

Overview of municipal solid waste management in India

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Challenges for urban development in India's hill states: Solid Waste Management
30 May 2014

Key facts



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- Present municipal solid waste generation is estimated at 62 million tonnes per annum
- Solid waste generation is considered largely a urban phenomenon
- Cities are considered to be engine of growth but are witness to deteriorating urban services including MSWM
- Uncontrolled disposal of MSW is not only source of environmental pollution but is also contributing to emission of GHGs
- Increasing waste generation would require increasing cost for its management

MSW characteristics in Indian cities



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Parameter	Unit	Range
Compostable	%	30 – 55
Recyclable (Plastics, Paper, Metal, Glass etc)	%	5 – 15
Inter including construction & demolition waste	%	40 - 55
Carbon/Nitrogen (C/N)	Ratio	14 – 53
Moisture	%	17 – 65
Calorific Value	kcal/kg	520 – 3766

Source: CPCB

Key features of MSW management



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- Recyclable content of the MSW is picked up by waste pickers and send for recycling
- India reports high recycling rate of 70% though most of it happens in informal sector
- C&D waste presently disposed on land but can be recycled
- High moisture content and low calorific value of organic fraction of Indian MSW makes it more amendable to biochemical conversion

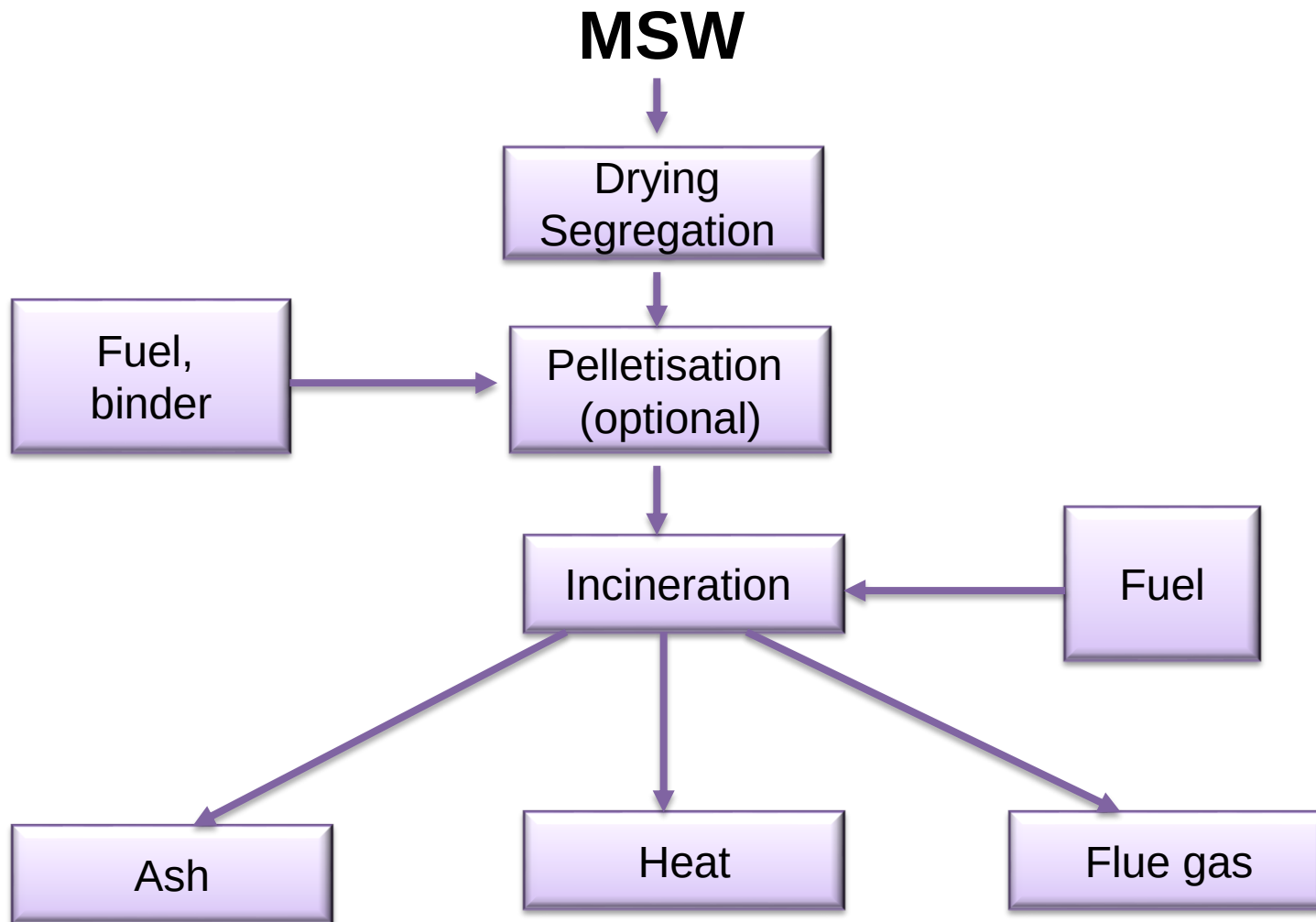
Technologies used of MSW processing and disposal

- Biochemical conversion
 - Composting
 - Windrow
 - In-vessel composting
 - Vermicomposting
 - Anaerobic digestion
- Thermal processing
 - Incineration/cement kilns
 - Use of RDF/fluff for energy generation
 - Landfilling with harvesting LFG
 - Pyrolysis/gasification
- Plasma torch

Incineration



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Key features



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- Direct burning of wastes in the presence of excess air at high temperatures liberates heat energy, inert gases and ash
- Advantages:
 - Most suitable for high calorific value waste (paper, plastics, wood)
 - Relatively free of noise and odor; requires small land area
- Disadvantages:
 - Low heating value waste -not ideal for energy recovery
 - Toxic metals/PVC lead to increased air emissions
 - High capital and O&M costs

Waste combustion in cement kilns



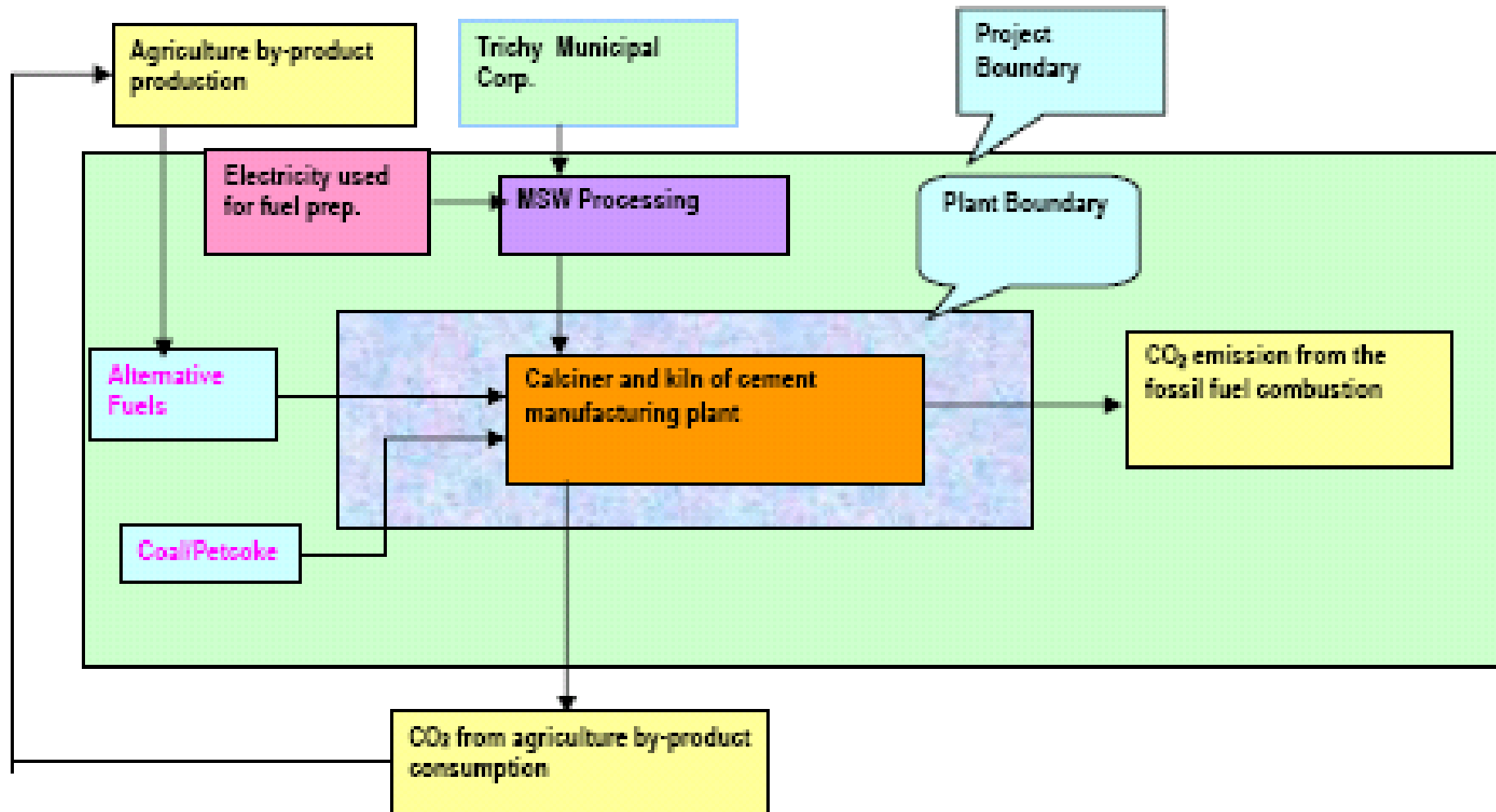
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- Alternatively waste can be used as fuel to substitute traditional fuel in cement kiln
- Advantages
 - Supplements traditional fuel
 - Waste treatment is achieved
- Disadvantages
 - High level of chlorides is not acceptable
 - Distance over which waste can be transported is also limiting factor

Co-combustion in cement kilns



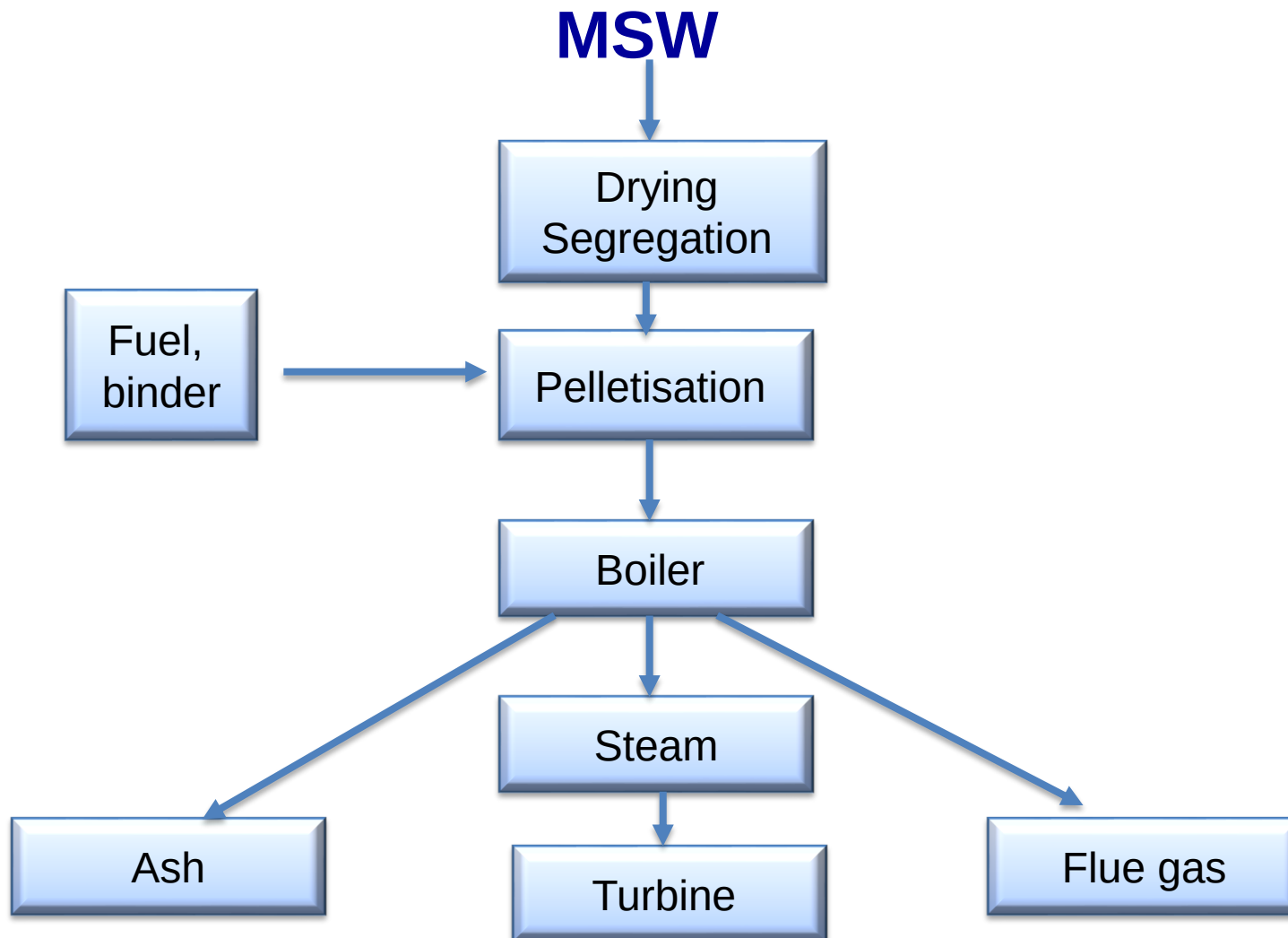
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Refuse Derived Fuel



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Justification for RDF processing



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MSW pelletisation plant at Hyderabad (courtesy MNRE)



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Key features



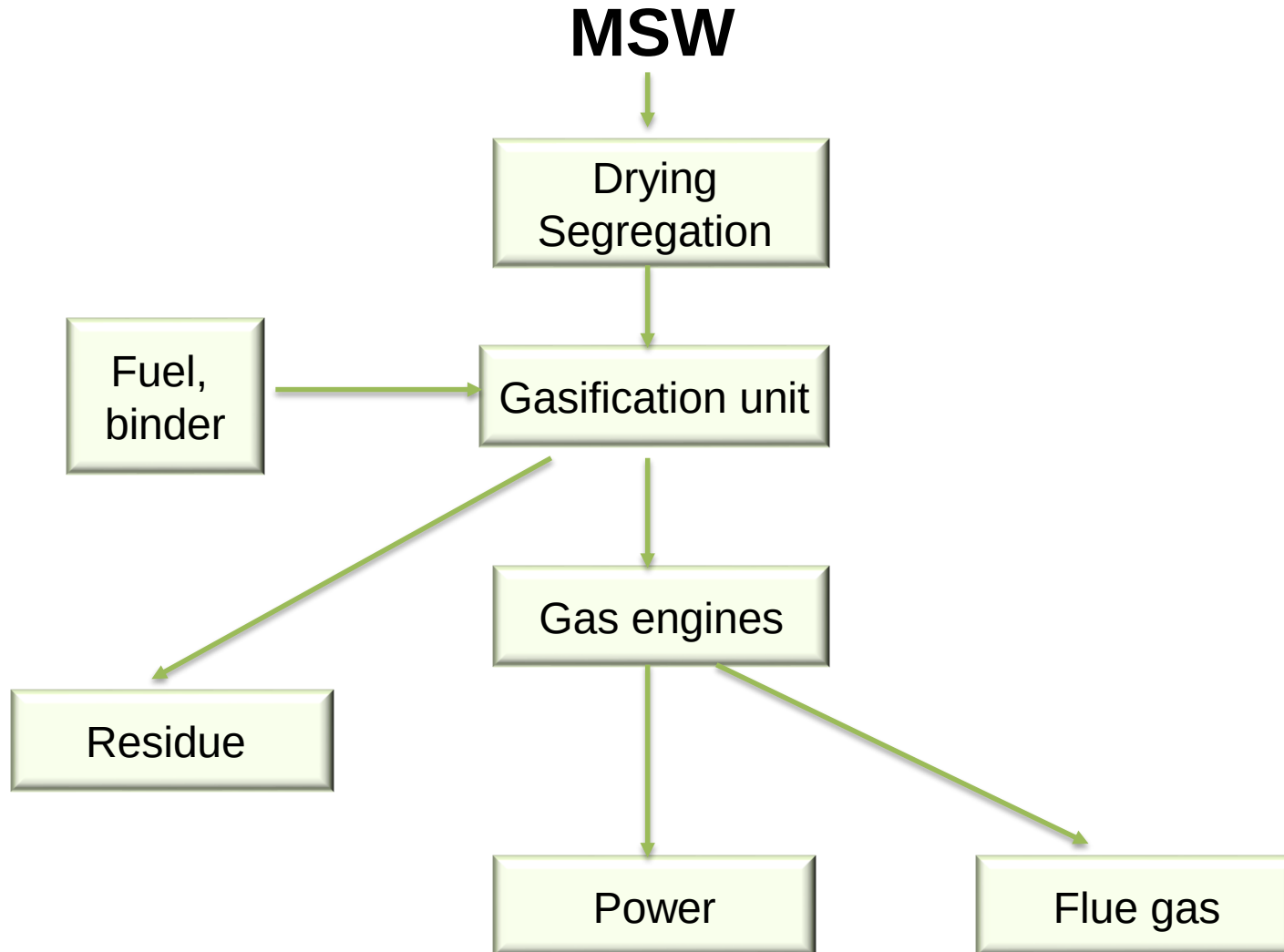
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- Segregating, crushing and drying of organic material from MSW into dense and solid fuel pellets that can be used as main or supplementary fuel for industrial boilers
- Advantages:
 - High energy content
 - Convenient for storage and transport
- Disadvantages:
 - High energy consumption for crushing and drying
 - Inorganic content tends to reduce effectiveness
 - Only conducive during periods of lower rainfall
 - May require gas cleanup to avoid air emissions

Gasification



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Biomass gasifier based power system heat/electricity applications



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Key features

- Gasification is normally followed by combustion of the produced gases in a furnace and in internal combustion engines or in single gas turbines after comprehensive cleaning of the product gas
- Advantages:
 - Most suitable for high calorific value waste (paper, plastics, wood)
 - Relatively free of noise and odor; requires small land area
- Disadvantages:
 - Low heating value waste -not ideal for energy recovery, moisture may be problem
 - Technology yet to be commercialized

Conventional Landfill with Gas Extraction **teri**

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- Advantages:
 - Low cost energy recovery due to scale economies
 - Controlled LFG recovers high percentage of total gas potential
- Disadvantages
 - Uncontrolled, methane gas easily escapes
 - Requires significant landfill infrastructure
 - Requires very high volumes of waste and large land areas



LFG extraction setup

Bioreactor Landfill with Gas Extraction



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- Advantages
 - Rapid organic waste conversion / stabilization
 - Maximum landfill gas capture for energy projects
 - More efficient use of landfill space due to rapid settlement
- Disadvantages
 - Requires high organic composition to be a cost-effective option
 - Limited technical experience



Yolo County California Bioreactor

Driving force for avoiding landfilling

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- Availability of land becoming a problem
- Therefore increasing distances for transportation
- MSW Rules also prohibit disposal of organics and recyclables

Insights from MSW-to-Energy projects



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- Information on processes is limited by secrecy claims
- No large-scale implementation experience for most new cutting-edge technologies
- Waste statistics and data are poor; extrapolations are dubious
- Advocates and experts tend to popularize unproven and inappropriate technologies
- Large amounts of development money during the early stages generally do not yield sustainable markets for the technology
- Technology failures are seldom reported – technology promotions continue despite failings

Thank you