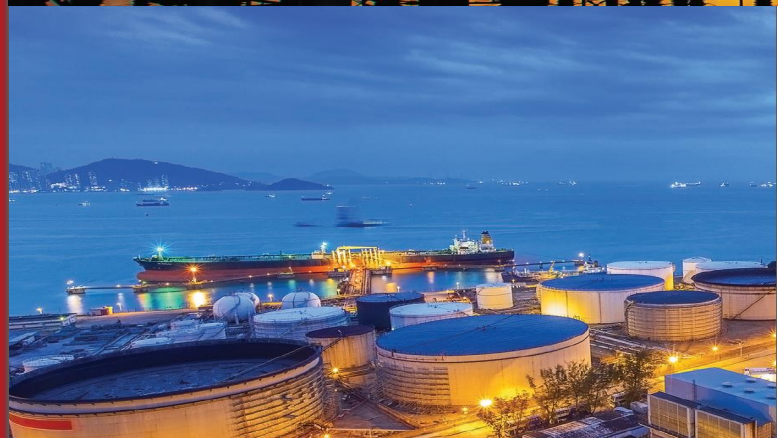
EAC ENERGY SECURITY POLICY FRAMEWORK



What prompted this policy framework

- The East African Legislative Assembly (EALA) through its resolution on integrated policy on energy security.

- The 17th Intergovernmental Committee of Experts (ICE) meeting on the theme "Enhancing Energy Access and Security in Eastern Africa."

- Observation of energy security challenges in Partner States, and Eastern Africa at large and interest in addressing the challenge.

What is the intent of the Policy Framework

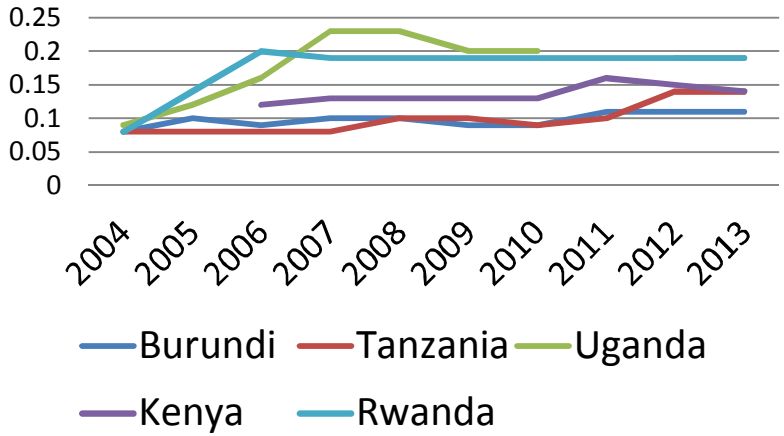
- This policy framework is intended to provide policy guidance towards better understanding, measurement, monitoring, evaluation and management of energy security risks and challenges.

- It aims to provide the foundational policy framework so that Partner States would take action to devise an energy security policy, strategy and action plan.

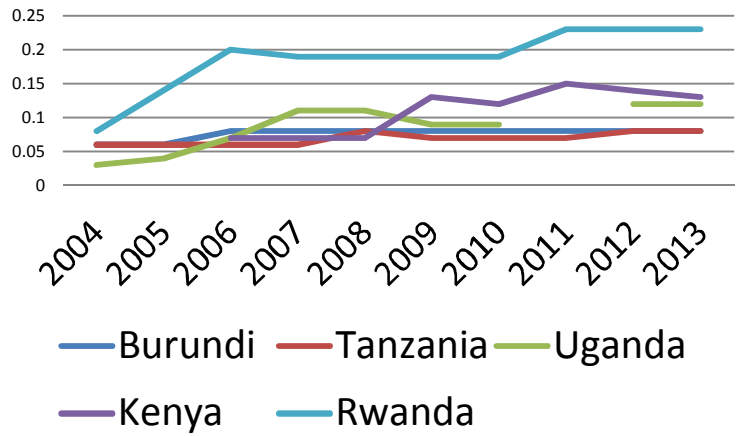
- The framework is developed based on consultative processes in EAC Partner States.

Electricity Affordability – Cost Trends

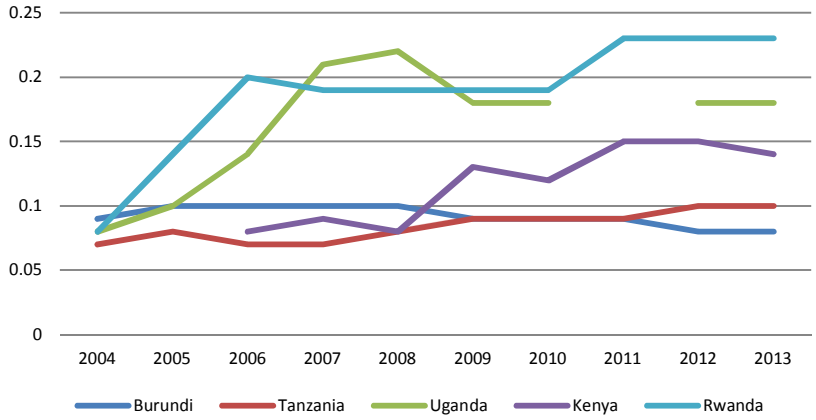
Commercial Tariffs



Medium Industrial Tariffs



Large Industrial Tariffs

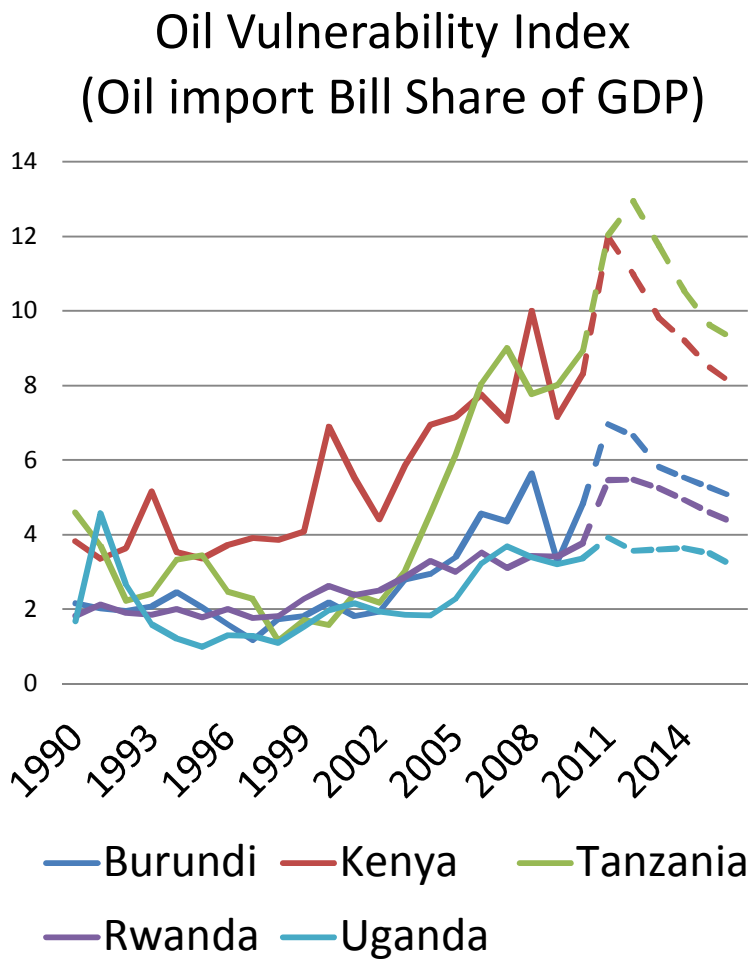


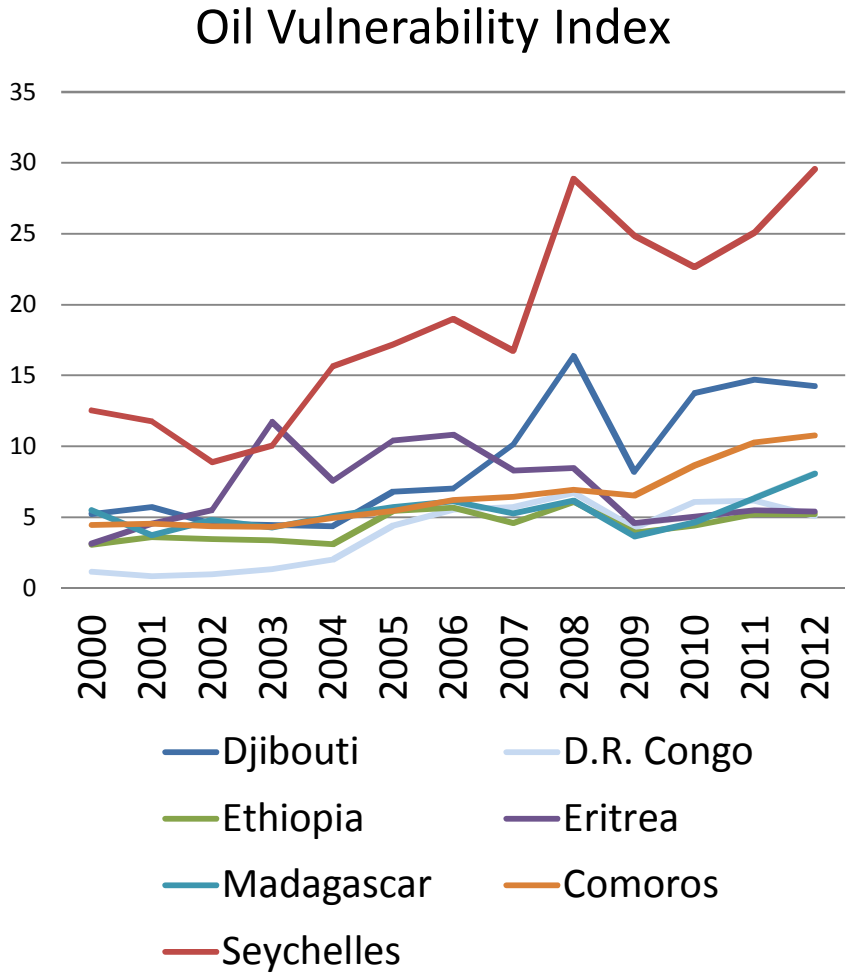
Tariffs increase (2006-2013):

	Medium Industries	Commercial
Burundi:	-20%	22.22%
Kenya:	75%	16.67%
Rwanda:	15%	-5%
Tanzania:	43%	75%
Uganda:	29%	18.75

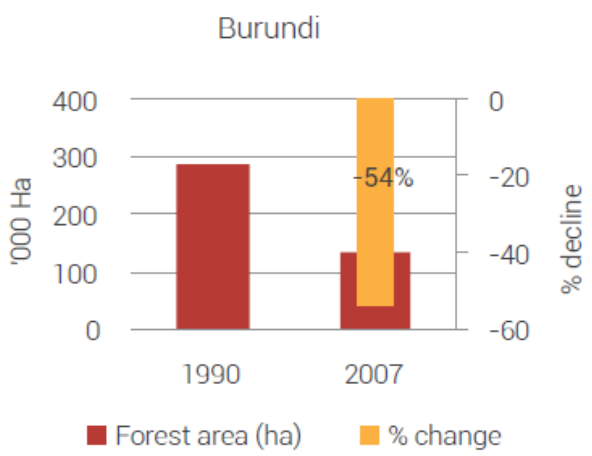
How can the medium to long term electricity cost trends be managed?
How can system costs be contained to enhance energy security.

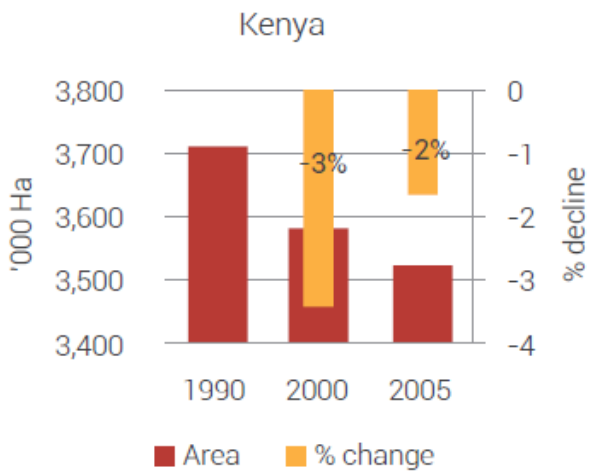
Vulnerability to Petroleum Dependence

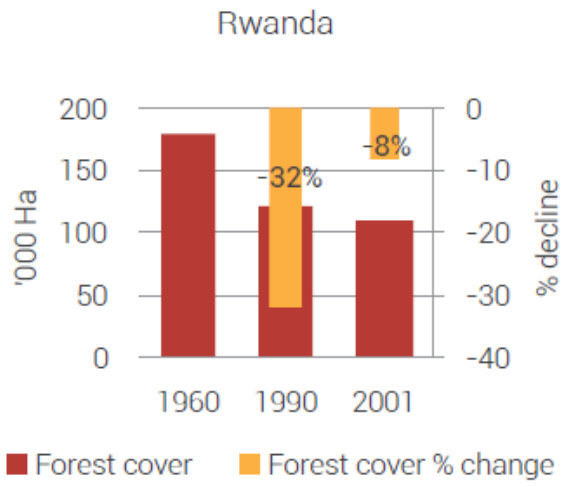


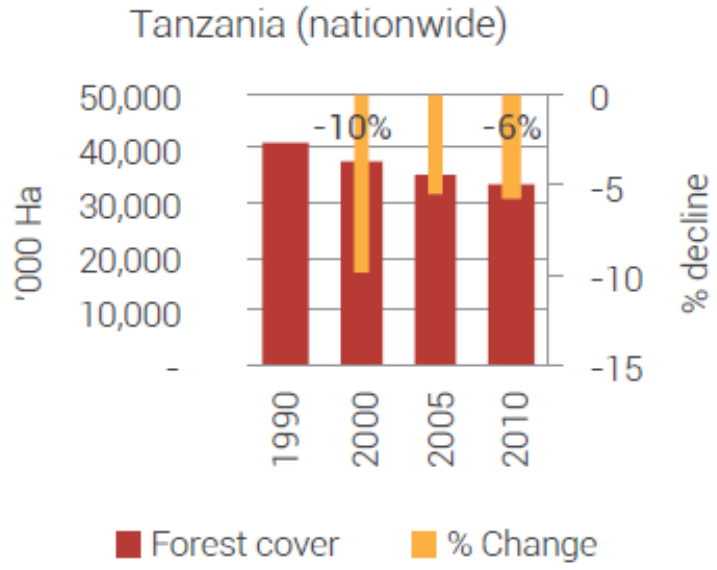


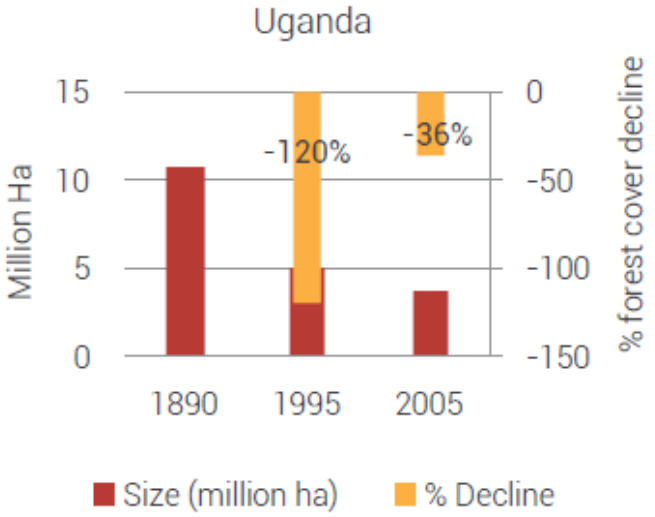
Biomass demand and supply condition in the EAC



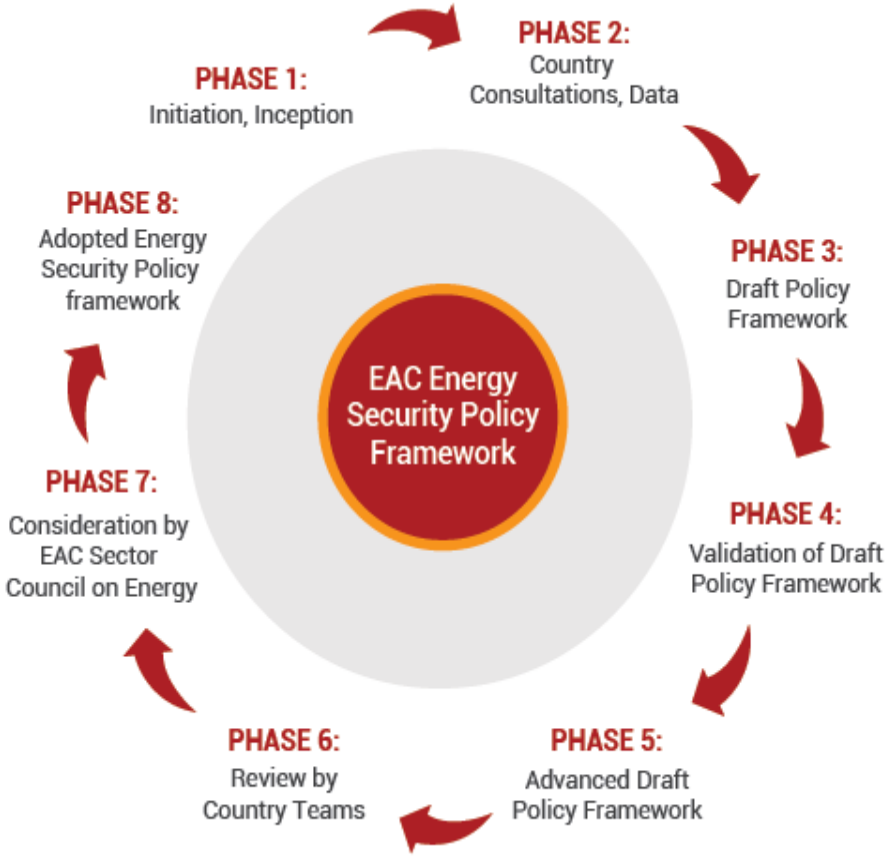


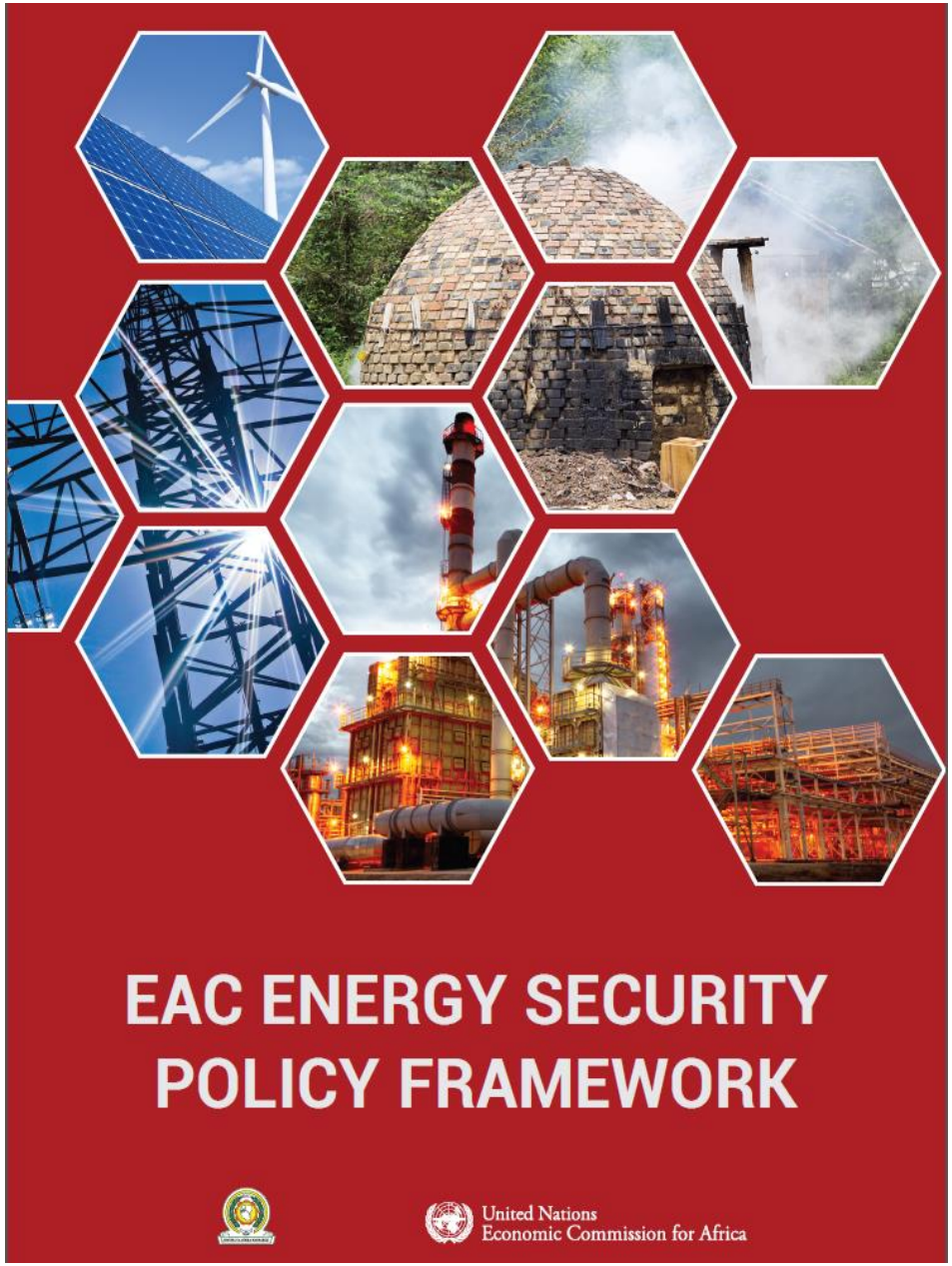






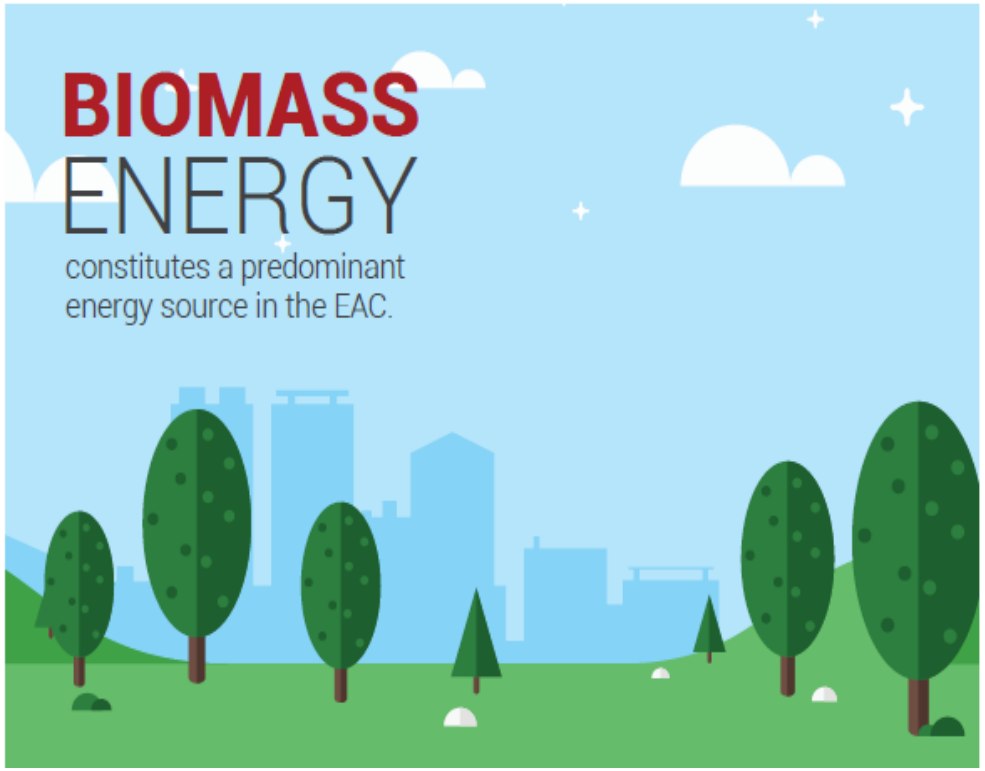
Response: the EAC Energy Security Policy Framework

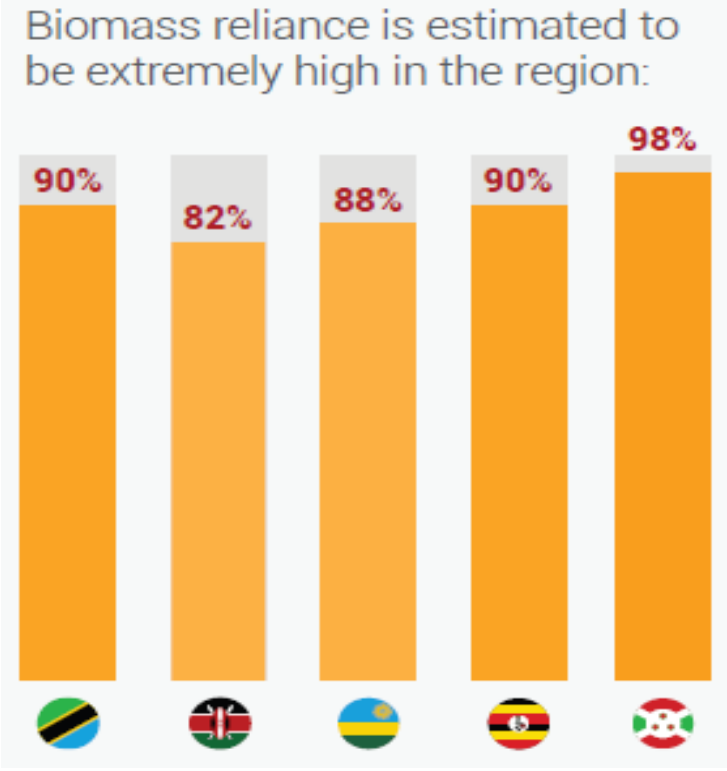





Biomass Energy Security

Biomass Energy Security





Biomass energy security refers to the continual availability, in a sustainable manner, and affordability of biomass energy sources to households, institutional, commercial and industrial end users.

Biomass demand and supply condition in the EAC

Degree of demand and supply imbalance and supply deficit :

- Burundi – wood demand and supply imbalance; deficit of 56% - 155%.
- Kenya - wood demand and supply imbalance for wood; deficit of 37%. For charcoal it is at 122%.
- Rwanda - wood demand and supply imbalance; 26%.
- Uganda - wood demand and supply imbalance; 69%.
- Tanzania - wood demand and supply imbalance; 20%. Zanzibar wood supply deficit of 10%, and charcoal of 178%.

What are the common challenges faced?

BURUNDI

- Threats to environment and family health
- Loss of time to collect firewood

KENYA

- Definition of a forest
- Lack of regional charcoal trade harmonisation
- Cultural practices: bush burning, poor agricultural practices, cooking methods

RWANDA

- Rising cost of wood and charcoal
- Lack of guidelines for wood and charcoal supply

UGANDA

- Regulatory framework for agro residues
- Private ownership of forest and regulation
- Low innovation and scaling-up models
- Market development by entrepreneurs
- Insufficient curriculum about biomass

THE UNITED REPUBLIC OF TANZANIA

- Switching to alternative energy
- Reliance on biomass for employment
- Lack of proper harvest plan
- Limited models for sustainable biomass
- Inadequate forest extension service

What are the impacts anticipated?

Partner State	Experienced and/or Anticipated Impacts
Uganda	▪ The shift of woody biomass energy prices towards expensive and unaffordable levels ▪ Continued depletion of biomass stock, mainly forest cover ▪ Negative impact of climate change on biomass stock ▪ Increased poverty resulting from energy insecurity ▪ Malnutrition and hunger from energy poverty ▪ Increased health impacts ▪ Increased rural to urban migration in search of better services
Burundi	▪ Increases in the price of wood ▪ Family health impact (fatigue in firewood collection) ▪ School drop-outs for girls ▪ Climatic change, reduced rainfall and food insecurity ▪ Degradation of ecosystem and natural biodiversity ▪ Destruction of public and private infrastructure (roads, houses, bridges, et cetera) ▪ Reduction of the water table resulting in the scarcity of drinking water ▪ Reduced hydroelectric potential ▪ Budgetary impact
Rwanda	▪ Considerable increase in biomass prices ▪ Availability of poor quality woody biomass ▪ Lack of access to products by end users ▪ Socio-economic impacts such as health, education, livelihood, gender, et cetera ▪ Forest resources degradation, reduced soil fertility ▪ Gap between demand and supply will widen ▪ Vulnerability of the population

What are the impacts anticipated?

The United Republic of Tanzania	**Mainland** ▪ Increased poverty ▪ Increased forest degradation, depletion and deforestation ▪ Inadequate human and financial resources capacity ▪ Increased social and environmental stress ▪ Time consumed during searching for wood would increase ▪ Higher prices for charcoal and fuelwood ▪ Unsustainable wood sector supply ▪ Suitable tree species for charcoal production will diminish, replaced by poor quality wood ▪ Drying of water sources and increased vulnerability to climate change ▪ Reduced income for dealers in the charcoal supply chain ▪ Increased social and environmental stress **Zanzibar** ▪ Malnutrition, especially in rural areas ▪ Higher unemployment rate ▪ Higher demand for other sources of energy ▪ Households economic welfare effect ▪ Rise in resources use conflicts
Kenya	▪ Health effects of indoor pollution ▪ Dwindling forest resources and inaccessibility of bio-energy ▪ Higher wood and charcoal prices ▪ Disruption of food preferences and diet due to availability and cost of biomass energy ▪ Deforestation and degradation of land and ecosystem and energy resources conflict ▪ Destruction of water catchments and contribution to rising food insecurity ▪ Increased effects of climate change

Tracing energy security driving factors

Efficiency of conversion technologies

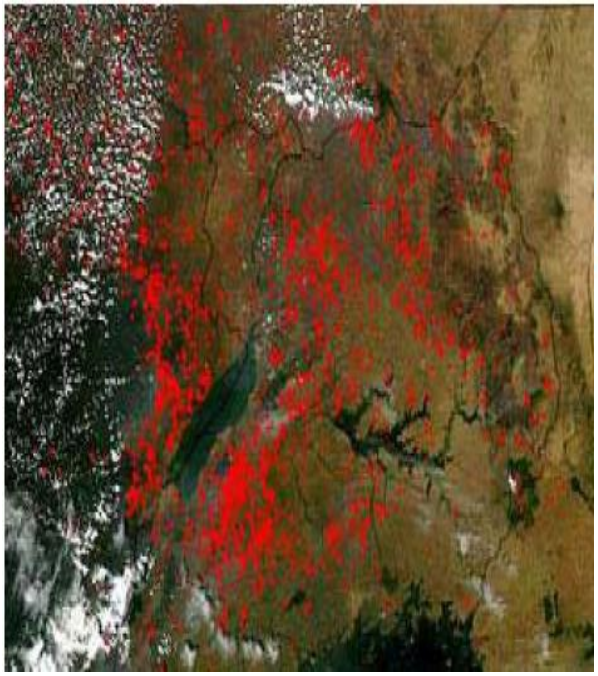
- Degree of efficiency of carbonization technologies:
  - Burundi – 8-10% efficiency
  - Kenya – 16% efficiency
  - Rwanda – 12% efficiency
  - Uganda – 10-12% efficiency
  - Tanzania - 19% efficiency

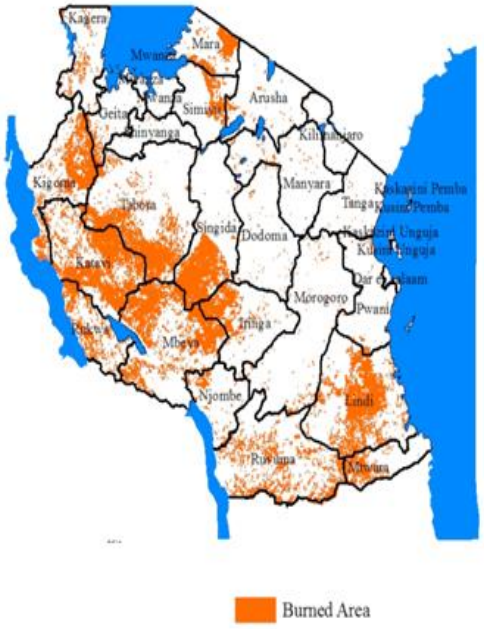
- Kenya: if efficiency is improved from 16% to 30%, the wood requirement for current levels of charcoal (47 million m3) would decline to 14 million m3.

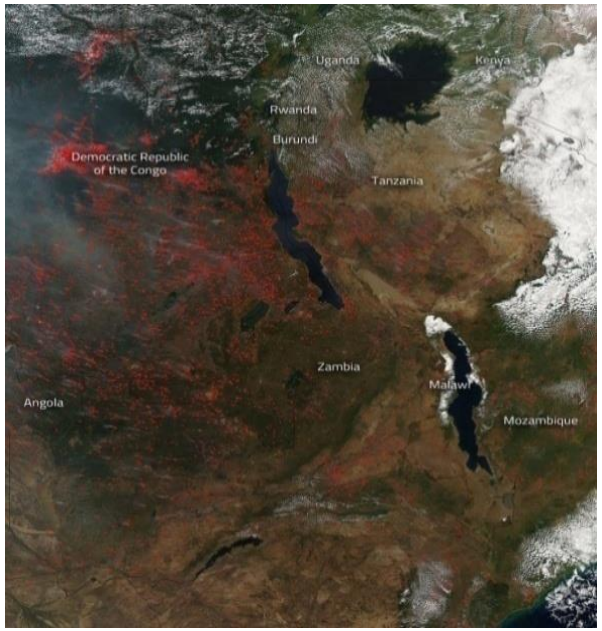
Tracing energy security driving factors

Forest fire and forest stock damage

- Degree of damage from forest fires:
  - Uganda – 2013 forest fire claimed 30% of forestland.
  - Tanzania - 2014-15 forest fire claimed 90,641 km2, or 10% of the landmass; some local areas faced up to 44% area burned.

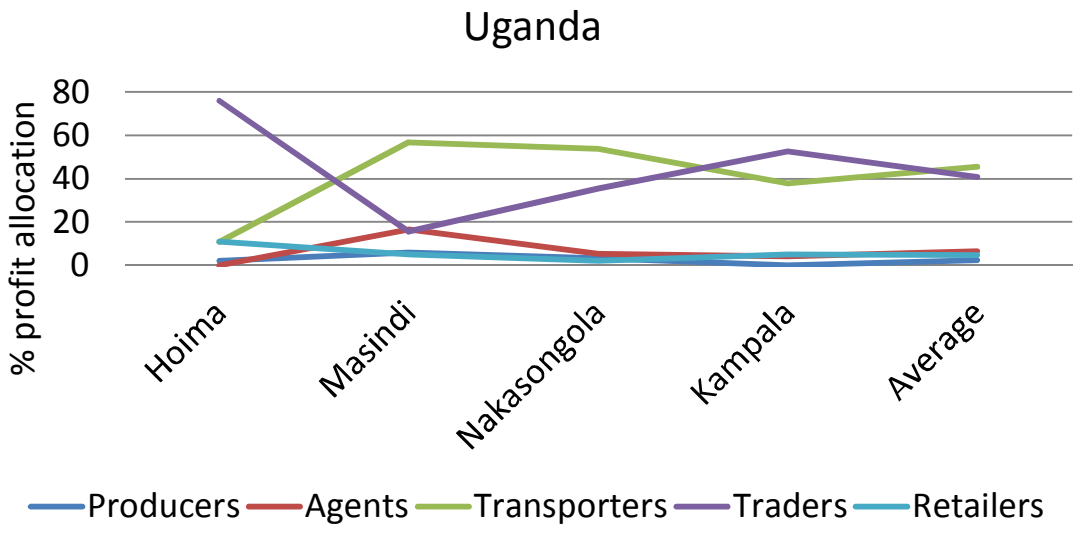


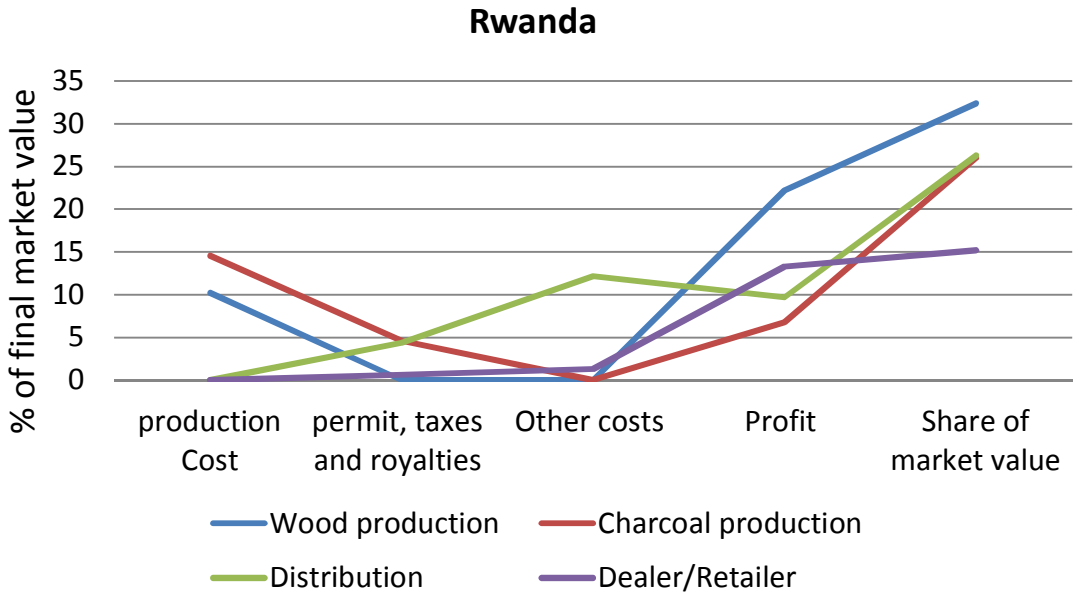




The biomass value chain and energy security

By concentrating premium value and high profit share in distributors and traders, consumers are exposed to prices that are significantly higher than production costs, indicating value chain inefficiency





The biomass value chain and energy security

The biomass energy security policy framework has eleven dimensions: demand side, supply side and value chain-related.

Security Factor	Indicators	Measurement
Forest fire and crime 	Number of forest fire incident	Number/year
	Intensity of forest fire (loss)	Ha/year
	Quantity of wood illegally harvested	M^3 wood/year
Efficient conversion technologies 	Tier 1: > 50% efficient carbonisation adoption	% of registered producers in a given year
	Tier 2: 26-50% efficient carbonisation adoption	% of registered producers in a given year
	Tier 3: 1-25% efficient carbonisation adoption	% of registered producers in a given year
Forest productivity 	Natural forest productivity	M3/Ha
	Community forest productivity	M^3/Ha
	Plantation forest productivity	M^3/Ha
	Agro-forestry productivity	M^3/Ha
	Other lands forest productivity	M^3/Ha

Security Factor	Indicators	Measurement
Resource stocking 	Afforestation	Ha/year
Energy plantation 	Establishment of forest plantation for energy	Ha/year
Forest health 	% of forestland afflicted by disease	%/year
	% of major fuel wood forest afflicted by disease by species	%/year

Monitoring and Evaluation

Efficient conversion technologies		Tier 1: > 50% efficient carbonisation adoption	• Compile national database of carbonisation operators and review Tier 1 adoption rate
		Tier 2: 26-50% efficient carbonisation adoption	• Compile national database of carbonisation operators and review Tier 2 adoption rate
		Tier 3: 1-25% efficient carbonisation adoption	• Compile national database of carbonisation operators and review Tier 3 adoption rate
Resource stocking		Afforestation	• Review and report annual afforestation

Key policy recommendations

Efficient conversion technologies

- Tier 1: > 50% efficient carbonisation adoption
  - Compile national database of carbonisation operators and review Tier 1 adoption rate
- Tier 2: 26-50% efficient carbonisation adoption
  - Compile national database of carbonisation operators and review Tier 2 adoption rate
- Tier 3: 1-25% efficient carbonisation adoption
  - Compile national database of carbonisation operators and review Tier 3 adoption rate

Value chain organisation

- Assessed total wood and charcoal production by licensed operators
  - Maintain database of licensed wood and charcoal operators and provide assessment of total supply from licensees
- Assessed total wood and charcoal distribution by registered operators
  - Maintain database of licensed wood and charcoal distributors and provide assessment of total distribution

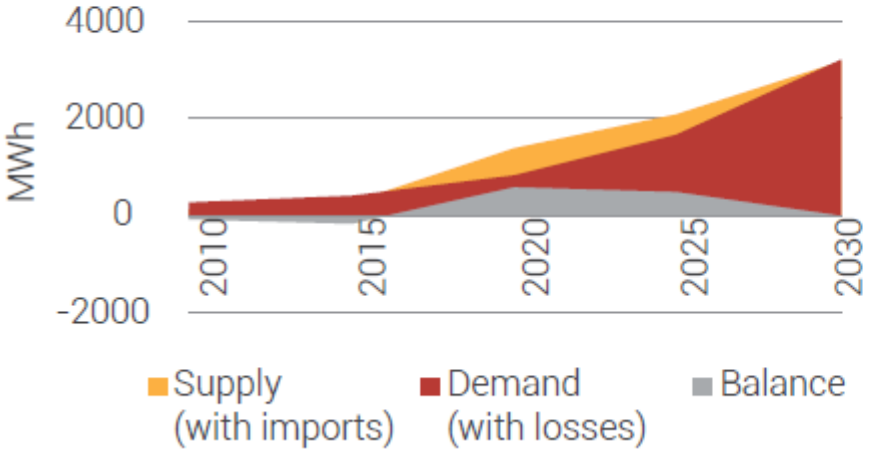

Electricity Supply Security

Electricity supply security

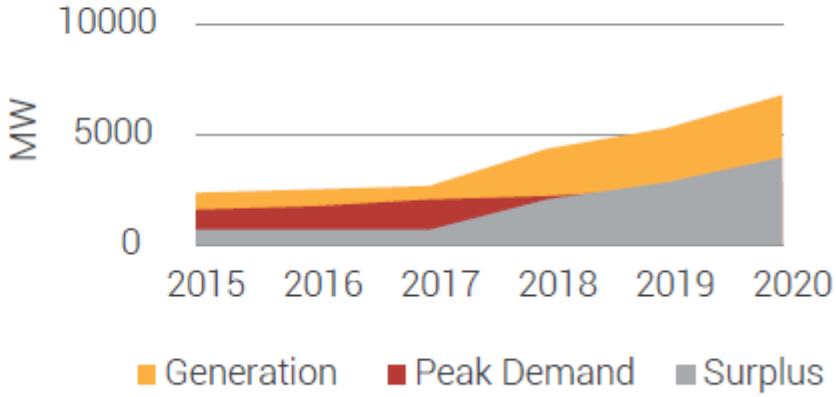
Supply security of electricity is the stability and reliability of the electricity system over time in a manner that delivers adequate, quality and affordable power supply to end-users.

Electricity demand and supply conditions in the EAC

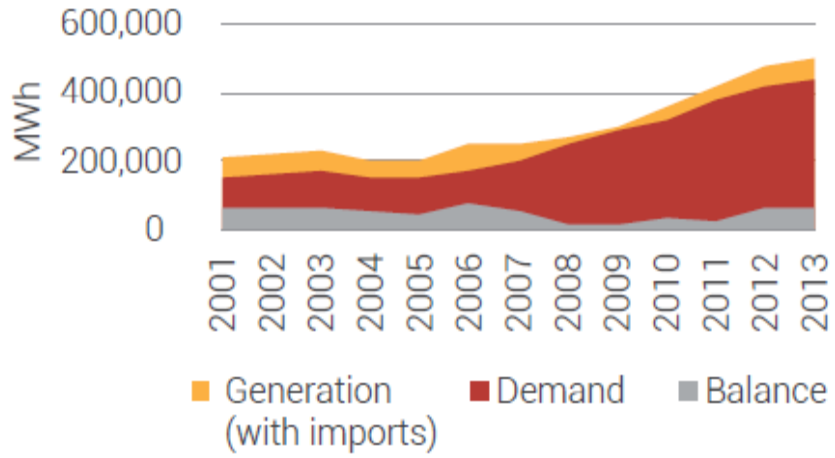
Burundi electricity demand and supply conditions: 2010 - 2030



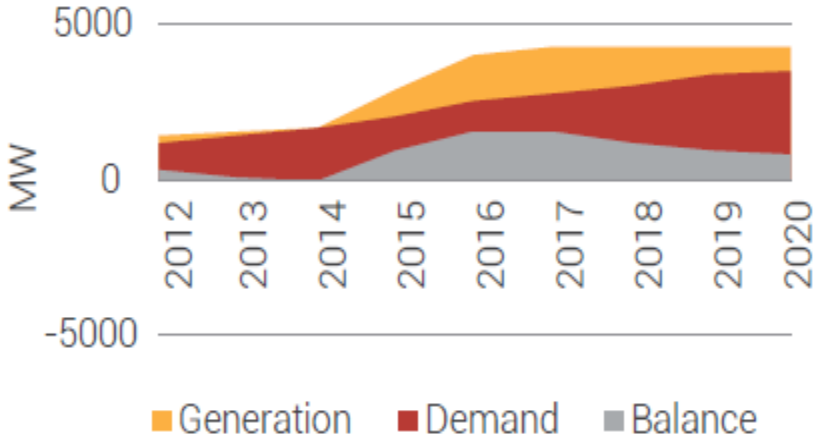
Kenya electricity demand and supply conditions: 2015 - 2020



Rwanda demand and supply conditions: 2001 - 2013



United Republic of Tanzania demand and supply conditions: 2012 -2020



Challenges faced and the impacts experienced

BURUNDI

Insufficient data on energy needs; lack of standardisation of installation materials; commercial network losses; low purchasing power of population; lack of information on electricity pricing at regional level; hydro generation reliability and general lack of reservoirs

KENYA

Limited diversification; attractiveness of feed-in tariffs (FiTs); lack of reserve margin requirements; blackouts when hydro is low; system stability and power quality; transmission network capacity; "ease of doing business" ranking and loans accessibility

UGANDA

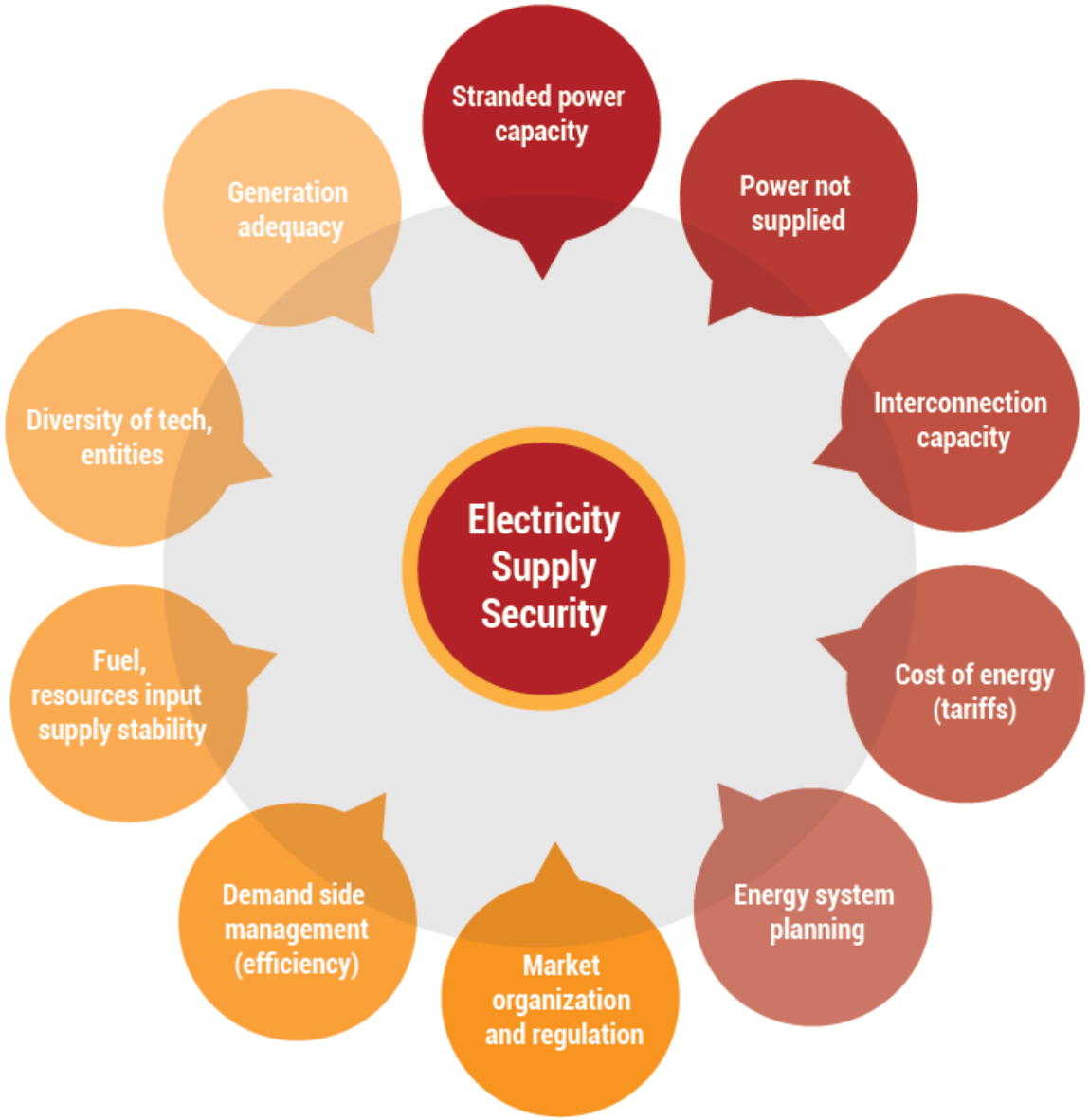
Low rate of electricity access; taxes on power imports and infrastructure equipment; transportation constraint to import equipment; lack of a guiding framework for PPPs; intermittent generation capacities of hydro plants

MAINLAND, TANZANIA

High fuel cost for thermal power plants; lack of cost-reflective tariff; high distribution interruptions; environment impact caused by thermal plants; Limited fuel for co-generation; non stand-alone generation facility for solar and wind

The biomass value chain and energy security

The electricity supply security policy framework has ten dimensions: demand side, supply side and value chain-related.



Security Factor	Indicators	Measurement
Fuel, resources input supply stability 	Non-renewable fuel input (diesel, coal, gas, etc.) supply stability	Number of hours/ year generation was reduced from average, or stopped, due to fuel input shortage
	Renewable energy resource inputs (water, wind, etc.) supply stability	Number of hours/ year generation was reduced from average, or stopped, due to fuel input shortage
Diversity of tech and entities 	Diversity of generation technologies	Herfindahl diversity index of generation sources - measured as sum of generation share of each technology squared
	Diversity of generation players	Herfindahl diversity index of generation players - measured as sum of generation share of each generation company squared

Security Factor	Indicators	Measurement
Generation adequacy 	Generation spinning reserve	Percent reserved reliably available spinning generation capacity by generation source
	Capacity to meet peak demand	Loss of load expectation (LOLE) - measured as number of hours/year available generation capacity will not meet peak load demand
	Unserved energy need (cost of unserved energy need)	Expected unserved energy (EUE) - measured as MWh/year that will not be supplied due to generation capacity limits
Stranded power capacity 	Locked-in generation capacity not evacuated	MW/year of available energy not evacuated due to transmission and distribution network availability and capacity

Monitoring and Evaluation

Fuel, resources input, supply stability

- Non-renewable fuel input (diesel, coal, gas, etc) supply stability
  - Review the number of hours per year generation was reduced due to fuel inputs shortage
- Renewable energy resource inputs (water, wind, etc) supply stability
  - Review the number of hours per year generation was reduced due to fuel inputs shortage

Diversity of tech and entities

- Diversity of generation technologies
  - Trace periodic changes in generation diversification
- Diversity of generation players
  - Update national database on the number of players

Generation adequacy

- Generation spinning reserve
  - Compile data on reserve capacity and prepare report
- Capacity to meet peak demand
  - Review energy demand and supply conditions and evaluate trends
- Unserved energy need (cost of unserved energy need)
  - Estimate and share the cost of unserved energy

Stranded power capacity

- Locked-in generation capacity not evacuated
  - Conduct periodic review of stranded power capacity and share analysis

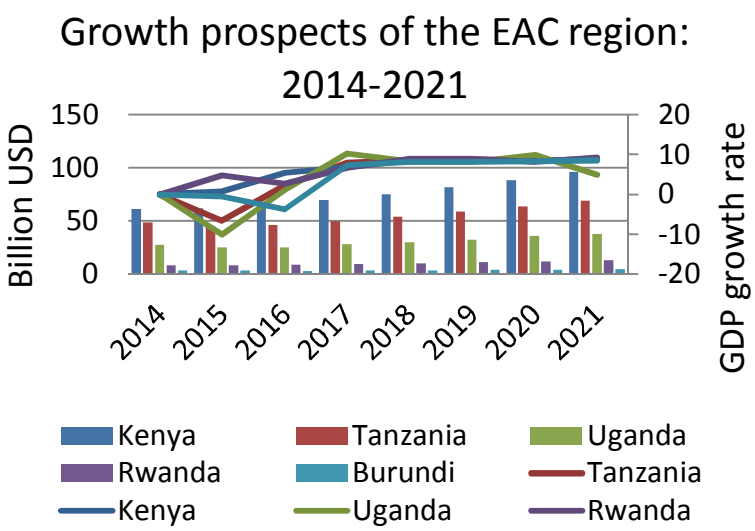
Energy Security Factor	Key areas	Policy actions
Stranded power capacity 	Locked-in generation capacity not evacuated	▪ Prioritise the expansion and upgrade of grid infrastructure in stranded power hot spot areas ▪ Clarify the responsibility of, and expectations on, investors in power evacuation ▪ Coordinate generation and grid development planning to minimise power evacuation constraints
Energy not supplied 	Integrated system power loss	▪ Establish mandate for max allowable integrated system loss ▪ Scale-up prepaid electricity credit system ▪ Scale-up automated metre reader for bulk consumers ▪ Strengthen monitoring and enforcement capacity for commercial loss mitigation

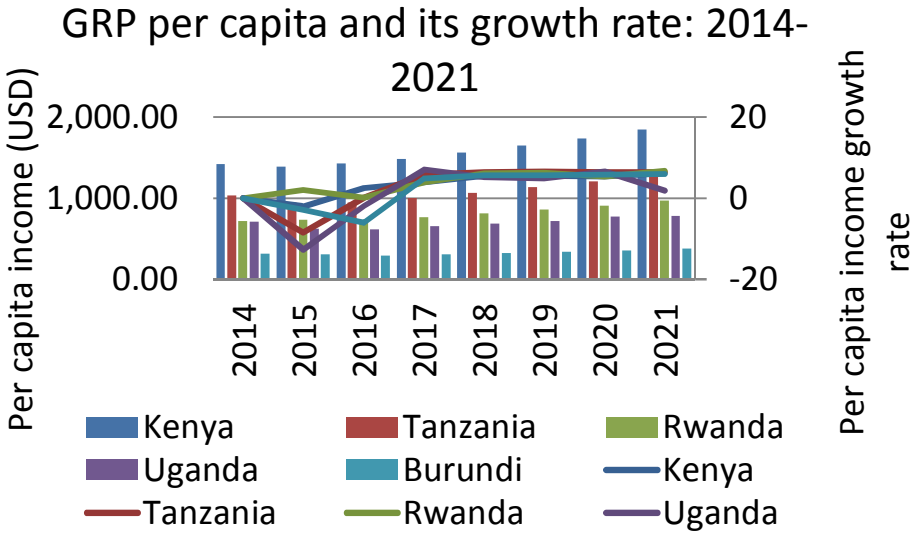

Oil and Gas Supply Security

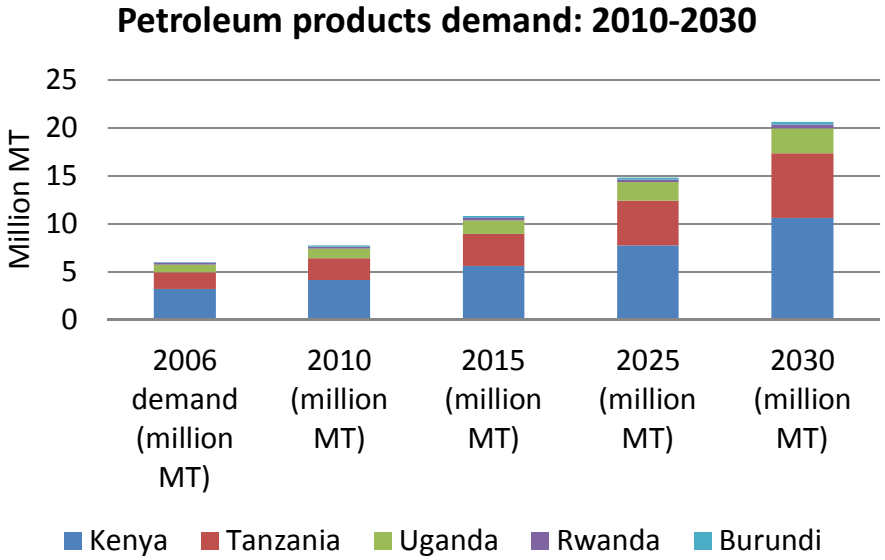
What is oil and gas energy security

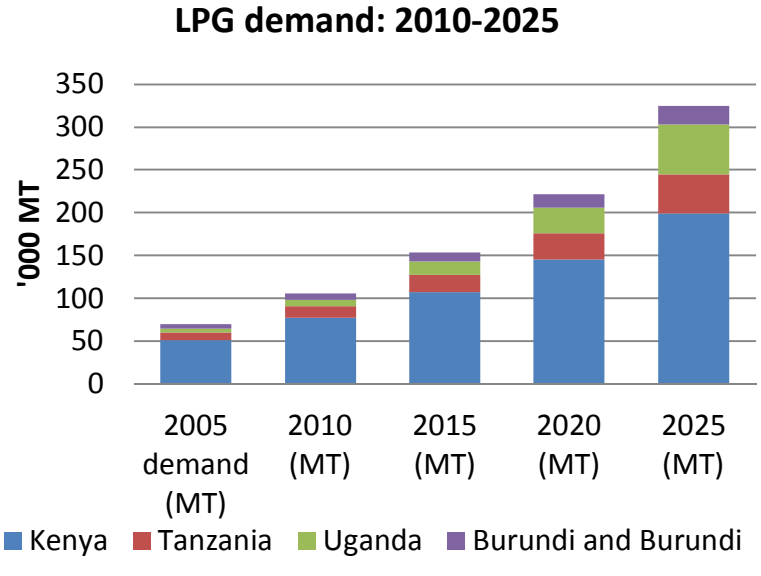
Oil and gas energy security is the uninterrupted availability of oil and gas supplies at affordable prices over a period of time.

Oil and gas consumption in the EAC

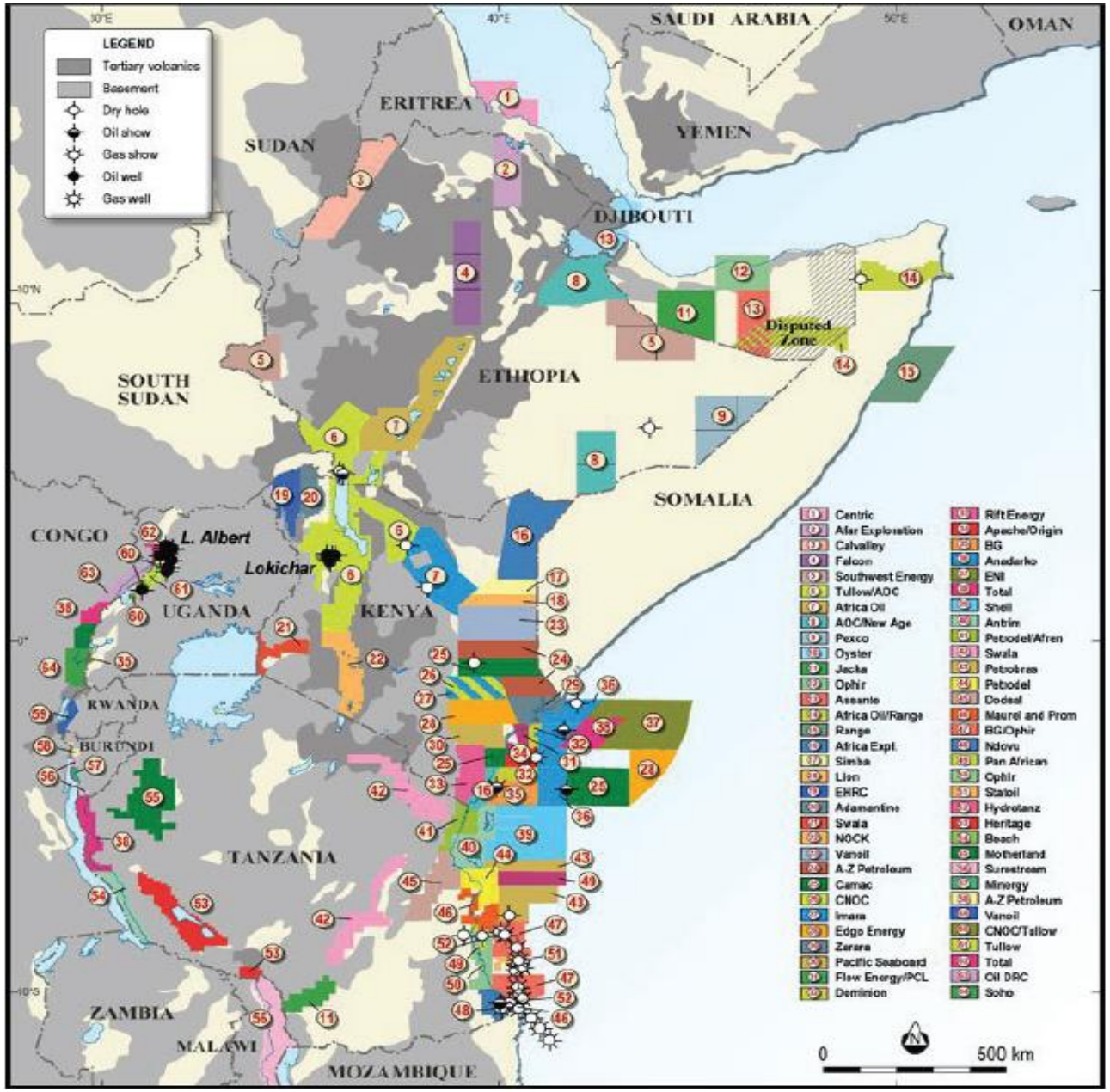








Oil and gas interest in the region



Oil and gas energy security challenges

KENYA

- Reliance on single jetty at port off-loading
- Obsolete refinery technology and closure
- Land access, acquisition and way-leaves
- Electricity outages and pipeline delays
- Reliance on import refined petroleum
- Improving the open tender system
- Institutional framework for energy security
- High initial cost of infrastructure
- Geopolitics and energy markets

UGANDA

- Constrained inland storage capacity
- Delays in granting production licenses
- Lack of emergency plan for disruptions
- Small-scale expected refinery and costs
- Low focus on inland infrastructure for refinery
- Low support for LPG infrastructure
- Lack of regional emergency planning
- Energy sector tax and investment impacts
- Delays to operationalise NPA, NOC, etc

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- Effect of petroleum prices on gas
- Lack of natural gas distribution network
- Inadequate investment in gas production wells
- Policy gap in the use of compressed natural gas
- Lack of bunkering facility (oil filling equipment)

ZANZIBAR

- Price build-up challenges
- Transport and handling of nearby ports
- Safety, health, environmental impacts
- Statistics on LPG
- Energy policy reviews
- Port windows limited at Mombasa and Dar es Salaam

The oil and gas energy security policy framework

The oil and gas energy security policy framework has eleven dimensions: demand side, supply side, value chain and external factors.

Security Factor	Indicators	Measurement
Value chain organisation and regulation 	Regulatory enforcement capacity	Number of inspections/ month
	Market organisation	Presence of oil and gas import coordination
	Product diversion	Number of product diversion incidents/month
	Product adulteration	Number of incidents/month

Security Factor	Indicators	Measurement
Strategic petroleum reserves 	Public, industry and private strategic stock reserves	Barrels, m^3

Energy Security Factor	Key areas	Policy Actions
Market volatility and political risks 	Oil price volatility in global markets	▪ Work with OMCs towards a minimum oil and gas import diversification plan. In the case of Kenya and Tanzania, OTS and BPS systems may introduce phased-in requirement for import diversification by OMCs ▪ Through OTS and BPS systems, consider a regional bulk procurement that enables oil market hedging and mainstreaming hedging options
	Diversity of oil import countries	
Import dependence 	Domestic petroleum and gas products consumption met by imports	▪ Develop and implement national biofuels strategy and action plan, with set target on displacing imported fuels ▪ Pursue import country diversification plan as advised above
Maritime and inland transit security 	Maritime and inland corridor security, port efficiency and capacity	▪ Strengthen existing regional cooperation on maritime safety and security ▪ Strengthen EAC regional transit security periodic review with the Northern and Southern Corridor institutions ▪ Pursue investment models to finance port storage, handling and evacuation capacity improvement and expansion based on regional demand

Institutional Framework for Energy Security Management

Key messages from the framework

- Countries should consider putting in place energy security strategies to reduce impacts and increase resilience.

- Energy insecurity costs 2-5% of GDP, in some cases higher. Energy security is also an economic security issue.

- The cost of inaction will be far greater, specially in energy sources we rely the most, such as biomass.

- There is scope for regional cooperation and joint initiatives to address energy security challenges.

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