Statement of Purpose

Niladri Chowdhury   *Ph.D. Applicant for 2022*

I am from a country where people suffer from both scarcity and quality of water. With the broader life goal of contributing to a sustainable future, I aim at gaining a profound understanding of the changes in the adversely impacted hydrosphere caused by rapid pollution, climate change. Also, I want to develop novel ideas that can help mankind to deal with global environmental challenges.

Research Motivation

Realizing that a majority of people in my country, India, lack access to basic amenities and infrastructure, I decided to pursue an undergraduate degree in Civil Engineering, eager to ameliorate the status quo. However, my interest in pursuing research in the disciplinary subfield, Environmental Engineering, was triggered by my undergraduate courses in this realm coupled with my growing disappointment at reading daunting editorials on pollution of the holy river Ganges, India along with poor water management and the increasing number of water contamination areas in my region. While studying these subjects I discovered that the different pollutants, their sources, effects, treatment processes, and the science behind the processes, which until then had seemed quite abstract to me, has a tremendous application in real-world problems and is indispensable in the understanding of environmental changes for the past few decades. I felt that these were the areas suitable for me to explore further. I realized that if I took up a job in the industry after graduation, I might not get an opportunity to delve into my specific areas of interest. So, I decided to pursue a career in research.

 I chose to work on a project from the sixth semester of undergraduate study at 'School Of Water Resource Engineering' at Jadavpur University (JU) which aimed to evaluate the potential for removal of contaminants by subsurface constructed wetland from municipal wastewater. The project fostered a desire to delve deeper into the subject, thereby, boosting my intent in pursuing a Master's degree in Environmental Engineering. During my master's study, I found broader directions of my research interests. I became more interested in environmental modeling while discussing research ideas with my teachers.

I would like to broaden the scope of my master's research in my Ph.D. in the area of water quality monitoring.

Research Experience

My **master's project** was under the supervision of **Professor Ajay S. Kalamadhad** in the Environmental Engineering Department of the Indian Institute of Technology Guwahati (IIT G) in the area of groundwater assessment and modeling. The primary step of the project involved collecting samples of groundwater from three districts of Assam, India during the pre-monsoon (summer) and post-monsoon (winter). Taking into consideration 20 contaminants, the collected samples were analyzed in the laboratory. After that, I used various tools for modeling, such as two scientific indices approaches (information entropy

and multivariate statistical-based); bivariate and multivariate statistical analysis (factor analysis, cluster analysis, discriminant analysis); heavy metal assessment; human health risk assessment and GIS mapping. I used software, like IBM SPSS (v 20), ArcGIS (v 10.5), Grapher(v 18) for modelling. The goals of the study were:1)What is the present condition of the groundwater in terms of the suitability for drinking and irrigation?; 2)Which are the severely affected regions?; 3)What are the major sources of contaminants?; 4)How are they interrelated?; 5) and how do they vary spatially and temporally? My research revealed the following results: 1)Degradation of groundwater quality is most severe during the pre-monsoon. 2) The influential heavy metals that affect the groundwater are iron, arsenic, and manganese, and 3) Bicarbonate and sodium are dominant anions and cations respectively. The main reasons behind the degradation of water quality are geogenic factors, overexploitation, excessive irrigation, and industrial waste. In conclusion, groundwater is unsafe for drinking in the entire area and unsuitable for irrigation in several areas. I completed the project independently except taking help from people in understanding local languages during sample collection.

During my undergraduate studies, I worked on a project titled 'Study of Performance of Horizontal Subsurface Wetland for Municipal Sewage of Sapuipara Canal, Kolkata, India' under the supervision of **Professor Pankaj Kumar Roy** and **Professor Arunabha Majumder** at the School Of Water Resource Engineering, Jadavpur University. The duration of the project was from August 2017 to January 2018. Apart from sampling, a bench-scale study on the performance of constructed wetland was conducted. Twelve essential parameters were considered for studying the removal efficiency. The study showed the constructed wetland is natural, energy-efficient, and economic. It has promising removal efficiency compared to the other wastewater treatment processes.