Modern bioenergy and its potential role towards enabling a sustainable future for Southern Africa

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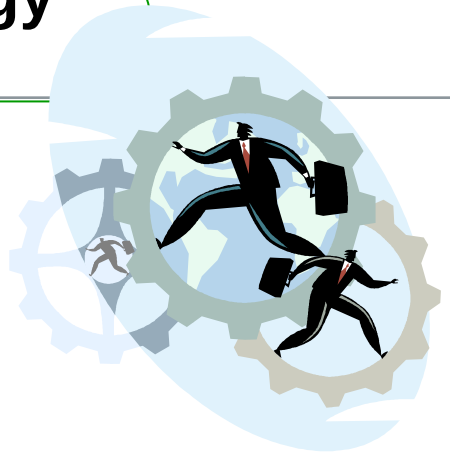
Words of Wisdom for Bioenergy

"The new idea either finds a champion or dies.....

No ordinary involvement with a new idea provides the energy required to cope with the indifference and resistance that major technological change provokes...

Champions of new ideas must display persistence and courage of heroic quality."



Southern Africa Transport and Communication Commission [SATCC] (2003)

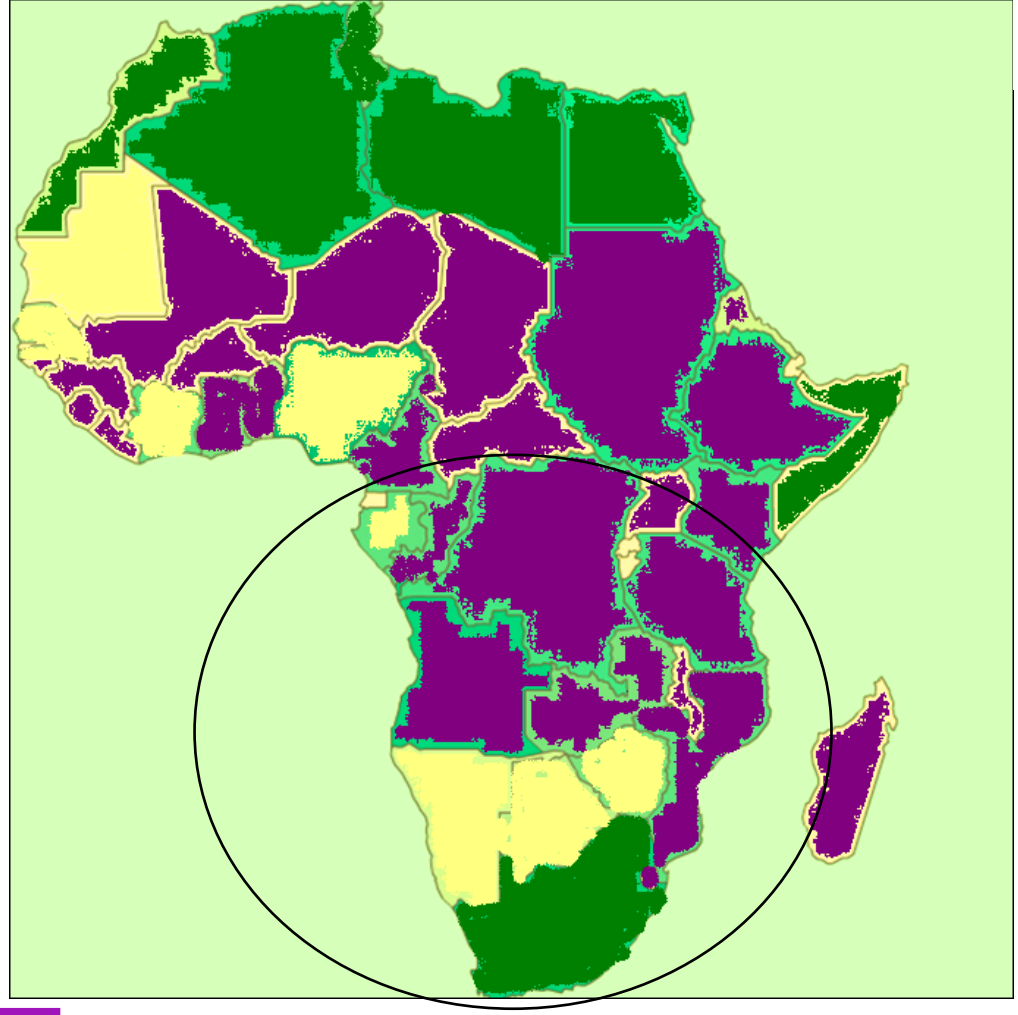
SADC Guideline on Low-volume Sealed Roads

Outline

- **WHAT TO KNOW**
  - Energy needs in SADC region
  - The roles of modern bioenergy in SADC
  - Bioenergy opportunities & limitations
- **WHERE TO START**
  - Prerequisites
  - Business models that maximise benefits to the local people
  - Strategies for value chain growth
  - Frameworks for monitoring and evaluating sustainability

Southern Africa

What to know: SADC



76-100%
51-75%
26-50%
0-25%

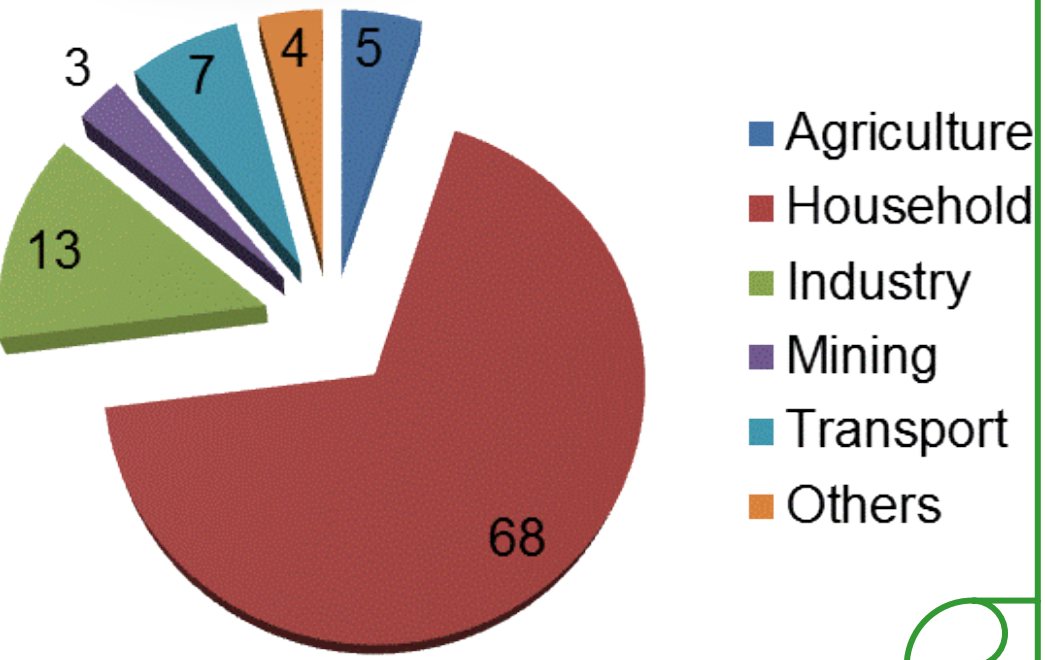
Energy poverty in households

Source: Redrawn from WHO 2006: Fuel for life. Household energy and Health

- HDI < 0.5
- Income below poverty line
- High unemployment rates
- Energy insecure- only 5% of rural areas have electricity connections

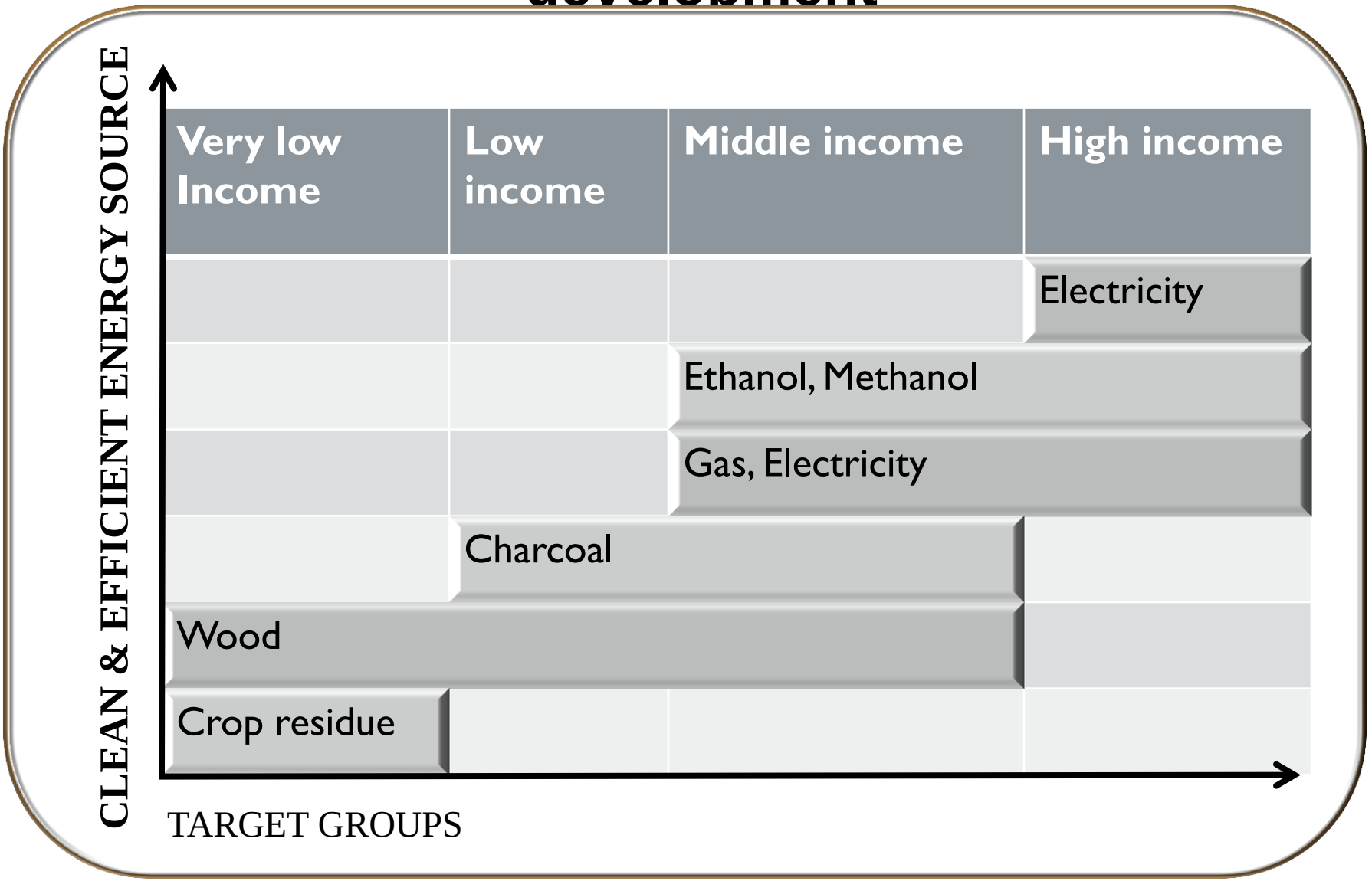
What to know: SADC

Energy Use (%)



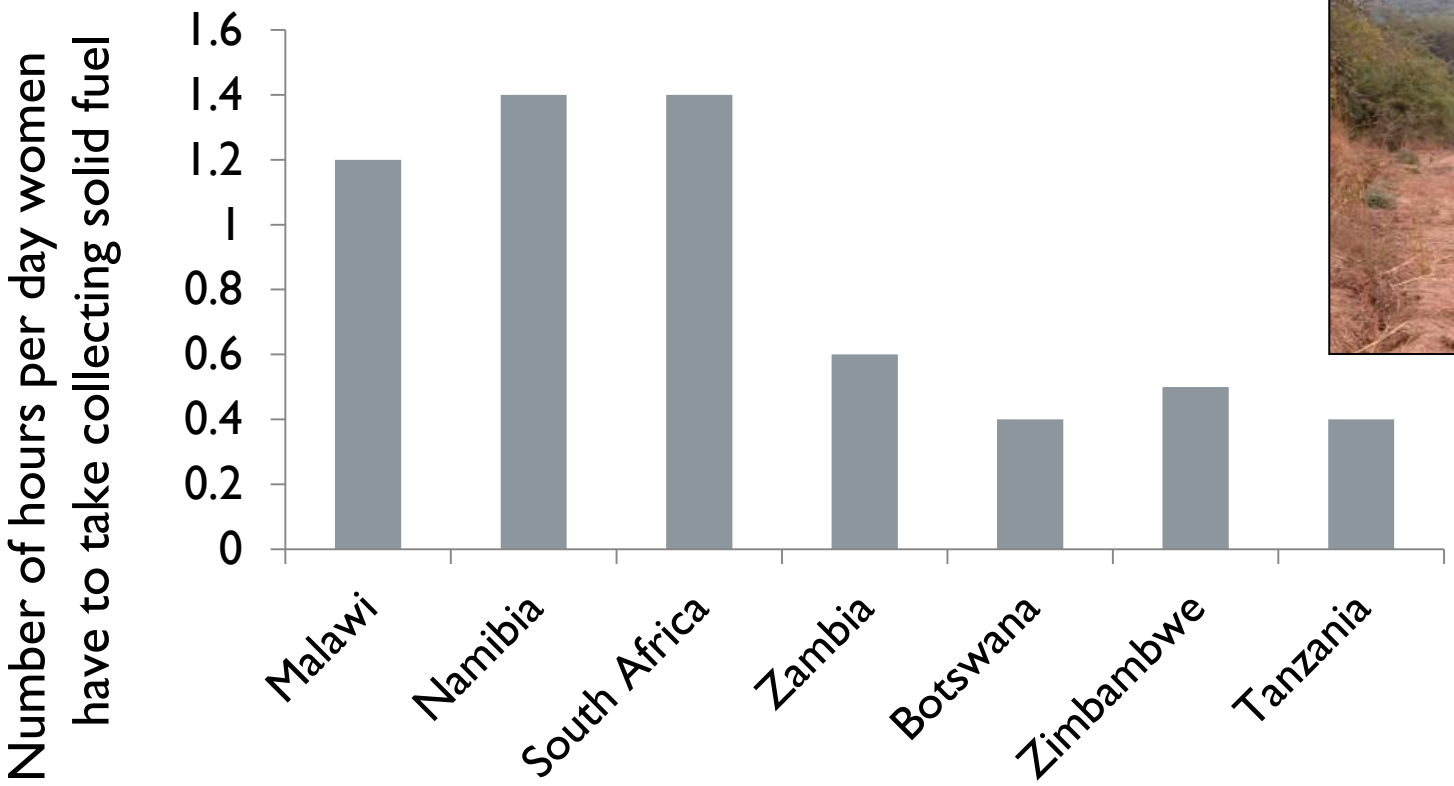
- Greatest bioenergy need is in household use.
- `More energy is needed in agriculture to boost production and advance postharvest processes.
- Energy in transport is high because of poor infrastructure.

Energy use at different levels of social-economic development



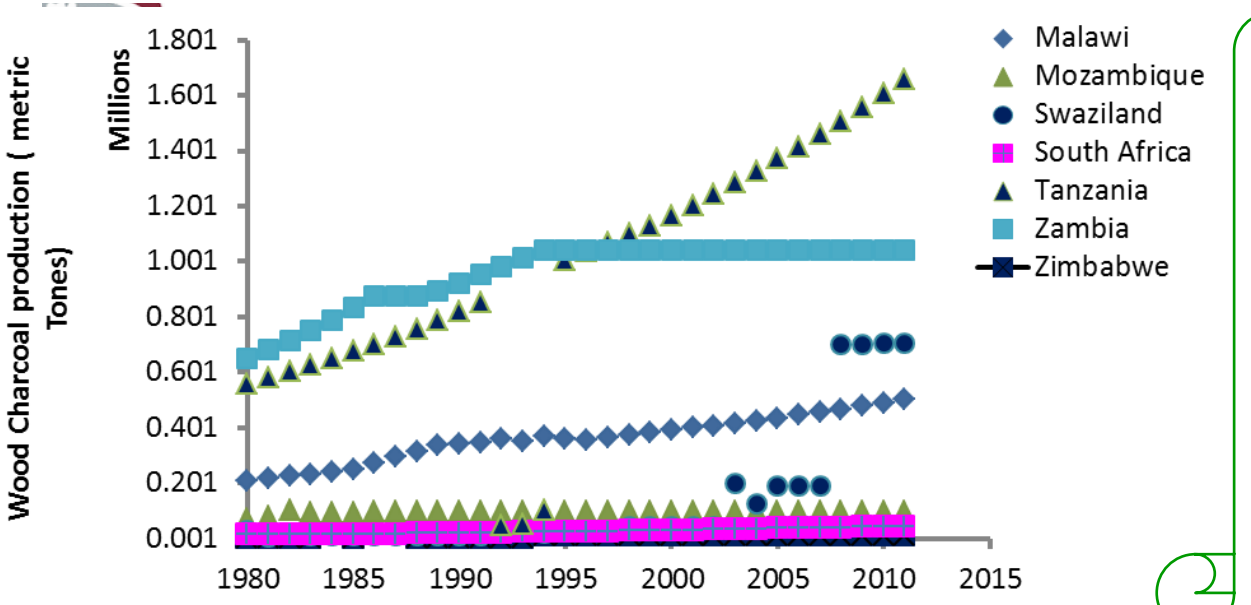
Source: Modified from WHO 2006: Fuel for life. Household energy and Health

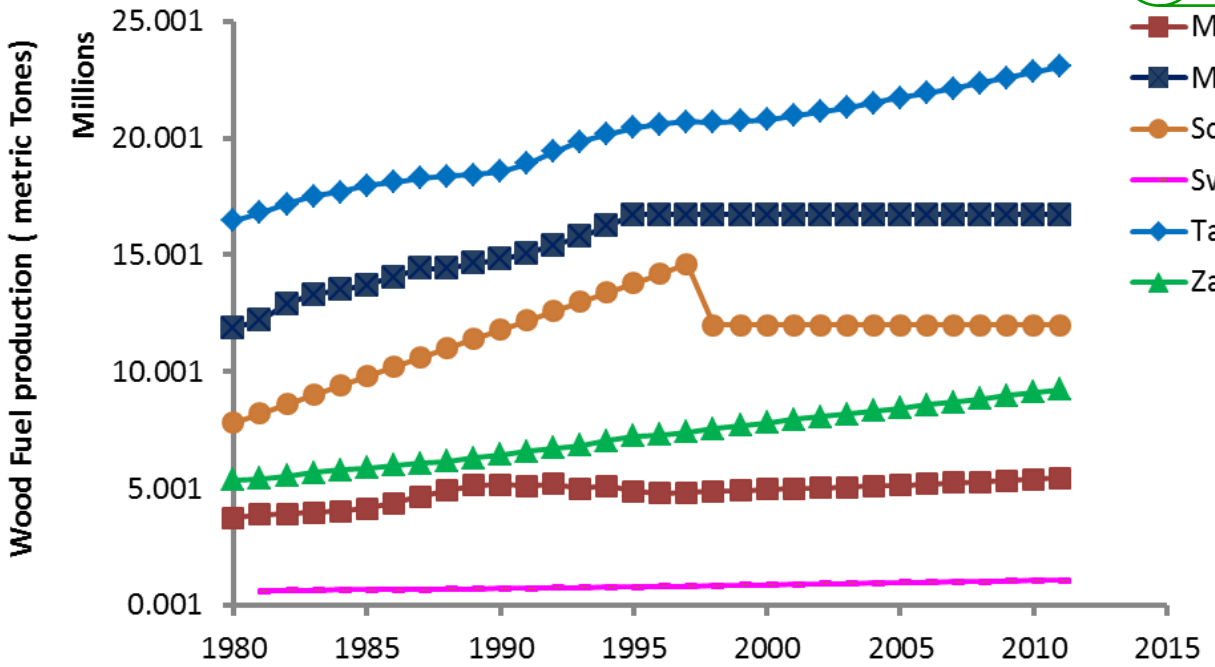
WHAT TO KNOW: More time is spent collecting fuel wood



Source: Modified from WHO 2006: Fuel for life. Household energy and Health

What to know: Charcoal and wood fuel use

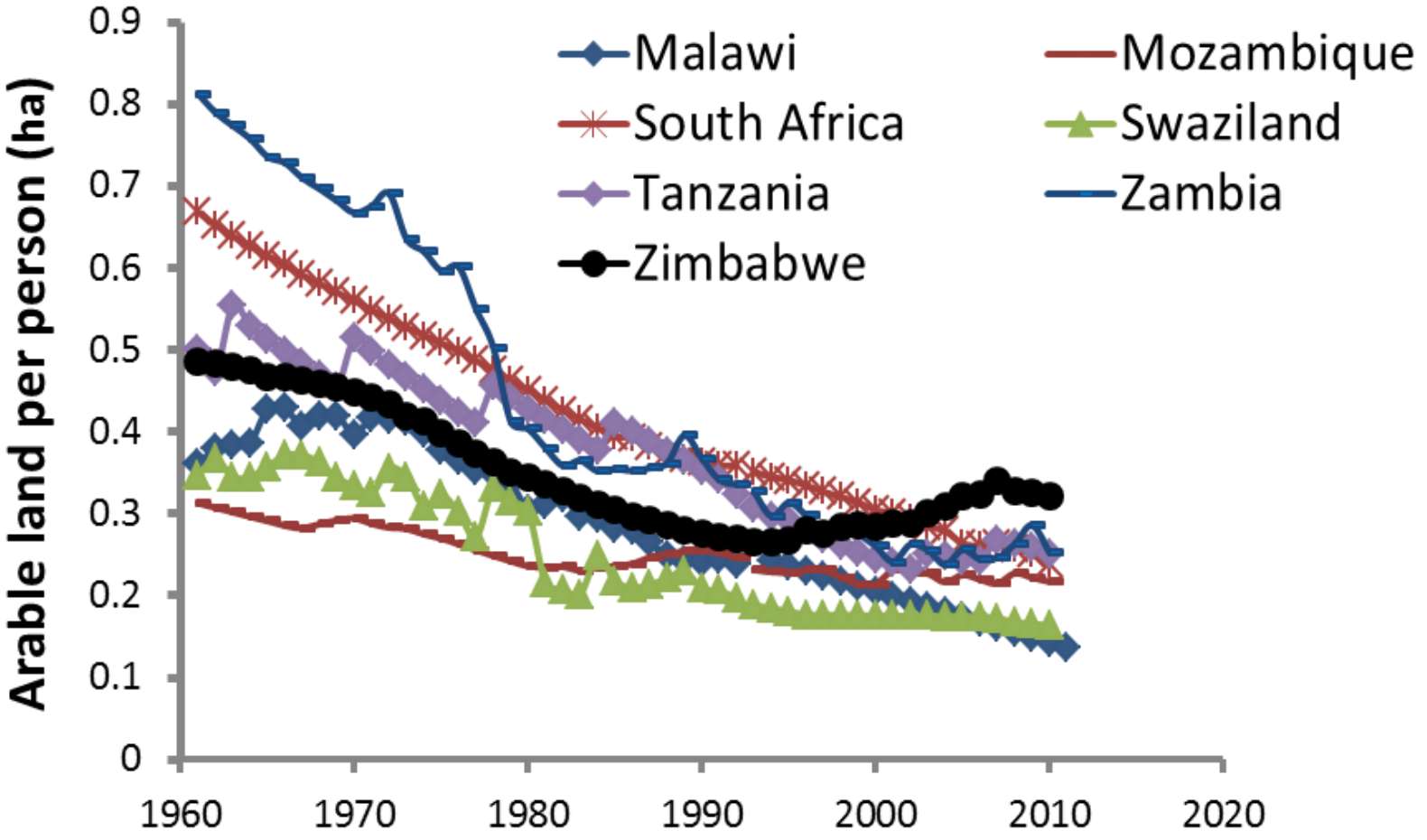




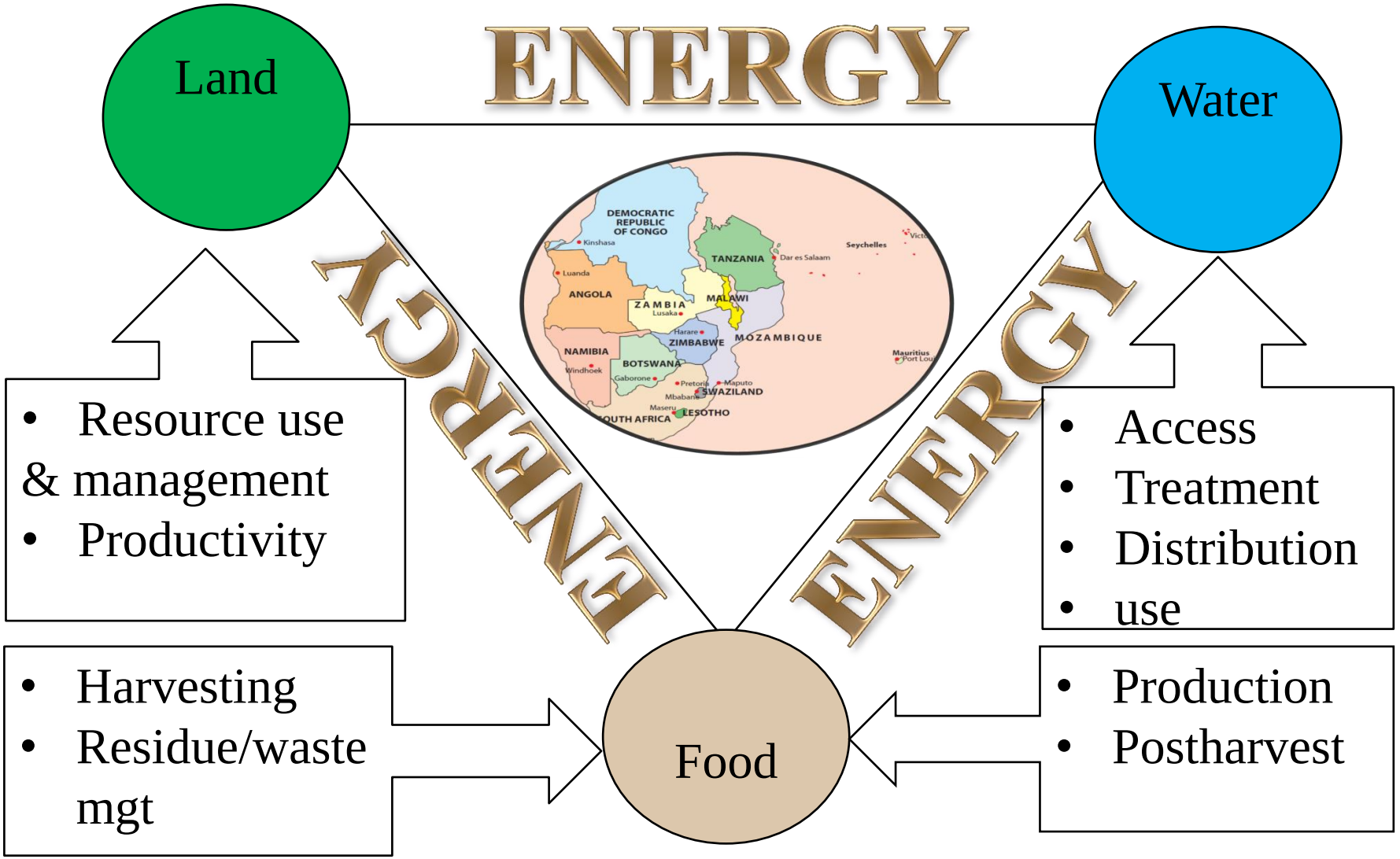
Therefore:

- Solid fuel should be developed alongside liquid and gas fuels.
- **Carbonisation vs Fermentation**

WHAT TO KNOW: Arable land per person is decreasing



WHAT TO KNOW: CRITICAL NEEDS- Land-Water-Food- & Energy - Nexus



WHAT TO KNOW: BIOENERGY ROLE IN SADC

Bioenergy role in SADC is beyond fuel

Because it promotes agricultural development & improves rural livelihoods through non-agricultural activities

It's a backbone for rural economic growth

WHAT TO KNOW: ROLE OF ENERGY IN MEETING DEVELOPMENTAL NEEDS

BIOENERGY

Jobs

Health

BIOENERGY

BIOENERGY

- Employment
- Entrepreneurship
- Gender up-liftment

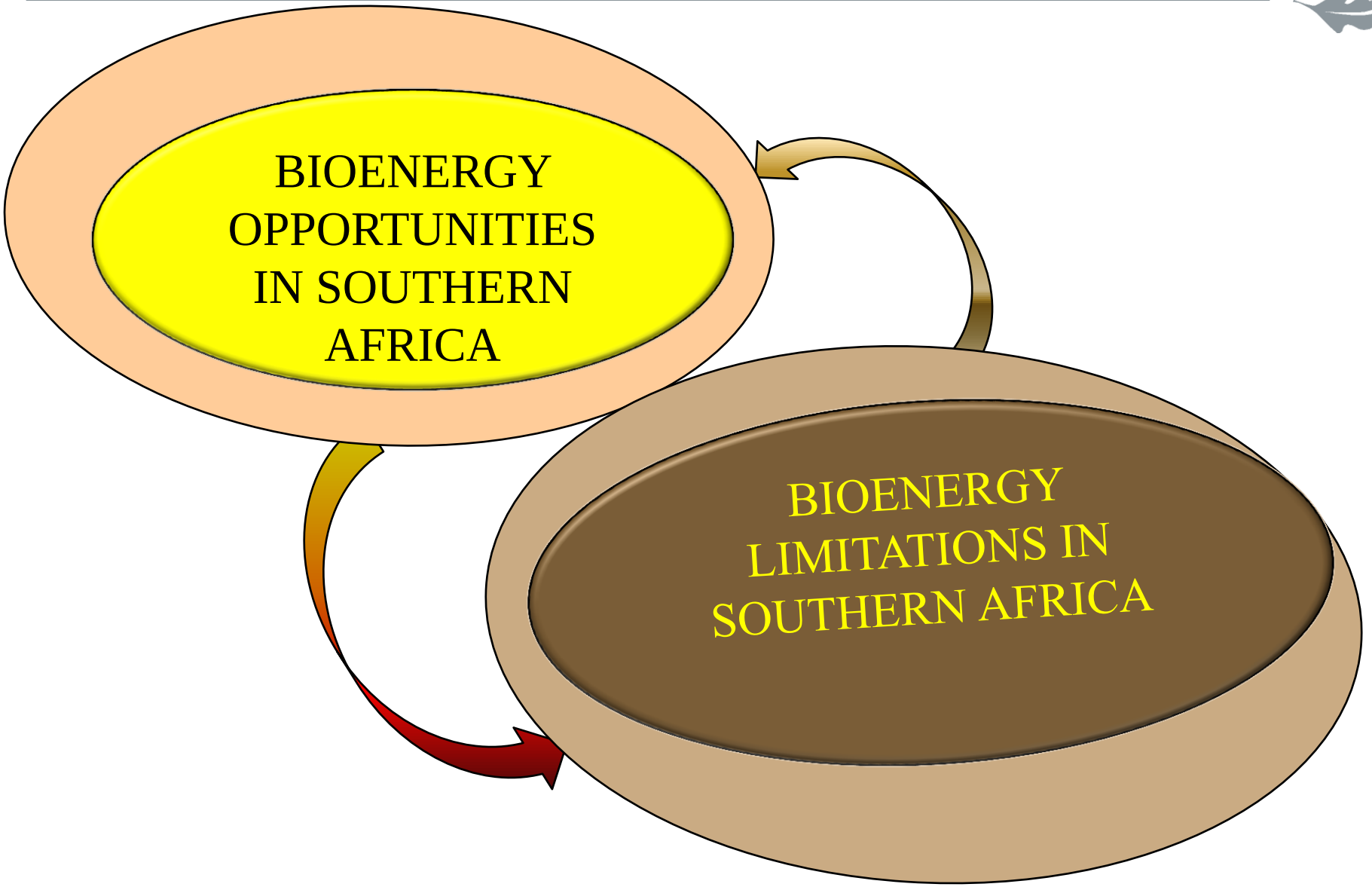
- Clean water
- Improved Clinical services

- Improved services
- ICT
- Education

Rural dev.

- Agri production
- Rural infrastructure

WHAT TO KNOW


BIOENERGY OPPORTUNITIES IN SOUTHERN AFRICA
BIOENERGY LIMITATIONS IN SOUTHERN AFRICA

WHAT TO KNOW: BIOENERGY OPPORTUNITIES

BIOENERGY

BIOMASS

- Indigenous knowledge
- Crop diversity
- Good soils

SADC

- Regional integration
- SADC Energy protocol

LABOUR

- Less costly

- Abundance
- Both male and female

WHAT TO KNOW: LIMITATIONS IN ACHIEVING SUSTAINABLE BIOENERGY

BIOENERGY

TECHNO-LOGY

POLICY GAPS

- Skills shortage
- Low-tech
- Lack of optimisation
- Limited Ext. services

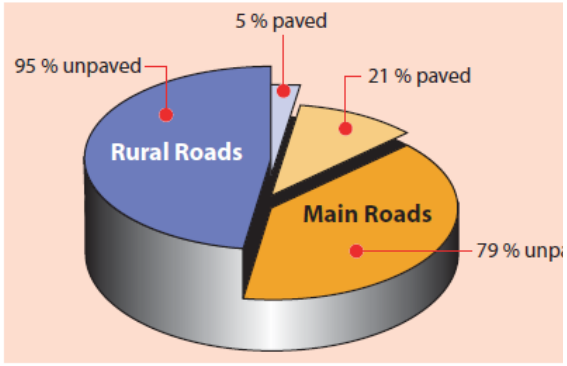
- Land tenure-overlapping user rights
- Markets
- Benefit sharing
- Accountability

- Funded projects
- innovative funding models

FINANCE

- Lack of financial and Management skills

Poor Road infrastructure (SATCC, 2003).



A substantial proportion of both the n and rural road networks in the SADC reg is unpaved.

Transporting bananas and other food-stuff by bicycles.

Table 1: How Africa compares with other developing regions

Region	Cereal yield kg/ha	Fertilizer use kg/ha	Irrigation % of arable land	Tractors per 1 000 ha
Africa[1]	1 040	13	5	28
Average of 9 selected countries[2]	3 348	208	38	241

1 Africa less Egypt and Mauritius.

2 Bangladesh, Brazil, China, India, Pakistan, Philippines, Republic of Korea, Thailand, Viet Nam.

Table 2: Farm power sources (percentages)

Region	Hand	Animal	Engine
SSA	65	25	10
3 other developing regions*	25	25	50

* Asia, Near East and North Africa, Latin America and Caribbean.

Source: FAO, 2005, World Agriculture, Towards 2015/2030, Table 4.16.

Table 3: Growth in tractor numbers between 1961 and 2000

Region	Increase %
Asia	500
Latin America and Caribbean	469
North Africa and Near East	1 350
Sub-Saharan Africa	28

Source: FAO, 2004, Agricultural Mechanization in sub-Saharan Africa.

WHERE TO START- Prerequisites

- **Biomass inventory**
  - Assess available quantities, geographical distribution, alternative uses and accessibility
- **Assess acceptance**
  - Assess stakeholder INTERESTS AND ASPIRATIONS (local people, investors, producers and consumers)
  - Knowledge of traditional and cultural values and local governance IS CRITICAL
- **Best PRACTICES**

Smallholder-led technology and building of LOCAL knowledge and capacity.

Biomass availability

Table 1: Availability of field residues- calculated based on residue production ratio

Field Residues(million tonnes)	Malawi	Mozambique	South Africa	Zambia	Zimbabwe	Total
Maize	3	1.52	10.78	1.93	1.03	**18.26**
Sugarcane	0.63	0.64	4.73	0.73	0.97	**7. 53**
Total	**3.63**	**2.16**	**15.51**	**2.66**	**2.80**	**25.79**

Table 2: Availability of sorghum field residues- calculated based on residue production ratio

Country	Sorghum field residues (metric tones)	Cultivation area (ha)
Malawi	69 152	76
Mozambique	373 407	475
South Africa	289 991	82
Tanzania	961 254	730
Zambia	26 167	29
Zimbabwe	106 621	253

Business models that maximise benefits to the local people

Value chain analysis: where can the poor benefit the most?

Production
Semi-mechanised
Medium potential
Out-growers
High potential

Harvesting
Medium to High potential

Pre-processing
High potential

Transportation
Low potential

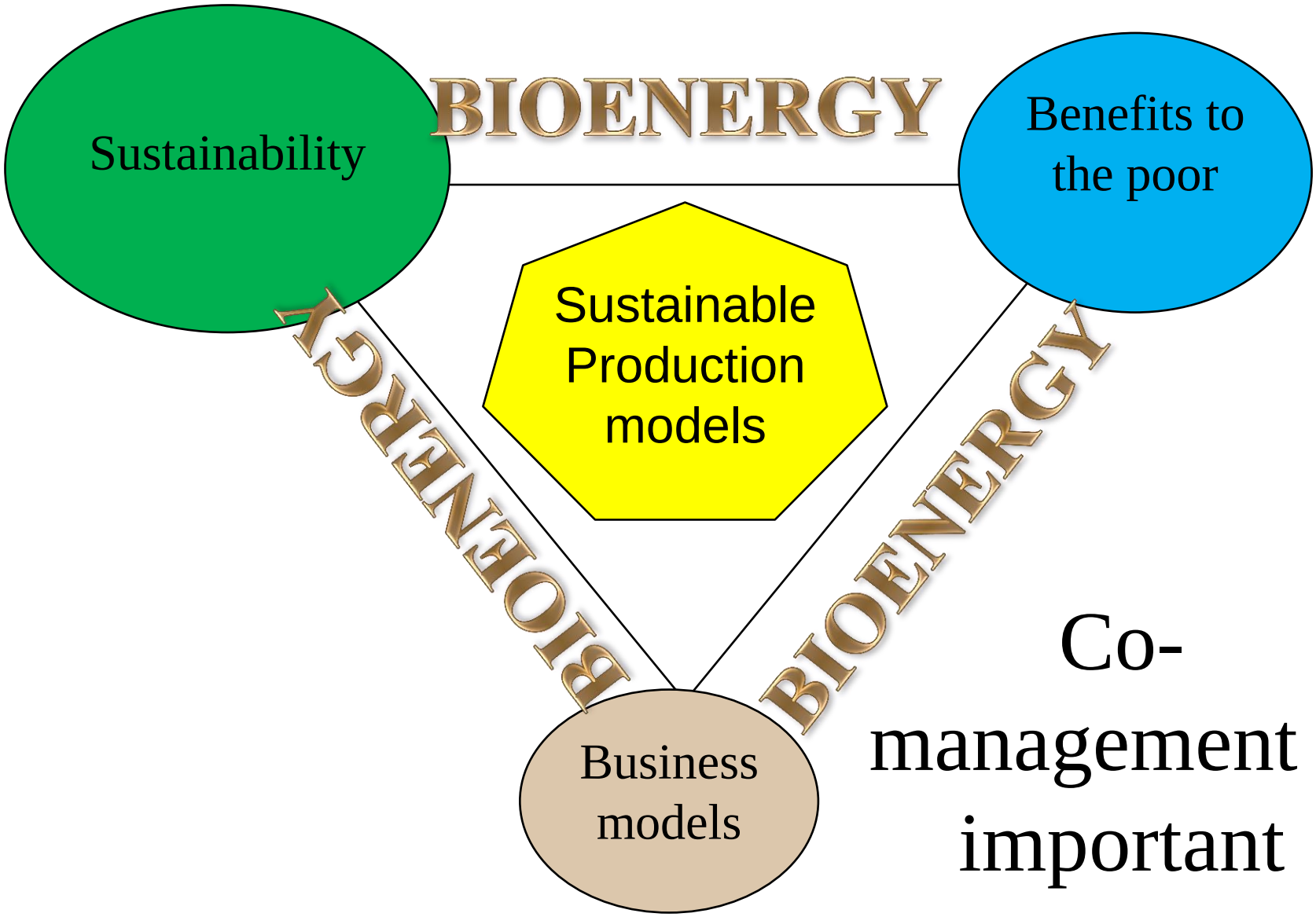
Storage
Low potential

Conversion
Depends on scale of operation
Low to Medium potential

Promotion of labour-based methods where feasible, is a key factor in creating productive employment and reducing poverty (SATTC, 2006).

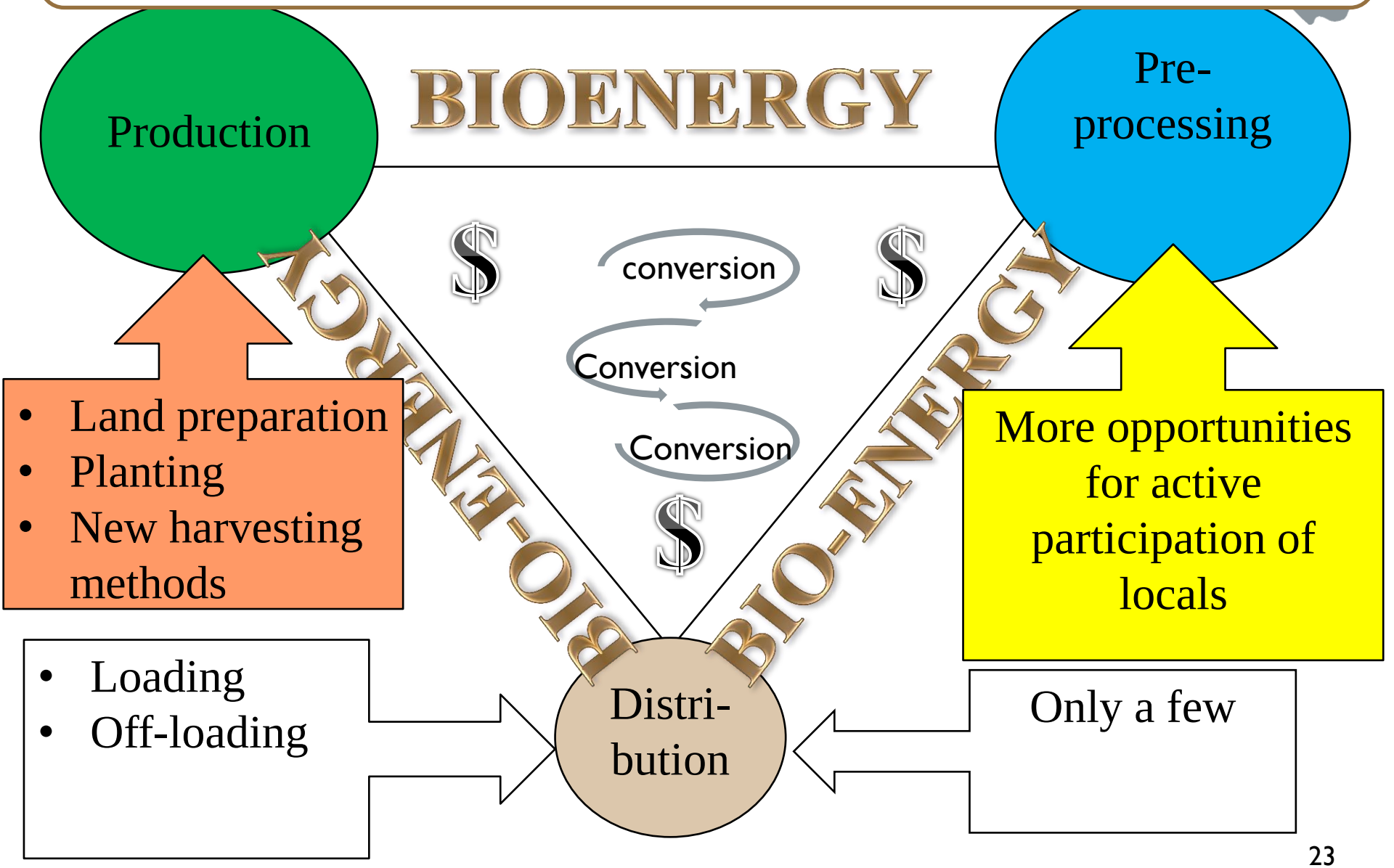
But requires innovation!

PRO-POOR APPROACH



Co-management is important

VALUE CHAIN ANALYSIS: who gets what and where?



Strategies for value chain growth: bioenergy value chain developmental path & sustainability

- **Partnership**
- **Value addition**
- **Integration** into existing industries
- **High level of organization** of communities is required
- **Maximising opportunities** afforded by external opportunities
- Improve value chain **governance**

(GNESD (2011). Bioenergy: The potential for rural developmentand poverty alleviation. Global Network on Energy for Sustainable Development (GNESD). Summary for policy-makers. GNESD-SPM-BET-11/2011)

BEST PRACTICES

Co-generation revenue-sharing in Mauritius

1. Benefits shared among all stakeholders revenue

2. A wide variety of innovative revenue-sharing measures had to be created

GNESD (2011). Bioenergy: The potential for rural development and poverty alleviation. Global Network on Energy
for Sustainable Development (GNESD). Summary for policy-makers. GNESD-SPM-BET-11/2011

BEST PRACTICES

Bioenergy for rural development in India

Biomass gasifier duel-fuel power generation system (70% biomass + 30% diesel)

1. Establishment of commercial shops and hotels, improved telecommunication systems and internet facilities.
2. Increased supply drinking water and irrigation
3. Street- and school-lighting.
4. 22 Direct employment

(Hitofumi, 2005, Cited in GNESD (2011). Bioenergy: The potential for rural development and poverty alleviation. Global Network on Energy for Sustainable Development (GNESD). Summary for policy-makers. GNESD-SPM-BET-11/2011).

BEST PRACTICES

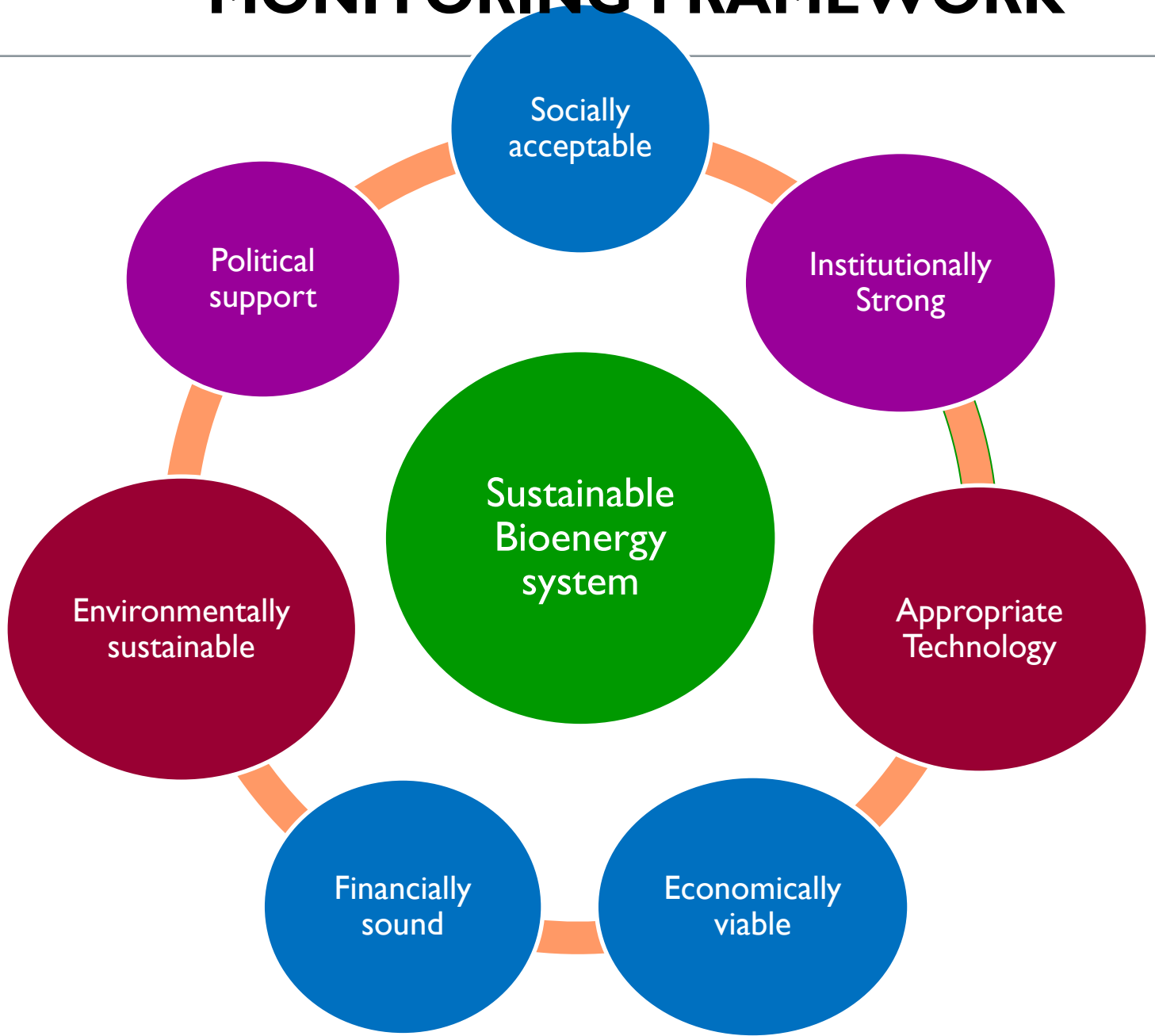
Biopower and job Creation in India

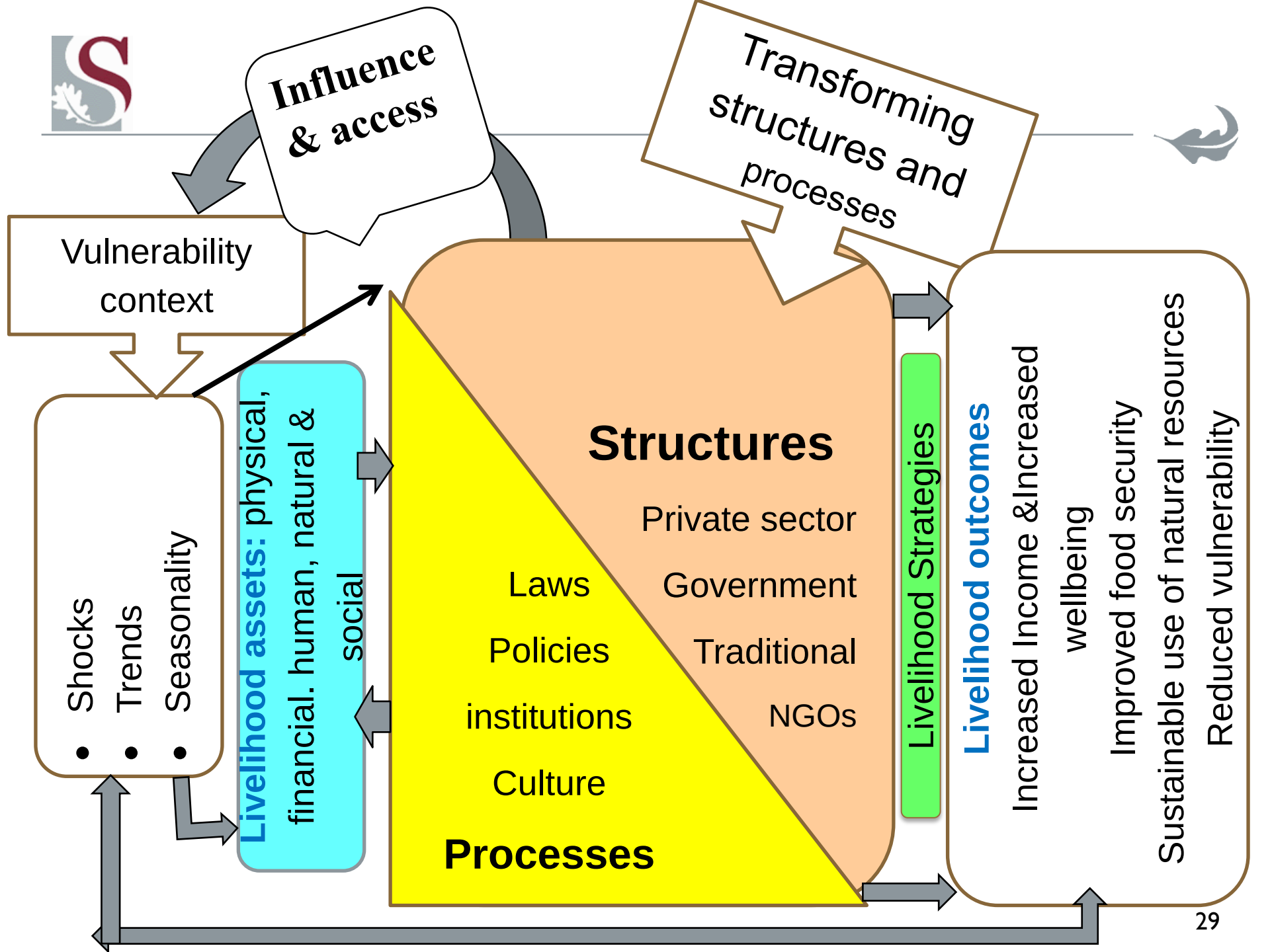
- A 4.5 MW (gross) capacity where 193 GWh are generated by using low density crop residues (70%) and other biomass fuels found in the local area that include sugar cane trash, coconut fronds, corn cobs, and toppings of plantation wood.

- About 450 new jobs were created in the crop residues supply chain

- 200 jobs at the Biomass Power Plant and Organic Fertilizer

BIOENERGY SUSTAINABILITY MONITORING FRAMEWORK




Influence & access
Transforming structures and processes
Vulnerability context
Shocks
Trends
Seasonality
Livelihood assets: physical, financial. human, natural & social
Structures
Private sector
Government
Traditional
NGOs
Laws
Policies
institutions
Culture
Processes
Livelihood Strategies
Livelihood outcomes
Increased Income &Increased wellbeing
Improved food security
Sustainable use of natural resources
Reduced vulnerability