

# Science & Technology Clusters – One Year on the Ground



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## SCIENCE AND TECHNOLOGY CLUSTERS: A FRAMEWORK OF INTER-CONNECTEDNESS

The Science & Technology (S&T) Clusters are being established as formal umbrella structures for S&T organizations in cities that already have a critical mass of S&T-focused organizations, to have better synergy while retaining their autonomy. The independent structure is to enable long-term autonomy, financial sustainability, and coordination with participating and external agencies.

The S&T clusters are being guided by the Cluster Apex Committee, chaired by Vice-Chairman (VC), NITI Aayog, with secretariat support from the Office of the Principal Scientific Adviser to the Government of India (O/o PSA). Their establishment was a recommendation of the Prime Minister's Science, Technology and Innovation Advisory Council (PM-STIAC). Six such pilot cluster frameworks, based out of their lead institutes, have been initiated with seed funding from O/o PSA. These include:

**Hyderabad (Research and Innovation Circle of Hyderabad)**

**Pune (Inter-University Centre for Astronomy and Astrophysics)**

**Delhi-NCR (Indian Institute of Technology, Delhi)**

**Bhubaneswar (Kalinga Institute of Industrial Technology)**

**Jodhpur (Indian Institute of Technology, Jodhpur)**

**Bengaluru (Indian Institute of Science)**

These institutions are bringing together academia, research institutions, industry members, MSMEs, the startup community, philanthropic institutions, and local administration.

The S&T Clusters are working towards carrying out applied R&D for solutions with defined end-users at three levels that can be described using a pyramid structure.



## EMPOWERING S&T ENTERPRISES TO SOLVE R&D PROBLEMS OF INDUSTRY AND GOVERNMENT DEPARTMENTS



### 1. Creation of a shared ecosystem:

The bottom of the pyramid is where clusters enable the creation of a shared ecosystem, i.e., a group of 15–20 institutions working together as one large institution through a formal umbrella structure. The umbrella structure will ensure these institutions have better synergy, while also retaining their internal autonomy.

A shared ecosystem entails:

- Sharing of high-end labs and equipment through the Indian Science Technology and Engineering facilities Map (I-STEM),
- Joint multi-institutional programmes,
- Allowing mobility of researchers through sharing of credit courses for students across different institutions (which is also mentioned in the National Education Policy) and also allowing the exchange of researchers between industry and public R&D labs, and
- Conducting high-quality human resource development programmes in partnership with industry experts.

### 2. Becoming a regional solution provider:

The middle of the pyramid focuses on clusters becoming solution providers to local bodies, state governments, and industries and creating a regional influence by solving local problems. For this, they are partnering with local incubators, state science & technology councils, and innovation societies. Such problem solving enables them to wield regional influence through high-quality research, development, and innovation.

### 3. Becoming nationally and globally competitive:

The top of the pyramid is where clusters focus on 1–2 domains of key strength and are building strong capability to become national and global leaders. They are contributing to the national missions of the Government of India and participating in global mega-science projects, to thereby become globally competitive.



## COVID-19 INITIATIVES OF THE CLUSTERS

Despite their starting year being hampered by the COVID-19 pandemic, the clusters rallied and made significant contributions to support their regions in dealing with the situation.



**The Hyderabad cluster** created a consortium of over 20 local MSMEs to be able to meet the regional demand of quality COVID-19 diagnosis kits and other required pandemic-related peripheral items.



**The Pune cluster** worked closely with the Pune Municipal Corporation (PMC) to collect, analyze and provide the PMC with trends and projections regarding the disease in the city. The cluster also carried out a city-wide COVID-19 sero-survey to help identify the prevalence of the pandemic in the various regions of the city for local authorities.



**The Delhi cluster** built an artificial intelligence (AI)/machine learning (ML) model to apply to the genomic sequencing data of COVID-19 patients to predict future increase in case loads due to emerging variants, and proposed a model for an early-warning system.



**The Jodhpur cluster** galvanized its members to deploy local level manufacturing of face shields to meet increased demands. The cluster also enabled the design and development of a UV+ photocatalytic oxidization sanitization machine. This technology was transferred to local MSMEs and is now in the market.



**The Bhubaneswar cluster** worked extensively with researchers and startups to develop innovative solutions during the pandemic, such as recycling of PPE kits by disinfecting, cleaning, and drying, followed by conversion to value-added products. Various startups were supported to further develop innovative solutions to address pandemic challenges such as, patient isolation capsules, thermal insulated reagents, and sample transportation devices. For example, an NT Mask, a device to protect healthcare workers during COVID-19 sample collection, and a 3D-printed ventilator splitting device which allows the intensivist to use a single ventilator in two or three patients in case of exigencies, were developed.



## PUNE S&T CLUSTER – PUNE KNOWLEDGE CLUSTER (PKC)

### OVERVIEW

- The Pune S&T Cluster has been established by the Inter-University for Astronomy and Astrophysics (IUCAA), an autonomous body setup by the University Grants Commission (UGC).
- The cluster is in the process of registering its section-8 company.
- The cluster has appointed Dr. Priya Nagaraj as their COO. She has more than nine years' experience in the pharma and biotechnology sectors and has worked extensively with the startup ecosystem. She leads a team of 13 scientists and science managers.
- The cluster has focused on solution-driven R&D projects, with active participation from local authorities and industry partners, for addressing regional issues.

- The cluster has been able to attract funding of around INR 4.19 crores for its various projects from CSR divisions of companies like Schlumberger and Hindustan Unilever, as well as various foundations including Rockefeller Foundation and Cummins India Foundation.

### THEMATIC AREAS

#### 1 SUSTAINABILITY & ENVIRONMENT



#### 2 HEALTH



#### 3 BIG DATA & AI



#### 4 SUSTAINABLE MOBILITY



#### 5 CAPACITY BUILDING



### KEY CLUSTER MEMBERS (REPRESENTATIVE LIST)



#### Academic organizations:

Indian Institutes of Science Education and Research (IISER, Pune), Armed Forces Medical College (AFMC, Pune), Maharashtra University of Health Sciences



#### Government labs:

CSIR-National Chemical Laboratory (NCL), Agharkar Research Institute



#### Companies:

Hindustan Unilever Limited, Persistent Systems, Serum Institute of India, IBM, Schlumberger



#### Government agencies:

Pune Municipal Corporation (PMC)  
Pune Smart City Mission, Pimpri-Chinchwad Municipal Corporation



#### International organizations:

Rockefeller Foundation, University of Southampton, Water Valley Denmark

## KEY INITIATIVES

1 ENVIRONMENT &amp; SUSTAINABILITY



## Sustainability and environment

01

## Targeted afforestation for socio-economic-environment resilience of Pune



The cluster is deploying projects to help enhance vegetation cover in the Pune Metropolitan Region and thereby aiming to increase carbon sequestration. Projects include sustainable afforestation and its utilization, citizen engagement platform for sapling adoption, and AI-based models for determining plantation strategies.

02

## Creating a regional plan for sustainable water management for local authorities



The cluster is utilizing satellite and locally-sourced imagery to help prepare a city-level sustainable water harvesting and conservation plan for city authorities, with the aim to prepare a participatory sustainable water management plan based on current knowledge, address gaps, and identify and prioritize problems and provide solutions.

03

## Establishing a regional biofuels supply chain



The cluster is planning to design and pilot an end-to-end “biomass-to-biofuel” chain in the region in collaboration with local industries like KPIT, Praj Industries, and Primove Engineers.

04

## Household carbon footprint reduction drive



The cluster is planning to pilot a digitally empowered drive (through a web portal) to map individual household carbon footprints in the city and then promote its reduction through training programmes.



01

### Supporting the Pune Municipal Corporation through COVID-19 data collection and analysis



The cluster is collecting, analyzing and providing trends, and projections to the city's municipal corporation to help manage the pandemic.

02

### Deployed a city-wide COVID-19 sero-survey



The cluster has supported local authorities in identifying the prevalence of the pandemic in the city and the differences in the transmission of the virus across various neighborhoods.

03

### Conducting study on the long-term immunogenicity of COVID-19 vaccines



The cluster is analyzing various parameters to understand the duration of the protective immunity acquired post-vaccination.

04

### Conducting an enhanced COVID-19 viral surveillance through viral genome sequencing and environmental parameters



The cluster is trying to understand the COVID-19 viral evolution in India to create an institutionalized viral genomic and environmental surveillance system as an early-warning apparatus.

05

### Creation of an epidemiological and clinical database on COVID-19



The cluster is compiling a comprehensive database of cases in the Pune region for a better understanding of the dynamics of the disease.



01

### Involving citizens in astronomy science



The cluster has developed a gamified website which trains citizens to analyze astronomical pictorial data and plans to crowdsource the analysis of a large dataset of such pictures to make this analyzed dataset available for researchers to build upon.

02

### Pune digital twin (Big data and AI)



The cluster is collaborating with TCS to utilize a digital model of Pune city to study issues like traffic flow, last mile connectivity, spread of COVID-19, etc.



## 4 ELECTRIC &amp; SUSTAINABLE MOBILITY



## Sustainable mobility

01

### Retro-fitting city buses with compressed biogas kits



The cluster is working with local authorities to switch the city bus fleet to a more sustainable and green mode.

02

### Design and deployment of a fleet of e-rickshaws



The cluster is working with local authorities to develop a last mile connectivity plan for Pune Metro using e-rickshaws.

03

### Technology development for recovery of precious metals from vehicle e-waste



The cluster is working to develop technology for lithium (Li) recovery from Li-ion batteries, as well recovery of precious metals from spent catalytic converters.

## 5 CAPACITY BUILDING



## Capacity building

01

### Hosting courses, talk series, and webinars



The cluster is holding a series of events for the capacity augmentation of scientists and researchers on diverse topics like AI/ML, vaccine production, plant breeding, biodiversity, oncology, etc.

02

### Train-the-trainer programmes for schools



The cluster is deploying multiple “train-the-trainer” programmes for regional school teachers on concepts in science, skill development, STEM topics, and digital pedagogy.



## HYDERABAD S&T CLUSTER – RESEARCH AND INNOVATION CIRCLE OF HYDERABAD (RICH)

### OVERVIEW

- The Hyderabad S&T Cluster is implemented through the Research and Innovation Circle of Hyderabad (RICH).
- RICH is an existing section-8 company, established by the Government of Telangana.
- The cluster has appointed Ms. Rashmi Pimpale as their CEO. She has over 17 years of experience in the innovation ecosystem and pharmaceutical sector. She leads a team of six technology managers and domain specialists.
- The cluster focuses on the development and deployment of technology solutions for the state government, by working in close coordination with regional startups and MSMEs, in addition to emphasizing solution-driven R&D.

### THEMATIC AREAS

#### 1 LIFE SCIENCES



#### 2 FOOD & AGRICULTURE



#### 3 SUSTAINABILITY



#### 4 OTHER INITIATIVES



- Over the last one year, the cluster team has raised about INR 4.15 crores for funding its projects in life sciences, food and agriculture from Foundation for Innovative New Diagnostics (FIND), the Bill and Melinda Gates Foundation, and from the Ministry of Agriculture & Farmer's Welfare.

### KEY CLUSTER MEMBERS (REPRESENTATIVE LIST)



#### Academic organizations:

Indian Institute of Technology (IIT, Hyderabad), International Institute of Information Technology (IIIT, Hyderabad), Indian School of Business (ISB), Hyderabad University



#### Government labs:

CSIR-Centre for Cellular and Molecular Biology (CCMB), Centre for Materials for Electronics Technology (C-MET), CSIR-Indian Institute of Chemical Technology (IICT)



#### Companies:

Cyient, Xynteo, Ramky Group



#### Government agencies:

Ministry of Agriculture & Farmers Welfare (GoI), Emerging Technology Wing (Government of Telangana)



#### International organizations:

National Health Service (NHS, UK), National Institute for Health and Care Excellence (NICE, UK), ICRISAT, World Vegetable Centre

## KEY INITIATIVES



Team interaction with Dr. Rajiv Kumar, Vice Chairman, NITI Aayog, and Prof. K. VijayRaghavan, Principal Scientific Adviser.



Interaction with local residents as part of the Vikarabad Nutrition Project.



## Life sciences

01

## Hyderabad reagents consortium



The cluster, through CCMB and other R&D labs, worked with over 20 regional MSMEs to build a local consortium and supported them with quality testing, validation and capacity-building. The consortium intends to cater to 100% of the local regional demand of affordable testing kits, and high-quality reagents and components through indigenous manufacturing. This effort was funded to the tune of INR 1.05 crores by FIND India with support from the Bill and Melinda Gates Foundation.

02

## Enabling development and deployment of medical technologies



The cluster, in partnership with AIC-CCMB and I-Venture@ISB, is supporting medical and diagnostic technology startups by providing testbeds, clinical advice, regulatory support, and mentoring in partnership with 14 local hospitals such as Apollo Hospitals, STAR Hospitals, L V Prasad Eye Institute, etc.

03

## Indian cancer genome atlas



The cluster plans to support the CSIR-led initiative in generating data on various types of cancer in India to identify actionable mutations, map functional/clinical implications, and create their genome profile, with the objective of improving treatment protocols for cancer.

04

## AI interventions for water, sanitation, and hygiene



The cluster plans to deploy an AI-based digital health promotion and campaign platform targeting homeowners via video or augmented reality (AR) overlays through mobile devices with the objective of reducing spread of vector-borne diseases.

## 2 FOOD &amp; AGRICULTURE



## Food and agriculture

01

### Enabling scale-up of agriculture technologies under Ministry of Agriculture



In partnership with the state government, the cluster secured a funding of INR 3.10 crores to demonstrate and scale-up six agriculture technologies under the National eGovernance Plan in Agriculture (NeGPA) of the Ministry of Agriculture, Government of India. It is currently deploying technology pilots by startups in the following six identified areas — (i) irrigation management, (ii) nutrient management, (iii) crop planning, (iv) weeding robots, (v) better quality assaying, and (vi) traceability for public and private seed companies. Additionally, in close collaboration with Professor Jayashankar of Telangana State Agricultural University, the cluster is enabling, at the state level, 10 additional pilots in emerging technologies for agriculture.

02

### Connecting agriculture and nutrition



The cluster, through its Agri-Nutri Connect project, aims to address malnutrition in women and children in the tribal population of Telangana. The project takes a holistic approach to nutrition and food safety by incorporating various activities ranging from basic research to communication for behavior change. It involves integrating crop-livestock technologies and management practices to build resilience into existing food systems to be more sustainable, profitable, and acceptable.

03

### Drone technologies for better living



The cluster plans to pilot drone technologies for vector control, afforestation, and medicine delivery to raise the standard of living in the region.

## 3 SUSTAINABILITY



## Sustainability

01

### City livability upgradation



The cluster plans to develop a city-wide decentralized waste management system, including cleaning of lakes and e-waste management, in partnership with the Centre for Materials for Electronics Technology (CMET), Ministry of Electronics and Information Technology (MeitY), Govt.

## OTHER INITIATIVES



## Additional capacity-building initiative

01

### Entrepreneurship fellowship programme for scientists



The cluster plans to run a fellowship programme with the aim to equip the S&T researcher/developer community with the entrepreneurial skill sets, business/industry acumen, and commercial outlook, required to facilitate technology innovation and entrepreneurship.





## DELHI S&T CLUSTER – DELHI RESEARCH IMPLEMENTATION AND INNOVATION (DRIIV)

### OVERVIEW

- The Delhi S&T cluster has been established by the Indian Institute of Technology, (IIT) Delhi.
  - The cluster has registered its own independent section-8 company.
  - The cluster has appointed Ms. Shipra Misra as their CEO. She has over 17 years of experience in the finance and innovation ecosystem in India and UK. She leads a team of three executives.
- The Delhi cluster had kickstarted its research projects utilizing the O/o PSA seed funding and made significant progress. It is now actively seeking industry, MSMEs, and startups to deploy and scale-up its developed pilots.

### THEMATIC AREAS

#### 1 SOLID WASTE MANAGEMENT



#### 2 WATER SECURITY



#### 3 AIR POLLUTION



#### 4 AI/ML HEALTHCARE



#### 5 SUSTAINABLE MOBILITY



#### 6 EFFECTIVE EDUCATION



- With the initial funds from O/o PSA nearing utilization, the cluster is rapidly making efforts to raise funds from external sources for the deployment and scale-up of its early R&D outputs.

### KEY CLUSTER MEMBERS (REPRESENTATIVE LIST)



#### Academic organizations:

Indian Institute of Technology (IIT, Delhi), Jawaharlal Nehru University (JNU), Delhi Technological University (DTU), Netaji Subhas University of Technology (NSUT), All India Institute of Medical Sciences (AIIMS, New Delhi), Indraprastha Institute of Information Technology (IIIT, Delhi)



#### Government labs:

CSIR-Central Road Research Institute (CRRRI), CSIR-Institute of Genomics and Integrative Biology (IGIB), ICAR - Indian Agricultural Research Institute (IARI)



#### Companies:

Tata Power, Mahindra, BSES-Rajdhani Power Ltd., BSES-Yamuna Power Ltd., Google, PhonePe



#### Government agencies:

Delhi Transport Corporation (DTC), Delhi Metro Rail Corporation (DMRC), Delhi Pollution Control Committee (DPCC)



#### International organizations:

World Economic Forum (WEF), United Nations Development Programme (UNDP)

## KEY INITIATIVES



The cluster is working on waste management initiatives, such as the production of biogas from solid waste.



The cluster has developed many lab-scale prototypes for the recovery of useful products from solid waste.

1

SOLID WASTE  
MANAGEMENT

## Solid waste management

01

## Development of prototypes of various technologies for solid waste processing



The cluster has developed lab-scale prototypes of waste processing technologies for converting plastic waste to fuel, extracting fuel and metals from e-waste, recovering biochar from biowaste/agri-waste, and utilizing demolition waste and incinerated waste in road construction.

02

## Socio-economic modelling for household waste segregation and management



The cluster is undertaking a survey to analyze household waste management attitudes in Delhi-NCR and plans to develop incentivization strategies accordingly.

2

WATER  
SECURITY

## Water security

01

## Initiatives to enhance water security of the region



The cluster plans to undertake water resources assessment for the region and develop strategies for effective management of water productivity technologies, cost-effective household/irrigation water quality treatment technologies, sustainable strategies for groundwater utilization, and systems for flood and drought management.



## Air pollution

01

### Pollution hot-spot management



The cluster has identified air pollution hot-spots in the region, analyzed the collected data, and is in talks with various startups for utilization of the data.

02

### Conducting intervention studies for air pollution



The cluster has carried out intervention studies to quantify inter-state transport, propose stubble management solutions, and test an ML-based forecasting model.

03

### Building awareness and capacity in government agencies



The cluster has trained Municipal Corporation of Delhi (MCD) personnel and is planning to train Delhi Pollution Control Committee (DPCC) personnel on latest air pollution related techniques.

04

### Creating dashboards for open-source access to air pollution data



The cluster has prepared air pollution data dashboards, which can be utilized by local agencies for policy formulation.



## Effective education

01

### Teacher training at the school and college level



The cluster has been organizing pedagogy and project learning based workshops for school and college teachers on AI/ML in education, National Education Policy (NEP) implementation, pedagogy with digital tools, pollution, and public health.

02

### Survey on COVID-19 impact on teaching learning processes



The cluster intends to study the effect of the pandemic on learning outcomes and design remedial strategies and tools.

## 5 SUSTAINABLE MOBILITY



## Sustainable mobility

01

### Creating a public transit automation system for buses



The cluster has built and deployed a Delhi Transport Corporation (DTC) depot automation system, which incorporates real-time data from 6700 buses and can show efficiency measurements for the system.

02

### E-mobility charging infrastructure development



The cluster has developed a home EV charger, which can coordinate with the electric grid for effective load management, along with an overarching EV charging infrastructure management system. A pilot battery swapping station has also been deployed in Janakpuri, New Delhi.

03

### Upgrading pedestrian infrastructure



The cluster plans to collate pedestrian data in the region to develop a pedestrian risk estimator and recommend appropriate safety measures to the local authorities.

04

### Public transport modes Sustainable Integration Index (SII) development



The cluster plans to create an Application Programming Interface (API) for enabling local authorities/planners to implement the most beneficial transport policies across various transportation modes for reducing the ill-effects of traffic.

05

### Developing an open ticketing platform



The cluster plans to create an open platform to allow for contactless and integrated ticketing for all modes of transport in the region.

## 4 AI/ML HEALTHCARE



## AI/ML in healthcare

01

### Creating a data and AI platform for COVID-19 surveillance



The cluster has operationalized an NDHM compliant data platform and onboarded around 10K open-source healthcare datasets for researchers' ease of access. Researchers have applied Natural Language Processing (NLP) techniques for genomic surveillance of COVID-19 and are working with INSACOG to explore the possibility of utilizing its model as an early-warning system.





## JODHPUR S&T CLUSTER – JODHPUR CITY KNOWLEDGE AND INNOVATION CLUSTER (JCKIC)

### OVERVIEW

- The Jodhpur S&T cluster was established by the Indian Institute of Technology (IIT), Jodhpur.
- The cluster has registered its independent section-8 company.
- The cluster has appointed Dr. G.S. Toteja as their CEO. He has nearly 36 years of experience working for the Indian Council of Medical Research (ICMR). He leads a team of six programme managers and assistant managers.
- The cluster has been able to tap into various government agencies for funding its projects and also secure CSR funding from the industry. The cluster has deployed field pilots for water management for the local population and is working closely with local administration to develop AI tools for governance. It is also undertaking a massive effort to establish a med-tech ecosystem in the region.
- The cluster has raised about INR 15.53 crores from various government programmes and agencies, such as the Department of Biotechnology (DBT) and the Jal Jeevan Mission, Ministry of Jal Shakti, and through the industry CSR route, from Siemens and Canara Bank.

### THEMATIC AREAS

#### 1 MEDICAL TECHNOLOGIES



#### 2 HANDICRAFTS & HANDLOOMS



#### 3 I-GOVERNANCE



#### 4 THAR DESIGNS



#### 5 WATER & ENVIRONMENT



#### 6 AIoT INNOVATION HUB



### KEY CLUSTER MEMBERS (REPRESENTATIVE LIST)



#### Academic organizations:

Indian Institute of Technology (IIT, Jodhpur), All India Institute of Medical Sciences (AIIMS, Jodhpur), National Institute of Fashion Technology (NIFT), Mugneeram Bangur Memorial (MBM University), Dr. Sampurnanand Medical College (SNMC)



#### Government labs:

ICMR-National Institute for Implementation Research on Non-Communicable Diseases (NIIRNCD), Defence Research and Development Organisation (DRDO), ICAR-Central Arid Zone Research Institute (CAZRI), Regional Remote Sensing Centre – (RSSC-W (ISRO))



#### Companies:

Jodhpur Industry Association, Siemens, Canara Bank



#### Government agencies:

Rajasthan State Pollution Control Board, Jodhpur Development Authority (JDA), Rajasthan Department of IT & Communications, Rajasthan State Industrial Development and Investment Corporation Limited (RIICO)



#### International organizations:

Swiss Federal Institute of Technology in Lausanne, Fraunhofer Institute

## KEY INITIATIVES



## Medical technologies

01

## Establishing a med-tech ecosystem in the region



The cluster plans to build upon the state government's focus on the health sector by creating a full chain innovation support ecosystem. As a first step, the cluster has initiated joint degree masters and PhD programmes in medical technologies between IIT and AIIMS, while securing funding from DBT to establish a Deep-Tech Biodesign Centre in the region. Additionally, it has established a DBT-funded BioNEST incubator to support med-tech startups. It is working with the state government agencies to establish a full-fledged medical device park in the region.

02

## Development of potential therapeutic leads for Duchenne muscular dystrophy for clinical trial



The cluster is working towards development of cost-effective therapeutic leads and social awareness for Duchenne muscular dystrophy disease.

03

## Development of low-cost oxygen concentrator for domestic use



The cluster is developing a low-cost oxygen concentrator for domestic use in order to reduce hospitalization costs and the load on medical infrastructure.

04

## Piloting an AIoT-based bed occupancy detection in a hospital setup



The cluster has developed and deployed a pilot 30-unit system with digital dashboard at Mathura Das Mathur (MDM) Hospital, Jodhpur.

2 HANDICRAFTS



## Handicrafts and handlooms

01

### Establish a lab and museum of crafts for the growth of Jodhpur craft



The cluster plans to infuse science and technology in traditional handicrafts by developing digitalization systems and techniques for traditional designs, creating a crafts lab and museum utilizing technologies, such as augmented reality/virtual reality (AR/VR), and providing livelihood incubation to crafts persons.

3 I-GOVERNANCE



## I-governance

01

### Live identification of traffic rules non-conformance



The cluster plans to support local police authorities with digital tools for real-time traffic surveillance and automatic anomaly detection.

02

### Development of traffic modelling and management framework



The cluster plans to support local authorities by modelling and evaluating specific transportation strategies and real-time signal control algorithms.

03

### Camera tampering detection system



The cluster plans to enable automatic detection of willful tampering of operational remote CCTV cameras.

4 THAR DESIGNS



## Thar DESIGNS

01

### Developing desert ecosystem innovations guided by nature and selection



The cluster plans to create awareness about the vulnerable Thar ecoregion, provide recommendations for an effective policy framework, create innovations in engineering, and build a precision-health framework for desert medicine.

## 5 WATER &amp; ENVIRONMENT



## Water and environment

01

### Water purification for rural schools



The cluster has developed and is currently deploying low-cost water treatment systems in the rural schools of Jodhpur.

02

### Development of coliforms sensors



The cluster is developing sensors to provide point-of-use or in-line coliform detection capabilities in water, funded by the Jal Jeevan Mission.

03

### Air pollution source apportionment study



The cluster plans to support local authorities by conducting inventory on emissions and carrying capacity for Kota city in Rajasthan.

04

### Development of a smart graded-water supply grid



The cluster plans to pilot an intelligent graded-water supply grid of one megalitre per day to optimally utilize the capabilities of locally available water and energy resources while delivering graded water supply. The effort is carried out in partnership with the Fraunhofer Institute.

05

### Development of an advanced water treatment



The cluster plans to pilot a capable water treatment plant with a capacity of 50 kilolitres per day that utilizes sustainable technologies in treating region specific textile and steel rolling mill effluents.

## 6 AIOT FAB



## AIoT Innovation Hub

01

### Establishment of an artificial intelligence of things fabrication facility



The cluster plans to work in collaboration with the state government to create a facility for providing end-to-end support till pre-commercial pilot stage for the components (sensors, etc.) and system design of the AIoT concept.





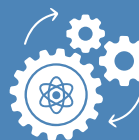
## BHUBANESWAR S&T CLUSTER – BHUBANESWAR CITY KNOWLEDGE INNOVATION CLUSTER (BCKIC)

### OVERVIEW

- The Bhubaneswar S&T cluster has been consolidated by the Kalinga Institute of Industrial Technology.
- It is in the final stages of registering its independent cluster section-8 company.
- The cluster has appointed Dr. Prashant Singh as their CEO. He has nearly seven years of experience in the diagnostic sector. He leads a team of eight science and project managers.
- The cluster is engaged in macro and micro S&T ecosystem building through its diagnostic hub and Jajpur district intervention projects in collaboration with state and local authorities. It has a healthy number of applied R&D projects for the development of specific technologies.

### THEMATIC AREAS

#### 1 QUANTUM ENGINEERED ADVANCED MATERIALS



#### 2 WASTE TO VALUE



#### 3 WETLAND MANAGEMENT



#### 4 BIOSCIENCES



#### 5 POLYMER BASED INTERVENTIONS



#### 6 OTHER INITIATIVES



- The cluster's engagement with local authorities, such as the Jajpur district administration, and industrialists, such as Mr. Subroto Bagchi, has allowed it to raise INR 3.38 crores for some of its projects. It is actively engaged with the industry to secure funds and end-users for its R&D efforts.

### KEY CLUSTER MEMBERS (REPRESENTATIVE LIST)



#### Academic organizations:

Kalinga Institute of Industrial Technology (KIIT), Indian Institute of Technology (IIT-Bhubaneswar), Ravenshaw University, Birla Global University



#### Government labs:

CSIR–Institute of Minerals and Materials Technology (IMMT), Central Institute of Plastics Engineering & Technology (CIPET-Bhubaneswar), ICAR-Central Tuber Crops Research Institute



#### Companies:

National Aluminium Company Ltd (NALCO), National Thermal Power Corporation (NTPC), Welspun Industries Ltd



#### Government agencies:

Startup Odisha, Chilika Development Authority, Jajpur District Administration



#### International organizations:

The cluster is currently working on building international partnerships

## KEY INITIATIVES



The cluster is creating a sustainable Chilika Lake wetland management ecosystem.



A reed found in the Chilika Lake ecosystem, *Phragmites karka*, has the potential to be commercialized to make paper, particle board etc.

1 QUANTUM ENGINEERED  
ADVANCED MATERIALS

## Quantum-engineered advanced materials

01

## Engineering efficient electron transfer in advanced composites for enhanced antibacterial activities



The cluster is working on a project to develop processes for the preparation and characterization of graphene oxide, process optimization for coating, and coated substrates for developing antibacterial surfaces.

02

## Developing nanostructured alumina-based electrodes for supercapacitors and heat exchangers



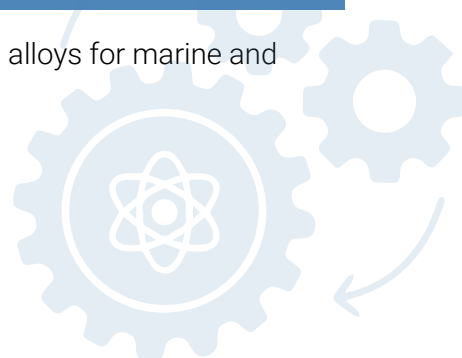
The cluster intends to develop technology for supercapacitors and energy efficient and cost-effective heat exchangers and cooking gas burners based on nano-structured aluminium oxide and related compounds.

03

## Development and validation of special aluminium-lithium (Al-Li) based alloys



The cluster plans to develop cost-effective alloys for marine and space applications.





## Waste-to-value

01

### Processing of chromite overburden in chromite mining



The cluster plans to develop a process for recovering nickel and cobalt from chromite overburden and treating effluents for chromium removal through the high-pressure acid leaching treatment of mining effluent.

02

### Comprehensive utilization of bauxite residue generated in mining



The cluster plans to develop a novel pyro-hydrometallurgical approach through "gaseous reduction-soda ash roasting" route for recovery of iron, alumina, mixed rare earth oxides, and titania from mining wastes.

03

### Technology development of wear-resistant ceramic tiles/glazed tiles from fly ash



The cluster plans to develop a process producing wear-resistant ceramic wall tiles from fly ash.

04

### Study on the reduction roasting process to maximize iron values recovery from low/lean grade resources



The cluster plans to design and develop a pilot rotary kiln process for iron recovery from mining wastes.

05

### Beneficiation of high ash Indian coking and non-coking



The cluster plans to develop a process for the beneficiation of high ash Indian coking coal (ROM) and washery slimes to generate clean coal having < 15% ash, which can be used for manufacturing of coke.

06

### Gasification of Indian non-coking coal for production of syngas



The cluster plans to develop a low-rank gasification technology for commercially producing syngas from non-coking coal.





## Wetland management

01

### Creation of sustainable livelihoods and management of Chilika lake wetland ecosystem



The cluster is in the process of creating local livelihood opportunities by commercializing *Phragmites karka* (reed found in local lake ecosystem) based technological interventions, such as paper making, particle board manufacturing etc., through the establishment of a local bioresource center.



## Biosciences

01

### Establishment of a diagnostic innovation hub



The cluster is working with the state government to extend existing local infrastructure on digital health, molecular biology, and biochemistry in the field of diagnostics. The cluster plans to provide support to up to 20 advance stage startups in diagnostics and develop a diagnostic sector in the state of Odisha.



## Polymer based interventions

01

### Ecofriendly polymer based feminine hygiene products for tribal blocks of Odisha



The cluster is in the process of piloting bio-degradable fibers developed from locally sourced cotton for developing feminine hygiene products through industry partners.

OTHER INITIATIVES



## Other initiatives to support district authorities

01

### Jajpur Innovation Hub



The cluster is working as the knowledge partner of the Jajpur district administration to generate self-employment for women self-help groups and the local youth of Jajpur with affordable technologies based on regional natural resources, such as agricultural output.



## S&T CLUSTERS: THE WAY FORWARD



The S&T clusters have been able to build a brand for themselves by acting as solution providers for their respective regions.



The clusters now have the capacity and capability to align with critical national missions and support these government initiatives.



The clusters must continue working with local authorities and government bodies to provide science and technology-based solutions.



Their interactions with industry and foundations are picking up traction and the clusters need to develop the capacity to address their needs and goals by aligning their projects.



The vision is for these clusters to become a single window for industry, foundations, and the government into the science and technology ecosystem of their respective regions.

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