ARTIFICIAL INTELLIGENCE FOR SUSTAINABLE
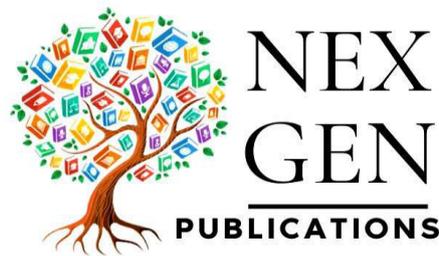# FUTURE

URBAN ECOLOGY, ENVIRONMENTAL MANAGEMENT, AND SMART DECISION-MAKING

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Artificial Intelligence for Sustainable Futures: Urban Ecology, Environmental Management, and Smart Decision-Making

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Preface

Sustainability is no longer a moral aspiration or a distant policy goal; it is an operational challenge demanding measurable outcomes, rapid decisions, and systemic accountability. Urban ecosystems are under unprecedented stress—from climate volatility and resource depletion to governance failures and unplanned technological expansion. Against this backdrop, Artificial Intelligence for Sustainable Futures: Urban Ecology, Environmental Management, and Smart Decision-Making is not written to celebrate technology, but to interrogate its capacity to confront real environmental constraints.

This book begins with a simple but uncomfortable premise: traditional environmental planning models are failing to keep pace with the complexity of urban systems. Human-centered decision-making, while essential, is often limited by fragmented data, political inertia, and short-term planning horizons. Artificial intelligence, when critically designed and ethically governed, offers tools to model ecological interactions, optimize resource use, anticipate environmental risks, and support evidence-based governance. However, AI is not a neutral solution, nor is it inherently sustainable. Its deployment can either reinforce existing inequalities and ecological damage or become a catalyst for adaptive, resilient urban futures.

The chapters in this volume examine AI as an instrument embedded within social, ecological, and political systems. Rather than treating technology as an autonomous force, the book situates AI within urban ecology, environmental management, and institutional decision-making frameworks. It addresses smart cities, climate-responsive infrastructure, predictive environmental analytics, and algorithmic governance, while also confronting ethical dilemmas, data biases, and power asymmetries.

This book is intended for scholars, policymakers, planners, and practitioners who are unwilling to accept superficial narratives of "green AI." It argues that sustainable futures will not emerge from technological optimism alone, but from rigorous interdisciplinary engagement, accountable governance, and informed human judgment. Artificial intelligence can assist sustainability—but only if sustainability remains the goal, not the excuse.

Ackowledgement

About the Authors

Dr. Archana Salve Dr. Archana Salve B.A.M.S,PGDHHM,MBA,NET,PhD is working as an Professor & Head of the Department, Department of MBA , Indira College of Engineering and Management Pune. She has got more than 23 years of Teaching and industry experience. Her area of specialization for Ph.D is Human Resource Management. Her area of interest is Human Resource management, Business Research Methodology, and Organization Behavior, & Life skills. She has presented more than 35 Research papers in the National and International Conferences. She has been a Resource Person and a Chair Person in many National and International Conferences. She is PhD research guide at SPPU Pune.

She has received Best Doctor award in 2004 in Niramaya Hospital Pune.She has received the "Dewang Mehata award" for Best Professor in Human Resource Management in2017, Outstanding Teacher Award in Academicians and researchers national conclave & Awards 2019. ESN Award for best Professor in Management in September 2019 at Chennai. Navdurga Award at chinchwad 2023, Maharashtra legend Women Empowerment Award 2023 she has also authored and reviewed seven books on Management

Dr. Prashantha H.Y. is an Assistant Professor in the Department of Studies and Research in Social Work at Karnatak University, Dharwad, Karnataka, having joined the service on September 4, 2014. His academic journey is marked by diverse qualifications, including a Master of Social Work (MSW) and a Master of Women's Studies (MWS) from Bangalore University. He also holds a Bachelor of Education (B.Ed.). He has qualified for the National Eligibility Test (NET) in both Women's Studies and Social Work, and the Karnataka

State Eligibility Test (KSET) in Social Work. His Ph.D. is from Bangalore University, with the topic: 'Transgender Sexual Minorities: A Gender Based study'. Dr. Prashantha's Areas of Interest are focused on Women and Child Rights, LGBTQ, Correctional Social Work, Women's Studies, Rural Development, and Youth Empowerment. His Working Experience and Academic Achievements are substantial. He has served as the Administrator (and previously In-Charge Administrator) of the Karnatak University P.G. Centre in Kerimattihalli, Haveri, from 2017 to December 2023. He has held numerous statutory positions, including Chairman and Member of the Board of Examiners (BoE) and Member of the Board of Studies (BoS) for Social Work and Women's Studies in multiple universities. Dr. Prashantha has actively contributed to academia and public discourse, having:

• Presented over 25 Research Papers at various conferences.

• Published more than 23 research papers in reputed UGC Refereed Journals.

• Delivered over 30 Special Lectures as a Resource Person and more than 70 invited talks as a Chief Guest.

He has also held administrative responsibilities within the university, such as Warden for P.G Boys Hostel and an E-Attestation officer for the State Scholarship Portal. He is a life member of several professional bodies, including the Indian Society of Professional Social Workers (ISPSW) and the Indian Association of Women's Studies. He has authored two books in Kannada.

He received the Inspiring Leader in Social Work National Award in 2020.

Dr. Dhanjit Deka is working as an Assistant Professor in the Geography Department at Gauhati University, Guwahati, Assam and has over 16 years of teaching experience. He is presently the steering committee member of the International Geographical Union (IGU) Commission on Geomorphology and Society and a Representative member of India in the Commonwealth Geographical Bureau (CGB). His research interests lie in watershed management, biodiversity conservation, land use change, urban mapping, remote sensing, and GIS applications. He has actively participated in and been associated with many IGU seminars and conferences in Germany, Russia, Japan, Canada, Ireland, and India. He has credit with a few research and consultancy projects funded by national and state organizations. He has published many articles and research papers in international and national journals of repute.

Dr. Kumar M. is an Assistant Professor and Postgraduate Coordinator for the M.Sc. Environmental Science and Sustainability programme in the Department of Environmental Science at St Joseph's University, Bengaluru. With over 15 years of experience in teaching, research and environmental consultancy, he excels in carbon accounting, ESG reporting, biodiversity assessment, climate change impact analysis and sustainable supply chain management. Dr. Kumar holds a Ph.D. in Environmental Science from Bangalore University, focusing on greenhouse gas inventorization in the Bangalore Urban District. Dr. Kumar has qualified national-level eligibility tests, including UGC-NET, K-

SET, and ICAR ASRB-NET in Environmental Sciences, and holds certifications in solid waste management, environmental management and industrial safety. Dr. Kumar has contributed to high-impact sustainability projects, including water neutrality studies, GHG inventory assessments, biodiversity studies and carbon stock assessments. His expertise extends to sustainability assessments of agricultural and dairy supply chains and environmental monitoring for large-scale projects. In academia, Dr. Kumar has authored books, published research papers, contributed articles and presented at conferences. He supervises dissertations, delivers invited lectures, and participates in curriculum design and academic governance. As a certified Functional Area Expert in Ecology & Biodiversity and Soil Conservation under NABET, QCI, Dr. Kumar applies his expertise to policy and planning, driving environmental science advancements through research, leadership and sustainability consulting.

Dr. Abhisek Saha is an Associate Professor in the Department of Chemistry, at Tufanganj College, Cooch Behar, India. The career of Dr. Abhisek Saha spans over twenty-three years of academic, Research, and administrative responsibilities at various colleges, school, and universities. Dr. Saha graduated from the University of North Bengal, India, and obtained a Master's degree in Chemistry from the same university. He completed his Ph.D. at the Department of Chemistry, Cooch Behar Panchanan Barma University, WB, India-736101. He qualified for the prestigious GATE (Graduate Aptitude Test for Engineers) examination in 2001 and CSIR-UGC-NET on Chemical Science in 2002. Dr. Saha acted as a SPOC in SWAYEM-NPTEL,

India since 2019 and faculty organizer of Spoken Tutorial, IIT Bombay, India. He acts as an Academic counselor (UG level) at Netaji Subhas Open University, India from 2015 to till date.

Dr. Saha's research interests are focused primarily on single crystal X-ray Diffraction, Synthesis, characterization and reactivity of transition metal Complexes. He is experienced in the multi-step synthesis of organic compounds as well as organometallic compounds and their separation/purification by chromatographic techniques. Possess knowledge for interpreting data from IR, NMR, UV-vis and FAB-mass spectra. Well-versed in solving structures using single crystal X-ray diffraction and possess knowledge of various softwares related to crystal structure solutions and representations (SHELXS, SHELXTL-PLUS, DIAMOND etc.). IR and UV-vis spectrophotometers, electro chemistry system (PAR-VarsastatTM II cyclic voltametry and coulometry), HPLC, GC. He worked as a Principal Investigator in the UGC-sponsored project on 'Application of platinum group metal complex to achieve C-H activation' in 2010-2012. The research work was the regioselective or regiospecific C(aryl)-H bond activation using cyclometallation reaction. Palladium(II), Platinum(II), Ruthenium(II), Rhodium(I) and Iridium(1) were used for C(aryl)-H bond activation. The cyclometallates were isolated and characterized. Single crystal X-ray crystallography has been used extensively for structure elucidation of the cyclometallates. The reactivity of the cyclometallates was also studied. Dr. Saha changed his research focus to Bioinformatics and Computational Biology, Next Generation Sequencing, DNA Sequence Analysis,

Genome Sequencing, Comparative Genomics, DNA Analysis, DNA Sequence Alignment, and Sanger Sequencing.

Dr. Saha published research papers (Twenty-four) in reputed National and International journals, edited book (Two), edited chapter in books (seven) published by National and International (Wiley-Scrivener, Springer Publication) publishers. Dr. Saha presented his research papers in many National and International seminars, conferences and symposia in India and abroad (Indonesia, Nepal). He also acted as Chairman, Co-Chairman, Rapporteur in technical sessions of many National and International seminar held in India and abroad.

Dr. Saha also renders his service as an editorial panel of National and International Journals. He is an associate editor of 'International Journal of Bio-Pharma Research journal' (ISSN: 2234-8638) and 'Anals of Pharma Research journal' (ISSN: 2347-1956). He acts an executive editor of 'International Journal of Current Science Research and Review' (ISSN: 2581-8341) and an editor of 'Asian Journal of Research in Chemistry (ISSN: 0974-4150; Online, ISSN: 0974-4169;Print). Dr. Saha is also a member of reviewer panel of 'International Journal of Chemical and Life Sciences' (ISSN: 2287-6898). He also acts as an editorial board member of 'International Journal of Pharmacognosy and Chemistry (Online ISSN:2582-7723) and 'Agricultural and Biological Research' (ISSN:0970-1907). Dr. Saha published patent from India and UK. The patents are Design patent (Design number-6319356) from Intellectual Property Office, UK on Gas Chromatography-Mass Spectrometer Analyzer on 1st November, 2023.

Dr. Saha was awarded National Scholarship of HRD, Govt. of India for his ranking in Higher Secondary Examinations conducted by the West Bengal Council of Higher Secondary Education. DPI, Govt. of West Bengal awarded him with Scholarship in 1997 for his performance at UG level. The Air India, Govt. of India has awarded him the prestigious BOLT Award for his teaching efficiency in 2007. Dr. Saha was awarded the 'Excellent Teacher Award' on his overall contribution to the field of Chemistry at the International Conference on Sustainable Development Initiatives in South East Asia held in Nepal in 2022.

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