

## Statement of Research Interests

### Research Interests

The global upsurge in the generation of plastic waste and ineffective waste management strategies are playing a prominent role in the rapid growth of landfills and degradation of natural resources. To create sustainable and cost-effective management solutions for plastic waste, scientific insights into the contemporary challenges, inefficiencies in plastic value chains, suitable treatment methods and appropriate economic incentives for recycling are needed. Advances in decision sciences and data-intensive modelling of coupled human-environment systems are yielding deeper insights into the nature of waste treatment issues and possible solutions. In this context, the focus of my Ph.D. studies will be to develop a sustainable system for management of plastic waste based on the contributing factors, such as waste composition, cost-energy expenditure, environmental impacts and recycling potential, etc. The IIT Kharagpur and University of Manchester campuses will be considered as field laboratories to operationalize the research. The research aims to create business models for plastic waste management in university campuses and use the scientific insights to develop sustainable solutions for plastic waste in educational and hospitality sectors, which can also be extendable to larger cities.

### Previous Experiences

During my training as a civil engineer at the Indian Institute of Technology Gandhinagar (IITGN) and as a social scientist at the Tata Institute of Social Sciences (TISS), I developed an aptitude for sustainability research and gained experience in solving contemporary environmental challenges. My experience in performing applied research is anchored by a self-conceptualized research internship project on machine learning based assessment of mangrove forests in an urban coastal setting. The study combined earth observations, machine learning algorithms and cloud computing methods for urban mangrove forest mapping and analysis of spatiotemporal changes in mangrove cover to improve the process of data-driven environmental policymaking in coastal cities. Presenting these research findings at multiple international conferences assisted me in learning scientific communication for the effective dissemination of research. Furthermore, the current master's thesis builds on the internship work and aims to understand the aspects of planning, policy and governance related to the degradation and conservation of mangrove forests. The study employs a mix of qualitative and quantitative methods, including field observations, ground truth surveys, stakeholder interviews and policy analysis, to decipher the implications of mangrove degradation on local communities and the multifaceted response of stakeholders to protect the ecologically-stressed mangrove ecosystems.

The cornerstone of my academic journey is the coursework that covers the broader domains of sustainability, solid waste management and entrepreneurship and supplements my research experience. Additionally, I worked on independent projects as part of these courses. Most notable was the development of a flood vulnerability index for a major city in India using Multi-Criteria Decision Making (MCDM) approaches to identify high urban flood risk zones for integrated disaster management and adaptation. Further, during my entrepreneurial experience, I focused on developing a prototype of an automatic retailing system for the effective distribution of healthy food and beverages in educational and corporate organizations. This unique opportunity allowed

me to learn business model innovation, value chain analysis and feasibility evaluation. These experiences constitute the foundation for my career in sustainability research and serve as an inspiration for future research.

### **Future Aspirations**

For a Ph.D., my vision is to integrate a grounded understanding of anthropogenic impacts, novel risks and environmental management strategies using interdisciplinary research methods and use the findings to guide data-driven policies. The ideal Ph.D. project for me bridges the gap between science and policy and makes a tangible impact on the ground. In this respect, I am inspired by the proposed project titled ‘Sustainable Management of Plastics Waste’ led by Dr. Vinay Yadav and Dr. Maria Sharmina. The applied nature of the project, which focuses on understanding and leveraging the opportunities in the current waste management regime and creating an optimal decision system for plastic waste, piqued my interest. Additionally, the idea of developing a novel methodology using a multi-objective optimization model to aid decision-makers in selecting appropriate methods for the management of plastic waste, resonates with my research objectives to conduct actionable and sustainability-oriented research. The prospects of establishing real-world applications of doctoral research with major academic and industry partners intrigue me the most. As I intend to tackle complex human-environmental problems of our times and become a leading scientist in the sustainable management field, I believe being at both IIT Kharagpur and the University of Manchester would foster my growth mindset and help me thrive both as a researcher and an individual, building my academic foundation and giving direction to my research journey.