MEETING REPORT

Science, technology and innovation policy research*

A three-day Workshop on Science, Technology and Innovation Policy Research (WSTIPR-2017) was organized to provide science, technology and innovation (STI) policy researchers and young scholars with a deeper understanding of STI policy drafting, implementation mechanisms and their subsequent socio-economic impacts in India. The workshop was targeted at policy researchers and practitioners at doctoral and postdoctoral levels and professionals in government agencies as well as think-tanks working in the area of STI policy research. Various theoretical and analytical components, data visualization tools and methodologies as well as diverse frameworks of STI policy research were introduced through a series of lectures, invited talks and panel discussions. The workshop also offered a multidisciplinary platform for active interactions, poster presentations and group discussions by participants on a wide range of STI-related topics. It was attended by 30 participants representing various institutions in India. Furthermore, there was a delegation of 18 invited speakers, who were experts in diverse areas of STI policy. The workshop was divided into three major tracks – Track I: Lecture series on science for policy and policy for science; Track II: The science of science policy – tools and methodology and Track III consisted of group events such as a panel discussion on STI for socio-economic development and an interactive session with T. Ramasami (formerly DST, New Delhi) on the roadmap and future directions of India's STI policy.

In the inaugural session T. A. Abinandanan (DST Centre for Policy Research, IISc, Bengaluru) welcomed the participants and briefed them about the format and scope of the Workshop. Pranav N. Desai (The Centre for Studies in Science

Policy, Jawaharlal Nehru University, New Delhi) delivered the introductory lecture on 'The science of science policy'; wherein he explained in detail about the purpose and historical aspects of science policy studies. He also gave an overview of STI system and the policy-making process in India; the key trends impacting the STI systems and some details about the merits of India's collaborations with other countries with respect to various STI actors along with some recent developments regarding STI policy.

The Workshop included three 'Science for policy and policy for science' invited talks on STI and health, STI and agriculture, and STI and entrepreneurship. Samir K. Brahmachari (formerly with CSIR, New Delhi) spoke on 'Science, Technology Innovation and Health', where he described about the developments in the Indian science and technology system over time. Moreover, he cited five case studies, each explaining the various roles played by the Indian STI policies for the improvement of the health sector in India.

In her talk on 'STI and agriculture', Rajeshwari Raina (Shiv Nadar University) explained that science policy analytical framework followed by the agriculture sector is based on the demarcation model. M. H. Bala Subrahmanya (Department of Management Studies, IISc, Bengaluru) gave a talk on 'Technological innovation: concept, theories, empirical findings and policy issues'. He explained in brief about globalization and competitiveness. He also elaborated on the role and importance of technological innovation, determinants of technological innovation as well as theories of innovation.

The workshop also included six 'Science of science policy' lectures, namely (i) Scientometrics, (ii) STI indicators, (iii) Data analytics and visualization, (iv) Econometrics and innovation economics, (v) Intellectual property rights (IPR), and (vi) Qualitative studies of science.

Subbiah Arunachalam (DST-CPR, IISc, Bengaluru) explained the theoretical concepts of scientometrics, viz. historical aspects of scientometrics, science

indicators, their measurement and current status of India among other nations. This was followed by a practical explanation of the functioning of various bibliometric tools and databases like the Web of Science as well as Journal Citation Reports, by Madhan Muthu (DST-CPR, IISc).

Sujit Bhattacharya (Academy of Scientific Research and Innovation and CSIR-National Institute of Science, Technology and Development Studies) gave a talk on 'STI indicators: challenges and opportunities'. He highlighted the significance of locally relevant STI indicators for policy-making in India, and explained the challenges involved in capturing them through national R&D and innovation surveys.

Kathirmani Sukumar (Gramener Technologies, Bengaluru) conducted a session on 'Data analysis and visualization tools'. Through some real dataset examples, he introduced and demonstrated various data analysis tools, and explained how to handle large and complex datasets; and how effective visualization of datasets will be useful in the evidence-driven policy-making process.

Sourabh Paul (IIT Delhi) gave a talk on 'Econometrics and innovation economics'. He explained the basics of innovation economics, dynamics of knowledge transfer and its applications to science, technology and innovation. He also introduced various econometric indicators, methods of statistical inference and models for data analysis to the participants.

T. C. James (National Intellectual Property Organization, India and RIS, New Delhi) gave a talk on 'Intellectual property rights: Indian landscape, challenges and opportunities – an innovation perspective'. He gave a broad idea about the IP landscape in India after the 1990s era of globalization and briefed about the National IPR policy (NIPR) 2016 and its implementation, various statistics of the trends in the patents, designs and trademarks applications and grants in India.

Sundar Sarukkai (NIAS, Bengaluru) in his talk on 'Qualitative methods of science studies', explained about the characteristics of science which can be measured, viz. the quality and impact of

research in the form of publications, patents, citations of research as well as impact on local societies and students. He also highlighted the importance of qualitative methods in understanding the macro processes in science practice as well as in the social composition of science.

The workshop also included an interesting panel discussion as a public event, on 'Science, technology, innovation and its impacts and socio-economic development'. Late Baldev Raj (NIAS) delivered the opening keynote on 'Science, technology and education policies' and introduced the topic of the panel by explaining the importance of interplay between STI and socio-economic development. The panel discussion was moderated by Sundar Sarukkai. The panellists, Pranav N. Desai, Smita Srinivas (Indian Council for Research on International Economic Relations), Gayatri Saberwal (Institute of Bioinformatics and Applied Biotechnology, Bengaluru) and Satya Prakash Dash (Impact Lab, PATH India) actively participated in the event. Desai discussed the interplay between technology and development in the Indian context and emphasized on the existing

mismatch. Srinivas pointed out few significant nuances in evaluating STI and development priorities, and India's position in an international comparison. Saberwal took a specific case of biomedical innovation, affordability and policy research. Dash discussed regulating innovation and future challenges with an emphasis on healthcare-related products. The event ended with an open discussion among the panellists, with some questions from the workshop participants and the general audience.

The final day of the workshop witnessed a 3-hour long captivating interaction with T. Ramasami on 'The roadmap for India's science, technology and innovation policy'. It was fully based on India's STI Policy 2013 and Ramasami's working manuscript on laying a roadmap for the country's future STI policy. He made a brief presentation on the evolutionary landscape, outcomes and impacts of science policies implemented in the country so far, an analysis of India's position in the global STI landscape as well as recommendations for future STI policy. This presentation was followed by a 2-hour long brainstorming interaction with participants on several key

issues in the context, such as public engagement strategy in STI policy-making process, outcome analysis of policy, and the need and availability of data for evidence-based policy framing among others.

This workshop was a first-of-its-kind exercise in India as the focus was narrowed down to the research aspects of science, technology and innovation policy. The participants were also a unique set of professionals working on various STI policy-related research problems. The presentations were relevant and the discussion sessions were interactive. Overall, the workshop was both a knowledge dissemination as well as a knowledge creation experiment.

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Connecting researchers for transformation in research culture*

Mountain ecosystems are globally important as centres of biological diversity and they are receiving increasing priority on global conservation agenda[1]. The Himalaya is recognized as one of the global biodiversity hotspots in view of its rich, unique biodiversity and vulnerability to perturbations. The goods and services emanating from this ecosystem are vitally important for ecological and economic security of a major part of the Indian subcontinent. Despite its global importance, the Himalaya is considered

as a data-deficient region[2]. Recognizing the significance of the Himalaya as an important biological hotspot, the Ministry of Environment, Forest and Climate Change (MoEF&CC), Government of India (GoI) launched the National Mission on Himalayan Studies (NMHS) as a Central Sector (CS) Grant-in-Aid Scheme in late 2015, with a vision to support the sustenance and enhancement of the ecological, natural, cultural and socio-economic capital assets and values of the Indian Himalayan Region (IHR). The mission currently supports innovative studies and relevant knowledge intervention to find scientifically sound solutions and best practices for conservation of the Himalayan ecosystem. In view of the ongoing difficulties in terms of remoteness, undulated terrain, lack of resources and infrastructure, research in the IHR has been advertently affected.

Subsequently, there is a need to support research programmes in IHR as continuous decline in the number of young researchers, quality research, resource personnel and mentors has been observed in recent years. In this regard, the NMHS has initiated the Himalayan Researchers Fellowship programme across 12 states of the IHR.

As part of the NMHS Researchers Fellowship programme, a two-day Himalayan Researchers Consortium (HRC) was organized with an aim to (i) provide a platform for Himalayan researchers to present and discuss their research findings for peer evaluation, (ii) interact and gain knowledge/guidance from subject experts/mentors, and (iii) enhance their capacity to influence the scientific fraternity. Eminent lectures by subject experts for promoting biodiversity-based research in the mountains, one-to-one