

REPUBLIC OF KENYA



MINISTRY OF ENVIRONMENT AND FORESTRY

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TOWARDS CLIMATE RESILIENCE

Scaling up clean cooking in urban Kenya with Bio-ethanol

Using technology and business model innovation to promote
sustainable cooking fuels

Supported by:



Federal Ministry
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and Nuclear Safety

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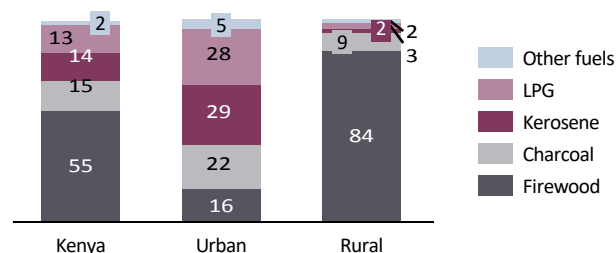
Prepared for COP25, NDC Partnership Pavilion

based on a decision of the German Bundestag

The urban Kenyan cooking fuel market is estimated at USD 600m – USD 800m per annum, and remains dominated by dirty fuels

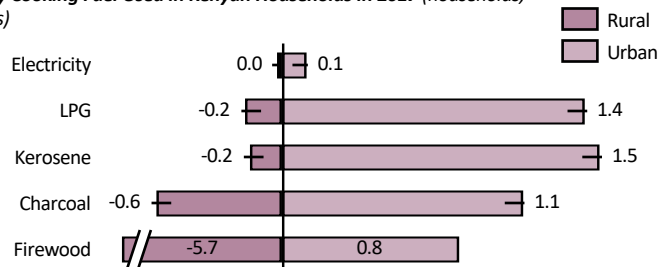
In urban Kenya, the majority still use charcoal and kerosene; this number is much higher when fuel 'stacking' is included

*Primary Cooking Fuel Used in Kenyan Households in 2017
(% of population)*



Kenyan urban households are now ready for rapid uptake of clean, modern fuels

Primary Cooking Fuel Used in Kenyan Households in 2017 (households, millions)



The majority of Kenyans currently paying for cooking fuels live in urban Kenya

- Most fuel used in rural areas is gathered and not purchased (e.g., 84% of households use firewood as their primary fuel)
- Market-driven approaches for expanding the use of modern fuels are unlikely to take hold in these areas in the short term
- In urban areas, on the other hand, over 80% of households are already purchasing cooking fuel and are prime targets for modern fuel use

Within modern fuel options, Bio-ethanol and LPG are the most feasible today; Bio-ethanol is the least understood

- LPG is well-understood, already promoted by the Government, and enjoys strong consumer recognition
- Bio-ethanol is relatively unexplored and has achieved lower penetration thus far
- Electricity will become increasingly important to the overall cooking mix; however, for now, only higher income consumers can afford the expensive but efficient electric stoves that are needed to make electric cooking viable

Continued dependence on dirty cooking fuels poses serious health, environmental, and food insecurity risks for Kenya

Impact of using biomass fuel for cooking

Health



- **Indoor air pollution:** 728k Disability-Adjusted Life Years (DALYs) and 16.6k deaths annually, **8-10% of early deaths** in Kenya¹, likely a substantial underestimate of the full disease burden as many negative cooking health effects have not yet been quantified (e.g., burns, eye diseases, physical injuries from carrying firewood, etc.)
- **Lower respiratory tract disease** is the third largest contributor of deaths in Kenya while pneumonia is a major cause of death to children under the age of five, largely due to indoor air pollution¹

Environment



- **Deforestation and forest degradation:** Kenya loses **10.3 million m³ of wood from its forests** every year from unsustainable charcoal and wood fuel use, a major contributor to the 0.3% per year deforestation rate²
- **GHG emissions:** Household fuel use in Kenya contributes **22-35 million tonnes of CO₂ eq** each year, which is equivalent to **30-40% of total Kenya GHG emissions**²

Food insecurity

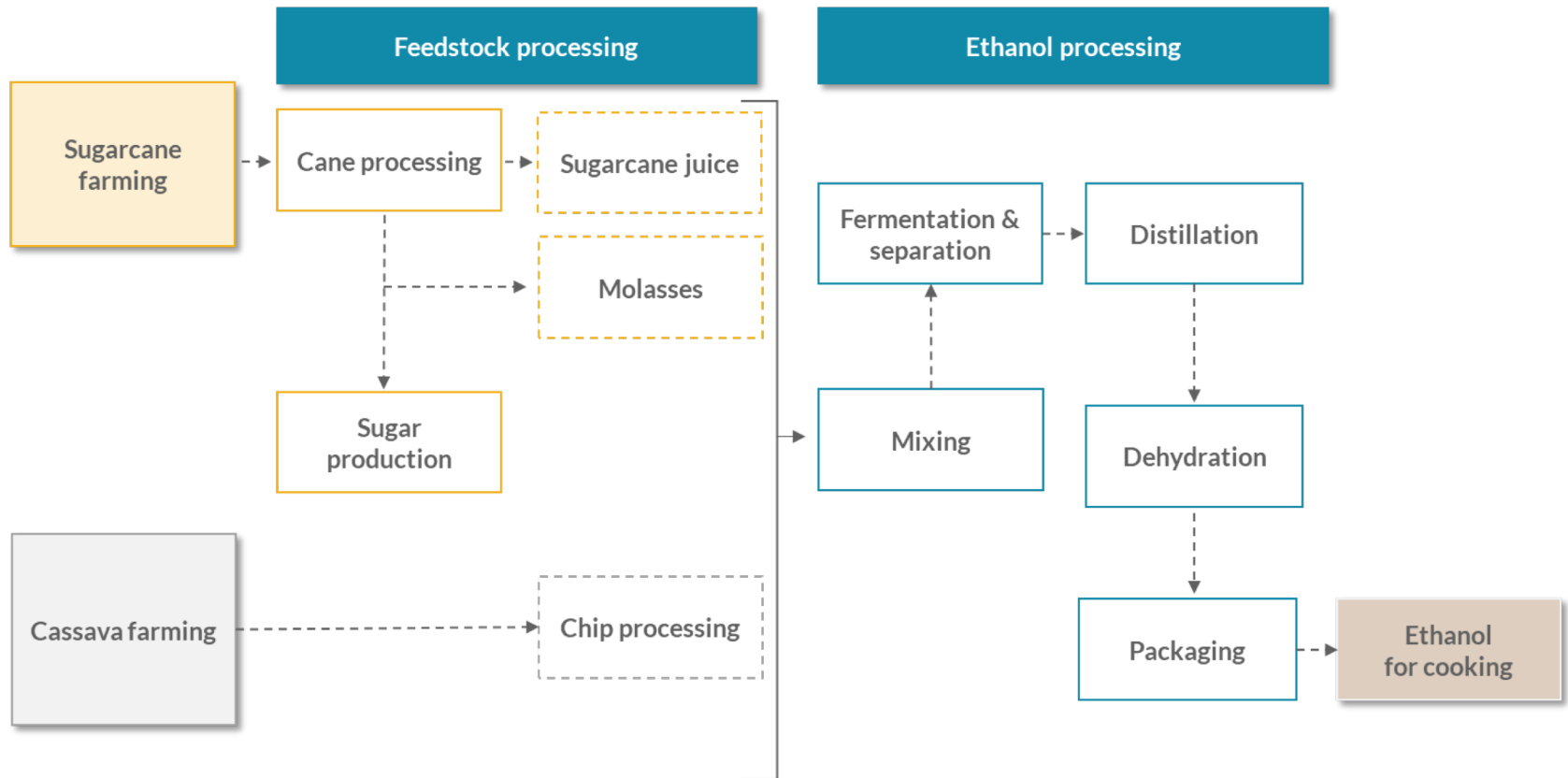


- **Food insecurity:** deforestation, resulting from the use of dirty fuels, exacerbates food insecurity and harms the agriculture sector. Kenya's five forest water towers feed filtered rainwater to rivers and lakes and provide **over 75 per cent of the country's renewable surface water resources**³



Bio-ethanol for cooking

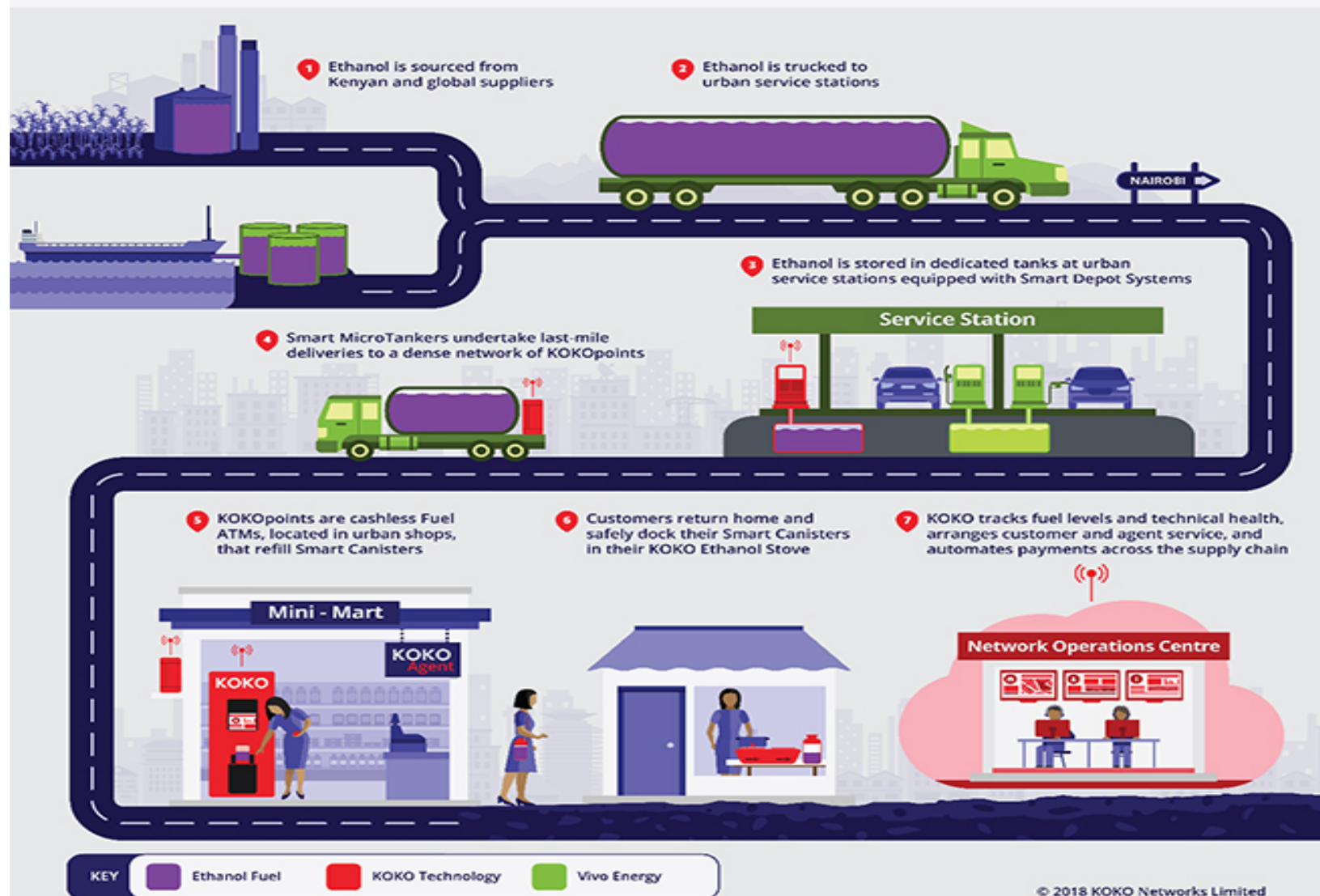
Source of Ethanol for Cooking



KENYAN PARTNERSHIP OVERVIEW

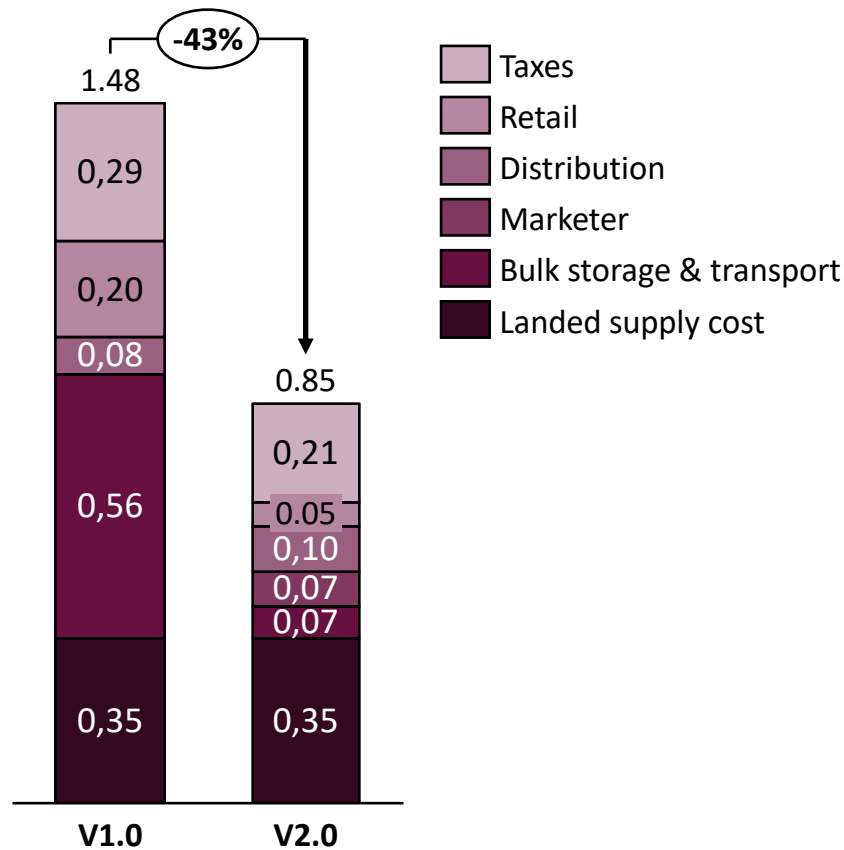
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V2.0 innovations mean that Bio-ethanol can be delivered at scale to the customer at a price up to ~40% less than the V1.0 approach

Supply chain margins for Bio-ethanol
(% of total cost)



Bio-ethanol V2.0 costs are significantly lower than those of Bio-ethanol V1.0

- Leveraging existing downstream infrastructure can **cut down bulk storage and transport costs by ~90%**
- Technology-enabled distribution can **reduce combined distribution and retail costs by ~45%**
- Aside from landed supply cost, taxes drive the retail price of Bio-ethanol V2.0

The cost at which Bio-ethanol can be sold to customers is inflated by high import taxes and VAT, which drive ~25% of the retail price

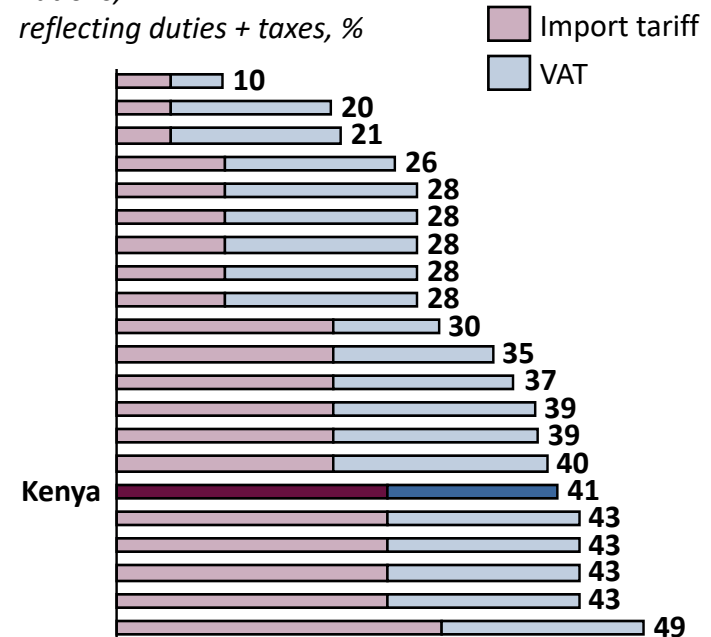
Taxes on Bio-ethanol are high relative to those on other fuels in Kenya

Kenyan duty and VAT rates for cooking fuels:

FUEL	Effective duty	Effective VAT
Charcoal	N/A	N/A
LPG	0%	0%
Kerosene	9% ¹	0%
Denatured technical Bio-ethanol	25%	16%

Taxes on Bio-ethanol are high in Kenya relative to in other countries

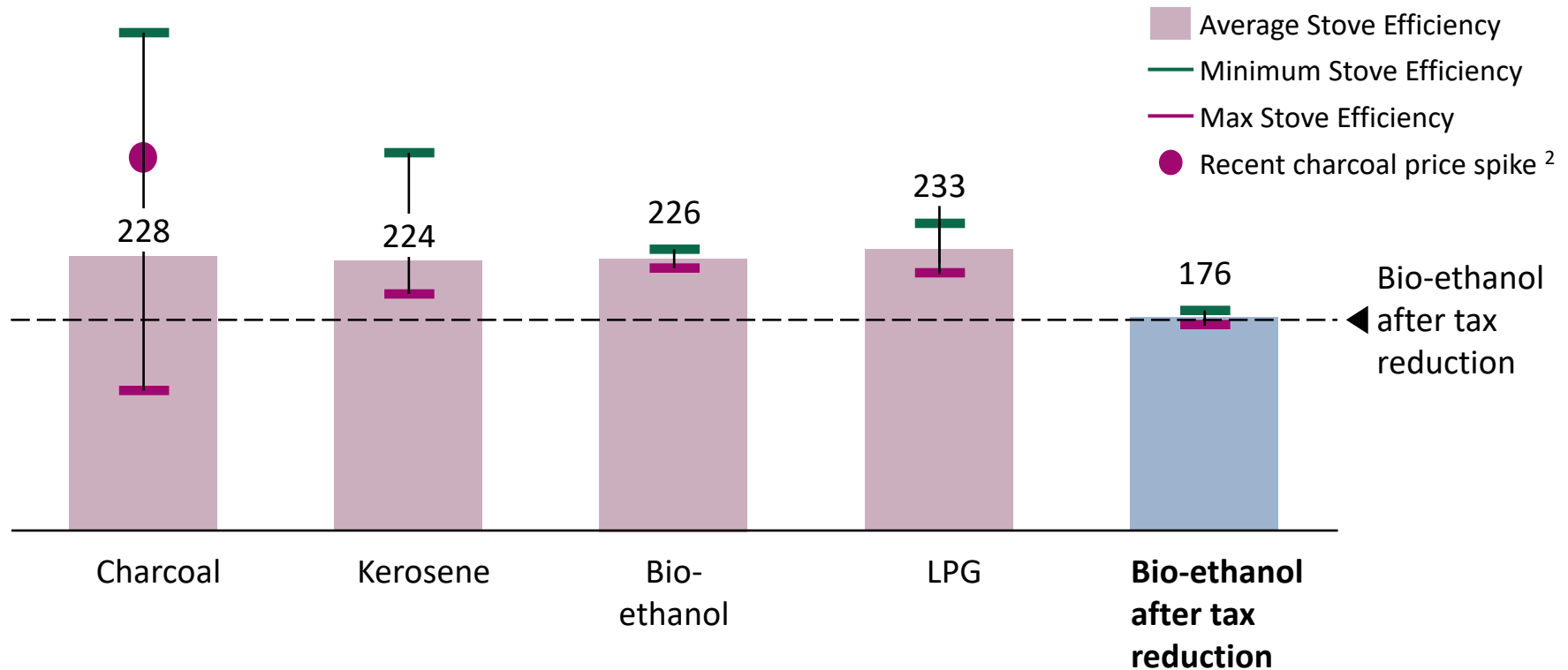
Duty and tax burden on imported denatured Bio-ethanol; subset of 21 SSA nations, reflecting duties + taxes, %



Granting industrial Bio-ethanol imports a VAT-zero rating and eliminating associated tariffs could reduce Bio-ethanol retail prices from \$0.85 /L to \$0.64/L

Granting Bio-ethanol a VAT-zero rating and eliminating tariffs would make it the cheapest cooking fuel option for Kenyans

Average annual fuel expenditure by fuel type to meet 3,500 MJ fuel diet of a typical Nairobi household¹, USD / year



(1) Average fuel diet taken from survey data; average size of household in Nairobi assumed to be 3.2

(2) Recent price spike in charcoal price reach \$0.5/kg and continue to rise; this is due to a ban on illegal logging introduced by the government in addition to the expected upswing during the wet season

(3) Assumes V2.0 model and using imported Bio-ethanol

Source: Renetech 2017; TERI 2016; Kenya institute for Public Policy Research and Analysis 2010; KOKO Networks consumer research; Dalberg Analysis

A transition of all kerosene / charcoal users in Nairobi to Bio-ethanol could result in ~2mn tonnes GHGs, 200K DALYs, and 1,500 deaths averted p.a.

A full transition of kerosene and charcoal users to Bio-ethanol in Nairobi alone would help towards achieving the Sustainable Development Goals



~200,000 DALYs and 1,500 deaths averted^{3 4} over a three year intervention period



time savings from collection, cooking, and cleaning **will accrue to women**



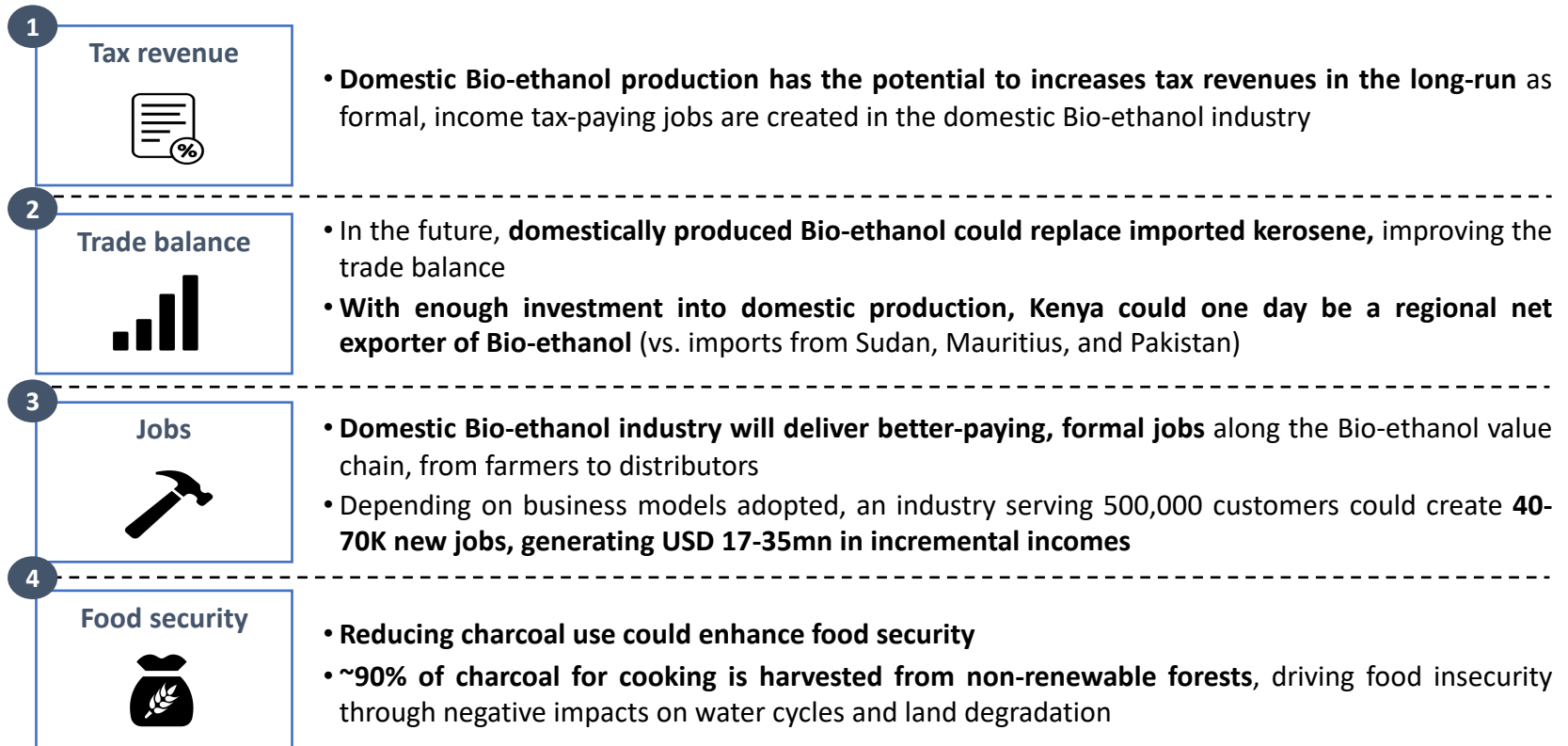
USD 60mn in annual consumer savings⁴



Reduction of 2mn tonnes of CO₂eq emissions¹

This represents 2-3% of Kenya's annual GHG emissions and **10% of Kenya's 2030 GHG reduction goal²**

Bio-ethanol presents potential opportunities for strengthening the Kenyan economy





The way forward

Kenya Ethanol Cooking Master Plan

- Understanding demand for ethanol cooking fuel
- Supply of ethanol cooking fuel
 - CAPEX
 - Additional revenue streams
- Employment, income, environmental, & health benefits of a transition to ethanol cooking fuel
- Recommendation and Implementation Roadmap

Creating awareness - Chuja Anthem



Thank you

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