Review of the activities of Indian Statistical Institute for the year 2018-2019

The Indian Statistical Institute, Kolkata was established on 17th December, 1931 and was registered as a non-profit learned society under the Societies Registration Act (XXI of 1860) on 28th April, 1932 and subsequently came under the purview of the West Bengal Societies Registration Act (XXVI of 1961) which was amended in 1964. The Institute was recognised as an "Institution of National Importance" by "The Indian Statistical Institute Act, 1959, No.57 of 1959" of the Parliament on 24th December, 1959. The "Indian Statistical Institute (Amendment) Act, No.38 of 1995" of the Parliament, empowered The Institute to award degrees/diplomas in Statistics, Mathematic, Quantitative Economics, Computer Science and such other subject related to statistics as may be determined by the Institute from time to time. The Institute is engaged in an integrated programme of research, training and practical application of statistics and interdisciplinary studies through several projects in close collaboration with the Government of India, national and international organisations, maintaining a very high standard as a centre of excellence which has resulted in its earning several national/ international recognitions over the years.

2.   The objectives of the Institute are:

(i)   to promote the study and dissemination of knowledge of statistics, to develop statistical theory and methods, and their use in research and practical applications generally with special reference to problems of planning of national development and social welfare.

(ii)   to undertake research in various fields of natural and social sciences, with a view to the mutual development of statistics and these sciences.

(iii)   to provide for and undertake the collection of information, investigations, projects and operational research for purposes of planning and the improvement of efficiency of management and production.

(iv)   to undertake any other ancillary activities in fulfillment of the objectives (i), (ii) and (iii) above.

3.   The Institute has its Headquarters in Kolkata with four other centres at Delhi, Bangalore, Chennai and the North-East Centre at Tezpur, Assam. The Institute has also a branch at Giridih and network of service units of Statistical Quality Control and Operations Research Division across the country at Mumbai, Coimbatore, Pune and Hyderabad besides Kolkata, Delhi, Bangalore and Chennai.

4.   As envisaged in the "Indian Statistical Institute Act, 1959, No. 57 of 1959", the Institute is fully funded by the Government of India. The major amount of internal receipts comes from the application fee for admissions, realisation from staff on account of licence fee, share of overhead charges from externally funded projects, fees from consultancy rendered by the faculty of the Institute.

5.   The accounts of the Institute for 2018 - 2019 has been audited by M/s. S.K. Mallick & Co. Chartered Accountants, Kolkata who were appointed by the Institute for the purpose after their selection by the Government of India in consultation with the Comptroller & Auditor

General, India and the Institute, as per provision contained in Section 8(1) of the "Indian Statistical Institute Act, 1959, No. 57 of 1959".

6. The programme of work in a particular year, the financial estimates thereof and quantum of grants to be given by the Ministry of Statistics and Programme Implementation for the purpose, are decided in the light of the recommendations of a committee set up by the Ministry of Statistics and Programme Implementation under Section 8(1) of the "Indian Statistical Institute Act, 1959, No. 57 of 1959". The composition of the committee includes distinguished economists and scientists as well as representatives from the Government of India, namely the Ministry of Statistics & Programme Implementation and Ministry of Finance. The programme of work and the expenditure estimates/grants for 2018-2019 were accordingly worked out on the basis of the recommendations of the aforesaid committee. During the year 2018-2019, ISI Council recommended Rs.29599.52 lakhs under salary head Rs.19377.87 lakhs under 'Creation of Assets' head and Rs.5123.32 lakhs under General Head (BE). The Government approved a sum of Rs.20398.00 lakhs, Rs.4749.10 lakhs and Rs.2795.00 lakhs for salary, capital and general expenditure respectively. At the revised estimate stage, the Institute sought for a grant of Rs.27249.00 lakhs, Rs.5779.10 lakhs and Rs.4145.00 lakhs under salary, capital and general respectively, which was also recommended by the ISI Council. The Government sanctioned Rs.24260 lakhs, Rs.4749.10 lakhs and Rs.2940.00 lakhs under salary, capital & general heads respectively. The revenue expenditure was more by Rs.534.73 lakhs from the fund allotted by the Ministry and Miscellaneous receipt. Capital Expenditure was Rs.102.63 Lakhs more than the fund allotted. The Audited Annual Accounts of the Institute for the year 2018-2019 has been furnished in Statement of Accounts and Auditors' Report.

7. During the year, the Institute continued to conduct its regular and professional courses for students leading to award degrees in B. Stat. (Hons.), B. Math. (Hons.), M. Stat., M. Math., Master of Science (M.S.) in Quantitative Economics, Master of Science (M.S.) in Quality Management Science, Master of Science (M.S.) in Library and Information Science, M. Tech. in Computer Science, M. Tech. in Cryptology and Security, M. Tech. in Quality, Reliability and Operations Research, Post Graduate Diploma in Statistical Methods and Analytics, Post Graduate Diploma in Computer Applications, Post Graduate Diploma in Business Analytics, Research Fellowships in Biophysics, Computer Science, Computer Science and Engineering, Genomics, Information Technology, Library and Information Science, Mathematics, Psychology, Quantitative Economics, Quality, Reliability and Operations Research, Statistics.

8. The Institute runs the International Statistical Education Centre (ISEC), an Associate Institute in Kolkata, under the auspices of the UNESCO and the Government of India. The centre provides training in theoretical and applied statistics at various levels to selected participants from the countries in the Middle-East, South and South-East Asia, the Far-East and the Commonwealth countries in Africa. Major training programme of the centre is a 10-month regular course in Statistics leading to Diploma in Statistical Training. In addition, special courses of varying duration were also organized. During the year, ISEC successfully completed its training program of 72nd Term batch of the Regular Courses with 14 trainees from eleven different countries like Democratic Republic Congo, Ethiopia, Fiji, Kenya, Liberia, Malawi, Niger, Sri Lanka, Tajikistan, Tunisia, Tanzania and awarded Diploma in Statistical Training.

9.   The R.C. Bose Centre for Cryptology and Security of the Indian Statistical Institute at Kolkata aims to promote interdisciplinary research in Mathematics, Computer Science and Statistics towards furtherance of teaching, research as well as training and development in Cryptology and Cyber Security. The Centre acts as a hub for all cryptographic requirements, cutting-edge research activities and technology development in relevant fields, in order to create a critical mass of researchers and experts to fulfil the growing demand in the national and international arena. M. Tech in Cryptology and Security, a one of its kind degree program, has been initiated at the Centre. As in previous years, in 2018-19 the Centre has provided direction and advice to various wings of Armed Forces, DRDO, Police Organisations and Security Agencies. A new certificate course in Cryptology and Data Security has been started this year specially designed for defence personnel. A total of 13 officers from various defence services are enrolled in this year's course. Many externally funded projects funded by Samsung, NettApp Inc., Cisco Systems Inc. etc. were also carried out this year. As part of capacity building at the national level, the Centre has provided dedicated research internship program in Cryptology and Security to senior undergraduate and fresh post-graduate students from premier institutions of the country.

Centre for Artificial Intelligence and Machine Learning

In sync with the national push for programs in the field of Artificial Intelligence (AI), ISI has initiated a Centre for Artificial Intelligence and Machine Learning (CAIML).

Centre for Research on the Economics of Climate, Food, Energy and Environment

Recognising the societal commitments to environmental sciences, a Centre for Research on the Economics of Climate, Food, Energy and Environment has been introduced at ISI Delhi Centre (CECFEE).

10.   The Associate Institute, "Center for Soft Computing Research: A National Facility", which was established in 2005 with funds from the Department of Science and Technology, Government of India under its IRHPA (Intensification of Research in High Priority Areas) scheme. The Center is aimed at conducting research both theoretical and applied, of international standard, in the fields of soft computing.

11.   The Annual Report for the year 2018 - 2019 indicates the details of research work carried out by the Institute during the year in Theoretical Statistics and Mathematics Division; Applied Statistics Division; Computer and Communication Sciences Division; Physics and Earth Sciences Division; Biological Sciences Division; Social Sciences Division; Statistical Quality Control & Operations Research (SQC & OR) Division; and Library, Documentation & Information Sciences Division. The composition of each Division is given below:

Theoretical Statistics and Mathematics Division: Stat-Math Unit at Kolkata, Delhi, Bangalore and Chennai.

Applied Statistics Division: Applied Statistics Unit at Kolkata and Chennai, Interdisciplinary Statistical Research Unit at Kolkata. Applied and Official Statistics Unit at North-East Centre, Tezpur.

Computer and Communication Sciences Division: Advanced Computing & Microelectronics Unit, Computer Vision & Pattern Recognition Unit, Electronics & Communication Sciences Unit, Machine Intelligence Unit, Cryptology and Security Research Unit at Kolkata, Documentation Research and Training Centre, Systems Science & Informatics Unit at Bangalore and Computer Science Unit at Chennai.

Physics & Earth Sciences Division: Geological Studies Unit and Physics & Applied Mathematics Unit at Kolkata, Theoretical & Applied Sciences Unit, at North-East Centre, Tezpur.

Biological Sciences Division: Agricultural & Ecological Research Unit, Biological Anthropology Unit and Human Genetics Unit at Kolkata.

Social Sciences Division: Economic Research Unit, Linguistic Research Unit, Population Studies Unit, Psychology Research Unit, Sampling & Official Statistics Unit at Kolkata, Sociological Research Unit at Kolkata and Giridih, Economic Analysis Unit at Bangalore and Economics Planning Unit at Delhi, Socio-Economic Research Unit, at North-East Centre, Tezpur.

Statistical Quality Control & Operations Research (SQC & OR) Division: Bangalore, Chennai, Coimbatore, Delhi, Hyderabad, Kolkata, Mumbai, Pune and a Central SQC (CSQC) Office at Kolkata.

Library, Documentation & Information Sciences Division: Central Library at Kolkata, Chennai, Delhi, Bangalore and North-East Centre, Tezpur.

The Computer and Statistical Service Centre (CSSC) is responsible for managing/ maintaining the IT infrastructures of the Institute. The IT infrastructures of the Institute consist of server's virtualization (cloud), softwares [VMware (esxi and VCenter), Matlab, Mathematica, ArcGis, R etc], Network (wired and wi-fi), Network and Internet security, IP Telephones, Video conferencing facility, e-library and internet facilities (NKN - 1 Gbps). CSSC have been maintaining the connection (using Site-to-Site Virtual Private Network (VPN)) with outlying Centres (Delhi, Chennai, Tezpur and Bengaluru) and the Giridih Unit of the Institute. The IT infrastructures have been utilized by all the Centers /Branches of the Institute by VPN connectivity. Various academic and administrative meetings including Academic Council meetings among the Institute's Centers (Delhi, Bengaluru, Chennai and Tezpur) and Giridih Unit through Video Conferencing facilities were being arranged/ managed successfully.The cloud infrastructure with virtualization software, Cisco UCS servers (408 cores/608 threads and 6000 GPU cores) and the EMC 260 Tb storage were managed by CSSC, providing the computing facility to the users of the Institute. Lab facilities to all the Students of Kolkata campus are provided. Laboratory classes of regular courses like B.Stat., M.Tech. (CS), M.Tech (QR), M.S. (QE), M.Stat. are being held in the computer laboratories of CSSC throughout the year. Some classes (especially M.Tech. (CS) and PGDA courses of Tezpur Centre) through video conferencing facilities are being organized by the CSSC throughout the year. Online tests of our students for placement purpose are being conducted in CSSC laboratories. The access of accounting package FACT (installed in the server of ISI Kolkata) have been maintaining by CSSC and these have been facilitated to all outlying Centers and Branches through the VPN connections. The LAN (wired) connections with 10 Gb backbone between hostel rooms (excluding ISEC) in Kolkata campus and CSSC have been maintained efficiently. The wi-fi facility covering the ISEC

hostel is maintained by the Center. Members of CSSC take part in teaching different courses of the Institute and also supervised project work of non-ISI students studying MCA, B.Tech. etc. The CSSC have been providing Laptops and Desktops to faculty, scientific staff and research scholars in Kolkata and Giridih campus. The CSSC have been providing required training to computer trainees who are in turn providing technical support to the Institute.

12. Externally Funded Project

Apart from theoretical and experimental plan research, the Institute undertook a variety of about one hundred and ninety eight externally funded projects from different Government and non-Government organizations like European Commission; Indo-French Centre for the Promotion of Advanced Research; United Nations Development Programme; Intel, USA; IBM, USA; The Nature Conservancy, USA; CEFIPRA; Indo-French Centre for Applied Mathematics; Dept. of Atomic Energy; Ministry of Defence; Ministry of Commerce and Industry; ISRO-Chandrayaan; Ministry of Tourism; Quality Council of India; Ministry of HRD; Ministry of Higher Education, Scientific Research of The Republic of Tunisia; Ministry of Finance; Airport Authority of India; Directorate General of Commercial Intelligence and Statistics; BARC, DAE, India; Reserve Bank of India; National Highways Authority of India; Ministry of Statistics & Programme Implementation; Science and Engineering Research Board; Directorate of Economics and Statistics, Raipur, Chhattisgarh; NSSO (FOD); NSSTA; Ministry of Tribal Affairs; Department of Food Processing, Industries and Horticulture, Government of West Bengal; Bhabha Atomic Research Centre; Finance Department (Revenue), Government of West Bengal; IWWAGE, IFMR; Ordnance Factory Board, Ministry of Defence; ITPAR-IV, Government of India; Asiatic Society; NADP, Nagpur; Department of Science and Technology; Metro Railway, Kolkata; Indian Council of Agricultural Research; Indian National Science Academy, New Delhi; Space Applications Centre, Department of Space; Cognitive Science Research Initiative; DBT, Government of West Bengal; Dept. of Science & Technology, Government of West Bengal; Department of Food Processing Industries and Horticulture, Government of West Bengal; Tata Auto Comp. Systems, Pune; Philips Carbon Black, Baroda; NTPC, Noida; HP, Bangaluru; National Institute of Biomedical Genomics; Tata Institute of Social Science; Tata Aeronautics Limited, Nagpur; Adani Power; Jacobs Foundation; R S Software (India) Limited; Keysigh Technologies; Samsung Electronics, Korea; NetApp Inc. USA; Cisco Systems Inc; Environment for Development (EfD) Initiative; Tata Consultancy Services; UltraTech Cement, Tata Steel, Jamshedpur; Dalmia Cement (Bharat) Limited, Refractory Unit, Rajgagpur, Sundergarh, Odisha; Biocon Ltd, Bangalore; Mother Dairy Fruits & Vegetables, Delhi; Caterpillar India; Hewlett Packard PPS India Pvt Ltd.; Syngene International; Quest Global; Ernst & Young; JSW Steel; Eaton, Pune; Man Truck, Pune; Mahindra CIE, Pune; Asian Paints, Mumbai; etc.

13. Seminars, Workshops, Conferences, Symposiums etc. organized

During the year, the Institute organized several seminars, workshops, conferences, symposiums with the participation of leading academicians/scientists from India and abroad. A few of them are highlighted below:

- International Conference on "*Exploring the Horizons of Library and Information Sciences: From Libraries to Knowledge Hubs*": Documentation Research and Training Centre, Bangalore, August 07-09, 2018.

- International Conferences on "*Complex Dynamical Networks*": Physics and Applied Mathematics Unit, Kolkata, October 04–05, 2018.

- International Conference on "*Countries in Socioeconomic Transition: Evidences from Axiology and Allied Disciplines*": Biological Anthropology Unit, Kolkata, November 21-24, 2018.

- International Library Conference on "*Future of Libraries*": Library, Documentation and Information Sciences Division, in collaboration with IIM, Bangalore, held at Bangalore, January 26-28, 2019.

- International Conference on "*India Biodiversity Meet – 2019*": Agricultural and Ecological Research Unit, Kolkata, February 14-16, 2019

- 4th International Workshop on "*Pattern Analysis and Applications*": Computer Vision and Pattern Recognition Unit, Kolkata, February 26-28, 2019.

- National Workshop on "*Mathematical and Statistical Software*": Sampling and Official Statistics Unit, Kolkata, in collaboration with Department of Mathematics, held at Sikkim Government College, September 22-28, 2018.

- National Workshop on "*Statistical Design of Experiments*": Applied Statistics Unit, Chennai, held at BCMC College, Kottayam, December 06-08, 2018.

- National Workshop on "*New Trends on SQC, Reliability with R-Programming*": Statistical Quality Control and Operations Research Unit, Coimbatore, Acharya Nagarjuna University, Vijayawada, February 01, 2019.

- Training Programme on "*Depositional sedimentary environment and sequence stratigraphy*" (for ONGC & GSI Officers): Geological Studies Unit, Kolkata, held at GSI Training Institute, Kuju, Jharkhand, April 27-29 and December 09-10, 2018.

- Workshop on "*Summer school for Women in Mathematics and Statistics*": Theoretical Statistics and Mathematics Unit, Bangalore, held at ICTS Campus, Bangalore, May 07-18, 2018.

- Summer Internship on "*Cryptology*": Cryptology and Security Research Unit, Kolkata, May14-July 06, 2018.

- 40th Conference on "*Stochastic Processes and their Applications – SPA 2018*", Theoretical Statistics and Mathematics Unit, Delhi, held at Gothenburg, Sweden, June 11–15, 2018.

- 14th Annual Conference on "*Economic Growth and Development*": Economics and Planning Unit, Delhi, December 19-21, 2018.

- Training Programme on "*Statistical Techniques for Business Forecasting*": Statistical Quality Control and Operations Research Unit, Mumbai, January 21-23, 2019.

- Workshop on "*Programme on Environmental Data Interpretation, Compilation and Reporting*": Statistical Quality Control and Operations Research Unit, Delhi, in collaboration with Central Pollution Control Board, Government of India, February 04-06, 2019.

- Training Programme on "*Recent Developments in International Statistical Systems*" Batch II (Overseas Learning Component, for ISS Officers): Sampling and Official Statistics Unit, Kolkata, held at Statistics Netherlands, Hague, March 17-23, 2019.

- Workshop on "*Advanced Tools and Techniques for Analysis of Demographic and Health Statistics and Application of Computer Software*": Population Studies Unit, Kolkata, March 18-20, 2019.

- Annual Workshop on "*Machine Intelligence and Application*": Machine Intelligence Unit, Kolkata, March 29, 2019.

14. Publication of the Institute

The internationally renowned journal *Sankhyā,* an official publication of the Indian Statistical Institute, was founded by Professor P.C. Mahalanobis in 1932 and began publication under his editorship. This quarterly journal, with ISSN 0976-8378, it is devoted to original research articles in Probability, Mathematical Statistics and Applied Statistics. Reviews and discussion articles on current research activity in the above areas are also published. A rigorous peer review process is followed for acceptance of articles submitted for publication in *Sankhyā*. Many seminal articles in Probability, Theoretical Statistics and Applied Statistics have appeared in *Sankhyā*. The journal is published in two separate series – Series A and Series B. Series A with two issues per year, one in February and the other in August, covers Probability and Theoretical Statistics, while Series B with two issues per year, one in May and the other in November, covers Applied and Interdisciplinary Statistics. Beginning 2010, the Institute has been collaborating with Springer for printing and marketing the international edition of *Sankhyā,* in both prints and electronic editions. The editorial system is now completely electronic, that is, the entire process starting from submission of articles to editorial processing ending in final editorial decision for articles is now done online. The free access to the articles of every editions of Sankhyā is available through the Sankhyā website (sankhya.isical.ac.in).

15. Scientific Papers and Publications

During the year, about 584 scientific papers were published in different journals of national and international repute.

16. Scientific Assignments Abroad

Ninety-three Scientists of the Institute visited a number of foreign countries either on invitation or under cultural exchange programme for attending international seminars and conferences. Most of them presented scientific papers and delivered lectures in those seminars and conferences. Countries visited by ISI faculty members were Austria, Bangladesh, Belgium, Brazil, Canada, Colombo, China, Czech Republic, Europe, Egypt, France, Germany, Greece, Hong Kong, Hungary, Israel, Italy, Japan, Laos, Leiden, Malaysia,

Mexico, The Netherlands, Nigeria, Norway, Nepal, Poland, Rome, Republic of Korea, Sri Lanka, South Korea, South Africa, South Wales, Spain, Sweden, Switzerland, Singapore, Thailand, Taiwan, Ukraine, UK, USA, Vietnam and a few others.

17. Visiting Scientists

Two hundred and thirty six scientists from, Australia, Bangladesh, Canada, China, France, Germany, Hungary, Iceland, Iran, Israel, Italy, Japan, Malaysia, Namibia, Netherlands, Paris, Philadelphia, Russia, Saudi Arab, Spain, Switzerland, Singapore, South Africa, Slovakia, Taiwan, Thailand, USA, UK and India visited the Institute to attend various Workshops, Conferences, Seminars etc. and also to participate in collaborative research, teaching and other scientific activities of the Institute.

18. Recognition to ISI Scientists

In appreciation and recognition to the high standard of research and scientific excellence maintained by the researchers of the Institute, several faculty members received laurels in the forms of Awards, Fellowships from Government of India and organizations/bodies/ universities of national and international repute like IEEE, INSA, DST, INFOSYS Prize, ICTP etc. Several faculty members served as Visiting Scientist, Honorary Professor, Visiting Professors in various universities in US and Europe; Indian Council of Social Sciences Research (ICSSR); Indian National Science Academy etc. Besides, many faculty members were invited by national and international Institute/bodies to act as chairman, members, chief editors, editors in committees/editorial boards etc. Among those, some of the most notable recognitions earned by the faculty members during the year 2018-2019 are indicated below: -

➢ N. Gupta has been Awarded Swarnajayanti Fellowship Award in Mathematics, 2014-15 to 2019-20.

➢ P. Roy has been awarded Swarnajayanti Fellowship Award in Mathematics, 2017-18 to 2022-23;

➢ A. Bose has been awarded J C Bose National Fellowship Award, 2014-2018 & 2019-2023.

➢ D. Goswami has been awarded J C Bose National Fellowship Award, 2016-2021.

➢ S. Mitra has been selected as Chair Professor of Indian National Academy Of Engineering, 2018-2020.

➢ S.K. Pal has been selected as Distinguished Professor Chair of Indian National Science Academy, 2018.

➢ P. Maji has been elected Fellow, National Science Academy, India, 2018.

➢ S. Mitra has been elected Fellow, Indian National Science Academy, 2018.

➢ T.S.S.R.K. Rao has been elected Fellow, National Academy of Sciences, India, 2018.

➢ S. Datta has been selected for Ramanujan fellowship, 2016-2021.

- N. Sikdar has been selected Ramalingaswami fellowship, 2018-2020.

- E. Somanathan has been selected as senior visiting fellow (Honorary), Centre For Policy Research Delhi , 2018.

- N.S. Dash has been selected as visiting fellow- British Academy & visiting researcher fellow, School of Psychology & Clinical Language Sciences, Centre for Literacy & Multilingualism, University of Reading, UK , 2018.

- A. Ghosh has been awarded MS New Researcher Travel Award by Institute of Mathematical Statistics, 2018 and also awarded IBS Travel Award by International Biometric Society, 2018.

- A. Ghosh has been awarded IEEE-GRSS Regional Leader Award by Institute of Electrical and Electronics Engineers, 2019.

- A. Sen has been awarded TWAS Siwei Cheng Prize in Economic Sciences by The World Academy of Sciences, awarded in 2018.

- A. K. Dutta has been awarded The first "Professor Satish C. Bhatnagar Award" of the Indian Mathematical Society for the best publication in History of Mathematics and also awarded as INSA Teachers Award of the Indian National Science Academy, 2018.

- D.D. Roy has been awarded DTNBWE&D Award for research on Workers Education, Ministry of Labour& Employment, Government of India, 2018.

- F. Afridi has been awarded IWWAGE-IFMR Sub-Award for conducting research on Identifying and Alleviating Constraints to Women's Economic Empowerment, Bill Melinda Gates Foundation 2018-2020.

- M. Kapoor has been awarded UNICEF Award for Proposal for engagement of Indian Statistical Institute to support in analysis of data, modeling, data visualization, writing manuscripts and policy papers, Comprehensive National Nutrition Survey.

- S. Bandyopadhyay has been awarded 2018 TWAS Prize in Engineering Sciences, Plaque and Cash Award at the 28th General Meeting by The World Academy of Sciences, 2018.

- T. Kabiraj has been awarded Emerald Outstanding Paper Award, 2018, 19th Asia-Pacific Conference, Singapore

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