GOVERNMENT OF INDIA
MINISTRY OF SCIENCE AND TECHNOLOGY
DEPARTMENT OF SCIENCE AND TECHNOLOGY
LOK SABHA
UNSTARRED QUESTION NO. 1789
ANSWERED ON 10/12/2025

NON-ORGANIC SOLID WASTE MANAGEMENT TECHNOLOGIES

1789. SHRI DAGGUMALLA PRASADA RAO:

Will the Minister of SCIENCE AND TECHNOLOGY be pleased to state:

(a) whether the Government has any plans to commercialise the advanced technologies developed for recycling and repurposing of non-organic solid waste management and if so, the details of the timelines proposed and the list of States currently using these technologies;

(b) whether the Government has done any pilot projects or technology demonstration projects for these technologies and if so, the list of the pilot projects or technology demonstrations done;

(c) whether the Government is considering for any potential States to establish pilot projects/technology demonstrations/commercial plants of non-organic solid waste management technologies and if so, the list of States and reasons thereof; and

(d) the list of pilot-scale facilities developed for processing and recovery of rare earth materials like Neodymium, Praseodymium?

ANSWER
MINISTER OF STATE (INDEPENDENT CHARGE) OF THE MINISTRY OF SCIENCE AND TECHNOLOGY AND EARTH SCIENCES
(DR. JITENDRA SINGH)

(a) The Government of India, through the Department of Science and Technology (DST), Council of Scientific and Industrial Research (CSIR), Ministry of Electronics and Information Technology (MeitY) and other agencies, is promoting the commercialisation of advanced technologies for recycling and repurposing of non-organic solid waste through technology transfers, industry partnerships, pilot plants and start-up support under Circular Economy and Waste-to-Wealth initiatives. Commercialisation is demand-driven and depends on technology maturity, regulatory approvals and industry adoption; therefore, no fixed national timelines have been prescribed. These technologies are being implemented across various states through institutional and industrial collaborations.

(b) to (c): The Government has undertaken several pilot projects and technology demonstration initiatives in the field of non-organic solid

waste management. These pilot projects, technology demonstrations and commercial plants for non-organic solid waste management technologies are operational in different states across the country. The Central Pollution Control Board (CPCB) in line with State Pollution Control Boards has been working for adoption of new waste processing technologies and has prescribed various performance standards for implementation.

DST has supported several pilot projects and technology demonstration initiatives in the area of non-organic solid waste management. Some of the major projects developed and demonstrated in different states are as follows:

- **Pilot-scale demonstration of ICT–Poly Urja Technology through a vehicle-mounted mobile plant to convert plastic waste into fuel at ICT Mumbai, Maharashtra, enabling on-site treatment and validation across diverse plastic waste streams.**
- **Establishment of a zero-discharge pilot plant by IIT Madras for processing 100 kg of printed circuit boards (PCBs) to recover lead, tin and copper.**
- **Process for selective recovery of rare earth elements (REEs) from spent neodymium iron boron NdFeB magnets at IIT Kharagpur, West Bengal.**
- **Solar pre-heated thermochemical conversion of municipal mixed plastic waste into high-quality "plasto-fuels" for transportation and industrial heating applications at Gati Shakti Vishwavidyalaya, Vadodara, Gujarat.**
- **Recycling of graphite from spent lithium-ion batteries for high-energy Li-ion capacitors at IISER Tirupati and CSIR-National Metallurgical Laboratory (NML), Jamshedpur, Jharkhand.**
- **Recycling of spent batteries into electrocatalysts for ammonia production and recovery of raw materials for new batteries at IIT Madras, Chennai, Tamil Nādu.**
- **Development of recycled polymer composites from plastic waste and industrial by-products for sustainable applications at IIT Bombay, Mumbai, Maharashtra.**

CSIR under its constituent laboratories, has supported the pilot projects or technology demonstration projects for non-organic solid waste management. Some of the major projects developed and demonstrated in different states are as follows:

- **Pilot plant has been commissioned for recycling of spent/used/discarded lithium iron phosphate (LFP) batteries for recovery of Lithium, iron and phosphorus at CSIR-National Metallurgical Laboratory (NML) Jamshedpur, Jharkhand.**

- **A 1 Ton Per Day (TPD) pilot plant along with necessary pre-treatment facilities has been set up at CSIR–Indian Institute Of Petroleum (IIP), Dehradun for chemical recycling of waste plastics into diesel.**
- **For steel slag, CSIR – Central Road Research Institute (CRRI) is supporting pilot and commercial road construction initiatives with leading steel industries (TATA Steel, JSW, AMNS India, RINL) and public agencies (NHAI, BRO, ADANI Ports).**
- **Pilot studies were carried out using (i) Jarofix at Udaipur–Chittaurgarh (SH-9), Rajasthan, (ii) Red mud at NH-130, Koraput, Odisha, (iii) Copper slag at the Madurai–Kanyakumari Expressway, Tamil Nādu and (iv) Phosphogypsum at Paradeep, Odisha.**

Under Circular Economy action plan of the Government, MeitY has developed cost effective technological solutions and has supported skilling and capacity building activities for e-waste management in the country. Considering electronic waste (e-waste) as a national challenge, MeitY has taken various initiatives. The details of same are as given below:

- **A Centre of Excellence (CoE) on E-waste management has been set up by MeitY at CMET Hyderabad with support from Government of Telangana and industry partners to create a physical infrastructure and knowledge hub for the development of cost-effective technologies for E-waste recycling, empowerment of informal E-waste recyclers in the country, safe disposal of end of life electrical and electronic devices, recovery of precious metals from E-waste etc.**

Bhabha Atomic Research Centre (BARC), a constituent Unit of Department of Atomic Energy (DAE), has developed a technology for production of high purity Copper Oxide nanoparticles from depopulated Printed Circuit Boards (PCB). This technology has been transferred to six private firms for commercialization.

As per the Solid Waste Management (SWM) Rules, 2016 notified by Ministry of Environment, Forest and Climate Change (MoEF&CC), Central Pollution Control Board (CPCB) is mandated to review proposals from State Pollution Control Boards for adoption of new waste processing technologies and prescribe performance standards. Further, Urban Local Bodies and Panchayats are required to facilitate establishment of waste processing plants either independently or through private partnerships.

(d) The Government has supported the establishment of pilot-scale and R&D-scale facilities for the processing and recovery of rare earth materials, including Neodymium (Nd) and Praseodymium (Pr). Further, the

Ministry of Mines is providing financial assistance to Start-ups and MSMEs under the Promotion of Research and Innovation in Start-ups and MSMEs (S&T-PRISM) initiative in the Mining, Mineral Processing, Metallurgy, and Recycling sectors.

Some of the notable facilities include:

S.No.	Name of pilot scale facility	Name of host institute
1.	MeitY's Pilot scale preparation of Nd, Pr metals, NdFeB alloy and magnets	Centre for Materials for Electronics Technology (C-MET), Hyderabad, Telangana
2.	DST-ANRF's Pilot plant for manufacture of near net shaped Nd-Fe-B magnets adopting NPLP technologies	International Advanced Research Centre for Powder Metallurgy & New Materials, (ARCI), Hyderabad, Telangana
3.	DST-TDB's domestically-scaled facility for neodymium-iron-boron (NdFeB) rare-earth permanent magnets	M/s Midwest Advanced Materials Private Limited (MAM), Hyderabad, Telangana
4.	Ministry of Mine's Pilot-scale (TRL-7) facility for the extraction of Neodymium–Praseodymium (Nd-Pr) metal from Nd-Pr oxide for permanent magnet applications	Ashvini Rare Earths Pvt. Ltd.
5.	BARC's Rare Earth & Titanium Theme Park with pilot scale facilities for production of Neodymium and Praseodymium	IREL (India), Bhopal, Madhya Pradesh

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