SWOT ANALYSIS OF THE GHANAIAN WOOD ENERGY VALUE CHAIN

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5. CONCLUSIONS/IMPLICATIONS/TAKE HOME MESSAGES
My task

- Undertake SWOT of Ghana Wood Energy Value Chain (GWEVC) to inform decisions for its improvement and sustainability

  - **Strengths**
    - i.e. internal positives /advantages that benefit functioning of the chain

  - **Weaknesses**
    - Bottlenecks or internal negatives we can control but are impeding efficient functioning of the chain that need improvement
      - e.g. institutional barriers relating to policies and regulations

  - **Opportunities:***
    - External positives that can be harnessed to improve value chain functioning or performance
      - Entry points for interventions to increase value chain performance

  - **Threats**
    - External environment or negatives not under our control that can influence strategies for improving performance in the chain
APPROACH

- Synthesis of SWOT issues from primary and secondary information on Ghana wood energy value chain
  - 3 product chains from production to consumption

- **Wood energy options in Ghana**
  1. Firewood
  2. Charcoal
  3. Electricity
  4. Briquette
  5. Pellet
CONTEXT: VALUE CHAIN ANALYSIS FRAMEWORK

Level 3

**Regulatory entities**: Resource governance, policy/regulations, law enforcement, taxation regimes, etc.

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Operators & operations /functioning/linkages

Level 1

- Raw material production
- Resource, Harvesting/Collection
- Aggregation
- Transportation
- Processing
- Distribution Marketing
- Consumption

Level 2

**Enabling influences**: Services providers - input supply, Business and financial services, research, extension, development assistance, producer & trade associations, etc.

Adapted from Hellin and Meijer, 2006 and Murererehe and Richter, 2011
Overview of the Ghana Wood Energy Value Chain

1. Solid wood
   - Farmlands
   - Forests
   - Logging residue
   - Sawmill off-cuts

2. Bamboo

3. Sawmill residue
   - Sawdust
   - Wood shavings

Enabling influences:
Services - Equipment, money, knowledge, negotiations
Business, finance, research, academia, development partners (NGOs & Grants agencies - SNV, FAO, UNDP, GIZ, DANIDA, TBG, KITE, INBAR), producer & trade associations, charcoal chamber, GHACCO, input suppliers, end-use device manufacturers, etc.
FIREWOOD CHAIN VALUE CHAIN

Regulatory entities (policy, law enforcement, tax, etc.):

- Resource owners
  - Traditional Authority, Farmers
  - Access fee/right/sale

- FC/FSD, EPA
  - Permit-fee

- DA-Toll

- Security agency (Police and CEPS, FC task force)
  - Conveyance/SR

- District and Municipal assembly-toll

- MOH, EPA, MOE/EC

Operators & operations

- Resource
  - Harvesting/collection and processing

- Transportation

- Retailing
  - Retailers

- Consumption
  - Consumers

Enabling influences: Rural Banks, Research/Academia, Producer association, SNV, etc.
### SWOT OF FIREWOOD CHAIN VALUE CHAIN

#### STRENGTHS

1. **Employment**: Income & livelihood
2. **Heat energy**: for rural household, service & food processing industry and institutions
3. **Range of raw material sources**
   - Natural tree stocks & woodlots, residues incl. spent agric. tree crops & clearing
   - 50-70 species for production
4. **Domestic demand high**
5. **Some improved end-use devices promoted**

#### WEAKNESSES

1. No management regimes
2. Declining natural stocks
3. Labour intensive production
4. Risky processing technology
5. Poor storage
6. Health hazards (smoke & heat) in use
7. Limited deployment & adoption of improved woodstoves in rural areas
8. Weak financing
9. Poor national statistics for planning

#### OPPORTUNITIES

1. National plantation development strategy to produce xha woodlot per annum for fuel
2. High productive firewood species- Cassia, Neem, etc. available
3. Improved processing and storage technologies available
4. Private sector/NGOs - development partner

#### THREATS

1. Weak policy support
WEAKNESS: LIMITED VALUE ADDITION

- No secondary processing of firewood to preserve in storage
- Wood left in the open
- Termite and fungal decay common
- Low energy content
CHARCOAL VALUE CHAIN

Regulatory entities (policy, law enforcement, tax, etc.):

- Resource owners
  - Traditional Authority, Farmers, FC
  - Access fee/right/sale

- FC/FSD, EPA
  - Permit- fee

- DA-Toll
  - FC- Toll

- Security agency (Police and CEPS, FC task force)
  - Conveyance/ SR

- District and Municipal assembly-toll

- MOH/ MOE/ EC/ EPA
  - MOTRADE/ GIPC

Operators & operations

1. Resource
2. Processing/ carbonization
3. Transportation
4. wholesaling
5. Retailing
6. Consumption

Resource owner
- Community
- Land owner
- Farmer

Charcoal producers

Transporters Middlemen

Wholesalers

Retailers

Consumers
- Households
- Service Industry Institutions
- Exporters

Enabling influences: Research/Academia, Financiers, Producer & trader association incl. exporters, NGOs and development partners, etc.

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## SWOT OF CHARCOAL CHAIN VALUE CHAIN

### STRENGTHS
- **Employment**: Income & livelihood -> 2m people
- **Heat energy** for household, service industry and institutions
- **Range of raw material sources**
  - Natural tree stocks, plantation, residues
  - 50-70 species for production
- **Range of carbonization technologies** (Kilns)
- Some **policy** attention
- **Supply & marketing system** well established
- Domestic **demand high**
- Potential **export**
- Wide range of end-use devices promoted

### WEAKNESSES
- Over dependence on **unmanaged wild stocks & Insufficient regeneration** leading to scarcity of preferred species
- Inappropriate species
- Inefficient & laborious traditional carbonization technology
- **Poor quality charcoal** - volumes of dust (5% of bag)
- **Health hazards** to producers
- Inefficient packaging and distribution system
- Poor **pricing and financing** arrangements
- Poor organization of producer and market associations

### OPPORTUNITIES
- Government & private sector incl. donor support
- Some resource **restoration models available**
- Woodlot of suitable **short rotation species**
- Could contribute to carbon sequestration
- **Efficient kilns** available though expensive
- **Briquetting** for high energy from **charcoal dust**
- Regulatory mechanism being designed

### THREATS
- **Unfavourable weather** for regeneration and woodlot development in endemic producing areas in savannah-transition
- **Tenure** restrictions to land for planting
- **Uncoordinated inter-sectoral** framework
- **Difficulty in regulating supply** i.e. production & distribution-poor regulation
Weaknesses of Charcoal Value chain

- Demand for charcoal but production is constrained by several challenges

- Health risks (Burns, dust into eyes and chest)
- Scarcity of trees for charcoal
- Inadequate finance
- Labour intensive
- Low pricing
- Difficulty transporting from production site
- Difficulty getting grass cover esp in dry season
- Risk of wood burning into ashes

% Response
WOOD TO ENERGY VALUE CHAIN
Cogeneration technology: converting wood and residue to power & heat (CHP)
Wood residue to power VC

Regulators: Traditional Authority, Ministry of Power, Energy Commission, Environmental Protection Authority, Ministry of Science Technology and Innovation, Forestry Commission, District Assembly, Export Promotion Authority, GRIDCO

Enabling Influences: Research and Academia, Financial Institutions, Communities-labourers, Development Partners, etc.

Figure xx: Value chain map/flow model of sawmilling and residue combustion for heat and electricity

Obiri et al 2019

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Wood Energy Resources: Sawmill Residue-Sawdust for Heat & Electricity

- 9.07% of log input volume generates sawdust
- 60% sawdust not used
- Some mills use for heat and power generation

(Adu, 2016).
<table>
<thead>
<tr>
<th>STRENGTHS</th>
<th>WEAKNESSES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resource-Sawmill &amp; logging residue available, plantations</td>
<td>Declining natural wood stocks</td>
</tr>
<tr>
<td>Transformation-CHP technology for power and heat production, gasification</td>
<td>Feedstock conveyance off production site is expensive</td>
</tr>
<tr>
<td>Consumption-off-grid use, supplementary power to industry</td>
<td>Obsolete machinery, High capital investment-USD 3.5 Million</td>
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<td></td>
<td>Marketing-producer off-taker, limited opportunity to sell to national GRID</td>
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<tr>
<td></td>
<td>Consumption- Limited use of heat, High cost of transmission for supply to nearby off-grid communities or for supplementary use</td>
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<tr>
<th>OPPORTUNITIES</th>
<th>THREATS</th>
</tr>
</thead>
<tbody>
<tr>
<td>High productive energy species-Eucalyptus, Bamboo, Acacia, Cassia, etc. available</td>
<td>Government policy not too strong to support development of Wood to Power</td>
</tr>
<tr>
<td>Modern efficient CHP technology</td>
<td>Limited opportunity to market excess power and heat produced</td>
</tr>
<tr>
<td>Could be profitable – <strong>BCR =1.5</strong></td>
<td>High cost of domestic borrowing for competitive business operations</td>
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<tr>
<td>High industrial power demand</td>
<td></td>
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<tr>
<td>Some government policy on renewable energy and bio-energy</td>
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Obsolete CHP machinery at sawmill
Wood to Power: Eucalyptus Plantations for electricity

- Africa Plantations for Sustainable Development (APSD) Atebubu, Brong Ahafo
  - Planned 21,500 ha for 60MW power via cogeneration for the national grid
    - 90000 ha planted

[Images: APSD tree nursery, APSD Eucalyptus plantation]
BRIQUETTE VALUE CHAIN ??

Sawdust
Bamboo

Resource → processing → Distribution → Marketing → Consumption

Export
Restaurant?

Super markets

Input suppliers - sawdust, binder; NGOs – SNV, INBAR
Bamboo plantations for carbonization into charcoal and briquette
### SWOT of Briquette Value Chain

#### STRENGTHS
- High volumes of sawmill, logging charcoal dust
- Technology available
- High energy content/low GHG emission
- Export

#### WEAKNESSES
- Future of wood residue from natural stocks uncertain
- Collection and transportation of residue
- Initial cost of investment high esp. on industrial scale
- Not popular on Ghanaian market

#### OPPORTUNITIES
- Woodlot/Plantations
- High volumes of charcoal dust
- Export

#### THREATS
- Limited policy support
- Limited fiscal incentives for unpopular SMEs/Startups
HIGHLIGHTS OF GWEVC SWOT

**Strengths**

1. Employment opportunities
2. Wide range of raw material sources
3. Range of transformation technologies available
4. Appreciable demand for wood energy (50% energy mix)
5. Some policy initiatives

**Weaknesses**

1. Unsustainable raw material supply - 98% natural stocks with poor harvesting techs
2. Ineffective use of residue & non-traditional species
3. Inefficient transformation technologies
4. Health hazards & risks
5. Expensive improved transformation technologies
6. Poor adoption of improved end-use techs-expensive
7. Poor packaging and transportation
8. Poor standardization and pricing
9. Ineffective regulation or control
10. Ineffective inter-sector coordination
11. Lack of innovative business models for harnessing non-traditional wood energy options e.g. CHP
HIGHLIGHTS OF GWEVC SWOT

**Opportunities**

1. Favourable support for wood resources development
2. Technologies for effective use of residue available
3. Wide range of stakeholders
4. Increasing private sector interest

**Threats**

1. Climate limitations to restoration of wood resources
2. Land and tree tenure
3. High cost of capital
4. Psycho-social
5. Inadequate policy support for transformation, distribution, marketing nodes of the value chain
Wood energy will remain important in ensuring energy, food and livelihood security in Ghana

Major issues in the value chain requiring attention
1. Sustainable raw material base
2. Improved less expensive technology
3. Environmental and health friendly transformation technologies
4. Awareness creation/promotion and deployment
5. Clear policy direction for regulating supply and demand
6. Innovative financing
7. Effective stakeholder engagement for inter-sector planning for a common way forward
8. Etc.