

**Department of Science & Technology**  
**Monthly Report**  
**August, 2021**

**I. Important policy decisions taken and major achievements during the month:**

**A. Science for Society**

1. Indian National Science Academy (INSA), New Delhi had agreed to support the STEM Women Asia Database Project established by the Association of Academies and Societies of Sciences in Asia (AASSA), with support and funding from the Inter Academy Partnership (IAP). Fifty eight Indian National Science Academy (INSA) Women Fellows and INYAS Women Members have been nominated by the Academy.
2. Indian Science Congress Association, Coimbatore Chapter in association with Department of Zoology and Research and Development Cell, Kongunadu Arts and Science College organized a virtual workshop on the topic ‘Natural Resource Management and Sustainable Development’
3. National Innovation Foundation (NIF) facilitated granting of 3 patents to its grass root innovators on (i) Herbal Anti-asthmatic compositions and process of preparation thereof; (ii) Device for Improving Hammering; and (iii) System To Integrate Driving License Validation In Vehicular Control.
4. NIF undertook the validation of purple potato variety ‘Sagar Jamal’ and multi-location testing of paddy variety *Kudrat5* at twelve locations (exhibiting yield advantage over check varieties). On-farm trials of *Niranjan Bhata-brinjal* variety were also completed at 20 locations (outperforming at all locations in comparison with local varieties and reported superior yield).
5. A total of 100 innovations related to Engineering domain were uploaded to the Innovations portal of NIF ([www.innovation.nif.org.in](http://www.innovation.nif.org.in)) and design improvement of two new technologies namely Monkey repellent and Wrist joint for spinal cord injury patient was undertaken by NIF.
6. A compendium titled ‘Nabashrujaneer’ consisting of innovations by women from the NIF database in the Odia language was developed, with the objective to widely disseminate and mobilize scouting and documentation of innovations from more women in the country.
7. The August issue of *Resonance* published by Indian Academy of Science (IASc) celebrated the life and contributions of Alexander von Humboldt, a polymath, whose contributions span the field of geology, biology, and ecology. Humboldt's work led him to some profound insights that are relevant even today. The issue carries two articles titled The Life of Alexander von Humboldt and other titled The Lasting Contribution of Alexander von Humboldt to Our Understanding of the Natural World.
8. ARI and IASST, Guwahati is testing COVID-19 samples on regular basis to detect SARS-CoV-2.
9. OPEC meeting of M/s BotLab Dynamics Private Limited, New Delhi held on 19<sup>th</sup> August, 2021 for project title “Design and Development of a Reconfigurable Swarming System Consisting of 500-1000 Drones for 3D Choreographed Drone Light Shows”.
10. OPMC meeting of M/s Thincr Technologies India Pvt Ltd, Pune held on 3<sup>rd</sup> August, 2021 for project title “Development of low cost and more efficient masks coated with antiviral agents to protect spread and protection of Covid-19 and other viral infections”.

11. OPMC meeting of M/s Biogen Fertilizers India Private Limited, Chennai held on 10<sup>th</sup> August, 2021 for project title “Commercial production of encapsulated multi nutrient granulation/ palletization of organic manure with bio NPK (liquid), bio-control microbes, HUMIC, VAM, enzymes, immune modulators and trace elements (zinc, boron, molybdenum, manganese and iron)”.
12. NSTEDB rolled out a new initiative NIDHI4COVID 2.0 for supporting startups/innovators with promising solutions against COVID 19. NIDHI4COVID 2.0 is being implemented by NIDHI Seed Support TBIs across the country and around 35 new Startup proposal were selected and supported.
13. Regional Refresher Workshops 2021 for the 29<sup>th</sup> National Children Congress with the focal theme **Science for Sustainable Living** were organized - Northern region 17/08/2021, Eastern region 18/08/2021, Western region 23/08/2021, Southern region 24/08/2021, North-Eastern region 25/08/2021.

## **B. National Technology Mission**

1. A Webinar on Policy Formulation for 25 Technology Innovations Hubs (TIHs) established under National Mission on Interdisciplinary Cyber Physical Systems (NM-ICPS) was organized on 19<sup>th</sup> August 2021 through online mode to discuss financial, procurement, Recruitment and SoP's of TIHs.
2. The 2<sup>nd</sup> meeting of Inter-Ministerial Co-ordination Committee (IMCC) on National Mission on Interdisciplinary Cyber Physical Systems (NM-ICPS) was held on 27<sup>th</sup> August 2021 at NITI Aayog, New Delhi under the chairmanship of Shri Amitabh Kant, CEO, NITI Aayog. The agenda of the meeting was to review the current status of TIHs and how they can leverage to meet the requirements of Central Line Ministries, PSU's and Industry.
3. DST participated in inaugural session of the Bureau of Energy Efficiency & India Hydrogen Alliance (IH2A) consultation series, closed-door sectoral interfaces to Strengthen Green Hydrogen Ecosystem in India on "Green Steel and Green Cement: Creating a Roadmap for Hydrogen Adoption" on 31st August 2021.
4. DST has organized a Pre-MAP Workshop on 31st August 2021 as part of the DST call on Integrated Clean Energy Material Acceleration Platform (IC-MAP) with Mission Innovation IC6 Co-lead Canada. The Pre-MAP workshop aimed to describe the MAP platforms internationally and what the MAP consortia are expected to do when the consortium is formed.

## **C. Technology Development**

1. An Indian patent was granted to Institute of Advanced Study in Science and Technology (IASST), Guwahati on Synthesis of ZnONanoparticle and its application for the treatment of wastewater contaminated by hydrocarbons.
2. Know-how transfer agreement signed by International Advanced Research Centre for Powder Metallurgy and New Materials (ARCI), Hyderabad with M/s. Allox Minerals Pvt. Ltd., Hyderabad for the Production of battery grade Lithium Iron Phosphate (LFP) cathode material for Li-ion batteries.
3. Li-Ni-Mn-Co-O/Graphite cells (5 Nos) made at ARCI were supplied to Electric Vehicle (EV) manufacturer for internal testing and validation.

4. 50 litres of Anti-reflective coating sol prepared by ARCI and supplied to Industry for field trials.
5. Inorganic p-type semiconductor copper thiocyanate (CuSCN) optimized by ARCI at lab-scale for hole-transporting application in perovskite solar cells (PSC) with minimum moisture ingress.
6. New projects :
  - I. The following three new projects were recommended under INDO-Dutch DST-NWO call on Cleaning Ganga and Agri Water Nexus:
    - a. Title: Hindon Roots Sensing HIROS River Rejuvenation through Scalable Water- and Solute Balance Modelling and Informed Farmers' Actions with Dr. D. Nagesh Kumar from IISc Bangalore as lead Indian PI & Prof.Dr. C.J. Ritsema, Wageningen University (WU) as lead from Dutch side.
    - b. Title: Co-creating Sustainable Agri-Water Use in the Hindon sub-basin - A Multi Scale Participatory Approach with Dr. P. Sanyal from IISER Kolkata as lead Indian PI & Dr. J.C.J. Groot Wageningen University, Wageningen as lead from Dutch side.
    - c. Title: Changing the fate of the Hindonriver by evaluating the impact of agriculture on the water balance Developing a template for a cleaner Ganga river with Dr. Vinod. Tare from IIT Kanpur as lead Indian PI & Prof.Dr. A.H. Weerts, WUR, Wageningen, The Netherlands as lead from Dutch side
  - II. Two Accelerating CCS Technologies (ACT) Consortia multilateral proposals with Indian's participation dealing with the area of Carbon Capture Utilization and Storage has been recommended:
    - a. SHARP Storage - "Stress history and reservoir pressure for improved quantification of storage containment risks", IIT Bombay as Indian partner with storage as focus.
    - b. SCOPE - "Sustainable Operation of post-combustion Capture plants", IIT Kharagpur and Indraprastha University as one of the Indian partners with Utilisation as focus.
7. Ongoing projects:
  - WTI has strengthened the support to ongoing Indo-UK project titled "Fate and Management of Emerging Contaminants" being led by Indian Institute of Technology Madras, Chennai". The project team from IIT Roorkee has completed Yamuna sample analysis and groundwater sample analysis as well as development of method for extraction of ECs from sludge. A pilot PPT reactor with a capacity of 1 m<sup>3</sup>/day has been also designed and fabricated under the work done and has been installed at IIT Madras.
  - WTI has also strengthened the support to ongoing project supported under Urban Water

Management Programme entitled “Advancing technological interventions in water supply, drainage and sewage treatment” led by IIT Kharagpur in collaboration with IISc Bangalore and IIT- Bombay. The project team has completed the field visits to pilot site Ludhiana and Umberpada for site assessment. The first phase design of IoT system for automation of water services has been also completed and the IoT system for continuous data collection and transmission has been established. The Multi-instrument (QQQ-ICP-MS and ICP-OES) water analysis facility has been also established at IISc Bangalore under the project.

8. As part of Remedial Action, Knowledge Skimming and Holistic Analysis of COVID-19 (RAKSHAK) project under NM-ICPS TIH at IIT Jodhpur, for easy analysis of COVID infections, a technology platform was developed where in people can upload their X-Rays and the platform will analyse through AI technologies and provide exhaustive analysis in minutes free of cost. This was developed in a record time of 4 months. Similarly, proximity estimation, medical data analytics etc. was also developed and is in testing phase.
9. In a Joint Industry-Institute project, the industry had identified a unique problem - "Mechanical seals, which are used in pumps for petroleum, oil, chemical industries, etc., fail due to high friction and wear at a shorter lifetime under harsh chemical environments. This leads to higher maintenance costs, downtime, and higher material loss for the processing units." To resolve this issue Professor MS Ramchandra Rao of IIT-Chennai has developed a Unique Diamond Coating Technology to solve the problem and increase the lifetime of these seals. The technology has been adopted by TI Tubes, Coimbatore and its further optimisation is currently going on. The project was reviewed, after 18 months of its beginning, by the Nano Applications and Technology Advisory Group (NATAG) and the progress so far was rated as "Excellent".

#### **D. International Cooperation**

1. Presented a talk in the workshop of US-India collaborative for smart distribution System with Storage (UI-ASSIST) during August 02-05, 2021 through virtual mode on ongoing activities and future road map to evolve future distribution grid that will allow the continuing increase of Distributed Energy Resources (DER) penetration towards a carbon-free electricity system with high penetration of energy storage.
2. An inter-Ministerial meeting for India-EU STI Cooperation was held on 16th Aug 2021 to chalk down India's unified approach and strategy.
3. DST has agreed to join Mission Innovation 2.0 (Second Wave) - Mission on Carbon Dioxide Removal (CDR) technologies.
4. Under Indo-Sweden Call on Smart grids First level Evaluation meeting was organised on 31st August 2021 for evaluation of 8 Indo Sweden proposals submitted.

#### **E. Human Capacity Building**

1. **Azadi ka Amrit Mahotsav:** WISE-KIRAN Division has organized a lecture of Prof. Annapurni Subramaiam, Director, Indian Institute of Astrophysics, Bangalore for Vigyan Jyoti Scholars on the eve of 75<sup>th</sup> Independence Day to celebrate Azadi ka Amrit Mahotsav.
2. **Vigyan Jyoti:** Several activities have been conducted under Vigyan Jyoti during August. A summarized view is given below:

***Career Counselling for Class XII Students:*** Career Counselling sessions were organized on

1<sup>st</sup> August, 2021 for all the Vigyan Jyoti students of Class XII. Mr Abhinesh Anand, Territory Head, FIIT-JEE was the resource person. The sessions were conducted in 2 languages i.e., Hindi and English.

**C-STEM Classes:** C-STEM classes aims to empower girl students to become thinkers and problem solvers. 3 Sessions of C-STEM Workshops have been conducted in the month of August in Hindi as well as English with an aim to enhance the understanding and concept clarity of Class X students through practical learning approach. They are as follows:

**Interactive Session with Vigyan Jyoti Ambassadors:** Under C-STEM Classes, few best performer and sincere students of Class X have been selected as Vigyan Jyoti Ambassadors. An interactive session was organized with these VJ Ambassadors and Teacher Coordinators for their feedback about C-STEM and also to understand the challenges faced by students. VJ Ambassadors have been requested to motivate their peers.

**Vigyan Jyoti Buddy Lecture Series:** Two lectures under a series of talks by girl students of IIT Roorkee on the potentials and promises of various disciplines in STEM as a career option for girls was conducted by JNV Haridwar on August 7 & 21, 2021.

**Special Online Classes:** During this month, 96 online classes have been conducted for Class XII VJ Scholars. Further, 15 tests have been conducted for JEE/NEET.

**3. Gender Advancement for Transforming Institutions (GATI):**

**Interaction Meeting with GATI Pilot Institutions:** Interaction meeting was organized with GATI Pilot institutions. Representatives from institutions have shared their thoughts on GATI Activities to be completed at their place.

**Introductory meeting:** An Introductory meeting was organized for Indian GATI and UK Athena SWAN (AS) institutions. Representatives from all invited institutions participated in the meeting. UK AS institutions have given short introductory presentations about their institutions.

**4. Women Scientists Scheme:** In August, 53 sanctions under WOS have been issued.

**5. CSRI-SATYAM:** Under Cognitive Science Research Initiative (CSRI), 3<sup>rd</sup> Task Force Meeting has been conducted on 19 July 2021 to review the progress made under ongoing projects. 23 PIs have participated in this meeting.

**6. Outreach Activities of the WISE-KIRAN Division:** Total 8 tweets have been shared by @IndiaDST on various activities of the Division during the month of August. Head, WISE-KIRAN Division shared various interventions under Vigyan Jyoti to enhance participation of girls in STEM Education in a meet organized by IBM, India.

**7.** About 200 PhD students continued their research work in different mega science projects. The output includes 1 PhD, 8 Research Publications, 8 collaborative Research Publications, 7 Conference papers, 4 Webinars and training of 11 other human resource.

**8. Innovation in Science Pursuit for Inspired Research (INSPIRE) Fellowship:**

- 78 INSPIRE Fellows received fellowship for pursuing doctoral degree programme.

- Agricultural Sciences, Biosciences and Biotechnology and Engineering Sciences Subject Expert Committee meetings for Level-2 evaluation of INSPIRE Fellowship applications were organized through virtual mode.
- INSPIRE Fellowship-2019 level 2 result for award of INSPIRE Fellowship for pursuing Ph.D. Programme was declared.
- 82 INSPIRE Fellows got upgraded from Junior Research Fellow (JRF) to Senior Research Fellow (SRF) for pursuing doctoral degree programme.

**INSPIRE Faculty Fellowship:**

- 36 INSPIRE Faculty Fellow's fellowship grant was released for pursuing Post-doctoral programme.
9. A virtual meeting between SEED Division, DST and Barefoot College International, Rajasthan regarding project being supported under TARA programme was held on 12<sup>th</sup> August, 2021 to discuss Science & Technology (S&T) strategies for building sustainability & resilience at community level and way forward. The organization has done extensive work for COVID response and it is recognized by the World Economic Forum as India's Top 50 COVID-19 Last Mile Responders.
  10. Prostate cancer (PCa) is a major cause of mortality and morbidity in men and available therapies yield limited outcome. In a new research work conducted at Bose Institute (BI), Kolkata anti-PCa activity in a Polyphenol-rich Fraction of *Bergenialigulata* (PFBL), a plant used in Indian traditional and folk medicine for its anti-inflammatory and antineoplastic properties has been reported. PFBL was found to efficiently reduce the PC3-tumor xenograft in NODSCID mice alone and in synergy with Paclitaxel. Results of this study suggest the possibility of development of a novel treatment protocol utilizing PFBL to improve therapeutic outcome for patients with aggressive PCa.
  11. Aberrant expression of Zinc-finger E-box binding homeobox 1 (ZEB1), which remains repressed in normal cells, is frequently associated with cancer aggressiveness. However, transcriptional mechanism underlying such atypical ZEB1 expression in cancer is not yet well understood. BI demonstrated an epigenetic mechanism of ZEB1 reactivation where dynamic occupancy of transcription regulators encompassing a G4 motif is crucial and thus, small molecule induced G-quadruplex stabilization may act as a potential molecular switch to turn-off gene expression.
  12. Formation of biofilm by *Vibrio cholerae* plays a crucial role in pathogenesis and transmission of cholera. In a work conducted at BI, the effectiveness of gold nanoparticles (AuNPs) of different size and shape on both the inhibition of formation and eradication of biofilm of the two biotypes of *V. cholerae* (classical (VcO395) and El Tor (VcN16961)) has been studied. The analysis revealed the reduction of cholera toxin production upon treatment with AuNPs. Spherical AuNS100 seems to be the best suited to inhibit the formation or destruction of biofilm, as well as to disrupt cholera toxin production and function.
  13. An analysis of statistical isotropy of the large-scale matter distribution inferred from lensing of the Cosmic Microwave Background (CMB) has been performed by Indian Institute of Astrophysics (IIA), Bengaluru. Sky patches which exhibit anomalous behaviour have been identified. The cause of the anomaly for most of them is found to be the inaccurate estimation of noise. Furthermore, two patches which exhibit anomaly originating from departure from statistical isotropy at higher than 95% confidence level have been identified.

14. To understand the exact mechanism of fluctuation dynamo saturation, the effects of stretching and compression terms in the evolution equation of the magnetic energy are being explored by IIA. It is found that the stretching term contributes to the decrease of growth rate in all the three principal directions as the dynamo evolves from kinematic to saturated state. However, compared to subsonic flows, this decrease is more prominent in supersonic flows. On the other hand, compression term is observed to contribute significantly only in the case of supersonic flows.
15. The holding structure for mounting the lightning protection system for 90 and 40 inches telescopes of VBO, Kavalur designed by IIA.
16. Scientists of S N Bose National Centre for Basic Sciences (SNBNCBS), Kolkata have found theoretical explanation for unique reversing motion of bacteria.
17. Experimentalists at Raman Research Institute (RRI), Bengaluru along with their collaborators has resulted in the fabrication of noble metal nanoparticle decorated dielectric nanowires with enhanced saturable absorption and optical limiting behaviour. This study indicates the potential of these materials for application as efficient optical limiters, for the safety of human eyes and sensitive optical detectors from accidental exposure to harmful laser radiation.
18. Specific types of disk galaxies in the ultraviolet and radio wavelengths has enabled astronomers at RRI to provide estimates for the star formation rates in these galaxies.
19. Astronomers at RRI along with its collaborators undertook observations in X-ray wavelengths and subsequent data analysis of a compact binary using multiple telescopes. A two-temperature thermal plasma model was found to fit the data very well while the time series analysis of the data provided no inputs on the orbital dynamics of the binary. This is attributed to the low sensitivities of the telescopes.
20. Wadia Institute of Himalayan Geology, (WIHG), Dehradun established persistent negative mass balance of glaciers (average:  $-0.69 \pm 0.28$  m w.e.a<sup>-1</sup>) by studying annual surface mass balance of 75 glaciers (size >1 km<sup>2</sup>) in the Suru sub-basin, western Himalaya for the period 1994-2018 using remote, geodetic mass balance and field survey, which coincide with the increased temperature and reduced precipitation in the valley, implying sensitivity of the glaciers to climate change.
21. WIHG also reconstructed the late Quaternary glacial history of Suru Basin, western Himalaya, which records five major glacial advances of decreasing magnitude, dated 33–23 ka, 16 ka, 13–11 ka, 10–7.3 ka, 2.8–2.3 ka, and a minor advance dated 0.7–0.4 ka, based on field mapping and OSL dating.
22. WIHG also explored spatial–temporal heterogeneity in a small post-glacial lake of the Lahaul Himalaya, which indicate strengthened Indian summer monsoon (ISM) during medieval climate anomaly (MCA) and weakened ISM during little ice age (LIA) in the NW Himalaya.
23. Institute of Nano Science & Technology's developed a non-invasive, easy to administer, cost-effective, and patient compliant potential therapeutic strategy against visceral leishmaniosis, a neglected tropical disease.
24. Eighty One technologies developed and patented by publicly funded academia and R&D labs which are at TRL 6 and above being examined by Technology Information, Forecasting & Assessment Council (TIFAC), New Delhi to assess their market and societal potential and need for further support under the ATMA Programme (Assessment of Technology Maturity for Aatma Nirbharta).

25. **Meeting on finalisation of the strategies for online sharing of geospatial data with the Delhi Development Authority (DDA):-**On 3<sup>rd</sup> Aug, 2021 Head (NSDI) participated in a meeting with the Additional Chief Secretary, Government of National Capital Territory of Delhi (GNCTD); Finance Secretary, GNCTD; Information Technology (IT) Secretary & Managing Director of Geospatial Delhi Limited (GSDL) to finalize the strategies for on-line sharing of geospatial data with the Delhi Development Authority (DDA) for the preparation of the Delhi Master Plan – 2041. It was decided to provide standards-based interoperable data services from the GSDL Cloud-based Virtual Machine following the completion of a demonstrative Proof-of-Concept (PoC) with the involvement of ESRI.
26. **Meeting of the Bureau of Indian Standards (BIS):-** Head (NSDI) chaired the Panel 3 meeting of the Bureau of Indian Standards (BIS) Geospatial Information Sectional Committee (Electronics & Information Technology Division LITD-22) meeting on 09 August 2021 to frame LIDAR survey standards useful in capturing 3-dimensional geospatial data sets. Concerned Government Agencies, Academic Institutions; and Industry Bodies participated and finalized a time schedule for the preparation of the required standard.
27. **Head (NSDI) and the Consultant (NDR-NSDI) participated** and recommended technical specifications during the Arunachal Pradesh Geoportal Technical Bid presentation meeting on 24<sup>th</sup> August 2021 – for the selection of a suitable System Integrator for developing the State SDI Geo-portal. The Geo-portal will be useful in sharing of geospatial data sets acquired by the Government of Arunachal Pradesh out of its own resources.
28. **A 2-day Training Programme was organized by the National Centre for Geodesy, IIT Kanpur on “Geodetic Network Adjustment for the acquisition of High Resolution of 2D/ 3D geospatial data sets for the development of NSDI Applications” held on 26-27 August 2021** with the help of the faculties of the Department of Civil Engineering. A group of 59 participants from the NSDI and State SDI Partnering Agencies attended the training that is useful in acquisition and maintenance of high resolution geospatial data sets in respective agencies for developing and sharing application and solution services as per the provisions of the upcoming National Geospatial Policy.

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