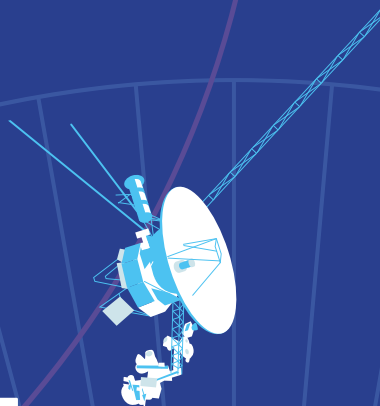
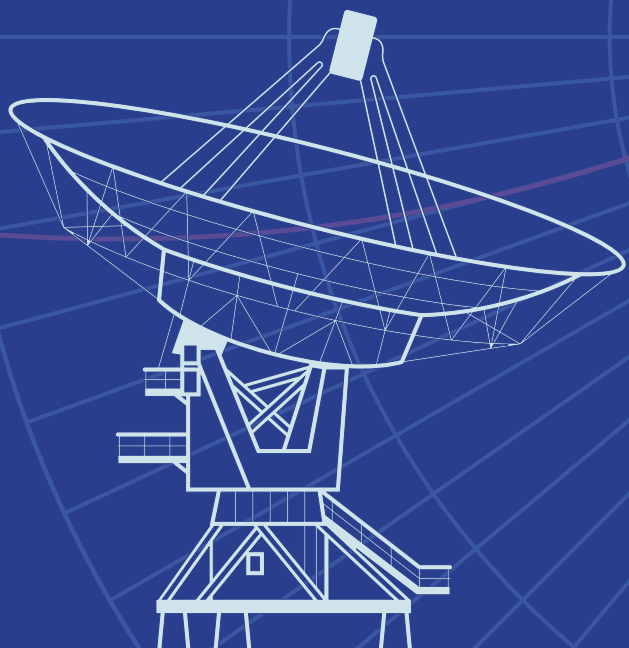




Office of the Principal Scientific Adviser
to the Government of India

REPORT OF THE OFFICE OF THE PRINCIPAL SCIENTIFIC ADVISER TO THE GOI

2019-2020



| | |
|--|----|
| 1. Foreword by the PSA | 06 |
| 2. Message from the Scientific Secretary | 08 |
| 3. PM-STIAC National Missions | 10 |
| 3.1 Natural Language Translation | |
| 3.2 Quantum Frontier | |
| 3.3 Artificial Intelligence | |
| 3.4 National Biodiversity Mission | |
| 3.5 Electric Vehicles | |
| 3.6 Bioscience For Human Health | |
| 3.7 Deep Ocean Exploration | |
| 3.8 Waste-to-wealth | |
| 3.9 Accelerated Growth For New India's Innovation (Agnii) | |
| 4. Empowered Technology Group | 16 |
| 4.1 Objectives of ETG | |
| 4.2 Pillars of ETG mandate | |
| 5. Policy Interventions | 20 |
| 5.1 Ranking of Publicly Funded R&D Organisations | |
| 5.2 New Science Technology and Innovation Policy | |
| 5.3 National Academic Ethics Policy | |
| 5.4 STI for SDGs – National Roadmap | |
| 5.5 Policy Inputs to DPIIT on Taskforce on Innovation | |
| 5.6 Sweden – India Innovation Partnership for a Sustainable Future | |
| 5.7 Allowing STEM R&D in CSR Expenditure | |
| 5.8 National Strategy for Artificial Intelligence | |
| Initiatives | 24 |
| 5.9 Open Access Initiative | |
| 5.10 Linking MSME engineering manufacturing clusters with CSIR | |
| 5.11 Creation of an Institutionalised Structure for Development of Emerging Technologies | |
| 5.12 Animal Husbandry sector | |
| 5.13 Energy Critical Elements | |
| 5.14 Intervention to Spur Electronics Manufacturing | |
| 5.15 Showcasing significant STI achievements = | |
| 5.16 Report on the Effects of Weighted Deductions Provisions in Section 35 of the Income Tax Act | |
| 5.17 Public Lecture Series on “Women in Science & Technology in India” | |

| | |
|--|----|
| 6. Synergy projects supported by Office of the PSA | 28 |
| Innovation | 30 |
| 6.1 City Knowledge and Innovation Clusters | |
| 6.2 Academia-Industry linkage for inclusive growth | |
| 6.3 National Research Foundation (NRF) | |
| 6.4 National Frontiers of Science (NatFOS) | |
| 6.5 Indian Science, Technology and Engineering facilities Map (I-STEM) | |
| Energy | 32 |
| 6.6 Projects in support of The Advanced Ultra Super Critical (AUSC) Technology | |
| 6.7 Project on the development of III-Nitride white and ultraviolet light emitting diode technology for green energy and societal impact | |
| 6.8 High Efficiency Electric Motors | |
| 6.9 Future Preparedness in STI: Transportation | |
| 6.10 A Study on ‘Emerging Technologies for Delivery of Energy to Electric Buses’ | |
| Industry and Tool Sector | 34 |
| 6.11 Project on the development of alternate materials for improving dynamic response and damping properties of machine tool structures | |
| 6.12 Technology upgradation of engineering goods | |
| 6.13 Project on Industrial valves | |
| Green Chemistry and Industry | 35 |
| 6.14 Evaluation of Pilot Scale Plant Performance of Pre-Clarified Molasses to Improve Alcoholic Fermentation | |
| 6.15 Recovery of Potash from Incineration Boiler Ash | |
| Health | 36 |
| 6.16 Project on medical devices | |
| 6.17 Project on advanced epilepsy research: a multidisciplinary approach | |
| 6.18 Project on the structure-based design of inhibitors for selected tuberculosis (TB) proteins involved in the maintenance of genome integrity | |
| 6.19 Multi-centric clinical trials of the indigenous total knee prosthesis | |
| 6.20 Brain Mapping Project | |
| 6.21 The 3DGB project | |
| Network Security | 38 |
| 6.22 Network Security | |
| 6.23 Society for Electronic Transactions and Security (SETS) | |
| 6.24 Physical Unclonable Function – A chip level fingerprint for hardware security | |
| 6.25 Project on the development of indigenous wireless sensor networks for assessment of slope stability of avalanche sites | |

| | |
|---|-----------|
| Rural and Social Development | 40 |
| 6.26 RuTAG (Rural Technology Action Group) | |
| 6.27 Science & Technology Intervention In North Eastern Region (STINER) | |
| 6.28 Technology dissemination and adoption of improved horseshoes | |
| 6.29 Feasibility Studies of Biogas and Compost Production | |
| 6.30 Development of a Near-IR Spectroscopy Based Handheld System for Quantification of Curcumin Content in Turmeric | |
| 6.31 Coastal Flood Warning System-Chennai (CFLAWS-Chennai) | |
| 6.32 Redesigning the Palanquin System for better Functionality | |
| Education and Development | 43 |
| 6.33 Code India | |
| 6.34 E-classroom | |
| 6.35 Deep Science transforming scientific discoveries into impactful solution | |
| 6.36 Identification and Nurturing of High Potential Learners | |
| 7. Reports | 44 |
| 7.1 R&D Expenditure Ecosystem Report – Current Status and Way forward | |
| 7.2 Report on Policies and Action Plan for a Secure and Sustainable Agriculture | |
| 7.3 Practical Statistics, Data Analysis & Graphics using R Language | |
| 7.4 Strategic S&T ties between countries are the only way to address climate change | |
| 8. Events and Activities | 48 |
| 8.1 4th PM-STIAC meeting: Focus on Scientific Management of Water, January 2019 | |
| 8.2 Quantum Computing workshop, January 2019 | |
| 8.3 Sir Mark Walport Lecture, January 2019 | |
| 8.4 Reusable Sanitary Napkin: Training cum exposure, January 2019 | |
| 8.5 Science and Industry Interaction on Genomics, January 2019 | |
| 8.6 PSA's Visit to the UK, February 2019 | |
| 8.7 Feed Block Machine at IIT Guwahati, February 2019 | |
| 8.8 Nisargaruna Plant for solid waste treatment: Bio-digester Plant, Date | |
| 8.9 Quantum Matters workshop, February 2019 | |
| 8.10 National Science Day, February 2019 | |
| 8.11 Press Briefing on PM-STIAC by the office of the PSA, March 2019 | |
| 8.12 International Advisory cum Interaction Meet at INSA for development of the Indian Museum of Earth (TIME), April 2019 | |
| 8.13 11th UDWIM Annual General Assembly, April 2019 | |
| 8.14 Science & Society Symposium, April 2019 | |
| 8.15 Swedish Research and Innovation delegation interaction with Invest India and PSA's office, April 2019 | |
| 8.16 NERLP Mizoram team visit to biodegradable Sanitary Napkin Production Unit, May 2019 | |
| 8.17 Centre of Excellence for Waste to Wealth Technologies, May 2019 | |
| 8.18 Discussion on India Geospatial Economy and Policy Imperatives, May 2019 | |
| 8.19 Inauguration of Re-usable sanitary napkin production unit, June 2019 | |

| |
|--|
| 8.20 Launching of biodegradable sanitary napkins "Na-Ri", June 2019 |
| 8.21 5th PM-STIAC meeting: Focus on Water Conservation and R&D ecosystem in Disaster Management, July 2019 |
| 8.22 Interaction with Industries, July 2019 |
| 8.23 6th PM-STIAC meeting: Focus on National Time Distribution Network, August 2019 |
| 8.24 Workshop on affordable EV charging infrastructure for 2-wheelers, Date |
| 8.25 India-UK workshop on Science for Disaster and Emergency Risk Management, Date |
| 8.26 Technical Textiles, Date |
| 8.27 7th PM-STIAC meeting, September 2019 |
| 8.28 National Solar Energy Federation of India Event, October 2019 |
| 8.29 I-STEM-Indian Science Technology, and Engineering facilities Map, October 2019 |
| 8.30 Urban Sewage Treatment launch at Barapullah, October 2019 |
| 8.31 Launch of CodeIndia programme, November 2019 |
| 8.32 Invest India Board of Directors Meeting, November 2019 |
| 8.33 Training Program on Capacity Building, November 2019 |
| 8.34 Policy awareness workshop on E-waste, November 2019 |
| 8.35 Solar Eclipse Meeting, December 2019 |
| 8.36 CodeIndia Program Visit, December 2019 |
| 8.37 IUCAA Center Inauguration, December 2019 |
| 8.38 Manohar Parrikar Vidhyan Mahotsav, December 2019 |
| 8.39 Jal Jeevan Mission Meeting, December 2019 |
| 8.40 PM-STIAC Mission Review, December 2019 |
| 8.41 India-Sweden High-Level Dialogue on Innovation Policy, December 2019 |
| 8.42 Indian R&D Ecosystem Conclave, December 2019 |
| 8.42 PSA's visit to the US, January 2020 |
| 8.44 APS Physics Annual Leadership Meeting, January 2020 |
| 8.45 Indian-Sweden Innovation partnership meeting, February 2020 |
| 8.46 Waste to Wealth Mission, February 2020 |
| 8.47 CSIR Society Meeting, February 2020 |
| 8.48 Electronics Corporation of India Limited (ECIL) Event, February 2020 |
| 8.49 CPSEs Forum on 'Scaling up R&D Investment – Way Forward', March 2020 |

FOREWORD BY THE PSA



***Principal Scientific Adviser,
Government of India***

The 21st century is witnessing a new era characterized by rapid deployment of emerging technologies in the physical, digital and biological spheres that will transform human life profoundly. Science, technology and innovation will transcend as a fulcrum for the levers of the government to affect social and economic change in a rapid and inclusive manner. For this to be effective, scientists, society and enterprises must seamlessly connect in order to build stronger foundations in research leading to 'knowledge creation', education leading to 'knowledge dissemination' and innovation leading to 'knowledge application'. Identifying, prioritizing and employing scientific knowledge coupled with technology led innovation will be an inevitable tool required across sectors and particularly, in critical areas such as agriculture, health, environment, energy and water.

Towards this end, the Prime Minister's Science, Technology and Innovation Council (PM-STIAC) has played a seminal role to assess the status of diverse science and technology domains, comprehend challenges and formulate roadmaps and actionable

interventions through the nine national missions that it has identified. The O/o PSA is creating an ecosystem conducive for harbouring partnerships across scientific and line ministries, research institutions, academia and industry to leverage cutting-edge scientific research and provide innovative solutions that will benefit the society and contribute to the knowledge economy of the country through these missions. This report highlights various policy interventions, position papers, roadmaps, that were generated and put in action as a result of these discourses.

The AGNli mission under the PM-STIAC aims to support the national efforts to boost the innovation ecosystem in the country. It is providing a platform for innovators to connect their technology products and solutions with industrial enterprises for upscaling and making them market deployable. AGNli is closely working with national R&D laboratories and academia to help commercialise their technologies and at the same time also linking specific needs of industry to research laboratories to enable development of cost-effective marketable solutions.

Recently the Government also approved the constitution of an Empowered Technology Group (ETG), as an institutionalized structure to proactively lay down, coordinate and oversee national-level policies relating to procurement, induction and support to R&D for technology deployment that require large outlays both of financial and human resources. The objectives of the Group inter-alia include identifying the important challenges before the country across various sectors that can be addressed through technological solutions. ETG will be providing an enabling platform for inter-ministerial synergy of efforts towards mega national science missions, advanced technology projects, and encourage better and greater use of technology in public service delivery. The O/o PSA will serve as the secretariat for the ETG.

The UN Inter-Agency Task Team has established a Global Pilot Program on Science, Technology and Innovation (STI) roadmap for the Sustainable Development Goals (SDG). Under the behest of this Office, India has been inducted as a pilot country to prepare national roadmap template on STI for SDGs. Given the thrust on STI for national development, we can now provide a roadmap that would reflect on India's unique position and remarkable capabilities and skills for harnessing existing indigenous technologies that can help us to achieve the SDGs and also attain self-reliance. Inclusion of STI component in different national strategies and initiatives can propel us to achieve the targets with focus on inclusive and equitable growth.

This report captures the work portfolio of this office which has broadly focused on the need to develop a strong nurturing arm required for new knowledge creation in emerging areas of scientific domain together with an application arm that promotes valorisation of this scientific knowledge for welfare of citizenry and economic growth of the nation.

MESSAGE FROM THE SCIENTIFIC SECRETARY



**Scientific Secretary,
Government of India**

India has a vibrant Science, Technology and Innovation (STI) ecosystem. In order to foster and promote the critical role that India plays in the global order of scientific and technological innovation, the Office of the PSA aims and works to provide pragmatic and objective advice on matters of Science and Technology. Today's most pressing issues and developmental challenges which nations face in one way or the other, have a scientific and technological dimension. Science and Technology led innovation offers greater opportunity to address these multifaceted challenges which are now truly cross-border in nature. S&T is increasingly recognised as driver and pillar of growth across diverse sectors covering agriculture, nutrition, communication, education, energy, health, water, transport, manufacturing, climate change, disaster management etc.

The Office of PSA has laid a roadmap for science and the technological path that 'New India' has embarked upon by rolling out critical national missions. The Prime Minister Science, Technology and Innovation Advisory Council (PM-STIAC), serviced

by the O/o PSA has played a significant role in identifying several key missions of national importance. These missions are aimed to provide innovative technology platforms through convergence of scientific knowledge.

To position India as a pioneer, the missions aim to understand and conserve our rich biodiversity and develop sustainable agriculture processes, access to scientific knowledge in native language using a combination of machine and human translation, leverage genomic based precision health for personal wellbeing, recover wealth from waste, develop capacity in the use of artificial intelligence and quantum frontiers, connected mobility solutions and importantly deep-sea mission for ushering blue economy. All the identified missions address frontier scientific questions that will provide answers to different challenges. This will help India to meet the UN Sustainable Development Goals (SDGs) by employing the soft prowess of S&T and also create an impact at the grass-roots by enabling us to become a modern yet inclusive economy.

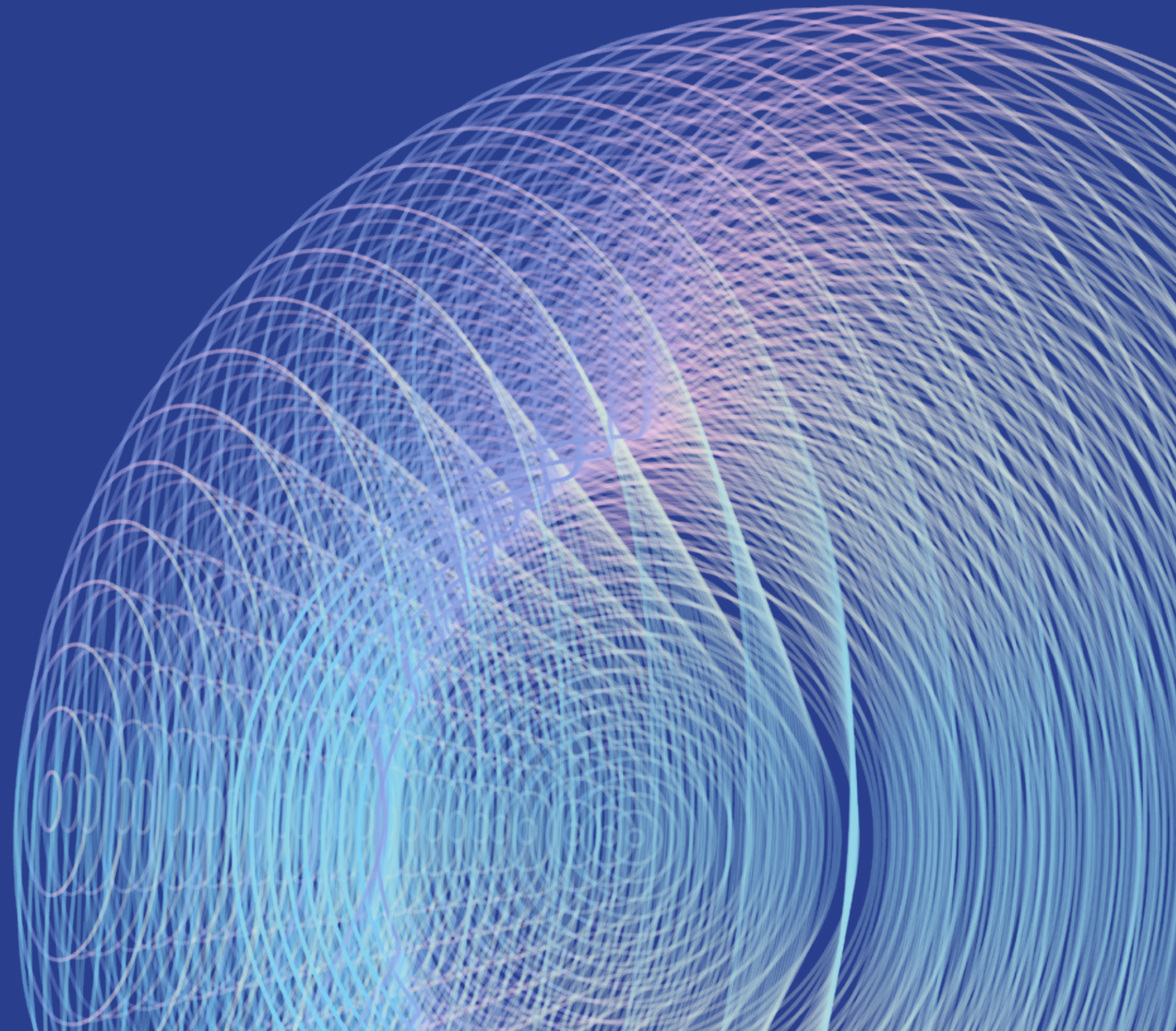
By taking on challenges in science and identifying solutions needed for societal problems, each mission is being thoughtfully designed to promote closer collaboration across scientific and other line ministries, research and academic institutions, along with industry partners, by leveraging cutting edge scientific research to address complex problems and provide implementable solutions in a reasonable time-frame.

To augment this effort the 'City Knowledge and Innovation Clusters' are being established across the country. This will be enabled through a dynamic networking of research labs, academia, industry and enterprises by leveraging scientific knowledge and infrastructure base already existing in many of our cities. The clusters will help to collectively use the existing research and innovation strengths in geographical proximity, driving future economic growth, wealth creation, and enabling rapid and direct knowledge exchange. The aim is to drive innovation and deployment of technological solutions for addressing local, national and international needs.

With the aim to link researchers and resources, an online gateway - Indian Science Technology and Engineering facilities Map (I-STEM) was launched by the Hon. Prime Minister. The I-STEM portal holds the database of R&D facilities established in public institutions around the country and enables their access and use in a transparent and optimal manner.

The need to broad base the use and adoption of scientific and technological tools across the various ministries and departments of the government and integrate this by leveraging the STI eco-system existing in our R&D laboratories, academia, industry and start-up enterprises is the underlying philosophy for which the Office of PSA aspires to work through its various initiatives and programs.

**PRIME MINISTER'S
SCIENCE, TECHNOLOGY
AND INNOVATION
ADVISORY COUNCIL
(PM-STIAC)
NATIONAL MISSIONS**



The PM-STIAC is an overarching Council that facilitates the PSA's Office to assess the status in specific science and technology domains, comprehend challenges in hand, formulate specific interventions, develop a futuristic roadmap and advise the Prime Minister accordingly. PSA's Office also oversees the implementation of such interventions by concerned S&T Departments and Agencies and other government Ministries. The other important terms of reference of the Council is to formulate, converge, collaborate, co-ordinate and implement multi-stakeholder policy initiatives, mechanisms, reforms and programmes.

Deliberations of the PM-STIAC led to the initiation of 9 national missions.



3.1 NATURAL LANGUAGE TRANSLATION

In this mission, a system will be deployed by integrating various tools to achieve the capability and translate lectures or speech given in English into Hindi text as well as Hindi speech in two subject domains chosen from the field of Computer Science and Engineering. Apart from English to Hindi, the project will also demonstrate the following systems:

- Speech to Speech machine translation from English to Tamil, Telugu and Malayalam (via Hindi and Tamil as intermediary Text to Text Machine Translation (TTMTs).
- Speech to text system from English to Punjabi via Hindi TTMT

The development would leverage existing technologies developed for Indian languages as well as develop new technologies. It provides access to teaching and researching material bilingually - English and one's native Indian language.



3.2 QUANTUM FRONTIER

The mission focuses on understanding and controlling the quantum mechanical systems with many degrees of freedom, to solve one of the great contemporary challenges in fundamental science and technology. Building excellence in the quantum frontier through this mission is essential for national security and development of quantum computers, quantum chemistry, quantum communication, new materials, quantum sensors, and quantum cryptography. This helps the Indian STI ecosystem progress into technology/industry of the future - synergistic with India's strengths in the computer industry



3.3 ARTIFICIAL INTELLIGENCE

The Artificial Intelligence (AI) mission focuses on creation of new knowledge, and the development and deployment of applications of AI in areas such as healthcare, education, agriculture, smart cities and infrastructure, as well as smart mobility and transportation.

The mission will engage closely with academia and industry to develop core research capability in AI at the national level, which will include international collaborations



3.4 NATIONAL BIODIVERSITY MISSION

This mission includes comprehensive documentation of India's biodiversity; assessment of the distribution and conservation status of India's biodiversity; development of a cadre of professionals; management and monitoring of biodiversity and establishment of a vibrant biodiversity-based sustainable economy anchored by a reliable information system; and public engagement for security and the general well-being of society.



3.5 ELECTRIC VEHICLES

The mission aims to develop vehicle sub-systems and components for Indian requirements including rare-earth based electric motors, Lithium-ion and batteries of new Chemistry, power electronics. This will be done through adoption of EV technologies will help India meet its sustainability goals and lower carbon emissions.



3.6 BIOSCIENCE FOR HUMAN HEALTH

The mission will utilise healthy and disease samples to understand the impact of nature and nurture on health. The primary goal of the mission is to construct comprehensive reference maps of genomes and understand the dynamics of how exposure to different environments impacts our bodies.

It will focus on the genomic study of human populations to identify and unravel the genetic basis and prevalence of rare and inherited diseases. This mission will help improve diagnosis and treatment techniques, that can ultimately feed into the health care system of the country.



3.7 DEEP OCEAN EXPLORATION

The purpose of this mission is to scientifically explore deep oceans, with the goal of improving our understanding of the blue frontier. The mission's focus areas cover the development of technologies for the deep-sea exploration of living (biodiversity) and non-living (minerals) resources; underwater vehicles and underwater robotics; ocean climate change advisory services; technological innovations and conservational methods for sustainable utilisation of marine bio-resources; offshore-based desalination techniques; and renewable energy generation techniques.

3.8 WASTE-TO-WEALTH

Taking Swachh Bharat Mission to the next level, the Government of India is committed to bring latest technologies that can transform waste to energy and wealth. The mission has identified Sentinel Sites across the country where technologies will be deployed to address issues of waste disposal, deteriorating air quality, and increasing pollution of water bodies through pilot projects. These projects will seek to discover, demonstrate, test, and learn from different waste to wealth services and techniques & approaches in collaboration with various departments & ministries.

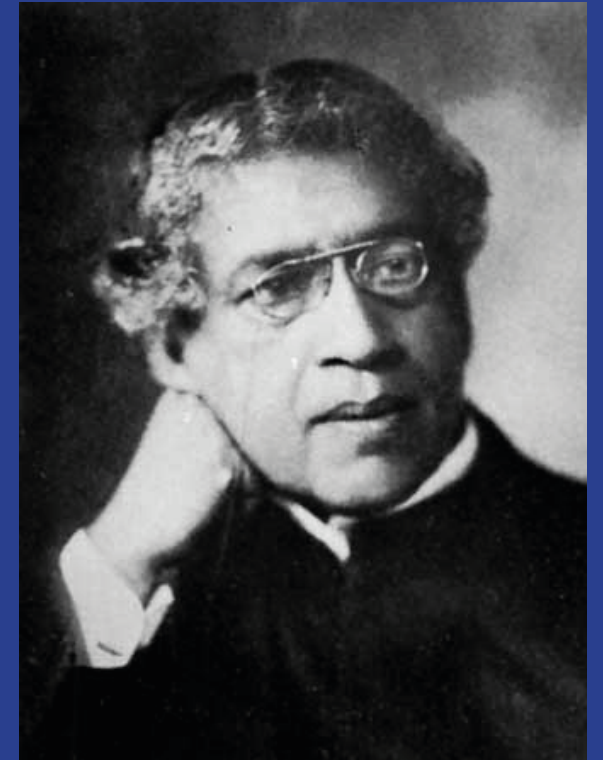
3.9 ACCELERATED GROWTH FOR NEW INDIA'S INNOVATION (AGNII)

Accelerated Growth for New India's Innovation (AGNII) is a Technology Commercialization Program which aims to support the national efforts to boost the innovation ecosystem in the country by connecting innovators across industry, individuals and the grassroots to the market and help commercialize innovative solutions. AGNII will provide a platform for innovators to bring their technology ready products and solutions to industry and the market, thereby helping propel techno-entrepreneurship which can usher a new era of inclusive socio-economic growth.

The mission includes services across the techno-commercialisation chain required to support and upscale market-ready indigenous innovations. The initiative includes working with government R&D laboratories and academia to help commercialize their innovations; collaborate and value add to existing innovation programs; training and capacity building of scientists, innovators, technology transfer offices and technology license offices. Linking specific needs of industry to research laboratories to enable development of cost-effective marketable solutions is another focus of the AGNII program.



EMPOWERED TECHNOLOGY GROUP



*"The true laboratory is the mind,
where behind illusions we
uncover the truth."*

– Jagdish Chandra Bose

The Empowered Technology Group (ETG) was constituted by the Cabinet as an institutionalized structure to proactively lay down, coordinate and oversee national-level policies relating to procurement and induction, and Research and Development (R&D) in technologies that require large outlays in resources, both financial and human, and to render sound and timely advice for determining direction and trajectory of Government's R&D and Technology Development Programmes. The twelve-member ETG is chaired by the Principal Scientific Adviser to Government of India and has the Chairmen of Atomic Energy Commission, Space Commission and DRDO and Secretaries of the Departments of Science & Technology, Telecom and the Ministry of Electronics & Information Technology as members. The remaining 5 members are special invitees from the Technology Advisory Group (TAG) of ETG.

The TAG comprising of 10 members from academia and 10 members from industry will support the ETG in achieving its mandates by rendering advice on R&D and technology development, considering the perspectives of both industry and academia. The stakeholders interacting with ETG include scientific and line ministries, state governments, R&D labs, CPSEs and Industry. The Technology Officers nominated from scientific and line ministries will be their nodal interfaces with ETG.



4.1 Objectives of ETG

- Ensure that India has appropriate policies and strategies for effective, secure and context-sensitive exploitation of the latest technologies for economic growth and sustainable development of Indian Industry.
- Advise the Government on priorities and strategies for research on emerging technologies across sectors.
- Maintain an updated map of technology and technology products available, and being developed, across India.
- Develop indigenization roadmap for selected key technologies.
- Advise the Government on its technology supplier and procurement strategy.
- Encourage all Ministries and Departments as well as State Governments to develop in-house expertise in policy and use aspects of emerging technologies such as data science and artificial intelligence, and to this end develop an approach to training and capacity building.
- Formulate policies for sustainability of public sector technology at PSUs/Labs while encouraging cross-sector collaborations and research alliances with Universities and Private Companies.
- Formulate standards and common vocabulary to apply in vetting of proposals for R&D.

4.2 Pillars of ETG mandate



Policy Support



Procurement support



R&D Support

Policy Support

Guide policy formulation in the development and use of technologies and render advice to promote Private Sector and global investment in R&D, education and skills in emerging technologies. Review of technology adaptation of Ministries and Departments, Development of a long-term technology roadmap for indigenization of key technologies and Coordination with Ministry of External Affairs to develop a strategy to influence international discourse will also be undertaken.

Procurement support

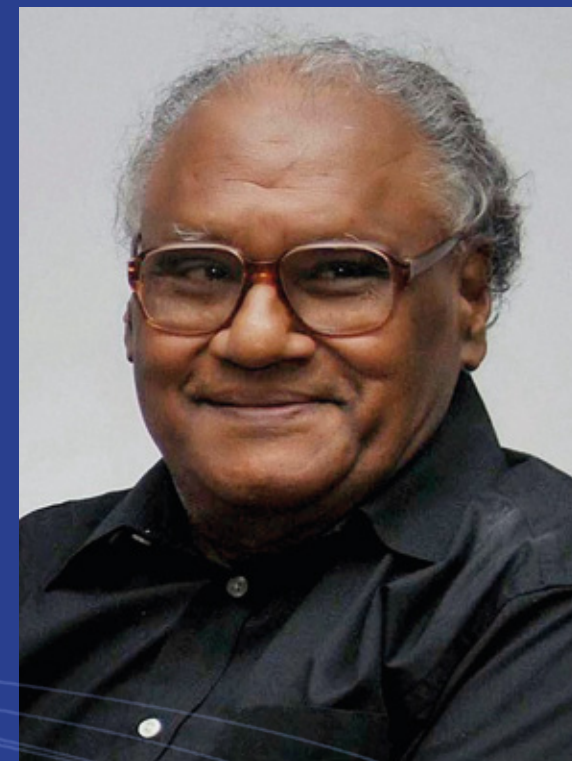
Proposals in excess of Rs. 500 crore for procurement of technology/ technology products will be placed before ETG prior to submission to the Expenditure Finance Committee (EFC)/Cabinet. ETG will ensure no duplication and overlap in procurement of technology products, technologies, services or facilities across Departments and promote procurement from Indian vendors. Preparation of a Digital catalogue of all technologies and technology products, and an e-Market Place will be catered to.

R&D Support

Proposals in excess of Rs. 500 crore relating to R&D will be placed before ETG prior to submission to the Expenditure Finance Committee (EFC)/Cabinet. ETG will ensure adoption of global best practices in R&D project proposals; establish synergy, ensure no duplication in proposals across departments and ensure setting up of an exit strategy subsequent to completion of research i.e. commercialization via technology transfer to Industry.

Development of an Innovation Index to objectively measure in-house innovation and conducting workshops to train senior decision makers on the standards, norms and best practices for developing R&D proposals will also be undertaken.

POLICY INTERVENTIONS & INITIATIVES



*"Always gain fresh insights,
don't hesitate to ask the right
questions."*

**– Chintamani Nagesa
Ramachandra Rao,**
Solid State Chemistry,
Bharat Ratna, 2013

5.1 Ranking of Publicly Funded R&D Organisations

Office of PSA was assigned by the PMO to develop a Rating and Ranking Framework for Public Funded R&D organisations based on a matrix drawn by an expert Committee under Niti Aayog. The Working Group has been set up and full-scale implementation of the project shall be completed in one year. This shall be a regular annual exercise across R&D organisations under administrative control of all Central government Departments/ Ministries. These ranking and rating structure will increase public awareness regarding top R&D centres and projects associated with them.

5.2 Science Technology and Innovation Policy

The Office of the Principal Scientific Adviser to the Government of India (Office of PSA) and the Department of Science and Technology (DST) have jointly initiated a decentralized, bottom-up, and inclusive process for the formulation of a new national Science Technology and Innovation Policy (STIP 2020)

STIP 2020 formulation process is organised into 4 highly interlinked tracks: Track I involves an extensive public and expert consultation process through inputs from larger public and expert pool during and after the policy drafting process. Track II comprises experts-driven thematic consultations to feed evidence-informed recommendations into the policy drafting process. Twenty-one (21) focused thematic groups have been constituted for this purpose. Track III involves consultations with Ministries and States, while Track IV constitutes apex level multi-stakeholder consultation. For Track III nodal officers are being nominated in States and in Ministries, Departments and Agencies of Government of India for extensive intra-state and intra-department consultation and for Track IV consultation with institutional leadership, industry bodies, global partners and inter-ministerial and inter-state consultations represented at the highest levels are being carried out.

5.3 National Academic Ethics Policy

A draft national policy on 'Academic Ethics' was formulated in collaboration with prominent academicians in the country and refined with feedback from the Indian National Science Academy and the Indian Academy of Sciences. The document lays down the foundational principles for upholding integrity and ethical practices in an academic environment and streamlines the course of action to ensure delivery of justice in case of malpractices. After a period of implementation of this draft policy, feedback will be taken, and a final national policy will be readied.

5.4 STI for SDGs – National Roadmap

India played an important role in the negotiations for introduction of a UN driven global Technology Facilitation Mechanism (TFM) as part of the SDGs. Concrete operational steps on TFM is currently underway through the Global Pilot Programmes on STI for SDGs Roadmaps launched in 2019. India has joined 4 others as pilot countries under this initiative. The European Union and Japan have joined the UN Inter-agency Task Team (IATT) on STI for SDGs in this initiative to support the pilot countries in their SDG Roadmaps exercise.

STI for SDGs Roadmaps in India, as decided, would focus on 4 SDGs viz. SDG 2 (Agriculture/nutrition); SDG 3 (Health and wellbeing), SDG 6 (Water and Sanitation) and SDG 7 (Affordable and Clean Energy). Under the STI for SDGs Roadmaps exercise in India, suggested key deliverable would be to work towards formulating a decision support system for expenditure review on R&D for greater

effectiveness in the Indian context, to be placed with the Office of the PSA. Scoping study in this regard has been initiated.

India and Japan have together come on board and are collaborating based on mutual interest in promoting the STI for SDGs Roadmaps in the respective countries, as well as in robustly supporting replication of this initiative in African countries including those who are already part of the exercise as pilot countries.

As part of this exercise, the Office of the Principal Scientific Adviser (PSA) and the Research and Information System for Developing Countries (RIS – the knowledge partner with PSA), jointly with the Cabinet Office, Government of Japan (CAO) and the UN-Interagency Task Team (UN-IATT) on STI for SDGs, organised a virtual workshop on "Developing STI Partnerships for Sustainable Development: Accelerating International Cooperation and Actions through the Global Pilot Programme on STI for SDGs Roadmaps" on 29 June 2020. This workshop has been recognised as an official work programme of the TFM ahead of the High Level Political Forum (HLPF), July 2020. Senior policymakers and experts from the pilot countries, India, Japan and UN/partner agencies, joined the workshop. The bilateral dialogue between India and Japan focusing on leveraging frontier technologies in implementation of the four aforementioned SDGs was hosted on 23 June 2020.

5.5 Policy Inputs to DPIIT on Taskforce on Innovation

Based on the request of Department for promotion of Industry and Internal Trade (DPIIT), inputs on the 'Taskforce on Innovation' were provided with the objective of examining the innovation indices and captures these to reflect in the Global Innovation Index (GII) of WIPO.

The inputs from the O/o PSA included incorporation of data on the new certifications of the Start-ups by the government, implementing the 'Utility Model' for simple inventions.

5.6 Sweden – India Innovation Partnership for a Sustainable Future

The Joint Declaration on India-Sweden Innovation Partnership for a Sustainable Future (JIP) was signed on April 17, 2018, during the visit of Hon'ble Prime Minister Shri Narendra Modi to Sweden. It was agreed that both countries will optimise the formal bilateral collaboration mechanisms, increase synergies between policy areas and enable exchange of best practice regarding innovation policies for the creation of vibrant joint innovation ecosystems.

As a follow-up on activities to deepen the JIP cooperation, a High-Level Dialogue on Innovation Policy was held in India on December 2, 2019, during the state visit of Their Majesties the King and Queen of Sweden.

5.7 Allowing STEM R&D in CSR Expenditure

Governing Rules for channelling CSR Funds for Scientific R&D through suitable modification of Schedule VII of the Companies Act, 2013 (Section 135 thereof) mooted by the Office of the PSA in July 2018 before the Ministry of Corporate Affairs was favourably considered by the Government in terms of Ministry of Corporate Affairs Notification: GSR 776(E) dated 11-10-19 under Section 467 of the Companies Act; whereby contributions to public funded Universities, IITs, National Laboratories and Autonomous Bodies of ICAR, ICMR, CSIR, DAE, DRDO, DST, and MEITY for conducting research in science, technology, engineering and medicine are now eligible to be considered under the CSR guidelines. This will allow CSR funds to be channelized towards scientific research and development and will help increase India's R&D expenditure as a percentage of GDP.

5.8 National Strategy for Artificial Intelligence

The mechanism for initiation and conduction of the “National Strategy for Artificial Intelligence” in the light of existing and proposed Schemes on that subject and to determine the appropriate agency to implement various recommendations was explored at the Office of the PSA on a reference from the PMO. The focus has been on issues that include pathways for making budgetary provisions for participating departments, and integration of CORE/ ICTAI with TAH/SAH of NM-ICPS alongside managing the AIRAWAT infrastructure, and select institutions.

INITIATIVES

5.9 Open Access Initiative

The Office of the PSA is driving an initiative to ensure that the scientific literature which results from publicly funded research is made freely accessible to anyone who needs them. The initiative aims to make full and immediate open access a reality. The first meeting of stakeholders from various government departments was conducted in October 2019. The meeting also saw participation from the representatives of “Plan S” which is the open access initiative launched by the European funding agencies.

5.10 Linking MSME engineering manufacturing clusters with CSIR and other laboratories

Under this project, Engineering Export Promotion Council (EEPC) of India of the Department of Commerce has been engaged with the Office of PSA. Thematic technology interactive meets with different MSME clusters are held to interact with the MSME clusters who might otherwise not have access to state-of-the-art research facilities. The interactions have resulted in developing proposals addressing technology up-gradation of engineering goods jointly between identified CSIR laborites and academia and a consortia of industries.

5.11 Creation of an Institutionalised Structure for Development of Emerging Technologies

A strategy to set out the necessary foundations for development and efficient induction of emerging technologies through creation of an institutionalised structure to facilitate leveraging of technology and technical skills, funding experimentation, access and sharing of data and facilities. In tackling legacy technology and updating standards via an empowered Technology Group is under active consideration of this Office.

5.12 Animal Husbandry sector

A Coordination Committee and Research and Technology Advisory Committee has been constituted under the chairmanship of the Principal Scientific Adviser, to boost the research and innovation related to animal husbandry sector, overall monitoring of the ongoing initiatives, policy instruments by different departments and providing overall guidance to R&D efforts.

The Committee focuses on Animal Husbandry and Dairying Sector for increasing the farmers’ income through enhanced livestock productivity and improvement of health status of animals. In this direction, many programmes have already been initiated including National Animal Disease Control Programme for Foot and Mouth Disease and Brucellosis, National Artificial Insemination Programme, National Livestock Mission etc.

5.13 Energy Critical Elements

The Office of the PSA constituted an 'Expert Committee for Exploration and Procurement of Critical Minerals, under the chairmanship of the PSA, with the objective of assessing the current demand and medium-term projections, globally and domestically, for both Lithium and cobalt and facilitate an Action plan for a comprehensive mining and extraction project, commensurate with the development agenda before the country. As recommended the Committee, a core team from MECL, HCL and NALCO, the participating CPSEs of the KABIL joint venture, visited Argentina for preliminary discussion and survey of the mining resources in Latin America. The group is also looking for sourcing options from other countries like Australia. The project will aid in procuring critical minerals for development across sectors.

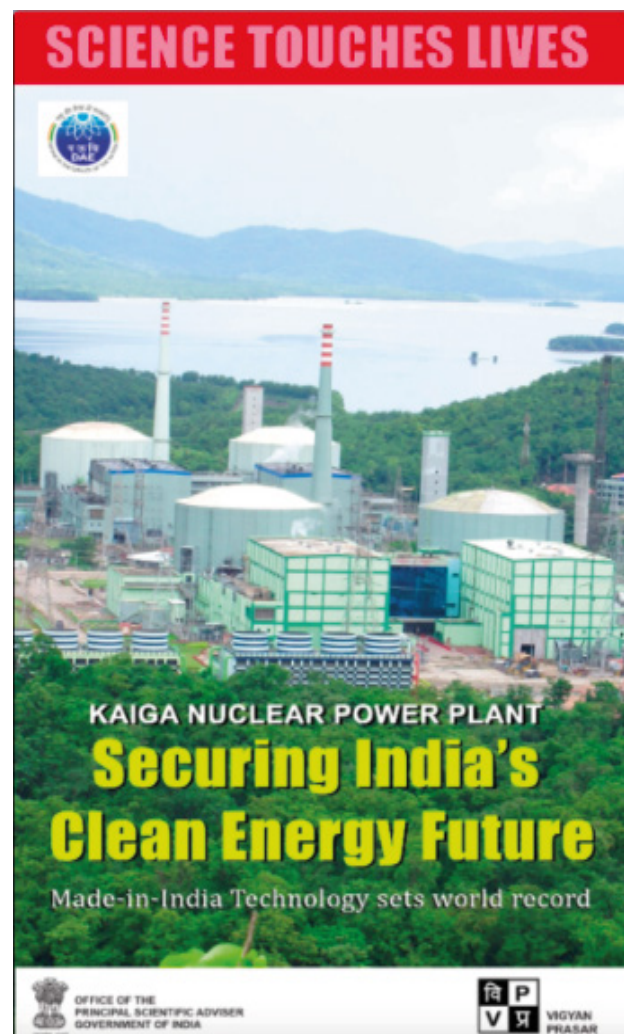
5.14 Intervention to Spur Electronics Manufacturing

This is an effort to initiate and invigorate electronics manufacturing through a R&D Fab by coordinating the technical bandwidth of IIT, Semiconductors Lab, foundry tech and management experts, MEITY, the Empowered Committee for FAB and the Industry. The aim is to ascertain demand and requirements for laying out a road map to develop key technologies around a backbone; conduct studies on scale-up (SCL, STARC and new Mega Fabs); ascertain IP transfer needs for strategic players and commercial entities; lay out the concept and design of R&D Centre including Infra, Fab and Design; understand technology acquisition needs and derivative technology roadmap. This will improve the fabrication ecosystem required for efficient function of the R&D system and advancing study of emerging technologies.

5.15 Showcasing significant STI achievements/ developments of the country

The activity was undertaken with a view to address the larger government mandate of developing policies and mechanisms to increase science awareness, building scientific temperament and communicating Government's views on science to the citizens. The project was implemented by Vigyan Prasar (DST).

A series of digital displays on digital screens were displayed during the period from June to October 2019 at Indira Gandhi International Airport, New Delhi. These displays covered 100 products/ services as S&T outcomes from various ministries and departments. The segments included health, agriculture and nutrition, technology for farmers, water, and energy.



5.16 Report on the Effects of Weighted Deductions Provisions in Section 35 of the Income Tax Act

A report on the likely repercussions arising on withdrawal of weighted deduction provisions contained in Section 35 of the Income Tax Act on the R&D ecosystem through responses of the stakeholder Departments (likely repercussions such as lower private sector investment in R&D, adverse impact on GDP, retarding new product development, slowing down of indigenisation and widening the gap between the public and private funding for R&D) and few possible legislative avenues to incentivise the Industrial sector has been shared with Department of Revenue.

Added to the withdrawal of Section 35 with effect from 01-04-2000 is the consequence of introduction of Section 115BAA on R&D spenders across all classes of Corporate taxpayers. This will bring equity among entities in a taxpayer status, whether they are engaged in R&D.

5.17 Public Lecture/Discussion Series on "Women in Science & Technology in India", called the WIST project

The limited presence of women in science, medicine and engineering is of wide concern and appropriately so. To put a spotlight on the topic, the Indian Institute of Technology, Delhi and the Indian International Centre, New Delhi were asked to organise a joint public lecture/discussion series on Women in Science & Technology. Thus far, three public lectures have been delivered by Prof. Gagandeep Kang, Director, Prof. (Retd) Sudipta Sengupta and Dr Parul Patel, ISRO in August and October 2019, and January 2020, respectively. The aim is to focus on publicising and celebrating the achievements of India women scientists and engineers, provide open opportunities for mentorship linkages between younger and more established colleagues and fostering inquisitiveness of young minds by harnessing space technology.



SYNERGY PROJECTS

SUPPORTED BY THE OFFICE OF THE PSA



"...science and technology are as important for administration now-a-days as law and order."

**- Dr. Meghnad Saha,
Astrophysicist**

The Office of PSA plays a catalytic role in supporting the execution of synergy projects which are R&D projects where multiple agencies, institutions and disciplines are involved. These projects are supported by office of PSA in the form of grants-in-aid to the agencies involved and a thorough review mechanism to ensure the timely execution of these projects.

INNOVATION

6.1 City Knowledge and Innovation Clusters (Academia, National Lab and Industry Interface)

The City Knowledge Innovation clusters work in areas of national importance, leveraging the existing strengths in geographical proximity, driving future economic growth, wealth creation, and enabling rapid and direct knowledge exchange. The creation of City Knowledge Innovation Cluster has been identified in Chandigarh, Pune, Kolkata, Bhubaneswar, Jodhpur, Ahmedabad and Hyderabad. A series of brainstorming meetings for the Innovation Cluster have been held in Pune, Kolkata, Bhubaneswar, Jodhpur, Ahmedabad and Hyderabad.

Furthermore, the High-Level Committee has proposed formation of Mega City Clusters in Bangalore, Hyderabad, Pune, and Delhi under the direction of the PMO. The Townhall meetings chaired by PSA were held at IISc-Bangalore, IIT-Delhi, IUCAA-Pune and RICH-Hyderabad. This initiated the process of establishment of World class mega science and technology clusters.

6.2 Academia-Industry linkage for inclusive growth

A meeting chaired by the PSA in January 2017 with Ministry of MSME and EEPD and a subsequent brainstorming meeting involving larger stakeholders including industry associations and academia held in February 2017 deliberated the challenges of technology infusion into MSMEs. The first introducer of the technology needs to be covered by buffering an insurance instrument to ensure successful implementation of new technology. This would eventually adopt others in the same cluster to follow the same technology implementation.

The deliberations resulted in three action plans which are to engage with a proximate academia institution for facilitating knowledge and skill transfer to each of the MSME cluster around each TC; utilize used equipment from the public sector manufacturing enterprises in addition to modern equipment; and a suitable funding mechanism or SPV in order to address financing technology. A recent industry interactive meet was organized at Aurangabad has recommended for creation of an academia-industry alliance with the Indo-German Tool Room, Aurangabad as the nodal platform.

6.3 National Research Foundation (NRF)

The Budget- announced “**National Research Foundation**” for funding competitive, peer reviewed grant proposals; seed, grow and facilitate research at academic institutions particularly at universities and colleges where research currently is at nascent level, through mentoring by eminent research scholars, hiring young research students and faculty; funding, strengthening and growing existing high quality; and increasing India’s role and participation in key areas of national and global importance; acting as liaison and coordinator among researchers.

Central and State governments and Industry will promote collaborations among researchers to develop the next generation of researchers through funding and human resource development. It will serve as a high-level think tank for coordination and short- term and long-term planning of research in the country. It will also provide recommendations on key policy initiatives to the PM and to the Parliament regarding research, innovation, and education to lay down the overall strategy and micro planning guidelines.

6.4 National Frontiers of Science (NatFOS)

The Frontiers of Science Brainstorming meetings across various disciplines in Science are designed by Organized by Indian National Young Academy of Sciences (INYNAS) jointly with PSA Office, Govt. of India, on the lines of the US National Academy Frontiers of Science model. The 2nd Meeting in NatFoS series in 2019 at Jaipur deliberated highly multidisciplinary themes such as Extreme environments on Earth, Engineered Material in Biology and Medicine, Climate resilience, Theoretical frameworks to explore the properties of Matter, Behavioral Ecology, Artificial Intelligence and Neural Networks. An additional session on ‘Innovations and Startups Ecosystem in India’ was also conducted. This helps in successfully fostering inter-institutional collaboration through cross fertilization of ideas across the disciplines resulting in the joint research proposals approved for funding and few joint research publications.



6.5 Indian Science, Technology and Engineering facilities Map (I-STEM) - Linking Researchers and Resources

The I-STEM Web Portal, is the online gateway through which researchers/user can locate the specific facility(ties) they need for their R&D work and identify the one that is either located closest to them or available to them the soonest. This can lead to a leap in R&D productivity and greatly enhance the effectiveness of public investment. In creating a shared economy which negates the need to purchase expensive equipment and creates a conducive environment aids in the inter institutional collaboration and exchange of ideas. It was launched by Hon’ble Prime Minister of India during 107th Indian Science Congress.



6.6 Projects in support of The Advanced Ultra Super Critical (AUSC) Technology

A consortium of Bharat Heavy Electricals Limited (BHEL), National Thermal Power Corporation (NTPC) and IGCAR (Indira Gandhi Centre of Atomic Research) was formed in 2010, under the aegis of the office of the PSA which has catalyzed the development of the AUSC technology.

NTPC, and BHEL have signed an MoU for forming a Joint Venture (JV) company, to set up an 800 MW Technology Demonstration Plant (TDP) at NTPC's existing power plant in Sipat, Chhattisgarh to demonstrate the home-grown Advanced Ultra Super Critical (AUSC) technology which will reduce CO₂ emission by 20%.

Once operational, the TDP at Sipat will be the most efficient coal-fired power plant in the world, while also supporting fulfilment of the NDC (Nationally Determined Contributions) committed by India as part of the Paris Climate Agreement.

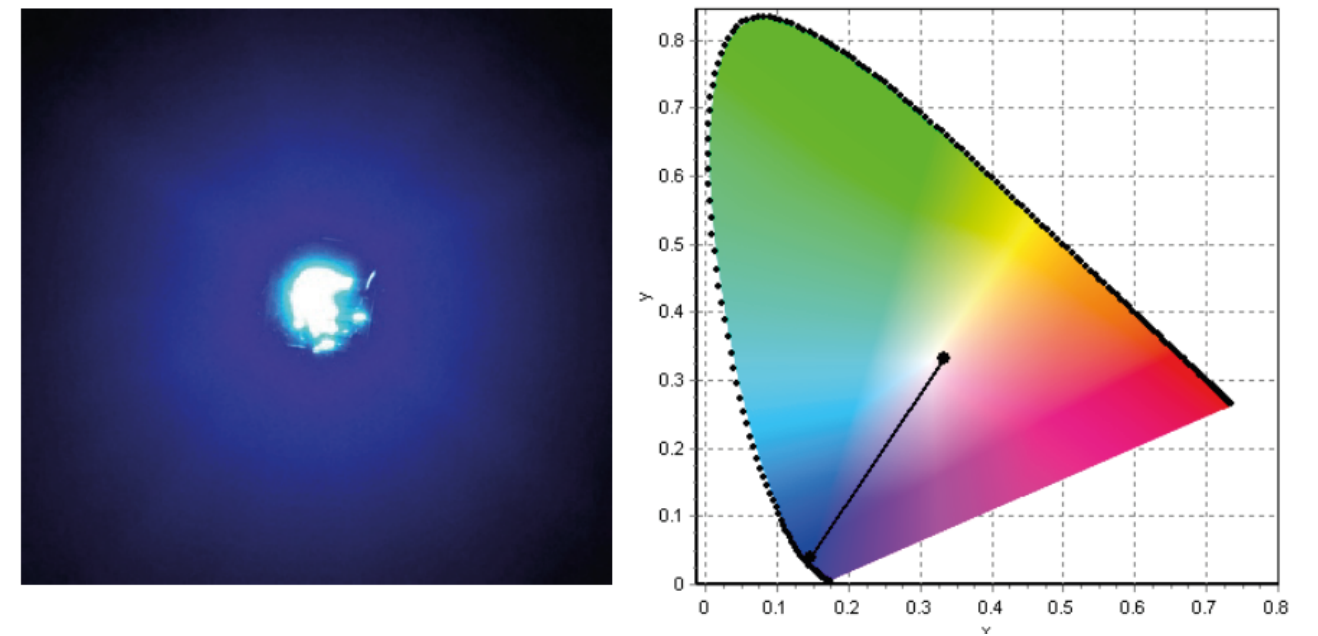
The PSA's Office has further sponsored 10 projects, on launching of the pre-project R&D, for various technological interventions required in the project.



6.7 Project on the development of III-Nitride white and ultra violet light emitting diode technology for green energy and societal impact, called the W-UV LEDs Project

The project is being jointly implemented by the IISc, Bangalore; the Institute of Radio Physics and Electronics (IRPE), University of Calcutta, Kolkata and the Central Electronics Engineering Research Institute (CEERI), Council of Scientific and Industrial Research (CSIR), and Pilani.

The project has two parallel tracks with the primary task to establish an optimized device process technology of III-Nitrides on silicon (111) and to develop and demonstrate packaged ultra-violet (UV) LEDs emitting at 260nm-285nm range, grown on sapphire substrates, with full width half maximum (FWHM) in the range of 10-15nm and single device power levels up to 5mW [5%] external quantum efficiency (EQE)] under direct current (DC) bias conditions.



6.8 High Efficiency Electric Motors

After intensive deliberations involving senior technical officials from different electric motor manufacturing companies along with scientist experts from BARC, IIT Delhi and DRDO, the following two activities, for making Indian electric motors competitive in the international market and developing futuristic motors, were taken up:

- Technology up-gradation of 5HP induction based electric motor from the existing IE2 to IE3 standard (88.5% efficiency) level
- Prototype development of 5HP motor with more than 93% efficiency (ultra-super efficiency) by employing Permanent Magnet (PM) based technology

6.9 Future Preparedness in STI: Transportation

As a host of future transportation technological options are on the horizon it is important to be future ready, carry out foresight and assessment of such technologies to be contextual to the country. Hence, a consultative group has been constituted by the Office of the Principal Scientific Adviser to Government of India which recommended preparing an assessment report that would capture both the positive and negative fallout, including public benefit, indigenous STI capability and subsystem level capacity, net carbon analysis, employment generation and cost of investment. The report will be finalized by this financial year end. As per the CGFT decision, currently, the following two projects are being undertaken:

- A pilot project demonstrating feasibility of 'opportunity charging' to charge EV buses in one or two identified locations.
- A Study on 'Emerging Technologies for Delivery of Energy to Electric Buses' is being undertaken with the TERI in the lead.

6.10 A Study on 'Emerging Technologies for Delivery of Energy to Electric Buses'

This study aims to measure the impact of opportunity charging and other emerging technologies on the choice and size of onboard in the context of electric buses in India and recommend optimal charging and battery solutions in the Indian context. The study is being undertaken with The Energy and Resources Institute (TERI) in the lead.

INDUSTRY AND TOOL SECTOR

6.11 Project on the development of alternate materials for improving dynamic response and damping properties of machine tool structures, called the DRDP Project

The project implemented by the PSG College of Technology (PSGCT), Peelamedu, Coimbatore as the Lead Partner and M/s Bharat Fritz Werner Limited, Bangalore and M/s Galaxy Machinery Private Limited, Coimbatore as the Industrial Partners successfully completed in 2019. It aimed at developing alternate materials (Glass Filled Epoxy Granite material) for manufacturing the base and columns of machine tool structures, in place of cast iron or concrete.

The outcome would be an indigenised material composition which will have better dynamic response, thermal stabilisation and damping properties when used to manufacture machine tool structures.



6.12 Technology upgradation of engineering goods

A technology up-gradation of the Indian engineering goods was necessary to be competitive in the international market for adding value to and improving quality of these products. A Initiative towards this was taken up by the Office of PSA jointly with Department of Commerce, after analysing the export performance of the country in this segment for the past one and half decades. As a result of continuous interaction of this office, with officials of Department of Commerce, BARC, DRDO, ISRO, DBT and CSIR certain products/product groups were prioritized. These include "Electric Motors", "Industrial Valves" and "Medical Devices".

6.13 Project on Industrial valves

A stakeholder brainstorming involving industry representatives, national mission-oriented agencies, national laboratories, academia and other stakeholders identified the Industrial Valve Cluster in Hubli for possible S&T intervention. Accordingly, as per the decision taken by the O/o PSA, the Industrial Valve Cluster, Hubli initiated the process of making a Detailed Project Report (DPR), based on which a proposal for setting-up of a common engineering facility centre will be submitted for funding by Government of India.

GREEN CHEMISTRY AND INDUSTRY

6.14 Evaluation of Pilot Scale Plant Performance of Pre-Clarified Molasses to Improve Alcoholic Fermentation

Pre-clarification of Molasses with carbonation method have been developed under synergy project. The fermentation of clarified molasses at lab scale (20 lots.) resulted in better ethanol yield. The pre-clarified molasses can provide a boost to domestic players in increasing their ethanol yield. Through the project the developed method was tested and validated at pilot level through installing skid mounted pilot scale plant at the sugar industry and improved alcoholic yield was observed.

This is suitable for pan India as technical support/hand holding would be provided by VSI. At present, there is a skid mounted pilot scale plant at Daund Sugar Pvt. Ltd at their distillery unit.

6.15 Recovery of Potash from Incineration Boiler Ash

With the involvement of industry and research organizations, following suitable technologies for sugar industry with pan India applicability were supported:

Recovery of Potash from Incineration Boiler Ash-

Efficient and easily adoptable process of recovering up to ~92-96% potash with water leaching from the incineration ash has been developed. It was validated at lab scale (1-10lt leachate) in the lab scale using ash samples obtained from different sugar industries. The applications/Potential for treating waste and generating wealth.

6.16 Project on medical devices

A meeting chaired by the PSA decided that 'Medical Devices' along with advanced analytical/diagnostic/therapeutic instruments will be taken up for R&D intervention with DBT as leading department. The meeting observed that Medical Devices Industry in India is export dependant to the tune of 78%.

As per the intervention of the O/o PSA, a decision was taken to setup the **Kalam Institute of Health Technology (KIHT)** with support from the DBT at Andhra Pradesh Med Tech Zone Ltd. (AMTZ), an upcoming manufacturing park spread over an area of 270 acres in Vizakapatnam, which is a joint initiative of the State Government of AP and central government departments. KIHT was envisaged to play the role of knowledge delivery to the AMTZ addressing the technology needs of the AMTZ.

6.17 Project on advanced epilepsy research: a multidisciplinary approach

The project is being jointly implemented by the All India Institute of Medical Sciences (AIIMS), New Delhi, IIT Delhi, Delhi University and the National Institute of Advanced Studies (NIAS), Bangalore. The project has four sub-projects which are aimed at development of a portable device for rapid detection of epilepsy; gaining a better understanding about the resistance to anti-epileptic drugs (AEDs) in some patients; and finding a lead, if not a product, in the direction of finding new drug targets for AEDs.

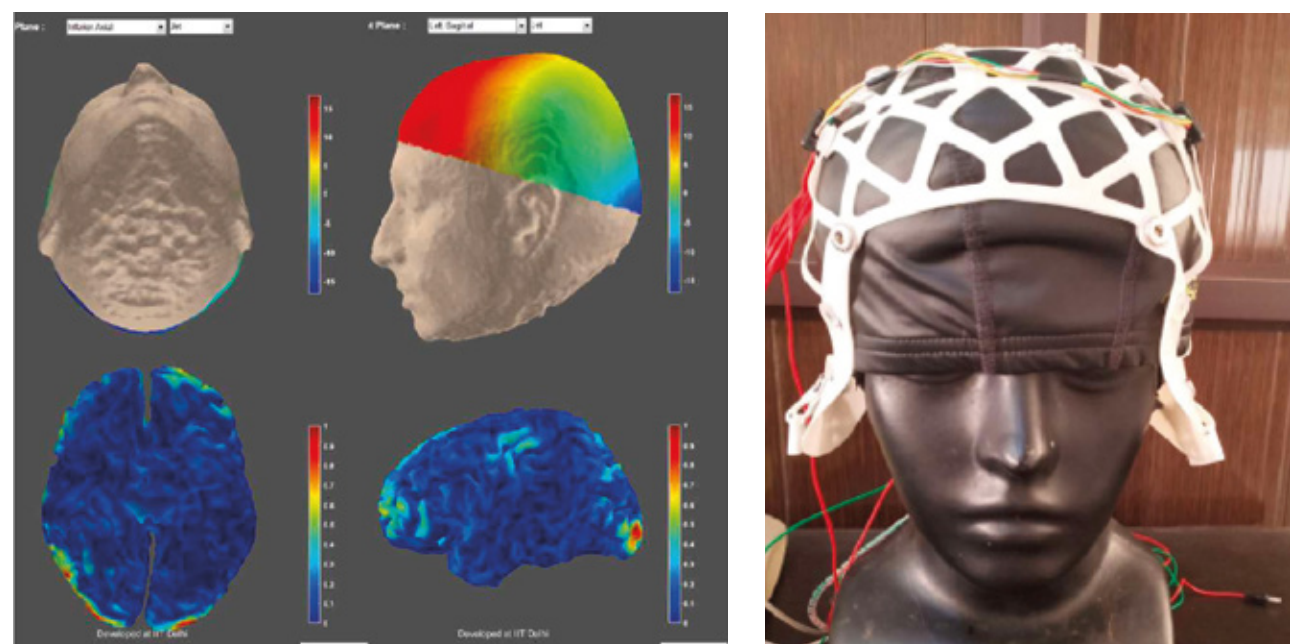


Fig: Wearable headgear for obtaining EEG signal and AI-based software for detection of epileptiform discharges

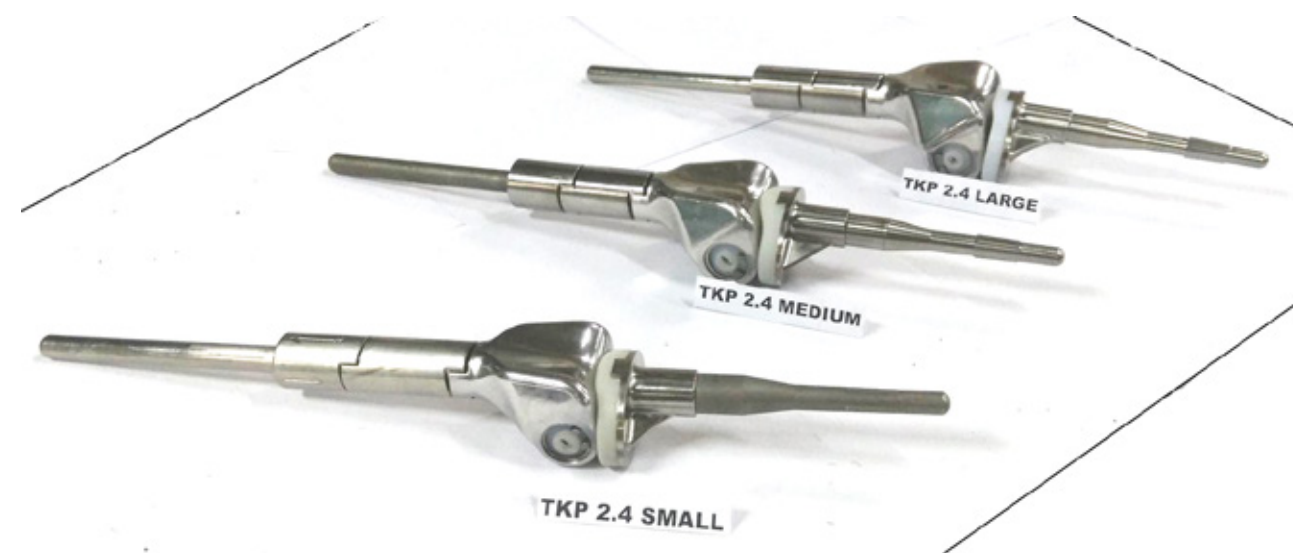
6.18 Project on the structure-based design of inhibitors for selected tuberculosis (TB) proteins involved in the maintenance of genome integrity and control of gene expression

The project is being implemented by the Indian Institute of Science (IISc) Bangalore. The lead compounds, designed and developed through this project for inhibition of TB proteins, will be utilized for physiological and clinical work aimed at drug development for TB.

6.19 Multi-centric clinical trials of the indigenous total knee prosthesis 2.4 and its pilot production

The project involves fabrication of medical implants along with the necessary armamentarium essentially addressing indigenous total knee prosthesis, pilot production, the necessary clinical trials for regulatory approvals and technology transfer. The project is being implemented by NFTDC, Hyderabad in partnership with Tata Memorial Hospital, Mumbai.

The two clinical trials have been successfully completed during 2019. In order to get to the market at the earliest, the clinical data with minimal possible surgery are being submitted to the Central Drugs Standard Control Organization (CDSCO) within the next one year. The project team will submit such data as per internationally accepted norms to establish product safety with reference to international standards. The technology is expected to be available for transfer by July 2021.

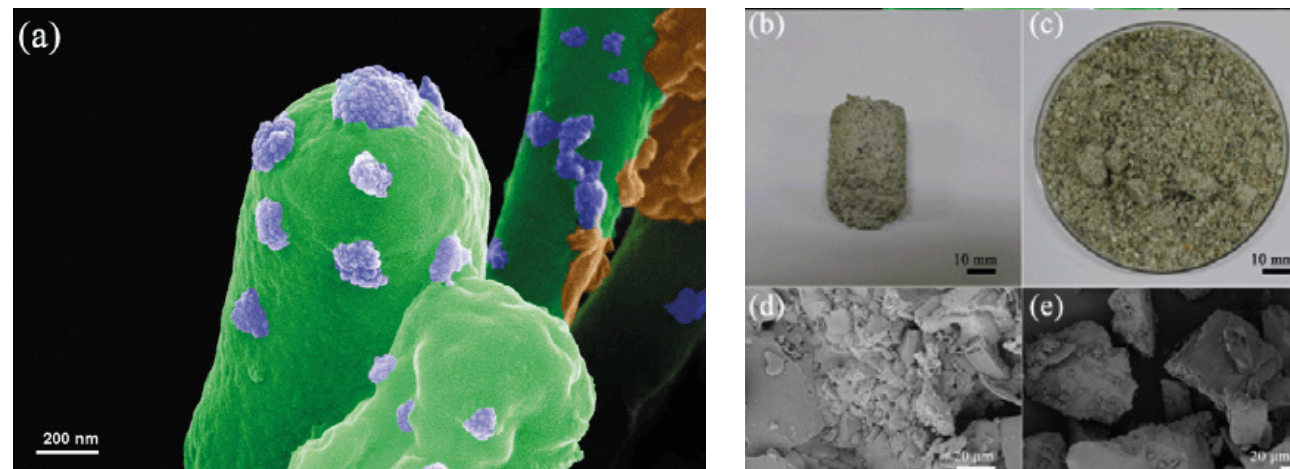


6.20 Brain Mapping project

This project is being implemented by IIT Madras. The project aims to develop a computational and experimental pipeline to study cellular architecture, connectivity and molecular architecture in postmortem whole human brains (Rabies and natural death). The project would involve work in the frontier cutting edge area of imaging the human brain to identify and analyse neuronal pathways at a single neuron level and develop high throughput slide scanner and digitizer technology which would be 10 times faster than currently available instruments.

6.21 The 3DGB project

The proposed project aims to develop a bacteria-mediated 3-D printer for making bricks using 'bio-cementation', a natural process wherein bacteria can produce calcium carbonate and secrete 'binders', which can bind loose particles together. The project proposal centers on a proof-of-principle objective to build a laboratory prototype for a 3D printer using this principle of bio-cementation. The project will be implemented by the Indian Institute of Science, over a period of two years.



NETWORK SECURITY

6.22 Network Security

Project: "Design and Development of Indigenous Virtual Private Network (VPN)"

The project is aimed to develop a VPN solution for organizations having transparency in security implementation, helping to get administrative control of user data with minimal configuration requirements from its users.

Project: Design and Development of Integrated Threat Management Appliance Version 2 (ITMA-2)

The project aimed to develop upgraded versions of these Systems with advancement of cyber-attack technologies and a VPN solution for organizations having transparency in security implementation, helping to get administrative control of user data with minimal configuration requirements from its users.

6.23 Society for Electronic Transactions and Security (SETS)

SETS has been working in the advanced areas of Information Security and Cryptography with a focus on Hardware Security, Cryptography, Cryptanalysis and Network Security.

During 2019, SETS has completed sponsored projects for Bharat Electronics Ltd (BEL) namely: Deep Packet Analysis Training Engine (DATE-II), proprietary ECC based software for PKI Infrastructure and Crypto layer for MANET Systems. The centre has also completed FPGA based True Random Number Generator (TRNG) for Cryptography applications.

SETS has bagged a number of R&D projects during 2019 sponsored by O/o PSA. SETS has also secured MeitY funding.



6.24 Physical Unclonable Function – A chip level fingerprint for hardware security

Physically Unclonable Function (PUF) is a state-of-the-art technology which is pursued world over. Under O/o the PSA the project is taken up with IIT-Bombay, IIT-Delhi, SETS-Chennai and SCL-Mohali. The PUF benefits are in the area of Cybersecurity, provides authentication, key generation and would be in a position to provide True random Number Generation (TRNG). This would specially help in Internet of Things (IoT) applications. This is totally indigenous effort, right from the design of the chip, fabrication of the chip and relevant applications in the Indian context.

6.25 Project on the development of indigenous wireless sensor networks for the assessment of the slope stability of avalanche sites

The project is jointly implemented by the Snow and Avalanche Study Establishment (SASE), DRDO, Manali and the IGCAR, Kalpakkam. It aims to develop a state-of-the-art autonomous platform for acquiring in-situ snow-meteorological parameters and avalanche occurrence information from avalanche-prone mountain slopes, using an indigenous wireless sensor network (WSN). The data, thus gathered, would be utilised for the estimation of the stability of the snowpack over the slope and thus help in the prediction of avalanches. The phase-I deployment of sensor nodes is under progress.



Fig: Photographs of test deployment of sensor nodes at avalanche site in Dhundi, Manali

6.26 RuTAG (Rural Technology Action Group)

This program is oriented toward development and dissemination of technology towards rural entrepreneurship and rural employment at seven IITs. Interaction with the Non-Government Organizations (NGOs), Community Based Organizations (CBOs) and S&T institutions for identifying problems, needs and demands from the area and creating a mechanism to provide the best possible ST&M inputs in a comprehensive manner. Facilitating transfer of technologies identified based on the needs and demonstrating them in the field.



IIT-M gifts GI tagged Pathamadai Gandhi mat to PM Modi on 1st October 2019

6.27 Science & technology intervention in north eastern region (STINER)

NERCORMP in association with Jatan Sansthan, Udaipur, Rajasthan supported by RuTAG, IIT Madras under STINER initiative of the Office of the PSA, funded by Ministry of MDoNER, Govt. of India has initiated to work in the field of Menstrual Health & Hygiene Management by involving SHGs for creating awareness among the communities, promote Eco-friendly Biodegradable Sanitary Napkins and setting up of Production Unit. The dissemination of the developed technologies in North East region through STINER was done through NERCORMP and NERLP SHG groups.



6.28 Technology dissemination and adoption of improved horseshoes

The new material was developed to make horseshoes which effectively reduced the frequency and pain of the animals and are easily made by farriers. Programs for training and promotional material have been organized. Considering the observations of the field trials and their effectiveness, a pan India program may be initiated.

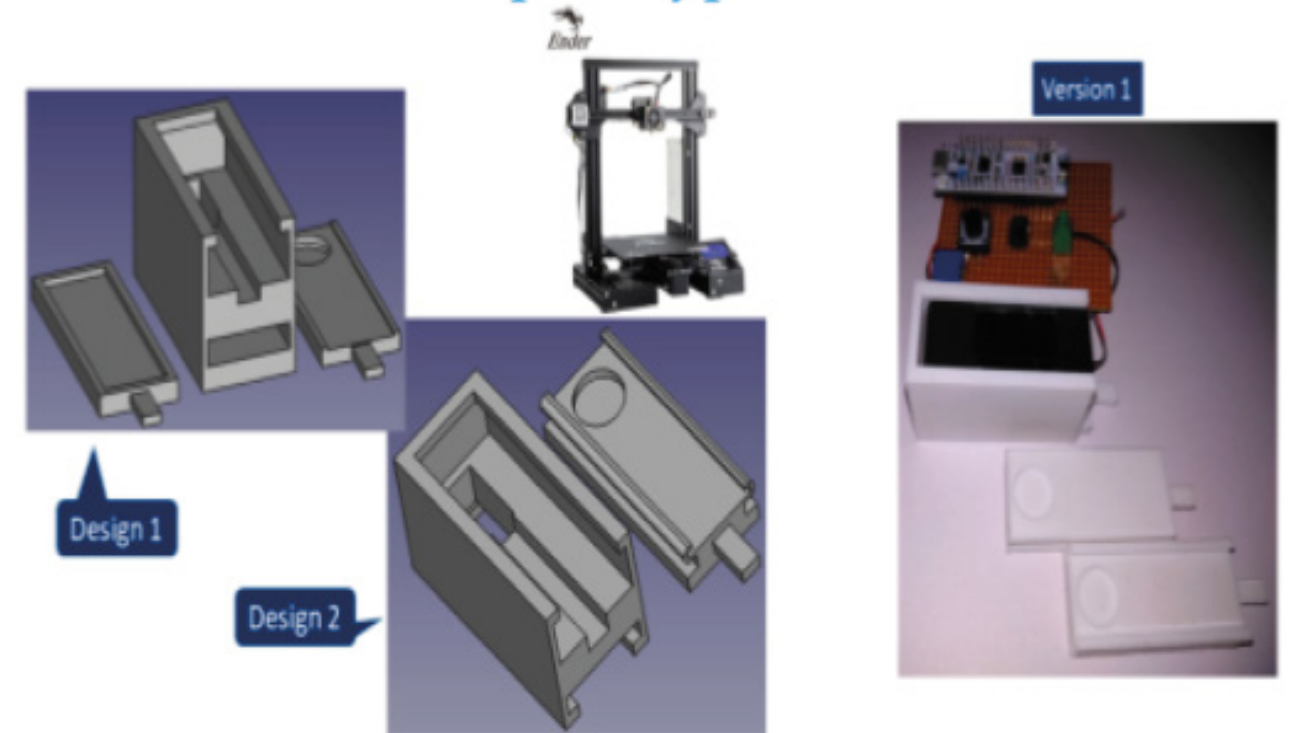
6.29 Feasibility Studies of Biogas and Compost Production

Scattered Mule dung at hilly region has great nuisance value and vermicompost/biogas is the options. Unlike from Cow dung biogas cannot be easily made from Mule dung due to low C: N ratio. This project developed feasibility studies on using mule dung for composting and biogas in India's hilly regions

6.30 Development of a Near-IR Spectroscopy Based Handheld System for Quantification of Curcumin Content in Turmeric

Through this project, a NIR (Near Infra-Red) spectroscopy based, portable and easily deployable device quantitating total curcumin content is being developed at #IISc Bangalore. The developed system, an interface on the smartphone for the end user (i.e. farmers/traders), would have a low maintenance cost for the purpose of cloud-based analysis. The proposed technique can potentially be used for quality assessment of a variety of food produce based on identified critical, chemical/nutritional constituents.

Handheld sensor 2: Sensing system prototypes



@ CeNSE, IISc, Bangalore

6.31 Coastal Flood Warning System-Chennai (CFLOWS-Chennai)

The CFLOWS system is the first of its kind in the country and is an operational web GIS based decision support system that can be used for flood mitigation by the state Govt. It houses about 796 flood scenarios that can be used along with the weather prediction models to plan mitigation operations well in advance.

Field data available with the state government have also been incorporated into the system thereby utilising the field and operational knowledge base of the ground staff. It is operational in the city of Chennai and was Inaugurated by Hon'ble Vice President of India.

An MoU was also signed with the State government (TNSDMA) and the Chennai Flood Warning system with support from Ministry of Earth Sciences. It will also be integrated with TN-SMART the disaster management portal of the state government.



6.32 Redesigning the Palanquin System for better Functionality

Re-designing the palanquin system for Mata Vaishno Devi Shrine- The new highly comfortable, much lighter weight, sturdier and aesthetically designed 'Palkis' have been developed by a team of the Industrial Design Centre of IIT Bombay and National Institute of Industrial Engineering (NITIE), Mumbai, in continuing collaboration with the Shrine Board.



EDUCATION AND DEVELOPMENT

6.33 Code India

The stated objective of CodeIndia, initiative announced by the office of the PSA, is to build an iteratively refining model for teaching skill-based programming for application development to school students. Office of the PSA to the Government of India announced the CodeIndia initiative with its' inaugural pilot implementation organized in partnership with Navodaya Vidyalaya Samiti. This initiative is a two-week module on application-based programming for middle and intermediate level school students.

6.34 E-classroom

For sensitizing the shop-floor personnel on using advanced equipment and enhance automation level, an E-classroom project was initiated. The course contents were developed jointly with scientists/ experts from BACE, L&T Valves, BHEL and IIT Gandhinagar. IIT Bombay, with its experience of conducting massive open online course (MOOC), implemented the online course. The E-Classroom will serve as a platform for knowledge transfer from national laboratory/academia to the industry on a continuous basis.

6.35 Deep Science transforming scientific discoveries into impactful solution

A project titled "Transforming Deep-Science Discoveries into Impactful Innovations for India Discovery to Innovation Accelerator (DIA) Program" through the PSA office aims to support programs by central and state Govt. agencies, including the affordable Healthcare program (Ayushman Bharat) and the Agricultural programs. The three years project (2019-22) is being implemented by C- CAMP, UAS-GKVK Campus, Bellary Road Bangalore. The areas of national importance building Indigenous solutions would be - Healthcare-Maternal and Child health, Infection Disorders, Drug Discovery, Diagnostic, Medical Device Nutrition, Health- Tech., Agriculture -Agricultural Solutions, Agri Diagnostics, Agri- Tech, Animal, Biotechnology, Animal Diagnostics and Environment - Water pollution, Air Pollution, Waste Management.

6.36 Identification and Nurturing of High Potential Learners

Understanding the need to identify and nurture high potential learners in Indian classrooms, Office of Principal Scientific Adviser to the Government of India, initiated Gifted Education Project. Three Teams of researchers independently worked at University of Delhi, National Institute of Advanced Studies (NIAS) and Agastya International Foundation. Each research team worked extensively in Delhi, Bangalore and in rural part of Southern India and developed multipronged strategies of identification and mentoring these students. The milestones they achieved are a Gifted Resource Lab has also been set up at Cluster Innovation Centre; Making Math Count-Developing Infrastructure; and standardized indigenized tools of identification of cognitive advanced learners.



REPORTS

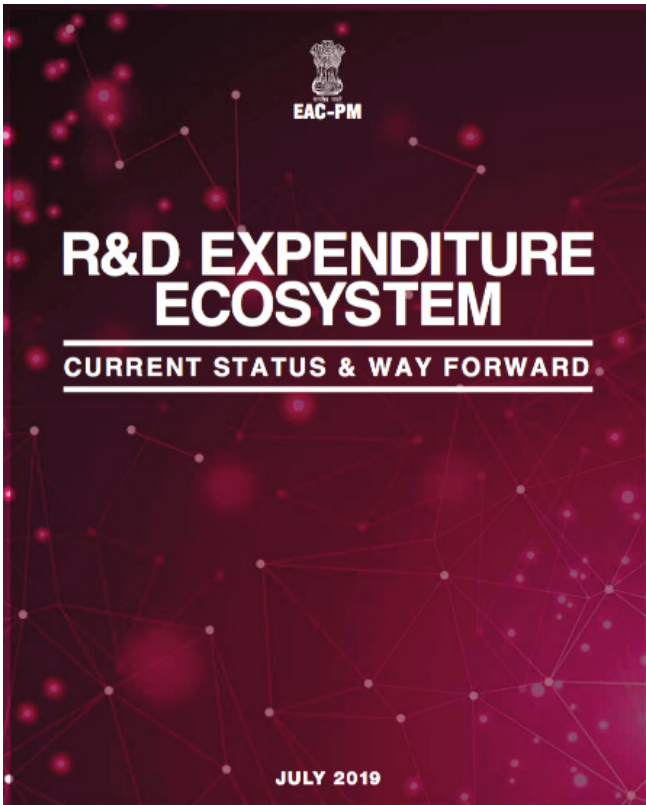


"...cross pollination of fields...innovating in one and bringing the revolutionary changes in another...it undoubtedly improves the quality of life."

- Ritu Karidhal

7.1 R&D Expenditure Ecosystem Report – Current Status and Way forward, July 2019

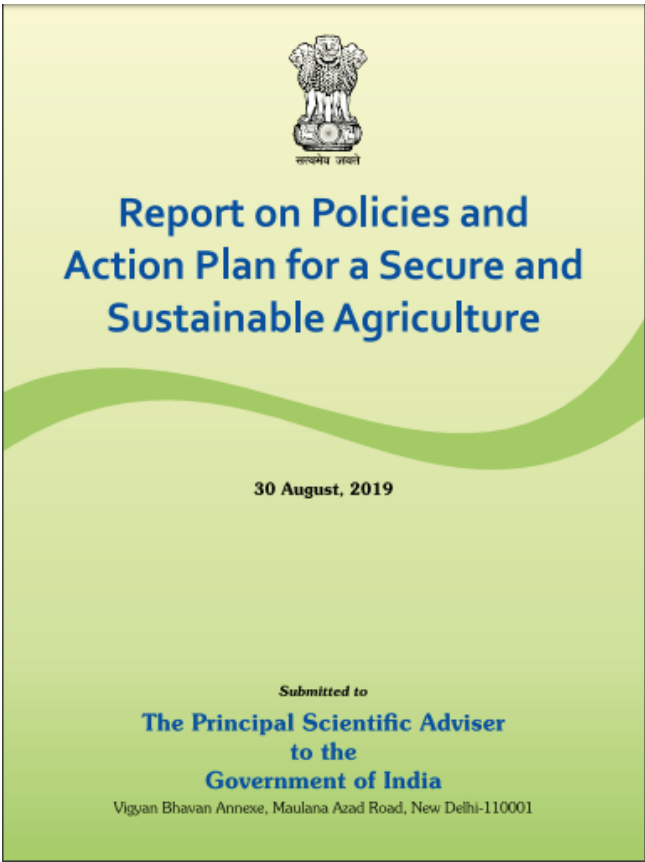
This report was prepared by the Economic Advisory Council to the Prime Minister (PMEAC) in consultation with the Office of the PSA. It contains 14 recommendations under seven categories namely: Institutional, Policy, Regulatory, Promotional, Monitoring & Evaluation, Data & Indicators and Tax Incentives with an empowered Office of Principal Scientific Adviser. The O/o PSA has initiated action on all 14 recommendations of the report. A two-day conclave on “Indian R&D Ecosystem” was also organized by O/o PSA in coordination with DPIIT and CII. Further work on the implementation of the recommendations of the above cited report is under process.



7.2 Report on Policies and Action plan for Secure and Sustainable Agriculture, August 2019

The Principal Scientific Adviser to the Government of India constituted a committee chaired by Dr. Raj Paroda, to review agricultural policies and suggest strategies as well as action plan to ensure improved livelihood of smallholder farmers. Besides its five meetings, the committee networked with more than 150 eminent scientists, agricultural experts and key stakeholders from across the country and those of Indian origin residing abroad, organized a few peer review meetings and had individual/virtual consultations. The committee reviewed key existing government policies, programs and schemes related to agriculture, along with some very promising innovations, which on scaling out, can make greater impact. The report was submitted in August and highlights:

- Role of agriculture in achieving sustainable development goals;
- Accelerating agricultural growth for secure and sustainable agriculture;
- Recommendations and proposed reforms, and iv) action plan for scalable innovations.



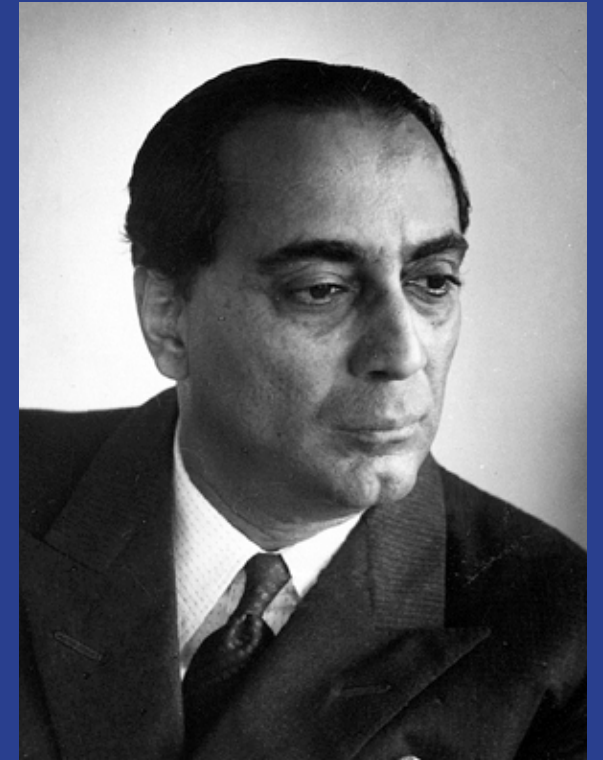
7.3 Practical Statistics, Data Analysis & Graphics using R Language, Date

This report allows to get beginners on R to perform common statistical tasks related to analysis and graphic depiction of scientific and research data.

7.4 Strategic S&T ties between countries are the only way to address climate change, January 2020

This article was published in the Indian Express and discusses the importance of international collaborations in S&T innovation. It highlights that no nation alone has the capacity, infrastructure, and human resources to address the massive challenges that the earth and mankind faces, threatening our very existence. S&T interventions have to be able to address both national needs and aspirations – by being inclusive – and, at the same time, they must meet the international obligations of a responsible country. Science diplomacy, thus, is a crucial policy dimension. This will require proactive engagement of the scientific and technological community with stakeholders – including the polity, the diplomatic corps and the knowledge enterprises – in order to design and develop effective tools for international engagement through S&T.

EVENTS AND ACTIVITIES



"A scientific institution, be it a laboratory or an academy, has to be grown with great care like a tree."

- Homi J. Bhabha

8.1 4th PM-STIAC meeting: Focus on Scientific Management of Water, January 2019

The meeting focused on the need for developing a multidisciplinary scientific approach, including real-time data collection of water resources. The larger aim is to move towards sustainable use of water in various river basins. As an initiative towards the same, a program for the Brahmaputra river basin has been proposed. Besides, a proposal to set up the Indian Earth Museum was also endorsed.

8.2 Quantum Computing workshop, January 2019

The Quantum Computing discussion took place on 13th Jan 2019 and the meeting was chaired by Prof K VijayRaghavan and attended by national and international experts from Princeton, Berkley, IITM, IITB, IITK, SETS, RRI, IISc, TIFR etc along with officials from DST, MeITY, PSA office and it was agreed that IISc and TIFR will work in consultation with DST to take the initiative forward.



8.3 Sir Mark Walport Lecture, January 2019

The PM-STIAC attended a lecture organized by the Office of the PSA where the CEO of UK Research and Innovation presented details of the UKRI role in expanding the science and innovation outreach of the UK.



8.4 Reusable Sanitary Napkin: Training cum exposure, January 2019

A total of 8 members from SHG Federations got training and exposure on re-usable Sanitary Pads at Jatan Sansthan, at re-usable sanitary napkins Production unit, Udaipur, Rajasthan from 8th - 10th Jan. 2019 supported by RuTAG,IIT Madras. After the training the SHG Federations has setup a total of 4 production units in their respective districts.



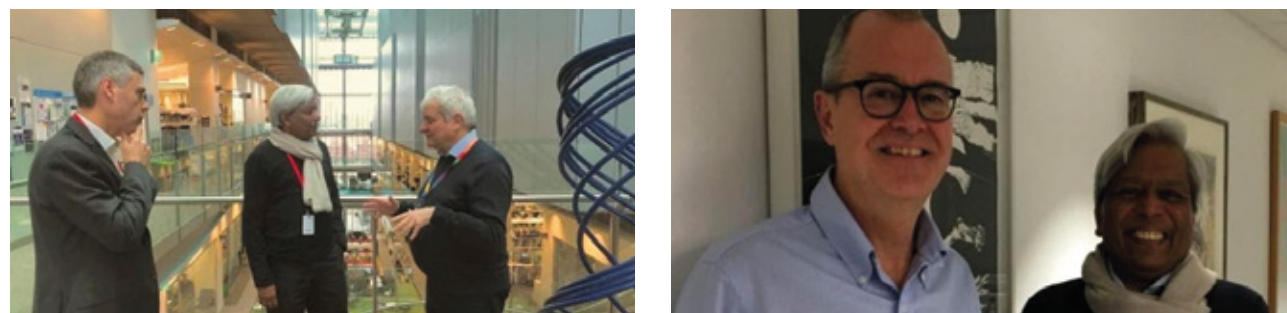
8.5 Science and Industry Interaction on Genomics, January 2019

The representatives from mission on BioScience for Human Health interacted with Illumina who is a leading developer, manufacturer, and marketer of sequencing and array-based systems for large-scale analysis of genetic variation and function. The meeting was attended by DBT, DST, ICMR, CSIR, IGIB, IISc and the office of the PSA and discussions focused on best practices from Illumina based on their experiences across global genomics initiatives and relevance to the Indian BioScience mission.



8.6 PSA's Visit to the UK, February 2019

In February 2019, the PSA attended various meetings in the UK, aimed to build on the existing UK-India collaborations on Science and Innovation and identify areas of future joint work. The meetings included the interaction with Sir Patrick Vallance, the UK Government Chief Scientific Advisor, visit to Alan Turing Institute, Cambridge Plant Science Board meeting, visit to Innovate UK Catapult centres, Genomics England meeting, Manufacturing Technology Centre (MTC), UK Research and Innovation UKRI meetings.



8.7 Feed Block Machine at IIT Guwahati, February 2019

One Day Training on Biomass Dryer and Feed block machine was conducted at RuTAG IIT Guwahati on 7th Feb. 2019. Altogether, 9 participants from NERCORMP project district participated in the training. During the training, demonstration was given on functioning of Feed block machine and biomass dryer by Shri. Neil Kalita, IIT Guwahati followed by presentation on few rural technologies of National Institute of Design Technology Guwahati.

8.8 Nisargaruna Plant for solid waste treatment: Bio-digester Plant, Date

The Tirap Community Resource Management Society under the North Eastern Region Community Resource Management Society (NERCORMP) organised the inauguration of the Bhaba Atomic Research Centre (BARC) developed technology NISURGRUNA Biodigester plant at Ramakrishna Sarada Mission School followed by flagging off of the Community Mahindra Bolero Pick up Vans at Khonsa by Shri. P.N. Thungon, Deputy Commissioner, today in presence of Shri. Jalash Pertin, Additional Deputy Commissioner, Heads of Departments, NERCORMP officials and the project communities.

8.9 Quantum Matters workshop, February 2019

During the Quantum Matters workshop on 12th Feb 2019, national and international experts from Princeton, New South Wales, Penn State, Harvard, IISc, IITB, IISER Mohali, IISER Pune, IACS, JNCASR, TIFR, IITM along with officials from DST, MeITY, DRDO, NTRO and representatives from Reliance industries, Aditya Birla Group and Mehta Family Foundation deliberated at the meeting. The group discussed theoretical perspectives on QM, bottom up design and commercialization of QM and agreed to work jointly with the Quantum computing group in consultation with DST to take the Quantum Frontier initiative forward.

8.10 National Science Day, February 2019

The PSA Office congratulated the science agencies, central and state governments departments, ministries and institutions for playing a pivotal role in promotion of S&T & innovation. The 2019 theme of 'Science for the People and People for Science' was re-emphasized through the PMSTIAC missions which aim to improve agriculture yield, leverage precision health for personal wellbeing, recover wealth from waste, leverage artificial intelligence, quantum computing, connected mobility solutions and other frontier technologies to solve India's lingering challenges, thereby enabling sustainable development for India.

8.11 Press Briefing on PM-STIAC by the office of the PSA, March 2019

In a press interaction in New Delhi the Principal Scientific Adviser to the Government of India, Prof. K. Vijay Raghavan shared details of the nine national missions guided by the Prime Minister Science, Technology & Innovation Advisory Council (PM-STIAC). The PSA said that science and technology is the fulcrum for the levers of government to effect social and economic change.



8.12 International Advisory cum Interaction Meet at INSA for development of the Indian Museum of Earth (TIME), April 2019

In April 2019, a meeting was chaired by Prof. K. Vijay Raghavan for the establishment of The Indian Museum of the Earth (TIME). It was held at Indian National Science Academy (INSA), which was attended by delegates from NHM, UK, Ministry of Culture, Florida Museum of Natural History USA, GSI, NSC, NSG, MoES, NCS and Ministry of Mines.

8.13 11th UDWIM Annual General Assembly, April 2019

The 11th Ukhrul District Women Institute of Micro Credit (UDWIM) Annual General Assembly was held on 3rd Apr. 2019 at Town Hall, Ukhrul. This is one of the biggest women SHG conclaves of NERCORMP, Ukhrul held in the district. This is also an event held annually wherein all the 5 SHG Zonal Federation camping of - SHGs of the district (North, East, South, West and Central) come together. The SHG movement in the district is not confined only to micro-credit but also on women empowerment.

8.14 Science & Society Symposium, April 2019

NITI Aayog, the Office of Principal Scientific Adviser to the Government of India and Harvard University, through the Lakshmi Mittal and Family South Asia Institute (The Mittal Institute) organized the science and society symposium which brought together academics, government, and industry leaders to illustrate the possibilities for scientific advancement. The focus of this symposium was to debate ways to strengthen the culture of scientific literacy in India. Speakers scrutinized the advancements in Agriculture, Catalyzing India's Digital Health Ecosystem, Methods and Tools to Enhance STEM Education and Why Study Life Sciences.



8.15 Swedish Research and Innovation delegation interaction with Invest India and PSA's office, April 2019

The meeting with the Swedish Research and Innovation delegation was held on 9th April, 2019 to discuss opportunities across PM-STIAC missions for international partnerships. The delegation shared best practices and policies implemented in Sweden and discussion focused on Indian and Swedish science and innovation landscape along with synergies for collaboration.

8.16 NERLP Mizoram team visit to biodegradable Sanitary Napkin Production Unit, May 2019

A team of SHG members from North East Rural Livelihood Project (NERLP), Aizawl, Mizoram has visited "Na-Ri" Sanitary Napkin Unit, Mairang, West Khasi Hills, Meghalaya for Exposure & Training on making of Biodegradable Sanitary Napkins on 10th May 2019. The Exposure cum Training visit was supported by RuTAG, IIT Madras and Vatsalya Foundation, Vadodara, Gujarat.

8.17 Centre of Excellence for Waste to Wealth Technologies, May 2019

Principal Scientific Advisor to the Govt of India, Prof K. Vijay Raghavan and Director, IIT Delhi, Prof V. Ramgopal Rao signed a Memorandum of Understanding for setting up a Centre of Excellence for Waste to Wealth Technologies for implementation of sustainable, scientific and technological solutions for waste management, through validation and deployment of available technologies for transformation of waste to wealth.

8.18 Discussion on India Geospatial Economy and Policy Imperatives, May 2019

A meeting on "Indian geospatial economy and policy imperatives" was chaired by the PSA to deliberate on how geospatial technology is driving the economy and societal development. Strategies to strengthen the geospatial domain were discussed.

8.19 Inauguration of Re-usable sanitary napkin production unit, June 2019

Dr. Devansh Yadav, IAS, Additional Commissioner inaugurated the re-usable Sanitary Napkins Production Unit on 4th June, 2019 in Wakhetna, Bordums. It was setup under STINER initiatives MDoNER, GoI & implemented by NERCORMP – NEC. Nightingale SHG Federation, Wakhetna, Changlang is running the Re-usable Sanitary Napkins Production Unit as part of their Income generation livelihood activities, and also creating awareness among the community on menstruation, health and hygiene.

8.20 Launching of biodegradable sanitary napkins "Na-Ri", June 2019

Launching of "Na Ri" Biodegradable Sanitary Napkin by Shri. Rambir Singh, IFS, Joint Secretary, MDoNER, Govt. of India; Dr. Ketki Bapat, Sr. Scientist, PSA, Govt. of India; Dr. Shailendra Choudhury, MD, NERCORMP; Shri. Pankaj Prasad, MD, NERLP & NERAMEC and other dignitaries during Stakeholders Interaction Workshop at Don Bosco Institute, Guwahati on 7th June 2019.

8.21 5th PM-STIAC meeting: Focus on Water Conservation and R&D ecosystem in Disaster Management, July 2019

Experts deliberated upon water conservation, R&D in disaster management, and promotion of maths and data sciences in India.



8.22 Interaction with Industries, July 2019

PM-STIAC at Invest India, in collaboration with the Confederation of Indian Industry (CII) and the Office of the Principal Scientific Adviser, held a meeting concerning MNC industry collaboration in India's Research and Innovation ecosystem. The interaction attended by CEOs and R&D heads of major industry players aimed at developing a deeper understanding of the policy bottlenecks in fostering private sectors' innovation and R&D investments and identify collaborative efforts for integrating MNC R&D efforts with the Indian R&D ecosystem



8.23 6th PM-STIAC meeting: Focus on National Time Distribution Network, August 2019

It highlighted the necessity to set up a Core Information and Communication Technology (C-ICT) Commission and a national research foundation. Besides, there was a discussion on the national time distribution network to achieve time synchronization across the country.

8.24 Workshop on affordable EV charging infrastructure for 2-wheelers, Date

Brainstorming workshop to develop low cost charging solutions to 2-wheelers and micro-mobility involving OEM, component manufacturers, power distributors, govt. officials & other stakeholders resulted in implementable action plans.

8.25 India-UK workshop on Science for Disaster and Emergency Risk Management, Date

A two-day workshop in New Delhi primarily focused on Indian and UK delegations sharing evidence-based science advise mechanisms and practices for using science and technology in the management of emergencies and disasters. The interactions at the workshop enabled both countries to present their respective scientific and technological apparatus by identifying new opportunities and building upon the existing Indo-UK collaborations on science and technology.



8.26 Technical Textiles, Date

A Committee under the Chairmanship of Principal Scientific Adviser was constituted with the objective of examining measures for boosting technical textile in different sectors. The Committee comprehensively reviewed the situation and recommended formulation of Apex Body headed by an eminent scientist/ technologist person with technical and administrative experts from Ministry of Textiles, Technical Textiles Association, manufacturing sector, DIPP, Academia, BIS and other stakeholders.

8.27 7th PM-STIAC meeting, September 2019

It highlighted the importance for data architecture framework for public policy decision making. Additionally, the way forward for City Research and Innovation Clusters and recommendations of the Sectoral Group of Secretaries were also discussed.

8.28 National Solar Energy Federation of India Event, October 2019

A panel discussion was held at NSEFI with the PSA and other stakeholders to discuss the prospects of solar cooking in India

8.29 I-STEM- Indian Science Technology, and Engineering facilities Map, October 2019

I-STEM was launched with the aim to ensure that through a dedicated web portal, access to public funded R&D facilities and equipment, installed and working in institutions around the country, is made available in a transparent, convenient and timely manner to needy and qualified users anywhere in the country.

8.30 Urban Sewage Treatment launch at Barapullah, October 2019

The PSA along with the H.M Willem-Alexander, King of Netherlands and H.E. Maxima, Queen of Netherlands inaugurated the second phase for local treatment of urban sewage streams for healthy use at Barapullah. This phase will help treat 10,000 litres of sewage water per day.



8.31 Launch of CodeIndia programme, November 2019

A two-week module on application-based programming for middle and intermediate level school students. Through this initiative, the students will not only learn programming skills but also gain an aptitude for building applications for diverse areas.

The PSA attended the launch at the Jawahar Navodaya Vidyalaya at Village Jaffarpur Kalan for the CodeIndia programme. Through this the aim is to build an iteratively refining model for teaching skill-based programming for application development to school students and to develop a model curriculum for the Ministry of Human Resource Development, Government of India for adaptation in the school curriculum.



8.32 Invest India Board of Directors Meeting, November 2019

The PSA attended the 23rd meeting of the Board of Directors at Invest India to discuss how each of the teams contribute to India's economic growth.



8.33 Training Program on Capacity Building, November 2019

Two and half day "Capacity Building and Awareness Programme on Aluminium", was held in Bhubaneswar organized by Ministry of Mines, O/o PSA and EAC-PM together with Jawaharlal Nehru Aluminium Research Development and Design Centre (JNARDDC), Aluminium Association of India (AAI), Material Recycling Association of India (MRAI) and Aluminium Secondary Manufacturers Association (ASMA). The programme received widespread participation from all three primary aluminium producing companies (NALCO, VEDANTA & HINDALCO), MRAI, ASMA, Secondary aluminium industries, representatives from Government organisations as well as technology providers, young entrepreneurs, academicians and students to focus on resource efficiency in Aluminium.

8.34 Policy awareness workshop on E-waste, November 2019

The International Telecommunication Union (ITU), the Economic Advisory Council to Prime Minister (EAC-PM) and the Office of Principal Scientific Advisor to the Government of India, with the support of the United Nations University (UNU), the International Labour Organization (ILO) and the World Health Organization (WHO), organized a Policy Awareness Workshop on E-waste in Hyderabad, India, from 27 to 29 November 2019. The workshop brought together key stakeholders from across India. The focus was on understanding e-waste in the 3Ps – PEOPLE-PLANET-PROSPERITY dimensions in India through a strategic perspective, linking marquee programmes with ongoing activities of Government of India.

8.35 Solar Eclipse Meeting, December 2019

Hon'ble Prime Minister Shri Narendra Modi met with the PSA along with officials from the Nehru Planetarium to discuss the eclipse and astronomy, in general.



8.36 CodeIndia Program Visit, December 2019

Students from the Navodaya Vidyalaya Samiti met with the PSA to share their learning and experience from the CodeIndia program to promote application-based computer programming for high school students.



8.37 IUCAA Center Inauguration, December 2019

The PSA inaugurated the Teaching Learning Center at Pune and delivered a 31st Foundation Day talk.

8.38 Manohar Parrikar Vidnyan Mahotsav, December 2019

The Government of Goa held the 'Manohar Parrikar Vidnyan Mahotsav' which intended to replicate the Nobel Prize Series 2019 held in Goa under the guidance of Mr. Parrikar was attended by the PSA. It will now be an annual science festival to be hosted in partnership with the PSA's Office and CSIR- National Institute of Oceanography.

8.39 Jal Jeevan Mission Meeting, December 2019

The Technical Committee meeting was chaired by Prof. K VijayRaghavan at Department of Drinking Water and Sanitation. The technical committee will examine and evaluate the technological innovations in drinking water and sanitation sector. Additionally, they will shortlist and facilitate techno-economic appraisal and recommend its use.

8.40 PM-STIAC Mission Review, December 2019

A review of all the nine PM-STIAC missions chaired by Prof. K VijayRaghavan, with representatives from each mission providing updates and timelines for each of the mission. Discussions on Mega Science Projects undertaken in the country including Thirty Meter Telescope, Square Kilometer Array, India Neutrino Observatory and LIGO took place. Also, the current status and way forward for each of the national missions and other mega science projects were deliberated on.

8.41 India-Sweden High-Level Dialogue on Innovation Policy, December 2019

Prime Minister of India, Sh. Narendra Modi, and His Majesty King Carl XVI Gustaf, the King of Sweden chaired the inaugural session of the 'India-Sweden High-Level Dialogue on Innovation Policy' to strengthen the partnership between the two nations and accelerate innovation.



8.42 Indian R&D Ecosystem Conclave, December 2019

A two-day conclave on 'Indian R&D Ecosystem' was held on 17-18 December 2019 at New Delhi. The objective of the conclave was to foster India's R&D ecosystem and to improve India's international ranking in the Global Innovation Index (GII) 2020 by addressing data gaps. Dedicated sessions were held focusing on key elements of India's R&D ecosystem, data gaps in GI, strategies and best practices in R&D, contract R&D and higher involvement of women in science & deep-tech start-ups, and nurturing STI ecosystem in the states.



8.43 PSA's visit to the US, January 2020

The PSA attended an event at the Indian Embassy in US aimed to build on existing US-India collaborations on Science and Innovation and identify areas of future work. The meetings included interactions with Amit Kumar, hargé d'affaires ambassador, US Government Department Officials, Diplomatic corps and representatives of the scientific community.



8.44 APS Physics Annual Leadership Meeting, January 2020

A panel discussion with the PSA along with other leading scientists was held at the American Physical Society annual leadership meeting to discuss a range of topics with a focus on international cooperation and competition. The meeting included officials from Laser Interferometer Gravitational-Wave Observatory, Kavli Institute for Theoretical Physics, and other renowned scientists.

8.45 Indian-Sweden Innovation partnership meeting, February 2020

A meeting with Hon'ble Klas Molin, Ambassador of Sweden to India to discuss the way forward for India Sweden Innovation partnership.



8.46 Waste to Wealth Mission, February 2020

Taking Swacch Bharat Mission to the next level, the Government of India is committed to bring latest technologies that can transform waste to energy and wealth. The mission has identified Sentinel Sites across the country where technologies will be deployed to address issues of waste disposal, deteriorating air quality, and increasing pollution of water bodies through pilot projects. These projects will seek to discover, demonstrate, test, and learn from different waste to wealth services and techniques & approaches in collaboration with various departments & ministries.

At present, there are three ongoing projects supported by the O/o the PSA:

- **Agri-Waste to High Energy Bio-Coal** – The office of Principal Scientific Adviser to the Government of India, in partnership with Bioendev, Sweden, has set up a torrefaction pilot plant for conversion of agri-waste into bio-coal at National Agri-Food Biotechnology Institute in Punjab.
- **Su-dhara: Cleaning and Rehabilitation of Babarpur and Gokulpuri Drains** – The Babarpur and Gokulpuri Drains in the East Delhi stretch up to 7.25 meter in length and are one of the dirtiest stretches. At present, attempts are being made to clean the drains by removing and treating the solid debris and municipal solid waste from the drain and the surrounding locality using booms and automated enhancer system.
- **Waste Mining and Land Recovery of Ghazipur Dump Site** – The East Delhi Municipal Corporation in partnership with, IL&FS Environment has set up a Waste to Energy plant at the Ghazipur dumpsite, which receives more than 2000 tons per day of Delhi's municipal solid waste focusing on legacy and fresh waste.

To help achieve India's sustainable development goals, these projects will serve as ready reckoners and path finders for evidence based, effective, scalable waste to wealth projects across India.



8.47 CSIR Society Meeting, February 2020

Prime Minister chaired a meeting of the CSIR Society in New Delhi even attended by Prof. K Vijay Raghavan, Principal Scientific Adviser to the Government of India during which extensive discussions on the rich work done by CSIR and the roadmap ahead. There was emphasis on the role of CSIR taking the lead towards harnessing science to improve people's lives.



8.48 Electronics Corporation of India Limited (ECIL) Event, February 2020

IMS based explosive detectors (12 numbers), developed by the ECIL were handed over to the various security agencies through the Intelligence Bureau (IB) for field trials. This project was implemented by the Electronics Corporation of India Limited (ECIL), Hyderabad. These detectors are characterised by very high sensitivity i.e. of the order of nanograms of explosive sample. After successful field trials and incorporation of user feedback, the detectors will be ready for field deployment.

8.49 CPSEs Forum on 'Scaling up R&D Investment – Way Forward', March 2020

The Office of the Principal Scientific Adviser to Government of India in collaboration with Department of Public Enterprises, Government of India and Confederation of Indian Industry organized the CPSEs Forum on 'Scaling up R&D Investment – Way Forward' on 4th March 2020 at New Delhi. The prime objective of this forum was to take cognizance of the R&D plan of PSUs for the next two years; proposed R&D activities under the amended CSR guidelines and the strategy for scaling up of R&D investment by CPSEs and explore potential collaboration opportunities for new technology and product development.

