A sustainable clean cooking/heating fuel strategy needs to look at the triple bottom line, focusing on benefiting the people, their environment and their economic well being. This is far bigger than just focusing on the cookstove.
**Waste Hierarchy Pyramid**

**Reduce**
- Strict Avoidance
- Reduction at Source

**Reuse**
- Reuse
- Preparing for reuse

**Recycle**
- Waste Sorting
- Recycling

**Energy Recovery**
- Disposal

**Cooking Fuel Strategies**

**Reduce Raw Material Use**
- Improve Stove Combustion
- Better “Harvesting” Practice
- Re-engineer Supply Chain

**Recycle Biowaste into Fuel**
- Biogas – Anerobic Digester
- Biomass Pellets – Pellet Mill
- Char Briquettes – Char Kiln
FUELS MOSTLY USED FOR COOKING/HEATING

- FIRE WOOD
- CHARCOAL
- PARAFFIN
- LPG

CLEAN BIO FUELS MADE FROM WASTE

- WOOD PELLETS
- CHAR BRIQUETTES
- BIOGAS

ALL UNSUSTAINABLE IN THE LONG TERM
ELECTRICITY PRICES IN SOUTH AFRICA OVER 10 YEARS

TOTAL POPULATION: 95% Access but only 70% Affordability
## WHY BIOMASS PELLETS?

<table>
<thead>
<tr>
<th>FUEL FACTOR</th>
<th>BIOMASS PELLETS</th>
<th>CHAR BRIQUETTES</th>
<th>BIOGAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stove Used</td>
<td>Gasifier</td>
<td>KCJ</td>
<td>Gas Burner</td>
</tr>
<tr>
<td>Reduces Local Waste</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Improves Access and Affordability</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Creates Jobs / Avoids Imports</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Energy Recovery Rate / Ton</td>
<td>High</td>
<td>Low</td>
<td>Medium</td>
</tr>
<tr>
<td>GHG Friendly Conversion Process</td>
<td>Yes</td>
<td>Somewhat</td>
<td>Yes</td>
</tr>
<tr>
<td>Production/Distribution Cost</td>
<td>Medium</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Scalable Production Volume</td>
<td>High</td>
<td>Medium</td>
<td>Low</td>
</tr>
<tr>
<td>Manufacturing Complexity</td>
<td>Medium</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Production Cost / kWh</td>
<td>Medium</td>
<td>Medium</td>
<td>Low</td>
</tr>
<tr>
<td>Storing / Moving Fuel to Market</td>
<td>Simple</td>
<td>Simple</td>
<td>Complex</td>
</tr>
<tr>
<td>Useful By-Products</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

INNOVATIVE BIOMASS ENERGY SOLUTIONS
SOLID BIO MASS WASTE TO ENERGY

RECYCLABLE BIOMASS WASTE

TIMBER MILL

HARVEST WASTE

RECYCLED MATERIAL

BIOMASS WASTE TO FUEL PRODUCTION MOBILE CONTAINER PLANT

PRODUCTION RATE: 400 KG/HOUR

RECYCLED BIOMASS HEATING

DOMESTIC

COMMUNITY

COMMERCIAL

INNOVATIVE BIOMASS ENERGY SOLUTIONS
400KG / HOUR WOOD CHIP TO FUEL PELLET PLANT
BUILT IN A 12M HIGH TOP SHIPPING CONTAINER
INNOVATIVE BIOMASS ENERGY SOLUTIONS
CREATING SUSTAINABLE JOBS & VALUE OPPORTUNITIES

BIOMASS WASTE COLLECTION
- TREE HARVESTING
- LOG DRYING
- CHIPPING

BIOMASS CONVERSION
- OUTPUT CAPACITY
  - UP TO 200 TONS / MONTH
  - EQUIVALENT TO 600 MWh
  - SAVING 400 TONS OF FOREST
- CONVERSION COSTS
  - ELECTRICITY / POWER
  - LABOUR & SUPERVISION
  - MAINTENANCE

PELLETS FUEL DISTRIBUTION
- STOVE ASSEMBLY
- WHOLESALE DISTRIBUTION
- RETAIL AGENTS

INNOVATIVE BIOMASS ENERGY SOLUTIONS
THE ECONOMICS OF LOCAL PELLET PRODUCTION

PELLET PRODUCTION

400kg / Hour
3 Operators / Shift

SINGLE SHIFT - $15,000 TO/MTH
250 Hours = 100 tons

DOUBLE SHIFT - $30,000 TO/MTH
500 Hours = 200 tons

CONVERSION COST
Aprox $0.10 per Kg

PELLET CONSUMPTION

DAILY HOUSEHOLD COOKING
2.5 Hrs / 5 kWh
= <2kg Fuel
@ $0.20 / kg
= <$0.40 / Day

Traders make 25% GP ($0.05 /kg)

100 TONS = 2,000 STOVES

200 TONS = 4,000 STOVES
Invasive Alien Plants cause billions of rands of damage to South Africa’s economy each year, and is the biggest threat to the country’s biodiversity.

South Africa’s Working for Water programme, the largest public-funded project to eradicate IAPs and improve water resources in the world, has created over 180 000 full-time jobs over the past two decades.
THE BENEFITS OF IAP BENEFICIATION

Environmental
- Assist water management through removal of alien vegetation
- Replace traditional applications with clean, renewable sources
- Carbon sequestration solutions to offset effects of global warming
- Prevent loss of biodiversity
- Reduce risk of fire hazard. Stabilise catchment areas and prevent erosion.

Social Impact
- Investments into education, SMME’s, community health and infra-structure
- Job creation and concerted skills development
- Poverty alleviation through community upliftment

Economic
- Develop industry value chains for green products like biochar, industrial heating, biomass 2 energy, timber / building materials & composting
- Develop low carbon economies, boosting local industries and communities
- Offset clearing costs, and create new jobs in typical farming and rural areas
BIOMASS FUELS PRODUCED FROM IAP CLEARING

LOW CARBON ENERGY MARKET OPPORTUNITY

BIOMASS HEATING / COOKING ENERGY MARKET

INNOVATIVE BIOMASS ENERGY SOLUTIONS
LOW CARBON ENERGY FUTURE

SOLAR PV  WIND  BIOMASS

INNOVATIVE BIOMASS ENERGY SOLUTIONS

7 AFFORDABLE AND CLEAN ENERGY  8 DECENT WORK AND ECONOMIC GROWTH  12 RESPONSIBLE CONSUMPTION AND PRODUCTION  15 LIFE ON LAND

CLEAN ENERGY  SMME JOBS  ZERO WASTE  BIODIVERSITY

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