



India's Translational Research Initiative

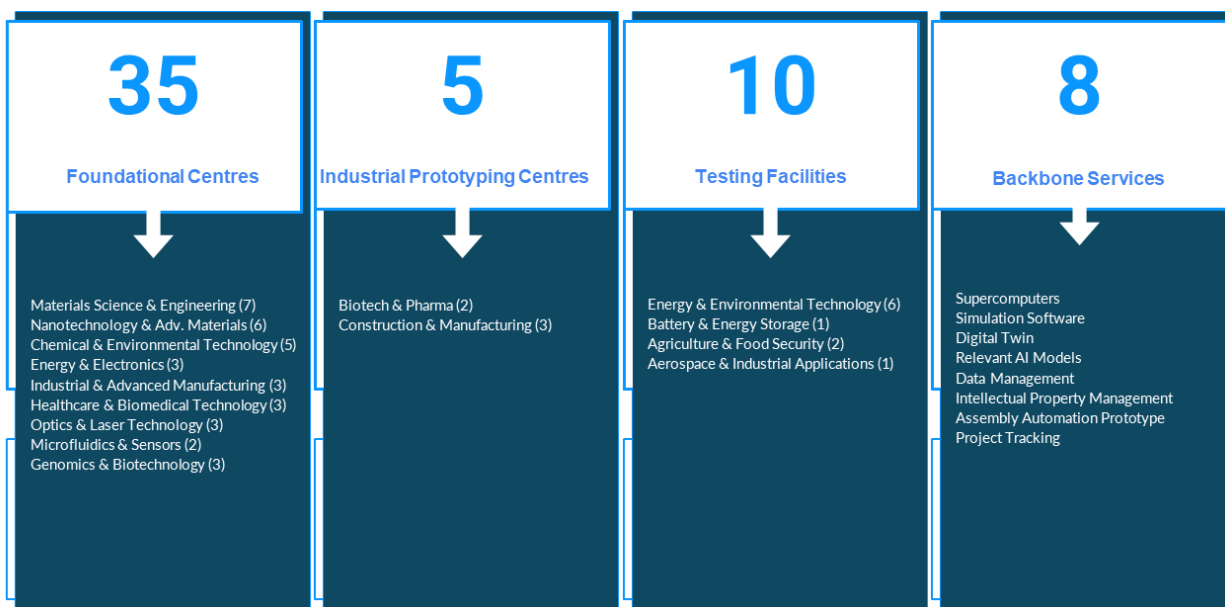
List of Key Technology Focused Translational Research Centres



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Key Technology Focus Areas:

- Foundational focus on materials (e.g., membranes, ceramics, 2D materials), advanced manufacturing, and biotech piloting facilities.
- Industrial prototyping for decarbonization, biopharma, and solar energy.
- Testing facilities for renewable energy, agriculture, and ocean technologies.



List of Key Technology Focused Translational Research Centres

Table 1. Key technology focus areas and potential applications for the proposed initiative
(In the Sl. No. F stands for Foundational, P stands for Industrial Prototyping, and T stands for Testing to demarcate the 50 facility types below)

Sl. No.	Focus Area	Type of TRC	Description	Potential Applications	Key Equipment / Facilities
F1	Membranes	Foundational	Key technology in Health, Energy, and Water. The center at IITB will have the equipment to produce various membranes and downstream products at a pilot scale.	Health Energy Water Membrane Manufacturers	Membrane fabrication units, Pilot-scale production lines
F2	High-performance ceramics	Foundational	Used in defense, sensors, and space due to heat resistance and abrasion properties. The center will have manufacturing and testing equipment.	Defense Sensors Space	High-temperature kilns, Abrasion testing apparatus
F3	Advanced metallurgy	Foundational	Develop new alloys, including high entropy alloys, with facilities for metallurgical processes like sintering and quenching. Applications include magnets, especially for industrial and EV motors.	Magnets Aerospace Automotive Companies	Alloy production units, Sintering, and quenching equipment
F4	2D materials	Foundational	Includes materials like Graphene and boron nitride nanosheets. The center will have manufacturing technologies and characterization equipment for these materials.	Electronics Composites Cell and Battery Manufacturers	Graphene production lines, Characterization equipment
F5	Engineering polymers and composites	Foundational	Develop polymers with niche properties and convert them into specific products. The center will have a polymerization lab and a composite lab.	Automotive Aerospace Electronics	Polymerization lab, Composite lab
F6	High-temperature superconductors	Foundational	Manufacture HTS tapes and develop applications like efficient generators and MRI machines.	Energy Medical Devices Industrial equipment producers	HTS tape production equipment, Application development lab

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F7	Advanced separations technology	Foundational	Chemical separations center with technologies like divided wall columns and continuous crystallizers for cleaner technologies.	Chemical Pharmaceutical Environmental	Divided wall columns, Continuous crystallizers
F8	Advanced reactors	Foundational	Develop efficient chemical transformations with advanced reactor setups like fixed bed and membrane reactors.	Chemical Energy Pharmaceutical	Fixed bed reactors, Membrane reactors
F9	Catalyst (Precious metals)	Foundational	Focus on producing, recycling, and recovering precious metal catalysts for various applications.	Chemical Environmental firms Energy	Catalyst production units, Recycling facilities
F10	Catalyst (Zeolites and others)	Foundational	Study and produce zeolites, organic, and biocatalysts in pilot quantities.	Chemical Pharmaceutical Environmental technology providers	Zeolite production units, Biocatalyst labs
F11	Nanomaterials	Foundational	Produce and characterize nanomaterials and create stable dispersions for transportation.	Electronics Medicine Cell and Battery Manufacturers	Nanomaterial production units, Characterization equipment
F12	Adsorption center	Foundational	Deploy pilot-scale adsorption technologies for DAC, CCS, dehumidification, and efficient HVAC applications.	Environmental HVAC Energy	Adsorption technology units
F13	Supercritical processes	Foundational	Use supercritical fluids for applications like thermal energy conversion and extraction. The center will handle pilot-scale conditions.	Chemical Pharmaceutical, Food processing Textile	Supercritical fluid systems
F14	Optics	Foundational	Precision engineer high-end refractive and reflective optics for lasers, EUV lithography, and sensors.	Lasers, Lithography, Sensors	Precision engineering tools

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F15	Electron Beam applications	Foundational	Machines like gyrotrons and klystrons are produced for fusion, food irradiation, and rock pulverization applications.	Nuclear Fusion, Food Processing, Mining	Electron beam generation equipment
F16	Corrosion and coating technology	Foundational	Test materials for corrosion properties and develop new coating technologies.	Industrial Construction companies, Marine technology providers	Corrosion testing units, Coating technology labs
F17	Sensors	Foundational	Manufacture and test high-quality sensors for Industry 4.0 and IoT to reduce import dependence.	Industrial Electronics Automation	Sensor manufacturing units, Testing equipment
F18	Aerogels	Foundational	Produce different types of Aerogel products using different processes and test them for application towards cold storage and biomedical-sensitive shipping	Industrial Cold Storage Logistics Pharmaceuticals	Supercritical Drying, Autoclaves, Microwaves, Testing equipment
F19	Microfluidics	Foundational	Research in manipulating fluids at the microscale for applications in diagnostics, drug delivery, and biosensing.	Drug delivery, diagnostic devices, biosensors, food safety, environmental monitoring	Microfabrication facilities, clean rooms, micro-pumps, sensors, optical microscopy
F20	Cryogenics	Foundational	Focuses on extremely low temperatures for advancements in quantum computing, medical imaging, and space technologies.	Quantum computing, medical imaging (MRI), space exploration, particle accelerators, low-temperature physics	Cryostats, MRI machines, superconducting magnets, dilution refrigerators, helium recovery systems
F21	Additive manufacturing	Foundational	Involves creating 3D-printed components for industries like aerospace, healthcare, and automotive sectors.	Aerospace components, medical implants, automotive parts, prototyping,	3D printers (metal/plastics), CAD software, laser sintering machines, material

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				energy-efficient construction	characterization labs, post-processing units
F22	RNA Therapeutics	Foundational	RNA therapeutics involve using RNA molecules to treat or prevent diseases by targeting genetic pathways or cellular mechanisms. These therapies include mRNA-based treatments, siRNA (small interfering RNA) and shRNA (short hairpin RNA), miRNA (microRNA), ASO (Antisense Oligonucleotides), RNA editing and aptamers. RNA therapeutics provide an efficient, targeted, and versatile platform for treating diverse diseases, including genetic disorders, cancers, and infectious diseases.	Vaccines, Genetic Disorders, Cancer, Personalized Medicine, Immune Modulation, Neurological Disorders, Cardiovascular Diseases	Automated RNA synthesizers High-performance liquid chromatography (HPLC) Capillary electrophoresis systems Electroporation devices Robotic liquid handlers X-ray crystallography Cryo-electron microscopy
F23	Lipid nanoparticles	Foundational	Develops nanoparticles for drug delivery systems, including mRNA vaccines and cancer therapies.	Vaccine delivery (mRNA), cancer therapies, gene therapies, cosmetics, food science	Nano-formulation labs, particle size analyzers, ultracentrifuges, lipid extraction systems, sterilization equipment
F24	Textiles	Foundational	Research into smart fabrics, eco-friendly materials, and high-performance textiles for medical, industrial, and consumer applications.	Smart fabrics, wearable tech, medical textiles, eco-friendly fabrics, high-performance sportswear	Looms, fiber analysis tools, fabric testing machines, coating units, 3D weaving equipment
F25	Lasers	Foundational	Focuses on laser technologies for medical devices, material processing, communication, and defense.	Optical communication, material processing, medical devices (laser surgery), defense applications, sensors	Laser labs, optical fibers, laser beam analyzers, spectrometers, high-precision CNC machines

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F26	High-energy particle therapy	Foundational	Involves particle accelerators for cancer treatment, imaging, and material science research.	Cancer treatment, imaging technologies, material science, nuclear research, space applications	Proton accelerators, particle beam delivery systems, dosimetry systems, radiation shielding, treatment planning software
F27	High entropy materials	Foundational	Studies complex alloys for applications in aerospace, automotive, and energy storage systems.	Aerospace, automotive, defense, energy storage, construction	Material synthesis labs, mechanical testing devices, thermal analysis equipment, X-ray diffraction machines, scanning electron microscopes
F28	Genetic Technologies	Foundational	Gene-editing research aimed at developing precision medicine, disease-resistant crops, and genetic therapies.	Gene editing, disease-resistant crops, precision medicine, therapeutic developments, livestock breeding	Gene editing tools, CRISPR libraries, PCR machines, DNA sequencers, cell culture labs
F29	Magnets	Foundational	Research on advanced magnetic materials for energy generation, electric motors, and data storage technologies.	Electric motors, magnetic storage devices, medical imaging, aerospace, power generation	Magnetometers, superconducting magnets, coil winding machines, cryogenic chambers, material characterization tools
F30	Nanopores	Foundational	Develops nanopore technology for rapid DNA sequencing, biosensing, and drug delivery.	DNA sequencing, biosensing, water purification, drug delivery, electronics	Nanopore sequencing devices, microfluidic chips, nanoparticle analyzers, AFM/SEM microscopes, bio-sample preparation tools
F31	Metamaterials	Foundational	Studies engineered materials with unique properties for applications in optics, antennas, and stealth technology.	Superlenses, stealth technology, antennas, medical imaging, energy harvesting	RF testing equipment, 3D printers for metamaterials, waveguides, anechoic chambers, terahertz imaging systems

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F32	Biocompatible materials	Foundational	Focuses on materials that integrate with biological systems for implants, tissue engineering, and drug delivery.	Medical implants, tissue engineering, drug delivery, wound healing, prosthetics	Bioprinting systems, mechanical testing equipment, chemical synthesis labs, sterilization units, cell culture incubators
F33	Low carbon steel	Foundational	Develops sustainable steel solutions for the construction, automotive, and energy sectors.	Sustainable construction, automotive industry, energy infrastructure, shipbuilding, pipelines	Steel processing mills, high-temperature furnaces, tensile testing machines, electron microscopes, corrosion testing facilities
F34	Stem Cells	Foundational	Use of multiple sources of stem cells for treatment of diseases of multiple systems	Cellular therapies, cardiovascular diseases, blood disorders, disease modeling, gene editing, tissue engineering, regenerative medicine	FACS, MACS, cell labelling techniques, culture equipment, microscopy, storage, molecular biology equipment, biosafety equipment, quarantine equipment
F35	Cell Therapy	Foundational	Cell therapy involves the administration of live cells to repair, replace, or enhance the biological function of damaged tissues or organs. These therapies can be autologous (derived from the patient) or allogeneic (from a donor) and often utilize genetically engineered or expanded cells.	Cancer Treatment, Regenerative Medicine, Autoimmune and Inflammatory Diseases, Genetic and Metabolic Disorders	Flow cytometers Magnetic-activated cell sorters (MACS) Bioreactors Viral vector production systems Imaging systems
P1	Biotech Piloting facility	Industrial Prototyping	Scale biotransformations for high-volume end use with large-scale fermentors and downstream facilities.	Biotechnology Agriculture Pharmaceuticals	Large-scale fermentors, Downstream processing facilities
P2	BioPharma piloting facility	Industrial Prototyping	GMP facility for piloting biopharma production, addressing the growing market for biomolecules in pharma.	Pharmaceuticals Biotechnology Healthcare	GMP production facility

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P3	Cement decarbonization	Industrial Prototyping	A center of excellence with pilot-scale technologies to accelerate decarbonization in the cement sector.	Construction Environmental Industrial	Pilot-scale cement production technologies
P4	Industrial scale metal working	Industrial Prototyping	Prototype metal working operations like forging and casting for various industries.	Automotive Aerospace Construction	Forging and casting equipment
P5	Mold creation	Industrial Prototyping	Versatile mold-making facility for industries, especially packaging, to accelerate prototyping.	Packaging Industrial Manufacturing	Mold-making machines
T1	Electrolyzer assembly & testing facility	Testing Facility	Test electrolyzers on a 100kW to 1MW scale to aid in commercializing low-carbon technologies in the future.	Energy Chemical Environmental	Electrolyzer testing units
T2	Solar module testing facility	Testing Facility	Test and compare various solar technologies to aid deployment and validation.	Energy Technology	Solar module testing equipment
T3	Battery testing line	Testing Facility	Prototype new battery chemistries and architectures with a demo manufacturing line and testing facilities.	Energy storage Automotive Electronics	Battery manufacturing line, Testing equipment, Low humidity space
T4	Wind tunnel testing	Testing Facility	Develop reliable products with a high-capacity wind tunnel for large objects and high wind speeds.	Aerospace Automotive Industrial	High-capacity wind tunnel
T5	Bioenergy testing	Testing Facility	A pilot facility will be used to test and compare biomass types for energy and biogas generation.	Energy Environmental Agriculture	Biomass testing units
T6	Water treatment	Testing Facility	Test and compare various wastewater treatment technologies, including industrial wastewater solutions.	Environmental firms Industrial Municipal authorities	Wastewater treatment equipment

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T7	Ocean related technologies	Testing Facility	Pilot platform for sea-related technologies like Ocean Thermal Energy Conversion (OTEC), wave power, and offshore wind.	Energy Marine Environmental	Ocean technology platforms
T8	Agriculture input field testing	Testing Facility	Test and compare new agricultural products like nano fertilizers and precision agriculture.	Agriculture Biotechnology Environmental	Agricultural testing facilities
T9	Agriculture equipment testing	Testing Facility	State-of-the-art facility to test new irrigation, harvesting, and seeding machines.	Agriculture Technology Industrial	Equipment testing units
T10	Steel testing facility	Testing Facility	A steel testing facility is equipped to evaluate the mechanical, chemical, and physical properties of steel to ensure its compliance with industry standards and application requirements. These tests assess steel's strength, ductility, hardness, toughness, and corrosion resistance, as well as its microstructure and chemical composition. Such facilities are essential in quality control, research and development, and failure analysis in various industries, including construction, automotive, aerospace, and manufacturing.	Quality Control in Steel Production, construction, automotive and aerospace, shipbuilding and marine applications, pipeline and energy industries, failure analysis	Mechanical testing equipment, chemical analysis tools, corrosion testing equipment, NDT facilities, heat treatment and simulation systems, etc.