of the poor	People need to access a range of energy sources to satisfy their energy needs, that is cooking, heating, transport, and communication.
Poor people cannot pay for their energy services.	Many poor people pay more per unit of energy than the better off, partly due to inefficient conversion and lack of integrated planning
Only rural areas suffer from lack of access to energy	Poor people in urban and peri-urban areas also suffer from lack of access to energy services, and their numbers are likely to increase. It is predicted that almost 61% of the world’s population will be living in urban and peri-urban areas and services are not expected to grow commensurately
Commercial energy required to satisfy the needs of the poor is significant with respect to total global energy consumption	Reaching the poor with basic modern energy services as envisioned in the <i>MDG Energy Vision</i> would increase global commercial energy consumption by about 900 TWh (terrawatt-hour) per year, which is less than 1% of the global energy demand.

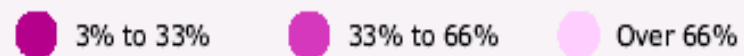
FIGURE 1

TOO MANY PEOPLE IN DEVELOPING COUNTRIES STILL LACK ACCESS TO ELECTRICITY

(PERCENTAGE OF THE POPULATION WITH ACCESS, 2000)



Source: World Bank Group staff estimates





Electrification rates in Africa

Rural access still below 20 %

Electrification rates ranking		Source : UNDP 2008
RANK	COUNTRY	RATE (Percentage)
1	Tunisia	99
2	Algeria	98
3	Egypt	98
4	Libya	97
5	Mauritius	94
6	Morocco	85
7	South Africa	70
8	Cote d'Ivoire	50
9	Ghana	49 (WB 54 % in 2004) reality 56 ?
10	Gabon	48
11	Cameroon	47
12	Nigeria	46
13	Botswana	39
14	Namibia	34
15	Zimbabwe	34
16	Senegal	33
17	Sudan	30
18	Benin	22
19	Eritrea	20
20	Zambia	19
21	Togo	17
22	Madagascar	15
23	Angola	15
24	Ethiopia	15
25	Kenya	14
26	Lesotho	11
27	Tanzania	11
28	Malawi	7
29	Burkina Faso	7
30	Democratic Republic of Congo	6
31	Mozambique	6



The Dual Electricity Challenge

Countries with large sections of the population and geographical areas with no access to electricity

- *Cannot rely on the internally generated cash from their power sector to finance the massive expansion needed.*
- *Public funds may have to play a role in providing access to electricity (as opposed to subsidizing electricity consumption)*
- *Some countries are making a dedicated push with a mix of approaches but rural access is still low*

How can large scale power sector development be linked with specific policy action on access to modern energy services for the poor

- *“Trickle down” not realistic*
- *Dedicated policy effort linked with sector reforms*
- *Renewable opportunities:*
 - *Hydro, geothermal, wind*
 - *Co-generation, biomass*
 - *Local mini grids*



The Dual Electricity Challenge Ghana

- **Urban and Industrial expansion requires increasing large scale supply**
- Hydro based supply can be expanded but rainfall patterns and water use are constraints
- Solar, Wind and Biomass has significant potential but so far mainly small scale applications
- Regional gas pipeline provides opportunity for gas based power
- Regional power integration could mean better efficiency
- **Increasing especially rural electrification remains a challenge**
- District capitals and larger townships targeted first but grid based expansion hampered by cost and supply constraints
- Losses in transmission and distribution also an issue
- Local grids and off-grid solutions part of the approach, including a specific RE focus
- Local employment and economic benefits should be a strong argument



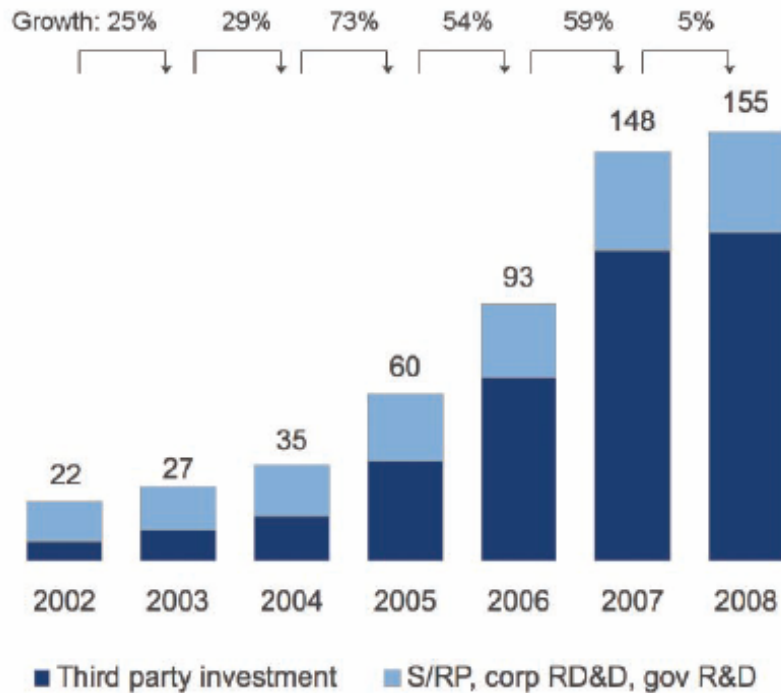
Why Low Carbon Energy Development

- Long term climate rationale – embarking on a new energy development path
 - Short term CC argument is not correct
- Financial assistance should be available to cover the incremental cost
- Energy security for countries with no fossil resources
- Green Economy benefits – employment, local environmental improvement etc...
- Many technologies suitable for decentralized applications
- Costs for many RE technologies have come down dramatically



Global power capacity from new renewable energy sources (excluding large hydro) reached 280 Gigawatts (MW) in 2008 adding approx 40 GW in 2009
For comparison 31 GW of coal-fired power-generation capacity is currently under construction in OECD countries

Figure 1: Global new Investment in Sustainable Energy, 2002-2008, \$ billions



S/RP = small/residential projects. New investment volume adjusts for re-invested equity. Total values include estimates for undisclosed deals

Source: New Energy Finance

Figure 3. Solar PV, Existing World Capacity, 1995-2008

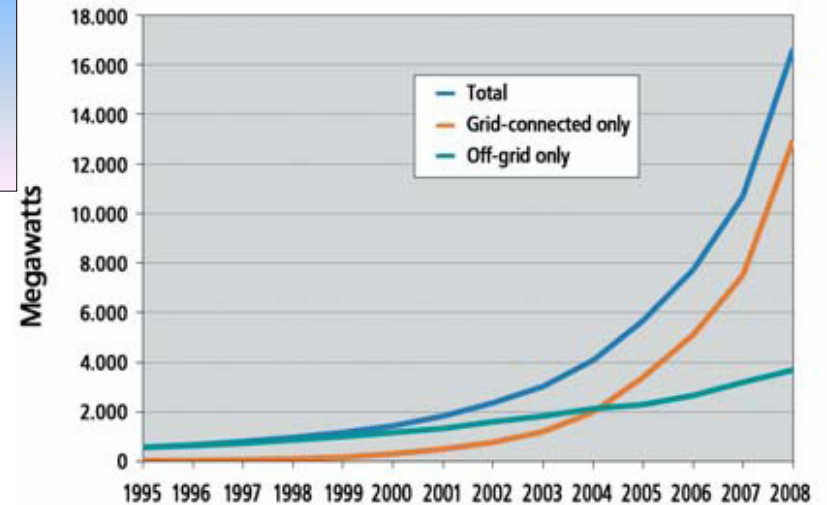
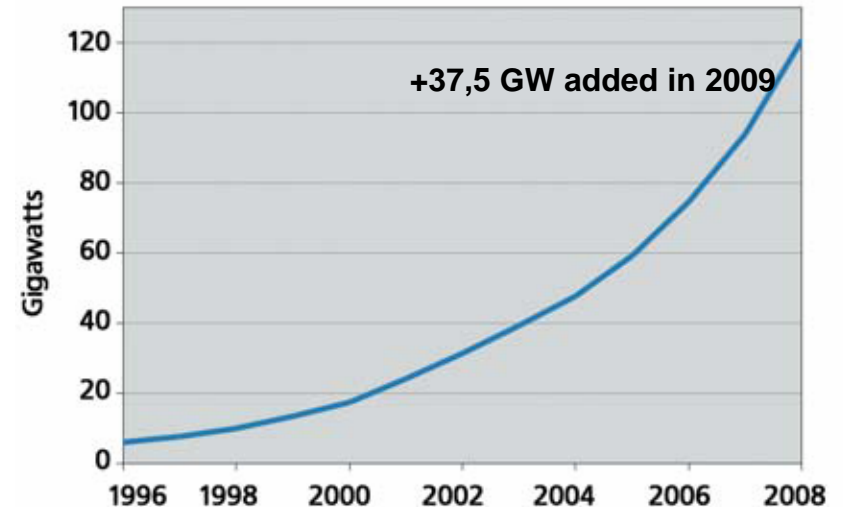


Figure 1. Wind Power, Existing World Capacity, 1996-2008





Non-electrical RETs options

- RE technologies can play an important role in improving electricity access either through central generation or local mini-grids
- However, there are many opportunities for access to other Modern Forms of Energy from non-electrical RE technologies.
- A few examples from GNESD studies are presented in the following



Results of GNESD studies

- Increased agricultural productivity and land under irrigation (treadle pumps in Kenya & RE pumping in Africa)
- Low cost energy for SMiEs (Biomass Gasification in India, China and Cambodia)
- Energy savings and employment generation (SWHs in South Africa, Lebanon and Argentina)
- Conservation of agricultural products (Vegetable Oil in Brazil)





Typical barriers to RE expansion

- Lack of policy attention or inadequate policies
- Weak institutional framework
- Financial barriers: high investment, low income, lack of financing
- Low quality of products and installation failures
- Lack of after sale services and maintenance
- Missing capacity: techno, policy, finance
- Low awareness: planners, politicians, academic



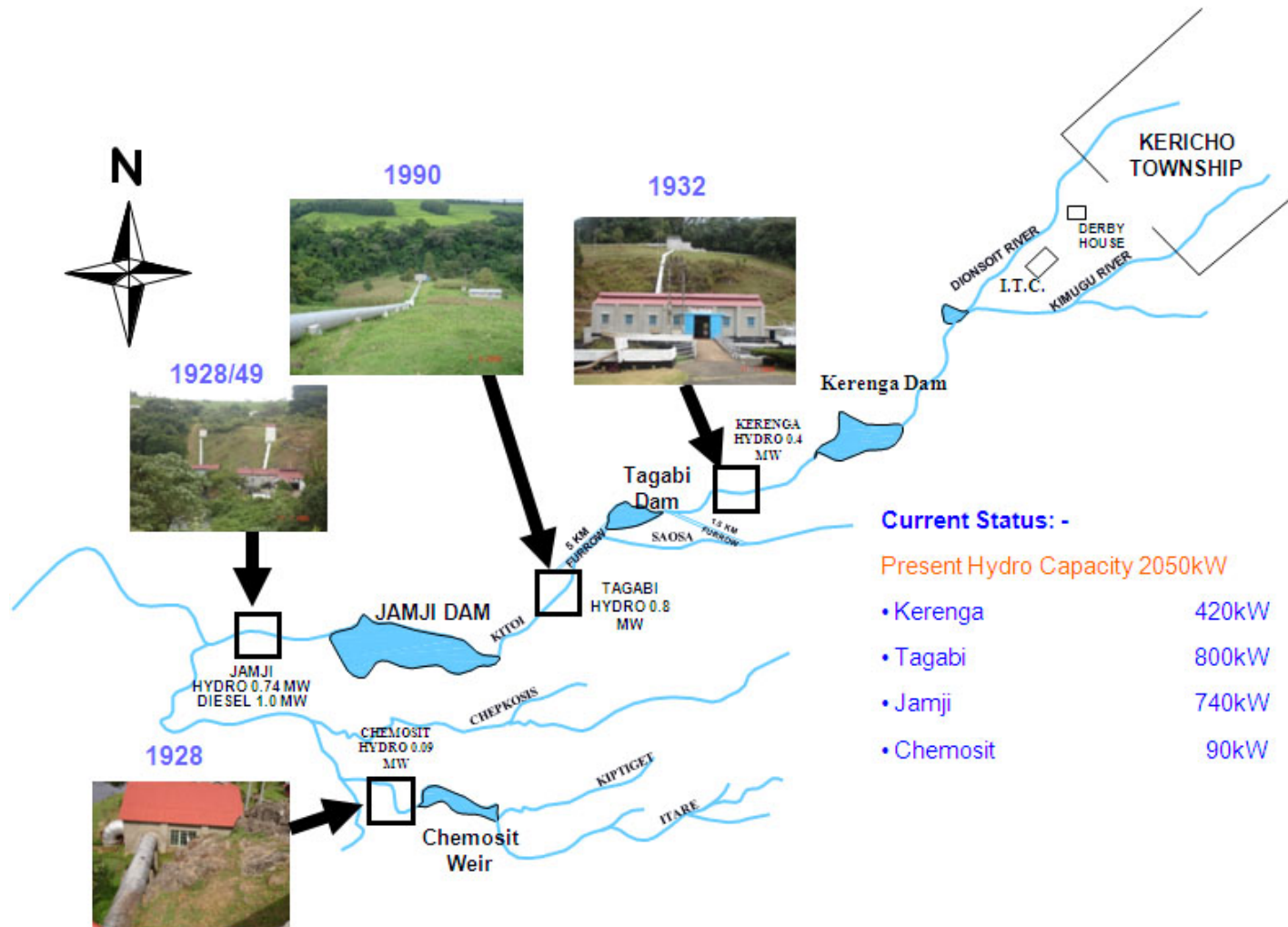
Ways of overcoming barriers

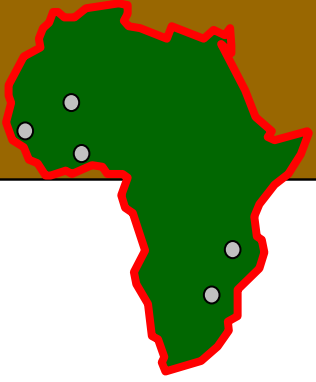
- Integration of RE into development policies and strategies aimed at the poor
- Development of adequate institutional framework to manage and implement local programs
- Ensuring financial viability of rural distribution
- Balancing public and private sector engagement
- Allowing both grid and off grid approaches
- Providing incentives to improve affordability ⇒ Costs reduction, targeted financing schemes and reduced connection charges
- Building capacity in national and local electricity companies
- Improving awareness at the political level



Greening the Tea Industry in East Africa

Greening the Tea Industry in East Africa, a small-hydro power initiative, co-implemented by UNEP & the African Development Bank (**AfDB**) and **executed by East African Tea Trade Association (EATTA)**.





African Rural Energy Enterprise Development

AREED

Demonstrating that needed energy services can be delivered on a sustainable commercial basis by clean energy SMEs.

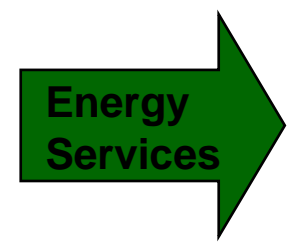
SME Energy Enterprise Development

**Enterprise
Development
Services**

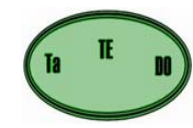
**Seed
Financing**



Entrepreneur



Customers



CEEZ

Example Enterprises

Usiss, Mali

- **Business:** Solar Crop Drying
- **Stage of Sector Dev.:** Very Early **proof of concept** phase
- **AREED Support:** \$18,000, 4 yr loan and enterprise development support from MFC, E+Co
- **Status:** Operating. Repayments current.



BETL, Tanzania

- **Business:** Logistics company coordinating ag. wastes for fuel substitution
- **Stage of Sector Development:** Early **commercialization** phase
- **AREED Support:** \$50,000 3-yr loan and Enterprise Dev. Support from Tatedo, E+Co
- **Status:** Increased sales from 500 Mt to 1200 Mt per month
Repayments current.



Example Enterprises

Anasset, Ghana

- **Business:** LPG distribution
- **Stage of Sector Dev.:** replication phase
- **AREED Support:** \$38,000, 4 yr loan and enterprise development support from KITE, E+Co
- **Status:** Repayments current, expanding with bank financing.

KPBS, Zambia

- **Business:** Charcoal production from sawmill waste
- **Stage of Sector Dev.:** Proof of concept phase
- **AREED Support:** \$73,000, 4 yr loan and enterprise development support from CEEEZ, E+Co
- **Status:** Construction of 15 kilns completed. Production, distribution and sales of charcoal started Feb 2003. **Enterprise folded in 2004**



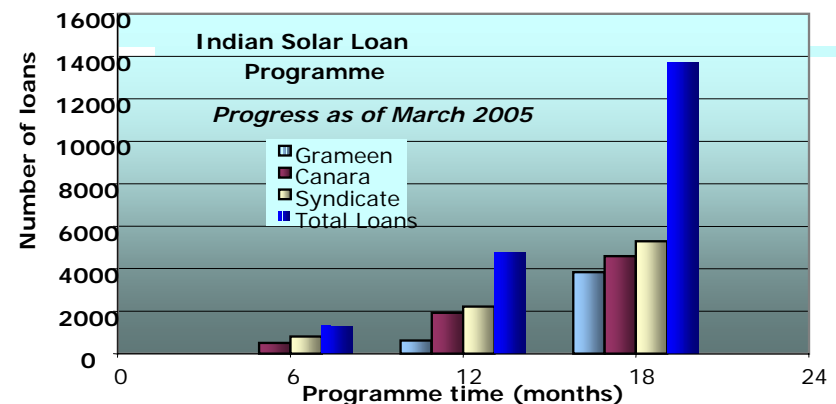


Financing the Customers of SMEs



**In markets where small scale clean energy is economically viable,
....why aren't banks lending ?
.... and, what can be done about it ?**

- **Example** – Indian Solar Loan Programme
 - State of Karnataka, Solar Home Systems, 2003 - 2006
- **Before:** many SHS vendors, small total sales, **little credit**
- **During:** consumer finance programme offered through Canara bank and Syndicate bank, **interest rate subsidy**, 16,000+ systems financed, other banks starting to lend
- **After:** **subsidy phased out**, banks continuing to lend, although lose market share in an increasingly competitive credit market
- **Real Driver** -> **access** to financing provided through 2076 bank branches





Core Areas for International Action

- Systematic support to energy development as a part of poverty reduction and economic development strategies
- Systematic inclusion of energy in design and cost of all development assistance addressing other sector MDGs
- Commitment to long term financing of low carbon energy sector development as part of NAMA
- Increase the global funding for energy poverty programs focusing on increased access to clean and efficient energy services



Key messages

- No single or simple solutions:
 - Action needs to combine different policies and approaches. Solutions that address both climate change and energy security at the same time are favorable
 - Long-term and predictable policy support is crucial to develop and sustain markets and industries
 - Market forces should be used where appropriate, but solutions are individual and no mantras exist.
 - Lots of political, economic and institutional resistance to overcome along with personal perception by many types of actors, so awareness based on solid information is key with credible data on technologies, policies etc....
 - International and regional collaboration essential

Climate change is basically a development issue

- Developing countries are already being affected
- The poorest countries and communities will suffer earliest and most
- Development gains and achievement of the Millennium Development Goals are at risk
- Lower carbon and climate resilient growth offers opportunities for sustainable development with multiple benefits





Water and energy nexus a special challenge - Ghana

- Reduction in rainfall and increased variability
- Impacting on hydro based power production
- Increased need (up to 10 times) for irrigation for food production in semi arid areas
- Creating a dual challenge for
 - Management of water for food and energy
 - Ensuring energy for increased irrigation
- No easy solutions - but increasing efficiency and diversifying electricity supply with gas and RE options combined with increased use of RE for decentralized energy services will be key



Still a long way to go analyzing NAPAs

- 21 out of the 41 LDCs consider food security (irrigation, water control, etc.) as part of first three adaptation priorities in their respective NAPAs
- Achieving food security with changing precipitation will increase irrigation needs and have significant energy needs
- But out of the 455 NAPA projects, only 17 (3.5%) are related to energy sector
- Only one project out of these 17 projects appears as part of top-three NAPA priority projects, so both impacts on energy supply and changing energy needs with adaptation are neglected



Time to act is now – on improving energy access for MDG achievement and enhancing resilience

- Many low carbon energy technologies have become economically attractive for both large and small scale applications and financing opportunities through CDM or new international climate funds can facilitate further access expansion
- Improving access to energy services important for both MDG achievement and increasing resilience for poor families
- Improving energy supply for SMEs and productive uses crucial when traditional livelihood approaches is under “climate threat”



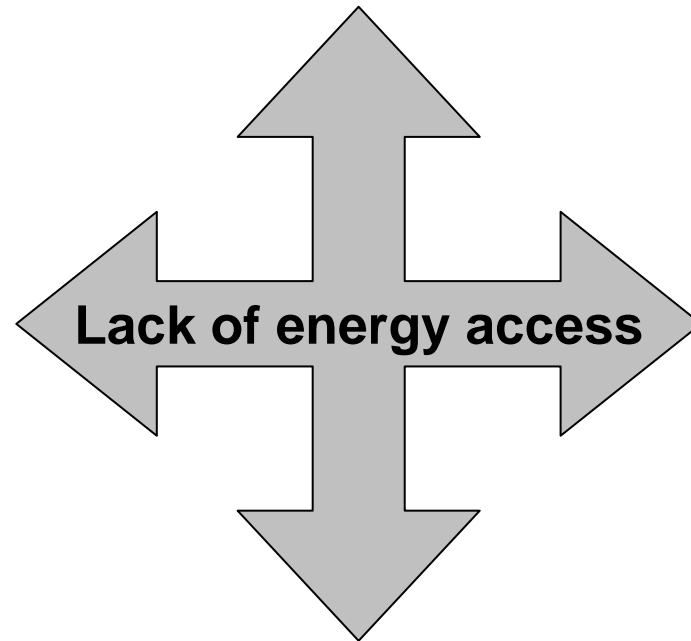
Some areas for research

- Links between energy services and poverty alleviation – social vs productive uses of energy etc...
- Green economy benefit possibilities for rural and peri urban poor and how to design programs to maximize these
- Peri urban energy development options and constraints
- Resource mapping for wind and solar
- Small grid options for rural and peri urban settlements
- Regulatory reform and policy development in support of LCE
- Models for public-private engagement in providing social and productive energy services
- Options for enhanced carbon finance for small scale systems
- Adaptation – mitigation links
- Water and energy
- Gender and empowerment aspects of new energy structures



Constrains delivery
of social services

Increases gender
inequality



Entrenches
poverty

Erodes environmental
sustainability

THANK YOU VERY MUCH