

# NATIONAL TRENDS IN BIOMASS ENERGY IN TANZANIA

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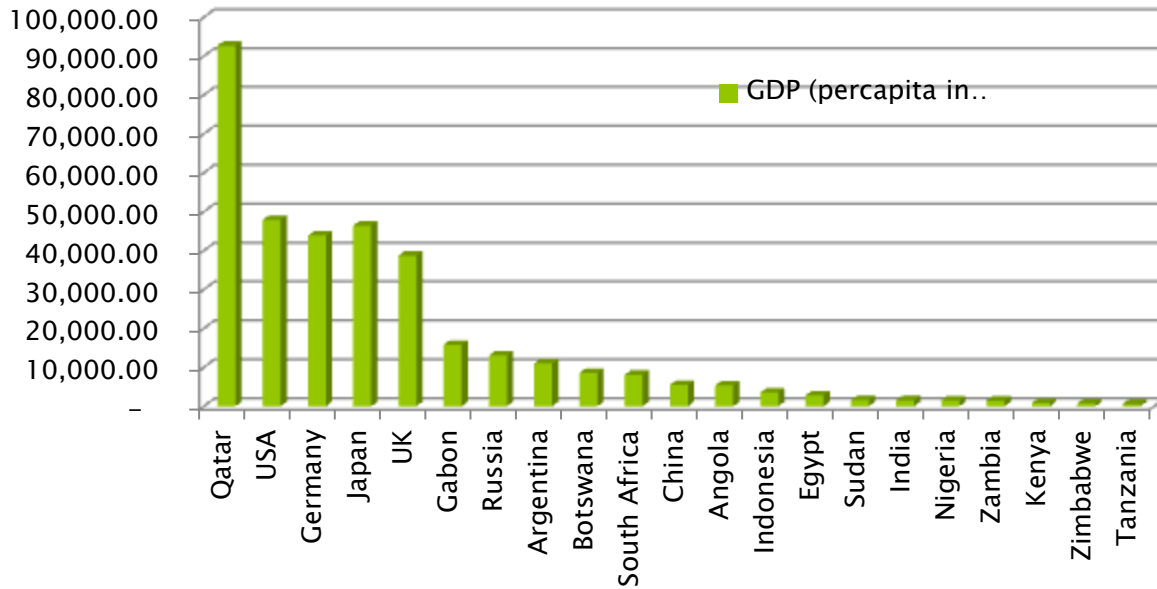
Presentation to Workshop on Exploring the evidence,  
mapping the way forward and planning for future actions for  
Developing Biomass Energy in Tanzania Hyatt Regency Hotel  
26 – 27 February, 2015 Dar es Salaam

# ▶ INTRODUCTION

# Energy and development

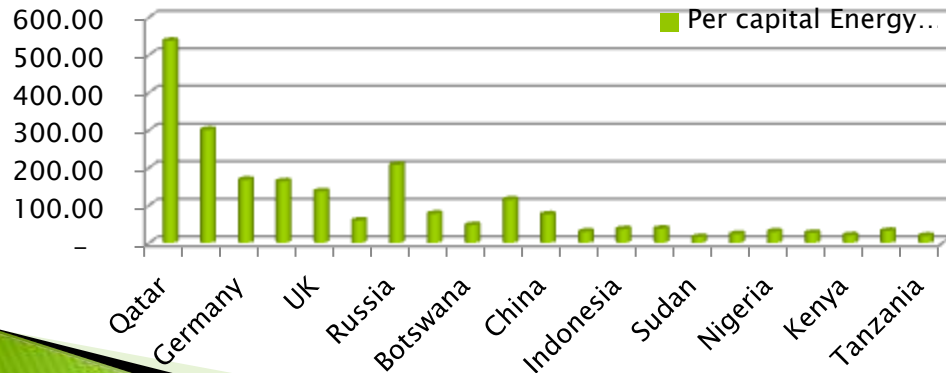
- Energy is needed to fuel economic growth and development.
- There are many sources of ( biomass, fossil fuels, wind, hydro, nuclear, solar, geothermal, tidal, etc) but they need to be developed. Developing energy resources needs funding but also takes time
- Developed economies consume more energy per capita and have capacity to develop new sources or secure imports.
- Poor countries have limited capacity to develop new sources; and energy imports (mainly oil) must be paid for in foreign currency, that is always in short supply, but also needed to pay for other imports (books, medicine, machinery& equipment, agric inputs, etc)
- Normally, poverty has a bearing to the type(s) and quantities of energy consumed

## GDP (per capita in US \$)



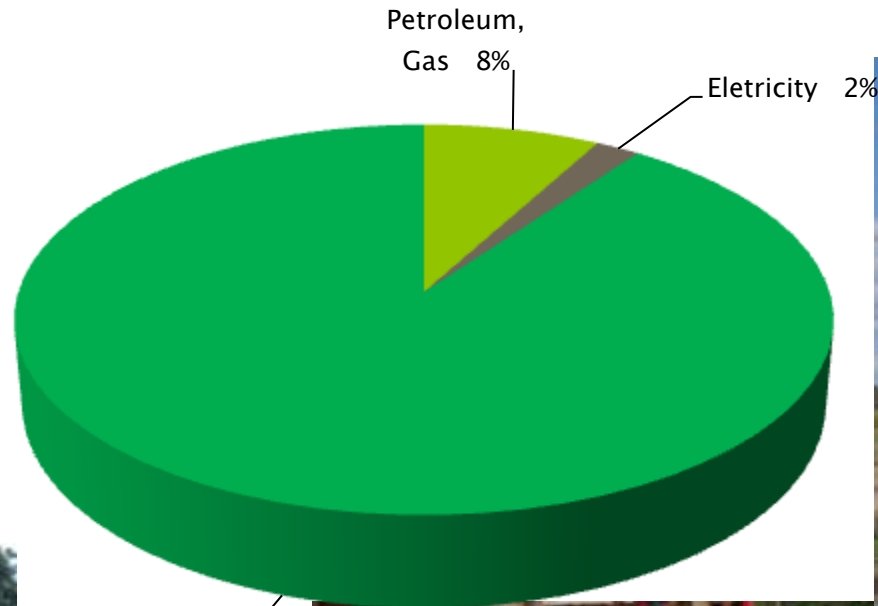
country	GDP (percapita in US \$)	Per capita Energy Consumption
Qatar	92,682.00	537.58
USA	47,882.00	300.91
Germany	43,865.00	168.14
Japan	46,407.00	163.73
UK	38,690.00	136.67
Gabon	15,738.00	59.54
Russia	13,006.00	207.61
Argentina	10,994.00	77.57
Botswana	8,533.00	47.37
South Africa	8,090.00	114.99
China	5,439.00	75.88
Angola	5,318.00	30.09
Indonesia	3,495.00	36.39
Egypt	2,801.00	37.93
Sudan	1,583.00	15.58
India	1,528.00	23.76
Nigeria	1,509.00	29.97
Zambia	1,426.00	26.37
Kenya	819.00	20.28
Zimbabwe	695.00	32.09
Tanzania	526.00	18.81

## Per capita Energy Consumption(GJ percapita per annum)



# ENERGY SITUATION IN TANZANIA

- In Tanzania like most developing countries, biomass fuel dominates as a source of energy
- Biomass accounts for about 90% of the total national energy consumption with 2% from electricity and 8% from petroleum products



## 2. BIOMASS ENERGY

- WOODFUEL

  - Fuelwood

  - Charcoal

- SOLID BIOMASS WASTES

  - Wood waste from saw mills, timber working facilities etc.

  - Sugar bagasse waste

  - Coffee husks and wastes

  - Rice husks and wastes

  - Cashew nut waste and other crop residues

- BIOMASS BRIQUETTES

- BIOGASS

  - Animal waste


  - Food waste

  - Sisal waste

- LIQUID BIO-FUELS

**This presentation will focus on wood fuel ( fuelwood & charcoal)**



- ▶ In year 2011, it was estimated that 90.8% of round wood harvested in Tanzania were used as wood fuel (Wuppertal Institute, 2012).
  - ▶ Most of the fuel-wood and charcoal are consumed by households for domestic energy, therefore consumption trends are strongly related to population growth.
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**FUELWOOD**

# Fuelwood as a domestic energy

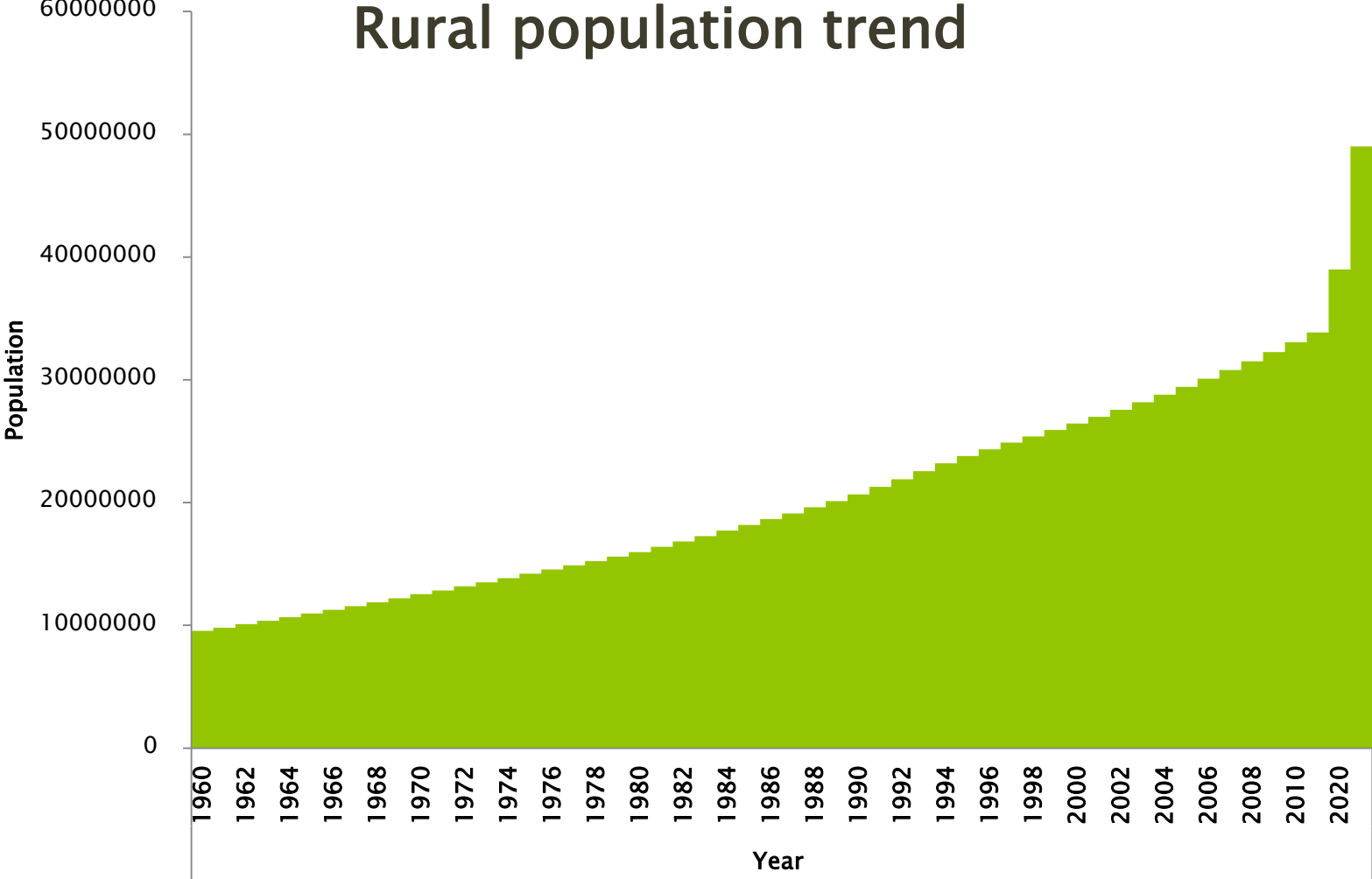
- ▶ Major source of domestic energy in rural areas (more than 70% of the Tanzanians)
- ▶ Also used in peri-urban areas
- ▶ Respiratory diseases
- ▶ Low thermal efficiency of 10% (3 stones)
- ▶ Efficiency can be improved to 20% or more







# Rural population trend

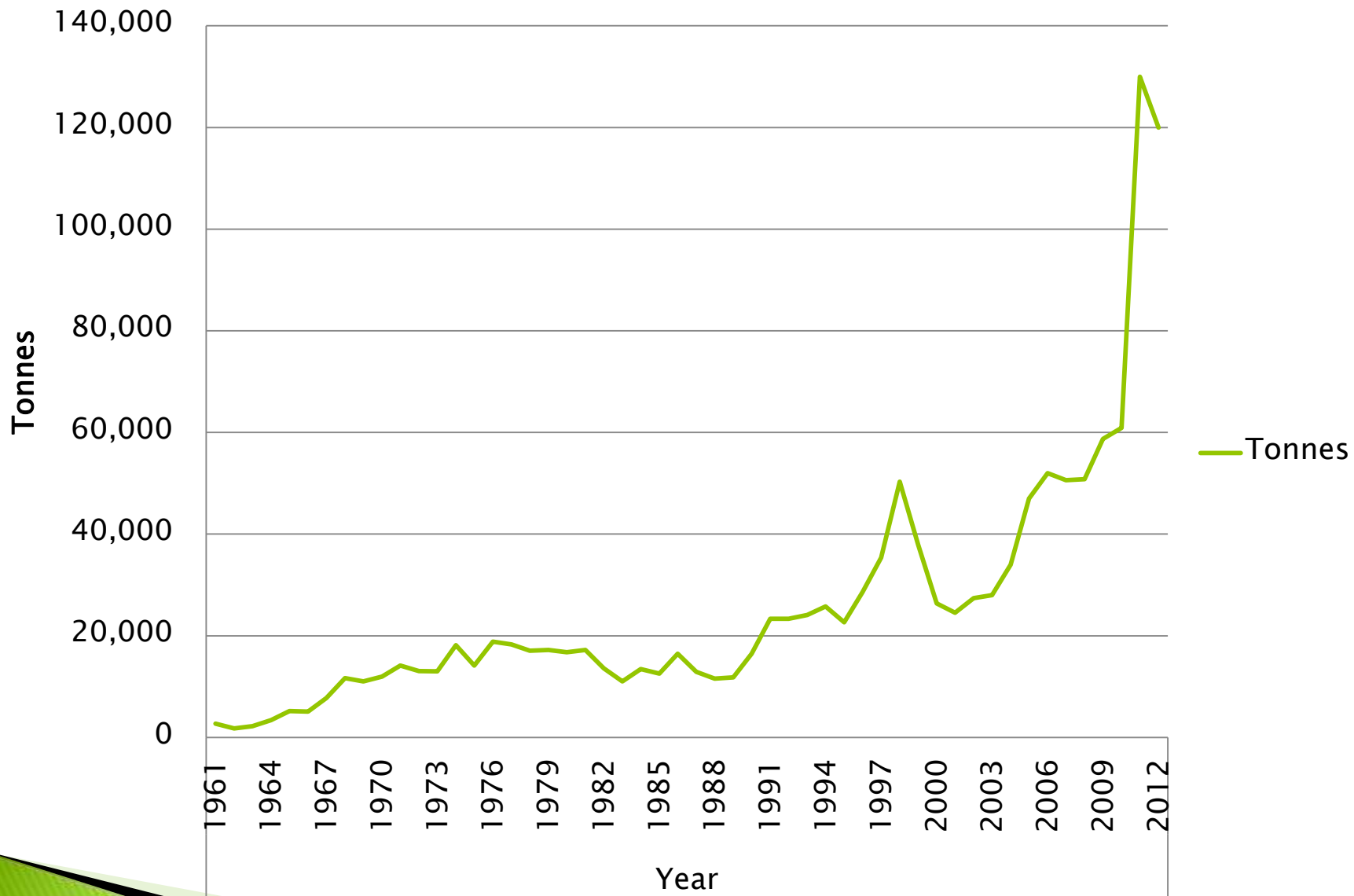


# Agricultural and industrial use of fuelwood

- ▶ Fuel wood is important source of energy for fish drying, brick burning, tobacco curing, tea drying local brewing, schools, bakeries, hospitals, prisons, etc




# Annual tobacco production



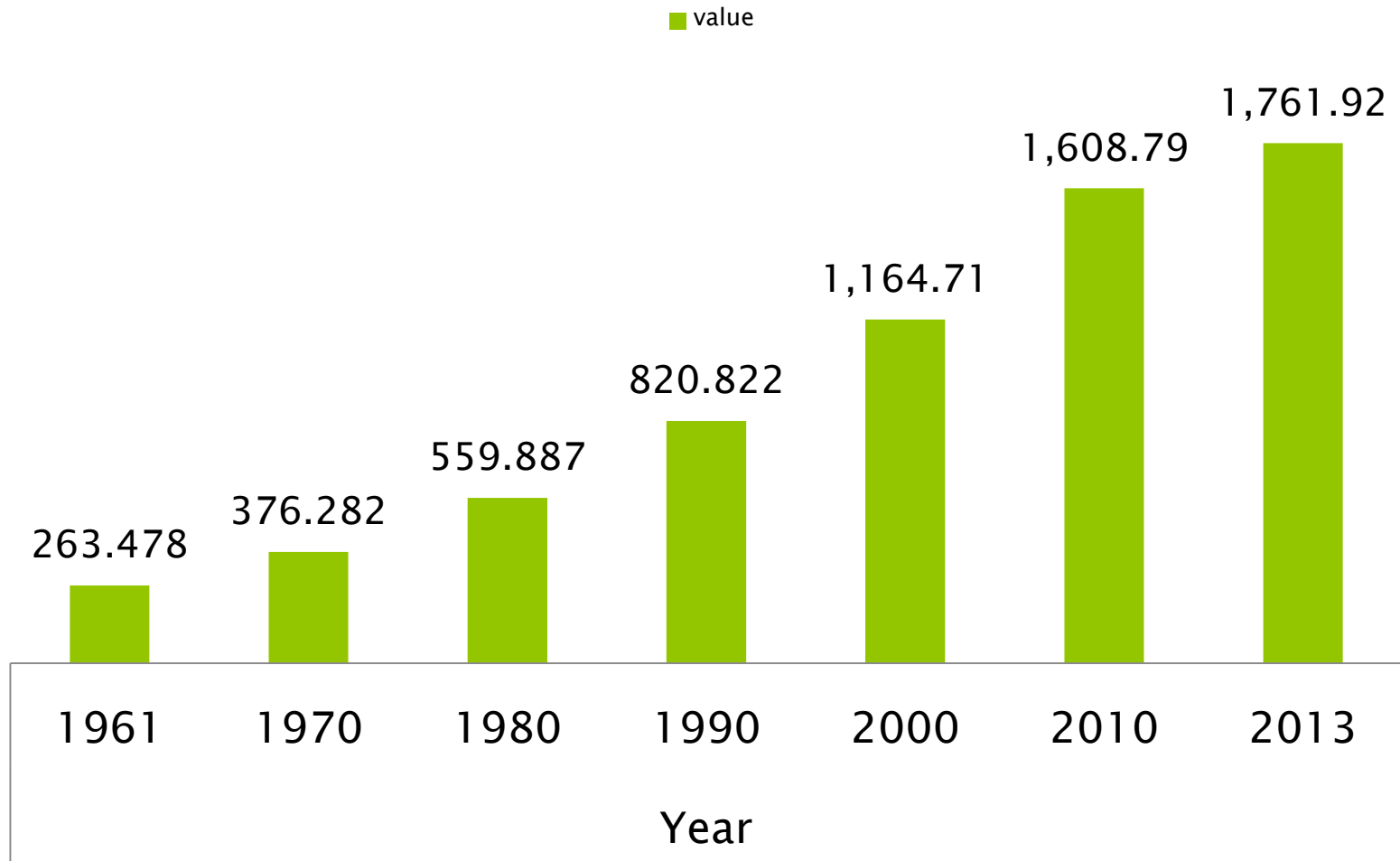
▶ CHARCOAL



# Charcoal

- ▶ One million tons of charcoal were consumed in Tanzania (half in Dar es salaam) in 2009, increased to 1.7 million tons in 2012
  - ▶ 28,500 bags (of 60–80kg each) were delivered into Dar es salaam daily in 2009, or more than 48,000 bags in 2012.
  - ▶ The contribution of charcoal to the economy was estimated at US\$650 million in 2009
  - ▶ People, from poor household consumers, to national policy makers and expatriate development partners use it
  - ▶ Charcoal is a massive industry, providing livelihoods for thousands of people along the supply chain
  - ▶ Charcoal production increase annually
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## Wood charcoal production (tonnes 1 000)



Source:FAOSTAT, 2014

## Charcoal production

- ▶ To produce one ton of charcoal in the traditional kiln, 10 – 12 tons of wood are used
- ▶ Wood contained 342.5 ha of forest required daily in 2009, or 583 ha in 2012 and is in most cases harvested illegally
- ▶ Over 300,000 rural families (over 1 million rural people) depend on charcoal production and their number is increasing
- ▶ Producers are not organized
- ▶ Unfortunately, charcoal is inefficiently produced & used but also unsustainably managed





# On the road side



# Charcoal transportation

- Thousands of people engage in transporting charcoal, from rural producers to urban users
- Bicycles, motorcycles, trucks, private , STK vehicles etc are used





# Charcoal transportation cont...

- Charcoal is produced and transported sometimes many kilometers from urban centres
- Production usually located close to access roads
- Transported on a return trip, after delivery upcountry



Sources of Charcoal for Dar es salaam (2008, Malimbwi and Zahabu,)



# Wholesaling and retailing ...

- ▶ Produced in rural areas and consumed in cities & towns.
- ▶ There are many charcoal wholesalers and retailers in urban Tanzania (including home delivery)



# Zanzibar relies on Tanzania mainland for charcoal and fuelwood



# Many end users



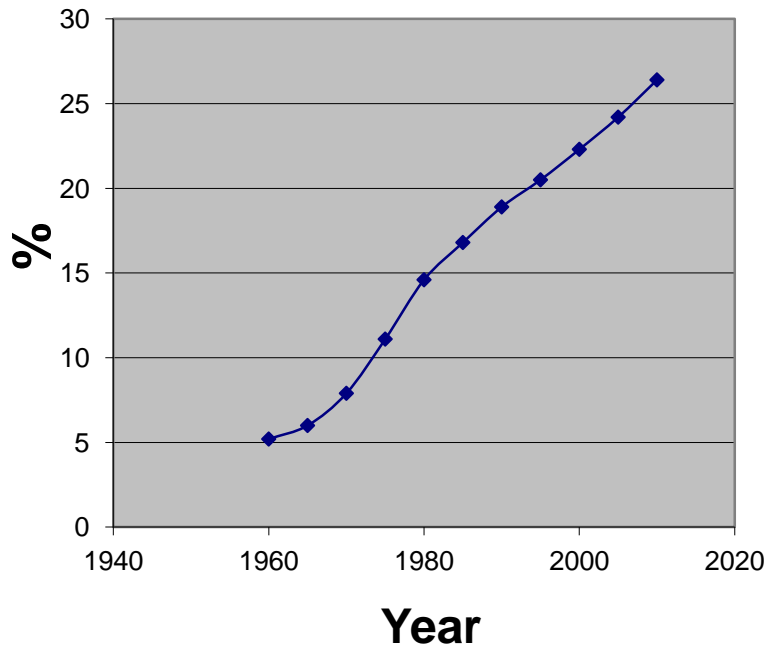




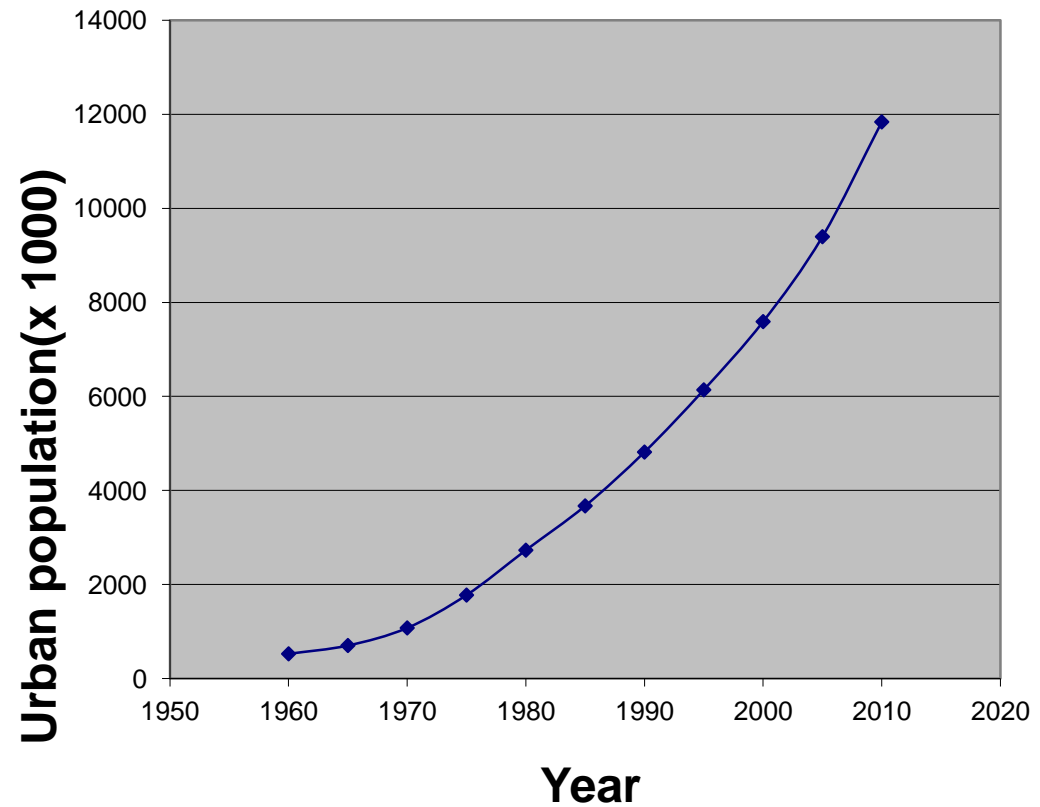


- ▶ Charcoal is mainly consumed by urban households, increased urbanization leads to increase in charcoal consumption
- ▶ The urban population is increasing annually in Tanzania
- ▶ Rural earnings from charcoal are greater than those from coffee, tea, cotton, sugar, cashews, etc

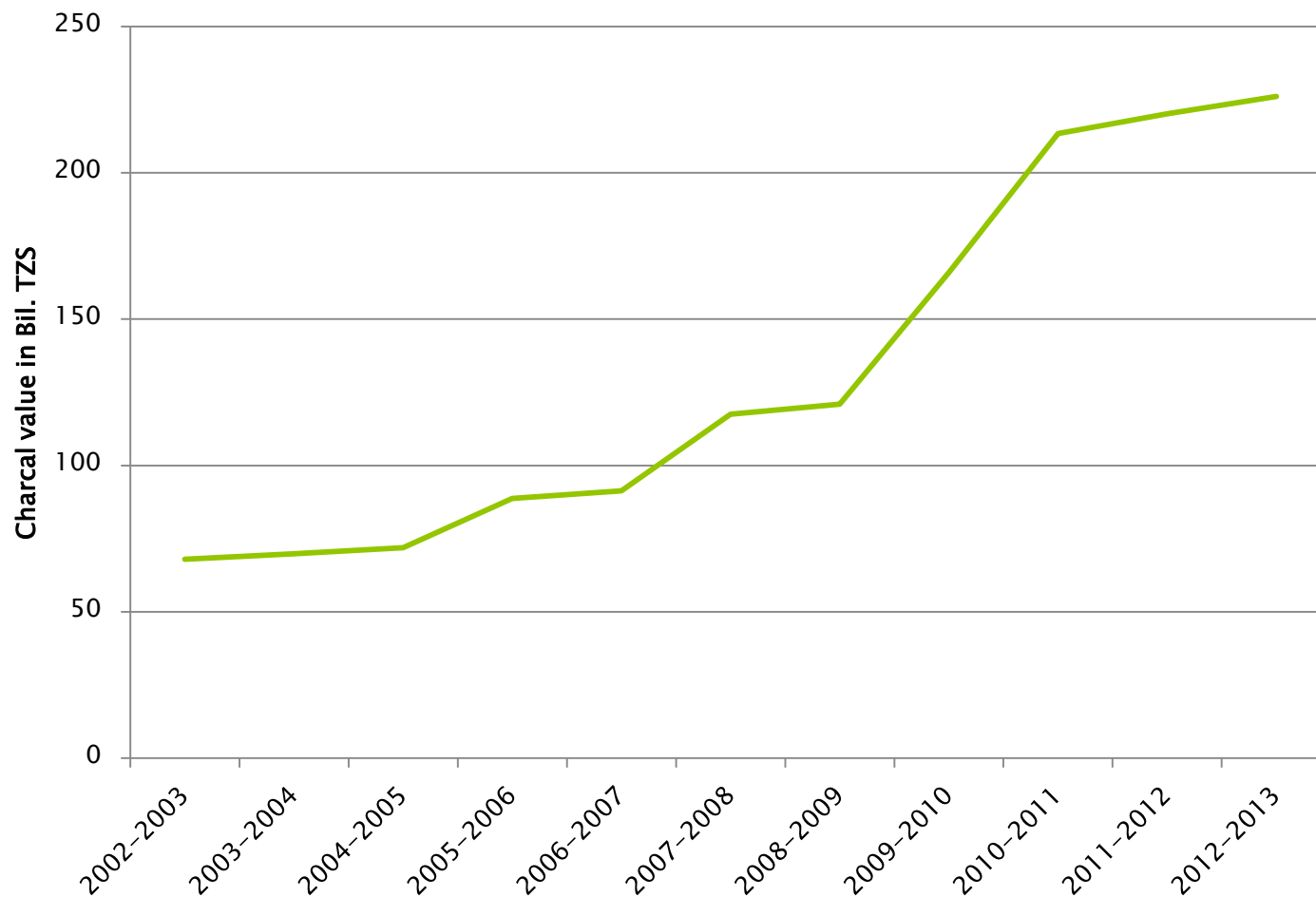
**% of Urban population in Tanzania**



**Urban population in Tanzania**



# Charcoal value estimates



- ▶ Source: Kaale, Kilahama, 2005, Sawe, 2004; Abdallah *et al.*, 2012, Ngaga, 2000, Abdallah, 2014






# CHALLENGES and BENEFITS



# CHALLENGES

- Characterized by very weak governance and weak law enforcement. It is almost a free access to wood resources.
  - Leading to deforestation and forest degradation
  - Generally, illegally and unsustainably harvested mainly from miombo woodlands without payments being made for the raw material (wood), and licenses and levies largely evaded
  - Inefficient production & utilization technologies
  - A perception that it is a poor man's business, considered 'dirty' and economically unattractive
  - The sector is informal, almost totally unregulated, and open to any and all who wish to participate in it.
  - Significant changes need to be introduced to regularize and legalize this sector
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## **Institutional and regulatory context**

- **The sector is characterized by;**
  - **a multitude of commercial players,**
  - **a large number of institutional and policy players**
  - **no comprehensive, unified national, regional or local vision, policy for the sector.**
  - **various laws, regulations and administrative procedures touch on wood fuels.**
  - **hardly feature in national or local policy and planning**
- **Wood fuels are not considered a “commercial energy source” like petroleum, electricity, gas and coal.**

- It is wrongly viewed as a “traditional”, “inferior”, as retrogressive and environmentally destructive, tolerated rather than encouraged energy source that will grow less important, as economic development occurs and “modern” energy sources become more widely available
- Tanzania’s “National Strategy for Growth and Reduction of Poverty II (NSGRP II or MKUKUTA II)” of July 2010 (following MKUKUTA I in 2005) holds the same vision of Tanzania transitioning from woodfuels to “modern fuels”.
- MKUKUTA I did set a target for reducing the “proportion of population depending on wood energy for cooking from 90 percent in 2003 to 80 percent in year 2010 (URT, 2005).
- The target of reducing dependence on wood fuel in the national energy consumption by 10% in year 2010 was not achieved.

- ▶ There is nothing that will change that quickly.
- ▶ Tanzania is today where USA was in 1850 or about 160 years ago. To develop an effective energy mix takes time, therefore Tanzania must not abandon / marginalize biomass energy

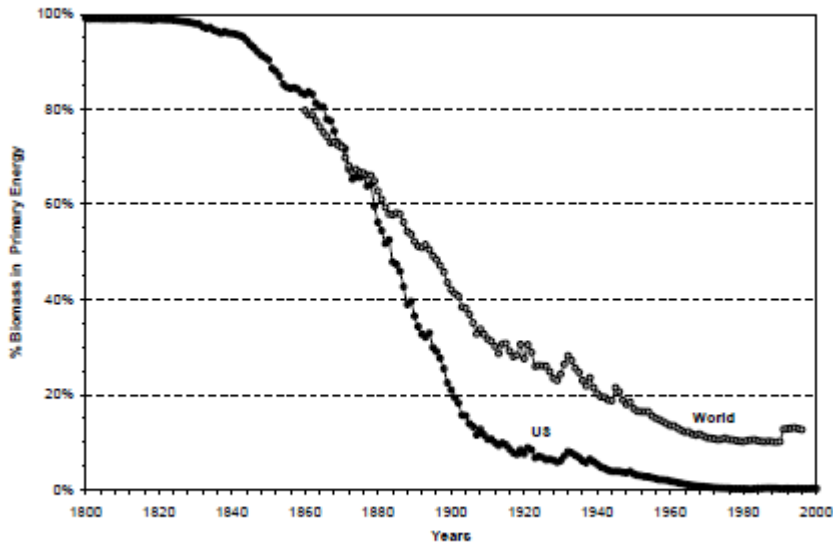
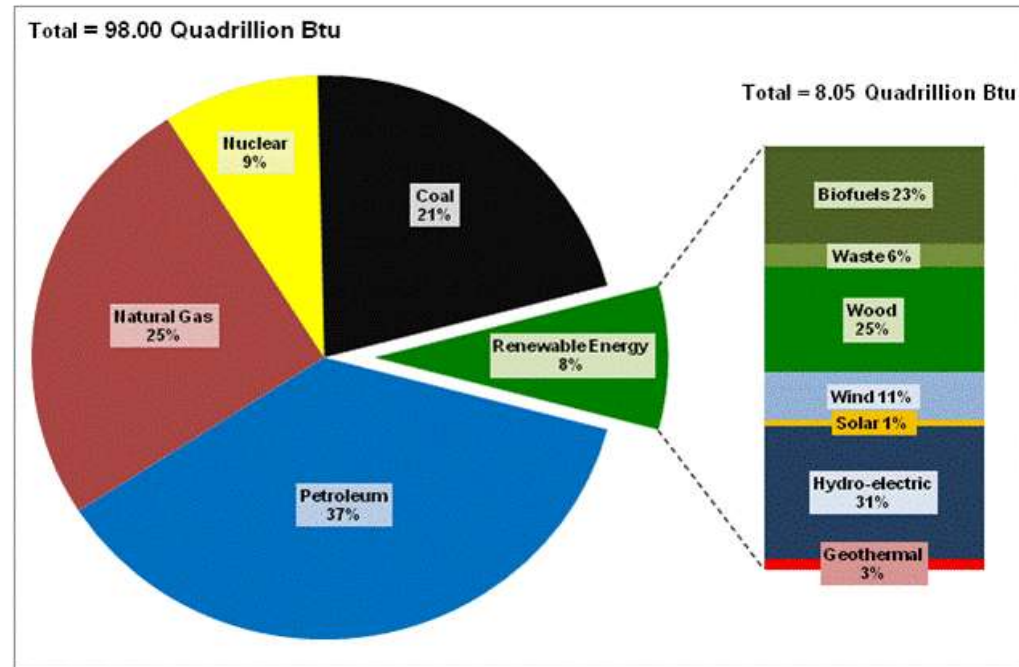



Figure 1. Share of Biomass in Primary Energy Mix for the US (1800-2000) and for World (1860-1996). Source: IIASA (1998), UN, EIA (2002)

## USA Summary of Energy Consumption, 2010



Source: U.S. Department of Energy, Energy Information Administration, *Monthly Energy Review*, July 2011,

- At current prices, most Tanzanians cannot afford fuel-switching since the so-called modern sources of energy are expensive and the prices are always increasing.
  - When using improved charcoal stove, the cost per unit of energy is only one-third of using electricity
  - On the other hand, Tanzania has a unique opportunity to convert its large biomass resource base potential into a sustainable and renewable energy asset
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# Current relative prices of energy for cooking

Energy source	Unit price (TZS) Nov 2013	KWH/KG	TZS/KWH equiv	End use cooking) efficiency	TZS/kWH equiv (effic factor
Kerosene (per litre)	2000	11.8	169.5	0.4	424
Tanesco electricity S	273	1	297.0	0.7	424
LPG					
3kg	16600	13.6	406.9	0.6	678
6kg	20000	13.6	245.1	0.6	408
15kg	50000	13.6	245.1	0.6	408
36kg	122909	13.6	237.8	0.6	396
Charcoal Briquettes(per kg)					
High	800	9.1	87.9	0.15	586
Low	400	9.1	44.0	0.15	293
Charcoal (per kg)					
Tradition cook stove	437.5	9.1	48.1	0.15	321
Improved Charcoal Stove	437.5	9.1	48.1	0.3	160
Fuel wood (per kg)					
Open fire	150	4.5	33.3	0.1	333
Improved Stove	150	4.5	33.3	0.2	167

- ▶ If nothing is done to address the rampant deforestation and degradation and no additional plantations are established, the annual deficit will increase exponentially
- ▶ The environmental and social impacts of this deficit will be devastating.

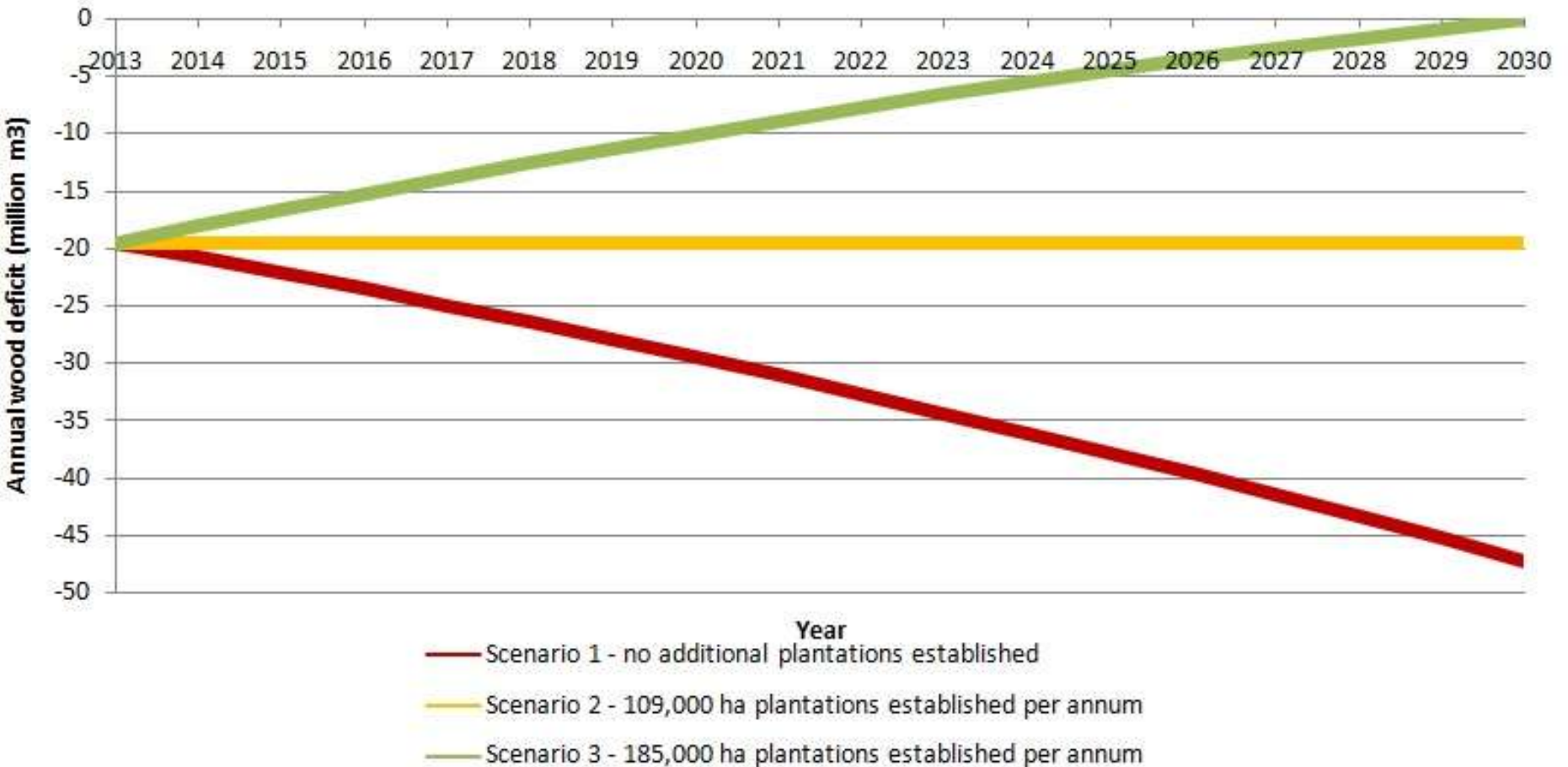




# Unsustainable supply

- ▶ The wood deficit was 19.5 m<sup>3</sup> in 2012 will increase to 47.2 million m<sup>3</sup> in year 2030

Mainland Tanzania, projected wood deficit (2014 - 2030)



# **BENEFITS (many)**

- **Wood energy is the primary energy source accounting for 90% of all energy in Tanzania; more than 95% of all household energy consumed in the country; will still play an important role in the national energy mix for many years to come**
- **It is renewable, and with favorable policies wood fuel can be managed and produced sustainably**
- **Contributes to Government revenue**
- **Reduce Tanzania's dependence on foreign currency (importation of petroleum i.e 8% of the total national requirement consume more than 25% of our foreign currency earnings);**
- **Contributing to energy security**
- **Over 300,000 families depend on charcoal production and sale along the supply chain for cash earnings and their number is increasing**
- **Contributes to poverty reduction**
- **Biomass energy is pro-poor, pro-development and a potential driver of economic growth.**

▶ **WAY**

**FORWARD**

- All trends show that wood fuels will remain dominant for many years to come; therefore need explicit recognition and a key place in the policies and strategies of Tanzania
- A policy and legal framework is required to guide the sustainable development and growth of this sector
- Significant changes (based on policy) need to be introduced to make wood energy more modern, efficient, sustainable, cleaner in both production and use. Wood fuels need to be formalized into the economy so as to continue as an important source of economic livelihoods to thousands of Tanzanians.





THANK YOU FOR YOUR  
ATTENTION



~~KAMBI YA MKAA~~

