



AI POWERED DIGITAL ALTWIN FOR ORGANIC WASTE TO FUEL CONVERSION

Embracing Nature for a Better Future

Brainy Bunchers



PROBLEM STATEMENT

By 2041, Delhi May Generate Over 19,000 Tonnes Of Waste Every Day

MCD Projections Show It Will Require Another 200 Acres For Complete Disposal

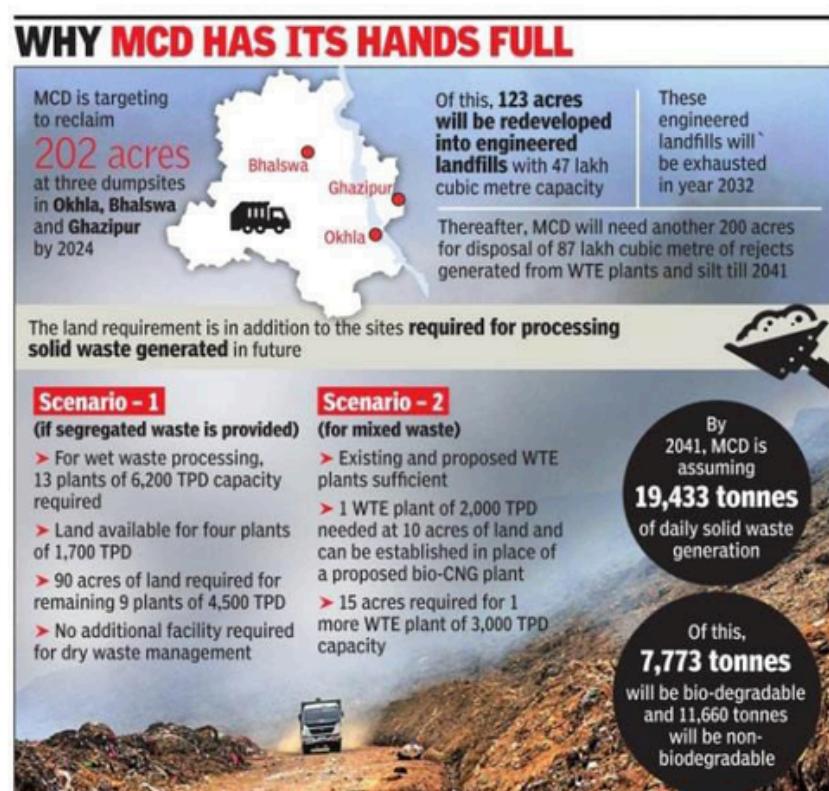
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New Delhi: Expecting the city to generate around 19,500 tonnes of solid waste every day by 2041, the Municipal Corporation of Delhi has requested the Union housing and urban affairs ministry requirement for at least 200 acres for the safe disposal of the remnants of waste processing.

The detailed project report submitted to the ministry stated that after reclaiming the three landfills at Okhla, Bhalswa and Ghazipur by December 2024, around 123 acre of land could be reutilised as engineered landfills. These sites will have the capacity to hold 47 lakh cubic metres of rejects, inert material or ashes generated by the existing waste-to-energy plants and the silt collected from drains.

The report, however, said that these engineered landfills would be exhausted by 2032. "It is expected that from 2033-2041, about 87 lakh cubic metres of rejects would be generated from the processing facilities and we will need approximately 200 acres of land or engineered landfill site for disposing of this waste," the report said. The projections are based on the Master Plan of Delhi 2041.

This land requirement will be in addition to the sites demanded from various agencies for establishing bio-methanation plants, CNG plants, etc.,



for processing the segregated wet waste. Of the 19,433 tonnes of daily solid waste generation expected, MCD assumes 7,773 tonnes to be biodegradable. "If we will continue to get non-segregated waste in the future, then two more WTE plants will be required in addition to those already proposed till date," noted a civic official. "These plants will require 25 acres and will consume 2,000 and 3,000 tonnes per day. We currently only have 10 acres."

If 100% segregation is achieved, MCD will require 13 bio-methanation plants to process 6,200 tonne of wet waste daily. "Of them, we have land available for four plants with capacity only have 10 acres."

The world is facing a dual crisis of excessive waste accumulation and dependence on fossil fuels. Conventional fuels like petrol and diesel contribute significantly to carbon emissions, accelerating climate change. At the same time, waste mismanagement leads to environmental hazards such as landfills, water pollution, and greenhouse gas emissions

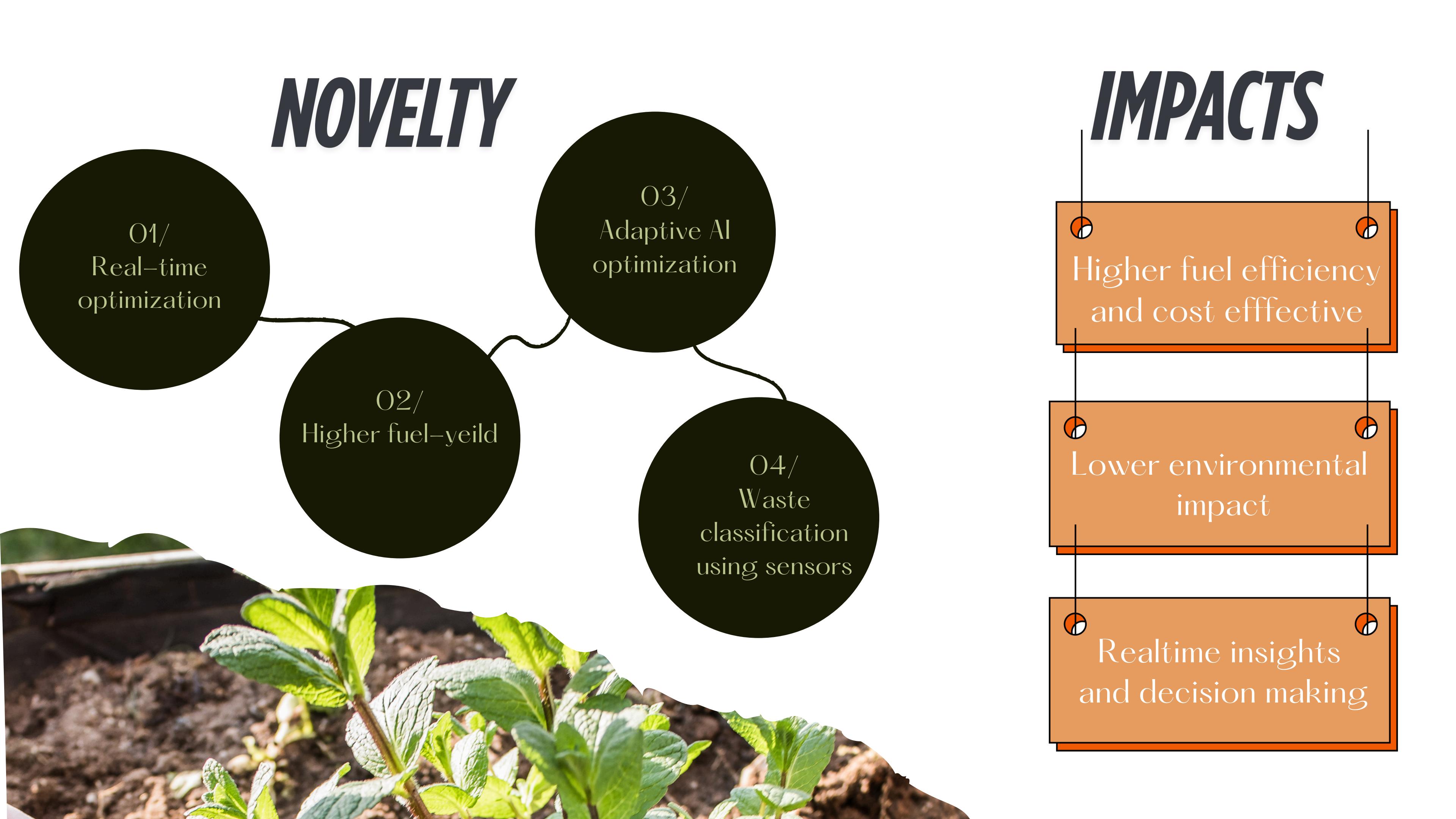


If we continue as we are, collective sources assume we will run out of fossil fuels by 2060. Considering we've only been using fossil fuels for approximately 200 years, our consumption of fossil fuels is undoubtedly quick.

Solution: AI-Powered Digital Twin

A digital twin is a real-time virtual replica of a waste-to-fuel conversion system. Using sensor data, AI, and simulations, the digital twin predicts optimal operating conditions, detects inefficiencies, and optimizes energy use—without affecting the real system.





NOVELTY

01/
Real-time
optimization

02/
Higher fuel-yield

03/
Adaptive AI
optimization

04/
Waste
classification
using sensors

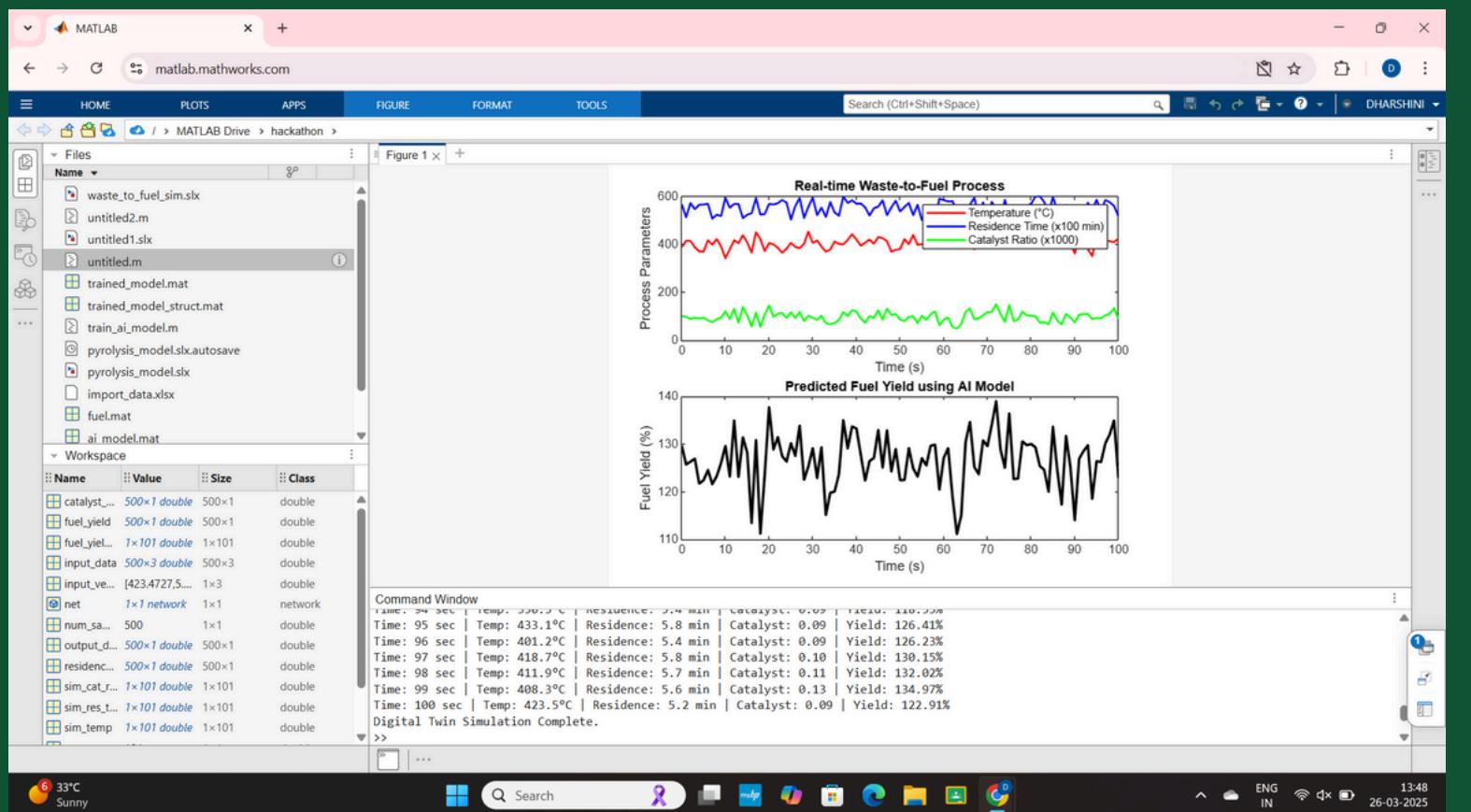
IMPACTS

Higher fuel efficiency
and cost effective

Lower environmental
impact

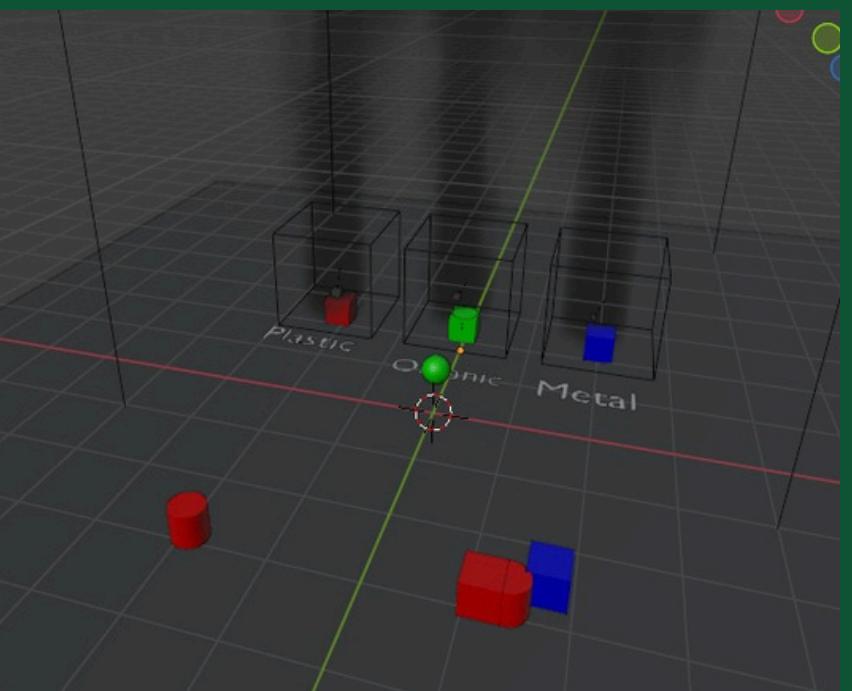
Realtime insights
and decision making

SIMULATION OUTPUT



Command Window

```
Enter Temperature (°C):  
250  
Enter Residence Time (min):  
45  
Enter Catalyst Ratio:  
63  
Predicted Fuel Yield: 82.13%  
  
Local minimum found that satisfies the constraints.  
  
Optimization completed because the objective function is non-decreasing in feasible directions, to within the value of the optimality tolerance, and constraints are satisfied to within the value of the constraint tolerance.  
  
<stopping criteria details>  
Optimal Parameters:  
Temperature: 692.00°C  
Residence Time: 30.07 min  
Catalyst Ratio: 15.00  
Max Yield: 86.14%
```





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