



WE ARE THE FUTURE



A wide-angle night photograph of the Sharjah city skyline, featuring numerous illuminated skyscrapers and buildings along the waterfront. The city lights reflect on the calm water in the foreground. The sky is a deep blue, and the overall scene is vibrant and modern.

Founded in **2007**  
as a Public Private Partnership

Headquartered in **Sharjah**  
with operations across the UAE

The Only **Fully Integrated**  
Environmental & Waste Management  
Company In The Region

Working to make Sharjah the first  
city in the Middle East to achieve  
**zero-waste** to landfill

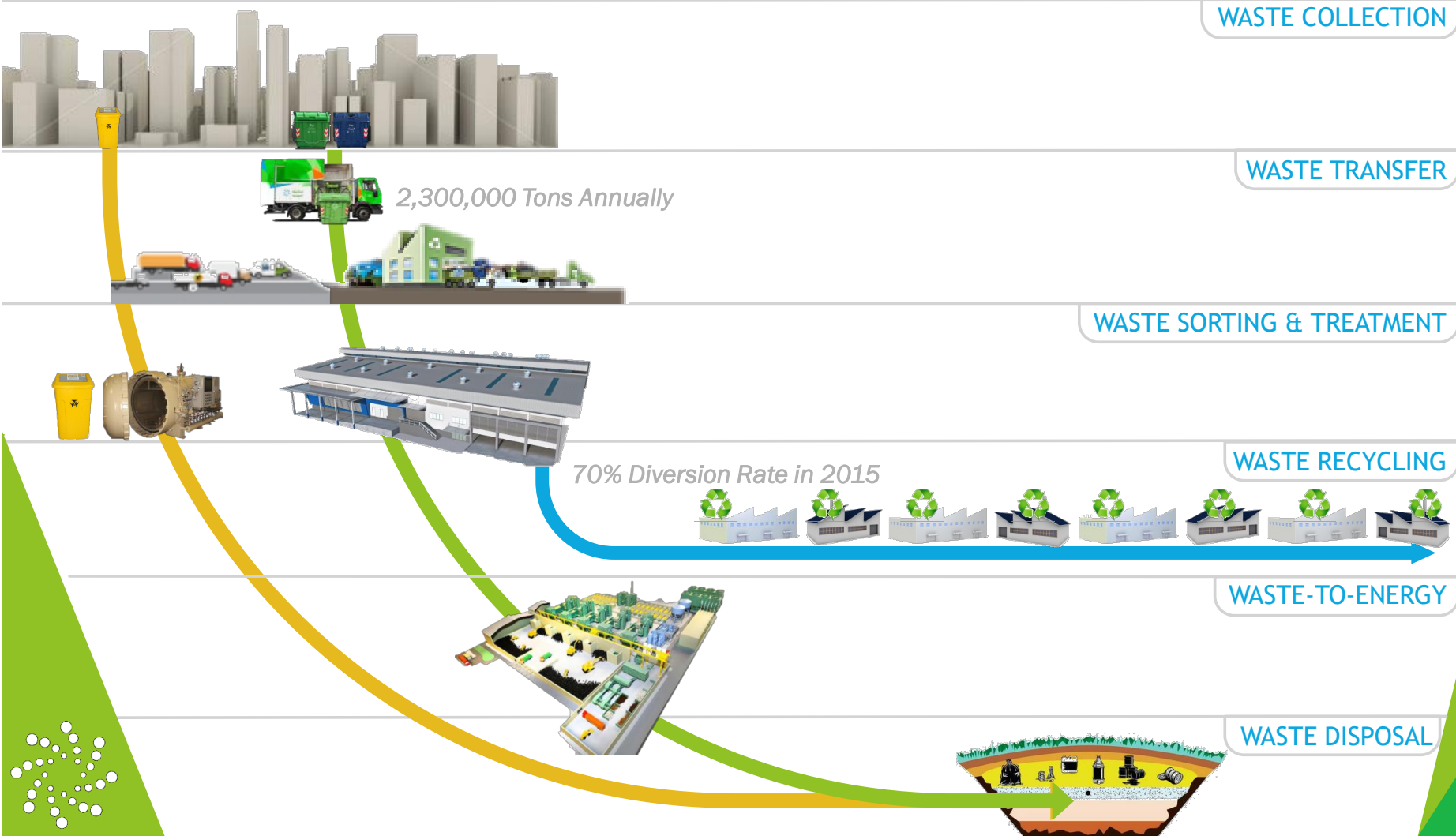


**OVER 4,000**  
NUMBER OF EMPLOYEES

**1,000,000+**  
RESIDENTS SERVICED

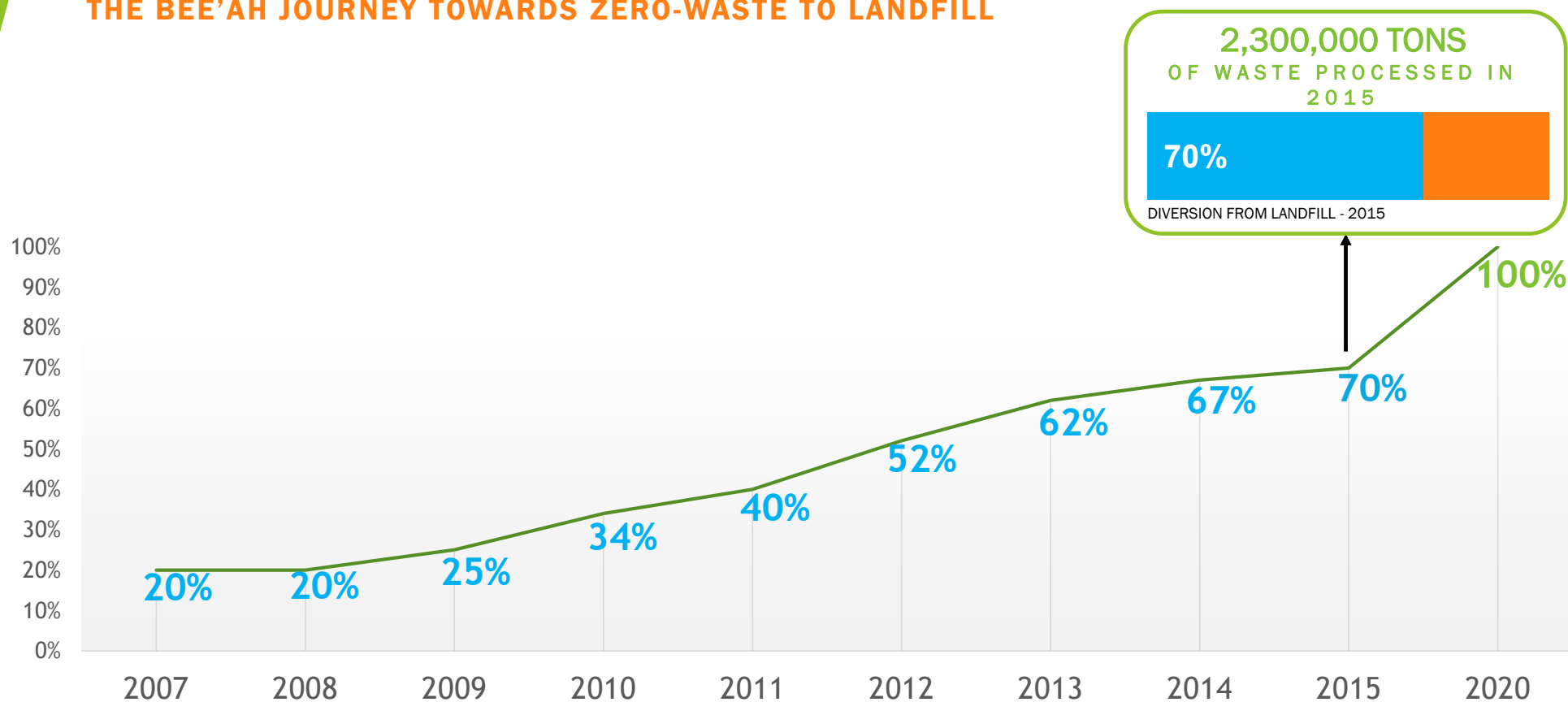
**6 LANDFILL**  
SITES MANAGED BY BEE'AH

## INTEGRATED WASTE MANAGEMENT



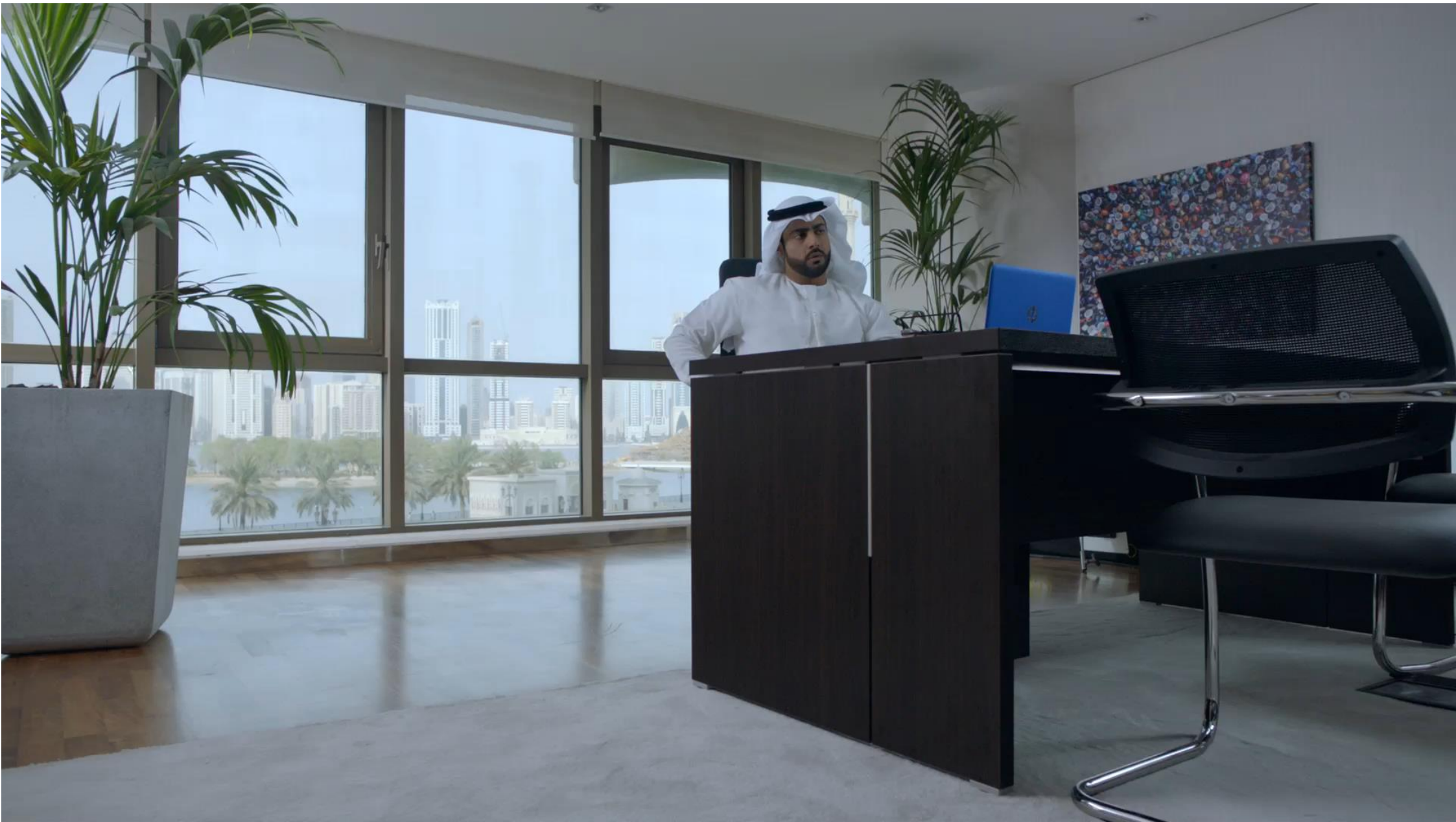
## WASTE DIVERSION RATES IN SHARJAH

THE BEE'AH JOURNEY TOWARDS ZERO-WASTE TO LANDFILL





**Beyond Waste**






**WASTE TO ENERGY**



# Waste to Energy Drivers

## UAE 2021 Vision

- **75% Diversion from landfill**
  - **90% Compliance WHO air quality guidelines**
  - **24% Energy from clean sources**
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# **WASTE TO ENERGY AS AN ALTERNATIVE TO LANDFILLING**

# CHALLENGES TO ACHIEVE RECYCLING AND AVOID LANDFILLING OF WASTE

**Education and infrastructure are needed to implement waste separation at source.**

**Residents and industry need to be educated, and given the infrastructure to recycle at source.**

**(In Europe it has taken two decades to get source recycling established from residential areas.)**

**Provision of separate bins and collections needs to be financed, and producers of waste need to be educated to use them properly.**

**Landfill Fees and legislation has to be introduced in to prohibit certain materials from going to landfills such as tyres, recyclable materials and organic wastes.**



## **DEVELOPING THE WASTE MARKET & INDUSTRY**

**Development of markets to increase price and use of recycled materials. Which in turn leads to creation of enterprises and jobs in local communities, providing local inward investment and contributing to the local economic growth.**

**Development of legislation and regulation for the building of facilities that deal with ‘difficult’ (hazardous or medical wastes and remaining non recyclable waste streams).**

**Creating an investor-friendly and economically sustainable environment for new “Green” businesses to be established**

**Finally to eliminate landfilling of un-recyclable wastes setup thermal treatment, which will reduce volume and toxicity as well as create alternative energy**

# Global Waste to Energy Market

Region	No. of plants	Plant size (ton/year)	Gate fee (USD)	Environmental requirements
Japan	>1,000	<100k	Up to 390	Strict ash treatment and emissions limits
Europe	>500	Up to 1.5m	33 – 210	EU Landfill and Industrial Emissions Directive
China and South Korea	~120	Varies	Low	Some emissions requirements but no ash treatment requirements
US	~75	Up to 1m	20 – 40	Slightly less onerous than Europe

# Global Waste to Energy Market

## Incineration / Combustion

- Thermal breakdown of waste supplying an excess of air, producing a flue gas ( $\text{CO}_2$ ,  $\text{O}_2$ ,  $\text{N}_2$ , water vapour) and heat.

## Gasification

- Thermal breakdown of waste under oxygen starved conditions creating a syngas (e.g. the conversion of coal into city gas).

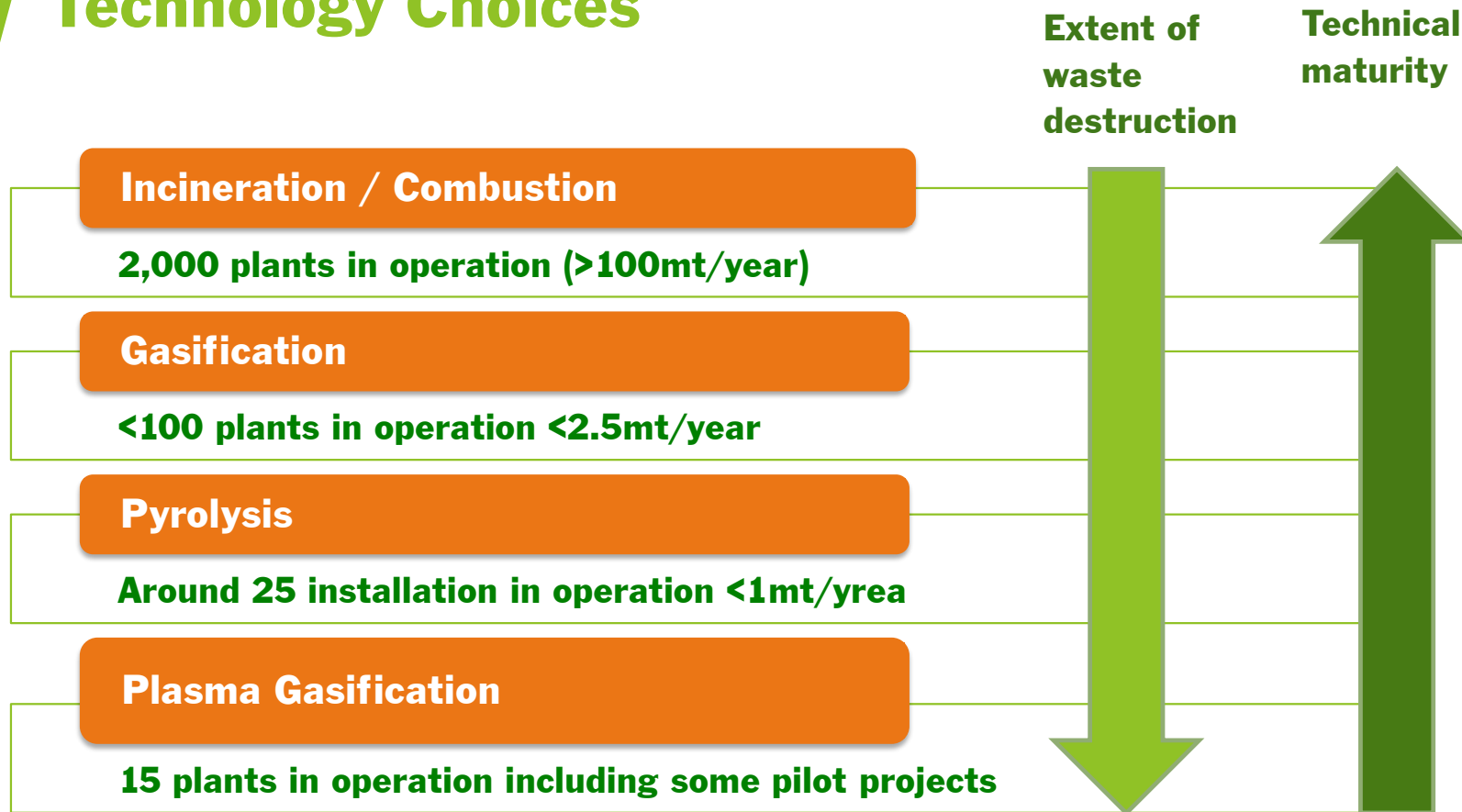
## Pyrolysis

- Thermal breakdown of waste in the absence of air, to produce char, pyrolysis oil and syngas (e.g. the conversion of wood into charcoal).

## Plasma Gasification

- Treatment of waste through a very high intensity electron arc, leading to temperatures of  $> 2,000^\circ\text{C}$ . Gasifying conditions break the waste down into a vitrified slag and syngas.

# Technology Choices



# Technology Choices – Incineration / Combustion

## **Advantages:**

- **Well established and flexible technology**
- **Waste doesn't require pre-treatment**
- **Waste efficiently converted into heat and electrical power**

## **Disadvantages:**

- **Extensive flue gas clean-up required and problematic disposal of toxic ashes (~25% of input)**
- **Total costs may be high compared to a number of alternative technologies**

## **Experiences:**

- **Globally around 2,000 combustion technologies have been built, with throughput of 100 million t/year. Installations function well, provided waste feed is managed and consistent. Widely proven technology**

# Technology Choices - Gasification

## Advantages:

- **Creates an intermediate product syngas**
- **Tar levels from syngas lower than in pyrolysis gas**
- **Low air emissions are generated**
- **Number of successful suppliers of gasification use 'staged gasification / combustion'. Waste gasified in first stage of the installation then combusted in steam boiler.**

## Disadvantages:

- **High requirement for pre-treatment for the waste input, leading to extra costs**
- **For two stage gasification / combustion processes efficiency is lower than for "once through" processes**

## Experiences:

- **Approx 100 installations worldwide, with total throughput of 2.5 million tons/year, majority in Japan**

# Technology Choices - Pyrolysis

## **Advantages:**

- **Ability to produce high value fuels in efficient conversion cycles (such as gas turbines or gas motors)**
- **Solid residues that can be easily recycled with a high product value**
- **Lower air emissions than incineration**

## **Disadvantages:**

- **High requirement for pre-treatment for the waste input**
- **Pyrolysis gases contain high amounts of tars which can lead to malfunction of the power generation cycle**
- **High maintenance and operation costs**
- **Need addition of gas or oil for start-up**

## **Experiences:**

- **Around 25 plants in operation, mostly in Japan**

# Technology Choices – Plasma Gasification

## **Advantages:**

- **Ability to process wider range of inputs than other technologies**
- **Vitreous solid residues allowing re-use**
- **Clean syngas allowing diesel production**
- **Reduced public health issues through more complete waste destruction**

## **Disadvantages:**

- **Small numbers of operating plants**
- **Energy intensive process and high maintenance costs**
- **High pretreatment requirements**

## **Experiences:**

- **Around 15 installations are now operating worldwide, of which the majority in Japan. The total throughput is around 300 ktonnes / year. The 15 installations include a number of pilot installations in Europe and America**



# THE CHALLENGES OF SUCCESSFULLY IMPLEMENTING WASTE TO ENERGY AS AN ALTERNATIVE TO LANDFILLS

**1 - Success depends on cooperation of all parties:**

- ① **Waste management companies.**
- ② **Municipalities.**
- ③ **Utilities companies.**
- ④ **Residencies.**
- ⑤ **Industries.**
- ⑥ **Legislators.**





# **THE CHALLENGES OF SUCCESSFULLY IMPLEMENTING WASTE TO ENERGY AS AN ALTERNATIVE TO LANDFILLS**

**2 - Success depends on Identifying Consistent Waste Characterization & Composition**

**3 - Success depends on Implementing The Necessary Legislations (Waste Management Service Fees & Tipping Fees Systems)**

**4 - Success depends on Sales Of Output Arrangements (Energy / Fuel)**





## **Bee'ah signed a strategic partnership with Masdar**

**Agreement signed at Abu Dhabi Sustainability Week 2016 launches development platform for future waste to energy projects across the Middle East-region**

**Under the agreement a Centre of Excellence in Waste Management will be set up in Sharjah to advance education, innovation and capacity building in waste to energy.**

**The initiatives, will contribute to the UAE Government's Vision 2021 which targets, among other goals, diverting waste from landfills by 75% by 2021.**

**The partnership establishes a platform to develop similar future projects across the Middle East.**

# Success Factors

**Vision of HH Sheikh Dr. Sultan bin Mohammed Al Qasimi, Member of the Supreme Council and Ruler of Sharjah**

**Leadership of Chairman H.E Salim bin Mohamed Al Owais and the Executive Team**

**Signing a Power Purchase Agreement with SEWA**

**Support of Sharjah Municipality**

**Bee'ah's Waste Stream Control and Management**

**Ownership of Appropriate Land**

# **CONCLUSION: STRATEGY TOWARDS SUCCESSFUL WTE IMPLEMENTATION**

**PUBLIC EDUCATION TO FACILITATE SOURCE SEGREGATION**

**SOURCE SEGREGATION TO FACILITATE RECOVERY AND RECYCLING**

**SORTING PLANTS TO MAXIMISE RECYCLABLE RECOVERY**

**RECYCLING FACILITIES TO MAXIMISE RESOURCE VALUE RECOVERY**

**WASTE EXCHANGE PROGRAMMES**

**WASTE CONVERSION TECHNOLOGIES TO PRODUCE ENERGY / BIO  
FUELS**



**Thank You**