4. Why do so many Waste-to-Energy Plants fail?

Prelims Syllabus: Environment

Mains Syllabus: GS-III Environment - Biodiversity & Environment conservation.

Why in News?

- The Kerala government has announced its first waste-to-energy project in Kozhikode, which is expected to be built in two years and generate about 6 MW of power.

What are Waste-to-Energy Plants?

- Waste-to-energy plants are facilities that use non-recyclable dry waste to generate electricity.
- The process involves combusting the non-recyclable dry waste, which generates heat that is then converted into electricity.
- These plants are used to increase a state's power generation capacity while also easing the burden of solid waste management.
- Feasibility of such plants
- Waste-to-energy plants consume a portion of the non-recyclable dry waste generated in urban local bodies (ULBs) nearby.
- These plants can be a good way to deal with the mountains of waste that Indian cities produce but require the unwavering support of the municipality, its residents, and the State to succeed.

Operational status in India

- In India, solid waste is generally composed of 55-60% biodegradable organic waste, 25-30% non-biodegradable dry waste, and around 15% silt, stones, and drain waste.
- However, despite there being around 100 waste-to-energy projects around the country, only a handful of them are operational, thanks to various production and operation challenges.

Why do such projects often fail?

- Waste-to-energy projects often fail because of improper assessments, high expectations, improper characterisation studies, and other on-ground conditions.
- They faces several challenges, such as-
- Low calorific value of solid waste in India due to improper segregation
- High costs of energy production, and
- Variable quantity of waste generated by cities due to multiple factors.

Various challenges:

- **Improper segregation:** The calorific value of mixed Indian waste is about 1,500 kcal/kg, which is not suitable for power generation. Waste-to-energy plants require segregated and dried non-recyclable dry waste, which has a calorific value of 2,800-3,000 kcal/kg. However, segregation of waste is often not done properly, which can lead to low-quality feedstock and reduced power generation.
- **High costs:** The cost of generating power from waste is around Rs 7-8/unit, while the cost at which the States' electricity boards buy power from coal, hydroelectric, and solar power plants is around Rs 3-4/unit. This high cost of energy production can make waste-to-energy projects less attractive compared to other sources of energy.
- **Low efficiency:** Such projects have low efficiency due to the low calorific value of mixed waste, which reduces the amount of energy that can be generated. This can make it difficult to generate sufficient power to make the project financially viable.
- **Operational challenges:** Such projects are often subject to operational challenges, such as improper assessments, high expectations, improper characterisation studies, and other on-ground conditions. The quantity of waste generated by cities varies due to multiple factors, including season, rainfall, and the floating population, which can make it difficult to get a consistent supply of feedstock.

- **Environmental concerns:** Such plants can generate emissions, such as nitrogen oxides, sulfur dioxide, and particulate matter, which can be harmful to the environment and human health. Therefore, it is important to ensure that these plants operate with proper environmental controls in place.

Way forward:

- **Proper segregation:** To overcome these challenges, the municipality must ensure that only non-biodegradable dry waste is sent to the plant and separately manage the other kinds of waste.
- **Public awareness:** The full support of the municipality, the State, and the people is crucial for the success of the project.
- **Extensive field studies:** It is also necessary to conduct field studies and learn from the experience of other projects.
- **All-stakeholders collaboration:** There should be a tripartite agreement between the municipality, the plant operator, and the power distribution agency to optimise cost per unit of power.