

**GOVERNMENT OF INDIA
MINISTRY OF SCIENCE AND TECHNOLOGY
DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH**

**LOK SABHA
UNSTARRED QUESTION NO. 869
(TO BE ANSWERED ON 05.02.2021)**

TARGET FOR THE COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH

869. SHRI HEMANT TUKARAM GODSE:

Will the Minister of SCIENCE AND TECHNOLOGY विज्ञान एवं प्रौद्योगिकी मंत्री be pleased to state:

- (a) whether the Government has set any target for the Council of Scientific and Industrial Research (CSIR) in the field of research and development;**
- (b) if so, the details thereof and the achievements made by the CSIR till date;**
- (c) the number and details of projects taken up by the CSIR for progress and development of the country during last three years; and**
- (d) the total funds allocated and spent by CSIR during the last three years and the current year?**

ANSWER

**MINISTER OF HEALTH AND FAMILY WELFARE; MINISTER OF SCIENCE AND TECHNOLOGY; AND MINISTER OF EARTH SCIENCES
(DR. HARSH VARDHAN)**

- (a) Yes Sir. Council of Scientific and Industrial Research (CSIR) is positioned to undertake research and development focused at the unmet need and deliver knowledgebase/ technology to benefit the masses and Indian industry. CSIR has been pursuing diverse Scientific and Technological activities and thus has been delivering as per national priorities.**
- (b) The major recent achievements /initiatives of CSIR are given in Annexure - I.**
- (c) Research & Development activities are being pursued by CSIR in following categories of projects namely: (i) Fast Track Translation (FTT) Projects; (ii) Fast Track Commercialization (FTC) Projects; (iii) Mission Mode Projects; (iv) Focused Basic Research (FBR) Projects; and (v) Niche**

Creating High Science/ High Technology (NCP) Projects. These are grouped into eight themes: (i) Aerospace, Electronics, Instrumentation & Strategic Sectors (AEISS); (ii) Civil, Infrastructure & Engineering (CIE); (iii) Ecology, Environment Earth & Ocean Sciences and Water (E3OW); (iv) Mining, Minerals, Metals and Materials (4M); (v) Chemicals (including leather) and Petrochemicals (CIP); (vi) Energy (Conventional & Non-Conventional) and Energy Devices (EED); (vii) Agri., Nutrition & Biotech (ANB); and (viii) Healthcare (HTC). Further, CSIR is also implementing projects under New Millennium Indian Technology Leadership Initiative (NMITLI), Harnessing Appropriate Rural Interventions and Technologies (HARIT) and Fundamental & Innovative Research in Science of Tomorrow (CSIR-FIRST) categories. The number of projects with their details implemented during last three years and under implementation during current financial year is attached at Annexure-II.

- (d) The total funds allocated and spent for CSIR during the last three years and the current year is as follows:**

Financial Year	Funds Allocated / Spent (Rs in Crore)
2017-18	4582.12
2018-19	4521.28
2019-20	4831.58
2020-21 (Revised Estimates)	4251.86
	3914.06 (spent up to January, 2021)

Major recent achievements/initiatives of CSIR

Indigenous Cultivation of Heeng to reduce imports

Ferula assafoetida (Heeng) one of the top spices in India is imported from Iran, Afghanistan, and Uzbekistan and spends ~100-130 million USD per year. CSIR-Institute of Himalayan Bioresource Technology, Palampur (CSIR-IHBT), along with ICAR-National Bureau of Plant Genetic Resources, has addressed the lack of planting material and agrotechnology, which were major bottlenecks in cultivation. Now the plants have been introduced for cultivation in the country with the first seedlings of heeng planted at Lahaul valley after the Institute successfully conducted experiments with plants and seed germination. Cold desert areas of India such as Lahaul and Spiti, Ladakh, parts of Uttarakhand and Arunachal Pradesh are suitable for cultivation of asafetida and can decrease the imports of Heeng substantially after successful cultivation.

India's First Hydrogen Fuel Cell Prototype Car

CSIR and industry partner KPIT successfully ran trials of India's Hydrogen Fuel Cell (HFC) prototype car running on an indigenously developed fuel cell stack. CSIR and KPIT have successfully developed a 10kWe automotive grade LT-PEMFC fuel cell stack based on CSIR's know-how. The heart of the (Proton Exchange Membrane) PEM fuel cell technology includes the membrane electrode assembly, which is wholly a CSIR knowhow. Hydrogen Fuel Cell (HFC) technology uses chemical reactions between hydrogen and oxygen (from air) to generate electrical energy. This is a boost for renewable energy based on the hydrogen as fuel, which is the cleanest fuel and will also reduce the petrol, and diesel imports.

Wax Deoiling Technology at Numaligarh Refinery, BPCL

CSIR- Indian Institute of Petroleum (CSIR-IIP), Dehradun, in association with the Engineers India Ltd (EIL) had won international competition to adopt the Wax Deoiling Technology developed by CSIR-IIP, at Numaligarh Refinery Ltd (NRL). The Wax Deoiling Plant based on such indigenously developed technology was set up with an investment of ₹750 crore at NRL - a subsidiary of Bharat Petroleum Corporation Limited (BPCL) - situated in north-east part of India. The Plant was dedicated to the Nation by Hon'ble Prime Minister in February 2016. The Wax Deoiling technology is used to produce waxes from petroleum streams. This newly set up plant will produce 50,000 MTPA of high value Paraffin Wax and 4,500 MTPA of Microcrystalline Wax that will help cut down the wax import by 50 per cent and will save the foreign exchange of about 500 crore rupees/annum. The wax plant will help to develop small-scale ancillaries and cottage industries in the nearby areas and will promote industrial development in the north-east region of India. The commercialization of indigenous technology is in line with 'Make in India' initiative taken by the Government of India.

CHENANI-NASHRI Highway Tunnel Project

The Chenani - Nashari tunnel project was completed in March 2017 and was dedicated to the nation in April 2017 by Hon'ble Prime Minister of India. CSIR-CIMFR has contributed in a significant way in this Highway Tunnel Project.

Establishment of a National Calibration Facility for PM1, PM2.5 and PM10 Sampling Inlets

A particulate matter (PM) wind-tunnel has been established at CSIR-NPL. This is a first and unique facility in the country to test and calibrate PM1, PM2.5 and PM10 samplers. With this facility, now all the PM samplers manufactured in the country can be calibrated and certified. Also, all the imported PM samplers can be tested for their suitability under Indian conditions. Parameters such as cut-off size, sharpness of cut-off

etc. can be tested and calibrated by using this facility. A high-volume PM2.5 sampler, has been developed and patented by CSIR-NPL. The technology has been transferred to M/s Environmental Solutions. Hon'ble Minister of S&T and Earth Sciences Dr. Harsh Vardhan inaugurated the indigenously developed and commercialized high-volume sampler by the M/s Environmental Solutions under the licensed technology (know-how) of CSIR-NPL patented technology.

State-of-the-art WHO cGMP Plant at CSIR-IIIM, Jammu

State-of-the-art WHO cGMP Plant has been set up at CSIR-IIIM, Jammu for extraction, formulation, packaging of medicinal plant based phytopharmaceutical drugs under internationally accepted GMP guidelines. This is first such national cGMP facility established in the public sector in India. The facility has been in making for last 5 years, completed in 2016 and issued a manufacturing license by Drug & Food Control Organization, Jammu & Kashmir.

First of its Kind “Waste Management Park” Built

CSIR-NEERI has established first of its kind Waste Management Park to Nagpur. The main focus of the park is to make people aware of effective waste management by reducing, reusing, recycling and segregating the waste; the park is itself a desirable model for depicting how well waste can be converted into useful products. The Waste Management Park exhibits how waste can be managed, reduced and beautified. The park has two huts that serve as a learning centre about how different kinds of wastes like hazardous waste, Construction and Demolition (C&D) waste, biomedical/reject waste, etc. can be treated and recycled and simultaneously highlight what a citizen can do to minimize waste generation.

CSIR Aroma Mission

The CSIR Aroma Mission is envisaged to bring transformative change in the aroma sector through development of superior aroma crop varieties and their agro-technologies and assessment of their suitability for the large scale cultivation in specific agro-climatic regions; promotion of cultivation and processing of aromatic crops, enhancing area under selected aromatic crops along with enabling interventions including setting up of distillation units and catalyzing setting up of cooperatives for marketing of the produce; value-addition of aromatic crops in the form of high-end aroma chemicals and products; and skill & entrepreneurship activities and facilitating the creation of Spin-offs. In the first phase of the project, an area of more than 6000 hectares has been brought under cultivation of aromatic plants across the country. Aromatic crops cultivation has been promoted in 46 Aspirational Districts under the Aroma Mission and about 1014 hectare area was brought under cultivation in these districts. In the 765 training / workshops conducted throughout the country, over 44,000 persons were trained in different aspects of cultivation and processing technologies. Processing of the harvest in 231 distillation units installed under the project, has yielded over 500 tonnes essential oil worth about Rs 57.04 crore for the farmers. The next phase of CSIR Aroma Mission is envisaged to bring a real transformative change in the aroma sector through desired scientific interventions in the areas of agriculture, processing and product development for fuelling the growth of aroma industry and rural employment. The focus would be on the utilization of waste and underutilized lands, multi-tier cropping system and integration with other crops.

CSIR Floriculture Mission

In India, CSIR has been in the forefront of developing floricultural crop varieties and has been a major developer of agrotechnologies for several floriculture crops including Gladiolus, Canna, Carnation, Bougainvillea, Chrysanthemum, Gerbera, Lilium, Marigold, Rose, Tuberose, Strelitzia, Alstromeria and Hippeastrum. CSIR, in collaboration with Ministry of MSME (FFDC, KVIC), Ministry of Agriculture (ICAR), Ministry of Tribal Affairs (TRIFED), proposes to enhance the export potential of the floriculture

sector, domesticate the wild floral diversity of the country to popularize them as global ornamentals, create employment opportunities for urban and rural youth through this fast growing sector, and to provide enhanced income to the farmers up to Rs. 18 lakh per year per hectare to 3800 farmers and generation of 15,58, 188 mandays. Cumulative benefit to farmers and entrepreneurs is expected to be about Rs. 305.77 crore. Expansion of floriculture crops and integration of floriculture with apiculture is expected over 4257 ha spread in over 21 states and union territories. As a result, import substitution worth Rs. 500 crore of floriculture and fragrant commodities is expected.

Nano-Biosensors and Microfluidics for Healthcare

The project was a multi-institutional mission mode initiative of CSIR aligning with Government of India schemes of Swasth Bharat and Make-in-India. The achievements of the project included development of Handheld Raman Spectrometer; successful detection of breast cancer biomarkers in tissue samples using two approaches; optical detection of typhoid biomarkers; successful testing for dengue detection using fluorescence method; Point-of-Care GaN HEMT based platform device realized and tested for biomarker like HER2 and C3G; and a microfluidic platform realized for electrochemical detection of biomarkers using unique marker concentration technique, making it suitable for early detection applications.

Innovative Processes and Technologies for Agrochemicals

The Indian agrochemical industry is mainly dependent on import of key intermediates and active ingredients. Hence, CSIR Agrochemical Mission focused on process development of key intermediates and final active crop protection molecules for indigenous use. Main aim and objective of this project was to develop innovative and novel processes for 12 molecules (Flubendiamide, Prothioconazole, Tembotrione, Pyroxasulfone Penflufen, Picoxystrobin, Penoxasulam, Fonicamid, Spirotetramat, Pymetrozine, Epoxiconazole, Glufosinate) that are soon to be generic and nationally important. The processes for these 12 molecules were developed at lab scale. Among them, three molecules (Flubendiamide, Tembotrione, Fonicamid) were taken for process scale up in Kg level. One molecule, Glufosinate is licensed to an Indian agrochemical firm.

Catalysis for Sustainable Development

CSIR-NCL, Pune under the Mission mode project aimed at offering an ultra-clean green fuel to bring down the level of air pollution across the country and providing sustainable mobility to the nation. An innovative, sustainable and most efficient DME process was developed with the help of indigenous catalytic system and reactor design and the technology developed under the project was dehydration of Methanol to DME. The indigenously developed pilot plant scale reactor could produce 24lit/day of DME, which is the first process developed in India. Through this process, conversion of 80-85% methanol to DME with 98.0% selectivity at 10 bar in laboratory scale and semi pilot plant set for the best catalyst could be achieved. The scale of operation of this process is 3g, 5g, 50g, 100g, 250g, and 1000g. Both registration for burner and reactor design and patent for catalytic conversions and process have been filed. Dr. Harsh Vardhan, Hon'ble Minister (S&T, ES, H&FW) had inaugurated nation's first indigenously developed DME pilot plant on September 9, 2019. NITI Aayog had also given green flag to CSIR-NCL – DME Process and advised to take it to industry scale at 1.5 MTPD. Multiple industries were interested in CSIR-NCL DME process technology which catered to the GoI Missions like 'Make in India' and 'Innovate in India'.

Sickle Cell Anaemia Mission

Sickle cell anaemia (SCA) is the most common blood related disorder in India which predominantly observed among ethnic groups that have a socio-economic disadvantage, such as tribal populations, etc. Every year approximately 5,00,000 children are born with SCA worldwide with India accounting for nearly

50% of the cases. The overarching goal of the CSIR Mission is to reduce the burden of sickle cell anaemia through multi-pronged strategies that allow early diagnosis, genetic risk prediction and appropriate therapeutic and management strategies. Under the Phase I of Sickle Cell Anaemia Mission, implemented by seven CSIR laboratories under the leadership of CSIR-CCMB, 2 lakh people have been screened for the genetic disease of which 12,000 has been found to be carriers of the disease and about 700 are afflicted. Several camps were organized in Chhattisgarh (Bilaspur and Raipur) and Maharashtra (Nagpur) organized under the aegis of CIMS, Bilaspur and GMC, Nagpur for creating awareness about the disease, the screening programme and various options for the affected and carrier individuals and treatment availability. A hydroxyurea formulation for treatment of SCA patients is being developed to undertake clinical trial. Few herbal extracts have also found to be effective in treatment of SCA and are being worked upon for development of phytopharmaceutical/nutraceutical for SCA. A new Phase II Mission is being planned to undertake development of leads obtained in Phase I.

Nutraceuticals and Nutritionals Mission

The Mission was implemented by ten CSIR laboratories with CSIR-IHBT as Nodal. Nutraceutical formulations/ products have been developed for bone health, cognition, immunity and sleep disorders, which has given leads and needs final support data of Human Intervention studies and evaluation, before it can go for commercialization. Further, 10 region specific and pan Indian Dense and Nutritious foods have been developed keeping in view of the societal role of CSIR for School children that meet the RDA requirement of nutrients through Food based approach, including scale up ready for installation. These products can be used as specialty food items either in the morning or in the evening and either for children or needy adults. The products are ready at pilot level, and needs setting up of region wise manufacturing plants perhaps in 5-6 different CSIR laboratories for reach out to Society for multipurpose use.

Food and Consumer Safety Solutions Mission

The Mission was implemented by seven CSIR laboratories with CSIR-IITR as Nodal. With the broad objective of developing technological solutions for food safety, the specific objectives of the Mission were: (i) Developing Sensors and Systems for food safety; (ii) Developing Methods and techniques for food safety; and (iii) Extension and outreach for food safety. The Mission has led to the development of 16 technologies under various paradigm of food safety. Some of the technologies have been commercialized and several others are under different stages of validation for taking up by the industries or regulatory stakeholders. The Mission has led to creation of ecosystem where CSIR and regulatory body, FSSAI, will work together to bring affordable technologies for food safety and testing in the market and raise the awareness among consumers. An MOU has been signed between CSIR and FSSAI as a result of this Mission.

Development of Fast, Durable and Energy Efficient Mass Housing Scheme

The project was a multi-institutional mission mode initiative of CSIR aimed to meet the challenges being faced in Mass housing and Smart City development. For this, a considerable leap in knowledge in many disciplines of engineering, architecture, urban, rural & regional planning, social sciences and information technology is required. Therefore this mission mode project was developed under the unified umbrella of CSIR, with the explicit purpose to bridge the gap in practice through innovation, with well-conceived objectives and distinct deliverables. The achievements of the project included development of Large panel precast elements for walls and floors using different materials such as EPS, Steel-foam concrete composite, self-flowing concrete-steel composites etc; design and development of joints for interlocking wall to wall, wall to floor and floor to floor panels and evaluating the joint efficiency; development of Precast foundation, beam, columns and staircase; Fabrication and prototype development of plastering machine for walls in housing construction; Rainwater harvesting system design finalized and site identified for implementation of

the system; development of Mode choice model; Synthesis of eco-friendly corrosion inhibitor and protective coatings; Simulation of spread of smoke and evacuation strategy carried on a G+3 housing unit; Construction of 3 lakhs houses under PMAY-Rural in Orissa state using CSIR-CBRI Technologies and installation of Wind Solar Hybrid (WiSH) systems over Demo building (TDC, CSIR-SERC) have been completed.

CSIR Innovation Centre for Next Generation Energy Storage Solutions [LIB Lithium Ion Battery]

Every month, 10 million Lithium-Ion Battery Cells are being imported to India from countries like China, South Korea, and Japan. In a step towards self-reliance and to cut the dependence on imports, the Council of Scientific & Industrial Research (CSIR) is making CSIR-Innovation Centre for Next Generation Energy Storage Facility. This facility will be the first one in India to demonstrate the Lithium battery fabrication up to 100 Mega Watt capacities. Lithium battery manufacturing is a capital and operation expenditure intensive industry which is typically about Rs. 800-1000 Cr for Giga-watt plant and India's requirement for batteries is several hundreds of Giga-watts. This Innovation Center would help the Indian industry to come up with Lithium battery fabrication facilities with environment-friendly, cost-effective, and energy-efficient technology. It will pave the way for industries to fabricate and develop their cells and validate before they establish the manufacturing plant saving on cost and time. Also, this will cater to the needs of some of the crucial requirements for strategic sector applications. This facility will enable the fabrication of 5 Ah cylindrical and 20 Ah capacity prismatic cells. The facility CSIR is building will exclusively work on Indigenous Li-ion battery technology and also leapfrog next-generation technologies such as Sodium-ion, Lithium-sulfur batteries, and Solid-state batteries. Tata Chemicals Limited has been chosen as industry partner to help run the facility.

Development of Advanced Materials and Devices for Opto-electronic, Biomedical and Strategic Applications

The mission project aims to develop new materials and undertake the associate research required to mature their application in the deliverable device / prototype / product for cutting edge applications, by the cohesive multidisciplinary R&D efforts of CSIR laboratories. It is specifically focused on advanced optoelectronic materials, meta-materials, bio-implants, and un-conventional composite materials and their device development, which is expected to make a big technological intervention and their outcome, can set forth the translational outcome in the subsequent years to come. The multifaceted outcome of the project will lead to many technologies for optoelectronic, healthcare (e-skin), bio-implant, armor, automobile, and other applications. All of these technologies will immensely contribute to the self-reliance of the nation and have good market potential. The project is led by CSIR-IMMT, Bhubaneswar.

Bulk Chemicals Mission

Globally, bulk chemicals are the most traded chemicals (in terms of volume) and are the building blocks for a host of products. With the increase in industrial activities, the demand for chemicals has also increased, which has resulted in higher international trade. Through the mission project on Bulk Chemicals, CSIR has pitched in with its diversified expertise and portfolio, thereby, generating a knowledgebase in the area of bulk chemical production. The project is led by CSIR-NCL, Pune, and focuses on the development of technology for production of Lithium from ores; Critical metals from used Li-ion battery; Propylene Oxide; High-Value Aromatics; Carbon Fibers from Petroleum Pitch Precursors and Coal Resin; DCDA; Cyclohexanone Oxime from Cyclohexanone; and Bisphenol-A.

Development of Processes for Active Pharmaceutical Ingredients towards COVID - 19

To address the Corona Pandemic, the only immediate option is repurposing the existing drugs, in particular anti-viral agents. Majority of the drugs are not marketed / available in India and even if available, the key starting materials need to be imported. CSIR has taken up a mission mode project with the aim of development of cost effective and complete process know-how for 23 selected API molecules to treat COVID 19. The APIs being developed are: Centhaquin, Umifenovir, Tilorone, Baloxavir, Saquinavir, Remdesivir, Dalargin, KSMs-Hydroxychloroquine, Ribavirin, EIDD-1931, Phosphonate Fragment of Remdesivir, Baricitinib, Ruxolitinib, Lopinavir-KSM, Ritonavir -KSM, EIDD 2801, and Galidesvir. The objectives of the project include development of complete process know-how for these API molecules, inter alia, development of analytical method for key starting materials of the APIs; indigenous and cost effective development of all intermediates and API's; demonstration of the know-how process for key intermediates on 500 g scale and each API on a minimum of 25 g scale; identifying the combination of drugs towards COVID19 through molecular modelling study and generating the clinical data for combination of drugs towards COVID-19. The project is currently in implementation at CSIR-IICT, Hyderabad along with 8 other constituent laboratories of CSIR for a short duration of nine months.

Medical Instruments & Devices Mission

This CSIR-Mission Mode Program on “Medical Instruments & Devices” has been formulated to take lead in the manufacturing of high-end medical devices in the country. High-end medical devices are mainly manufactured by multinational companies and mostly imported. In present government policies, the main thrust should be on reducing the import dependency by manufacturing even high technology medical devices in India. The mission will focus on development on (i) Diagnostic & Therapeutic Devices; (ii) Rehabilitation and Assistive Technologies for Elderly & Disabled; (iii) Imaging based Technologies for Medical Application; and (iv) Advanced Manufacturing based Orthopaedic and Dental Implants.

Demonstration and validation of a 5kW HT-PEMFC based combined cooling and power system

A 5.0 kW Fuel Cell Prototype has been designed, developed and demonstrated based on High Temperature - Proton Exchange Membrane (HT-PEM) Fuel Cell Technology. The prototype system has majority of indigenously developed components, especially indigenous Graphite Plates, Carbon Paper and Membrane Exchange Assembly (MEA). The field trails are under process. The developed system could be most suitable for distributed stationary power applications like; for small offices, commercial units, data centres etc., where highly reliable power is essential with simultaneous requirement for air-conditioning. This system may also meet the requirement of efficient, clean and reliable backup power generator for various applications, like telecom towers, remote locations and strategic applications as well. Hon'ble President of India unveiled the first Indigenous High Temperature Fuel Cell System Prototype developed by CSIR in partnership with an Indian industry, M/s Thermax Ltd., Pune on the occasion of CSIR Foundation Day Celebrations at Vigyan Bhawan, New Delhi on September 26, 2019.

Novel Therapy for Management of Sepsis

In the partnership of M/s Cadila Pharmaceuticals Ltd. and PGI, Chandigarh under a CSIR-NMITLI project, a randomized, double blind, two arms, active comparator controlled, phase IIb clinical trial to study the safety and efficacy of Mycobacterium w in combination with standard therapy versus standard therapy alone in sepsis due to gram negative infection was undertaken. The clinical trial report was submitted to DCGI which has approved the drug for use. With the success of the trial, Cadila Pharmaceuticals has launched the product, “Sepsivac” which is poised to resolve the unmet medical need of the world by gram negative bacterial infections.

Truenat for Point of care Tuberculosis Detection

The Truenat platform from Molbio Diagnostics is the world's only commercial field usable, battery-operated PCR that can be deployed in resource-limited settings worldwide for rapid, sensitive, and accurate diagnosis of infectious diseases like Corona Virus, TB, Dengue, Chikungunya, H1N1, HCV, HPV, among other tests. The success of the Truelab Platform that does Nucleic Acid Amplification Testing (NAAT) of pathogens is a result of the farsightedness of CSIR in supporting start-ups. CSIR's NMITLI project which started in 2005, helped in the development of the device involving Bigtec, Bangalore; IISc, Bangalore; and CSIR-IIIM, Jammu. The device was validated for hepatitis-B detection through CSIR-NMITLI Support. Later on DBT, through the BIPP program helped with early validation of select clinical parameters. ICMR's extensive testing of the platform and suggested modifications for use in the hands of minimally trained technicians has shaped the final product in the market today. This platform is one of India's most widely patented products today, with patents in over 150 countries. Indigenous portable Truelab (Molbio Diagnostics, India) workstations, previously used and recommended by WHO for tuberculosis are now being used for detection of Covid-19. The performance and accuracy of the Truenat assays have been assessed by FIND in a real-world multicentre diagnostic accuracy study conducted in India, Peru, Ethiopia, and Papua New Guinea. The study determined the diagnostic accuracy of the Truenat tests when performed in peripheral laboratories, compared with culture as the reference standard. Alongside endorsement by WHO, the Truenat tests are listed by the Global Fund to Fight AIDS, Tuberculosis, and Malaria as eligible for procurement, and Truenat MTB, MTB Plus, and MTB Rif have been added to the diagnostics catalog of the Stop TB Partnership's Global Drug Facility (GDF).

Seaweed Formulations for Productivity and Health of Dairy and Poultry Animals

Under a CSIR-NMITLI Project, CSIR-CSMCRI has developed novel seaweed-based animal feed additive formulations to enhance the productivity of animals, improving the quality of animal products, and boosting immunity. Seaweeds are a rich source of choline, glycine, betaine, nutrients along with biologically active compounds such as fucoidan, betaine, and glucans which are known to enhance animal's immunity. Polyphenols in the seaweed exhibit antioxidant and Reactive Oxygen Species (ROS) scavenging activity. Seaweed formulations were developed to harness the active ingredients for improving productivity, improved rumen function, boost immunity, and all-round health of animals (cattle and poultry). The formulation was validated by the Indian Veterinary Research Institute (IVRI), Central Avian Research Institute (CARI), National Dairy Research Institute (NDRI), and Toxicity trials done at CSIR-Indian Institute of Toxicology Research (IITR). M/s Aquagri Pvt Processing Ltd was an industrial partner in the project.

Development of Dental Implants

Under the partnership of Maulana Azad Institute of Dental Sciences (MAIDS), Delhi and IIT, Delhi, an indigenous dental implant has been designed, developed and successfully validated in human clinical trial under CSIR-NMITLI project. The innovation has been granted a US Patent in 2017 and an Indian Patent in 2019. The technology for Dental Implants has been transferred to M/s Innvolution Healthcare Pvt. Ltd., Delhi. With the transfer of technology of Dental Implants to Indian Company, M/s Involution Medtech Pvt Ltd (Joint venture of IHPL and Kamal Encon), the country has taken the first step towards "Make in India" implants and import substituted technology. A dedicated manufacturing, cleaning and packaging setup has been established at Faridabad. The industry has obtained the manufacturing license in June 2019 and has commercialized the implants in the name of "ifix" in India. The developed technology has been appreciated through a letter of commendation by Hon'ble Prime Minister of India.

India's first biofuel-powered flight: CSIR Technology for Aviation Grade Biofuel

A historic flight powered by indigenously produced aviation biofuel based on patented technology of CSIR-Indian Institute of Petroleum (IIP), Dehradun completed journey from Dehradun to Delhi on August 27, 2018. With this maiden flight India joined the exclusive club of nations using biofuel in aviation. The use of bio jet fuel, apart from reducing greenhouse gas emissions by about 15 percent and Sulfur Oxides (SO_x) emissions by over 99 percent, is expected to provide indigenous jet fuel supply security, possible cost savings as feedstock availability at farm level scales up, superior engine performance and reduced maintenance cost for the airline operators. For the first time in the country, on 26th January 2019, an An-32 transport aircraft of IAF flew with blended bio-jet fuel produced by CSIR technology.

Successful Inaugural Flight of SARAS PT1N

SARAS PT1N (14 seater) light transport aircraft designed and developed by CSIR-National Aerospace Laboratories (CSIR-NAL) was flown successfully on 21.02.2018. The primary objective of PT1N is to evaluate system performance in about 20 flights and the data collected from this shall be used to freeze the design of 19 seater production version aircraft - SARAS MkII.

Drishti Transmissometer: Deployment across Indian Airports

Drishti is an Indigenous - Innovative –Cost effective visibility measuring system — First of its type and CSIR is the only organization to have developed this technology in the country. It is useful for airport operations and gives information to pilots on the visibility at the runway. Drishti Transmissometers have been installed at a number of civilian and Indian Airforce airports across the country.

CSIR Technologies for India's First Light Combat Aircraft - TEJAS

CSIR has been Integral Partner with ADA in Design and Development of TEJAS. CSIR developed and fabricated 165 composite parts, Fly-by-Wire (FBW) Control Systems and State of art training simulator.

CSIR signs MoU with Unnat Bharat Abhiyan-Indian Institute of Technology, Delhi(UBA-IITD) and Vijnana Bharti(VIBHA), New Delhi

A Memorandum of Understanding (MoU) was signed between Council of Scientific and Industrial Research (CSIR) New Delhi, Unnat Bharat Abhiyan-Indian Institute of Technology, Delhi(UBA-IITD) and Vijnana Bharti(VIBHA), New Delhi. The MoU is expected to lay the foundation for cooperation and joint action in the area of Unnat Bharat Abhiyan (UBA) for rural development of India through CSIR technologies and related knowledge base in tune with the people's aspirations in furtherance of the Government of India's initiatives like Vijnana Bharati(VIBHA). The Unnat Bharat Abhiyan (UBA) is a flagship national program of the Ministry of Human Resource Development (MHRD), Government of India, envisioning the transformational change in rural development processes by leveraging knowledge institutions to help build the architecture of an Inclusive India. The purpose of this Memorandum of Understanding is to provide access to CSIR rural technologies for Unnat Bharat Abhiyan (UBA).

Indian air quality Interactive Repository or IndAIR launched

CSIR-NEERI, Nagpur launched the Indian air quality Interactive Repository or IndAIR which has archived approximately 700 scanned materials from pre-internet era (1950-1999), 1215 research articles, 170 reports

and case studies, 100 cases and over 2,000 statues, to provide the history of air pollution research and legislation in the county. Such a repository on the subject of air pollution is one of the first in the world.

Technology to convert Distillery Waste to Fertilizers

Distilleries generate 10-15 litres of wastewater effluent or “spent-wash” while producing one litre of alcohol from fermentation of sugarcane molasses. There are almost 300-odd molasses-based distilleries in India churning out 2.5-2.6 billion litres of alcohol annually, and in doing so also discharging 30-35 billion litres of spent wash having potential to contaminate surface and ground water. CSIR-CSMCRI has developed a process to separate the main source of pollution — potash and biodegradable organic matter — from distillery spent-wash. While helping distilleries comply with the Central Pollution Control Board’s mandated zero liquid discharge (ZLD) action plans, this technology will also meet up to a tenth of India’s potassium-based fertiliser requirements which is entirely met through imports. CSIR-CSMCRI has filed a patent and has converted the process into a commercial-scale technology in collaboration with Chem Process Systems Private Ltd, Ahmedabad. The first full-fledged commercial plant using the technology has been commissioned by Aurangabad Distillery Ltd (ADL) at Walchandnagar, Maharashtra. Plant based on CSIR-CSMCRI spent wash technology commissioned at Aurangabad Distillery Ltd. (60 klpd), Walchandnagar, Maharashtra

Made in India aviation weather monitoring system installed at Bengaluru International airport

CSIR-NAL has indigenously developed Aviation Weather Monitoring System (AWMS) which has recently been installed at the new runway of Kempegowda International Airport (KIA). With this, KIA has become the first airport in the country to install indigenous AWMS technology, at both ends of the new runway. With the web-enabled feature, the data can be accessed, and maintenance carried out from any location. The 10-meter mast on which AWMS sensors are installed is a first-of-its-kind, designed by NAL, with several unique features, including being eco-friendly and lightweight, with a life of over 60 years. The sliding mechanism enables easy maintenance - a useful feature-considering the busy traffic on the runway.

Waste Plastics to Fuels

CSIR-IIP in collocation with and GAIL (India) Ltd have developed a technology for converting waste plastics to fuel (diesel). After the completion of lab scale and bench scale studies, a demonstration plant of 1 ton per day (TPD) capacity has been set up. The process utilizes waste polyethylene and polypropylene type waste plastics available from MSW and other sources and generates about 800L of diesel per batch. A MoU for the technology to convert the plastic waste into diesel has also been signed with DDA and Delhi Municipal Corporation.

Agreement with Sun Pharma Industries Ltd for licensing of patents on a New Chemical Entity (NCE)

CSIR-IICT signed an agreement with Sun Pharma Industries Ltd. for out licensing of patents on a New Chemical Entity (NCE) (Bedaquiline) with potential therapeutic activity across multiple indications in Sun Pharma’s specialty focus areas. Under the terms of the license agreement, Sun Pharma gets exclusive global license for the said patents and any other future patents covered in the agreement. Sun Pharma will pay CSIR-IICT upfront and potential development, regulatory and sales milestone payments totaling up to Rs.2.40 billion, plus royalties on net sales from commercialization of the products developed using these patents. Sun Pharma will be responsible for development, regulatory filings, manufacturing and commercialization of these potential products. This agreement will facilitate addition of pre-clinical

candidates to Sun Pharma's global specialty pipeline. A successful clinical development of these potential compounds may enable Sun Pharma to commercialize pharmaceutical products for various therapeutic indications over the long term.

Indigenous Process Technology for Carbon Fiber for Aerospace application

Carbon fiber is an excellent reinforcement in structural composites used in aerospace, military, transport, energy sector, etc. Aerospace grade carbon fiber is a monopoly of few countries. The availability of indigenous carbon fiber is a must for composites, meeting specific requirements like, ablative, structural, braking, thermal shock resistance etc for Indian defense and nuclear programs (development of Intercontinental Ballistic Missiles, Light Combat Aircraft, Advanced Light Helicopter, High temperature Nuclear Reactor etc). CSIR- NAL has developed standard modulus grade carbon fiber in pilot scale and demonstrated the process technology to Centre for Military Airworthiness and Certification (CEMILAC) & Directorate General of Aeronautical Quality Assurance (DGAQA). The developed product has been certified by CEMILAC for aerospace application. The carbon fiber developed will benefit the aerospace sector as well as automobile, sports industries, energy sector etc. Technology know how has been transferred to Bhabha Atomic Research Centre (BARC) on non-exclusive basis.

Aerospace Grade Autoclave Technology (Industrial and Lab Scale sizes)

Autoclaves are used to manufacture airworthy composite components under suitable settings of pressure, vacuum and temperature. CSIR-NAL has successfully developed state-of-art Indigenous Autoclave Technology for processing advanced light weight composites that are integral to modern day civil and military airframes. The size of autoclaves developed range from smaller lab scale to very large sizes up to 5m working dia and 12m working length. The operating temperatures can be as high as 425 Deg C and pressures up to 15 barg. This will meet the requirements of Aerospace Industry, Research and Educational Institutes. The technology has been transferred to two private industries. In the last 7-8 years several autoclaves have been supplied to various organisations in the strategic sector as well as academic institutions. The autoclave technology has been largely successful in promoting the local eco-system, mitigating imports and creating millions of employment man-hours within the country.

Recycling of E-Waste

E-waste or electronic waste is created when an electronic product is discarded after the end of its useful life. The rapid expansion of technology the consumption driven society results in the creation of a very large amount of e-waste in every minute. Electronic scrap components, such as CPUs, contain potentially harmful materials such as lead, cadmium, beryllium, or brominated flame retardants. Informal processing of e-waste can lead to adverse human health effects and environmental pollution. Huge generation of mobile phone batteries, its rudimentary disposal, improper collection system as well as lack of cost-effective processing technology has resulted in loss of valuables encapsulated in it. No effective technologies exist at present within the country for safe recycling of electronic waste in the industry. To address the aforesaid, CSIR-National Metallurgical Laboratory, Jamshedpur has developed a process for ecological recovery of cobalt and other valuable metals from the black powder and other constituents of LIBs. Further, laboratory has also developed a process flow sheet to recover precious metals and Co & Au from e-waste. The processes developed have been transferred to industries for extraction of cobalt metal/ salt from black powder of lithium batteries and recovery of precious metals from e-waste.

Design & Development of Mob Control Vehicles

The recent statistics from Ministry of Home Affairs and the National Crime Records Bureau reveal that substantial numbers of riots/ communal incidents are happening every year in India. These riots are becoming very aggressive causing loss of human lives, loss of lives of police/ security personals, loss or public and private property etc. Due to easy availability of ammunitions, mobs are becoming more desperate and harmful to the society. With a view to provide security personal an advanced improved armoured vehicle to handle riots and mobs in the streets and urbanized areas, CSIR-CMERI has developed three Mob Control Vehicles (MCV). The first MCV is built on a tractor, fitted with hydraulically operated retractable shields and suitable for Police and BSF. Other significant features include hydraulically operated stair; IP Bullet from view, rear view and side view cameras; PTZ Camera with 360-degree view mounted on a hydraulic operated platform with controller. The other developed MCVs are Heavy Category (Stallion chassis) MCV 7.5T payload and Medium Category (LPTA chassis) MCV 2.5T payload with add on features like Front shovel; Front shield; Water canon; Form spray system; Multi-Barrel Launchers (Mechanized shell loading); pressurised cabin, among others to disperse mob surrounding the vehicle. Mock trials and Inspection of Heavy Category (Stallion chassis) MCV 7.5T payload and Tractor based MCVs has been carried out by CRPF-RAF team. The results of the trial were satisfactory.

Electronics Augmentation on Bullet Resistant Bunker (BRB) Vehicle

CSIR-CMERI electronically augment BRB vehicle of CRPF. The augmented features includes: Display with Wide Coverage to achieve a Wide FOV (Field of view) over a High Range; High Speed Video Transmission to Remote Location with Dynamic Cellular Network Assignment via Channel Bonding for High Speed Video Transmission; Public Addressing System (PAS) with Siren to help address the mob from vehicle; Search-cum-spot light aids operations during night or low light scenarios: Range 100-150 m and GPS aided navigation & tracking system - allows the authorities to get the locational update of the vehicle with tracker accuracy upto ± 10 m. The augmented vehicle was handed over to CRPF on July 18, 2019 in the presence of DG, CSIR and DG, CRPF. The vehicle was during Shri Amarnath Ji Yatra 2019.

Vertical Slurry Transport System for Lifting of Minerals/Ores in Heterogeneous Regime

CSIR-IMMT has design, developed and installed a vertical lifting system for hydraulic transportation of minerals/ores has been successfully completed. The pilot test set-up consists of 75mm and 100 mm hose pipes, a high pressure water pump, a rotary feeder of capacity in range of 8-10 Tons/hr., a mechanical pulsar mechanism for achieving pulsating flow with adequate instrumentation & data acquisition system. The test results indicated that, it is quite feasible to adopt the environment benign technology for vertical hoisting of minerals/ores from opencast mines/sea bed mining, with anticipated benefits including less in-ground manpower, less maintenance, potentially lower capital and running costs. The technology has been demonstrated to M/s. Dalmia Cement Ltd., Rajgangpur, Odisha for possible implementation at their limestone mines in Sundargarh District.

Image-guided vascular vein visualizer (VeinViz)

In case of critical ill patients, intravenous (IV) therapy is considered as the fastest mean of providing fluids and medications through peripheral venous catheter. It is often a problem for clinicians to find and locate vein and in the process they pricks several time before placing the needle successfully, which causes pain and distress to the patient, and frustration to the clinicians. CSIR-CSIO is working to develop a non- invasive, real-time portable device for detection and visualization of peripheral subcutaneous veins of neonatal, obese and dark skin patients. A prototype of the device has been developed.

Hydrogen Standard in Steel

Certified reference material (CRM) used for determination of hydrogen in steel by hot fusion technique is cumbersome in terms of both cost and time as it an import product to India. CSIR-NML has developed an indigenous hydrogen standard (CRM) in steel as an import substitution. The CRM developed are cost effective ($\approx 50\%$ reduced cost) compared to available import standard. CSIR-NML is in advance stage in commercializing the hydrogen standard in steel as an indigenous product for the Indian customers.

CSIR-NCL Transfers Technology for Organic Farming

CSIR-National Chemical Laboratory (CSIR-NCL), Pune, has signed a Technology Licensing Agreement with Greenvention Biotech Pvt. Ltd, Pune, for integrated pest and pathogen management in agriculture using fungi and their metabolites , on 12th June 2019. Eco-Friendly, integrated pest management in agriculture approach has been developed at CSIR-NCL as a technology using microorganisms such as fungi and their products. An eco-friendly, cost-effective, integrated pest management shall be useful to the farmers having small land holdings as well as to the farmers who export agricultural produce that has no chemical residues. Greenvention Biotech Pvt. Ltd is a start-up from Uruli-Kanchan (Pune) works on several agriculture-related products.

Early Diagnosis of Prediabetes Using Novel Markers

According to the Global Report on Diabetes of World Health Organisation (WHO), an estimated 422 million people were living with diabetes in the year 2014. Prediabetes will affect more than 450 million people worldwide by 2040. In the absence of prediabetes diagnoses all these people are at high risk of developing diabetes and microvascular complications. CSIR-NCL, Pune, in collaboration with the Chellaram Diabetes Institute, Pune, have identified some novel markers for efficient prediction of prediabetes. The glycosylated peptides of a protein, namely Albumin were studied and differentiated to evaluate their ability to predict the prediabetic condition. Prediabetes is a condition wherein the blood glucose or blood sugar levels in the body are higher than the normal. At a certain level of sugar in the body, it becomes type 2 diabetes which is the advanced stage. Prediabetes can be controlled with simple changes in lifestyle and eating habits. A study was carried out to quantify these four glycation sensitive peptides in the selected patients. All these peptides were observed with a higher fold difference in prediabetes than the corresponding unmodified peptides like FBG, PPG and HbA1c. The study suggested that these peptides may determine prediabetes more efficiently, and therefore they could form a potential panel of biomarkers for diagnosis of prediabetes.

CSIR Technology Compendium

CSIR has come out with a technology compendium having technologies which are ready for commercialization. The compendium consists of 240 technologies which are at TRL 6 and above identified under eight themes. The copies of compendium were circulated to NITI Aayog, MoMSME, and other relevant Ministries/ Departments for wider publicity about the technologies of CSIR.

Process for recovering iron, nickel and chromium from chromite overburden

CSIR-IMMT has developed a process for recovering iron, nickel and chromium from chromite overburden in the form of nickel and chromium bearing pig iron has been developed. A pilot scale campaign has been successfully demonstrated for scaling up the process to 100 kg. The nickel bearing pig iron produced from Chromite overburden has been used for making stainless steel of HARDOX grade. The slag obtained during the smelting operation is further utilized for making value added products such as bricks, thereby making it a zero waste process.

The nickel bearing pig iron with nickel percentage ranging from 2- 18 % has been prepared by variation in smelting parameters. A metal yield of around 91 % is achieved for the nickel bearing pig iron containing 8 % nickel. The chromium bearing pig iron with chromium percentage ranging from 8-16 % has been prepared by variation in smelting parameters. An MoU has been signed with Jindal Stainless Ltd., Kalinganagar, Odisha for collaboration towards effective utilization of chromite overburden.

Improved PNG (Piped Natural Gas) Burner

There are more than 50 lakh registered domestic PNG users in India. Due to unavailability of dedicated PNG burner / stove customers are using common LPG stoves modified for PNG which is unsafe and highly inefficient. In view of this, CSIR-IIP has developed a domestic cooking burner for the efficient and safe application of Piped Natural Gas (PNG) with the financial support of PCRA, New Delhi. The developed PNG burner can save up to 25% of the precious fuel (PNG) ensuring the user safety at the same time.

Technology for effective delivery of pheromones in fields

Pest attack results in a loss of food produce worth US\$ 470 billion globally. Pests are conventionally managed by spraying pesticides that could pollute soil and ground water. Pest control using sex pheromones is a revolutionary technology to selectively treat pests, without the use of pesticides and without harming helpful insects. CSIR-NCL has developed technology for effective delivery of pheromones in fields.

Drishti Systems at Runways of the Country - Niche Aerospace Technology implemented with IMD

Developed and manufactured by CSIR-National Aerospace Laboratories (CSIR-NAL), 47 Systems have been installed at 21 International Civilian Airports in the country. Also, 54 Systems have been provided to 18 IAF Airbases. The market potential is about 180-200 numbers for both strategic and civil applications

Salt Free Tanning Technology

Enabling the Indian leather industry for global competitiveness at reduced environmental impact, more than 10 million square feet of leather processed based on CSIR-Central Leather Research Institute (CSIR-CLRI) developed technologies. The UNIDO, Vienna joined hands with CSIR-CLRI to establish UNIDO-CLRI Centre for Salt Free Tanning.

Menthol Mint

India is global leader in Menthol Mint production due to CSIR developed plant varieties and agro-technologies: Area of menthol mint production increased from 50,000 hectares in 1994 to 2,50,000 hectares in 2015. The 80% of the area is under CSIR-CIMAP developed Kosi variety cultivation; Per unit area of production of menthol-rich menthe oil increased up to 50-60%.

CSIR's new patented Clot buster, PEGylated Streptokinase set to revolutionize the treatment of Strokes

Ischemic stroke is a condition caused by a dysfunction in the supply of blood to the brain due to emboli, thrombus or atherosclerosis occurring in cerebral arteries. Surprisingly, the prevalence of stroke is much higher in India than the West and about 87% of all strokes are ischemic strokes. CSIR-IMTECH and Epygen have entered into an agreement for the latter to develop PEGylated Streptokinase for treatment of Ischemic Stroke.

Non-vascular self-expandable stents

Stents are used in the treatment of numerous biliary tract diseases, ranging from benign biliary diseases to malignant strictures. Two types of biliary stents find extensive use: plastic stents and self-expanding metallic stents. Amongst these while the self-expandable metal stents offer longer patency their prohibitive cost makes them unaffordable. CSIR-NCL in collaboration with a start-up has developed a new class of self-expandable stents based on a novel scroll design. These stents have been made with simple polymer-metal composites unlike the shape memory alloy based stents. These stents could be made a much lower costs than the currently available ones. Process for transferring the technology to two companies is on.

CSIR's Divya Nayan for Visually Impound

CSIR-Central Scientific and Industrial Organization has developed a Personal Reading Machine named-Divya Nayan, for Visually Impaired which can read any printed and digital books available in Hindi and English. Divya Nayan has been tested with a number of visually impaired people with different age groups and has gained wide popularity.

Development and licensing of affordable Water Disinfection System Oneer™

CSIR-Indian Institute of Toxicology Research (CSIR-IITR), Lucknow has developed technology for "Drinking Water Disinfection System" with Trade name "Oneer™". It is useful for continuous treatment of water. The technology of "Drinking Water Disinfection System" was transferred to M/s Bluebird Water Purifiers, New Delhi. Oneer developed by CSIR-IITR will provide safe and clean drinking water at a cost of just 2 Paise / Ltr. The Community level model is of 450 LPH capacity. It can be scaled up to 5000 to 1 lakh L/day.

Waterless Chrome Tanning Technology- a Game Changing Technology

Chromium is the most sought after tanning agent with about 2.0 billion sq. ft. of leather being made in India. About 20 thousand tons of chrome tanning agent is discharged in the wastewater. In order to overcome the problem, CSIR-CLRI has developed waterless chrome tanning technology. The waterless tanning technology has now found PAN INDIA acceptance, with tanners in all clusters enrolling for its adoption. The technology has been put to use in about 50 tanneries in the country. This is truly a game changing technology that has emerged from the CSIR through CLRI.

Zero liquid discharge leather technology

A zero wastewater discharge process technology based on Electro-oxidation (EO) has been developed for the first part of the leather manufacturing process, the pre-tanning processes. The potential environmental benefits and potential social impacts for India includes: No discharge of wastewater from tanneries; The possible reduction of cost will be about Rs. 96 million per annum from reduction in the cost of wastewater treatment; This system does not result in generation of sludge (about 160 tons' sludge per annum) and less average annual fatalities due to release of H₂S. The technology has been transferred to M/s Leayan Global Pvt ltd, Kanpur; M/s Royal Tanners, Kanpur; and AN Leathers Pvt Ltd, Agra.

High Grade Gelatin from and Protein Hydrolysate from Raw Hide and Skin Trimming Wastes

Gelatin is widely used in the pharmaceutical industry to make capsules for drugs as well as in the food industry to make jelly candies, ice cream, and as thickening agent in cakes and soups. Leather processing generates huge amount of raw trimming wastes. CSIR-CLRI has developed technology for making high grade gelatin from waste material-trimmings of raw hide. The technology developed by CSIR-CLRI is towards complete utilization of proteinous constituents present in the trimmings. This technology is exclusively licensed at a cost of Rs. One Crore to M/s Anipro Manufacturing Company for making gelatin and protein hydrolysate within India.

Coal dust collecting and briquetting system

It is pertinent to collect the dust from mine roads and put it to alternative use not only for reducing air pollution but also for improving the health of local populace. Road dust collecting system has been developed. CSIR-CIMFR has transferred the patented technology to M/s Tata Motors Limited, Mumbai.

Phytopharmaceutical for Glucocorticoid-induced Osteoporosis

Globally glucocorticoid is the third biggest cause of osteoporosis. CSIR-CDRI has developed a standardized fraction of *Cassia occidentalis* Linn. for the treatment of glucocorticoid-induced osteoporosis and muscular atrophy. Technology licensed to M/s Pharmanza Herbals Pvt Ltd., Gujarat for further development and commercialization as a Phytopharmaceutical drug. The product is under development in Phyto-pharmaceutical mode and would be available in Indian and the U.S. market after completing necessary studies as per the regulatory guidelines.

Safe Disposal of Municipal Solid Waste utilising high temperature plasma

The technology has been developed for effective & eco-friendly disposal of municipal solid waste material generated on daily basis and generation of fuel gas containing predominantly CO and H₂ utilizing high temperature (>3000 °C) Plasma arc. The technology has been licensed to M/s Positronics Innovation Pvt. Ltd, Kolkata, WB for commercialization on non-exclusive basis for a period of 5 years.

Non-toxic Radiation Shielding Material for X-ray Protection

Non-toxic radiation shielding materials utilizing industrial waste like red mud (from aluminum industries) and fly ash (Thermal Power Plants) developed which has been accredited by Atomic Energy Regulatory Board (AERB) for application in diagnostic X-Ray rooms.

JD Vaccine for Farm Animals

Vaccine developed and commercialized for Johne's disease affecting Sheep, Goat, Cow and Buffalo so as to immunize them and increase milk and meat production.

PRABHASS Initiative of CSIR

On the directive of Hon'ble Prime Minister to engage the Global Indian S&T community through virtual platform, for addressing Indian societal challenges / problems, CSIR has developed (i) a database of over 200 well acknowledged Indian S&T diaspora who have confirmed to participate in this endeavour, and (ii) a Virtual Platform - "PRABHASS" Pravasi Bharatiya Academic and Scientific Sampark (PRABHASS) Portal

aiming to serve as National Digital Platform to continuously engage with the Global Indian S&T Community for Societal Good. CSIR brought together all major central scientific ministries / departments [DST, DBT, MoES, ICMR, ICAR, DRDO, DAE, DOS] and the Ministry of External Affairs, by setting up a Working Group for PRABHASS, with an objective to integrate similar efforts of different departments and enable PRABHASS serve as a National Digital Platform to effectively collaborate with Global Indian S&T Community for collectively promoting inclusive growth in India, strengthening Indian innovation ecosystem and contributing towards nation building".

Indigenous Nano-Materials for Construction

CSIR-CBRI has developed cost effective nano-silica (n-SiO₂) for high performance concrete to replace silica fume, an imported material. The prepared SNPs are amorphous, powdered, spherical and particle size ranges from 20-50 nm. Pilot Plant for preparation of SNPs has been installed and running successfully. The developed nano-silica will result in speedy construction with higher performance and enhanced durability. It can be used as an admixture in cement/ concrete.

Hybrid Agro Waste Composite Materials

CSIR has developed a process for manufacturing agro waste particulates/fibers (Parali) reinforced composites as an alternative for Medium density fiberboard (MDF). The process has been developed to utilize Parali (paddy straw) to provide a solution to avoid Parali burning. Agro-waste based hybrid medium density composites materials can be used as a substitute for particle board for multifunctional applications in civil infrastructure as door, false ceiling, and partition and furniture materials. The developed material is durable and better in quality compared to MDF and particle board.

Knowledge Partner of Uttar Pradesh State

CSIR is partnering with Uttar Pradesh to work as a Knowledge Partner to provide technology-based support for development in the areas of infrastructure, water-source protection, agriculture, health protection, chemicals, petrochemicals, pharmaceuticals, defence technology etc in Uttar Pradesh. Pharma parks will also be developed in the UP state with the help of CSIR.

Agarbattis from Flower Waste

CSIR has signed a MoU with Shri Mata Vaishno Devi Shrine Board at Katra to provide free consultancy, technical support and guidance to the Board for making Agarbattis from flower waste. Under the project, a small infrastructure facility will be created for making the incense sticks. The used flowers will be collected from the temples, petals segregated from stems, washed, dried, grinded and rolled to make the incense sticks.

Large Scale Production of Graphene Oxide

Graphene oxide is extensively used in energy storage devices, polymer composites, desalination of water, conducting ink, aqueous lubrication, nano-coolant, additive for phase change materials, etc. Graphene oxide is not toxic and hazardous for the environment. The cost of commercially available graphene oxide is very high and scaled-up production of graphene oxide at reasonable price without compromising the quality is a challenging task. The technology developed by CSIR demonstrates the production of graphene oxide starting from natural flake graphite. The Technology has been transferred to one Indian Industry for commercialization for a period of 5 years.

Salivary Fluoride Detection Kit

The indigenous salivary fluoride level detection kit and sensor station is unprecedented in its kind towards diagnosis of salivary fluoride level for the welfare and betterment of the society. It protects from Dental Caries; helps in remineralization; protects against tooth decay; and helps prevent premature tooth loss. The Technology has been transferred to two Indian Industries for commercialization for a period of 5 years.

Boring machine based on trenchless technology

Trenchless construction limits the amount of excavation and the surface repairs needed after digging. Available imported machines are of large capacities for big projects and very expensive. No such machine is being manufactured indigenously. To address this gap, boring machine based on trenchless technology has been designed and developed.

The developed machine can bore upto 14 m length and 160 mm dia. holes under the roads and buildings for laying sewer/ pipe lines and cables. The developed machine is affordable and can be used by small/middle class contractors. It is light in weight, portable and requires low maintenance and Suitable for both wet and dry boring. The technology has been transferred to M/s Techno Industrial Marketing, Uttarakhand.

Micro Fuel Cell

Micro fuel cell is a power source for electronic devices that converts chemical energy into electrical energy. The scaled down fuel cells can be used in electronic devices such as digital cameras, radios, toys and other low power applications. CSIR has developed cost effective, simple and easy to fabricate micro fuel cell for use in low power applications. Technology has been transferred to M/s Victor Industries Pvt. Ltd., Sangli, Maharashtra on non-exclusive basis.

New Rice Variety with Low Glycemic Index Released- A Diabetic Friendly Rice

CSIR-CCMB in collaboration with the Indian Institute of Rice Research at Hyderabad has released a new variety of rice that resists pests and is also beneficial for those with diabetes. The new Improved Samba Masuri (ISM) rice variety is resistant to Bacterial Blight (BB) and at the same time has the lowest Glycemic Index (GI) at 50.9 among all major rice varieties, which is an improvement over the 52.9 GI of the earlier Samba Masuri variety. At present, almost 40 per cent of the normal Samba Masuri rice crop is being lost due to Bacterial Blight (BB). The new ISM variety of rice is, therefore, expected to significantly reduce this crop loss, which eventually would lead to reduced prices of rice and increased profit margins for farmers and traders. The traditional Samba Masuri rice is commonly called Sona Masuri and Kurnool Masuri and has very low resistance to BB, a pest disease for which there is no chemical solution yet.

Handheld GPS-Enabled 'Ksheer Tester'-System for detection of Adulteration in milk

'Ksheer Tester', newly developed by CSIR, is a handheld GPS-enabled version of the recently launched Ksheer Scanner technology to check adulteration in milk. It will empower the common man with a technology to tackle a national level health hazard due to adulteration in milk. The device would enable any person to track the location of the tested sample and receive the test results through SMS on the device.

CSIR's certification for coal used power plants

CSIR has signed an annual Rs. 250-crore deal with several state-run coal and thermal power companies to certify the quality of the coal being supplied and used in their facilities. The certification helps power plants

to use coal appropriate to the machinery and technology available in the plant and contribute to efficient use and, in the long run, reduce emissions. It provides a robust mechanism for proper inspection of coal and overtime [and has led to an improvement in the quality of coal.

Development of Green crackers with less pollutant emission

Ahead of Diwali, CSIR launched green firecrackers in a bid to "resolve the crisis of air pollution" in the capital. These environment friendly Crackers are of new formulations for reduced emission light and sound emitting crackers with 30% reduction in particulate matter. CSIR has also successfully developed various environment-friendly fireworks such as sound emitting crackers, flowerpots, pencils, chakkar and sparklers. CSIR in developing these green crackers have signed nearly 230 MoUs and 165 Non-disclosure Agreements with firework manufacturers in order to deliver the crackers. Also these green crackers are equipped with a green logo as well as a Quick Response (QR) coding systems which have been developed for differentiation of green crackers from conventional crackers.

1000 Genome Sequencing completed

CSIR has conducted Whole Genome Sequencing of 1,008 Indians from different populations across the country. The whole genome data is important for building the knowhow, baseline data and indigenous capacity in the emerging area of Precision Medicine. The outcomes of this will have applications in a number of areas including predictive and preventive medicine with faster and efficient diagnosis of rare genetic diseases. CSIR also pioneered the application of genomics in clinical settings in the area of rare genetic diseases in India by means of DNA/Genome based diagnostics and interaction with large number of clinical collaborators.

CSIR's Integrated Skill Development initiative

CSIR labs established connect with various Sectoral Skill Councils (SSC):

- Leather Sector Skill Council (CSIR-CLRI);
- Life Sciences Sector Skill Council (CSIR-IICT);
- Capital Goods Sector Skill Council (CSIR-CSIO);
- Automotive Sector Skill (CSIR-CSIO);
- Aerospace & Aviation Sector Skill Council (CSIR-NAL);
- Agriculture Sector Skill Council (CSIR-NIO/ CSIR-NBRI/CSIR-IITR);
- Skill Council for Mining Sector (CSIR-CIMFR); and
- Health Care Skill Council (CSIR-IICB) and Paint & Coating Skill Council (CSIR-CECRI).

CSIR JIGYASA: Inculcating Scientific Temper in Youth Through Vibrant Scientists-Students Interaction

Under CSIR & KVS Student-Scientist connect programme "JIGYASA". 1151 Kendriya Vidyalayas connect with 37 CSIR Laboratories targeting one lakh students and nearly 1000 teachers annually. The focus is on connecting school students and scientists so as to extend student's classroom learning with that of a very well planned research laboratory based learning.

The programme is a unique platform to bringing in teachers and scientists for nurturing young minds. The programme envisages opening up the national scientific facilities to school children, enabling CSIR scientific knowledgebase and facility to be utilized by school children.

CSIR Efforts for COVID Mitigation

The unprecedented situation arisen due to the COVID-19 pandemic has posed multifarious S&T challenges. CSIR has responded to the situation with a well-coordinated and integrated approach in cooperation with all relevant stakeholders. CSIR is extending all possible R&D support to the industry and is also aligned to the Government's strategy of mitigation of outbreak. Within the constraints of the lockdown in the country, the initiatives undertaken by CSIR so far can be broadly categorized under the five verticals: Digital and Molecular Surveillance; Rapid and Economical Diagnosis; Development of new drugs/repurposing of drugs; Hospital Assistive Devices and PPEs; and Supply chain and logistics. CSIR has developed 100+ technologies under these technology verticals and is working with about 100 industries. Some of the technologies developed by CSIR are given below:

Digital and Molecular Surveillance:

- Coronavirus genome sequencing- CSIR-CCMB, CSIR-IGIB, CSIR-IMTech, CSIR-CDRI, CSIR-NBRI, CSIR-IITR are doing sequencing of coronavirus to know if any genetic changes are occurring in the virus while it is spreading in the country. The information will help gauge the severity of disease in various geographical regions, developing an ELISA detection test, and ultimately vaccine against coronavirus.
- Surveillance in Kolar, Karnataka; and Jamshedpur in collaboration with Tata Group
- Sero-Surveillance- CSIR Cohort-Scientists and staff of all CSIR laboratories are being tested for presence of corona antibody following due ethical procedure.
- Sewage Surveillance-CSIR-CCMB has developed this procedure and tested in Hyderabad. CSIR-CCMB and CSIR-NEERI will undertake such studies in other cities.
- **Testing Capacity:** Thirteen (13) CSIR labs are engaged in corona testing. Lab wise tests done so far as on January 15, 2021 are given below:

Name of Laboratories	Total tests done
CSIR-IIIM	60,562
CSIR-IMTech	8,821
CSIR-IHBT	82,586
CSIR-NEERI	31,179
CSIR-IITR	1,82,620
CSIR-CCMB	55,617
CSIR-CDRI	1,00,955
CSIR-CLRI	21,357
CSIR-IGIB	15,297
CSIR-NEIST	37,442
CSIR-IIP	7,935
CSIR-NBRI	1,06,581
CSIR-CFTRI	1,07,173

- CSIR-CFTRI and CSIR-IHBT provided nutritional food packets to needy in several parts of the country.

Diagnostics:

- **FELUDA (FNCAS9 Editor-Linked Uniform Detection Assay) - A Novel, Rapid, Simple, Affordable and Innovative COVID-19 Diagnostic:** A CRISPR/ Cas-9 -based paper diagnostic test has been developed by CSIR. The FELUDA methodology has been developed in CSIR-IGIB for detecting single nucleotide variants in RNA or DNA or more broadly detecting any DNA or RNA fragment, without the need for sequencing. This makes it only the third nation in the world to use this technology for Covid-19 diagnosis. The CSIR technology, which has been licensed to TATA Sons, has received DCGI approval and is now being manufactured and marketed as TataMD CHECK. It is the world's first CRISPR Cas-9 based diagnostic tool to be launched globally and will be available through diagnostic centers and hospitals across India.
- **Loop-mediated isothermal amplification (LAMP)-PCR:** LAMP is an isothermal nucleic acid amplification technique. In contrast to the polymerase chain reaction (PCR) technology, in which the reaction is carried out with a series of alternating temperature steps or cycles, isothermal amplification is carried out at a constant temperature, and does not require a thermal cycler. The technology has been transferred to Reliance Industries. Currently, it is under validation at ICMR.
- **Dry Swab Technology for RT-PCR:** CSIR-CCMB has developed RNA extraction free dry swab method for RTPCR based detection of SARS-CoV-2. The method will save time and reduce cost as compared to standard PCR test using Viral Transport Medium (VTM) and RNA extraction. ICMR has conducted two validations of the dry swab method in August and November 2020 respectively. Results indicated that the sensitivity of the dry swab variant method is 79% and specificity is 99% when compared with standard RTPCR test as the gold standard. Considering its lesser cost and quick turn-around, the dry swab variant method can be used as a screening tool only in settings where automated RNA extraction is not available.
- **Large scale sample testing using NGS:** Next-generation sequencing (NGS) allows for analyzing a large number of viral sequences from infected patients, presenting novel prospects for studying the structure of viral populations, and understanding virus evolution and epidemiology. CSIR and Syngene have come together to use NGS for testing of a large number of samples. Using sample pooling and barcoding, it is possible to do sample testing of about 20,000 samples within 2 days. The technology has been submitted to ICMR for approval.
- **Antibody detection in Blood:** For identification and quantification of total Ab specific to SARS-CoV-2, a kit has been developed on a FortBio Octet Platform [Bio-Layer Interferometry]. The developed test is Fast (<1 minute/sample), low cost (₹ 50/test, 200 tests/hr), Error-free @ picomole level, Direct blood (20ml) process, 2000 tests/day/unit/person.
- **Implementing Micro and Mega-Lab sequencing-based SARS-CoV2 diagnostics for cost and time effective molecular epidemiology**

A first of its kind genome sequencing laboratory is has been launched at the New Delhi International Airport for testing samples of all travelers arriving into the country who test positive for Coronavirus disease (Covid-19). The positive samples will be genome sequenced to identify and contain the new mutant variant of Sars-CoV-2, the virus that causes Covid-19, detected in the UK and other countries. Spice Health and CSIR-IGIB have agreed with doing Nanopore-based sequencing. The study involves NCDC and has been started as a pilot project at Delhi airport.

Drugs Development:

CSIR has deep knowledgebase for developing generic drugs and is also known for the development of many new drugs. Indian Generic drugs Industry which supplies drugs to about 200 countries is in strong position because of synthetic processes developed by CSIR-IICT, CSIR-NCL, CSIR-CDRI and CSIR-IIIM. In order to utilize its knowledgebase and help India people fight the menace of coronavirus, CSIR has identified some drugs for synthesis and repurposing which are given below.

- **Favipiravir:** CSIR has developed and patented the synthesis of Favipiravir. In India, initially Favipiravir was launched by GlenMark as oral formulation for treatment of corona at Rs 102 per tablet of 200 mg dosage. Within 6 weeks, CSIR-IICT process became commercial with Cipla which launched it at Rs 68 per tablet. In the meantime, CSIR-IICT has transferred the process to another 5 companies on non-exclusive basis. All this competition resulted in further reduction in the drug price to Rs 40 per tablet. This product is approved by DCGI as drug for mild and moderate patients of Covid-19.
- **Remdesivir:** CSIR-IICT has developed the process for Remdesivir. CSIR-IICT developed the process even before the tech pack by the innovator Gilead was given to 6 major pharma companies in India. Because of ready know-how, now more than 6 companies compete in the market and the price initially was Rs 5800 per injection of 100 mg which came down to around Rs. 2800 per injection. CSIR-IICT know-how helped start-ups and CROs to supply key intermediates to the major pharma companies in minimizing import of key starting materials.
- **Arbidol:** CSIR-CDRI has developed process technology and undertaking clinical trials with a company.
- **Phytopharmaceutical Formulation:** CSIR and Sun Pharma are developing ACQH, a formulation developed for dengue being repositioned for coronavirus. The application for the clinical trial has been submitted to DCGI and approval is expected soon. This is first phyto-pharmaceuticals application from the country.
- **Ayush Drugs:** CSIR-IIIM, Jammu is conducting clinical trials of the following Ayush formulations:
 - *Withania somnifera* (*Ashwagandha*)
 - *Tinospora cordifolia* (*Guduchi*)
 - *Glycyrrhiza glabra* (*Mulethi*)

Hospital Assistive Devices:

- **Swasthavayu - An Indigenous Non-invasive BiPAP Ventilator:** To address the shortage of ventilators faced during the Covid-19 pandemic, CSIR-NAL has developed the non-invasive ventilator called Swasthavayu in a record time of 36 days. This ventilator can be used in non-ICU settings such as make shift hospitals etc. for addressing respiratory problems in mild Covid-19 patients. The ventilator has undergone several regulatory certifications and also clinical trials on patients at multiple hospitals and has received approval from DGHS and the technology has been transferred to multiple industries.
- **Coverall:** CSIR-NAL has developed high quality PPEs and transferred the technology to MAFL, Bengaluru. After certification, about one lakh pieces have been supplied to Government. The current

capacity of the production is 7000/day which can be enhanced to 30,000/day depending upon requirement.

- **Face Mask: CSIR constituent's laboratories have developed following face masks:**
 - **High Efficiency Hydrophobic Three-Layered Facemask:** The facemask is composed of two/three hydrophobic non-woven polypropylene (PP) layers in the outer and inner side and a 'High Efficiency Particulate Air' filter in the middle. The performance of the developed mask certified from SITRA, Coimbatore.
 - **Poly Ti:A Biopolymer Coated Medical Grade Mask:** It is a two layered masks that use biopolymer (Bacterial cellulose) coated mask, which are having much higher surface area and very fine nanofiber of cellulose to trap viruses and bacteria. It is developed using the patented technology of CSIR-NCL on Bacterial cellulose. The performance of the developed mask certified from SITRA, Coimbatore.
 - **Reusable Face Mask with Antimicrobial Coating:** It is a tri-layered mask which consists of the hydrophobic outer layer that repels the liquid aerosol and the middle bactericidal layer to kill the microbes that comes in contact with the masks thereby providing dual protection benefits to the end-users. The inner hydrophilic layer absorbs the hot air, sweat and facilitates improved breathability. These masks and the coatings have been designed and formulated to sustain up to 30-50 washes. The properties of the masks have been certified by SITRA, Coimbatore.

Makeshift Hospital: CSIR-CBRI and CSIR-SERC have developed the technology of fabricating makeshift hospital within a short span of time. L&T is the industrial partner for this activity. Demonstration hospitals (consisting of 10 bed) has been erected at Ghaziabad and 4th Bn National Disaster Response Force (NDRF), Arakkonam.

Fast Track Translation (FTT)/ Fast Track Commercialization (FTC) Projects implemented during FY 2018-2020

Sr. No.	CSIR Lab	Project Title
1.	CSIR-AMPRI	Red mud based lead free material for X-ray and CT scanner rooms
2.		Development of multilayer sandwich panel for defense applications
3.		Development of Fly Ash based Geopolymeric Materials for Broad Application Spectrum
4.		Pilot scale production and demonstration of closed cell aluminum composite and hybrid composite foams for transportation, defence and construction sectors
5.		Advanced Geopolymeric Coating Material for Structures of Mild Steel (AGCM)
6.		Development and Manufacturing hybrid green composites using industrial and agro wastes in pilot scale and facilitating entrepreneurship
7.		Development of solid-state electromagnetic joining technique for materials of interest in aerospace/space
8.		Design & Development of bamboo structures (Bamboo/composite sections & joints)
9.	CSIR-CECRI	A surface treatment process for enhanced corrosion resistance of Iron and steel
10.		SX-EW process for the regeneration of etchant and recovery of copper from spent alkaline ammoniacal cupric chloride PCB etchant
11.		Multi-analyte sensing platforms and molecular probes for detection of target biomarkers using electrochemical and optical methods
12.		Thermal barrier coatings for strategic applications
13.		Self-humidified Nafion based composite membranes for open cathode PEMFC stacks
14.		Development of 2.5V / 1A sodium-ion batteries with performance scalability possibilities
15.		Development and demonstration of rechargeable Li-S batteries for lighting and consumer electronics applications
16.	CSIR-CGCRI	100 W CW/Modulated Thulium fiber laser: at 1.94 μm for efficient tissue vaporization and at 2.05 μm for strategic application
17.		Wear resistant Ceramics for cutting & milling operation: Process optimization of SiAlON-WC composites for rock drilling application

18.		Synthetic high alumina aggregate from sillimanite beach sand for refractory application
19.		Superior fused magnesia from impure Indian magnesite for self sustenance
20.	CSIR-CMERI	Process technology for large area (10 cmX10 cm) manufacturing of micro-nano patterned (300 nm-300 micron) hydrophobic surfaces
21.		An engineered design and development of a solar assisted community level multifunctional adsorbent based integrated water filtration unit for removal of ground water fluoride, microorganism with supported handy fluoride level detection kit and proper management of generated sludge
22.		Design and Development of 1 TPD Fully Automatic Biodiesel Plant
23.		Design and development of Mob Control Vehicle (MCV)
24.		Development of Carbon-Graphite Piston Ring and Solenoid Valve suitable for high temperature aircraft LRUs
25.		Development of self-propelled specialty harvester for leafy crops with a minimum field capacity of 4 acre/day (ex. Stevia, mentha, vegetables)
26.		Design of a combined cutting, binding and baling equipment for stubble management
27.	CSIR-CCMB	Develop novel DNA based identification system of Plant bioresources (both agri and wild varieties grown/harvested) for conservation
28.		Development of male infertility diagnostic kits (DeMID)
29.		Up scaling of high yielding / elite Samba Mahsuri mutant line 'SM93' for product translation
30.		Development of climate resilient lines of the bacterial blight resistant and low glycemic index rice variety, Improved Samba Mahsuri possessing resistance against blast disease and enhanced tolerance to submergence and drought
31.	CSIR-CBRI	Pilot Scale Preparation of Silica Nanoparticles and their applications in cement based materials
32.	CSIR-CDRI	Clinical development of antiplatelet compound S007-867 for treatment of cardiovascular diseases. (Antithrombo-867)
33.		Development of a small molecule inhibitor of PCSK 9
34.	CSIR-CEERI	Design and Development of Dispenser Cathodes for Microwave Tubes
35.		Development and optimization of software for real-time monitoring of milk supply chain
36.		Solar PV based Smart Multi-vehicle EV Charging Station
37.	CSIR-CSMCRI	Energy efficient process to treat the reject stream of water desalination

		plant
38.		Generation of energy from microalgal feedstock through CO ₂ capture from flue gases
39.		Greener process for the synthesis of 3-methyl-5-phenylpentanol (Mefrosol) at 1 Kg level with >90% yield ad 98% purity
40.	CSIR-CSIO	Smart Electrochemical Tongue (e-Tongue) to detect heavy metal ions in potable water
41.		Image Guided vascular vein visualizer: VeinViz
42.		Electromyogram (EMG) controlled Below Elbow prosthesis
43.		Technological solutions for contactless alive/dead detection of victim soldier in battle field
44.		Precision instrumentation towards whole-slide digital microscopy for high-throughput analytics
45.		Ligament Injury Assessment & Therapy Device for motor-rehabilitation of Soldiers “L-GEAR”
46.		Online Monitoring System for detection of Night-time Poor Visibility areas in Urban settings
47.		Harvesting of electrical energy using geared AC synchronous motor to charge batteries of mobile phones
48.		Design and Development of Airfield Ground Lighting Systems (AGLS)
49.		Design and development of enhanced vision system for military surface transport vehicles
50.		Design & Development of Head Up Display for Passenger Aircraft
51.		Divya Nayan: A personal reading machine for visually impaired
52.		Scale - Up of AutoCEPH: A software for 2D computerized Cephalometric Analysis as a web service
53.		Design and Development of Indigenized Lyophiliser for preservation of Indian fruits and vegetables
54.	CSIR-CIMFR	Bio-methanation of coal rejects / low grade coal and biomass-Demonstration Model at village Gaurigram, Chandankiyari, Dhanbad
55.		Installation and commissioning of a 10000 LPH coalmine water reclamation plant for obtaining drinking water
56.	CSIR-CLRI	Retanning cum fatliquoring agent
57.		Retanning agent from Paper Industry Wastes
58.		Waterless Chrome Tanning Technology
59.	CSIR-IICT	Development of Engineered Biochar from non-edible de-oiled seed cake/stubble wastes for the removal of targeted herbicides/pesticides

		from agricultural wastewaters and subsequent soil remediation
60.		Catalytic conversion of linear alkylbenzene raffinate to be utilized for Jet rocket fuel
61.		Indigenous enzymes for degumming of rice bran oil and other vegetable oils
62.		Preparation of polymer-grade vinylidene fluoride (VDF) and chlorotrifluoroethylene (CTFE) and their polymerization processes
63.	CSIR-IMMT	In-house development and fabrication of stirred mills for energy-efficient processing of low-grade ores
64.		Synthesis of Mg-Y ₂ O ₃ magnesium nano-composite by hot consolidation process for light weight applications
65.		Production of Sm ₂ O ₃ and CO ₃ O ₄ from SmCo permanent magnet scrap
66.		Design & development of a vertical slurry transport system for lifting of minerals/ores in heterogeneous regime
67.		Recovery of Nickel, Chromium and Iron from Chromite Overburden (COB) in 100 kg scale
68.		Membrane technology for separation/recovery of heavy metals (Cr, Ni, Zn) from industrial waste water: Mathematical modeling and process development
69.		Development of advanced Tribological Coatings and Environmental Barrier Coatings (EBC) by Electrophoretic deposition and thermal spraying for mining equipments, pipeline, industrial applications and processes
70.		Development of Novel Tungsten Alloy Cubes for Strategic Applications
71.		Wireless Thermocouple for temperature measurement of rotating and moving surfaces
72.		Development of cost effective Industry grade non contact type online moisture sensor using microwave and NIR
73.		Development of an Image Processing based system for monitoring feed rate of materials moving on a conveyor
74.		Development of an induration furnace monitoring system with IoT and Artificial Intelligence (AI) technique in a pelletization plant
75.		Processing of secondary resources for the production of battery materials
76.		Rapid and Point Care Microfluidic kit for multiplex diagnosis of viral diseases in tomato and apple
77.		CSIR-IHBT
78.	Optimization of aeroponic and hydroponic conditions for increasing	

		commercial crop productivity
79.		Introduction of high value spice Saffron (<i>Crocus sativus</i> L.) in unexplored areas
80.		Identification of improved clone(s) of <i>Stevia rebaudiana</i> (Bertoni)
81.		Combating Iron and Zinc deficiency using microalgae based foods
82.		L-Asparaginase (HimAspase™) with no glutaminase activity for food processing and therapeutic applications
83.	CSIR-IGIB	Genomic Approaches for Rare Genetic Disease Diagnosis (RareGen)
84.		Radiological AI system for Parallel Informatic Detection of Clinical Triage emergencies (RAPID-CT)
85.		GOMED-TeCh: Development, Translation and Commercialization of Genetic tests for prevalent genetic diseases in India
86.		Genomics for Public Health in India (IndiGen)
87.	CSIR-IMTECH	Development of bio-better of G-CSF (Granulocyte-Colony Stimulating Factor) for prophylactic and therapeutic interventions in neutropenia
88.		Validation of potential biomolecules against Parkinson's disease: A pre-clinical study
89.		Development of Anti Thrombin-Clot Specific Streptokinase (ACSSK), for Treatment of Acute Myocardial Infarction and Ischemic Stroke
90.		Technology development for Gellan gum production
91.		Development of applications of laccase for Diverse (Food health and cosmetic) Industries (DALDI)
92.	CSIR-IIP	Aircraft testing with Bio-Aviation fuel blended in Jet-A1 fuel
93.		Development of Catalyst and Alternate Process for Producing Light Olefins (C2-C4)
94.	CSIR-NEIST	Efficient and large scale production of carbon quantum dots (CQDTs) from cheap coal feedstock
95.	CSIR-NIIST	Development of an onsite sewage treatment for small establishments
96.		Development of Cellular Sensors: Biocompatible fluorescent molecules for sensing and cellular imaging of PH, Zn ²⁺ and reactive oxygen species
97.		Fused Thiophene based FET devices for lung cancer VOC biomarker detection
98.		Electrochromic Devices for Efficient Energy Management and Utilization
99.		Development of lithium silicate based ceramics as CO ₂ sorbents for sorption enhanced steam methane reforming
100.		Technology assessment and integration of CSIR's lignocellulosic ethanol programs/facilitating technologies for a feasible 2G ethanol

		technology (CSIR-2GE)
101.		Fluorescent Materials for Security Applications
102.	CSIR-NML	Annealing simulator integrated with online process control sensors for run out table process simulation
103.		Piloting of the process for Production of Premium Grade Iron Oxide from Waste Ferrous Chloride Solution Generated from Steel Pickling and Ilmenite Processing Units
104.		Pilot scale processes for recycling of metals/ materials from E-waste
105.		Development of biodegradable eco-friendly flotation reagents for sillimanite, limestone, iron ore fines and coal
106.		Smart sensing system for cold drawn high end wires
107.		Scale up and commercialization of indigenously developed hydrogen standard in steel
108.		CSIR-NBRI
109.	CSIR-NEERI	Restoration of Nallah with Ecological Units - RENEU
110.		Development, Demonstration and Dissemination of Improved Ceramic based Cook-stoves (Both domestic and Community) for Particulate Emissions Control
111.		RISK-PiNET : GIS based Risk Assessment Modelling Tool for Water Distribution System
112.		Smart Disposal, Incineration and Carbonization Systems (SMART-DISC) for Menstrual Waste Management
113.		Utilization of industrial waste through appropriate technologies for developing value-added Products
114.		Scale-up of process for CO ₂ capture based on biogenic molecules and pilot scale demonstrations
115.		CSIR-NAL
116.	VTOL Winged UAV for multi-mission application (VTOL-UAV)	
117.	CSIR-NCL	Energy efficient clean production of hydrogen
118.		Smart AGroinformatics with Internet of Things to enable Agriculture-4.0 (SAGITA)
119.		Continuous manufacturing platform for diazonium salt based reactions for synthesis of Azo dyes and APIs
120.	CSIR-NIO	Coral Reef Monitoring and Surveillance Robot (C-Bot)

**Ongoing Fast Track Translation (FTT)/ Fast Track Commercialization (FTC) Projects
(Financial Year 2020-2022)**

1.	CSIR-AMPRI	Lightweight Aluminium hybrid foam core multi-layer sandwich panels with metal / 3D Carbon Fibre / Kevlar as face sheets for aerospace, blast resistance and transportation applications
2.	CSIR-CECRI	Aerogel based thermal protection systems for nozzle surfaces in space and aerospace applications
3.	CSIR-CECRI	Development of eco-friendly trivalent chromium plating process
4.	CSIR-CEERI	Development of High Power Thyratrons for Fast Switching Applications
5.	CSIR-CEERI+ IIM+ CFTRI	Development of rapid Honey adulteration detection system
6.	CSIR-CSIO	Batch digital microscopy with marker-specific auto-scoring for high-throughput analytics
7.	CSIR-CSIO	Development of force-distance curve based Atomic Force Microscope for multi-parametric Imaging of Biological Systems.
8.	CSIR-CSIO	Energy Management using Non-Intrusive Load Monitoring (NILM) Technique
9.	CSIR-CSIO	Marine Bearing Sight for Indian Naval Ships and Submarines
10.	CSIR-CSIO	Postural Stability Assessment System (Dynamic)
11.	CSIR-CSIO	Visual Landing Aids for Naval Operations
12.	CSIR-IMMT + NAL	Stealth Technologies: Development of carbon- Ferrite composites materials for microwave absorbing
13.	CSIR-NAL	Development of spin valve GMR based current sensor
14.	CSIR-NPL	Broadband Rydberg Atom-based Quantum Sensor
15.	CSIR-CBRI	Development of technology for high strength binder/value added building products using flue gas desulphurization (FGD) gypsum - a by-product of coal based thermal power plants
16.	CSIR-CBRI	Technology package for eco-friendly burnt clay bricks with low carbon footprints
17.	CSIR-CBRI	Valorization of lime sludge through development of environmental friendly building products
18.	CSIR-CBRI	Utilization of marble waste to develop cost-effective sustainable building products
19.	CSIR-CMERI	Batch scale production of high quality activated carbon from biomass wastes for waste water treatment – an initiative towards waste to wealth

20.	CSIR-CMERI	Design & development of self-sustainable integrated municipal solid waste disposal system (iMSWDS) for bulk waste generator
21.	CSIR-CRRI	Microscopic traffic network simulation model for mixed traffic conditions (MiTraNS)
22.	CSIR-SERC	Development of simple low cost flexible heating module for assessing fire rating of steel structural components
23.	CSIR-SERC	Dissipative fuse link beam-column connection for seismic resilient steel moment frames
24.	CSIR-SERC	Folded textile reinforced concrete fencing panels for highway and other infra project applications
25.	CSIR-AMPRI	Development of Advanced Non - Toxic Radiation Shielding Material From Tailored Brine Sludge
26.	CSIR-AMPRI	Light Weight Aluminium Alloy Matrix composites for automobile, defence and Engineering Applications
27.	CSIR-CECRI	Indigenous Development of Phosphors for Image Intensifier Tubes
28.	CSIR-CECRI	Super Hard Nanocomposite Coatings by PVD onto Automotive Chain Pins/Cutting Tools
29.	CSIR-CGCRI	Development of high-power optical amplifier (1.0 -5.0 W)
30.	CSIR-CGCRI	High piezoelectric coefficient composites for application as flank array sensors
31.	CSIR-IMMT	Development of process for reduction roasting of low and lean grade iron ores using fluidized bed roaster (in pilot scale) to maximize the recovery of iron values
32.	CSIR-IMMT	Pilot Scale Study of Reduction of Phosphorous Content in High Phosphorus Indian Iron Ore
33.	CSIR-IMMT	Processing of spent liquor for improvement of alumina productivity in Bayer process
34.	CSIR-IMMT	Development and scale up studies for Cu incorporated Zn/Al layered double hydroxide antimicrobial material as protective cement additive
35.	CSIR-NML	Development of advanced giant magneto-impedance (GMI) based sensor for structural health monitoring of engineering structure with enhanced area coverage
36.	CSIR-NML	Production of Fe-Ni/Co-Mo metallic alloy & alumina rich slag from NiMo/Co-Mo spent catalysts
37.	CSIR-NML	Pilot plant and commercial plant scale flotation studies using newly

		developed eco-friendly reagents for limestone and sillimanite flotation
38.	CSIR-NML	Development of CS Analytical and Charpy Impact Toughness Physical Standard (CRM) in Steel
39.	CSIR-NML	Development of the close loop pilot process for recycling of metals/ materials from e-waste
40.	CSIR-NML	Industrial Hot Rolling Run Out Table and Continuous Annealing Line Simulations for developing Advanced High Strength Steels (AHSS)
41.	CSIR-CECRI	Design and development of electrodes to generate hydrogen peroxide
42.	CSIR-CLRI	Translation of Technology on Preservation-cum-Unhairing of Hides and Skins
43.	CSIR-CLRI	Translation of the Technology on "Manufacturing Organic Supplement and Compost from Hair Waste"
44.	CSIR-CSMCRI	Greener process for the synthesis of perfumery chemicals alpha-Campholenic aldehyde and Carveol at 1 Kg level in ~85% yield and >95% purity
45.	CSIR-CSMCRI	Deployment of Integrated process for enhancement of brine evaporation rate @ 30-40% to improve yield of solar salt in existing areas
46.	CSIR-CSMCRI	Multi-locational Commercial Deployment of CSIR-CSMCRI's 'Zero Waste' Spent Wash Management Technology - Potash Fertiliser & Regulatory Compliance
47.	CSIR-IICT	Development of vapour phase catalytic ammoxidation processes for the synthesis of aromatic nitriles
48.	CSIR-IICT	Development of Process for Pharmaceutical grade Hydroxy Propyl Methyl Cellulose (HPMC)
49.	CSIR-IICT	Development of process for production of 4-methoxy acetophenone in a continuous single-step process
50.	CSIR-NCL	Synthesis of bio-derived 2,5-furan dicarboxylic acid (FDCA) as analogue to Purified terephthalic acid (PTA)
51.	CSIR-NCL	Process for the catalytic dehydration of methanol (MeOH) to dimethyl ether (DME)
52.	CSIR-NEIST	Development of an efficient and cost-effective process for production of Caffeine and Tannins from Tea Waste
53.	CSIR-NIIST	Fluorescent Pigments for Currency Application
54.	CSIR-CECRI	Design and Development of Indigenous Smart Battery Management System for Energy Storage and E-vehicle applications
55.	CSIR-CECRI	Development of 250W direct methanol fuel cell stack with in-house

		Nafion based hybrid membranes for portable and strategic applications
56.	CSIR-CECRI	Fabrication of 12V, 500F supercapacitor device assembly
57.	CSIR-CECRI	Refurbished cathode material from spent lithium-ion batteries: a direct approach towards renewable feed stock
58.	CSIR-CIMFR	Pilot scale demonstration of coal mine water usage for commercial algal production for food – fertilizer in hybrid photo-bioreactor for combating malnutrition
59.	CSIR-IIP	Vacuum Swing Adsorption (VSA) Process for Up-gradation of Bio-gas to Bio-methane Meeting BIS Specification for Bio-PNG and CBG Applications
60.	CSIR-NIIST	Indigenous Fabrication of Transparent Conducting Oxide (TCO) Coatings by Spray Pyrolysis for Dye Sensitized Solar Cell Application
61.	CSIR-NIIST	Translating Electrochromic Devices to 1'×1' Dynamic Windows: Towards Industrial Smart Glass Technologies
62.	CSIR-AMPRI	Development of Bamboo Composite Beams and their specifications for engineering applications
63.	CSIR-CFTRI	A cost-effective process of preparation of arabinoxylan from wheat bran and its incorporation in low dietary fiber food products for their commercial application
64.	CSIR-CFTRI	Development of export protocol (sea route) for fresh pineapples
65.	CSIR-CFTRI	Minimally processed fruits with extended shelf life
66.	CSIR-CFTRI	Production of Isomaltooligosaccharides (IMO) using indigenous transglucosidase from primary and secondary starch sources
67.	CSIR-CIMAP	Commercialization of 'CIM-Pushti': Withanolide-A rich, Leaf Blight tolerant high yielding variety of Ashwagandha (<i>Withania somnifera</i>) with good root textural quality
68.	CSIR-CIMAP	Scale-up process for isolation of ricinoleic acid from castor oil and its biotransformation to food-flavor perspective (+)-g-decalactone using <i>Candida</i> strain
69.	CSIR-CIMFR	Pilot scale demonstration of "silica composite "Si-Bps- HAs" (Silica-Botanical pesticides-Humic acid) from coal ash/biomass ash/biogenic silica rich resources as bio-pesticide for agricultural/store grain pests control
70.	CSIR-CMERI	Design and Development of Retractable-Roof Poly House
71.	CSIR-CSMCRI	Cost effective sustainable process for microalgal based γ -linolenic acid production from microalgae through biorefinery approach
72.	CSIR-IHBT	Development of botanical formulation using <i>Artemisia maritima</i> extract for the control of aphids in cabbage/cowpea (DBAM)

73.	CSIR-IHBT	Development of microalgae based protein and micronutrient rich animal feed
74.	CSIR-IHBT	Development of processes for edible and industrial dyes from plant sources for enhanced income
75.	CSIR-IHBT	Up-scaled production of disease free corms of saffron (<i>Crocus sativus</i>)
76.	CSIR-IICT	Agri-waste Biorefinery for Microcrystalline cellulose, Reducing Sugars and Lignin Recovery
77.	CSIR-IIP	Techno-economic analysis of xylitol production from lignocellulosic biomass using whole-cell biocatalyst
78.	CSIR-IMMT	Production of Potash, Sulfur And Phosphorus Enriched Biochars Utilising Biomass And Fertiliser Industries Waste
79.	CSIR-NBRI	Bioefficacy and Toxicity data generation for CIB registration of microbial formulations applicable for the biological control of Fusarium diseases in different crops
80.	CSIR-NBRI	Field trial for early maturity of cotton using Anacardic Acid formulation and CIB registration of the product
81.	CSIR-NBRI	Preparation of Certified Reference Material of important phytomolecules
82.	CSIR-NIIST	Design & development of prototype solar dehumidified drier for cost effective drying of agricultural products
83.	CSIR-CDRI	IND enabling studies and development of CDRI-4655 as anti-hyper triglyceridemic formulation
84.	CSIR-CDRI	Development of new Smac Mimetic against chemotherapy resistant colon cancer
85.	CSIR-IICT	Developing a novel effective therapeutic agent targeting pancreatic and renal cell carcinoma
86.	CSIR-IMTECH	Preclinical studies and process development for production of Tridecaptin M, an antibiotic against colistin resistant Gram negative bacterial infections (AGNI)
87.	CSIR-IHBT	Preclinical Efficacy Validation in Non-human Primate Stroke Model of Anti-thrombin-Clot Specific Streptokinase (ACSSK), with dual properties of fibrin specific clot dissolution and prevention of arterial re-occlusion, for the treatment of acute myocardial infarction and Ischemic Stroke
88.	CSIR-NIIST	Customized Portable Raman spectrophotometric device for multiplex detection of breast cancer biomarkers
89.	CSIR-CSMCRI CCMB CECRI	Homocysteine Specific Novel Sensor for Diagnostic Use
90.	CSIR-IGIB	Development and pilot implementation of a genetic information

		access and analysis system for genetic diseases (GENOMEAPP)
91.	CSIR-IGIB	Radiological AI system for Parallel Informatic Detection of Clinical Triage emergencies (RAPID-CT): Phase 2
92.	CSIR-NBRI	A novel herbal product for vulvovaginal candidiasis
93.	CSIR-CSIO	Electrostatic dust mitigation and environment protection device
94.	CSIR-CSMCRI	Technology for single stage seawater antifouling RO membrane modules and rejuvenation of the same at the end of their life
95.	CSIR-CSMCRI	Advanced Water Treatment System of Antifouling Hollow Fiber and Nanofiltration Membranes
96.	CSIR-CSMCRI	Development of electro-deionization (EDI) system for continuous production of medical grade ultrapure water
97.	CSIR-CSMCRI	Development of indigenous high performance membrane separator for redox flow batteries
98.	CSIR-NEERI	RISK-PiNET Contaminant Intrusion Point Detection Tool for Water Distribution System -Field implementation and Commercialization
99.	CSIR-CIMFR	Investigation into permeable liner for disposal of coal ash in ash disposal ponds
100.	CSIR-NIIST	Reactive Gel-Curing Process for Transforming Environmentally Threatening Industrial Solid Wastes into High Value Building Materials

FBR/NCP Projects implemented during Financial Year 2018-2020

S.No	CSIR Lab	FBR/NCP Projects
1.	CSIR-AMPRI	High performance metal matrix composites for transportation, defense, aerospace and engineering sectors
2.		Additive Manufacturing of Graphene reinforced metal and polymer composites
3.		Hierarchical Reinforcement Approach for improved ILSS of CFRP
4.		Prospects in Development of Magnesium Alloys for engineering and biological applications
5.		Development of Metallic foam for biological, thermal and engineering applications
6.		Electrical insulating Hybrid Composite Sheet using Industrial Inorganic Wastes
7.	CSIR-CCMB	Apomixis Technologies for Increasing Agricultural Production
8.		Towards product development in rice using mutants that have traits of agronomic importance
9.		Genome sequencing of the halophyte <i>Salicornia brachiata</i> CC+E1+A13:N13
10.		Genome Regulatory Elements and the Evolution of Complexity
11.		Mechanistic and functional role of a 'Chiral Proofreading' variant in Animalia
12.		Genomics and epigenetics in health and disease (GEHead)
13.		Mechanistic insights into bacterial growth and morphogenesis
14.		Generation of monoclonal antibodies for research and diagnostics.
15.		Generation of Hepatic organoids by tissue engineering approaches
16.		Tissue Engineering of cartilage and IVD for arthritic and disc degeneration problems
17.	CSIR-CDRI	Investigating chemical therapeutic space and determinants of survival and virulence in malaria [ParaDIgM]
18.		Development of identified lead molecule as novel anti-leishmanial therapeutic agent
19.		Development of therapeutics against skeletal targets to improve bone health
20.		Dissecting the architecture and molecular mechanism of multi-protein complexes (BERosomes) involved in DNA Base Excision Repair (BER) repair and Transcription Coupled DNA repair (TCR) pathways from <i>M. tuberculosis</i>
21.		Non-alcoholic Steatohepatitis (NASH)
22.		Chronic Respiratory Disease Innovation and Solution Program(CRISP)
23.		Development of therapeutics against skeletal targets to improve bone health: therapeutic repurposing of pentoxifylline

24.		Regulatory Development of CDRI Prioritized Lead Compounds
25.		Therapeutics for Lifestyle Disorders [TheraLSD]
26.		Cell penetrating peptide, IMT-P8 as a drug delivery vehicle in management of MRSA infections (PEPTIDOCURE)
27.	CSIR-CEERI	Development of novel compact high power THz device technologies
28.		Development of new generation nano metal-oxide/graphene-polymer composite materials for use in wearable electronics (with CGCRI as implementing lab)
29.	CSIR-CECRI	In-silico guided design of Corrosion Inhibiting Molecules to Materials (CIM2M)
30.	CSIR-CFTRI	Establishment of 'National Analytical Facility' for analysis of nutraceuticals and chemical markers in food products (NAFANC)
31.		Translation of pre-clinically tested probiotic formulation to human population with emphasis on immuno-modulation and gut microflora
32.		Understanding structure-function relationships in enzymes critical for the survival of bacterial food pathogens
33.		Data analytics based on diet diversity, food consumption and nutritional deficiency targeted to the selected aspirational districts in Karnataka and Kerala
34.	CSIR-CGCRI	Development of Hydrophobic Ceramic Hollow Fiber Membrane for MD-based Domestic Water Purification System
35.		Chalcogenide glass and fibers for mid infrared photonics applications
36.		Development of surface modified adsorbents with higher sorption capacity for specific contaminants removal in water/ industrial wastewater (SMA).
37.		1KW Fiber Laser for Industrial and Strategic Applications (LISA)
38.		Development of new generation nano metal-oxide/graphene-polymer composite materials for use in wearable electronics
39.	CSIR-CIMAP	DNA-free CRISPR-mediated Genome-editing in rose-scented Geranium
40.		Understanding the biosynthesis of bioactive triterpenes in the medicinal tree banaba (<i>Lagerstroemia speciosa</i>) for the development of yeast-based synthetic biology platform
41.		Identification of molecular targets towards improvement of root biomass and/or texture in <i>Withania somnifera</i>
42.		Development of Withanamide enriched high yielding, variety of Ashwagandha (<i>Withaniasomnifera</i>)
43.		UAV based high resolution remote sensing for modernized and efficient cultivation practices of commercially important medicinal and aromatic crops. (Acronym: DroneAgri)
44.	CSIR-CIMFR	Preparation of <i>in-situ</i> stress map of Jharia Coalfield
45.		Catalytic Petcoke Gasification
46.		Studies on Sorption-Induced Strain and Permeability Changes in Coal and Shale as a Result of CO ₂ Injection
47.	CSIR-CMERI	Development of multifunctional care device for army personnel
48.		Indigenous development of LRUs suitable for small aircraft

		(InDeLiRU)
49.		Robotic Intervention for Industrial and Strategic Applications
50.	CSIR-CLRI	Polymer Filaments for 3D printing
51.	CSIR-CRRI	Development of Rejuvenating Agent (RA) for use in recycling of Asphalt Pavements RAP
52.		Cold Mix Technology for High Volume Roads
53.		Upgradation of Half Warm Mix Technology for Construction and Maintenance of Bituminous Surfacing
54.	CSIR-CSIO	Design & Development of Angle Independent Multilayer Thin Film Filter (AIMTF) on Foldable and Military Grade Optical Optical Substrates
55.		Design and development of precision optics for soft X-Rays
56.		Magnetic Graphene Coated Polymeric Stationary Phase Ion-Exchangers for Ion Chromatography Column Separations
57.		Low cost functional materials in Selenium Detection in Water
58.		Photonic meta-surfaces for smart applications
59.		Development of multifunctional care device for army personnel
60.		Energy Management using Non Intrusive Load Monitoring (NLIM) Technique
61.		Development of Customized Flow Hive for quality Honey Harvesting & Extraction
62.		Development of Mobile-Soil-Sensing-System and Digital Spatial Repository for Precision Agriculture using Fusion of Proximity Sensors and Geo-statistics Modelling
63.	CSIR-CSMCRI	Indigenously developed reverse electro dialysis process for salinity gradient based power generation
64.		Genome sequencing of the halophyte <i>Salicornia brachiata</i>
65.	CSIR-IGIB	Mechanistic basis of lncRNA mediated regulation in organ development and function (DevoRNA)
66.		Decoding telomerase reactivation in cancer - molecular mechanisms of G-quadruplex-mediated telomerase (hTERT) control
67.		Chronic Respiratory Disease Innovation and Solution Program(CRISP)
68.		Genomics and epigenomics in health and disease (GEHead)
69.		GEAR – Genomic, Evolutionary and Big Data Analytic strategies to address antimicrobial resistance
70.		GRAFT(Garnering Regenerative Approaches For Transplantation)
71.	CSIR-IHBT	Development of high-throughput genotyping platform for next generation plant breeding in tea
72.		characterization and development of agro and process technology for low calorie natural sweetener (<i>Siraitia grosvenorii</i>)
73.		Exploration of Himalayan Plants for Novel Antimalarial Agents: Characterization of potential molecules
74.		UAV based high resolution remote sensing for modernized and efficient cultivation practices of commercially important medicinal and aromatic crops. (Acronym: DroneAgri)

75.		Molecular mechanism underlying Apple scar skin viroid-whitefly interaction
76.		Development of process for converting raw cellulosic biomass into textile fiber and nanocellulose
77.		Creation of aroma bank by utilization of western Himalayan biodiversity (AROMA-BANK)
78.		Bisoprospection Microbiome from Himalayan niches
79.		Non-invasive technology for production of naphthoquinone pigments from Arnebia species on sustainable basis
80.		conservation and sustainable resource generation of high altitude bioresources at CSIR – Centre for High Altitude Biology
81.	CSIR-IICB	EXOsomal MIRna Inhibitor: Identification of the new classes of inhibitors of miRNA trafficking via exosomes (EXOMIRIN)
82.		Non-alcoholic Steatohepatitis (NASH)
83.		Chronic Respiratory Disease Innovation and Solution Program(CRISP)
84.		Genomics and epigenomics in health and disease (GEHead)
85.	CSIR-IICT	Non-destructive depth profiling and identification of debonding defects across polymer interfacial layers by using portable single-sided NMR
86.		Development of hybrid flocculants at 100 g scale for selective adsorption of low grade iron ore slimes and fines to recover iron ore more than 80 %.
87.		Sustainable production of Edible oils from Microalgae
88.		Scale up of materials for Dye Sensitized Solar Cells and Organic Photovoltaics
89.		Mimicking Muscles: Electroactive Polymers for Bionics
90.		Vegetable oil-based Gels as trans free fat (Oleogel)
91.		Chronic Respiratory Disease Innovation and Solution Program(CRISP)
92.		Autologous Transplantation of Transgenically Modified Hepatic Progenitor Cells expressing therapeutic genes-mediated Liver Regeneration (PROMPT)
93.		Enzymatic Process for the preparation of API intermediates
94.		Accelerated Wound Healing by Bone marrow Stem Cells delivered using PEG-PU porous Polymer Scaffolds Grafted with KGF- and/or VEGF- Mimetic Peptides (GRAFT)
95.	CSIR-IIP	Modeling of mono/bi-metallic catalysts for hydroprocessing reactions
96.		Carboxylation of naphtha grade olefins to high value chemicals using CO ₂
97.		Catalytic oxidation of propylene to propylene oxide
98.		Methane Transformation over Nanostructured Catalyst
99.		Process/catalyst development for reduced hydrogen consumption for the hydrocracking of renewable oils (HLess-HCRO)
100.		Catalytic process for the production of BTX/gasoline from bio-naphtha

101.		Electric Conversion of High Polluting Diesel/Petrol 3W, 4W Vehicles in Electric Vehicles and Development of Solar Charging Station
102.	CSIR- IMMT	Green synthesis of Silver nanoparticles against plant pathogens: An alternative solution for chemical pesticides
103.		Developing magnetic refrigerant materials for cooling applications at cryogenic temperatures-(MRM)
104.		Sensors for detection of heavy metal ion contaminations
105.		Dephosphorization of high phosphorus iron ore
106.		Ferro Manganese production from lean grade Manganese ore
107.		Processing of Mineral & Metallurgical Wastes, and Flyash for their value addition
108.		Kinetics and thermodynamics study on reduction roasting of low and lean grade iron ores using fluidized bed roaster to maximise the recovery of iron values
109.		Thermodynamics and kinetics study of ferruginous ilmenite reduction and smelting for production of titania slag
110.		Highly Ordered Functionalized Nano structured Electrolytic Manganese Dioxide with enhanced electrochemical performance for Batteries and Supercapacitors
111.		Protective conducting materials coating of La _{0.6} Sr _{0.4} Co _{0.2} Fe _{0.8} O ₃ (LSCF), MnCo ₂ O ₄ and Mn _{1.5} Co _{1.5} O ₄ on SOFC interconnect Crofer 22 APU by Electrophoretic deposition to mitigate high temperature oxidation and degradation
112.		Development of Active Noise Control Chair for Aircraft Cabin
113.		Preparation of coke and ferro-coke from low ash non-coking coal
114.		Recycling of spent battery materials for value addition
115.		Solvatometallurgical extraction of Cu and Zn from low grade ores and secondaries through Deep Eutectic Solvents(DES)
116.		CSIR-IMTECH
117.	Evolutionary studies on Flexibility and Function of Lipid-bound efflux proteins for Understanding eXtreme drug resistance in microbes (EFFLUX)	
118.	GEAR-Genomic, Evolutionary and Big Data Analytic strategies to address antimicrobial resistance	
119.	Cell penetrating peptide, IMT-P8 as a drug delivery vehicle in management of MRSA infections (PEPTIDOCURE)	
120.	Developing high yielding CHO cell clone producing the anti-RSV mAb	
121.	Development of mass spectral library for characterization of recombinant therapeutic monoclonal antibodies (MSLAB)	
122.	Mega-genomic insights into co-evolution of rice and its microbiome	
123.	Exploring the Indian coastal and marine biodiversity for discovery and production of industrially important microbial proteins	
124.	Development of a microbial system for the production of neo-glycopeptides/ neo-glycoproteins for useful applications	

125.	CSIR-NAL	Aerodynamic studies of aircraft configurations including wing-propeller interaction	
126.		Development of Aeroelastic Algorithms in Aircraft Design	
127.		Environment Establishment for generating Flight Worthy Code from the Display Simulator Code	
128.		Tailoring of Carbon Fiber Reinforced Composites for Enhanced Heat Dissipation Capability, Mechanical Properties and Electrical Conductivity using Carbon Nanotubes /Carbon Materials for Aerospace Applications	
129.		Active Thermal Imaging for Non-destructive Evaluation (NDE) of thin composite aircraft structures	
130.		Certification of 30 HP Indigenous Wankel Rotary Combustion Engine	
131.		Design and Development of Integrated Avionics Display Processing Computer(IADC)	
132.		Development of Airboat (JALDOST)	
133.		Development of Active Noise Control Chair for Aircraft Cabin	
134.		Iron Bird Technology Platform for Evaluating Aircraft Actuation Systems	
135.		UAV based high resolution remote sensing for modernized and efficient cultivation practices of commercially important medicinal and aromatic crops. (Acronym: DroneAgri)	
136.		CSIR-NBRI	Small RNAs and Associated factors for enhanced post-harvest Life (sRNA-life)
137.			Pathway elucidation and identification of genes involved in guggulsterones biosynthesis in <i>Commiphora</i> sps
138.			Sub-genome dominance in endoreduplication and its implication in heterotic benefits to F1-hybrids for biomass and their adaptation
139.			Understanding the epigenetics of fitness advantage of high altitude <i>Arabidopsis thaliana</i> populations under new environments
140.	Genome-editing for enhanced yield and quality traits (GE-plant)		
141.	Characterization and value addition of plant-based resins, gums and waxes		
142.	CSIR-NCL	Nanofiber membrane of PET-cellulose derivative immobilized with nanocomposites as separators in lithium ion battery	
143.		Design and Development of Indigenous Strain Portfolio for the Production of Penicillin V (PenV-IP)	
144.		Scalable synthesis of multifunctional nanomaterials for advanced applications (batch processing/flow synthesis)	
145.		Towards Large Scale Solar Hydrogen Production (SoHy)	
146.		Insight into cell physiology for cell culture medium formulation	
147.		Development of mass spectral library for characterization of recombinant therapeutic monoclonal antibodies (MSLAB)	
148.		In-silico guided design of Corrosion Inhibiting Molecules to Materials (CIM2M)	
149.		CSIR-NEERI	Estimation of Ecosystem Services and Environmental Damage Cost

		Due to Climate Change: Biodiversity Perspective
150.		Understanding Critical Zone Structure: WRJ-1 Critical Zone Observatory
151.		Waste to Wealth
152.	CSIR-NEIST	Utilization of North East Region (NER), India clay minerals for ceramic applications
153.		Value addition of non-timber wood available in the North Eastern region of India by chemical modification for different industrial applications
154.		Plasmonic nanoparticles decorated 2D nanosheets for detection of the fluoride and arsenic in drinking water: Fabrication of a paper strip based analytical device
155.		Ammonia from dinitrogen at ambient condition by new advanced material: a potential energy saving process than Haber-Bosch
156.		Development of brown spot (<i>Drechsleraoryzae</i>) disease tolerance in rice through multiplex-multi-gene CRISPR-Cpf1 genome editing system
157.	CSIR-NGRI	Geodynamics and Metallogeny of parts of the East Indian Shield with specific reference to Diamond, Iron Ore & Chromitite-PGE occurrences (GeoMet)
158.		Synthesis of Earthquake Hazard scenario in NW Himalaya by Investigating the multi-scale Variations in structural and seismotectonic Assemblages (SHIVA)
159.	CSIR-NIIST	Development of Mn-based RE-free intermetallic permanent magnets for automotive and energy generation
160.		Exploring in-situ synthesis for Titanium Metal Powder by direct reduction of synthetic rutile
161.		Development of Warm White Light Emitting Single Phased Oxyfluoride Phosphors for Energy Efficient and High Color Rendering LEDs
162.		Deciphering the microbiome of native wild coastal saline tolerant rice varieties of southern India and understanding the impact of seawater in structuring the root associated core microbiota using pokkali rice as a model plant
163.		Chromogenic Materials for Smart Coating Applications
164.	CSIR-NIO	Impact of Climate Change on the Physics, Biogeochemistry, and the Ecology of the North Indian Ocean (CliCNIO)
165.		Enhancing live stocks of herbivore fishes through captive breeding to control the macroalgal dominance in coral reefs to sustain the fishing revenue
166.	CSIR-NML	Self-healing Coatings for Corrosion Protection of Steel & Aluminium alloys
167.		Synthesis of new 2D materials other than graphene for energy application
168.	CSIR-SERC	Development of Methodologies for Remaining Life Assessment and Risk-based Inspection Scheduling of Piping Systems under Corrosive Environment (ReLife-InS)

169.		Multi-scale damage characterization of laminated FRP composites under fatigue loading
170.		Development of composite Bridge Deck Systems for Fast Track construction
171.	CSIR-4PI	Carbon and Nitrogen cycling in the Earth Sciences (CNCES)

Ongoing FBR/NCP Projects (Financial Year 2020-2022)

1.	CSIR-NCL	Phagocytosis of full-length Tau oligomers by actin-remodelling of activated microglia
2.	CSIR IICB	Deriving a pan-omics diagnostic pipeline for systems level immune health and therapeutic targeting in systemic autoimmunity
3.	CSIR IICB	Leishmaniasis: target specific approaches to affect host-pathogen interaction and disease process
4.	CSIR IICB	Modern innovative solutions for environmental/ occupational lung health challenges using clinical and pre -clinical strategies
5.	CSIR IICB	Non-alcoholic fatty liver disease (NAFLD): Novel pathogenic mechanism and therapeutic development
6.	CSIR IICB	Targeting RNA driven processes: Novel chemical biology approaches to identify new classes of RNA modulators
7.	CSIR IICB	Exploring role of mechanical cues in immunocellular regulation
8.	CSIR -IICB	Mechanistic understanding of role of human ZMYND8 in tumor microenvironment-dependent transcriptional reprogramming leading to metastasis in colorectal cancer
9.	CSIR IICB	Restoration of p53 and Rb through targeting their post-translational modifiers (PTM) HAUSP and MDM2 in glioma and stepping towards development of novel inhibitory peptide designing from interacting interface
10.	CSIR IICB	Theranostic approach in Glioblastoma Multiforme (GBM) using engineered oncolytic Virus derived particles (VDPs)
11.	CSIR-IICT	Chemically induced degradation of proteins using proteolysis targeting chimera (PROTAC) molecules
12.	CSIR-IICT	Strategies to ameliorate neurodegenerative disorders: mitochondria targeting agents for disease modifying role
13.	CSIR-NGRI	Probing the Structure and Kinematics of the NW Himalaya for Assessment of Earthquake Hazard Potential
14.	CSIR-NGRI	Geodetic measurements for crustal deformation Along a N-S Transect in India
15.	CSIR-NEIST	Earthquake Hazard Studies in Moderate and Severe Seismic Zones
16.	CSIR-4PI	Integration of GNSS and Broadband data for high resolution velocity structure and crustal deformation in Jammu, Kashmir and Ladakh Himalaya
17.	CSIR-NGRI	Structure, Anatomy and Geological Evolution of the Singhbhum Mobile Belt, Singhbhum Craton, East India (SIMO)
18.	CSIR-NGRI	Hydro- Mechanical Modelling in Seismically active Koyna- Warna region, Maharashtra, India
19.	CSIR-NGRI	Electrical Vector Resistivity Imaging (EVRI): a novel method for 3D subsurface mapping
20.	CSIR-NGRI	To Develop Capability in Multicomponent, Long-Offset Seismic Data Acquisition with increased seismic bandwidth 10 to 200Hz
21.	CSIR-NIO	Focused Research on specialized ecosystems in the South Eastern Arabian Sea for sustainable utilization and management of resources (FoRSEAS)

22.	CSIR-NIO	Long-term evolution of monsoon and associated processes
23.	CSIR-NIO	Influence of methane/methane hydrate on ecology and biodiversity at the methane seep locations in Indian EEZ
24.	CSIR-NIO	Study on the nature and formation of Ramsethu & its surrounding environment.
25.	CSIR-NIO	Tectonic and magmatic processes along the slow-spreading mid-oceanic ridges and subduction zone in the Indian Ocean
26.	CSIR-NIO	Interactions between trace metals and marine biota in the Indian Ocean
27.	CSIR-NEERI	Assessing influence of open and closed drain system on ecosystem services using meta-omics approach
28.	CSIR-NEERI	Mapping of the impacts of Climate Change (Extreme weather events) on critical health and social care systems in Aspirational Districts (ADs)
29.	CSIR-NEERI	Understanding Food-Energy-Water Nexus in Dynamics of Critical Zone: WRJ-1 Critical Zone Observatory
30.	CSIR-NGRI	Development of new technologies for Seismic Image Enhancement and fine scale Subsurface VELOCITY structure
31.	CSIR-NIO	Synergizing marine ecology with bioprospecting: Harnessing marine living resources for products and bioprocesses “BIOPROsmar”
32.	CSIR-NIO	Ecological processes and prediction of coastal pollution in Mumbai waters
33.	CSIR-4PI	Development of a modelling platform for Hydro-meteorological Disaster early Warning System for major metro cities in India
34.	CSIR-AMPRI	Development of 3-D printer for additive construction of scaled model of building and construction material optimization
35.	CSIR-AMPRI	Development of polymer / geopolymer based nanocomposites for antimicrobial coating applications
36.	CSIR-CBRI with CSIR-CIMFR	Geotechnical Novel Solutions for Underground Infrastructures
37.	CSIR-CBRI	Spalling-mitigation solution of self-compacting high-strength concrete at elevated temperature condition using recycled tire’s polymer fiber
38.	CSIR-CBRI	Development of Innovative cool roof with improved thermal & energy performance
39.	CSIR-CBRI	Structural Performance Assessment of Connections in Bamboo Structures
40.	CSIR-CBRI	Multi-temporal Optical Imaging Drone based Landslide Monitoring and Warning
41.	CSIR-CIMFR	Roof rock reinforcement system (R3S) for mine roadways intersection under varying geomining conditions.
42.	CSIR-CMERI	Development of Ultra-precision Co-ordinate Measuring Machine (UCMM) with sub-micron range uncertainty
43.	CSIR-CRRI with CSIR-NPL	Development of prefabricated plastic panels for road construction
44.	CSIR-CRRI	Development of Trip Generation Manual for Indian Cities
45.	CSIR-SERC	Performance Based Retrofitting of Ageing Infrastructure (Existing Bridges, Power Plant Structures & Transmission Line Towers)
46.	CSIR-SERC	Engineering of Large Floating Offshore Structures and Systems for

		Renewable Energy Farming
47.	CSIR-SERC	Advanced Cementitious Composites for 3D printing
48.	CSIR-SERC	Nondestructive Testing and Evaluation of Submerged Concrete Structures
49.	CSIR-SERC	Phase-Field Approach for Prediction of Crack Initiation and Growth in Structural Components
50.	CSIR-SERC	Methodologies for prediction of Fatigue damage and remaining life assessment of Latticed Transmission line towers due to wind loads
51.	CSIR-SERC	Development of novel Electrically Conductive concrete utilizing high carbon content industrial solid wastes
52.	CSIR-AMPRI	Development of special radiation shielding materials
53.	CSIR-AMPRI	Bio-Inspired Surface Functionalization of Carbon Nanostructures with Catecholamine/Catechol Rich Polymers: Novel Approach to Develop Advance Biosensors
54.	CSIR-AMPRI	High strength creep and corrosion resistance Magnesium – RE-TE Alloy, composite and foams for Engineering and strategic sectors
55.	CSIR-AMPRI	Advanced Protecting of Magnetic Storage and Bio-Medical Systems using Smart Thin Film Materials
56.	CSIR-AMPRI	Design and development of Smart, Hybrid Polymer Composites and Structures For Advanced Engineering Applications
57.	CSIR-AMPRI	Functional bio-degradable polymers with antibacterial properties for tissue engineering applications
58.	CSIR-CECRI	Computationally aided synthesis of artificial receptors: Biomimetic molecularly imprinted polymers (MIPs)
59.	CSIR-CECRI	Reclamation of spent platinum group metals utilizing hazardous exhaust from plating baths
60.	CSIR-CGCRI	Advanced Manufacturing of Nanofinished Ceramics and Hard Alloy Components by Laser Assisted Ductile Mode Machining
61.	CSIR-CGCRI	Multicomponent glass based optical fibers for Vis-MIR photonic applications
62.	CSIR-CGCRI	Microwave melting of glass: A potential method for tailoring glass properties.
63.	CSIR-CGCRI	Demonstration of Pulsed Fiber Laser Sources for Additive Manufacturing and Precision Material Processing
64.	CSIR-CGCRI	Development of a biodegradable and biocompatible nano ceramics/bioactive glass-polymer composite material with anti-bacterial properties for use in female sanitary hygiene products.
65.	CSIR-CGCRI	Development of an array based low temperature sensing device for early detection of multiple diseases by monitoring exhaled breath
66.	CSIR-CGCRI	Development of Low Carbon MgO-C Refractory for Clean Steel Production
67.	CSIR-CGCRI	Development of thermally stable and antimicrobial bioactive glass based bone graft material
68.	CSIR-CGCRI	Efficient Supercontinuum Sources in the Mid-IR and Visible-NIR using Photonic Crystal Fibers: Innovative Solutions for Deep-Penetration and Ultrahigh-Resolution OCT
69.	CSIR-CGCRI	Development of ultra-low expansion glass-ceramic from low cost resources for application in cooktop panel of LPG gas oven

70.	CSIR-CGCRI	Development of Fiber Bragg Grating long gauge sensors for Structural Health Monitoring
71.	CSIR-CIMFR	ASSESSMENT OF ROCK BOLTING IN –SITU BY ULTRASONIC GUIDED WAVES FOR HUMAN SAFETY IN UNDERGROUND MINES
72.	CSIR-CMERI	Development of Scanning Laser Epitaxy (SLE) process
73.	CSIR-CMERI	Development of Compressed Hydrogen Composite Storage Tank for Fuel Cell Electric Vehicles
74.	CSIR-CSIO	Advanced Functional Nanosurfaces For Optical Sensing of Emerging Pollutants and Their Removal
75.	CSIR-CSIO	Dielectric and Magnetic Material based Composite for Microwave Absorption Applications
76.	CSIR-CSMCRI	Development of efficient synthetic protocol of high temperature (≥ 1200 °C) stable anatase TiO ₂ : A technological challenge for self-cleaning ceramic tiles industries.
77.	CSIR-CSMCRI	New material & strategy for recognition and removal of toxic Polyaromatic hydrocarbons (PAH ₄) and “Dirty dozen” Persistent organic pollutant
78.	CSIR-IIP	Development of Graphene-Based Materials as Booster Dose Additives to Fully Formulated Engine oil for Enhancement of Lubrication Properties
79.	CSIR-IIP	Design and development of nanostructured hybrid materials comprising a semiconductor light harvester and molecular complex for photo-electrochemical reduction of CO ₂ to methanol
80.	CSIR-IMMT	Development of ferro alloys using alternate reductants: syn gas/producer gas, methane, and hydrogen through pyrometallurgical route
81.	CSIR-IMMT	Recovery of metal values from FeCr slag en route to zero waste
82.	CSIR-IMMT	Feasibility study on combustion of Petcoke-coal fuel mix in a Fluidized bed reactor (FBR) and reduction of emission through appropriate dosages of chemical reagents during combustion.
83.	CSIR-IMMT	Recovery of Mn as EMD from low grade ores and secondaries for energy application
84.	CSIR-IMMT	Nanometal engrained Agro waste based Dielectric materials for Embedded Capacitors (NanoDEC)
85.	CSIR-IMMT	Liquid - Liquid - Liquid Extraction and Stripping of Metal Ions in Multi-Helical Flow Reactor
86.	CSIR-IMMT	Value addition of bauxite mining waste rocks for refractory applications
87.	CSIR-IMMT	Development of Green Surfactants for Mineral Flotation and Flocculation: Molecular Level Design, Characterization, and Synthesis (GSMF)
88.	CSIR-IMMT	Design of Novel Luminescent Materials For White Light-Emitting Devices Application
89.	CSIR-IMMT	Development of Flexible Piezocomposite Materials for Self-Powered Electronics
90.	CSIR-IMMT	Multiscale modeling and computational design of high-performance materials for remediation of polluted water

91.	CSIR-IMMT	Synthesis of Calcium sulfo-aluminate: An Eco-cementing material alternate of Portland cement
92.	CSIR-NCL	Understanding Reaction Mechanism of Ethylene Epoxidation
93.	CSIR-NCL	Development of MXene based Composite 2D Nanoengineered Materials for charge storage.
94.	CSIR-NEIST	Nanozyme Decorated Paper-Based Analytical Devices (μ PADs) for Detection of Pathogens and Pesticides
95.	CSIR-NEIST	Development of Microbial based process for Bio-cement, Bio-brick and self-healing concrete using locally available resources.
96.	CSIR-NEIST	Design and Synthesis of π -Extended Carbon Materials for Photonic Applications
97.	CSIR-NEIST	Eco-friendly process for making anatase grade TiO ₂ from Low grade ilmenite
98.	CSIR-NEIST	Exploring biodegradable and biocompatible Magnesium based alloys and coatings for temporary implants
99.	CSIR-NEIST	Conductive Copper Ink for Inkjet Printable Flexible Electronics
100.	CSIR-NEIST	Aluminium-Magnesium-Scandium Alloy and Product Development for Aerospace and Strategic Applications.
101.	CSIR-NEIST	Development of lightweight aluminum alloy and functionally graded components for automotive Category and strategic applications
102.	CSIR-NML	Development of fire resistant lightweight structural materials by hybridization of inorganic-organic polymers
103.	CSIR-NML	Process development of high quality layered transition metal carbides/nitrides/ carbonitrides (MAX)
104.	CSIR-NML	Development of Tin-Selenide (SnSe) based thermoelectric thin films for waste heat recovery in metallurgical and other industries
105.	CSIR-NML	Development of dry beneficiation process technology for low grade iron ore for iron and steel making
106.	CSIR-NML	Big Data Assimilation and Synthesis for Materials Creep Degradation
107.	CSIR-NML	Thermodynamic and kinetic assessment of interfacial equilibrium conditions in multi-component based bulk nano-pearlitic steels.
108.	CSIR-NML	Development of high ballistic strength armour steel with 2 GPa tensile strength and min 50MPa ^{1/2} fracture toughness
109.	CSIR-NML	PREPARATION OF COKE FROM NON-COKING COAL
110.	CSIR-NPL	Establishment of parameters for certain ferrous and nonferrous Alloys and Specialized Polymers for developing their standards & Life Cycle Extension
111.	CSIR-CECRI	Tailoring the graphene reinforced PEEK composite-based filament for 3D printable aerospace structural components
112.	CSIR-CEERI	Development of high emission density nanotechnology based scandate cathode for high power mm wave devices
113.	CSIR-CEERI	Development of Cold Plasma Technologies
114.	CSIR-CEERI	Task 1: High Power Sub-THz Compact Source Applicable for Security screening and Non-destructive evaluation (HP-SCAN) Task 2: Compact photonic crystal (PhC) based W-Band source
115.	CSIR-CSIO	Development of Precision Optical Coatings for Beam Manipulation in Airborne Infrared Search & Track Systems

116.	CSIR- IMMT	Rare earth phosphate TBCs for high temperature insulation and hot corrosion protection applications
117.	CSIR-NAL	Development of corrosion protective coatings for AA 2024 and AA 2014 by low pressure cold spray
118.	CSIR-NAL	Development of Smart Electro-Rheological Fluid System with Hybrid Inclusions for Damping Applications
119.	CSIR-NAL	Enhanced Flight Vision System for Civil Aircraft Simulator
120.	CSIR-NAL	Development of technologies for indigenous Wankel Rotary Combustion Engine
121.	CSIR-NAL	Design and Development of Aerospace grade Autoclave for processing thermoplastic composites (HTHPAT)
122.	CSIR-NAL	Design and analysis of structurally integrated antennas over manned and unmanned aircraft
123.	CSIR-NAL	High Strain Rate Characterization of Structural Materials used in a Transport Aircraft
124.	CSIR-NAL	Development of Micro Gas turbine Engine
125.	CSIR- CSIO	Design and Development of precision Infrared optical elements for Thermal imaging
126.	CSIR-CSIO	Development of holographic systems for 3D dynamic displays
127.	CSIR-NAL	Experimental studies on selection of a liquid fueled and method of injection in a reverse intake valveless pulsejet engine
128.	CSIR-NAL	Multi-Sensor Data Fusion Concepts for Condition Monitoring and Diagnosis of Rotating Machinery
129.	CSIR- NPL	Realization and Dissemination of Boltzmann constant based new kelvin (K)
130.	CSIR- NPL	Design Development and Establishment Of Optical Interferometer Manometer: A Primary Quantum Pressure Standard at CSIR-NPL
131.	CSIR-CIMAP, CCMB, CFTRI, IIM, IHBT, IMTECH, NBRI, NEIST	“Deciphering the mechanism(s) of host-entophytes’ oevolution, enhanced secondary metabolite production and crop productivity”
132.	CSIR-, CIMAP, NBRI, IIM, NEIST, NCL, IHBT, CFTRI, CCMB	Genome-editing for crop improvement (GE-Crop)
133.	CSIR-AMPRI, CIMAP, CSMCRI, IHBT, NIIST, NBRI	Bio stimulants for stress amelioration, enhanced plant productivity and soil health
134.	CSIR-CCMB	Towards product development in rice using mutants that have traits of agronomic importance: Phase-II
135.	CSIR-CIMAP, NBRI	Small RNAs and Associated factors for enhanced post-harvest Life (sRNA-life) Phase-II
136.	CSIR-NCL	Design and Development of Indigenous Strain Portfolio for the Production of Penicillin V (PenV-IP)
137.	CSIR-CFTRI	Understanding structure-function relationships in enzymes critical for

		the survival of bacterial food Pathogens. Phase-II
138.	CSIR-IHBT	Exploration of Himalayan Plants for Novel Antimalarial Agents: Characterization of potential molecules (Phase-II)
139.	CSIR-IMTECH	Development of a Microbial System For the Production of Neo-Glycopeptides/ Neo-Glycoproteins For Useful Applications
140.	CSIR-NBRI	Characterization and value addition of plant-based resins, gums and waxes
141.	CSIR-NBRI	Pathway elucidation and identification of genes involved in guggul stereos biosynthesis in <i>Commiphora</i> sps.
142.	CSIR-NBRI	Sub-genome dominance in end reduplication and its implication in heterotic benefits to F1-hybrids for biomass and their adaptation
143.	CSIR-AMPRI, NBRI	Synthesis of Zeolites from Flyash for Agriculture Applications
144.	CSIR-CCMB	Apomixes and Hybrid Seed Technologies for Increasing Agricultural Production – Phase -II
145.	CSIR-CFTRI	Non-digestible carbohydrates as functional mimics of human milk oligosaccharides
146.	CSIR-CFTRI	Development of chito-conjugates of spice bioactives and clove oil nano-encapsulated polymeric films for enhanced bio-functionality and anti-inflammatory activity
147.	CSIR-CFTRI	Characterization of nutraceuticals from <i>Ulva lactuca</i> and their utilization in functional food
148.	CSIR-CFTRI	Development of a prototype of Machine Learning based Ripening Classifier for selected mango varieties
149.	CSIR-CIMAP	Development of Functional food: <i>Ocimum basilicum</i> derived line (Tukmaria) to be released as plant variety yielding “functional food” for weight management
150.	CSIR-CIMAP	Utilization of <i>Ocimum</i> Genome for production of industrially important medicinal and aromatic compounds
151.	CSIR-CIMAP	Understanding essential oil biosynthesis in commercially important aromatic grasses (<i>Cymbopogon</i> sp.) and <i>Davana</i> (<i>Artemisia pallens</i>) for crop improvement
152.	CSIR-CIMAP	Induction, identification, characterization. And selection of polyploidy in <i>Stevia rebaudiana</i> to increase biomass, stevioside, and rebaudioside-A yield.
153.	CSIR-CIMAP, CDRI	Metabolic engineering of <i>Bacopa monnieri</i> by redirecting the flux towards triterpenoid biosynthesis for enhanced bacosides production
154.	CSIR-CLRI	Developing a Bio- fabricated Leather
155.	CSIR-CIMAP	Development of bare-root seedling simulations system and automatic seedling transplanted for stevia
156.	CSIR-CMERI, IHBT	AI based methodology for grading machine Harvested tea leaves
157.	CSIR-CSMCRI	Process development for the production of phytol and lutein from microalgae through valorization of agro-wastes.
158.	CSIR-CSMCRI, CCMB	Genome sequencing of Recretohalophyte <i>Aeluropus lagopoides</i> (L.) trin. Ex Thw. (Poaceae)
159.	CSIR-IHBT	Genetic improvement of high value medicinal plants
160.	CSIR-IHBT	Introduction, characterization and cultivation of <i>Ferula assa-foetida</i>

		(Heeng) in cold desert regions of Indian Himalayas
161.	CSIR-IHBT	High resolution NextGen remote sensing for medicinal, aromatic and commercially important crops
162.	CSIR-IHBT	"iPRESS: Integrated Plant REgulomics Software & Server"
163.	CSIR-IICB	Classification and characterization of Phytophthora capsici effectors in understanding the early, late onset of pathogenesis and developing inhibition strategies
164.	CSIR-IICT	Isolation and characterization of epothilone production strain and identification of yield improvement factors
165.	CSIR-IIIM	Understanding the physiological role of forskolin in Coleus forskohlii
166.	CSIR-IIIM	A essential oil based formulation for Post-harvest storage of fruits
167.	CSIR-IIP	The engineering/omics potential of Rhodotorulamucilagenosa IPL32 (MTCC 25056) as a workhorse for biotechnological applications
168.	CSIR-IIP	Techno-economic evaluation, nutritional mapping, and toxicity profiling of MUFA rich yeast lipid production from biodiesel plant derived glycerin targeted to be used as edible oil blend
169.	CSIR-IMMT	Shelf-life enhancement of seeds/grains by plasma treatment (PTS)
170.	CSIR-IMTECH	Development of glycocins as “clean label” Food Preservative
171.	CSIR-IMTECH	Iron Deficiency Anemia Solutions via Microbial Engineering Technology
172.	CSIR-NBRI	Unraveling molecular details of drought tolerance in cotton.
173.	CSIR-NBRI	Epigenetic modifications in Rhizoctoniasolani during interaction with Bacillus amyloliquefaciens and its implication for biotic stress management in rice
174.	CSIR-NBRI	Regulation of pectin methylesterase inhibitor for enhancing plant-generated methanol for broad spectrum insect resistance.
175.	CSIR-NBRI	Deciphering the role of sRNAs during synergistic interaction between two Trichoderma spp
176.	CSIR-NBRI	Fe and Zn bio-fortification in rice through integrated microbial and soil nitrogen management in crop field
177.	CSIR-NBRI	Arsenic (As) risk assessment in vegetable crops in arsenic affected areas and mitigation through microbial consortia containing AsMT activity
178.	CSIR-NBRI, IHBT, NEIST	Conservation of threatened plant species of India
179.	CSIR-NBRI	Plant Resource Mapping of Chambal Ravines
180.	CSIR-NBRI	Leveraging genetic resources for accelerated genetic improvement of grain amaranth using genomics and phenotyping approaches
181.	CSIR-NBRI	To identify the potential Aloe species for cultivation in salt affected soils
182.	CSIR-NBRI	Conservation, Agronomics, Metabolomics and genomics of Indian Lotus (KAMAL)
183.	CSIR-NBRI	Targeted metabolite genetics in two underutilized narcotic crops (Cannabis and Opium poppy) for Cannabinoids and Oripavine improvement
184.	CSIR-NBRI	Characterization of Boll-Weight (BW) QTL Hotspots for Cotton Yield Improvement

185.	CSIR-NCL	Developing microRNA-based strategies to control fungal plant-pathogens
186.	CSIR-NCL	Screening of elite genotypes, elucidation of biosynthetic pathway and extraction process improvisation for colchicine in <i>Gloriosa superba</i>
187.	CSIR-NCL	Gels (micro/macro) for pheromone release
188.	CSIR-NCL	Phyto-inspired peptides derived from plant protease inhibitor for crop protection
189.	CSIR-NEIST	Understanding the Rhizobacteria-Induced Resistance in BhutJolokia (<i>Capsicum chinense</i> Jacq.) against Fungal Diseases
190.	CSIR-NEIST	Edible biocatalyst for the sensory alteration of essential oils
191.	CSIR-NIIST	Investigation on the separation, composition and utilization of deoiled microalgal biomass as value added nutraceuticals
192.	CSIR-NIIST	Food additive based on exopolysaccharides (EPS) of lactic acid bacteria – Process development, structural modifications and functional characterization
193.	CSIR-NIIST	Process development for enzymatic production of Ascorbic acid 2 glucoside
194.	CSIR-NIO, CFTRI, IMTECH, CSMCRI, IIP	Valorisation of Fishery Waste for Development of Biofertiliser, Biorefinery, Biofeed & Recovery of Biopolymers (VALBBBB)
195.	CSIR-CECRI	Tailored 2D supramolecular self-assembled architectures for investigating on-surface catalysis
196.	CSIR-CECRI	Sustainable Electrochemical Conversion of CO ₂ to Methanol using Highly Selective Catalytic Electrode/GDE
197.	CSIR-CLRI	Spatial regulation of collagen orchestrated protein dynamic exposition in skin
198.	CSIR-CLRI	Innovative Fundamental Research for attaining Sustainability in Leather Sector
199.	CSIR-CLRI	Chemicals for Low Temperature Applications of Leather in Strategic sector
200.	CSIR-CSMCRI	Development of CO ₂ selective membrane and adsorbents for biogas purification and flue gas treatment
201.	CSIR-CSMCRI	Fundamental studies on designing & synthesis of multinucleating ionophores towards high lithium loading and extraction from various sources
202.	CSIR-IICT	Practical Organic Synthesis Harnessing Light
203.	CSIR-IICT	Extremozymes: Studies on enzymes from extreme environments and their Industrial applications
204.	CSIR-IICT	Stereoselective synthesis of all carbon stereocenters bearing C-CF ₃ bond via CF ₃ -Pd- π -benzyl intermediate under transition metal catalysis
205.	CSIR-IICT	Stimulus-Driven Molecular-Motors for Asymmetric Synthesis (SDMMAS)
206.	CSIR-IICT	Presenting Metallated Porous-Organic-Polymer as Next Generation Photocatalyst for Solar-Fuel Production
207.	CSIR-IIP	Photochemical carboxylation of naphtha feed with carbon dioxide
208.	CSIR-IICT	Development of PANI-Graphene Based Composites As Functional

		Fillers to Conventional Coatings for Enhancement of Corrosion Inhibition Properties
209.	CSIR-IIP	Recovery of aromatics from cracked naphtha
210.	CSIR-IIP	Development of a Process for Catalytic Cracking of Phenolics Tar to Phenols
211.	CSIR-IIP	Feasibility study for the vapour phase conversion of glycerol to acrylic acid in a fixed bed reactor setup
212.	CSIR-NCL	Rheology and structural investigations of the flow of polymer functionalized particles
213.	CSIR-NCL	To develop scale-up guidelines for continuous flow solvent free synthesis platforms using mechanochemistry
214.	CSIR-NCL	Exploiting Frustration in Activation of N ₂ and CO ₂
215.	CSIR-NIIST	Chromogenic Materials and Inks for Smart Coating and Printable Applications
216.	CSIR-NIIST	Development of cardanol based colourless functional superhydrophobic coating

Mission Projects launched in last three years (Financial Year 2018-2021)

SNo.	Title of the Mission Mode Projects (MMPs)
1.	Sickle Cell Anaemia
2.	Catalysis for Sustainable Development
3.	Innovative Processes and Technologies for Indian Pharmaceutical and Agrochemical Industries
4.	CSIR Aroma Mission
5.	CSIR Phytopharmaceuticals Mission
6.	Development of Fast, Durable and Energy Efficient Mass Housing Scheme
7.	Technologies for Robust Structural Health Monitoring of Critical Infrastructure and Conservation & Restoration of Heritage Structures
8.	Drone based Electromagnetic and Magnetic Systems
9.	Food and Consumer Safety Solutions
10.	Nutraceuticals and Nutritionals
11.	Nano-Biosensors and Microfluidics for Healthcare
12.	Safety and Security of Vital Installations
13.	Intelligent Systems (IS): Intelligent Technologies and Solutions
14.	Development of Affordable Technologies for Quality Milk Assessment
15.	Next Generation Insect Resistance in Cotton
16.	Technological convergence for sustainable production and utilization of seaweeds
17.	Commercial Deployment of Salt and Potash Technologies to Augment National Capability
18.	Innovative Processes and Technologies for Agrochemicals
19.	CSIR Innovation Centre for Next Generation Energy Storage Solutions
20.	Development of Advanced Materials and Devices for Opto-electronic, Biomedical and Strategic Applications
21.	Bulk Chemicals
22.	Coal-Syngas to Methanol
23.	Development of Processes for Active Pharmaceutical Ingredients towards COVID 19
24.	Medical Instruments & Devices
25.	Demonstration and validation of a 5 kW HT-PEMFC based combined cooling and power system
26.	Demonstration and Validation of a LT-PEMFC system for automotive application
27.	Development of Dental Implants-Phase II study
28.	Development of Innovative eco-friendly / formaldehyde free Fluorescent Pigments for vast array of water and solvent based applications
29.	Developing Dental Implants for Advanced and Critical Applications
30.	Development of Novel Antistroke Phyto-pharmaceutical formulation from the roots of a Ashwagandha variety, NMITLI-118

Ongoing NMITLI COVID-19 Projects	
1.	Generation of neutralizing human monoclonal antibodies against the SARS-Cov2 virus as a threapeutic strategy to contain the COVID-19 pandemic
2.	Development of Mycobacterium W for Covid-19: Safety and Efficacy Trial in critically ill hospitalized and at risk patients
3.	Development of Ayurveda based botanical drugs for prophylazis and management of the New Corona Virus Disease (COVID-19)
4.	Dev. Of an inactivated SARS-CoV2 vaccine for COVID-19 (ICoV2Vac)
5.	Design and Development of a portable personal Air Purifying Respiratory Device
6.	Development of an accurate, affordable point-of care diagnostic kit for Covid-19

Ongoing CSIR MLP COVID-19 Projects	
1.	INtegrative GENomics of COVID-19 (INGEN-CoV2)
2.	Development of Nanobody/mAb based ELISA for COVID19 detection
3.	Setting up of anti-Covid19 screening cell culture platform
4.	Population level based screening for COVID19 using Next Generation Sequencing (NGS)
5.	Genome sequencing of SARS-CoV-2 samples from Lucknow/Uttar Pradesh
6.	Pectin-derived prebiotics as adjuvants for prophylactic treatment of COVID-19 and other similar virus diseases
7.	Development of aptamer for recombinant SARS-CoV-2 Spike Glycoprotein-S1
8.	Development of sensitive, cost effective, easy to use dipstick kit for the precise detection of COVID 19 infections
9.	Diagnosis of COVID-19 at CSIR-IICB as part of the CSIR-Digital Surveillance Vertical
10.	Development of in vitro reporter based assay system for TMPRSS2 serine protease mediated COVID-19 spike protein cleavage and screening serine protease inhibit
11.	An open label randomised placebo-controlled trial on passive immunization with convalescent plasma in severe covid-19 disease (picp19)
12.	Evaluating SARS-CoV-2 Main protease (Mpro) inhibitors identified from the library of FDA approved drugs and novel CSIR molecules
13.	Development of a rapid Nanoparticles based immunoassay for SARS-COV-2 infection early and late phase serological diagnosis
14.	Bacteriophage recombination- and CRISPER-based combined array system and SARS-CoV2-Spike protein-based serological assay to detect COVID-19 infection
15.	Development of fluorescent probes, quenchers and their oligonucleotide conjugates for RT-PCR and Lateral Flow Assay based COVID-19 diagnosis
16.	A High Throughput Screening Kit for COVID-19
17.	Augmenting immunogenic response to COVID19 with recombinant BCG (AIRCOVER-BCG)
18.	Serological test for COVID-19 exposure at population level
19.	Multiplexed lateral-flow device(s) for detection of COVID-19
20.	SARS-CoV-2: Sensing Sweet Spots
21.	Standardization of expression and purification of highly antigenic recombinant SARC-CoV2 Spike, S1, and N proteins using mammalian expression system for the downstream usage as antigens for preparation of serology-based diagnostic kit (under CSIR sub-vertical serology-based diagnostic kits)
22.	A long-term longitudinal observational cohort study of health outcomes-Preparatory Phase
23.	Development of Zinc Gluconate - Vitamin C formulation for immunity improvement and

	management of Corona Virus Disease (COVID-19)
24.	Repurposing of colchicine for management of COVID-19 patients
25.	Evaluation of Candidate FDA-approved drugs, candidates from library of Non-toxic compounds that have been pre-clinically cleared and specific Phytopharmaceuticals for repurposing against COVID-19 infection
26.	Setting up a small molecule compound library screening platform for human serine protease TMPRSS2 and SARS-CoV2 RdRp
27.	Testing for COVID-19 in wastewater as a community surveillance measure
28.	Development of Drug-target based Assay platforms and screening against COVID-19
29.	Clinical Trials: Phase 3, Randomized, Double-blind, comparative trial of Efficacy, Safety and Tolerability of Umifenovir and hydroxychloroquine combination therapy vs hydroxychloroquine therapy in non-severe COVID-19 patients
30.	Development of proof of concept vaccine strategies for COVID-19
31.	Design, Development, Certification and Commercialization of BiPAP – Non Invasive Ventilator for COVID-19
32.	CSIR Initiative on recycling of COVID-19 plastic waste from Testing Facility
33.	Development of Ultrasensitive, Rapid and Portable system for COVID-19 Screening using Label-free Raman Fingerprinting and AI
34.	Design and development of antimicrobial coated 3d printable face shield to protect from covid-19
35.	Respiration Assistance Intervention Device A Portable Ventilator (Respi-AID)
36.	Biosensor Development for COVID-19 Diagnosis

Details of Lab Projects

Sr. No.	CSIR Lab	Project
1.	CSIR-CEERI	Indigenous design, development & qualification of Ku band (140-210 watts) and Ka band (100-150 watts) Travelling wave tube (TWT)”
2.	CSIR-NPL	Creation and Calibration Facility for LED and LED based Lighting
3.	CSIR-URDIP	Informatics for drug-repurposing and rescue discoveries (IDrRD)
4.	CSIR-URDIP	Intellectual Property Evaluation and Commercialization (IPEC)
5.	CSIR-URDIP	Creation of E-Markets for Knowledge Products and Services
6.	CSIR-TKDL	Modernization and upgradation of Information Technology Infrastructure of Traditional Knowledge Digital Library Unit (TKDL)
7.	CSIR-TKDL	Digitising Traditional Indian Systems of Medicine
8.	CSIR-NAL	Design, Development and Certification of HANSA-NG
9.	CSIR-NAL	Development and Certification of 19-Seat Light Transport Aircraft (LTA)
10.	CSIR-NPL	Excellence for Ballistic Material Testing at CSIR-NPL, Delhi under Make in India Project in Body Armour
11.	CSIR-NPL	Production of Certified Reference Materials- Bharatiya Nirdeshak Dravya (BND)

Details of HARIT Projects

Sr. No.	CSIR Lab	Project
1.	CSIR-CCMB	Popularization of Improved Samba Mahsuri, a bacterial blight resistant and diabetic friendly rice to increase farmers' income
2.	CSIR-CFTRI	Empowerment of Rural Women in Food Processing Sector through CSIR-CFTRI Intervention with Select Technologies
3.	CSIR-CFTRI	Dissemination of Nutrition, Food Safety, Food Research and Hygiene practices to general public through social media
4.	CSIR-CFTRI	Establishment of Facility Centre for Spice Processing (150-200 kg /day)
5.	CSIR-CLRI	Enhancement of Economic and Social Status of Rural Populace of North-east India
6.	CSIR-CLRI	Social Intervention on augmenting Job opportunities & Wome Empowerment in Punjab through HRD Initiatives
7.	CSIR-CSIO	Rural Penetration and Pilot Trials for Divya Nayan
8.	CSIR-CSMCRI	Empowering coastal population by training on cultivation and harvesting value added product from economically important halophytes Salicornia brachiata and Juncus rigidus

9.	CSIR- CSMCRI	Improving quality of salt with simultaneous recovery of sodium sulphate through scientific intervention, in Nawa - Didwana region of Rajasthan
10.	CSIR- NISTADS	Increased crop productivity and enhanced income generation through smart micro irrigation system (More yield per Drop).
11.	CSIR- NISTADS	Intervention for herbal health and nutrition
12.	CSIR- CSMCRI	Popularizing sustainable and alternative livelihood options for low income coastal communities through imparting training on cultivation of economically important seaweeds
13.	CSIR- NEERI+6	Technologies and Products Fireworks

Ongoing Projects under CSIR-Fundamental & Innovative Research in Science of Tomorrow (CSIR-FIRST) Category

SNo	Lab	Title
1	CSIR-IMTECH	Multi-temperature crystallography to probe conformational switching in FtsZ
2	CSIR-CSIO	Development of optical multilayer mirrors with enhanced Laser Induced Damage Threshold (LIDT) for high power continuous wave fiber laser
3	CSIR-IGIB	Increasing the protein folding arm of proteostasis using evolutionary strategies
4	CSIR-CCMB	The origin of multiple Dicers and dsRNA Binding proteins in the RNAi initiation pathway of <i>A. thaliana</i> and <i>D. melanogaster</i>
5	CSIR-CCMB	Dynamic regulation of structure and function of respiratory complexes
6	CSIR-CLRI	Sequence Axial periodicity and exploring telo-peptide assembly in collagen: Rediscovery of biomedical treasury
7	CSIR-IHBT	Characterization of reverse transcriptase (RNA dependent DNA polymerase) activity from greenhouse whitefly <i>Trialeurodes vaporariorum</i>
8	CSIR-CCMB	Mechanistic and functional role of a 'Chiral Proofreading' variant in Animalia
9	CSIR-CGCRI	In-situ and synergistic Magneto-Acoustic regenerative treatment (i-SMART)
10	CSIR-CDRI	Elucidation of neonatal cardiac regenerative potential following angiotensin II/isoproterenol mediated injury
11	CSIR-IGIB	Role of unusual secondary structures in lncRNA functions
12	CSIR-IHBT	Bioprospecting kinetically stable lytic polysaccharide monooxygenase (s) (LPMOs) for accelerated degradation of lignocellulosic biomass
13	CSIR-NIIST	Engineering Next Generation Low Cost and Highly Efficient Copper Hole Conductor Based Hybrid Dye Cells for Outdoor/Indoor Photovoltaics
14	CSIR-CSIO	Design and Development of Augmented Reality Display for Use in Aviation Maintenance
15	CSIR-CSIO	Design and Development of Precision Silicon Optics for Soft X-Rays by Micro-Machining process Chain
16	CSIR-IHBT	Investigating mechanisms underlying transgenerational heat stress adaptation in plants
17	CSIR-CSMCRI	Biomimetic design and application of chiral bifunctional ligands for asymmetric?- functional reactions

Establishments of CSIR are as given below:

Biological Sciences

- (i) CSIR-Centre for Cellular and Molecular Biology (CSIR-CCMB), Hyderabad
- (ii) CSIR-Central Drug Research Institute (CSIR-CDRI), Lucknow
- (iii) CSIR-Central Food Technological Research Institute (CSIR-CFTRI), Mysore
- (iv) CSIR-Central Institute of Medicinal and Aromatic Plants (CSIR-CIMAP), Lucknow
- (v) CSIR-Institute of Genomics and Integrative Biology (CSIR-IGIB), Delhi
- (vi) CSIR-Institute of Himalayan Bioresource Technology (CSIR-IHBT), Palampur
- (vii) CSIR-Indian Institute of Chemical Biology (CSIR-IICB), Kolkata
- (viii) CSIR-Indian Institute of Integrative Medicine (CSIR-IIIM), Jammu
- (ix) CSIR-Institute of Microbial Technology (CSIR-IMTECH), Chandigarh
- (x) CSIR-Indian Institute of Toxicology Research (CSIR-IITR), Lucknow
- (xi) CSIR-National Botanical Research Institute (CSIR-NBRI), Lucknow

Chemical Sciences

- (i) CSIR-Central Leather Research Institute (CSIR-CLRI), Chennai
- (ii) CSIR-Central Electrochemical Research Institute (CSIR-CECRI), Karaikudi
- (iii) CSIR-Central Salt & Marine Chemicals Research Institute (CSIR-CSMCRI), Bhavnagar
- (iv) CSIR-Central Institute of Mining and Fuel Research (CSIR-CIMFR), Dhanbad
- (v) CSIR-Indian Institute of Chemical Technology (CSIR-IICT), Hyderabad
- (vi) CSIR-Indian Institute of Petroleum (CSIR-HP), Dehradun
- (vii) CSIR-National Chemical Laboratory (CSIR-NCL), Pune
- (viii) CSIR-North-East Institute of Science & Technology (CSIR-NEIST), Jorhat
- (ix) CSIR-National Institute of Interdisciplinary Science & Technology (CSIR-NIIST), Thiruvananthapuram

Engineering Sciences Cluster

- (i) CSIR-Advanced Materials and Processes Research Institute (CSIR-AMPRI), Bhopal
- (ii) CSIR-Central Building Research Institute (CSIR-CBRI), Roorkee
- (iii) CSIR-Central Glass and Ceramic Research Institute (CSIR-CGCRI), Kolkata
- (iv) CSIR-Central Mechanical Engineering Research Institute (CSIR-CMERI), Durgapur
- (v) CSIR-Central Road Research Institute (CSIR-CRRI), New Delhi
- (vi) CSIR-Institute of Minerals and Materials Technology (CSIR-IMMT), Bhubaneswar
- (vii) CSIR-National Aerospace Laboratories (CSIR-NAL), Bengaluru
- (viii) CSIR-National Environmental Engineering Research Institute (CSIR-NEERI), Nagpur
- (ix) CSIR-National Metallurgical Laboratory (CSIR-NML), Jamshedpur
- (x) CSIR-Structural Engineering Research Centre (CSIR-SERC), Chennai

Physical Sciences Cluster

- (i) CSIR-Central Electronics Engineering Research Institute (CSIR-CEERI), Pilani
- (ii) CSIR-Central Scientific Instruments Organization (CSIR-CSIO), Chandigarh
- (iii) CSIR-National Geophysical Research Institute (CSIR-NGRI), Hyderabad
- (iv) CSIR-National Institute of Oceanography (CSIR-NIO), Goa
- (v) CSIR-National Physical Laboratory (CSIR-NPL), New Delhi

Information Sciences Cluster

- (i) CSIR-National Institute of Science Communication & Policy Research, New Delhi
- (ii) Fourth Paradigm Institute (CSIR-4PI), Bengaluru
