Wheig

Waste is energy

Affordable small and medium scale Waste-to-Energy plants

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About WHEIG

WHEIG Group

- Wheig is specialized in biomass and waste to energy solutions for small/medium projects
- Wheig has operations in South America, Europe, South East Asia, the Indian Ocean and the Pacific
- Wheig has 3 references and 4 projects under development
- Wheig is able to finance, build and operate WtE or provide a turnkey plant
- Wheig is your one stop service for integrated waste management

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Introduction

At glance: Waste in Asia

STRENGHTS

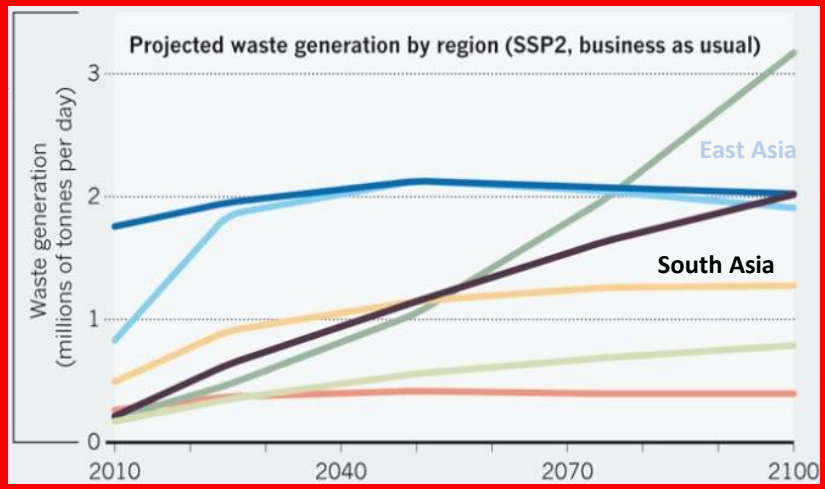
- Asia is a booming waste market (multitude of providers)
- Informal sector
- Constant growth of energy demand
- FDI attraction
- Swap transportation costs to treatment costs
- Low labor costs
- Low waste valorization

	2000-2010 Compound Wtd Ave	2011	2012	2013	2014e	2015f	2016f	2017f
China	10.5	9.3	7.7	7.7	7.4	7.1	7.0	6.9
India	7.5	6.6	4.7	5.0	5.6	6.4	7.0	7.0
Indonesia	5.2	6.5	6.3	5.8	5.1	5.2	5.5	5.5
Malaysia	4.6	5.2	5.6	4.7	5.7	4.7	5.1	5.2
Philippines	4.8	3.6	6.8	7.2	6.0	6.5	6.5	6.3
Thailand	4.3	0.1	6.5	2.9	0.5	3.5	4.0	4.5
Vietnam	6.6	6.2	5.2	5.4	5.6	5.6	5.8	6.0

Source: Global Economic Prospects, January 2015, World Bank

CHALLENGES

- Which technology? Jump or step by step?
- Low waste sorting at source
- Waste is organic and wet
- No more open-dumps - Public protest
- Poor polluter pay principle
- Creation of wealth first



Successful WtE requires **proper study and preparation**

Waste procurement, analysis and composition

Mass balance and plant design

Secure revenues and permits

Successful WtE requires **proper implementation and operation**

- Quality control of the construction
- Operation by the plant supplier
- Collect the revenues

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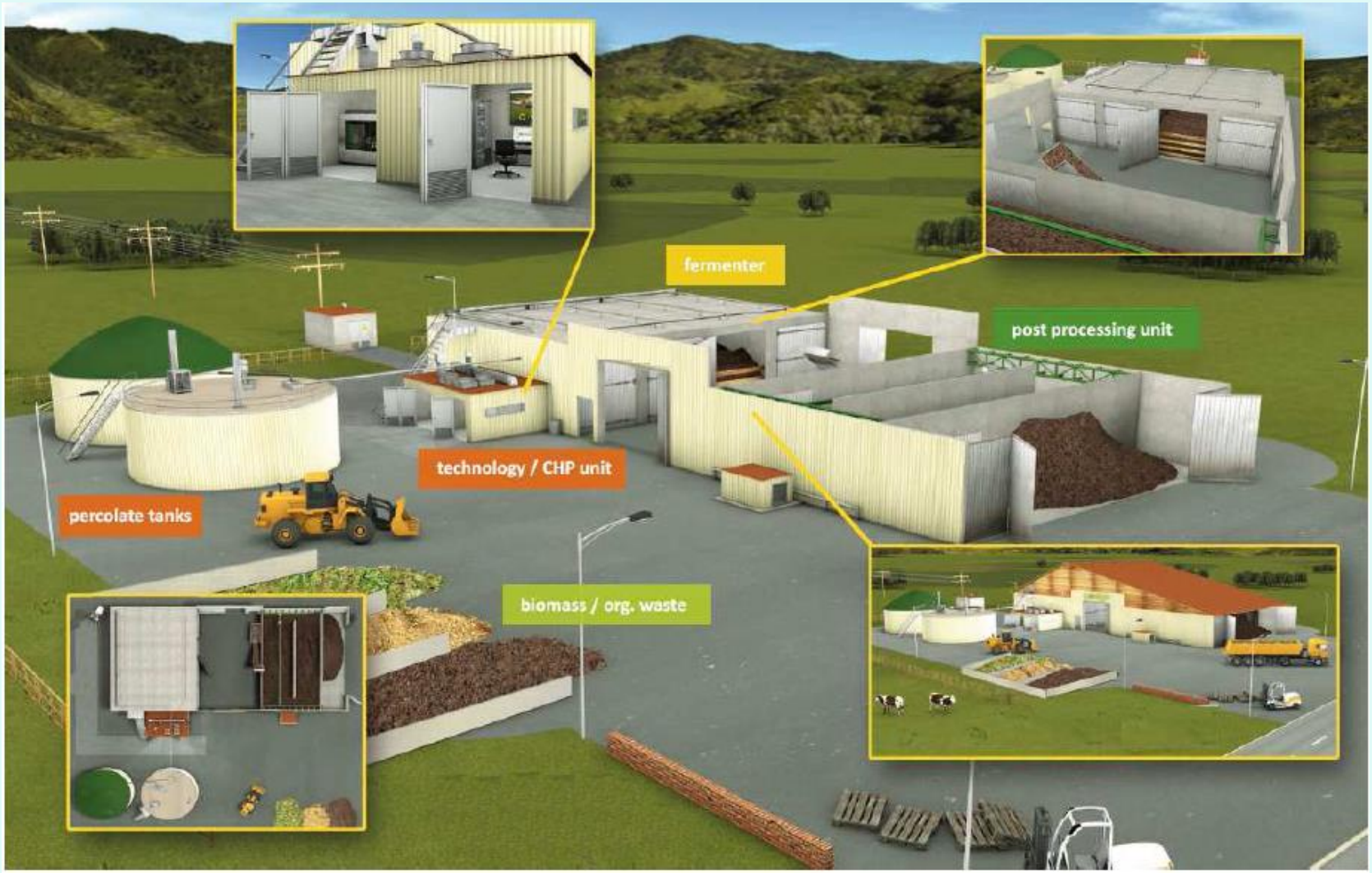
Case Study

Plant 3D view



Semi-Dry Fermentation in Thailand

Sung Noen Municipality, Korat Province

60 Tons / day (21,900 tons per year) of MSW

Project Developers: Municipality and DEE Foundation

Project Auditor: Wheig

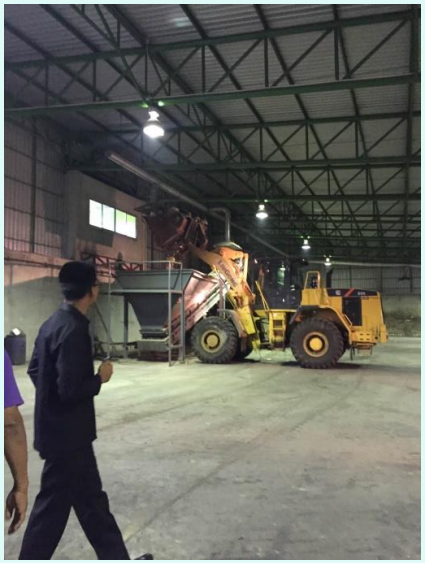
CAPEX: 4 M USD financed by the central government

In operation since Q3 2015

Payback: 4 years in theory – 15 years in reality before audit and 9 years after audit

Service or Product	Input/Output Design	Input/Output Reality	Yearly Revenues	After Audit
Waste treatment	10,950 tons	5,500 tons	0.09 M USD	0.09 M USD
Electricity	2,281 MWh_e	380 MWh_e	0.08 M USD	0.2 M USD
Compost	2,200 tons	1,500 tons	0.11 M USD	0.11 M USD
Recyclables	1,750 tons	650 tons	0.16 M USD	0.2 M USD
RDF	8,100 tons	6,500 tons	0.11 M USD	0.15 M USD
TOTAL			0.55 M USD	0.75 M USD

Technical audit by Wheig



Waste separation is rudimentary → Low recyclables and Low organic fraction

Doors are not air tight → Composting (no biogas)

Technical audit by Wheig

Addition of green waste → more compost and more value

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Conclusion

WtE Project Economics – What is crucial?

- All potential revenues of a WtE must find a market or be subsidized
- Long term contract
- Financial model assumptions must be conservative
- Projected Project IRR must be close to 15% or higher - In reality, always lower
- Cutting the project CAPEX leads to slash some (important?) project features
- Include in the initial budget one or two years of operating costs
- Internalize all costs (landfill mining, land cost, impacts…)
- Right business environment:
  - Direct or indirect Subsidies for local or foreign direct investment
  - Clear, enforced and long term regulation

WtE Technology and Structure – What is crucial?

- Priority to technology with multiple revenue streams
- Proper waste sorting (at source whenever possible)
- Design in Europe/Japan/US with local data and procure locally when possible
- Reduce automation and hire more staff for waste sorting
- Choose modular technology
- Choose non aggressive technology for public support
- Think multiple small scale plants rather than one large plant

- PPP cuts 10 to 15% of overhead costs
- For turnkey, always secure one year operation contract

Thank you for your attention
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