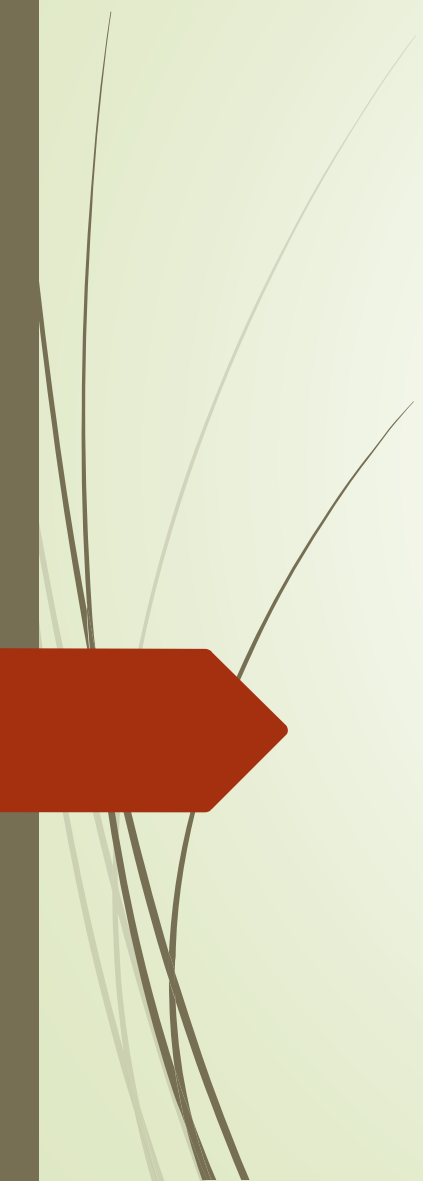




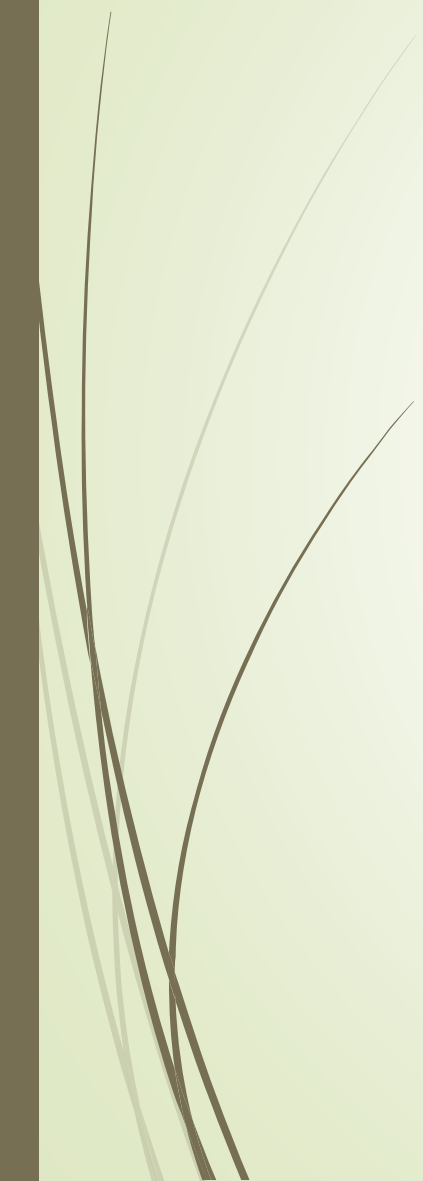
Transition and Circular Economy: Turning Waste into Energy

3rd December 2025

Bahasura Wijesundara



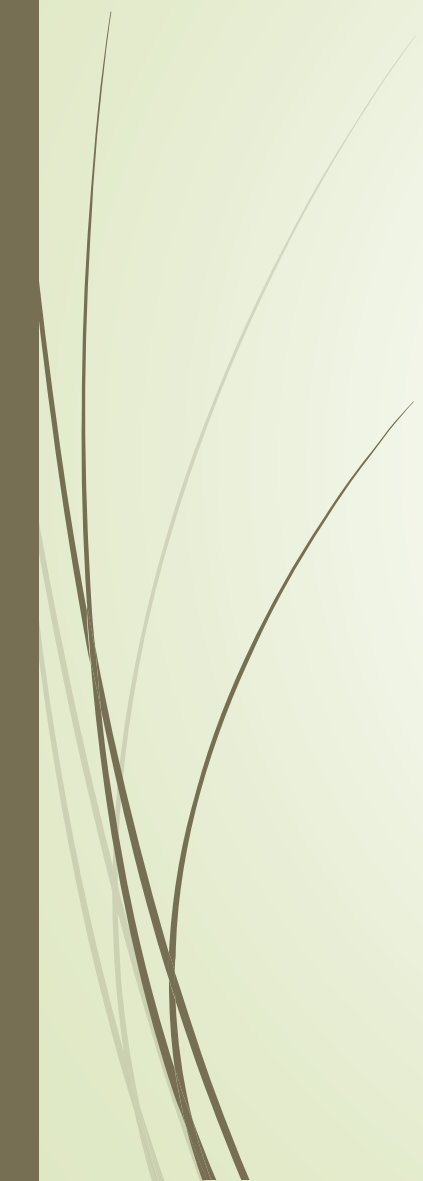
Introduction



- The fundamentals
- Waste to energy management – global perspective
- Case study – brief background story
- Case study- success story
- Policy framework and future



The fundamentals

- Circular Economy (CE)
 - CE in Renewable Energy (RE)
 - Waste and waste to energy
- 

Circular Economy (CE)

- The circular economy is a model of production and consumption, which involves sharing, leasing, reusing, repairing, refurbishing and recycling existing materials and products as long as possible. In this way, the **life cycle of products is extended**.
- **Based on 3 main principles**
 - Eliminate Waste & pollution
 - Circulate products & material
 - Regenerate nature
- **Driven by Design**
 - Do Better before





CE in Renewable Energy (RE)

- Basic life cycle extension of CE is adopted in the sector
- Additionally sustainable end life management under CE is one key factor
 - Examples cover PV panels recycle & Wind turbine de commissioning



Waste & waste management

- Typically adopted practices are 3R – Reduce, Reuse & Recycle
- CE Model discuss about reduction and elimination of Waste produced in life cycle of subject in focus
- Why its important (Energy, Manpower & time cannot be recovered)
- Mas scale waste management techniques
 - Land fills
 - Incineration
 - Waster to energy

Waste to Energy (WTE)

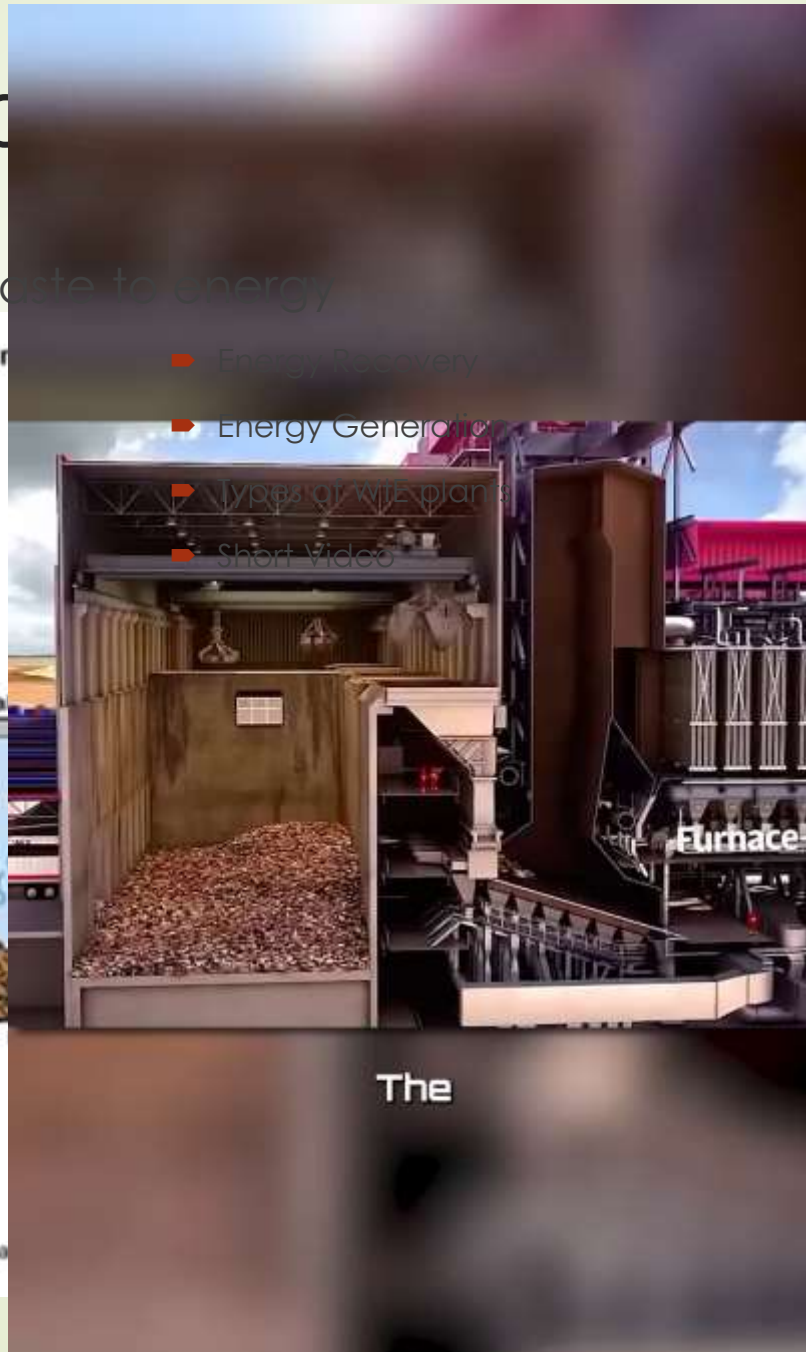
Waste to energy

- Energy Recovery
- Energy Generation
- Types of WTE plants
- Short Video

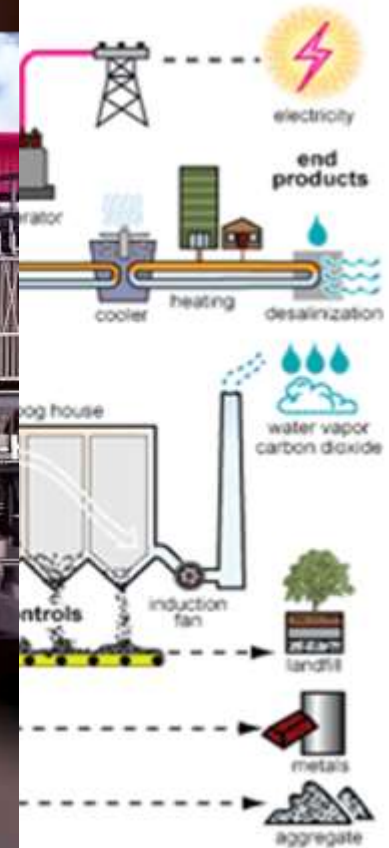
Waste-to-energy plant



Source: Adapted from the Na

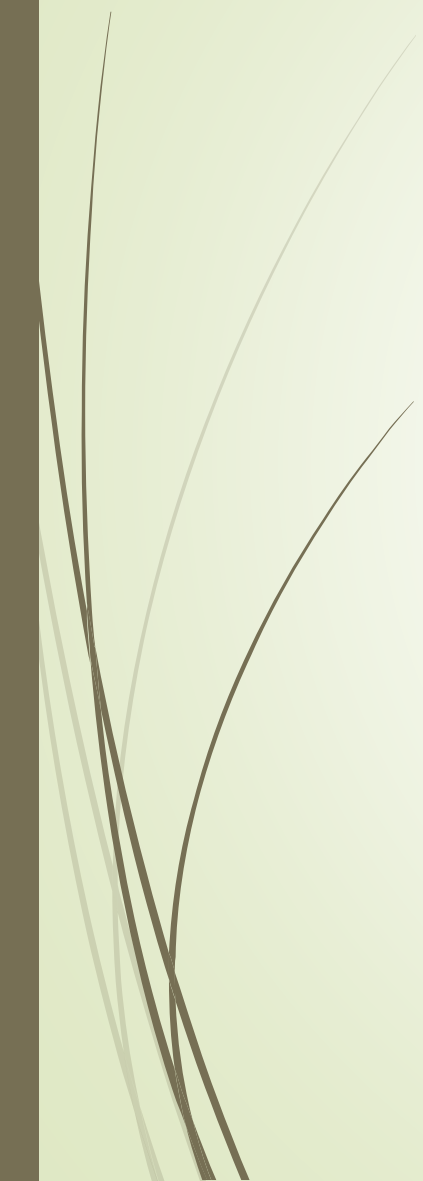


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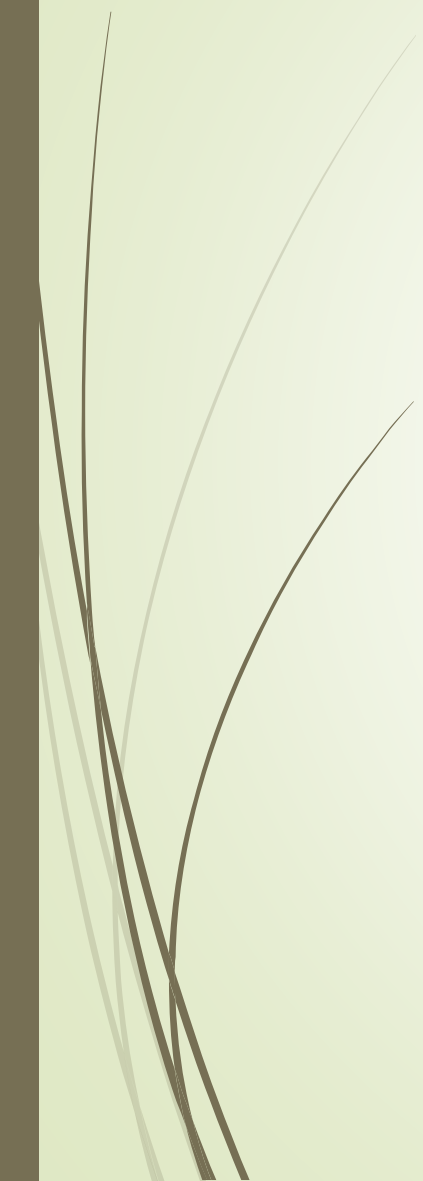


Waste to Energy (WtE)

- 
- Importance of WtE in circular economy
 - Converts waste into usable energy
 - Reduces landfill use
 - Promotes resource efficiency
 - Role in Energy Transition
 - Supports decarbonization
 - Provides renewable baseload power
 - Enhances energy security
 - Role in global and South Asian energy transition

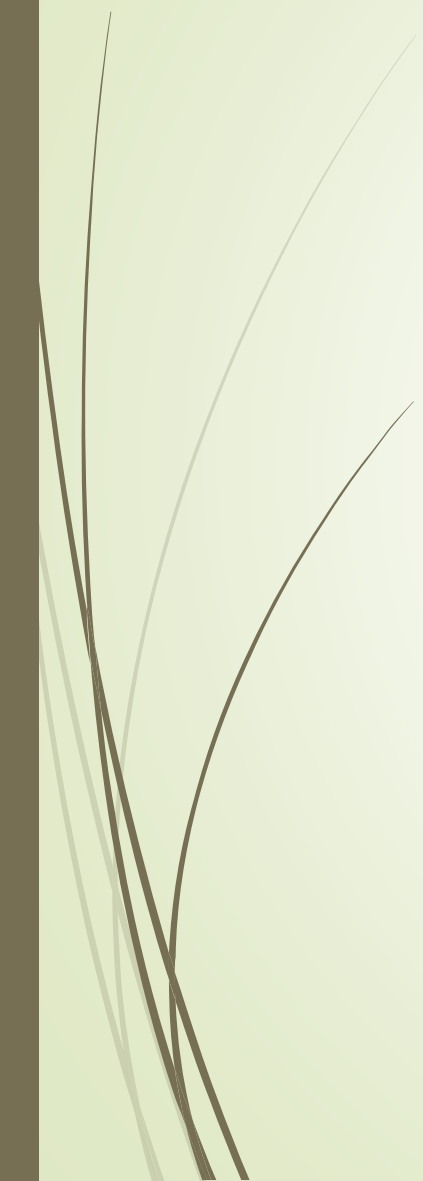


Global Perspective on WtE

- EU, Japan, and China leading adoption
 - Focus on emissions control and efficiency
 - Integration with waste segregation policies
- 



South Asian status



- India has about 11 Waste to energy plants in operation
- Pakistan has higher potential
- Bangladesh 2 plants in operation and several in development stages
- Maldives 1 in final stages of development and operation
- Nepal

Case Study -10 MW Colombo WtE Power plant (Sri Lanka)

- Capacity- 700 TPD
- Power Generation- 10 MW
- Started – in 2018
- COD- Dec 2020
- Owner- Aitken Spence Plc
- Stake holders
 - Colombo Municipal Council
 - Ceylon Electricity Board
- Annual Waste process- 265,00 Mt
- Annual energy generation 80 M Kwh
- Investment 80 MUSD



Source- UN global compact



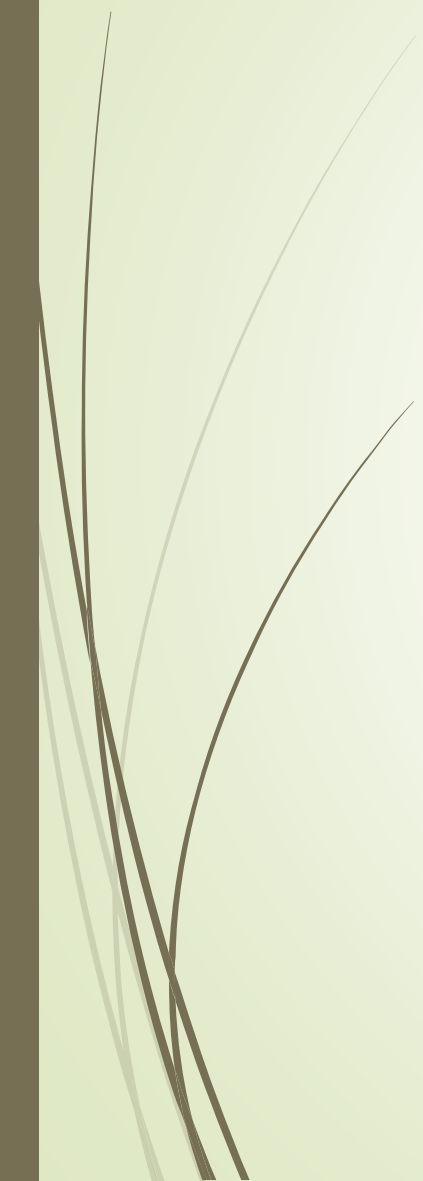
Case study

➤ Project time line

- First Waste to Energy power plant to achieve commercial operation
- Started in 2016, project completed by the end of December 2020
- Trial Operation of 3 months
- 3-year operation by EPC contractor
- Project Timeline effected by security issues (Easter bombing in 2019), Covid-19 Pandemic
- Commercial operation effected by Economic crisis



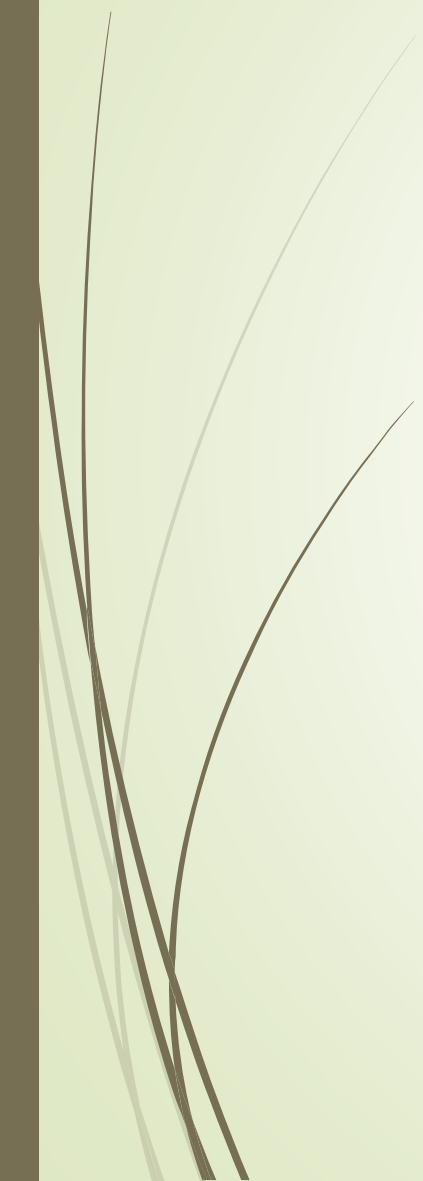
Technical Challenges



- Strategic location – positioning close proximity to high urban area
- Data Availability – No long term accurate data available for plant design and planning
- Mixed waste composition
 - Varying waste composition
 - Low quality of waste – non combustion waste eg, construction waste, glass, metal, insulation material etc
 - High moisture
 - Availability of hazardous waste and heavy metal in waste
- Need for advanced emissions control due to the Heavy metal and acidic gases
 - High cost of operation and technology



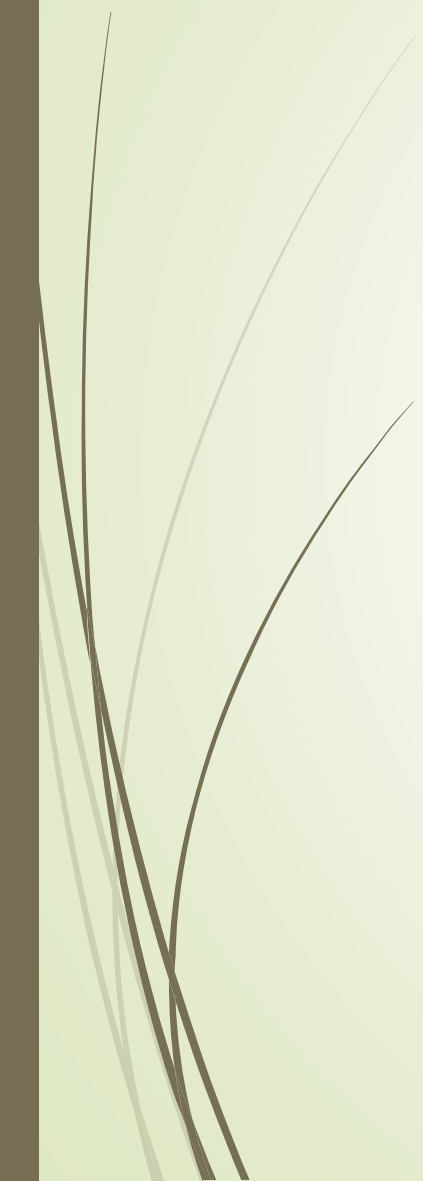
Technical challenges



- Water- used canal water high salinity during low rainfall season
- Used air cooled condenser technology to limit water usage – CE adoption
- Leachate treatment – high content of bio degradable waste and moisture (100 CUM/Day) capacity
- Maintaining critical operation parameters
- Low Operation and maintenance competency in market
- Ash disposal -



Adoption in Fundamentals in Case study

- Design
 - Water re use (leachate) & air-cooled condenser
 - Location – closer to waste and load center (minimal transport)
 - Energy transition
- 

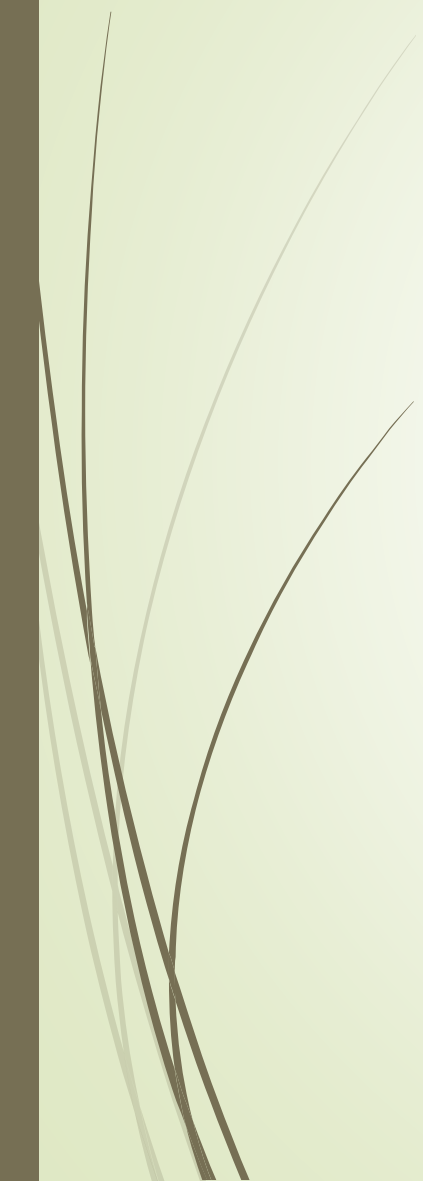


Legal & Regulatory Challenges

- Waste collection authority – local government can collect waste
- Environmental compliance (EPL)
- Limited allocation for low enforcement over misuse/ misconduct violation of environmental pollution
- Lack of regularity farmwork and implementation on environmental protection
- High degree of political influence and concerns over the human rights –
- Lengthy approval process



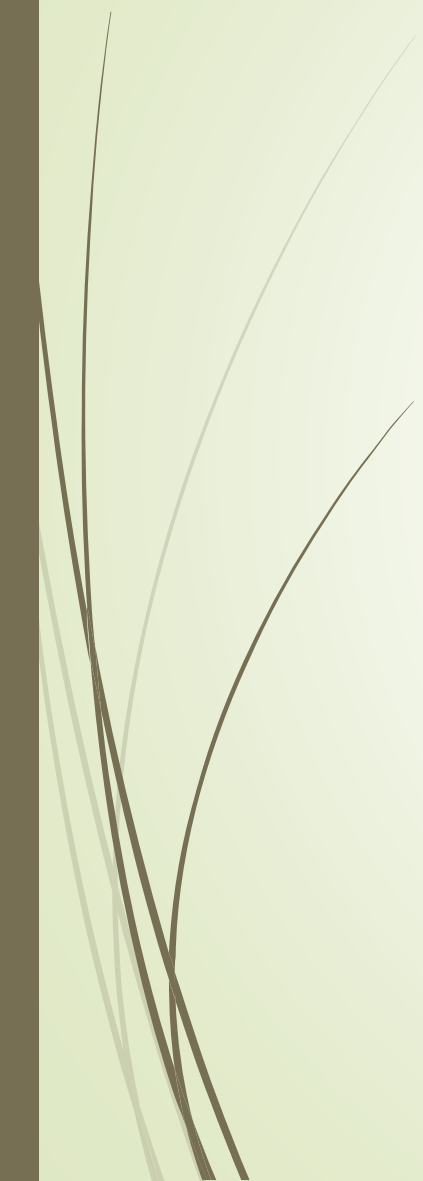
Financial Challenges



- High capital cost
- Long ROI periods
- Limited access to private financing
- High O&M cost (about of tariff 1/3 for direct operation) cost of chemicals, cost of by products handling
- Financial cost due to the techno-commercial operating model – income is based on energy generation



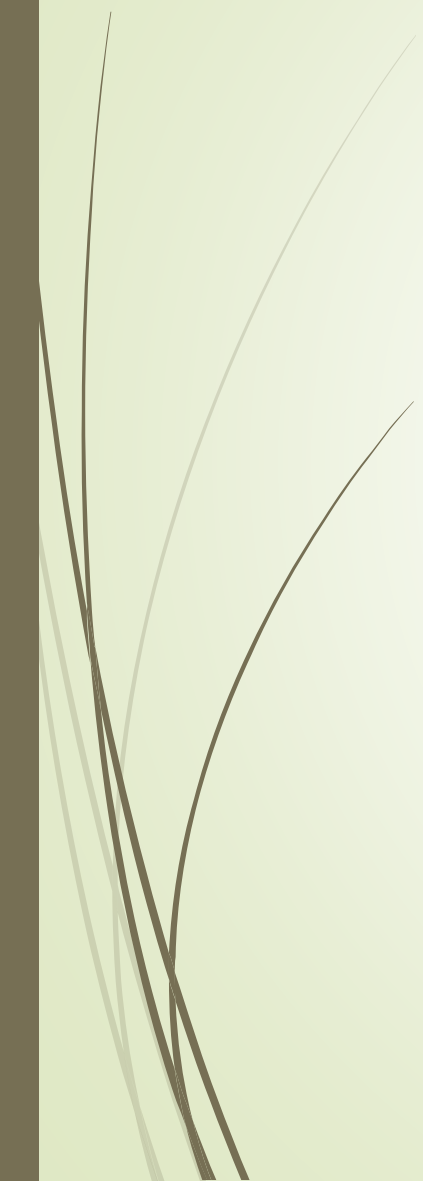
Social Challenges



- Public resistance due to pollution fears-
- Waste separation
- Changes in consumption pattern
- Education over the importance of waster management (mixing waste, dumping unacceptable waste types)
- Low living standards -



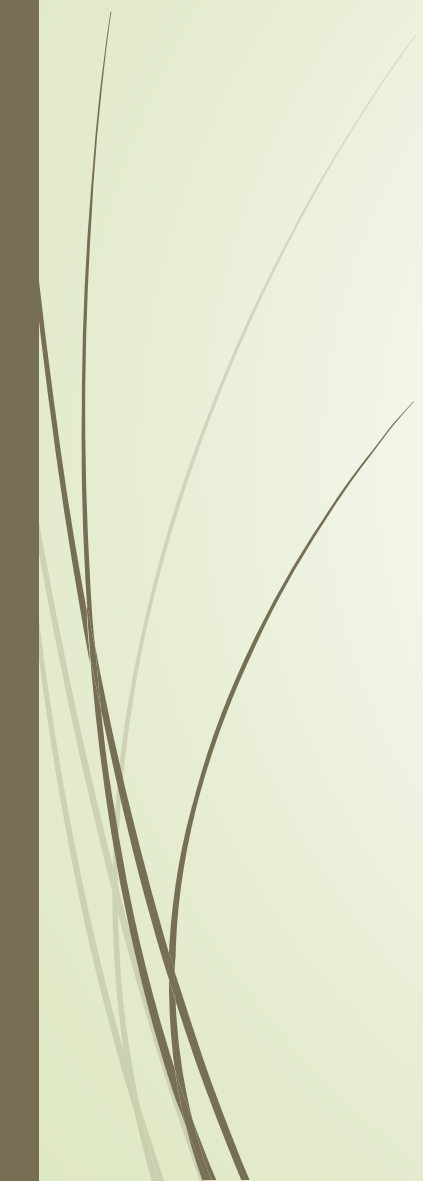
Policy Recommendations



- Use of Multiple mass scale waste management methods – include landfills, waste to energy, 3R plants, CE methods implementation
- Introduction of National CE policy framework
- Provide financial incentives – for waste management and CE initiatives
- Establish strict emissions standards- has to be step by step approach
- Adoptive operation models – feed in tariff as well as price on waste delivery
- Policy on customer responsibility cost recovery – fines or financial Buren on pollutants (use of PP packaging)
- Policy on Manufacture's responsibility and cost recovery



Way Forward

- Regional cooperation in South Asia
 - Technology transfer and capacity building
 - Integrating WtE into national energy mix
- 



Q&A

