

Academic and Research Experience and Excellence: Prof. Dr. Nirmal Kumar J. I.

I. Academic Experience and Excellence:

i. Advancing Higher Education through Teaching and Scholarly Excellence: Dr. Nirmal Kumar J. I. obtained Ph.D. degree from Department of Biosciences, Sardar Patel University, Gujarat, in 1990, served in P.G. Department of Botany, Jai Hind College as a Lecturer (1991-1996) and contributed as field supervisor in the “Conservation of Biodiversity Inventory Network Program on the Western Ghats” at the **Centre for Ecological Sciences, Indian Institute of Sciences**, Bangalore (1994 and 1996) and complemented 31 years of teaching experience at undergraduate, postgraduate, and doctoral levels at different capacities like Lecturer, Senior lecturer, Head (N.V. Patel Science College Vallabh Vidyanagar, Anand 1996-2005), Reader, Head, Professor in P.G. Department of Environmental Science and Technology, Principal, Institute of Science and Technology for Advanced Studies and Research (ISTAR) (my personal profile <http://nirmalkumarji.in/>). He was the first approved Ph.D. guide in Environmental Science in Gujarat (2002) and pioneered in developing and starting of the B.Sc. Environmental Science program (1997) at NVPAS College and M.Sc. Environmental Science program (1999) at ISTAR, under Sardar Patel University.

Leadership and Recognition : During his tenure as a **Principal of ISTAR** (2017 to 2021), institution has achieved many milestones, landmarks at State and National level. Few are : ISTAR achieved Top 1st Rank College among all colleges (2021), Top 1st Rank college among Engineering and Technology institutes (2020) and Top 3rd rank college among all colleges (2019) in Gujarat, GSIRF ranking, Govt. of Gujarat. Moreover, ISTAR ranked between 101 to 150 and 151 to 200 rank among all colleges in India during 2020 and 2021, respectively, in NIRF ranking, New Delhi at National level, where only three colleges from the Gujarat listed below the 200 rank. Beyond institutional rankings, he has consistently fostered holistic student development by conducting curricular, co-curricular, extracurricular, and placement activities, ensuring that students were equipped with academic knowledge, practical skills, and career readiness. Moreover, worked, as Coordinator for Research and Consultancy (III criteria of NAAC), ISTAR achieved an “A” grade from 2014–2019

Prof. Dr. Nirmal Kumar J. I. has been the recipient of more than 60 research and academic honors, awards, and certificates of appreciation. Notable recognitions include: **Hari Om Ashram Award (1997)** with cash prize, **Dr. C.K. Shah Award (2008, 2011)** with cash prize, **Award of Exemplary Performance (2007)** with cash prize, **Fellowship, National Environmental Association (2009), Membership, American Chemical Society, USA (2012)**, Biography published in *Who's Who in the World*, USA (2009), **Bharat Shikshak Ratan Award (2011)**, **Associate Fellowship, Gujarat Science Academy (2011)**, **Certificate of Contribution Award (2018, 2019, 2020, 2023)** by Gujarat Cleaner Production Centre (GCPC), Gandhinagar, jointly with the Ministry of Environment, Forest and Climate Change, for interlinking industry, academia, and government. **Appreciation Award (2022)** for Green Audit Cell by Gujarat Cleaner Production Centre (GCPC), **Best P.G. Teacher Award (2022)** by Gujarat Science Academy, Ahmedabad, **International Iconic Award (2023)**, **Star Education Award (2023)** by the Education Department, Government of Maharashtra, **Eminent Scientist Award for the year 2024** in International Conference at Banaras Hindu university, Banaras by the National Environmental Science Academy (NESA), New Delhi.

ii. International Collaborations (MoUs) for the Academic and scientific collaborations for the benefits of M.Sc and Ph.D students : He has developed international academic and research collaborations with Dr. Nobuyoshi Yamashita, Chair, National Institute of Advanced Industrial Science and Technology (AIST), Tsukuba, Japan enabling doctoral students to pursue advanced

research on emerging pollutants in AIST, Japan. He has also initiated academic faculty and student exchange programs and project works with Prof. Daniel Oerther (Missouri University of Science and Technology, USA, 2013) and the University of Cincinnati, USA (2008). These collaborations have strengthened global academic partnerships, facilitated cross-border knowledge sharing, and provided students with opportunities to engage in cutting-edge environmental research and their academics. By integrating international expertise, these initiatives have advanced both scientific innovation and sustainable development practices.

In pursuit of advancing knowledge and fostering global dialogue on environmental sustainability, Dr. Nirmal engaged in academic visits and discussions with distinguished scholars and experts across the United States and Japan. Prof. Kumar has visited Prof. Dr. Dibyendu Sarkar, University of Texas, San Antonio, USA, Prof. Carol Rice, North Carolina A&T State University at Greensboro, Dr. Prasada Rao USEPA Raleigh-Durham, NC, Dr. Susan Genning, Department of Sustainable Development, Massachusetts University, Dartmouth, Boston, Prof. Smith David, Acme, University of Michigan, Michigan, USA, Dr. Nobuyoshi Yamashita, Chief Chair, National Institute of Advanced Industrial Science Technology, Dr. Xinhong Wang Ibaraki, Agriculture University, Tokyo, Japan to discuss on advances, crosscutting facets on Environmental Sustainability <https://www.nirmalkumarji.in/International.html> , <http://www.nirmalkumarji.in/MoU.html> . These engagements focused on pollution mitigation, climate resilience, sustainable resource management, and innovative approaches to conservation. The collaborative discussions enriched his research perspectives and strengthened international networks for advancing sustainability science.

iii. National Collaborations - MoUs done for the Academic and scientific collaborations for the benefits of M.Sc and Ph.D students with Shri. Bhabubhai Patel, Chairman, Nandesari Industrial Association, Green Group of Industries, Baroda, Gujarat Institute of Desert Ecology (GUIDE), Gujarat Ecological Commission (GEC), Climate Change Department (Gandhinagar), Foundation for Ecological Security (FES), and Voluntary Nature Club (VNC) for academic, placement, research and training for P.G and Ph.D students. Prof. Nirmal unwavering commitment to academic excellence and institutional growth has left a lasting impact on higher education in Gujarat and beyond fostering innovation, sustainability, and community engagement. These collaborations have facilitated academic enrichment, research advancement, training programs, and placement opportunities for his postgraduate and doctoral students. By bridging academia, industry, and government agencies, these partnerships have strengthened applied research, enhanced student career readiness, and promoted sustainable practices across Gujarat.

II. Research Experience and Excellence in Environmental Sustainability: Scientific Contributions to Environmental Research:

Undertaking impactful studies and initiatives to promote sustainable practices, **over the course of 36 years**, Prof. Nirmal major areas are Environmental Science, Technology and Sustainability related to Air pollution, Green House Gas emissions and Global warming, Climate change and mitigation measures, Biodiversity monitoring, Conservation, Restoration and Sustainable Development of Forest ecosystems, Wetlands ecosystems of Gujarat, Maharashtra and Rajasthan, Environmental pollution monitoring & Control technologies by Biodegradation process, Nanomaterials. Outstanding contributions were made in the domains of global warming, climate change mitigation, biodiversity monitoring, conservation, restoration, and sustainable development of forest and wetland ecosystems. Research emphasized environmental pollution control technologies, including bioremediation, biodegradation, and nanotechnology applications at exsitu and insitu studies in Pharma industry, Chemical industry and Dye industry, Nandesari Industrial Area, Baroda. On the above subjects, Prof. Nirmal awarded 19 Ph.D. scholars (Sardar Patel University, Vallabh Vidyanagar,

Anand) (https://www.istar.edu.in/est/doc/2021/PhD_Degree.pdf), guided over 150 M.Sc. dissertations and actively participated and delivered talks in more than 100 in International, National, and state-level seminars, symposium, workshops, and training programs. His scholarly output includes 230 peer-reviewed research papers/ articles at national and international level, 22 books and 15 completed research projects as Principal Investigator including international projects with AIST Japan, MST, USA. He was the first approved Ph.D. guide in Environmental Science in Gujarat (2002)

Prof. Nirmal conducted extensive, advanced, frontiers research in Environmental Science and Technology and Sustainability. Through these sustained efforts mentioned below, his research investigations have not only advanced scientific knowledge but also influenced policy decisions, empowered communities, and inspired students and educators to embrace sustainability as a guiding principle (Please refer publications in CV). He has completed 15 research projects as a Principal Investigator from MoEFCC, MoES, UGC, IISc, GUJCOST, GEC, FES, Climate change Department, Gujarat Forest Department, Gandhinagar including 2 International projects (MoU) from AIST Japan, and Missouri University of Science and Technology, MO, USA, on below subjects:

i. Air pollution, Green House Gas emissions (temperature, light intensity, humidity, rainfall, wind velocity, CO₂, N₂O, CH₃) and Global warming, Climate change and mitigation measures and resilience its impact on human health (across agricultural lands, aquatic ecosystems, industrial sites, and urban and rural environments in Gujarat) since the year 2012 onwards; His research has encompassed the monitoring and health effects of more than 300 emerging pollutants, including perfluoroalkyl substances (PFAS), perfluoroalkyl carboxylic acids, perfluoroalkyl sulfonic acids, Aliphatic and Aromatic compounds : alkanes, alkenes, carboxylic acids, polycyclic aromatic hydrocarbons (PAHs), bisphenols (A, F, S), and polychlorobenzenes. These contaminants were analyzed across diverse matrices such as surface water, wastewater, roadside dust, atmospheric samples, and human hair collected from major cities in Gujarat and capital cities of several Indian states—representing the first comprehensive report of its kind from India and compared with cities of China, Korea, Japan.

Dr. Kumar has also conducted extensive investigations into climate change impacts, focusing on ambient air monitoring, air pollution indices, air pollution tolerance index (APTI), anticipated performance index (API), and greenhouse gas (GHG) emissions. His work has examined GHG concentrations, fluxes, and emissions in relation to meteorological parameters (temperature, light intensity, humidity, rainfall, wind velocity) across agricultural lands, aquatic ecosystems, industrial sites, and urban and rural environments in Gujarat. He has evaluated global warming potential (GWP) and climate change vulnerability in industrial, urban, and rural settings of Anand, Ahmedabad, and Surat, and assessed exposure, sensitivity, and adaptive capacity to extreme events such as the 2021 floods and Cyclone Tauktae in Gujarat. The findings highlight the urgent need for systematic monitoring, pollution control, and climate resilience strategies to safeguard both ecosystems and human health for long.

Emerging Pollutants in India

This study represents the **first comprehensive evaluation from India** of emerging pollutants, including per- and polyfluoroalkyl substances (PFAS), persistent organic pollutants (POPs), and polycyclic aromatic hydrocarbons (PAHs). Concentrations of these contaminants were found to be significantly higher in metropolitan regions such as Delhi, Mumbai, Chennai, and Ahmedabad compared to other Indian cities. Analysis of human hair samples revealed elevated levels of perfluoroalkyl substances, perfluoroalkyl carboxylic acids, and perfluoroalkyl sulfonic acids in non-

vegetarian individuals relative to vegetarians. Age-specific variations indicated maximum accumulation in the 35–50 year group, followed by 20–35 years, <20 years, and >50 years. Geographical differences showed higher pollutant burdens in samples from southern states, followed by eastern, western, and northern regions. Bisphenol compounds were detected at elevated concentrations in the Yamuna River (Delhi), Chooms River (Tamil Nadu), and Mulla-Mathur River (Maharashtra). Bisphenol A was predominant in Indian aquatic systems, whereas Bisphenols F and S were reported at higher levels in comparative studies from Korea, China, and Japan.

Air Pollution and Climate Change

Air Pollution Index (API) and Air Pollution Tolerance Index (APTI) values were consistently higher in capital cities, particularly in industrial zones. Plant species such as *Mangifera indica* (mango), *Ficus benghalensis* (banyan), *Azadirachta indica* (neem), *Delonix regia* (gulmohar), *Tectona grandis* (teak), and *Butea monosperma* (palas) exhibited high tolerance to air pollutants, making them suitable candidates for green belt development in industrial regions. Greenhouse gas (GHG) emissions, concentrations, and global warming potential (GWP) were highest in industrial and urban sites, particularly Ahmedabad, followed by Surat, Vadodara, and Anand. Methane (CH₄) and nitrous oxide (N₂O) levels were elevated in rural and agricultural environments. Extreme climate events during the study period included severe flooding (September 2021) affecting over 1.6 million people across 44 villages in Rajkot, Jamnagar, Porbandar, Valsad, Junagadh, Anand, and Ahmedabad districts, with rainfall exceeding 50 cm in 24 hours. Additionally, Cyclone Tauktae (May 2021) made landfall with wind speeds of 160–170 km/h, causing widespread destruction, flooding, and displacement of over 200,000 individuals.

ii.Environmental pollution monitoring & Control technologies by Nanotechnology applications: Nanomaterials in Pollution remediation: Dr.Nirmal Fabricated and characterized nanoparticles of TiO₂, MnO, FeO, Fe₂O₃, and ZnO, including silver-doped variants with biogenic and biochore , biochar (plant waste) , evaluated for their efficacy in dye decolorization (crystal violet, Sudan blue, acridine orange, Congo red), remediation of nutrients (PO₄³⁻, NO₃⁻, SO₄²⁻), hardness, and heavy metals (Fe, Cr, Ni, Pb) from pharmaceutical, chemical, and textile effluents. Photocatalytic degradation experiments were conducted under UV, artificial, and solar radiation using microcosm studies *ex situ*, investigated since the year 2012 onwards. These studies demonstrate the potential of engineered and doped nanoparticles, combined with sustainable biochar supports, to provide effective, eco-friendly solutions for wastewater treatment and environmental sustainability. Through these sustained efforts, his research has not only advanced scientific understanding but also influenced policy decisions, empowered communities, and inspired students and educators to embrace sustainability as a guiding principle

iii.Environmental pollution monitoring & Control technologies by Biodegradation and bio-remediation process: Isolated and characterized bacterial, fungal, and cyanobacterial strains (identified via molecular markers) capable of degrading highly toxic chemicals including bavistin, 2,4-D, isoproturon, pencycuron, anthracene, pyrene, and petroleum hydrocarbons (petrol, kerosene, diesel) from contaminated soils **in vitro** and **ex situ** conditions.. Efficient strains were developed and applied both individually and in consortia for in vitro and ex situ degradation studies. Post-treatment soils were enriched and successfully used for cultivation of crops such as tomato, fenugreek, wheat, and rice demonstrating the dual benefit of pollution mitigation and agricultural ,carried out since the year 2012 onwards. This work highlights the potential of microbial consortia in addressing persistent organic pollutants and petroleum contamination, while simultaneously restoring soil health for sustainable agriculture.

iv. Monitoring, Conservation, Restoration and Sustainable Development of Forest ecosystems: including semi-evergreen, dry deciduous, and disturbed dry deciduous forests. Field investigations were carried out in Navapur, Ukalapani, Satpuda forests (Maharashtra), Saputara, Waghai, Dharmapur, Purna, Shoolpaneshwar Wildlife Sanctuary, Jambughoda Wildlife Sanctuary (Gujarat), and forests of Bilwara and Udaipur (Rajasthan) carried out since the year 1994 onwards. Biodiversity monitoring, Conservation, Restoration was investigated through community-oriented- involving aboriginal populations, local people, tribal communities, undergraduate, postgraduate, and doctoral students, along with faculty from botany and zoology, collaborated with forest officials to promote awareness and sustainable use of bioresources, ethnobotanical values for medicine and daily routine house hold purposes . Rare, endangered, endemic, vulnerable, and dominant species were documented across landscape elements (LSEs). Conservation through education was delivered by group meetings, workshops, competitions, and incentive-based programs to foster environmental stewardship and developed few Sacred groves in Waghai, Khatana, Dharmapur , Purna forest areas to often dedicated to local gods, spirits, or ancestors, harbor rare and endangered species, repositories for Ayurvedic herbs and other natural remedies) of forest Biodiversity. Few sacred groves were established in 1998 to promote in situ conservation. The integrated approach not only strengthened biodiversity conservation but also empowered local communities and inspired students to become custodians of ecological sustainability. By combining scientific research with community engagement, the initiative exemplifies how collaborative efforts can restore ecosystems while promoting the sustainable development of forest landscapes .

Ethnobotanical surveys documented medicinal preparations employed by local *Vaidyas* for treatment of various ailments. Ethnomedicinal knowledge of local *Vaidyas* was recorded, highlighting the use of wild plant varieties (*Ocimum sanctum* [tulsi], *Azadirachta indica* [neem], *Moringa oleifera* [drumstick], *Curcuma longa* [turmeric], *Butea monosperma* [palas], *Mitragyna parvifolia* [mavdo], *Anthocephalus cadamba* [kadam]) for treatment of arthritis, paralysis, leprosy, bone fractures, asthma, bronchitis, dermatological disorders, and sleep disorders. Patients from Maharashtra, Madhya Pradesh, and Gujarat sought these low-cost indigenous therapies. Community-driven conservation practices included biodiversity monitoring, sustainable resource use, and restoration of degraded forest pockets through multi-species plantations (teak, bamboo, *Terminalia chebula* [hirda], *Terminalia bellirica* [behda], palas.

Research was community-oriented, involving aboriginal populations in participatory biodiversity monitoring and conservation initiatives. Undergraduate, postgraduate, and doctoral students, along with faculty from botany and zoology, collaborated with forest officials to promote awareness and sustainable use of bioresources. *Conservation through education was delivered by group meetings, workshops, competitions, and incentive-based programs to foster environmental stewardship.* This integrated approach not only strengthened biodiversity conservation but also empowered local communities and inspired students to become custodians of ecological sustainability. By combining scientific research with community engagement, the initiative exemplifies how collaborative efforts can restore ecosystems while promoting the sustainable development of forest landscapes (Please refer publications in CV).

v. Wetland and Aquatic Ecosystem Monitoring, Trophodynamics, Anthropogenic pressures: **Prof. Nirmal** investigated trophodynamics and eutrophic status of Nationally and Internationally significant wetlands, analyzed biotic interactions correlated with abiotic nutrient dynamics, Pollution status and anthropogenic pressures in wetlands & their surrounded by multiple villages, in Nalsarovar Bird Sanctuary, Thol Bird Sanctuary, Wadvana Lake (our results contributed to MoEF CC, & Gujarat Forest Department to be designated as International RAMSAR sites- Nalsarovar and Wadvana, Thol wetlands as International Ramsar sites in 2012 and 2021), Pariage Lake, Kaneval Lake, Ratreshwar

Lake, and other wetlands of South-East Asia, major river systems (Narmada, Tapi, Mahi, Sabarmati, Banas, Mahishwo, Karicut canal) and their estuaries, as well as mangrove ecosystems- Wamleshwar, Khambhat, and marine environments-Gulf of Kutch (Okha, Bet Dwarka, Gopnath, Alang) since the year 1987 onwards .**Contributions to the designation of wetlands as International Ramsar Sites, strengthening global recognition of Gujarat's ecological heritage.**Through this long-term research, Prof.Nirmal demonstrated how systematic ecological assessments can guide policy decisions, enhance wetland conservation, and promote sustainable management of aquatic ecosystems and made enduring contributions to environmental sustainability, combining scientific rigor with practical solutions that benefit both ecosystems, society and environment by enlarge.

Wetland Ecology and Restoration

Wetlands were classified into oligotrophic, mesotrophic, eutrophic, and hypereutrophic categories, developed Site-specific management strategies and submitted to MoEFCC and MoES, contributed to designated as Nalsarovar and Thol wetlands, Wadvana wetlands as International Importance **Ramsar sites in 2012 and 2021**, respectively, thereafter . Prioritized **Restoration** efforts and conservation of aquatic biodiversity, fish populations, and avifauna, including endangered *Crocodylus palustris* (mugger crocodile). Invasive *Eichhornia crassipes* (water hyacinth) was eradicated through physical removal, enhancing the diversity of submerged, marshy, and free-floating aquatic plants, fish, and resident bird species. Local communities engaged in controlled livelihood activities such as fishing, aquatic plant collection, boating, and eco-tourism to sustain ecosystem services.

III.Prof. Nirmal Kumar sponsored the Gujarat State Level Award every year : **GSA- Prof. Nirmal Kumar Ph.D. Thesis Citation Award in Lifesciences** — to recognize and encourage young researchers, with the aim of enhancing the quality of scientific research through Gujarat Science Academy, Ahmadabad.

IV.Green Audit of Educational Institutions: Implementing and monitoring eco-friendly measures to foster environmentally responsible campuses, **Prof.Nirmal** pioneering in initiating and conducting unique GREEN AUDIT CELL, CVM (Clean Campus and Green Campus) as a **Coordinator**, evaluated every year the Educational/ academic institutions-schools & colleges for Green Practices, Environmental and Sustainable ambience (as per the NAAC, MoEFCC, NCART) in collaboration with Gujarat Cleaner Production Cell (GCPC) (MoU), Department of Industries and Mines, Govt. Of Gujarat, Gandhinagar from 2018 onwards , audited 35 institutions in every phase of year ,which is the first of its kind in the state of Gujarat(<http://greenaudit.ecvm.net/TEAM.html> , <http://greenaudit.ecvm.net>).‘The Green Audit ’of our academic institutions assessed and evaluated on the basis of Water Conservation, Tree Plantation, Waste Management, Paperless Work, Alternative Energy and Mapping of Biodiversity, introduce, involve, students awareness to real concerns of environment and its sustainability programs, National and International Day Celebrations. The Green Auditing for our academic institutions benefited with more efficient resource management ,create a green campus , enable waste management through reduction of waste generation, solid- waste and water recycling , create plastic free campus and evolve health consciousness among the students, teaching and non teaching faculty, stakeholders, provide a basis for improved sustainability, water and wastewater proper management, rain water harvesting , impart environmental education through systematic environmental management approach.

V.Societal and Philanthropic Contributions:

Prof.Nirmal consistently demonstrated a deep sense of social responsibility through voluntary engagement in philanthropic activities, focusing on uplifting local communities and extending support to those who are poor and need. His passion for social service is reflected in ongoing initiatives each year, which include: by providing cloths, medicine and food regularly to Popatbhai orphanage-foundation , Anand , National Association for Blind, Vallabh Vidyanagar, Old- age Home (Anand Dham, Lambvel, Anand), providing the scholarships (Methodist Church , Anand , Gujarat),financial assistance to poor , needy, (P J. Stephen Paul Ministries), Secunderabad, Telangana. More details of his charitable initiatives can be found on my personal profile: (<https://www.nirmalkumarji.in/Helping.html> , <https://nirmalkumarji.in/Helping.html>). Through these sustained efforts, he exemplify how academic leader by inspiring young minds to serve society, can extend their influence beyond institutions — making a tangible difference in communities and embodying the values of service and humanity.

Environmental Education and Awareness Programs

Prof.Nirmal regularly attended and conducted International, national, and state-level seminars, symposia, workshops, summer training programs, and industrial/field visits which significantly improved knowledge, exchange on environmental conservation, sustainable development, ecosystem restoration, pollution challenges, and mitigation strategies. These platforms facilitated dialogue among scientific communities, students, stakeholders, government officers, and local populations. Annual intercollegiate competitions and observance of global and national environmental days cultivated environmental consciousness among undergraduate, postgraduate, and doctoral students. Recognition through prizes and certificates incentivized participation and reinforced conservation-oriented behavior. Academic mentorship produced a generation of B.Sc., M.Sc., and Ph.D. graduates who now contribute significantly to environmental sectors, symbolically described as “glittering stars” in the field. Moreover, Local communities were trained in ecosystem conservation and restoration practices, ensuring participatory approaches to environmental management in studied forests and wetlands.