GOVERNMENT OF INDIA
MINISTRY OF SCIENCE AND TECHNOLOGY
DEPARTMENT OF SCIENCE AND TECHNOLOGY
LOK SABHA
UNSTARRED QUESTION No. 3436
TO BE ANSWERED ON 13/03/2020

NANO SCIENCE AND TECHNOLOGY

3436. SHRI BHOLA SINGH:
DR. SUKANTA MAJUMDAR:
SHRI RAJA AMARESHWARA NAIK:
SHRI VINOD KUMAR SONKAR:
DR. JAYANTA KUMAR ROY:
SHRIMATI SANGEETA KUMARI SINGH DEO:

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

(a) whether Nano technology has varied applications and far reaching impact and implications in prominent sectors and if so, the details thereof;

(b) whether the Government has implemented Nano Mission to promote Research and Development in Nano Science and Technology;

(c) if so, the details thereof including funds allocated, R&D projects undertaken and their output during the last three years and the current year;

(d) whether there is urgent need to formulate national level regulatory framework for Nano-technology; and

(e) if so, the steps being taken by the Government for the development of Nano-technology and physical and human infrastructure in this sector?

ANSWER

MINISTER OF HEALTH AND FAMILY WELFARE; MINISTER OF SCIENCE AND TECHNOLOGY; AND MINISTER OF EARTH SCIENCES
(DR. HARSH VARDHAN)
स्वास्थ्य और परिवार कल्याण मंत्री, विज्ञान और प्रौद्योगिकी मंत्री और पृथ्वी विज्ञान मंत्री
(डॉ. हर्ष वर्धन)

(a) Yes Sir. Novel materials developed using the Nano. S&T has profound impact on various areas that include the following:
Smart Agriculture – to know the health of Soil for its content related to Nitrogen (N), Phosphorous (P) and Potassium (K) for inputs related to fertilizer and nano herbicides. The moisture sensor assists in optimal utilisation of Water used in Irrigation.
Forensic Applications – Explosives detection using Nano Sensors in parts per billion (ppb) scales for domestic/ strategic use.
Health Care – by using Nano based carriers for targeted drug delivery for diseases common to India.
Nano based Advanced Materials – for Automobile Sector, Defence Sector (in Navy and Air Force), Aerospace sector;
Nano Coatings – for industrial use (pharma and manufacturing industry)
Nano for Energy and Environment – Solar Photovoltaics, Next generation Energy Conversion and Storage Devices
Quantum Materials with Novel properties & applications – Photonic Devices, Nano Engineered Quantum Devices, Low dimensional Quantum matter.

(b) Yes Sir. Government approved Nano Mission that was implemented by DST during 2007 to 2012 as Phase-I followed by Phase-II (2012-2017) with its extension till 31.03.2020. During this period, 2 Autonomous Institutions focusing on Nano S&T have been initiated in the form of Institute for Nano Science and Technology (INST) at Mohali and Centre for Nano Science and Soft Matter Science (CeNS) at Bengaluru. Apart from these two dedicated Institutions, DST had funded Technical Research Centre (TRCs) in 5 of its Autonomous Institutions for Technology Development and Transfer since last 5 years. These TRCs are at JN Center for Advanced Scientific Research (JNCASR)-Bengaluru, Indian Association for Cultivation of Science (IACS) – Kolkata, SN Bose National Centre for Basic Sciences (SNBNCBS) – Kolkata, Advanced International Research Centre on Powder Metallurgy and Materials Science (ARCI) – Hyderabad and Sri Chitra Tirunal Institute for Medical Science & Technology (SCTIMST) - Thiruvananthapuram. These Centres had transferred few technologies based on Nano Science to start-ups and MNCs. Apart from this, the Nano Mission, during 2019-20, has funded a Technology Business Incubator (TBI) for Nano based

Start-ups at CeNS, Bengaluru. Last year (2019-20), DST in collaboration with M/o Electronics and Information Technology (MeitY) along with the 5 premier host Institute (4 IITs and IISc), had started a collaborative project titled "Nanoelectronics Network for Research and Applications (NNetRA)", with 1:1:1 funding worth of Rs 299 crores.

In addition to the above, Ministry of Electronics and Information Technology (MeitY) has started Nanotechnology Initiatives with focusing on Nanoelectronics in the year 2004. State-of-the-art Centres of Excellence in Nanoelectronics (CENs) have been established at IISc, Bangalore, IIT Bombay, IIT Delhi, IIT Kharagpur and IIT Madras for carrying out R&D for development of Nanoelectronics/ Nanotechnology in the country. Further, to make available the R&D facilities established at IISc and IIT Bombay to the researchers across the country and develop a pool of Nanoelectronics researchers in the country, an Indian Nanoelectronics Users Program (INUP) was initiated at IISc and IIT Bombay. The CENs at IISc and IIT Bombay has resulted in technology development and incubations/startups. INUP has resulted in substantial increase in number of researchers, patents and publications in Nanoelectronics/Nanotechnology across the country.

Also, Centre of Excellence in Theranostic Devices is being established at IIT Guwahati to cater to the needs of the North East Region. As on date, six technologies based on nanotechnology have been developed for healthcare that have been transferred to companies for commercialization.

A Centre for Nano-metrology has been setup at National Physical Laboratory (NPL), New Delhi for Electro-Mechanical parameters such as Nano Volt, Nano Ampere, Nano Resistance, Step height, Line Spacing and texture.

(c) Funds allocated and utilised by DST in last three years and the current year are as follows:

Allocation 2016-17 (Rs in Cr)	Utilised Amount (Rs in Cr)	% Utilisation
BE 95cr RE 125 cr	123.64 cr	98.91

Allocation 2017-18 (Rs in Cr)	Utilised Amount (Rs in Cr)	% Utilisation
BE 136 RE 122.50 cr	105.04 cr	85.75

Allocation 2018-19 (Rs in Cr)	Utilised Amount (Rs in Cr)	% Utilisation
BE 150 crore RE 74.90	74.31 crore Capital	99.21

Allocation 2019-20 (Rs in Cr)	Utilised Amount (Rs in Cr)	% Utilisation
BE 65 crore RE 64 crore	60.18 crore (as on 28.02.2020)	94.03 (likely to reach 100%)

On an average 50 projects in various areas and Institutions are sanctioned per year. We have recommended 5 proposals in Nanotechnology for Agriculture, 3 proposals in Nano for Energy & Environment and 11 proposal in Novel Quantum Materials for which sanctions would be issued in next Financial Year. Apart from the above major projects, small and medium projects have also been taken up for the development of Nanoelectronics/ Nanotechnology in the country with funding from MeitY.

The Department of Biotechnology is also funding a major programme on NanoBiotechnology focussing on nanomedicine, imaging, diagnostics, tissue engineering and other biomedical applications and nanoagriculture. The total amount of investment over the past three years in this area was Rs. 64.62 Crores. Further, 92 projects were supported during this period.

(d) Yes, Sir. There is a need for formulation of National level Regulatory framework for Nano-technology. DST along with Bureau of Indian Standards is involved in preparation of calibration Standards for Nano Technology. DST had already issued "Guidelines for handling of Nano Materials in lab". Department of Biotechnology has recently released "Guidelines for evaluation of Nano pharmaceuticals in India" jointly with ICMR and DCGI, CDSCO in October 2019 in which DST's inputs were also taken and incorporated. DBT will be releasing "Guidelines for evaluation of Nanobased Agri and Food Products in India" soon.

(e) In the recent third party evaluation of programmes of DST, the Committee had recommended to make Nano Mission as a regular programme of DST, which will provide the required continuity to the programme and thereby continuing support for quality manpower generation in Nano Science and Technology for the Country. The NanoElectronics Programme of MeitY and NanoBiotechnology programme of DBT are regular programme with regular manpower at MeitY and DBT since their inception. The present Mission mode programme, having an end date, is becoming an hurdle for retaining manpower in the Nano Mission of DST. The existing Missions in its 2 phases has provided State-of-Art Nano Science facilities across India and this has resulted in India emerging as third ranked country globally in SCI publications related Nano S& T field above South Korea, Iran, Russia, Germany and UK etc.

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