



**CEHEEN**

**CENTRE FOR HOUSEHOLD ENERGY AND ENVIRONMENT**

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## POVERTY IN THE MIDST OF PLENTY IN THE NIGER DELTA



- Oil is Nigeria's major revenue earner
- The Niger Delta accounts for Nigeria's total oil production
- Nigeria is the World's 6<sup>th</sup> largest producer
- 80% of the population of 5 million are energy poor; living on income of less than 1\$ per day
- Majority of the households lack access to quality cooking and lighting fuel



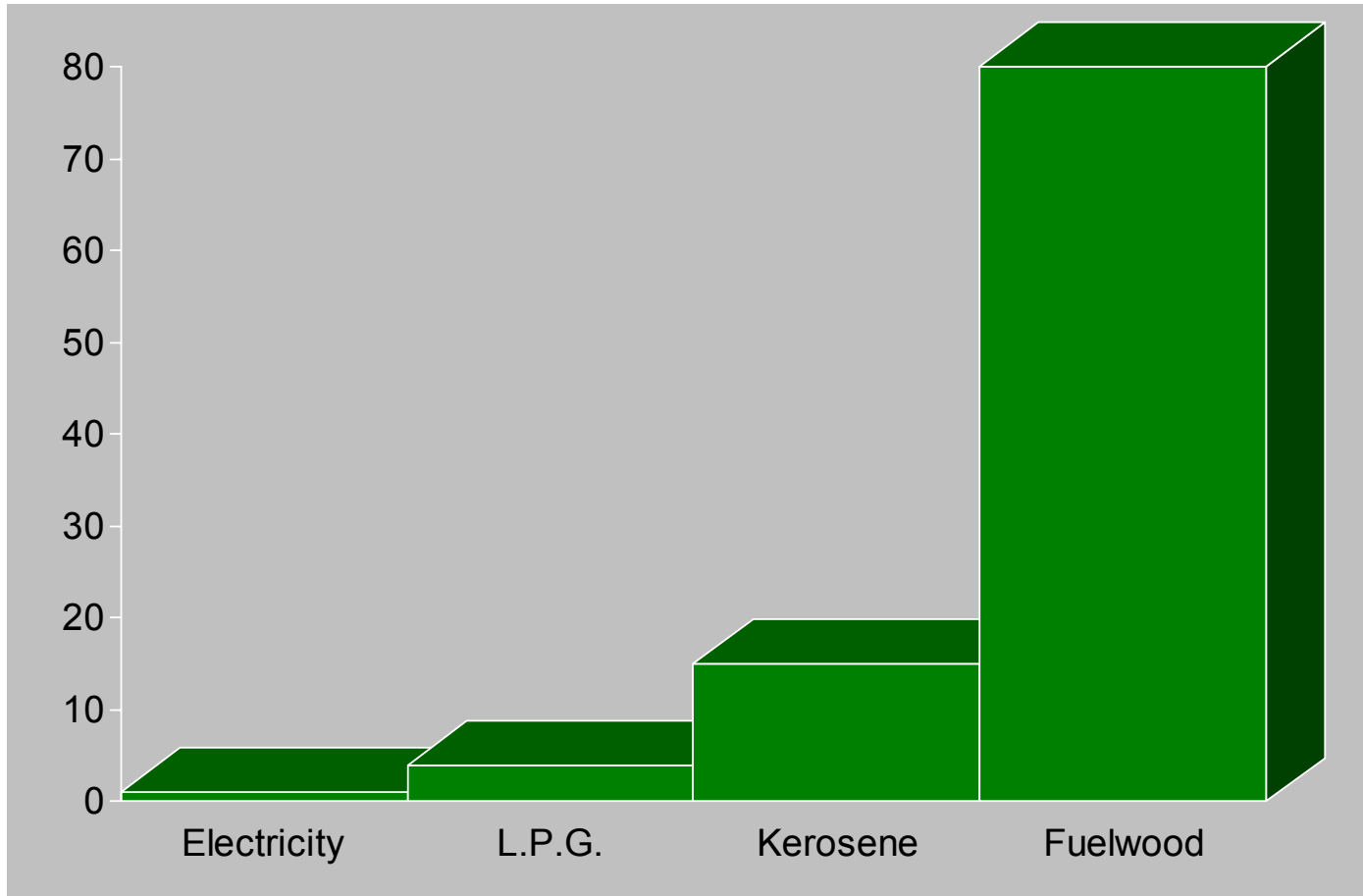
## WHAT THE TREND HAS CAUSED



- Widespread agitation for improved livelihood and access to quality energy leads to violence, restiveness and lawlessness
- Fuelwood is the predominant cooking fuel in the rural communities against the backdrop of flow station, oil pipelines and gas flares.
- Fuelwood extraction is accelerating local deforestation whereby rural communities have lost some 30% of their forest resource
- Kerosene which has been tagged “killer fuel”, is scarce, dirty and expensive.
- Kerosene explosions have claimed over 2000 lives in Nigeria since 2001 with the Niger Delta worst hit
- LPG is not available, very expensive and attracts safety concern
- A significant number of rural families especially women and children are already living with symptoms suggestive of smoke – related diseases.
- Pollution from gas flares impacts living homes, and the environment in the process resulting to acid rain which is threatening buildings, forests and aquatic resources



# ENERGY USE PATTERN IN NIGER DELTA HOUSEHOLDS





## SOME SOLUTIONS



- CEHEEN conducted a 2 year baseline study into household energy situation in the Niger Delta with key emphasis on poverty; health, environment and gender issues.
- The study was done in 2 Niger Delta communities of Oghara – rural communities; Benin – Peri urban community
- Results of the study are found below:



**Table 1:** Household sampling on the cause of over reliance on biomass as the sole source of cooking fuel in Oghara.

	<b>Men</b>	<b>Women</b>	<b>Children</b>	<b>Total</b>
Percentage of total population 1991 figure (8,214)	2,767	3,018	2,429	8,214
No interviewed in the sample	520	750	–	1,270

**Table 2:** Reasons given for over reliance on biomass as the sole source of cooking fuel in Oghara.

	<b>Poverty</b>	<b>Deforestation</b>	<b>Culture</b>	<b>No Idea</b>
Total No interviewed in the sample (1270)	991	152	102	25
Percentage (%)	78%	12%	8%	2%



## TECHNICAL INTERVENTION - PROMOTION OF IMPROVED ENERGY - EFFICIENT EGAGA STOVE



- An Integrated approach was designed to:
  1. strike a balance between the short term welfare needs of the rural poor, whose livelihoods depend on access to the available forests, and the need to protect their health, and at the same time conserve those same forests;
  2. help save fuelwood in indigenous communities of Niger Delta where strong cultural traditions and age-long conservation techniques rule the day;
  3. have a significant and measurable positive impact on the quality of life of resource-poor people in terms of the improved standards of living offered through job creation, the emergence of small scale enterprises, Improved health; and the protection of local biodiversity.



## ABOUT THE IMPROVED ENERGY - EFFICIENT EGAGA COOKSTOVE



- *Egaga* is a local device used in carrying pots while preparing meals over traditional open fires in parts of rural and urban Niger Delta
- It evolved over a hundred years ago
- Funded by a grant from the UK – based Ashden Trust in 2001
- 1000 stoves were piloted in Ogharo and Benin
- Improved *egaga* encompassed new advantage while retaining key norms, myths & beliefs associated with smoke, tastiness and preservation of food.

### **Features of the Improved *Egaga* stove**

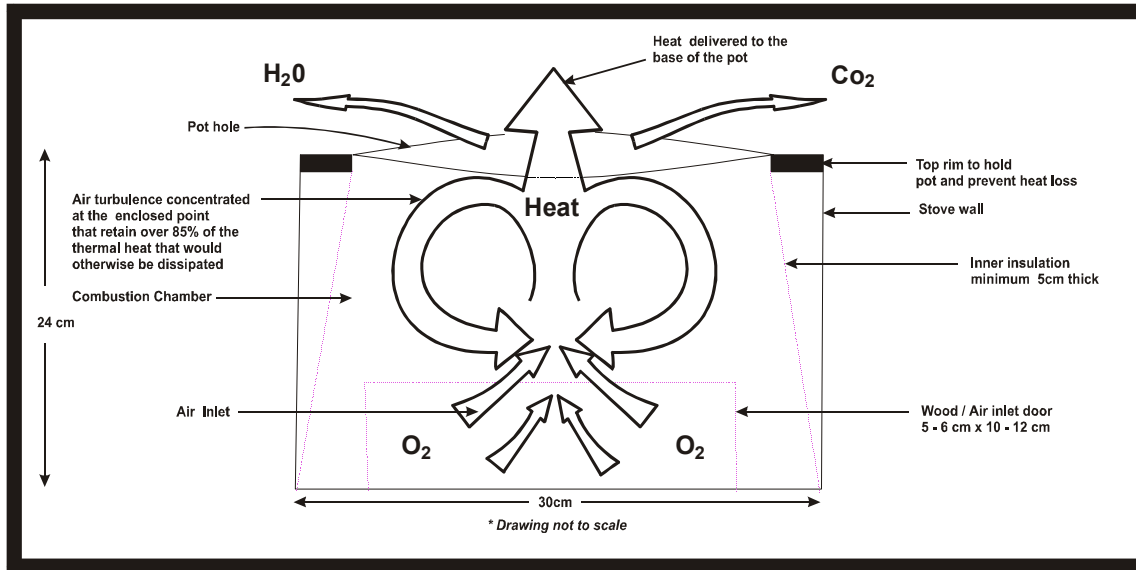
- User friendly
- Portable
- Conserves thermal heat by up to 40%
- Less smoke
- Conserves fuelwood, using 4 piece per cooking task
- Reduced cooking time
- Enhances the women's status





### TECHNICAL DETAILS

❖ Capacity	-	4 pieces of Fuelwood
❖ Size	-	Height 24cm
❖ Diameter	-	300mm
❖ Weight	-	6kg
❖ Efficiency	-	40%



**Source:** CEHEEN, February 2000

### **FEATURES**

- ❖ User friendly
- ❖ Portable
- ❖ Conserves Thermal Heat by up to 40%
- ❖ Less Smoke
- ❖ Conserves Fuelwood
- ❖ Reduced Cooking Time
- ❖ Enhances the Woman's Status

### **SCHEMATIC DIAGRAM OF THE IMPROVED EGAGA METAL STOVE**



# OUTCOMES OF THE EGAGA STOVE PROJECT IN THE NIGER DELTA



- Improved indoor air quality in the homes by reducing CO<sub>2</sub> from a baseline figure of 140ppm to 8ppm in 8hrs of measurement; pm from a 24hr average exposure concentration of 1500µg/m<sup>3</sup> to 600µg/m<sup>3</sup>.
- Reduced fuel used for cooking task by 50%; thus reducing local deforestation
- Provided employment to 30% of the rural work forces
- It encompasses a briquette process that recovers 40% of spent fuel
- Symptoms suggestions of respiratory infection in children under 5 years of age and adults were significantly lower among households using the improved egaga stove than households that were still using the 3-stone open fires.



# The Need for Change



The need to affect change in household energy consumption patterns in developing countries is of the utmost importance given the adverse impact current energy demand has on health, society, the economy and the environment.

- Traditional fuels, along with the highly prevalent household “intermediate” fuels such as kerosene, impose heavy tolls on health via smoke, emissions, and fire hazard; these include acute respiratory infection in children, chronic obstructive lung disease, adverse pregnancy outcomes and lung cancer in women.
  - The World Health Organization estimates that indoor air pollution results in 1.6 million deaths worldwide per year due to indoor air pollution, 24% occurring in Africa alone, and 2.7% of the global burden of disease, over half of which arises in Africa.
  - The impact on women and children is especially pronounced, with 56% of deaths of children under the age of five, along with 80% of the global burden of disease on children under the age of five, being caused by indoor air pollution.
- Collection of firewood and other traditional biomass fuels is time-consuming—the World Bank estimates that fuel collection accounts on average for 20% of a rural woman’s work time—and thus prevents time being spent in more productive ways such as education.
- Environmental impacts from traditional fuel exacerbate the rapid deforestation and desertification occurring across the developing world while also adversely impacting the broader environment in terms of greenhouse gas emissions.



# How Can Project Gaia Make a Difference?



***By revolutionizing the household energy economy of Africa and the Developing World by leading the way to alcohol fuels derived from currently wasted or under used resources, both biomass and hydrocarbon resources, for daily household use, including cooking, refrigeration, heating, lighting and electrical generation.***



# Why Alcohol Fuels?



Transition to the use of alcohol fuels will reduce or avoid these impacts in a number of ways, offering numerous benefits that make them perfect for use in the household energy market.

- Alcohol fuels are the cleanest of fuels and the safest when used in properly designed appliances
- The use of alcohol fuels in the household results in greatly improved air quality in the kitchen and courtyard, safer handling with reduced danger of fires, burns and explosions, and reduced environmental impacts from better resource management.
- A market for currently wasted or underused resources, such as waste molasses currently being dumped into African rivers, will turn a no-value by-product into a high value industrial product, spurring productivity and increasing employment in industry, agriculture, manufacturing, and the service sector, the latter via stove and fuels sales and distribution.
- On a macroeconomic level, with most African countries dependent on petroleum imports, displacement of such imports by domestically produced alcohol fuels will result in valuable foreign exchange savings and an improvement in the balance of payments, especially if an export market is developed.



# Where Do We Begin?



*Through a series of carefully planned pilots making use of the CleanCook stove.*

## “Mini-Pilots”

- eMbalenhle (Johannesburg), South Africa: 12 stoves
- Delta State, Nigeria. 20 stoves

## Grant-Funded Full-Scale Pilots

- Ethiopia: 850 stoves funded by the Shell Foundation
- Delta State: 300 to 400-stove study in funded by the U.S. EPA



# The CleanCook Stove



- This stove is a non-pressurized, high-performance stove, constructed entirely of stainless steel, the result of which is a product that is both durable and long lasting, the estimated life-time being a minimum of ten-years;
- It is one of the most efficient stoves on the market today;
- When fuelled by methanol or a methanol-ethanol blend, the stove burns very cleanly without any odour, soot or smoke;
- When burned with ethanol alone, a small amount of soot will form and some odour will be detected when pots are cold, though it quickly dissipates as pots heat.
- The stove possesses excellent safety features, holding its fuel in a manner that eliminates the risk of leakage, flare-up or explosion.



# Stove Efficiency & Emissions Across Different Fuel Types



Fuel	Stove Efficiency %	Emissions (g/MJ delivered energy)				
		CO <sub>2</sub>	CO	Methane	Total Non-Methane Organic Compounds	N <sub>2</sub> O
Alcohol Fuels	Similar to LPG Stove	<LPG*	=Biogas*	None	=Biogas	Negligible
LP Gas	53.6	126	0.61	Negligible	0.19	0.002
Biogas	57.4	144	0.19	0.10	0.06	0.002
Kerosene	49.5	138	1.9	0.03	0.79	0.002
Fuelwood	22.8	305	11.4	1.47	3.13	0.018
Crop Residue	14.6	565	36.1	4.13	8.99	0.028
Charcoal	14.1	710	64.0	2.37	5.60	0.018
Dung Cakes	10.0	876	38.9	7.30	21.80	0.022





# Phasing of the Pilots



1. Selection of Households
2. Baseline Energy Survey
3. Stove Demonstrations
4. Stove Introduction
5. Follow-Along Survey
6. Final Market Evaluation



# Issues Addressed in the Final Pilot Evaluation



- Demand for fuel/stove
- Stove final design
- Fuel handling
- Packaging and delivery
- Consumer safety
- Stove/fuel affordability strategies
- Cost of project development and infrastructure
- Need for and extent of government buy-in and supportive public policy
- Design of commercial projects
- How to design and finance commercial projects so that they will address the need in the marketplace and reach the largest number of consumers possible



# The Surveys



The Baseline: This will capture energy-use, fuel purchase/collection, reasons for fuel choices, cooking habits, ownership and use of energy consuming devices/appliances, fuel/stove affordability, fuel/stove convenience, fuel/stove safety, fuel/stove quality, financing of energy, and social and gender issues associated with energy use; socio-economic characteristics are also recorded at this time.

Follow-Along: Factors measured in the baseline survey will be tracked after stove placement to understand how the stove affects change in these patterns. Impressions of alcohol and the CleanCook stove, including quality, safety, convenience, affordability, and efficiency will also be gathered.

Follow-Up: One last snapshot of data gathered in the baseline will be taken to understand whether use of the stove changed energy-use patterns and consumption. Final impressions of the stove and fuel will also be captured.



Since this is Nigeria. . .



## Why a Pilot in Nigeria?

*A unique set of circumstances currently exists within Nigeria that allows it to be a leader for the rest of Africa in creating such a market for alcohol fuels.*

- Nigeria leads the world in feedstock for developing an alcohol-based economy; while she has abundant gas resource most of which is currently wasted through flaring, she leads the world in cassava production and with the largest market in Africa.
- Nigeria imports all of its petroleum fuels, including kerosene, with sizeable impact to the balance of trade.
- Nigerian families have great need of more affordable and improved fuels and safer stoves.



# The Stove



- Not pressurized
- Fuel cannot leak even when the tanks are inverted
- Cannot explode
- Stable and durable, cannot tip and will hold up under the toughest use
- Long lasting
- Affordable
- Fuel economy
- Produces no soot
- Efficiency equals the LP Gas stove at 55%; exceeding the performance of a standard electric burner



# Harvesting the Last Tree



***Thanks for Listening !!!***