



Clean Energy Access for All

Low Carbon Energy Technologies and Poverty Alleviation

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Clean Energy Access for All - Low Carbon Energy Technologies and Poverty Alleviation

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Danish Development Research Network

Global Network on Energy for Sustainable Development

*PEGNET Conference 2010
DBSA, Midrand, South Africa
2 - 3 September 2010*



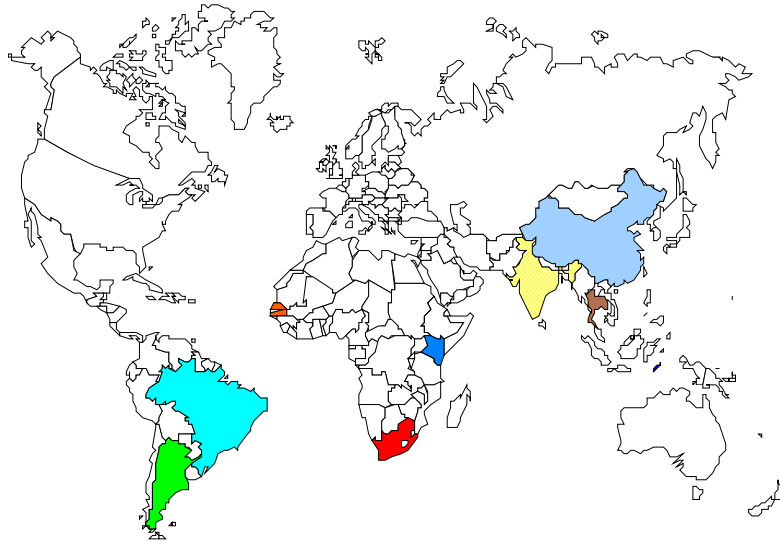


Outline of presentation

- Global Network on Energy for Sustainable Development - GNESD
- Adequate access for the poor remains a global challenge
- Importance of improved energy access for MDG achievement
- **Universal access vision** – UN SG Advisory Group on Energy and Climate Change.
 - What would it take to provide universal access
 - Why a low carbon development focus
- GNESD analysis of RE options and experiences
- Practical examples of African action
- Conclusions and areas for further research



www.gnesd.org



GNESD: A Type II partnership of the WSSD

GNESD Objective:

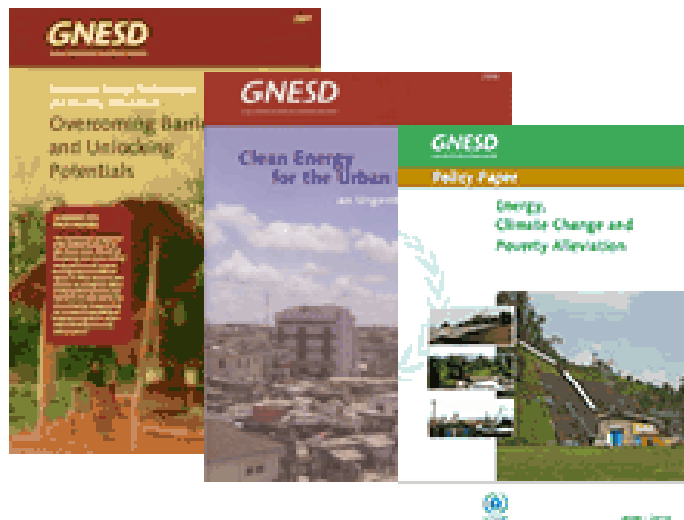
To promote sustainable development and poverty alleviation by expanding the knowledge base about environmentally sound provision of energy services.

GNESD structure

Network of 10 Centres of excellence on energy and development in Africa, Asia and Latin America

Activity areas:

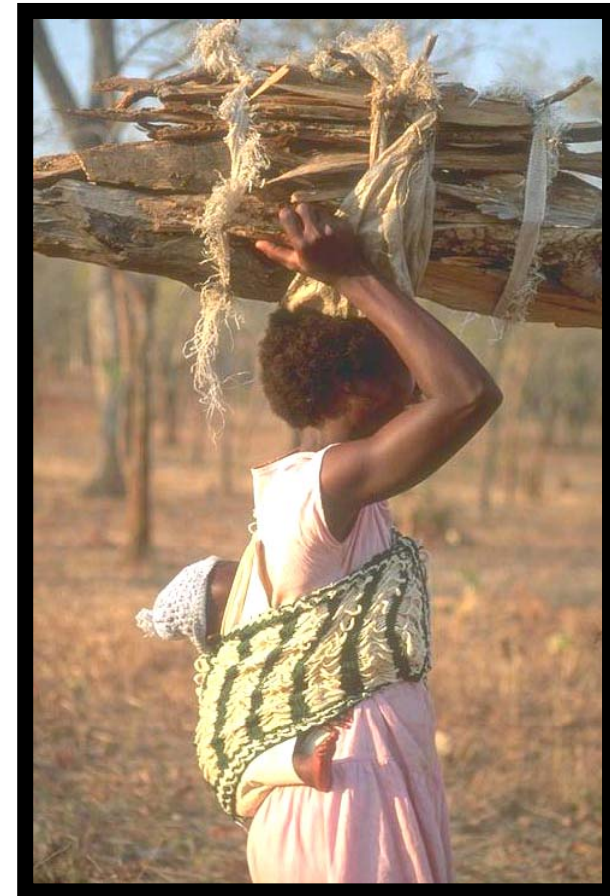
- Power sector reform
- Renewable energy and rural development
- Peri urban energy development
- Role of bioenergy in improving energy access





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

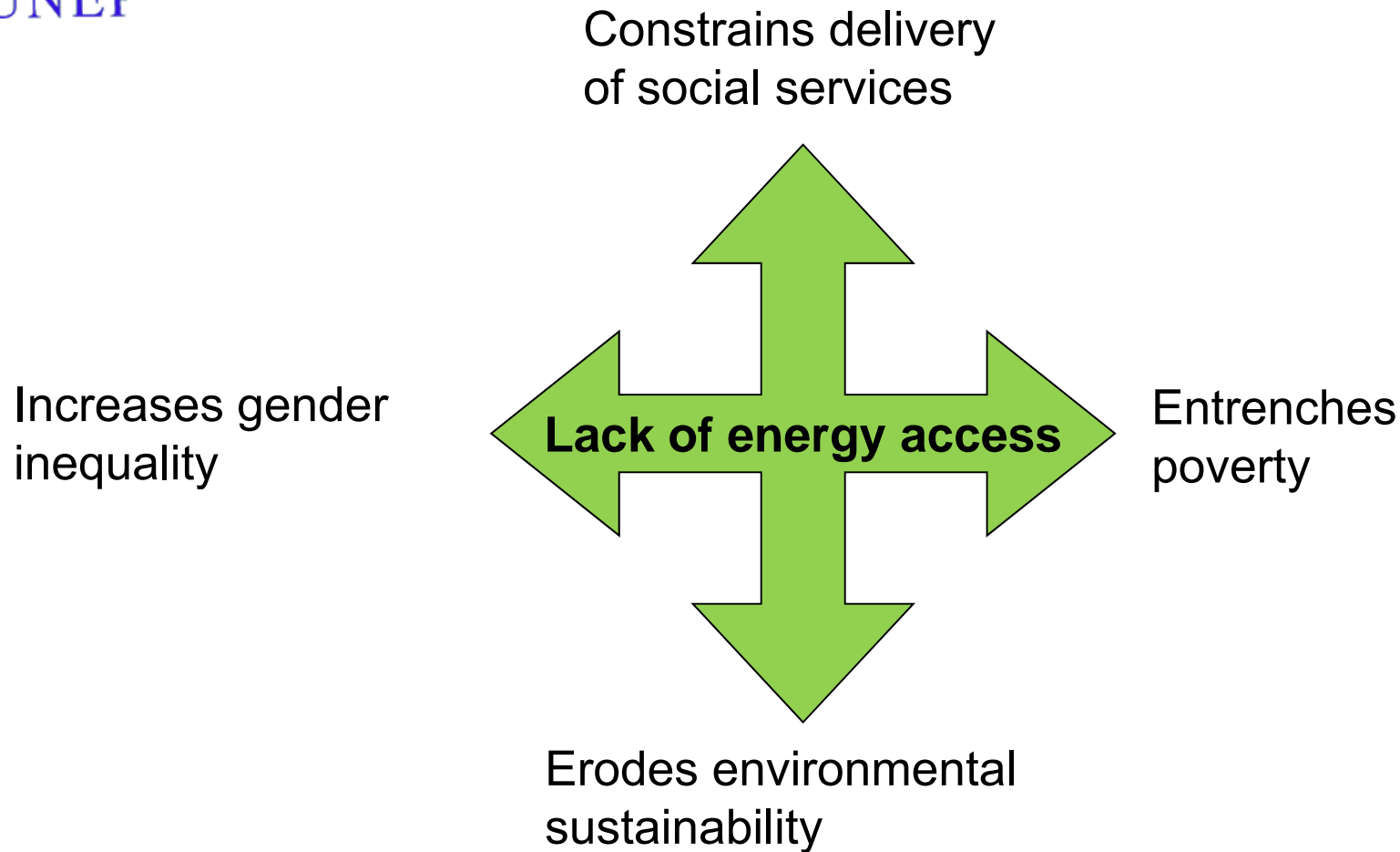




Electrification rates in Africa

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
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



Energy services have a significant role in facilitating both social and economic development. Energy underpins economic activity, enhances productivity, and provides access to markets for trading purposes. It enables fulfillment of the basic human needs of nutrition, warmth, and lighting, in addition to education and health. **Therefore, ensuring energy access to all remains important in order to achieve the MDGs (Millennium Development Goals).**

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.



New global political impetus

What will it take and can it be done?



**THE SECRETARY-GENERAL'S
ADVISORY GROUP ON
ENERGY AND CLIMATE
CHANGE (AGECC)**

**Energy for a
Sustainable Future**

**REPORT AND
RECOMMENDATIONS**

**28 April 2010
New York**

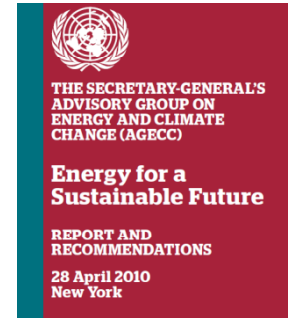
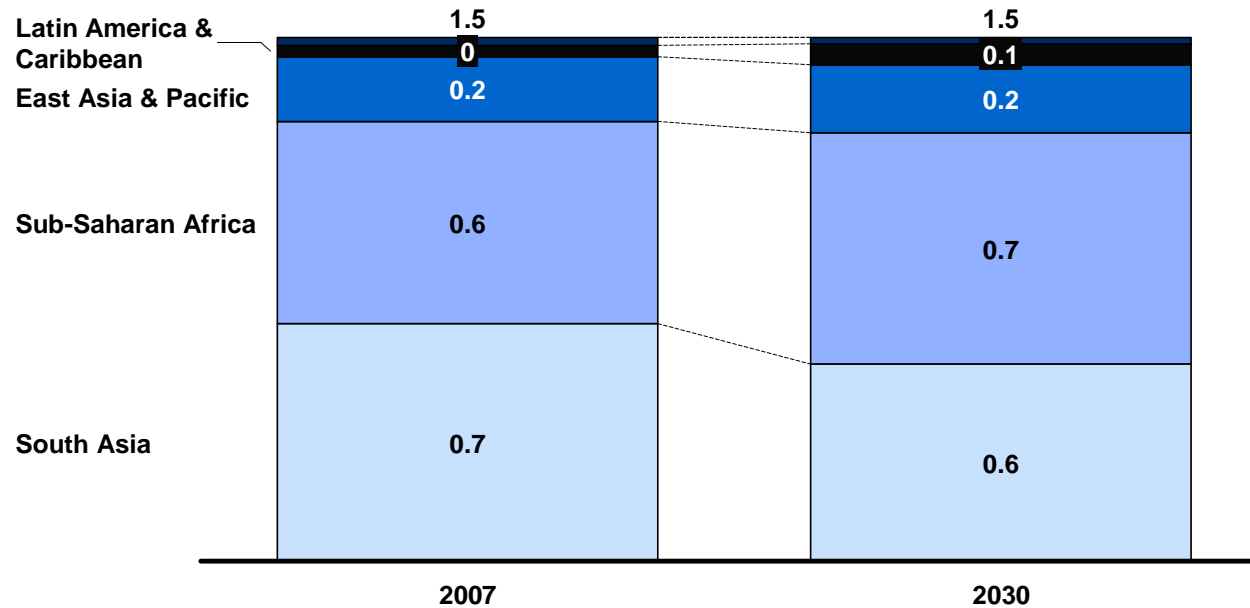
Ensure universal access to modern energy services by 2030. The global community should aim to provide access for the 2-3 billion people excluded from modern energy services, to a basic minimum threshold of modern energy services for both consumption and productive uses.⁶ Access to these modern energy services must be reliable and affordable,⁷ sustainable and, where feasible, from low-GHG-emitting energy sources. The aim of providing universal access should be to create improved conditions for economic take-off, contribute to attaining the MDGs, and enable the poorest of the poor to escape poverty. All countries have a role to play: the high-income countries can contribute by making this goal a development assistance priority and catalyzing financing; the middle-income countries can contribute by sharing relevant expertise, experience and replicable good practices; and the low-income countries can help create the right local institutional, regulatory and policy environment for investments to be made, including by the private sector.



With current efforts the total number will remain quite constant

By 2030, nearly 45% of population without electricity access will be in SSA

Population without electricity access in reference case¹
Billion



¹ WEO 2009 Reference Scenario, access increasing by 5% in all regions other than 15% in South Asia and East Asia & Pacific

Lessons from the 1990s indicate that the scale of universal electricity access challenge is not insurmountable

Average number of households gaining access to electricity
Millions



Implementation had to be done with great speed and intensity:

In the early 90s, **China** was electrifying over 30 villages a day

Viet Nam granted almost 400 people access to electricity per hour for 15 years

South Africa made a new grid connection every 30 seconds, placed a pole in the correct position every 10 seconds and strung 200m of cable every minute



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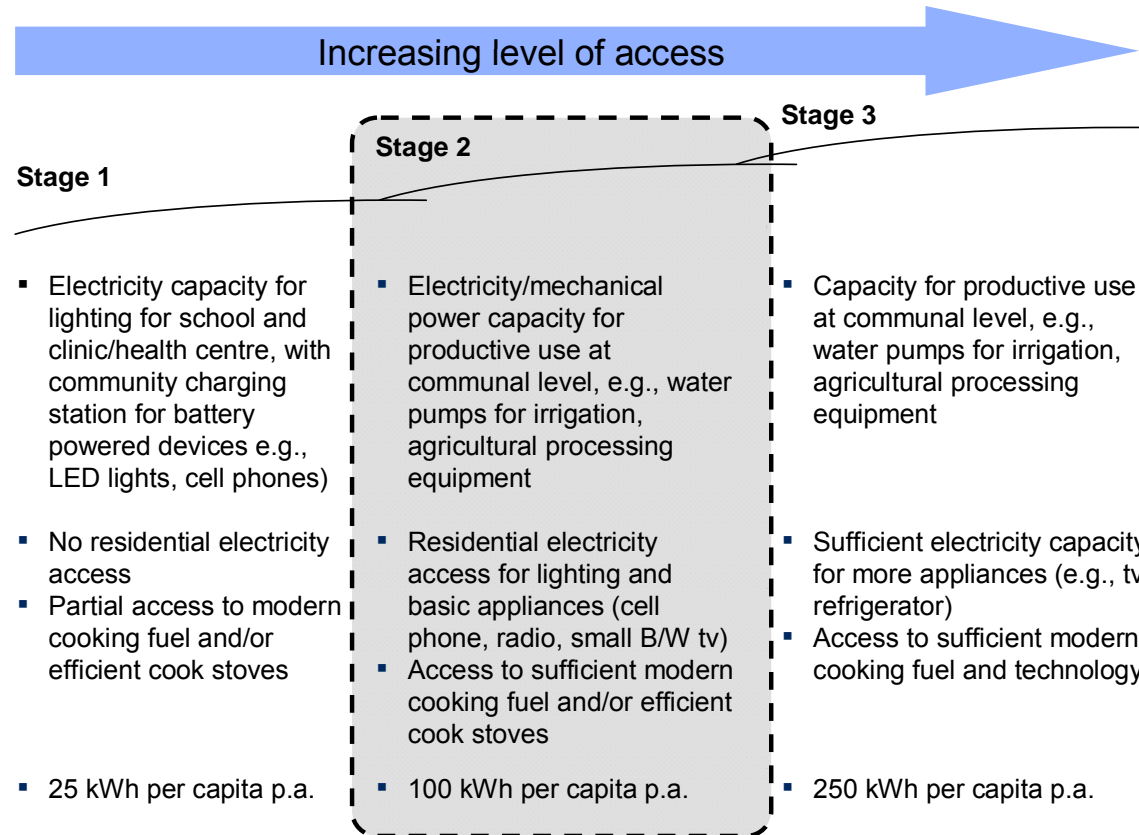
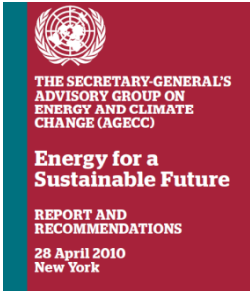
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Energy access can be viewed as incremental

 Suggested minimum level required to meet MDG objectives

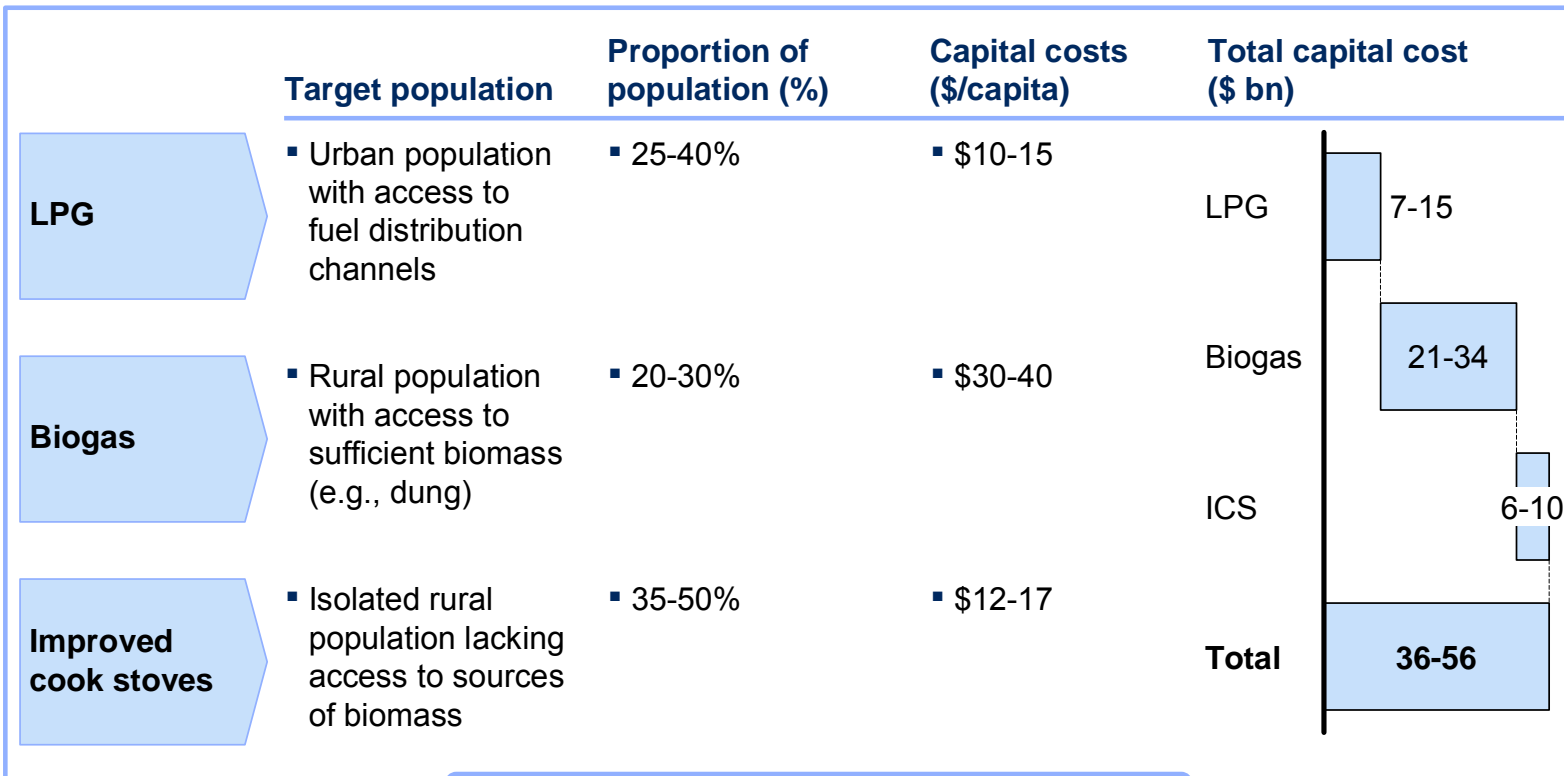


1 Applies UNDP 100 kWh per capita urban and 50 kWh per capita rural assumptions
 2 Improved cook stove



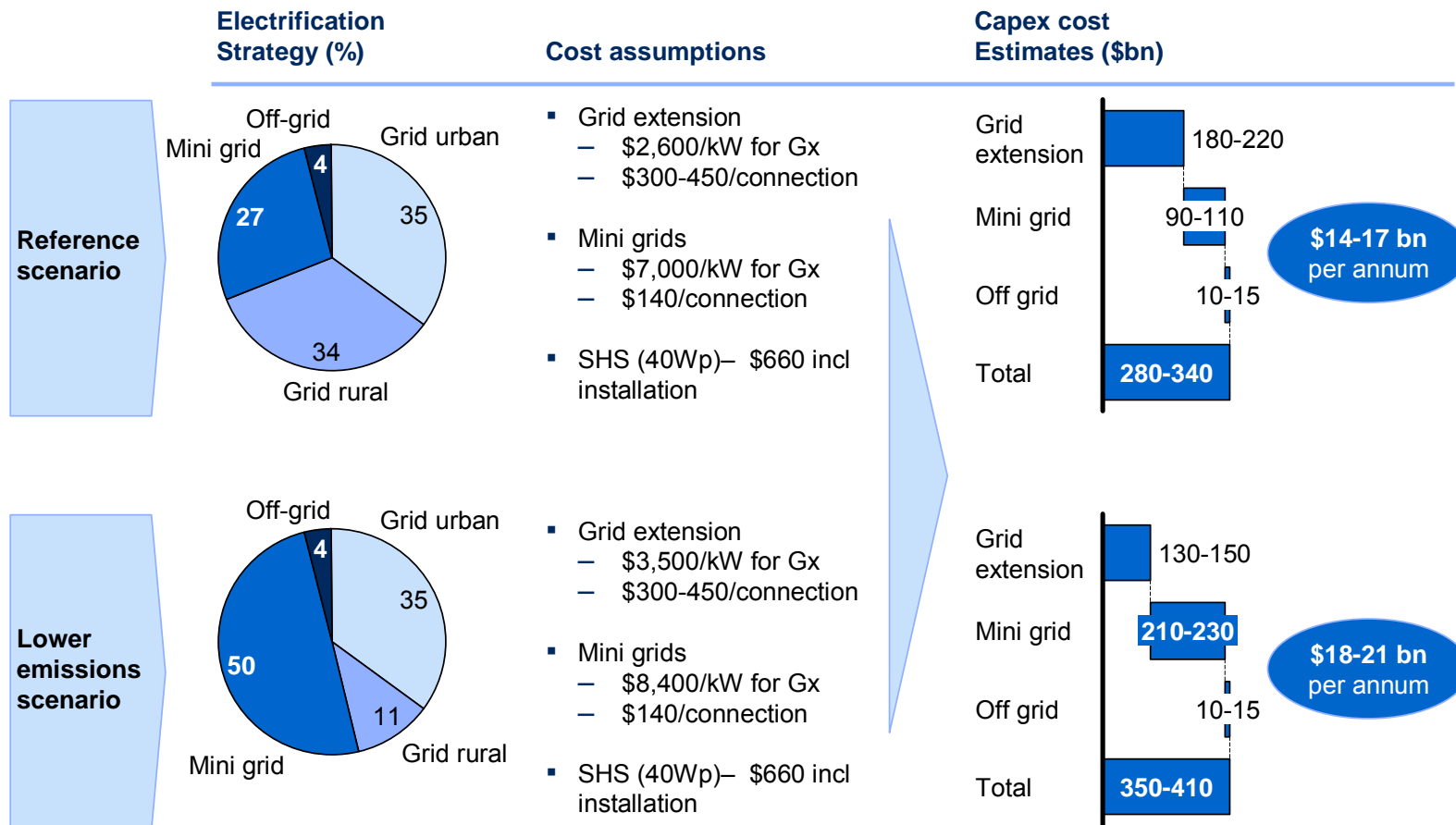

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A 20 year program to close the access gap to modern fuels will require and average investment of \$2-3 bn per year



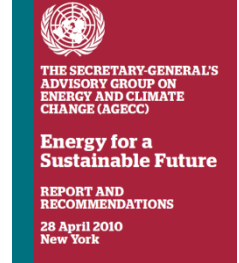
A program to provide 2.8bn people with access to modern fuels by 2030 will require a capital investment of \$2-3 bn per annum

Providing a universal basic level of electricity access will require an investment of \$14-21 bn per year



1 Roads, water supply, fuel supply infrastructure

SOURCE: Iea, UCT, ESMAP, McKinsey analysis



What will it take?

- **Governments need to prioritize energy access and set national targets**
- **Minimize costs to increase affordability**
- **Access to finance to cover upfront capital costs**
 - grant funding of \$15bn per year will be required by 2020 to cover capital costs
 - concessional finance of \$10bn per year will be required by 2020 to provide loan capital to banks and microfinance institutions to fund end user capital requirements
- **Financially sustainable business models**
- **Local institutions, capacities and capabilities need to be developed**



The Global Energy Investment Challenge

- Key numbers from IEA and World Bank
 - US\$ 16 to 20 trillion over next 30 years for energy sector investments
 - US\$ 10 to 12 trillion (60%) for electricity
 - Approx. 5 -6 trillion in DCs/CEITs where risks are perceived as high and private investments declining
 - Stable policy frameworks necessary to attract international finance and local finance needs to be much more engaged
 - Dedicated funding required for an energy access for all target is a small fraction of energy investments, but current national and international resources far from enough
 - New climate funds and carbon markets can help close the gap



Role of Carbon Finance

- Carbon market is only emerging and is still fragmented with the CDM and EU ETS dominating
- RE dominate number of CDM projects but are small on credits
- Market value for CDM during 2008 –12 estimated to be between 2 and 10 billion USD potentially leveraging 5 to 10 times in core investment
- EU ETS crucial for short term market and Post 2012
- Global carbon market in 2008 close to 120 billion \$
- Global Cap and Trade important for longer term and could create a market with 1 – 2 Trillion USD annually



Why Low Carbon Energy Development

- Long term climate rationale – embarking on a new energy development path
 - Short term CC argument is basically not correct
- CC Funds should become 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



Typical barriers to RE expansion

- Lack of policy attention and institutional framework for promotion of RETs,
- Financial institutions are risk adverse and unfamiliar with RETs requiring different financial packages than fossil systems due to high up front investments and low operational cost
- Lack of certification systems for the RETs often resulting in low quality, extending from the equipment itself right through to installation, operation and maintenance.
- Missing capacity at all levels from policy to manufacturing and installation
- Low awareness both in policy institutions and among potential users

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



Results of GNESD studies

- 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 and from other UNEP programs 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)





	Millennium Development Goals (MDGs)				
Energy Technology	Halve poverty	Reduce hunger	Ensure environmental sustainability	Increase gender equality and empowerment	Reduce child mortality
Mechanical water pumping and irrigation technologies	√	√	√	√	√
Low cost efficient hand tools and animal drawn implements	√	√	√	√	√
Solar dryers	√	√	√	√	√
Improved biomass Cook stoves	√	√	√	√	√
Pico and micro hydro	√		√	√	√
Solar water pasteurisers			√	√	√

Some examples from UNEP work

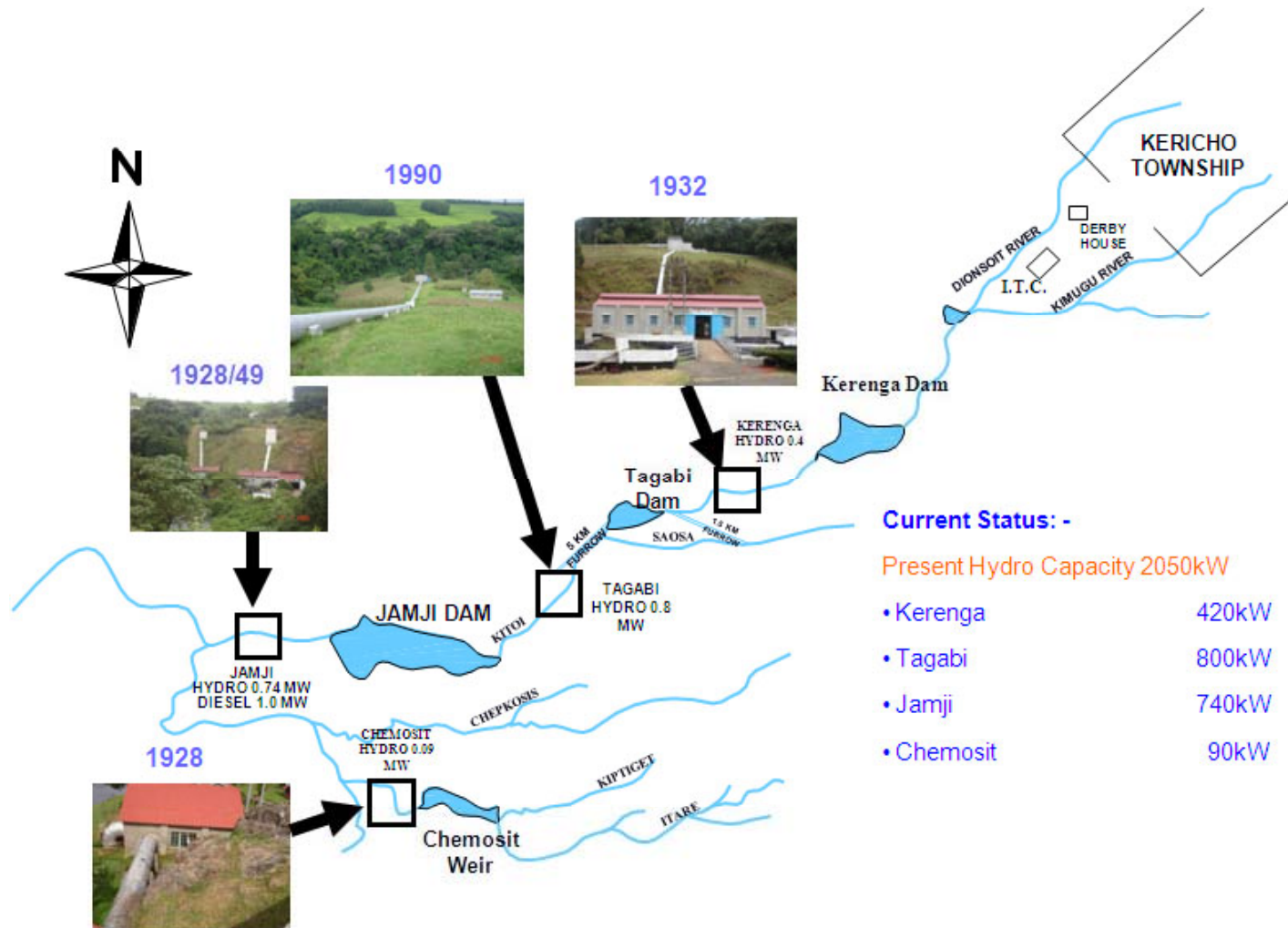
- Local mini grid
- SME development
- Engaging the finance sector
 - SME
 - Consumer lending
- Carbon finance

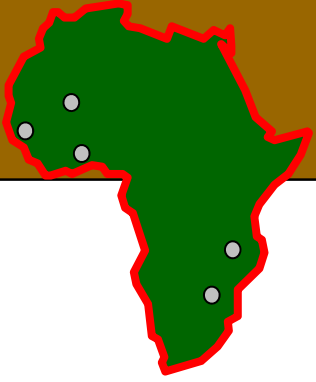




Greening the Tea Industry in East Africa

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.

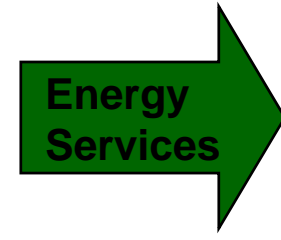
SME Energy Enterprise Development

**Enterprise
Development
Services**

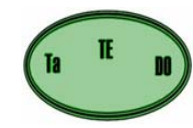
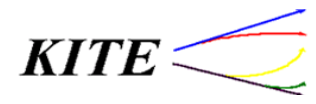
**Seed
Financing**



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.

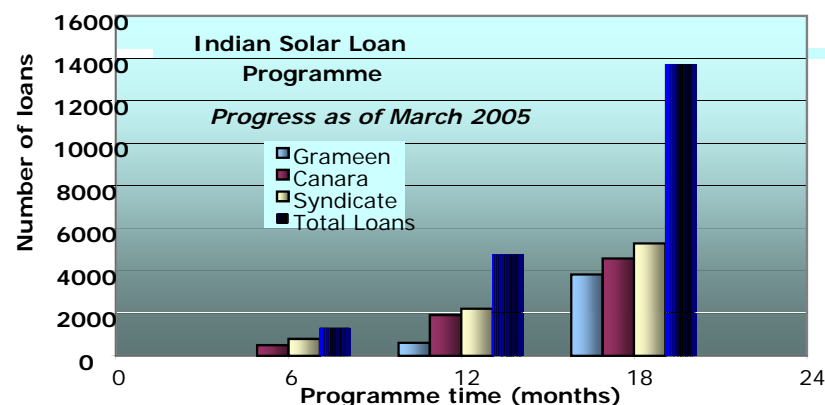
KPBS, Zambia

- **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



**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





CDM examples

Kuyasa low-cost urban housing energy upgrade project, South Africa

Insulated ceilings; Solar Water Heater installation; and Energy Efficient Lighting. Validated as qualifying for the "Gold Standard".





Solar PV drinking water disinfection in Rwanda

Will provide bacterially decontaminated water safe for drinking, food preparation and personal hygiene at two sites in rural Rwanda.



Figure 6: Typical Water Boiling in Rwanda



Partial Substitution of Coal by Jatropha Fruits and Biomass Residues in the Production of Portland Cement in Rwanda.

Substitution of Diesel for truck transport in Zambia



6 MW Bagasse Based Cogeneration Project in Nyanza, Kenya



Heaps of bagasse behind the factory premises



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



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



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 climate resilience for poor families
- Improving energy supply for SMEs and productive uses crucial when traditional livelihood approaches is under “climate threat”



Some areas for further 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