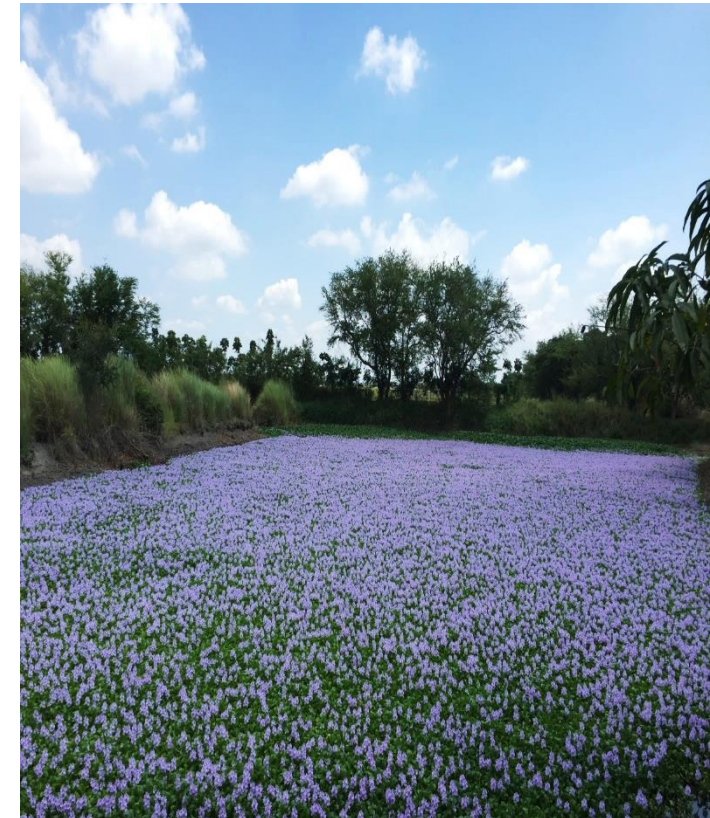




# Eco-charcoal from Water Hyacinth for Rural Energy Application: A Social Enterprise

Adlansyah Abd Rahman  
6<sup>th</sup> September 2018



# Presentation Outline

- Water Hyacinth
- Rural Fuel
- Social Enterprise
- Solutions?
- Minimum Viable Product (MVP)
- Smokeless eco-charcoal
- Impacts
- In the media
- Funding & Exposure
- Market growth potential





# Water Hyacinth, *Eichhornia crassipes*

- Floating aquatic plant
- Fast growing – approximately double spatially every fortnight
- Block waterways entrance and exit – cause of local flooding
- No commercial value – removal incur cost













## Rural fuel

- Firewood and charcoal in many region
- Mainly for cooking and heating
- Source of domestic indoor air pollution → respiratory diseases
- Firewood derived from young trees propagate local deforestation



# Social Enterprise

- Social Entrepreneurship - *The use of start-up companies and other entrepreneurs to develop, fund and implement solutions to social, cultural, or environmental issues*
- HiGi Energy Pte Ltd was set up to supply affordable cooking fuel while alleviating water hyacinth flooding and providing local community employment
- Not a charity to ensure longevity
- Not a 'grantpreneur' to ensure independent decision making
- The team:



Jackie Yap (CEO)



Leon Kee (CTO)



Hazel Pajotagana (CFO)

# Advisory Board and support

- Engineering & Business Development



**Dash Dhakshinamoorthy**

Pre-seed investor & he has 10 years experience in startups, exited several companies



**Jorden Woods**

Exited 3 startups & based in Silicon Valley, USA



**Katka Letzing**

More than 10 years experience in business & entrepreneurship



**Kres Jacobsen**

Director at Northwind Power Corp, owned wind (60MW) & solar farms (2.5MW) in Philippines, familiar with solar power market



**Adlansyah Abd Rahman**

More than 12 years experience in biomass research & community engagement projects



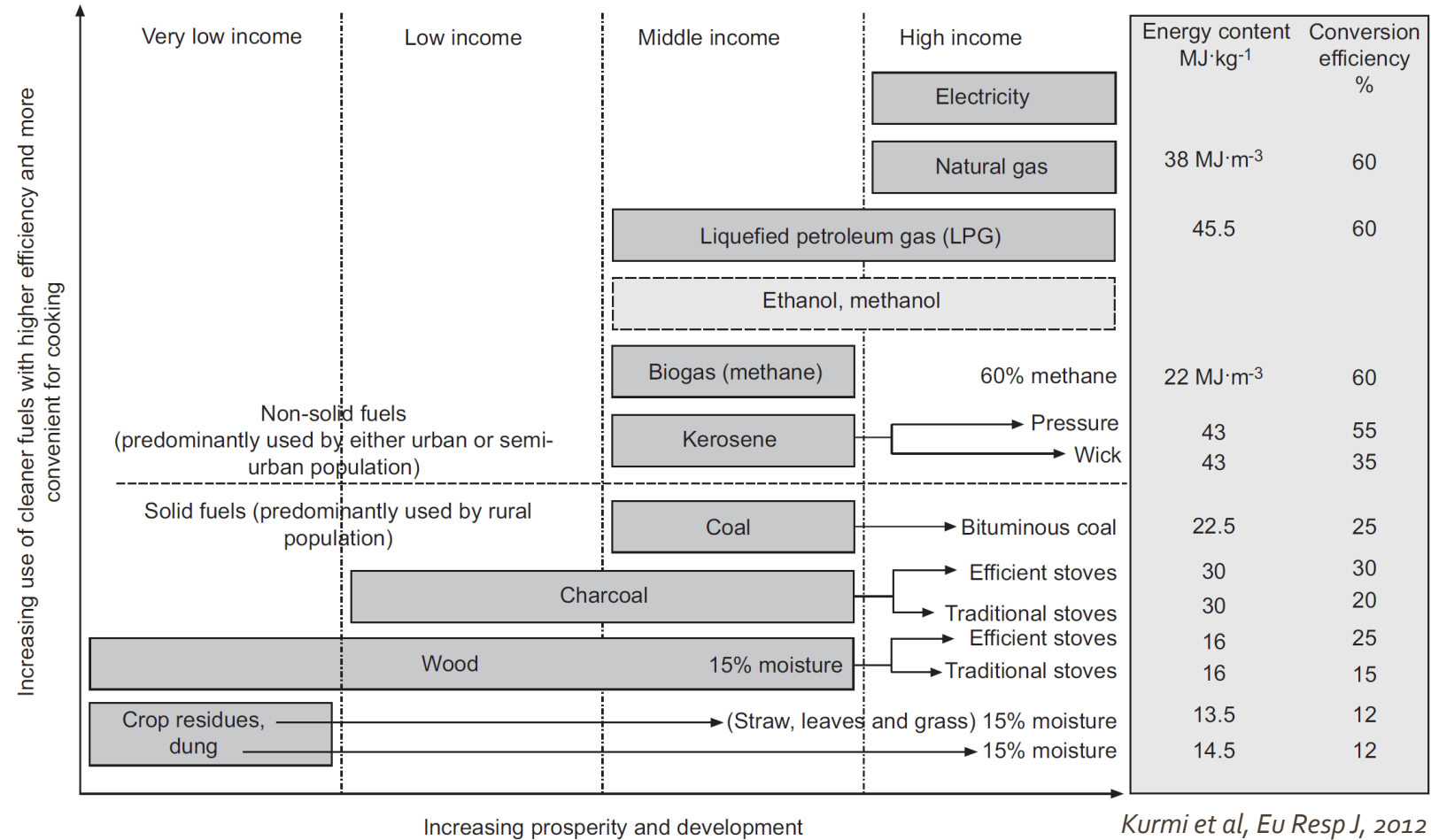
**Rahul Mirchandani**

CEO at Aries Agro Limited, listed on India Stock Exchange



# Solutions?

- Non-energy
- Community biogas
- Gasification stoves
- Fuel replacement ✓





# Minimum viable product (MVP)

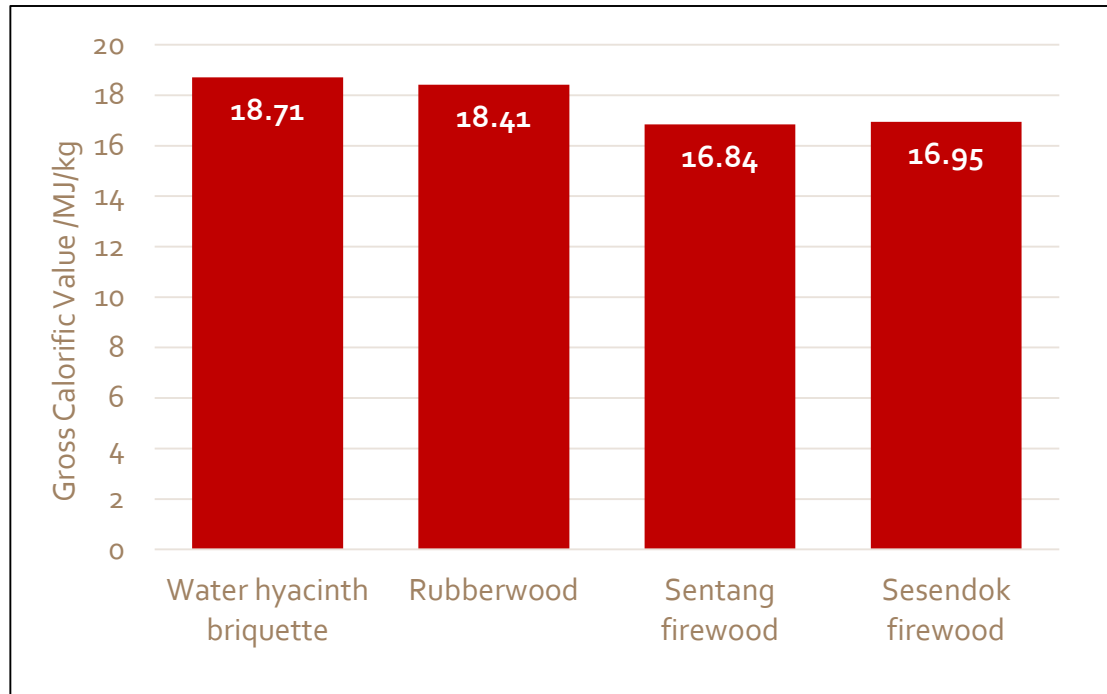
- Crushed water hyacinth briquette
- Approx. 1" x 2" x 6"
- Direct replacement of firewood



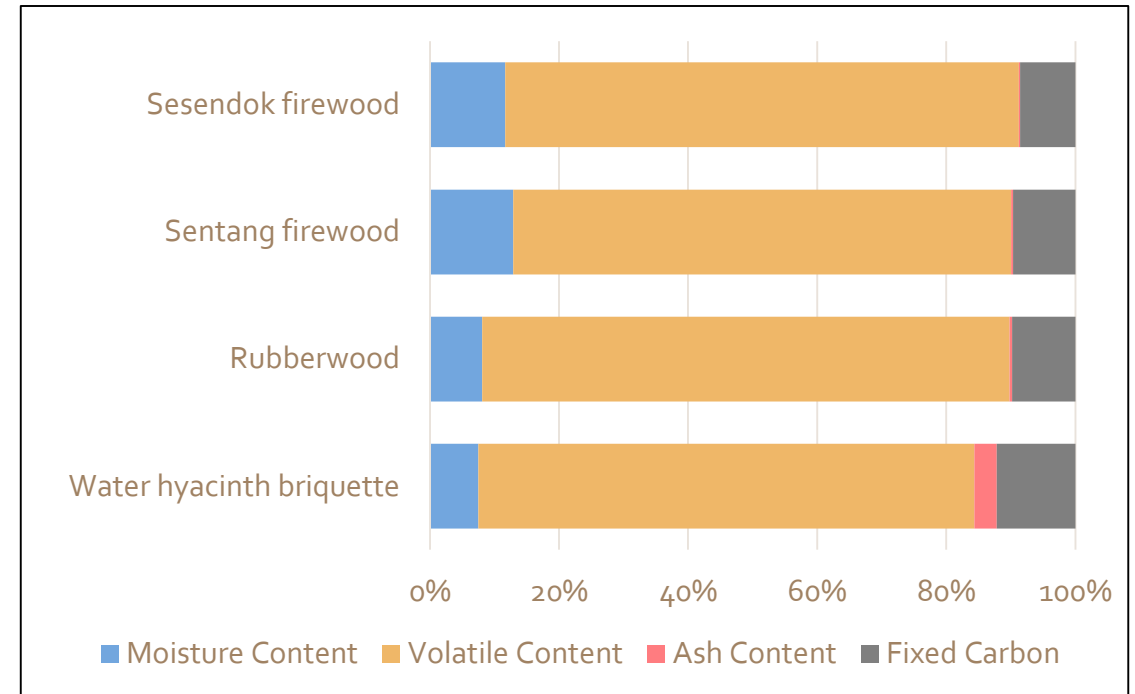


# Testing and Analysis of MVP

## Energy density



## Proximate analysis



## Burning test:

- Smoke released improved than traditional firewood



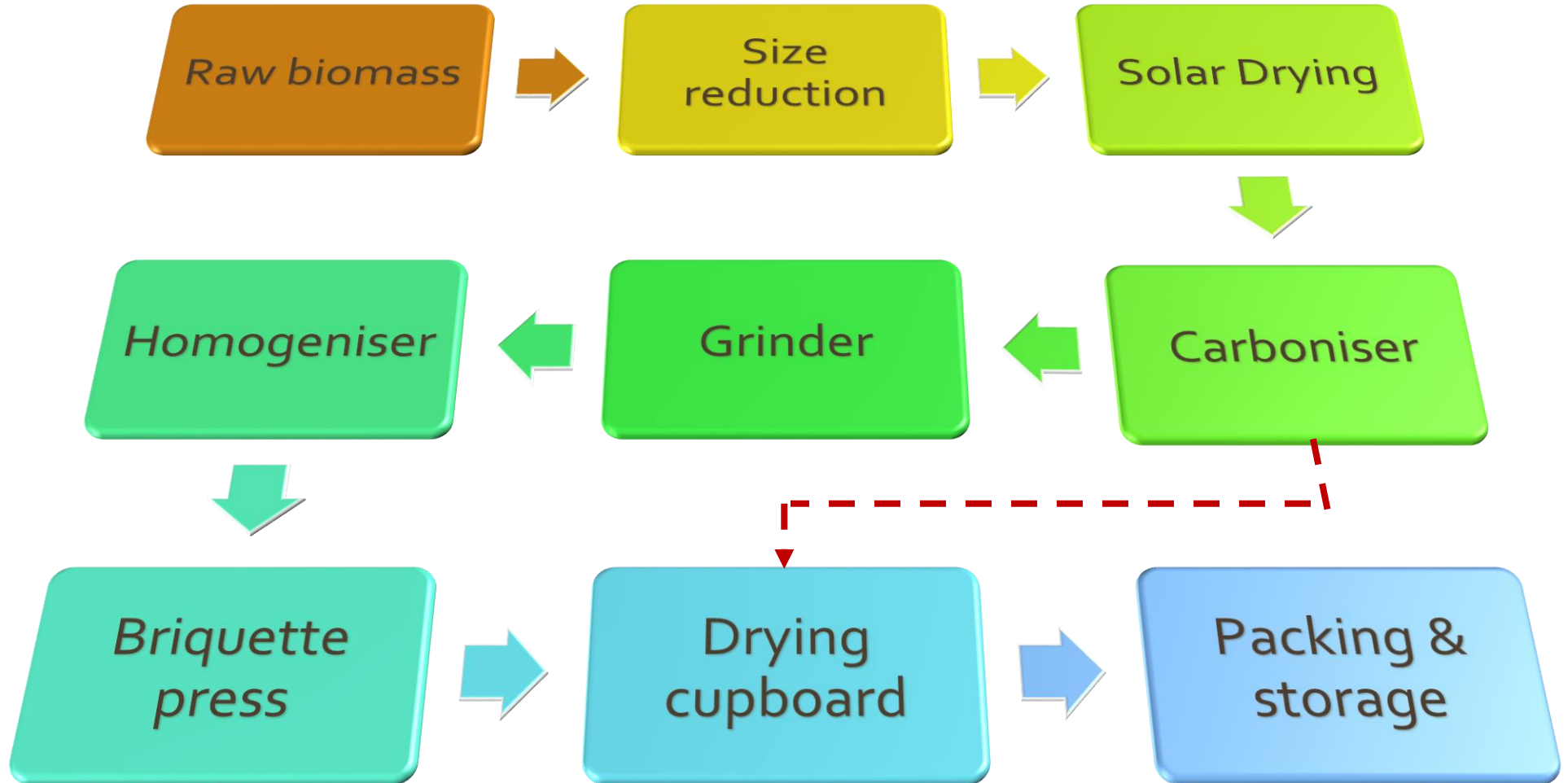
# Smokeless eco-charcoal

- MVP failed to gain market traction
- Little competitive advantage at minimum selling price
- Low income market wants a smokeless fuel → charcoal
  - ✓ Allow more competitive pricing
- Charcoal has larger market
  - ✓ Domestic low & medium income (cooking & heating)
  - ✓ Street food vendors
  - ✓ Domestic high income (leisure)
  - ✓ Niche restaurateurs
  - ✓ Export
- Must employ clean production





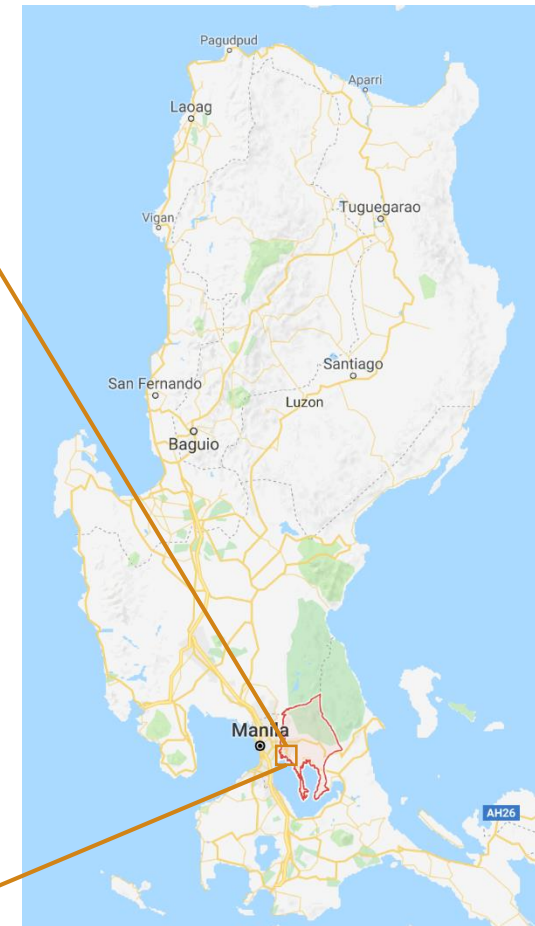
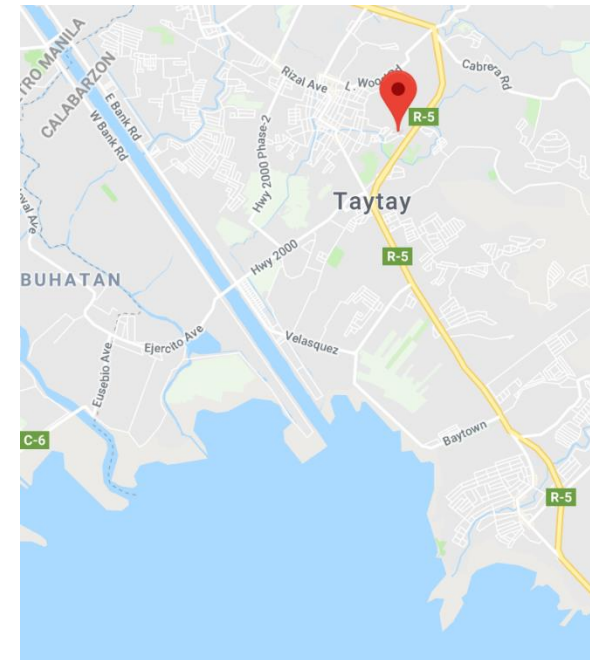
# Lili Process (patent pending)





# Harvesting

- HiGi is contracted, responsible for water hyacinth removal (exclusive access in Taytay, Rizal, Phippines)
- Employ local residents, beneficiaries, to harvest and dry
- HiGi buys at PHP 1 per kg









# Clean carbonisation

- Batched loading; sealed drum
- Three drums in tandem for semi-continuous operation
- Recirculation of volatile gases to support heating



VS



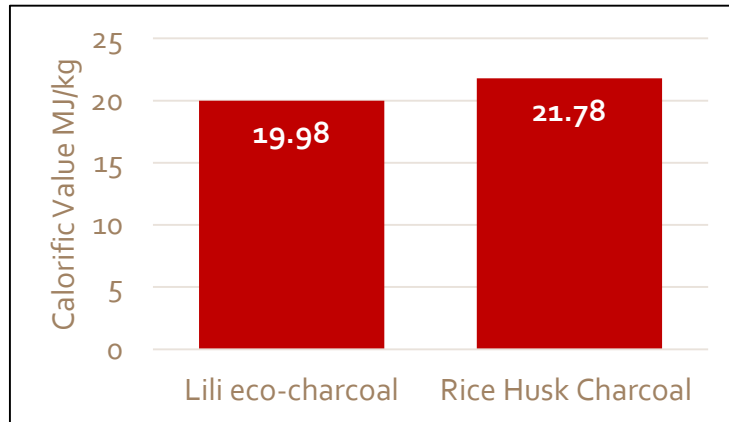






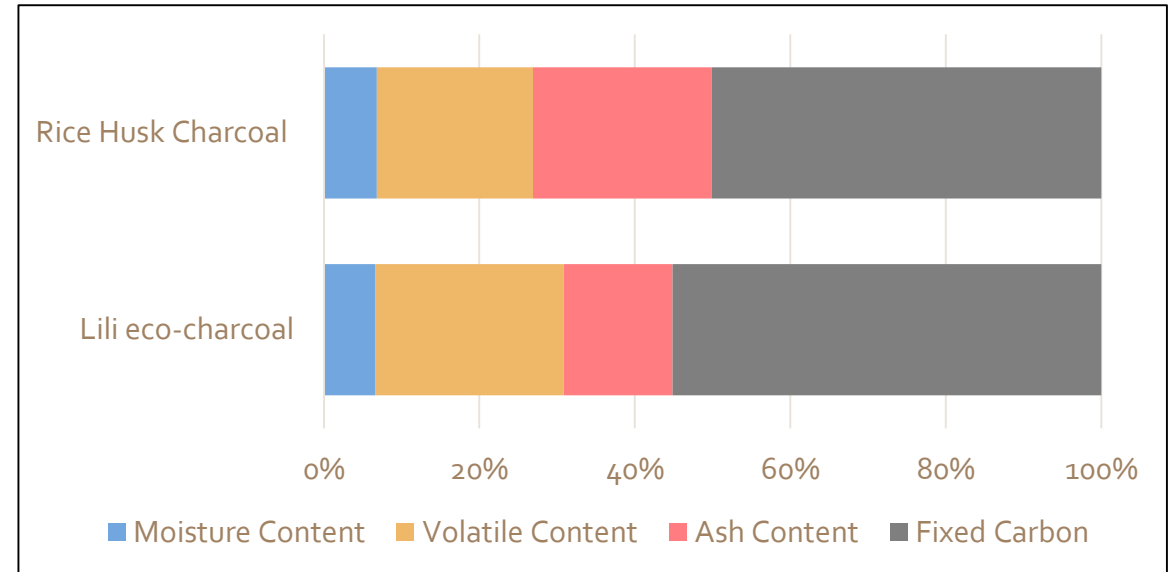
# Testing and Analysis of Lili

- Energy density of 20\* MJ/kg



\* to be repeated

- Proximate analysis

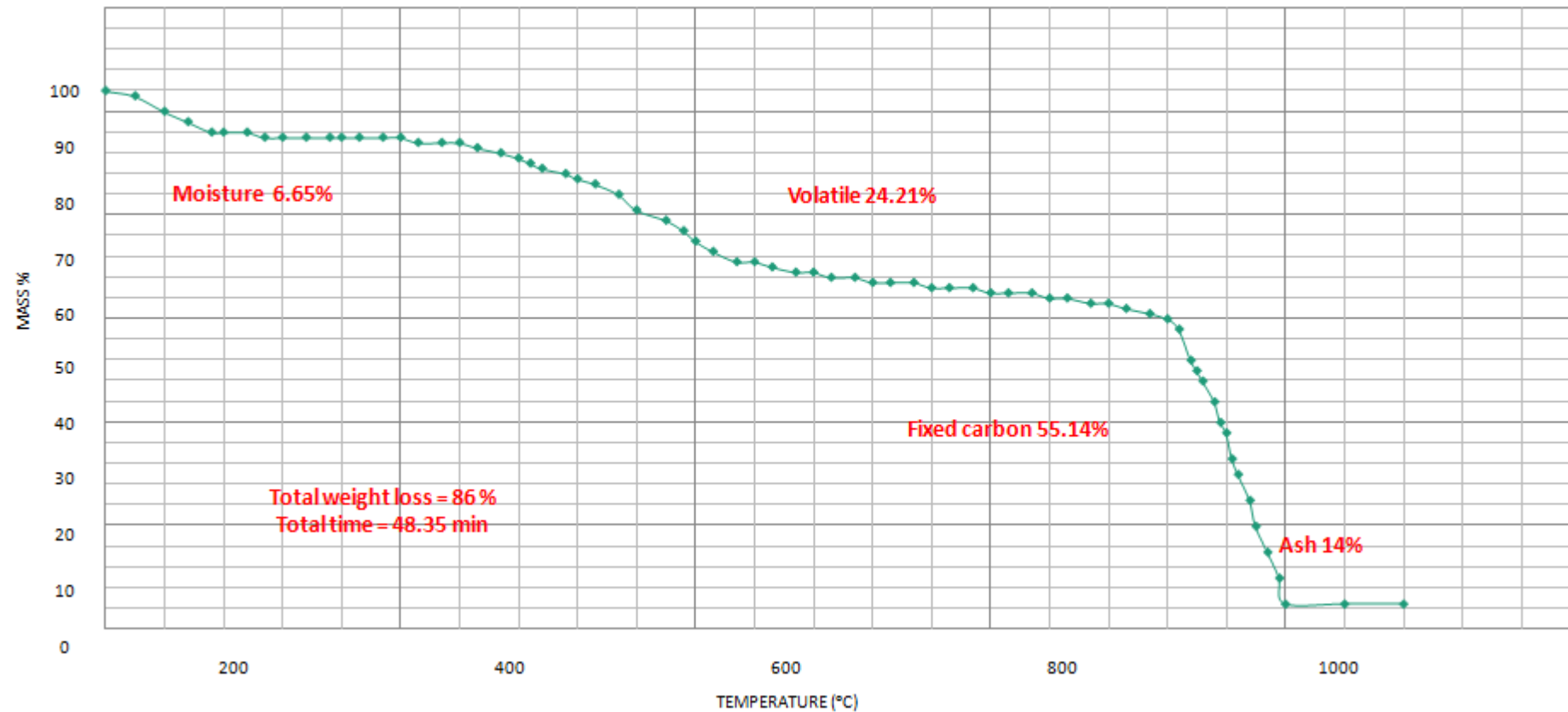


- Burning test:
  - visibly smokeless
  - can sustain for 45 mins per piece



# Testing and Analysis of Lili

- Thermogravimetric









## Impacts: direct



850 m<sup>3</sup> of water hyacinth regulated daily

Environment



35 beneficiaries could be lifted out of poverty earning US\$ 3 / day

Social - Blue economy



28,500 MJ of energy renewed from pest plants to serve 25 restaurants

@ 5 x more efficient energy than competitors



# Impacts: indirect

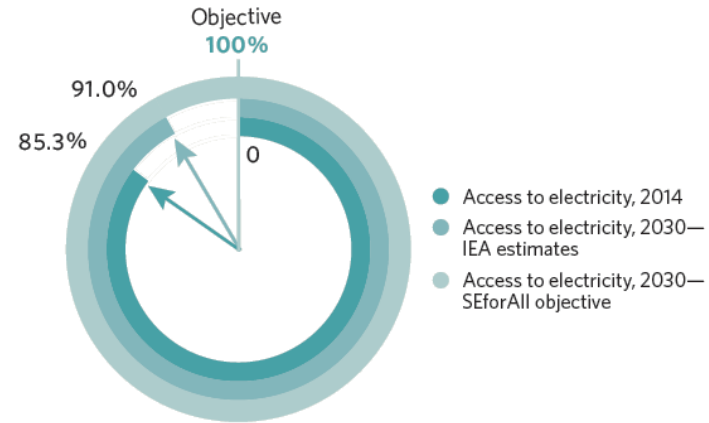


Rural families of domestic application

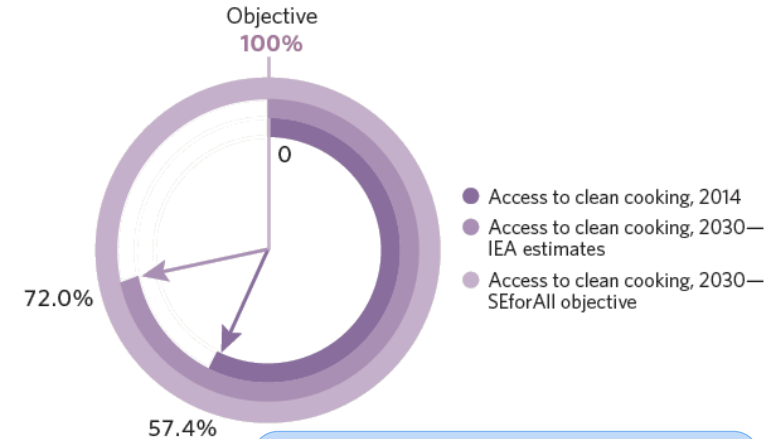
Education and awareness

Social health and disaster

**FIGURE 1** Access to electricity

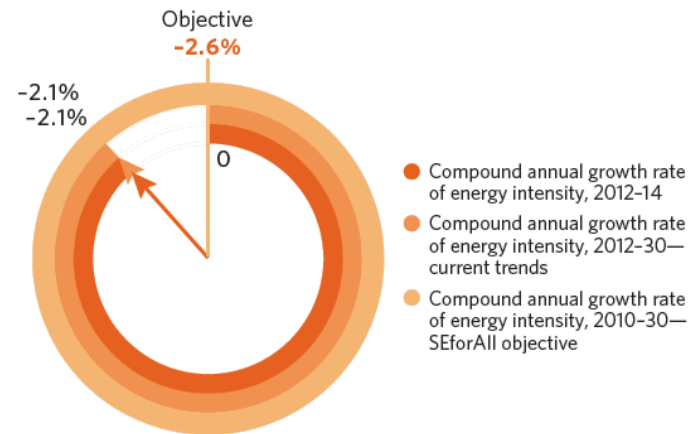


**FIGURE 2** Access to clean fuels and technologies for cooking

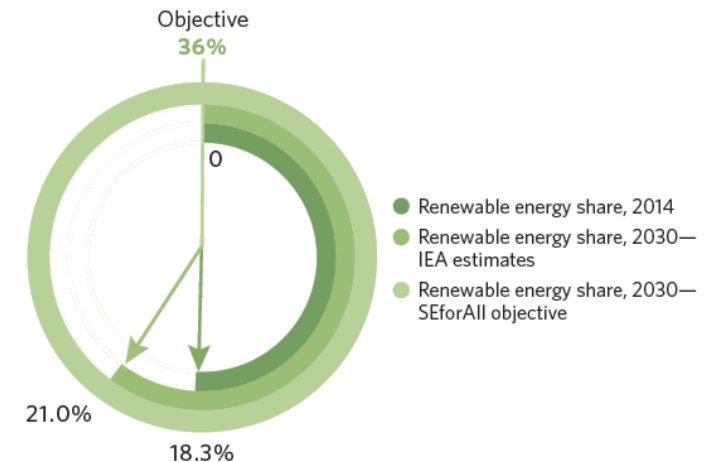


**Energy poverty**

**FIGURE 3** Energy efficiency



**FIGURE 4** Renewable energy







# In the media


higi energy


News


About 738 results (0.21 seconds)

- 

**Making cleaner energy from pesk**  
**Rappler** - 28 Jan 2018  
 In 2015, they co-founded **HiGi Energy**, "HiGi's solution is to convert water hyac"
- 

**These Are 2 Crazy Innovative Cle**  
**Forbes** - 14 Mar 2017  
 So he launched a startup, **HiGi Energy** markets the briquettes to wealthier cons
- 

**Watch This Space: 5 Promising G**  
<http://www.impact4all.org/> (press releas  
**HiGi Energy** focuses on producing bio  
 still heavily rely on charcoal or firewood
- 

**8 promising green energy startups**  
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**HiGi Energy**: They convert water hyaci  
 Analytics: The company provides highly
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**Tech.Co** - 1 May 2017  
**HiGi Energy** is a Philippines-based sta  
 aquatic plant that are generally conside

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ABOUT HIGI ENERGY

Our Story

HiGi Energy Pte Ltd  
 is an Impact for-profit company  
 founded to reduce usage of firewood and  
 charcoal ...  
 See more

[www.facebook.com/higi-energy](http://www.facebook.com/higi-energy)

[www.higi.biz/](http://www.higi.biz/)

# Funding & exposure

- Seed funder + founders
- Startup Competitions
  - Startup Malaysia
  - GIST Network Tech-I, Silicon Valley
  - ImpactHub, Philippines
  - TAYO 14, Philippines
- Angel investment
  - 1<sup>st</sup> Round: Dec 2017 (US\$100k)
  - 2<sup>nd</sup> Round: Dec 2018 (US\$??)
- R&D Grant
  - AAIBE Chair of Renewable Energy
  - UNITEN





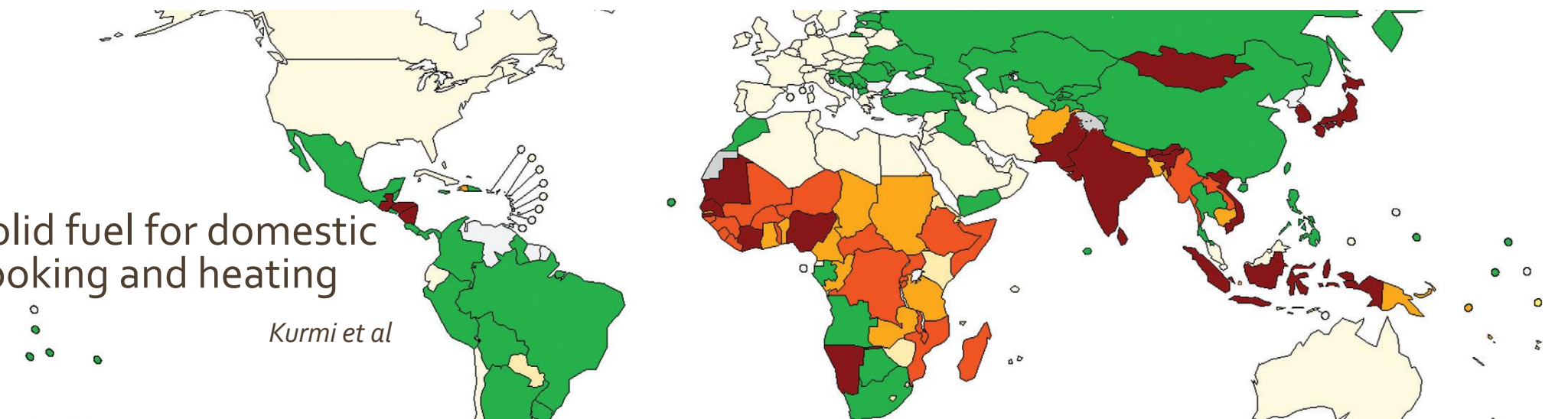
# Market growth potential



- Water hyacinth infestation

- Solid fuel for domestic cooking and heating

*Kurmi et al*





# Thank You



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