



# Development of Clean Development Mechanism Projects in Tanzania

## Lessons Learnt

Presentation at the  
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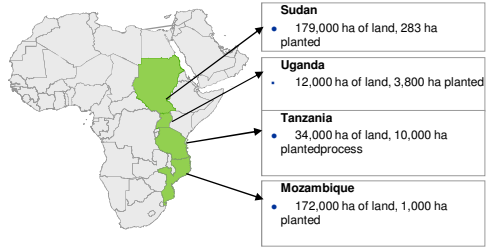


## Green Resources at a glance

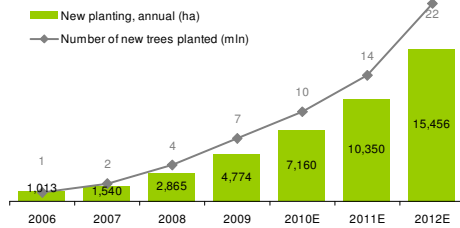
### Green Resources AS among the leading afforestation company in Africa

<b>Afforestation</b>	14,000 ha of forest plantations and over 610,000 ha land under process for future planting and conservation
<b>Industrial operation</b>	East Africa's largest sawmill and one of the largest transmission pole producers; carpentry and joinery plants
<b>Carbon offsets</b>	A leader in forestry derived greenhouse gas emission reductions with the first verified carbon credits received in 2000
<b>Renewable energy</b>	15MWe CHP plant, Industrial charcoal production and development of wood pellet projects in Africa

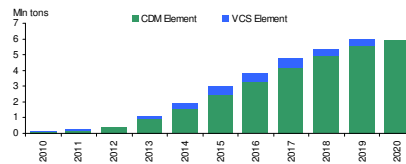
Green Resources operates in 4 countries and employs ca. 3,500 people

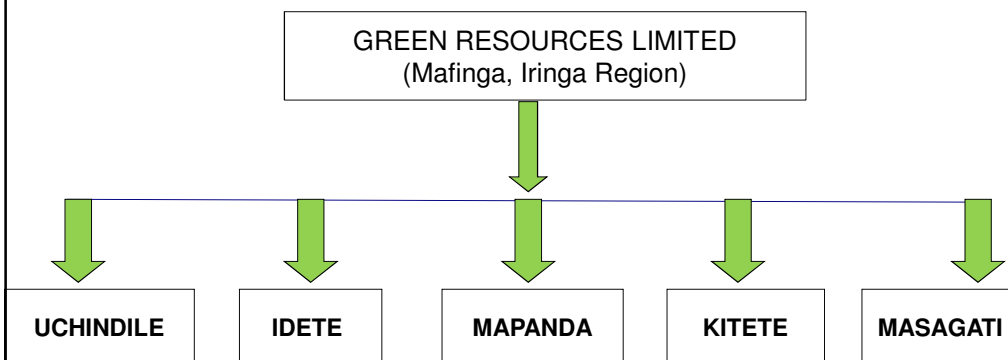
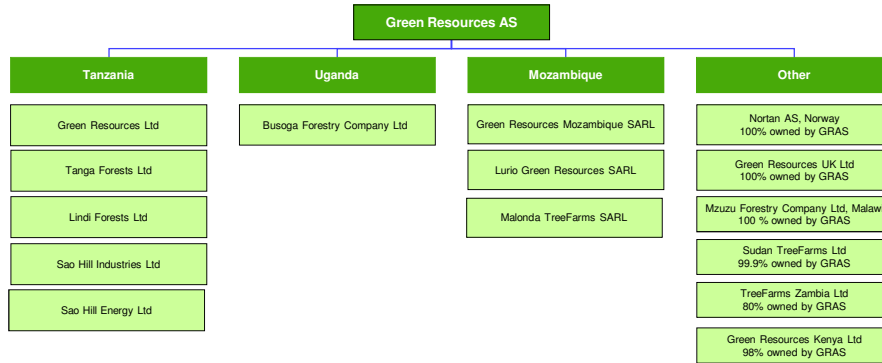


### Strong growth in planting operations



### Potential C revenues from projects underway





- Other afforestation projects in **Tanga** and **Lindi**

### Sawn timber and joinery

- **Purchased new small and medium log sawmill for pine and eucalyptus**  
- First sawmill of its kind in East Africa – 4 exist in South Africa and Swaziland
- **Acquiring dry kilns to produce high quality dried timber**  
- Raw material for quality local timber, value added products and local joinery and furniture producers
- **Expand door and component production for joinery and furniture industries**  
- Huge potential for value added export industry,

### Transmission poles

- **Building African leadership in transmission poles based on quality and capacity**  
- Large fast growing rural electrification
- **Largest pole treatment facility in Tanzania, building factory in Uganda**

### Energy

- **Charcoal: simple but important**  
- Replacing mineral coal at Mbeya cement. Purchased briquetting factory to be installed in 2010
- **Combined heat power plant, producing energy from waste products**  
- Providing secure electricity and heat
- **Wood Pellets from saw mill waste**  
- Planned for 2011

### Panel Boards

- **Evaluating options for MDF and chipboard factory at Sao Hill**  
- Become quality leader in fast growing East African market, converting all waste material into high value products
- **Rationale: convert waste into a fast growing market for building products.**

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**Green Resources received NOK 1 209 335 (USD 220 000) Support by the Royal Norwegian Embassy of Dar es Salaam**  
In March 2008, to conduct studies on the possibility of developing above CDM potential projects in Mafinga, Mufindi District, Iringa Region, Tanzania.

1. Utilization of forest residues from harvesting sites and sawmill residues to generate clean renewable energy.
  - Assess feasibility of developing two CDM projects "2 MW CHP" and "10 MW CHP";
  - Prepare the necessary Project Design Documents (PDDs) for such projects in accordance with the rules and guidelines of the CDM Executive Board (EB);
  - Carry out Social and Environmental Impact Assessments (SEIA) of each.
2. Avoidance of negative environmental impacts of saw mill residue handling by producing clean renewable energy bio-products: charcoal and saw dust briquettes.
  - Assess the development of these as CDM projects.



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### Primary energy source a major cause of deforestation:

- Deforestation accounts for 55% (4million hectares) of the annual global forest loss.
- 20% of the recent rise in CO<sub>2</sub>e in the atmosphere globally through burning (shifting agriculture).
- In Tanzania and Uganda 15% and 25% respectively of forest has been lost since 1990.
- Presently, primary energy source for the majority of Tanzanians remains to be firewood and/or charcoal from natural forest. This is a leading cause of deforestation of natural forest in the country.

**Availability of Wood Residues in Mufindi District – Opportunities for CDM projects:** Biomass waste available to-date in the Southern Highlands calculated to be 350,000m<sup>3</sup>/a of forest and sawmill residues, the amount growing to more than 430,000m<sup>3</sup>/a by 2015.

### Sao Hill Forest Project – key source of residues:

- Government owned Sao Hill Forest Plantation (SHFP), the largest forest plantation in East Africa with approx. 65,000 ha, out of which 41,604 ha planted mainly with pine (85%) and eucalyptus (15%). Managed under Ministry of Natural Resources and Tourism under the Forestry and Beekeeping division.
- Total annual allowable cut (AAC) of 1 million m<sup>3</sup>, with approx. 75% utilization. (SHI, MPM, Smaller sawmillers)
- Overall industrial utilization of the wood harvest estimated at 30% (i.e. total waste amounts to 70% of total harvest).
- Firewood and wood used by tea factories, MPM boilers and private uses, estimated to account for up to 10% of the annual harvest. Remaining 60% is wasted, burnt or left to rot. Includes sawdust, slabs from saw mills, and crocked, out-sized and decaying logs in the harvested areas.
- Additional 15% of the total biomass as harvesting waste: branches, tree tops, etc

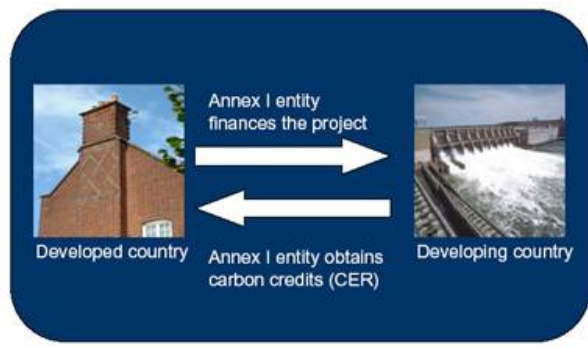
**Own source of forest residues:** Thinning available from GRL plantations estimated at 12,800m<sup>3</sup>/a in 2012 growing to 41,477m<sup>3</sup>/a in 2017 with assumption that 40% of the thinning can be recovered as forest residues.

### Sawmill Residues

- 160,000m<sup>3</sup>/year of sawmill residues generated in the southern highlands area (including those produced at SHI). Waste includes sawdust, off-cuts, and slabs.
- Disposal is in stockpiles occupying large areas and polluting local environment.
- Severe fire risk of spontaneous combustion of sawdust. Decay of stockpiled wet residues leads to methane emissions, a potent GHG.
- **First CDM opportunity** – Utilization of forest residues combined with sawmill residues to produce renewable energy through a 15 MWe CHP plant, utilizing approx. 200,000m<sup>3</sup>/year
- **Second CDM opportunity** – Avoidance of methane emissions through utilization of waste to produce charcoal, charcoal briquettes, wood pellets.



- The purpose of CDM is to provide support to Non-Annex 1 Parties (such as Tanzania) in **achieving sustainable development through the implementation of project activities** and to contribute to the ultimate objectives of the UNFCCC.
- Successful implementation of CDM activities will attract capital investment to Tanzania. Main benefits include: Sustainable industrial development, poverty reduction through improved and increased rural income, employment opportunities to the communities, availability of affordable energy sources to the rural communities, improvement of social services such as education, health, etc., as well as enhancement of technology transfer and development.



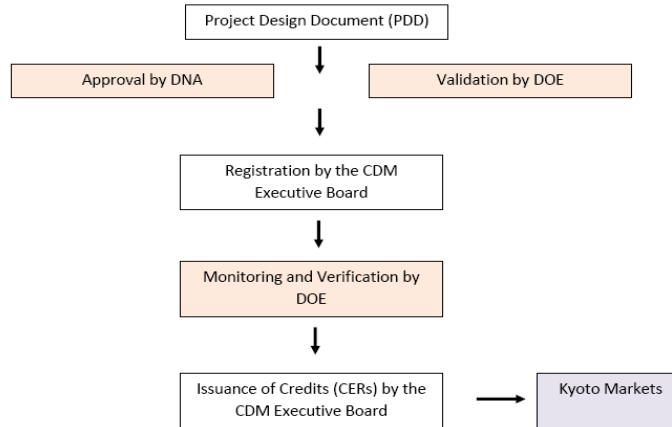
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- Tanzania CDM guide for investors provides a list of the 'Approved interim CDM projects that can apply in Tanzania', the first one being 'renewable energy project activities with maximum output of up to 15MWe'. The following are among the sustainable development criteria for CDM acceptability in Tanzania.
  - Compatibility with national sustainable development including, ecological and social dimensions
  - Consistency with the national agenda on poverty eradication
  - Congruence with the national environmental policy and related action plans and strategies
  - All CDM activities require Special and Specific EIA, consistent with the national EIA guidelines and procedures and the national environmental legislation
  - Energy projects particularly in rural areas are accorded the highest priority
  - There must be a partnership between investor country company and the host country local private company, NGO, Research /Academic Institutions or government.
- The DNA of Tanzania is the Vice President's Office, Division of Environment. The DNA is responsible for certifying that the project contributes to the sustainable development goals and meets the national development priorities of Tanzania, by coordinating the agencies responsible for setting suitability policies, environmental and investment regulations, and the organizations involved in CDM project development. This takes place in the form of a letter stating approval of the CDM project.

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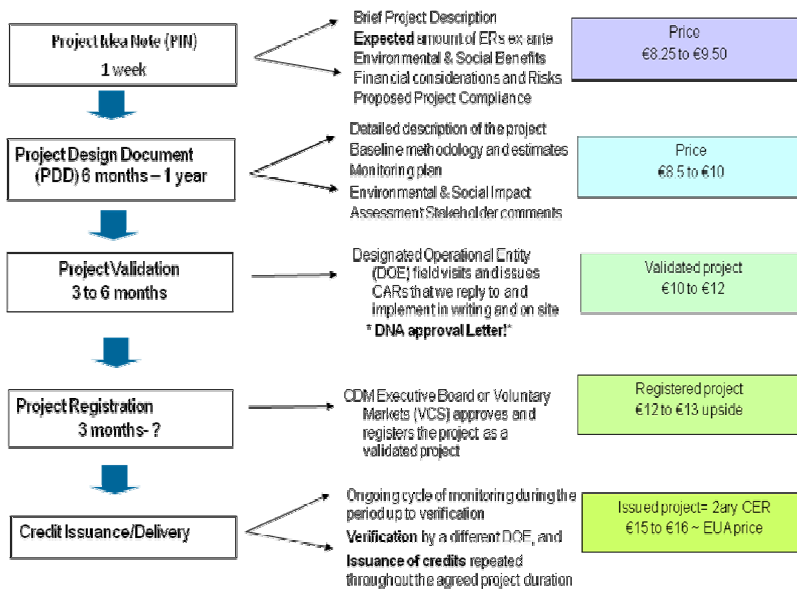
## CDM Project Cycle – Simplified

Prior to writing a PDD, a PIN may be written and submitted to the DNA for a letter of no objection (LoNO).



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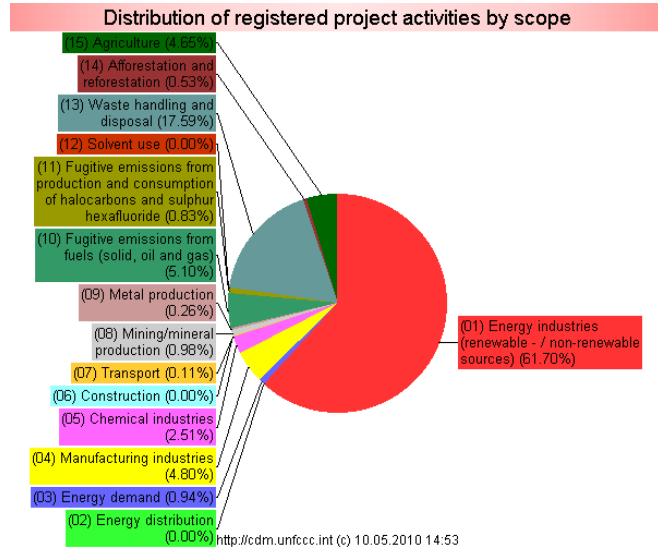
## CDM Project Cycle (2 years min.) – with 2009 prices



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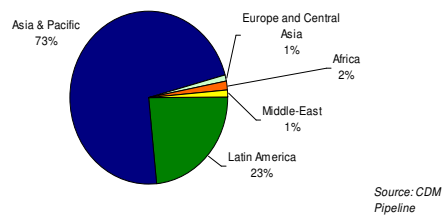
## Registered CDM Project Activities by Scope

Total of 2,201 registered CDM projects to-date out of which 62% energy projects. Total issued CERs of 363million, expected to rise to >1.78billion by end of 2012. Tanzania: 1 CDM approved land-fill gas recovery project.

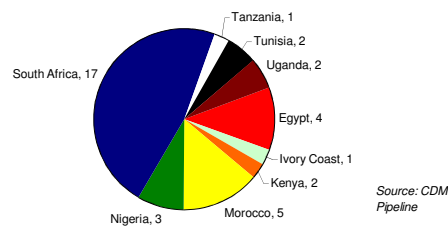


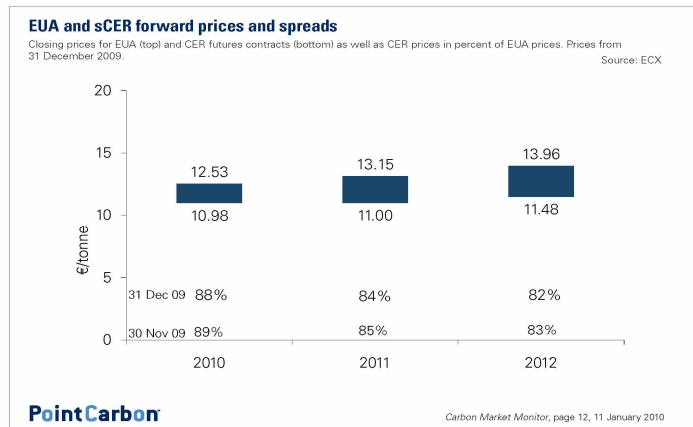
## Beneficiaries of the carbon market

### Location of Registered CDM Projects Worldwide



### Location and Number of Registered CDM Projects within Africa





**Basic technical data**

Capacity	MWe	15
Total generation capacity	MWh/a	131,400
Annual operating hours	h	7,737
Maintenance stops		4%
Gross electricity output based on operating hours	MWh/a	116,052
Net electricity output after internal consumption	MWh/a	100,966
Transmission losses		1%
Output after transmission losses	MWh/a	99,956
Fuel to electricity efficiency		23%
Steam sales to SHI	MWh/a	38,684
Total energy output (electricity + steam)	MWh/a	138,640
Biomass fuel input	GWh/t	516
Heat value of biomass mix	MWh/t	3.03
Average moisture content of biomass mix		38%
Average biomass fuel mix density	t/m <sup>3</sup>	0.80
Biomass fuel need in moist. tons	m <sup>3</sup> /a	170,495
Biomass fuel need in moist solid cubic meters	m <sup>3</sup> /a	213,119

- Green Resources fired up its first Katugo kiln at Sao Hill, Tanzania in October 2007 (top picture; below is a traditional kiln). This is an efficient kiln with 30% efficiency compared to <15% in traditional earth kilns. Currently: 12 kilns, 8ton every 2 weeks.
- Investing in East Africa's first wood based charcoal briquette factory in 2010:
  - fully automated briquetting factory shipped from supplier to Sao Hill in September 2009
  - replacing imports in the higher-quality retail market.
  - and, making charcoal for the mass market.
- Charcoal is extensively produced from eucalyptus in Brazil, and represents an important new market for wood waste in the Southern Highlands.
- Deforestation is the single largest source of carbon offsets in the world. Charcoal burning and shifting agriculture drives deforestation in Africa. Supply of charcoal from sustainably grown forest is a pre-requisite to stem deforestation.
- Future development of a CDM project by producing briquettes or pellets from sawdust.



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**1. Selection of appropriate applicable methodologies:** Important first step towards writing a PDD. Limit of CDM renewable energy projects that can use the simplified small scale PDD methodology is 15MW<sub>el</sub> or 45MW<sub>th</sub> capacity from one project owner in one site. For the CHP project, the following methodologies were applied from Sectoral Scope 1: Energy Industries (renewable – non renewable sources). Type I: Renewable Energy Projects. AMS I.C: '*Thermal Energy generation with or without electricity*' and AMS I.D.: '*Grid connected renewable electricity generation*'.

**Lessons learnt:** Tanzania lacks the experience in developing such PDDs. The process is long and complicated, and needs a thorough understanding of the different methodologies before applying them to a specific project. Hiring external consulting is expensive and therefore limits the development of such projects. In the case of this project, the PDD was developed by Energy Changes of Austria at the cost of EUR 30,000.

### 2. Calculating the Grid Emission Factor for Tanzania

The national combined margin grid emission factor (GEF) is used as the basis for calculating Emission Reductions (ERs). The GEF was calculated as per UNFCCC guidelines, using TANESCO hourly generation data over a three year period (in this case 2006, 2007 and 2008).

**Lessons learnt:** While the AMS I.C methodology provides a '*Tool for calculating the grid emission factor*', this requires extensive knowledge on how to apply the data and the formulae. GRAS calculated a Tanzania GEF of 0.586 tCO<sub>2</sub>/MWh (compared to 0.50 tCO<sub>2</sub>/MWh as published by the UNEP RISØE). Using this factor, the 15MW CHP project will generate an estimated 374,875 tons of CO<sub>2eq</sub>. (CERs) over the first seven year crediting period.

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### 3. Demonstrating Additionality

According to the simplified modalities and procedures for small scale CDM project activities, project participants shall provide an explanation to show that the project activity would not have occurred anyway due to at least one of the following barriers: Investment, Technological, Prevailing Practice such as existing regulatory or policy requirements, or Other barriers such as managerial, institutional, finance, etc.

**Non-binding best practice examples to demonstrate additionality for small scale project activities** the **Access-to-finance barrier**: is defined as: *'the project activity could not access appropriate capital without consideration of the CDM revenues'*. Best practice examples include but are not limited to, the demonstration of limited access to capital in the absence of the CDM, such as a statement from the financing bank that the revenues from the CDM are critical in the approval of a loan.

**Lessons learnt:** The limit for CDM financing is a profitability not exceeding 15%, which may limit the development of new small scale renewable energy projects in developing countries such as Tanzania. The structure of development of small power projects in Tanzania, with an export capacity not exceeding 10MWe to the main grid, is based on a tariff structure that is regulated and annually revised by the Energy and Water Regulatory Authority (EWURA). The tariff paid to developers is in Tanzanian Shillings, while project financing is in a large part through foreign loans. This is an additional risk to the development of a project. For the Green Resources' CHP project, carbon financing will provide the additional funds needed to make the project viable. The International Finance Corporation (IFC) is providing loan financing to the proposed project, with the condition that revenues from CDM are critical in the approval of financing.

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### 1. Background Studies/ Achievements:

GRAS began background studies in May 2008 (on-going process)

- May/June 2008: DAPROMA AS (Sweden) conducted a fibre study of the southern highlands.
- Dec. 2008 – April 2009: Further analysis (verification) of the amount of wood biomass availability in the Southern Highlands. Total: 430,000m<sup>3</sup>/a, out of which 212,000m<sup>3</sup>/a for CHP
- Nov. 2008 – Apr. 2009: ESIA for the proposed CHP project was conducted according to the national environmental guidelines and CDM guidelines.
- Nov. 2008: Conceptual Design report and tender documents completed by Pöyry Energy Oy (Finland)
- Nov. 2008 & May 2009 (dry & wet season): Wood samples tested in Sweden lab. Av. Moisture content 35 – 40% with heat values of 3.17 – 2.58 MWh/t
- Jun. 2009: Received approval for loan financing by the IFC, with condition that the revenues from CDM are critical in approval of financing.
- Nov. 2009: EIA certificate for the CHP project was awarded by Minister for Environment
- Feb. 2009/ Jan. 2010/ Apr 2010: Visits to potential plant suppliers (Chinese, Indian, European)
- Jan. 2010: Hired experienced project management – having looked since Jan. 2009
- Feb. 2010: Signed a SPPA with TANESCO for 10MWe. Process initiated in April 2009.
- Apr. 2010: Load flow analysis of the Mufindi Mgororo grid network
- Apr. 2010: Soil Analysis done by Dar es Salaam Institute of Technology
- Future studies to include: Air emissions, acoustics study (May 2010)

**Lessons learnt:** Prior to starting a CDM project, it is important to gather as much information as possible to ensure project sustainability and contribution to long term sustainable development in the host country. In this case, the wood supply chain has to be in place, project financing has to be in place, sale of electricity has to be reliable, strong project management and experienced staff is equally important.

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### 2. Process towards Project Approval:

Requires:

1. Country approval or letter of approval (LoA) by country DNA is a pre-requisite to final registration. It should be noted that currently, there is only one landfill gas recovery registered CDM project in Tanzania. The good news is that renewable energy projects with generation capacity not exceeding 15MWe are highly encouraged in Tanzania as CDM projects.
2. Validation by a Designated Operational Entity (DOE), a domestic or international entity accredited by the CDM EB to conduct validation of projects, verification and certification of ERs, to maintain a list of CDM project activities and to make public information about CDM projects unless deemed confidential by project participants.

**Lessons learnt:** i) DOEs are very few considering the enormity of the CDM projects. Secondly, they are only allowed to validate certain sectors, and therefore finding a DOE for the energy sector, with a slot of time is difficult. A DOE will give up to six months before being available to validate a project. The cost is prohibitive (> Euro 15,000 for this project with additional costs for further visits), ii) With only one registered CDM project in Tanzania, it can be concluded that Tanzania has very little experience of this type of projects, iii) While GRAS submitted a PIN for the CHP project in 2008, a 'letter of no objection' (LoNO) from the DNA has yet been obtained. This shows slowness in speeding up the growth of similar projects in the country, iv) Tanzania has not submitted the national grid emission factor to the UNFCCC, so this needs to be calculated by a project developer. Since the sources for power generation change each year (energy mix of hydropower, gas and diesel/HFO), monitoring of the calculations will have to be done every year to justify or re-calculate the estimated CERs. v) It is important for a country to develop a CDM guide that promotes projects that are practically applicable and provide long term sustainable benefits to Africa.

### 3. Process towards Looking for Buyers and Price Negotiations:

It is expected that the CHP plant will produce an average of 53,554 tons of CERs per year over the first seven years crediting period (2012 to 2018). Preliminary discussions with carbon credit buyers started in January 2009 with an objective to reach an agreement for the sale of all carbon credits generated through 2020. But Who are the buyers? How does a project developer enter the Carbon Markets? Can a project developer receive payments before project completion? How does a developer negotiate for the right price? What is the right price according to the project type? What are the legal requirements for an ERPA? How does a developer sell the right to purchase CERs (Options agreement)?

These are some of the few challenges which Green Resources' faced when looking for buyers.

**Lessons learnt:** i) It is important to get a PDD validated and it is equally important a project is approved by the country DNA. The value of the CERs becomes infinitely much more and increases the negotiating power for the project developer. ii) Securing buyers who are willing to: a) pay for the real value of a project, b) provide up-front payment, c) consider security against up-front payments based on an African insurance firm/ bank, etc. is not an easy process, and requires knowledge of the markets, prices, buyers, need for type of project, etc. iii) In addition, the process of project financing is not easy, it is long, and may involve brokers, a process which may confuse project developers, or even be a barrier to the process towards developing a CDM project.

### 4. Process towards Project Monitoring

Important in order to ensure sustainability of the project, with occasional verification visits. As an example, the simple operating margin, national grid emission factor, net calorific values of the fuel source, and a number of other calculations/assumptions/figures etc. will need to be monitored throughout the lifetime of the project.

**Lessons learnt:** While monitoring is important, it may turn out to be an expensive process and require full time expertise of a person with good knowledge of the CDM Tools and Methodologies. The advantage of the process is that capacity is built within the organization each year. And this knowledge can be transferred and shared with other project developers in the country.

## Contribution towards sustainable development

Sustainable development is not only about profit, but also people, the communities and the planet = optimized economic, social and environmental performance. The investments meet project objectives and goals of The Tanzania Development Vision 2025 and the National Strategy for Growth and Reduction of Poverty (MKUKUTA).

### Socio-economic benefits

### Environmental benefits

- **500 jobs: construction and 50 permanent positions. Indirect: 5,000**  
- Both in the form of skilled and un-skilled labour, first priority to locals. Increase quality of life. An affirmative action employer, promoting women and other minorities
- **Increased access and opportunities to education, health facilities, clean water, better housing, and a safe environment.** : - Help building the local middle class, improve survival, health and well-being of children and women,
- **Purchase of 17 – 19,000m<sup>3</sup> per year from small holder farmers and saw millers**  
- New income and positive effect on small business activity in the region.
- **Utilization of 200,000m<sup>3</sup>/a of residues. Increased economic activity**  
- Promote local transport companies, canteen, housing, banking, retail trade, etc.
- **Training of local staff in new technologies:** - Promote local knowledge
- **Contribution towards Rural Electrification:** - Estimated >10,000 new connections
- **Facilitate development of industrial operations through steam provision**
- **Provide clean reliable 10MW electricity to the national grid**
- **Payment of Statutory :** - Pension for workers at all levels, contribution to Government income
- **Contribute to global fight against GHG emissions**  
- Efficient generation of clean, renewable energy while complying with national and international reg.
- **Avoidance of methane emissions from wood waste decay by charcoal production**
- **Production of charcoal from sustainably managed forest as the only way of fighting deforestation**  
- The demand for charcoal will not disappear, but must be satisfied from sustainably grown forest
- **Produce value added products from forest and sawmill residues**

## Conclusion

The CDM process aims to provide support to countries such as Tanzania in achieving sustainable development through the implementation of project activities and to contribute to the ultimate objective of the UNFCCC. CDM activities will therefore attract capital investment to Tanzania and bring growth and knowledge of climate change as a whole. While the process is possible and profitable for the nation as a whole, it is long, expensive and requires knowledge, expertise and a lot of patience. At present, very little, if any, local familiarity with the CDM exists in Tanzania. Working with both the private and public sectors will assist in building awareness on the opportunities and challenges in the CDM market. But also build capacity within the country in order to promote more project development for future CDM activities in Tanzania and Africa as a whole.

### The road to issuance.....

