

Brief on Indo-German Cooperation in Science & Technology

The Indo-German Science & Technology cooperative program *is implemented under an Inter-governmental Agreement* on “Cooperation in Scientific Research and Technological Development” signed in May 1974. The Department of Science & Technology (DST) from Indian side and the German Federal Ministry for Education and Research (BMBF) are the nodal agencies for overall coordination of the programme.

An apex *Indo-German Committee on S&T* was established in 1994 to coordinate the implementation of the cooperation; joint review of the activities; consider major issues and suggest measures towards enhancement of cooperation including those of DST, DBT, MOES, CSIR, ICMR and DAE. So far 11 meetings of the S&T Joint Committee have taken place. The last meeting of the Indo-German Joint Committee on S&T was held in Berlin on 8 May 2017. The Indian side is co-chaired by Secretary DST and the German side by State Secretary BMBF.

Modes of Cooperation

Various modes have been put in place for implementation and intensification of cooperation between India and Germany, under various arrangements for collaborative work in Science & Technology:

- Joint research projects between institutions and scientists
- Joint R&D projects in the 2+2 mode (R&D Institution and Industry on both sides)
- Project based personnel exchange programme with emphasis on exchange of young PhD scholars (PPP Programmes)
- Young Indian scientists visiting Germany to interact with Nobel Laureates
- Joint Workshops / Seminar / Symposia / Schools / Trainings
- Networked Partner Research groups
- Frontiers of Engineering symposium
- Participation in mega science projects like FAIR, DESY etc.
- Establishment of Centres like Indo-German Science Centre for Infectious Diseases (IG-SCID), Indo-German Max Planck Centre on Computer Sciences (IMPECS), Indo-German Center for Sustainability (IGCS)
- Mobility programmes

A brief update on collaborative programs / schemes implemented by DST is as follows:

(1) DST- Federal Ministry of Education & Research (BMBF) Program

The DST-BMBF program was initiated in 1998. A total of 42 joint research projects in application oriented areas have been supported under DST-BMBF mobility scheme.

Indo-German Science and Technology Center (IGSTC)

Through an agreement signed in 2010 the ***bilateral Indo-German Science and Technology Centre (IGSTC)*** was established as a flagship initiative of Government of India (DST) and Government of Germany (BMBF) to promote research partnership of industrial relevance. IGSTC started operating from Gurgaon in 2011. The IGSTC had a committed funding of 2 million euro (Rs. 13 crores) each year for the first five years of its operation. Considering the significance and success of the Center, both the Governments in 2015 agreed to extend the IGSTC for another five years starting from 2017 with a doubling of funding from Euro 2 million to 4 million from each side.

The IGSTC collaborative research projects involve participation of one academic institution and one industry from each country (2+2 model). It has funded 31 bilateral projects since the first call for proposals in 2009. 16 Projects have been already completed and 15 are on-going. The Centre has supported 14 bilateral workshops on technology focused themes.

Additionally, IGSTC will support proposals for organizing Indo-German workshops on areas of mutual interest with an aim towards creating platforms for interactions between researchers from academia and industry.

(2) DST- German Academic Exchange Service (DAAD) Program

DST-DAAD Project based Personnel Exchange Programme (PPP) launched in 1998 has expanded to more than 325 joint research projects enabling focused interaction through exchange of about 600 scientists/ research students from each side. This Program's emphasis is on academic training to young scientists at doctoral and post-doctoral levels. The Program has resulted in more than 700 joint publications; and participation of more than 2000 PhD students from both sides. Against the last call of 2016, 29 new projects have been selected jointly for implementation.

Indo-German Centre for Sustainability (IGCS): DST and DAAD are also jointly supporting an ***Indo-German Centre on Sustainability*** at IIT Madras with RWTH Aachen University, TU9 and CAU, Kiel from German side. The Centre aims at promoting fundamental and applied research including policy support, teaching and training in the area of sustainable development with special focus on water, energy, land use and development and waste management. The Centre has been actively organising academic courses, summer/winter schools, networking and outreach activities among scientists and students. So far more than 300 graduate students from India and Germany have participated in a total of ten schools organised by the Centre. Starting in 2013, DST's contribution to this centre is to the tune of Rs. 8.00 crores over a period of 5 years.

The two sides have decided to support the 2nd phase of the Centre in 2017 with focus on 'climate change and influence on coastal infrastructure'. In this regard, a JDI has been signed during the IGC held on 30 May 2017.

(3) DST-German Research Foundation (DFG) Program

DST-DFG MoU was signed in Oct 2005 under which 49 joint research projects have been implemented so far. The Program aims to support joint research projects; support to use major facilities in Germany and India; establish International Research Training Groups (IRTG) and collaborative Research Centers etc.

In the year 2016, a joint call for inviting collaborative research projects in the broad areas of Physics was launched and 7 new R&D projects have been selected for joint implementation.

(4) DST-Max Planck Society (MPG) Program

Under the MoU between the Max Planck Society and the Department of Science & Technology signed in 2004, cooperation with the Indian Partner Institutes is being promoted. Under this program, the following activities are supported:

- a) **Partner Groups** constitute the outstanding junior scientists who return to their home country following a research residency at a Max Planck Institute are supported by the Max Planck Society and DST in establishing a partner group between their home institution and a Max Planck Laboratory. Since the establishment of Max Planck Partner Groups in 2005 a total of 59 Max Planck Partner Groups with India have been created which is the highest number in any country? DST-MPG Partner Groups are administered by IGSTC. There were 15 such Partner Groups during the period 2011-2018.
- b) **Mobility Grants** are given to excellent young Indian scientists who receive a stipend of Euro 3000 a year with travel support from DST for the period of three years and have to spend a minimum of 1 month at an MPI in a year. Since the establishment of Indian Mobility Grants a total of 62 Mobility Grants have been awarded to Indian researchers.
- c) **Kick-off workshops** enable scientists from Max Planck Institutes to acquaint themselves more closely with research conditions in India and to make initial contacts to Indian scientists. So far 29 such workshops have been conducted.

DST and Max Planck Society have established the **Indo-German Centre on Computer Science (IMPECS)**. This virtual research Centre is coordinated by Indian Institute of Technology, Delhi and Max Planck Institute of Informatics and Software. A total of 14 groups from India are participating. Support extended by DST is Rs 6.00 crores. Research projects have been implemented in the areas covering complex algorithm; program analysis; database and information retrieval; acquisition modelling; and deploying online social network etc. These have yielded very high impact research outcome and helped in manpower training and capacity building. Considering that some of the best groups on computer sciences in India and Germany have cooperated very productively, both DST and Max Planck Society have launched the next phase of IMPECS in 2017 with focus on practical applications for cyber physical systems.

The Indo-German Max Planck-NCBS Center for Research on Lipids at the National Center for Biological Sciences in Bangalore was established in September 2011 as the second Max Planck Center in India. The Max Planck Center of Molecular Cell Biology and Genetics in Dresden is involved in this. The Center is co-financed by the MPG, the BMBF and DST.

(5) Nobel Laureates meetings in Lindau, Germany

Lindau Foundation, Germany has been organizing the meeting with Nobel laureates in Physics, Chemistry and Medicine to discuss the major issues of importance in these fields, since 1951. The meetings include lectures, round tables and interactive sessions among the young students and the scientists. DST is supporting the participation of meritorious Indian students at Masters, Doctoral and Post-Doctoral levels to interact with Nobel Laureates and other scientists to shape up their future research careers, since 2001. DST has so far deputed about 350 young researchers in the age group of 20-30 years during last 16 years to the meeting of Nobel Laureates and Students in Lindau Germany. The young Indian researchers are also being exposed to various premier research institutes in Germany during the 2nd week which is sponsored by DFG, Germany. Many of the young Indian researchers who participated in Nobel Laureates meeting have opted for scientific research as career path.

. The last Lindau meeting focused on physiology and medicine and was held during 23-29 June 2018 in which 30 Indian students participated. The next Lindau meeting in June 2019 is dedicated to cosmology, particle physics and quantum technology.

(6) Indian participation to FAIR project of Germany

An International Facility for Antiproton and Ion Research (**FAIR**) is being constructed and established in Darmstadt, Germany. The facility will provide the international science community a worldwide and 4th Generation facility for performing front end research in high energy physics in many areas of science leading to applications. Recognizing the importance and the technological requirements, a total of 13 countries including China, Spain, Finland, France, UK, Italy, Poland, Romania, Russia, Sweden, and Greece have enrolled into the establishment and use of this next generation international facility. The project is spearheaded by Germany and the total cost of the project is estimated at 2.7 Billion Euros which includes civil construction cost, accelerator construction cost and annual operating cost for ten years. Germany has already committed 75% of the total project cost, with the remaining 25% being provided by the other partnering countries either in cash or in kind.

The FAIR Convention and Act was signed by Secretary DST on behalf of Government of India on 4th October 2010 in Germany. India has committed contribution of 3% of the total construction cost i.e. 36 Million Euros of FAIR on equity basis.

(7) India - Germany cooperation in Synchrotron research (DESY) Hamburg

Saha Institute of Nuclear Physics (SINP), Kolkata and Deutsches Elektronen-Synchrotron (**DESY**), Germany signed one of the four major Cooperation Agreements in Delhi on 31st May 2011. DST is extending total support for this programme. India will contribute 14 million Euros for the construction and operation of a beamline in one of the PETRA III extensions and in return will get access to 1.3 beamline-year time across the entire facility. The India centric beam line was inaugurated in 2016.

This facility will enable Indian scientists to access world's best high-energy synchrotron light source PETRA-III and free electron laser source at DESY. Synchrotron light source provides intense light ranging from Infra-red to X-rays which may be used to investigate materials for basic research and industrial application in various subjects ranging from medical applications to Nano-technology. Access to the world's best synchrotron source PETRA-III provides high brilliance, nano-sized X-ray beam with energy tunable from fraction of a keV to several tens of keV, and with tunable polarization, enabling the Indian science community to be at the fore-front of basic and applied materials research.

Scientists and research scholars from more than 25 Indian Institutions have already carried out a large number of experiments over last four years here at the DESY. So far more than 84 experiments at PETRA III have been carried out involving 521 user visits and 1719 shifts (8h).

(8) DST-Alexander Humboldt Program on Frontiers of Engineering: An MoU for organizing Indo-German (DST-AvH) seminar on Frontiers of Engineering was concluded in Feb 2008. DST and AvH co-sponsor organization of inter-disciplinary seminar with participation of 35-40 best and brightest young engineers from both side for networking and discussing latest topics in engineering sciences and technology. So far 9 such symposiums have been organized in India and Germany. In May 2016, the 8th Indo-German Frontiers of Engineering Symposium was organized in Potsdam, Germany focusing on Energy Harvesting, Exploring Length Scale in Biomechanics, Smart Materials including Bioinspired Systems. 10th Indo-German Frontiers of Engineering Symposium was held in Potsdam, Germany from May 24-27, with 30 participants from each country. The areas that were covered at the 2018 INDOGFOE symposium were "Ambient Assisted Living and Robotics for Societal Needs", "Future Agriculture", "Next-generation Automotive & Aerospace Mobility" and "Self-healing Materials".

(9) DBT- BMBF Collaboration:

The basis of Indo-German cooperation in Biotechnology is an agreement for cooperation signed between the Department of Biotechnology (DBT) and The German Federal Ministry of Education, Science (BMBF) along with Forschungszentrum Julich GMBH (FZJ) in February 2001.

DBT signed also a Programme of Co-operation (PoC) with the German Research Foundation (DFG) in 2012 to develop Collaborative Research Centres (CRC), International Research Training Groups (IRTGs) and Research Projects.

The call for proposals for joint projects is jointly issued by DBT and BMBF every year on respective web-sites.

(10) Ministry of Earth Science (MoES) with Helmholtz Association

A Cooperation exists between Helmholtz Association and MoES on two major Areas.

- Earth System Sciences signed on 7th April 2016.
- with German Research Centre for Geosciences (GFZ) and MoES for cooperation in scientific planning, management of the Earth Science Drilling programme known as International Continental Drilling Programme (ICDP). GFZ is the Executive Agency for ICDP.
- MoES has taken the initiative with the Leibniz Centre for Tropical Marine Research (ZMT), Bremen, to organize a workshop on “Indo-German Workshop on Marine Sciences and Coastal Sustainability” in August 2018 as part of the MoU between Leibniz Association and DST.

(11) Indian Council for Medical Research (ICMR)- Helmholtz program: Promote research in the area of Anti-Microbial Resistance. An MoU has been signed in this regard on 29 May 2017. ICMR, New Delhi and Federal Ministry of Education and Research (BMBF), Germany jointly organized an Indo-German workshop on Antimicrobial Resistance (AMR) during January 2018 at ICMR Headquarters.
