CURRICULUM VITAE OF BRIJESH KUMAR BANSAL

Prof. B.K. Bansal served as the Director of the National Centre for Seismology and as an Adviser to the Ministry of Earth Sciences, Government of India, for more than a decade. After retirement from active government service, he joined IIT Delhi as a Visiting Professor in August 2021, with a two-year tenure. Prof. Bansal specializes in seismology and has over 35 years of experience as a proactive researcher and science planner. Under his dynamic leadership and guidance, the science of seismology has witnessed major growth, including the transition from analog to digital real-time monitoring and induction of interdisciplinary programs for high-resolution imaging of crustal structures and dynamics. Imprints of his vision are visible in providing balanced thrust to earthquake forecasting/warning programs and quantitative assessment of earthquake hazard. His research accomplishments in the field of seismic hazard assessment have paved the way for technology-based microzonation studies all over the country. To meet the pace and adopt modern technologies, Prof. Bansal has emphasized and implemented programs for trained human resource development.

Career Profile: With a master's degree in Applied Geophysics, Prof. Bansal obtained initial research exposure, first at the Department of Earthquake Engineering, Indian Institute of Technology, Roorkee, and later at Nuclear Power Corporation, Mumbai, in observational seismology, seismic risk assessment and design of earthquake resistant structures. This initial training in applied seismology served as a solid foundation for fulfilling his bigger responsibilities at the Earth Science Division of the Department of Science and Technology (DST), Government of India, where he joined in 1998. Climbing the cadre structure, when an independent Ministry of Earth Sciences (MoES) was carved out in 2007, Prof. Bansal moved to MoES and took up larger responsibilities as Adviser and Head of the Seismology and Geosciences.

Professional Expertise: Akin to other meteorological-hydrological-tectonic natural hazards, earthquakes are also extreme events causing severe loss of life and property. In line with the socio-economic impact, the research plans seek a balance between basic science and societal needs. In the first category, programs aim to improve our understanding of the physical processes causing earthquakes and factors determining their severity in terms of damage potential in different geotectonic settings. Societal-based programs were targeted at realistic earthquake hazard assessment relying on the characterization of source, media, and site response, which collectively determine the damage scenario in-depth risk analysis and suggest technology-based mitigation measures.

Academic Pursuits: Prof. Bansal's research pursuits primarily come under the category, of "Earthquake Hazard Assessment". His Ph.D. thesis, "Seismic hazard studies in Northeast India", was based on comprehensive investigations and review. With continuous up-gradation in the seismological network, the detection threshold of lowest magnitude earthquakes has significantly come down, leading to an improved understanding of the spatio-temporal distribution of earthquakes. Taking advantage of these developments, Prof. Bansal took another vital initiative to formulate programs on Active Fault Mapping and Microzonation studies. Such studies have been completed for over a dozen urban cities, and a major program to microzone major cities in India is in progress. By combining the time evolution of seismicity, rate of convergence, and tectonics, his work has led to the hypothesis of the seismic resurgence in the Kishtwar-Chamba region following the prolonged quiescence after the 1905 Kangra "great" earthquake. The review on triggered earthquakes in the ambit of the Koyna-Warna region, which appeared in "Earth Science Reviews", reflects his broader vision towards geosciences. The Holistic SeismotectonicModel for the Delhi region, published by Nature Scientific Reports, is another recent landmark work in his credit.

Leads as Science Planner: DST and MoES, like the National Science Foundation, USA, are primary agencies of the Government of India to promote and implement research in challenging areas of sciences. Prof. Bansal has been associated for more than 20 years with these august bodies. As a promoter of science in the field of seismology, his job responsibilities included identifying knowledge gaps, developing science

plans in such areas, identifying key science players, formulating experiments, mobilizing resources to create the necessary infrastructure, implementing and monitoring the research progress and quick dissemination and publications of emerging research. Accomplishments of the research initiatives have transformed the phase of earthquake science in the national context and have given higher visibility at the International level. Some of the milestone achievements of Prof. Bansal, where he had played a significant role in the growth of the science of seismology in India, are summarized below:

- **All India Co-ordinated Programme on Seismicity and Seismotectonics (Himalaya & Shield components):** Enhanced seismic monitoring and multi-disciplinary imaging programs undertaken in the Himalaya and elsewhere in the Indian Shield region have led to new insights on the role of fluid dynamics on seismogenesis in the inter-plate collision boundary zones whereas, in the stable intra-plate areas, underplated magmatic region form the repository of the strain transmitted back from the Himalayan collision zone.

- **Mission Mode Programme on Real Time Seismology:** Strengthening the National Seismological Network and introduction of VSAT-inter-linked digital broadband seismograph stations has reduced the detection threshold of low-magnitude earthquakes. This real-time monitoring has also facilitated first-time studies on nucleation, seismic swarms, and clustering, which are markers for the reactivation of faults under accumulating strains.

- **GPS-based Geodetic Studies in India:** The introduction of GPS measurements across the Himalaya has provided quantitative estimates of strain accumulation due to ongoing convergence. GPS-constrained strain budget has given estimates of the return period of great and major earthquakes, explaining the resurgence of seismic activity in the sections of the Himalaya, following long quiescence after great earthquakes.

- **National Programme of Earthquake Precursors (NPEP):** Random and selective appearances of various precursory signals, including seismic, geophysical/ geochemical/hydrological, prevent efficient applications of precursors in routine forecasts. An important lead in earthquake prediction is the establishment of Multi-Parameter Geophysical Observatories in the Himalaya, marking a path-breaking mode to study earthquake precursors in an integrated manner.

- **Scientific Ocean Drilling in the Indian Ocean through the International Ocean Discovery Program (IODP):** Compared to the exhaustive deep-sea drilling data available for the oceans worldwide, the Arabian Sea-Bay of Bengal sectors are marked by very few deep-sea drilling operations. The lack of critical basement data has been a major constraint in our endeavours to unravel the history of the geological evolution of our ocean basins. Further, due to the lack of substantial deep core records from these areas, it has not been possible to decipher the linkages between the Himalayan orogeny and the Indian monsoon, as has been postulated by several hypotheses. A dedicated program was launched through the National Centre for Polar and Ocean Research to recover long marine sediment records by drilling more than 1.5 km deep hole below the sea floor in the eastern Arabian Sea utilizing the services of the unique drilling vessel "JOIDES RESOLUTION" of NSF, USA to understand the possible link between Himalayan mountain building and large scale monsoon variability.

- **Scientific Deep Drilling in the Koyna Intra-Plate Seismic Zone of Maharashtra:** The localized zone between the Koyna and Warna artificial water reservoirs is an outstanding example of Reservoir Triggered Seismicity (RTS). The region has not only witnessed the largest ever reservoir-triggered earthquake (M 6.3) soon after the impoundment of the Sivaji Sagar reservoir but also hosts recurrent seismic activity continuing for the last five decades. To resolve the mechanism of prolonged reservoir-triggered seismicity, an innovative program of scientific deep drilling investigations in Koyna was launched for mapping source fault(s) as well as studying pre-seismic,

co-seismic, and post-seismic changes in in-situ physical properties, pore-fluid pressure, hydrological parameters, etc. in the near-field of earthquakes. On behalf of the Ministry of Earth Sciences, Prof. Bansal has played a catalytic role in facilitating this program and bringing it to fruition.

- **National Facility for Geochronology:** To generate high-quality geo-chronological data and its characterization, dating of geologically youngest and old formations/rocks/sediments in the Earth's history to provide improved and quantitative understanding of the evolution of the Indian lithosphere, as well as help in contemporary cutting-edge research in atmospheric, oceanic and planetary sciences at the international level, Prof. Bansal initiated a major project to set up a Facility for Geochronology in the country.

International Cooperation: Prof. Bansal has served and continues to play a key role in International committees. He has fruitfully exploited his proactive interactions with Taiwan in launching a dream project on "Earthquake Early Warning", which has placed India on par with a select few countries where such programs are in the testing phase. Also, a new initiative to develop a cooperation program with Norway in the field of Geohazards was firmed up and launched. Similarly, he has taken the lead in developing joint programs of mutual interest with China in the field of Earthquake Science and Earthquake Engineering.

Imprints: Prof. Bansal's research accomplishments and leadership skills are distinctly seen in the growth of the science of seismology in India. One of his exemplary achievements is the creation of the **National Centre for Seismology**, a long-standing requirement of the country. The Centre is an independent body under the Ministry of Earth Sciences to nurture and promote the science of Seismology. To meet the task of Human Resource Development, Prof. Bansal has established interlinkages between students/teachers in remote colleges and researchers at national universities/institutions. Prof. Bansal's long field experience, coupled with skills to develop and interlink human resources, could be usefully exploited in planning and executing science missions for the societal benefit of the country.

Honours: 1) Recipient of Hari Narain Award 2019 in recognition of Lifetime contributions in the field of Geophysics, 2) Fellow Indian Geophysical Union, 3) Recipient of Platinum Jubilee Lecture Award, Indian Science Congress (2016) and 4) Center for Excellence in Disaster Management and Mitigation, Indian Institute of Technology, Roorkee honoured him for his outstanding contributions in the field of Seismology and Earthquake Engineering.

Membership of Academies and Professional Committees: He is a member/Fellow of academic societies such as AEG, ISET, and GSI and serves on the Governing Board / Governing Council of various national and international bodies.

Research Publications: In addition to several government publications (Monographs, Books, Manual, etc.)**,** Prof. Bansal has more than 80 SCI publications to his credit (**Annexure**)
(https://scholar.google.com/citations?hl=en-US&user=nfGGlloAAAAJ),
(https://www.researchgate.net/profile/Brijesh-K-Bansal/research)

Deputation Abroad and International Academia Participation: Prof. Bansal has attended many important international conferences related to his field of specialization in addition to various scientific meetings and Government assignments abroad.

Annexure

LIST OF SCIENTIFIC PUBLICATION OF PROF. B.K. BANSAL

(a) Research papers published

1. Mohamed Asanulla, R., Radhakrishna, T., **Bansal, B.K**., and Ramakrishna, Ch. (2024). Mineral Magnetism in Relation to Thermal Thellier Palaeointensity Experimental Results of the Deccan Basalt Flows Along the Deep Drill Hole in Western India and Their Significance, Pure and Applied Geophysics, DOI: 10.1007/s00024-024-03538-5

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Morphometric Analysis. Journal of the Geological Society of India. 97. 451-456. 10.1007/s12594-021-1711-5.

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(d) Other publications/reports

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