

**TRAVEL REPORT****Name****Year and term**Johan Olsson FagerbergSpring 2024**Country for the project**India**Degree programme**Degree Programme in Engineering Physics

## Modeling Pollutant Spread in Water Bodies, KTH Field Study

### Before departure

I have always wanted to take part in as many international activities as possible at KTH, and as I am interested in development issues KTH Field Studies especially appealed to me. Although I knew that I wanted to conduct a field study, I was not completely sure where I wanted to go. Having lived in France before, I initially considered going to a French-speaking country. However, due to the turbulent situation following the Quran burnings in Sweden during 2023, I concluded that it would not be appropriate to conduct my field study in an Arabic country during the coming spring. Thus, when I had to reconsider my options, I came across the idea of going to India. However, I thought it was difficult to find a relevant project without any prior knowledge of the country. To navigate this, I reached out to the regional advisor at KTH that recommended me to contact IIT Bombay and IIT Chennai. By sending a request to the Environmental Science and Engineering Department at IIT Bombay I came in contact with a professor who offered me the opportunity to conduct my field study as a part of one of his research projects on river pollution.

Once the formalities of my field study were finalized, I still had a few more practical preparations to complete before my departure. Other than booking my flights and arranging transportation from the airport, I applied for my student visa at the Embassy of India and took the vaccines for Japanese encephalitis, Cholera (Dukoral) and Typhoid fever (Vivotif). As the process for getting my visa was quite cumbersome, I encourage you to start this process as soon as possible if you plan to go to India.

### Upon arrival

I arrived in Mumbai one day before my field study began. My contact person at the department had arranged a taxi from the airport to my hostel, which was very helpful given how hectic the transportation in Mumbai can be. At IIT Bombay there was also an organized group for international students which made it easy to get to know new people. However, since the Indians were very outgoing, it was not difficult to make Indian friends either.

### Financials

Besides the KTH Field Studies travel grant I did not have any other income than my CSN loans and a buffer of saved money. Although accommodation in Mumbai can be quite expensive, the cost of food and other living expenses are generally much lower than in Europe. During my stay at IIT Bombay, I lived in one of the hostels and only paid 29,000 INR for accommodation and departmental expenses for the entire duration of my stay. Thus, even though the plane tickets and the vaccinations were a bit expensive, overall living expenses were quite low.

## Accomodation

During my time at IIT Bombay, I stayed in Hostel 14, where most of the seniors and PhD students lived. Although the accommodation was cheap and conveniently close to the department, the hostel's overall standard was quite poor. While my room was fine, the shared bathrooms were in bad condition. There was for example no hot water and black mold in the bathroom on my floor. Moreover, there were cockroaches and spiders in my room and rats in the corridor. Thus, if you plan to stay at IIT, I definitely recommend that you ask the international office if you may stay at the newly built Hostel 18, where the freshmen and most of the international students lived.



*Figure 1: The common canteen and the hostels surrounding Hostel 14.*



*Figure 2: Hostel 14 seen from above at night.*



*Figure 3: My room at Hostel 14.*

## **Project**

The purpose of my field study was to address the water contamination in the Ganges River in India by proposing a mathematical model to monitor the spread of pollutants such as coliform bacteria in a water body. This was in broad terms done by solving the so-called shallow water equations and the advection-diffusion equation in a confined area of the river. A particular focus was also directed towards the Varanasi Bend, an area prone to pollution accumulation in the northern parts of the Ganges.

Throughout the two months that I spent in Mumbai, the part of the project that I worked with under supervision of my supervisor at the mathematics department at KTH progressed well. However, as the data from the river was found to be too scarce to validate the initial model I had to rethink some parts of the project after a few weeks. During this time, I got a lot of help from two PhD students at the department, who advised me on how I could use the data and modify the model to make the project manageable. Through this experience, I really learnt the lesson that you should try to ask for help when you get stuck – especially in a foreign country, where you might not be familiar with the given constraints and possibilities.

## **Country**

Overall, I had a great experience in India. The Indians are friendly and outgoing, which made it easy to make new friends and travel on my own. Although Mumbai can be quite rough, it is a beautiful city. Since I arrived before the monsoon season, I did not experience any rain during my stay. However, by the beginning of April, the weather became quite warm, reaching around 35°C, with high humidity that made the nights a bit less comfortable. The weather was otherwise nice, with daytime temperatures ranging between 25-30°C.

Compared to most European cities, Mumbai is undoubtedly quite crowded and hectic, but I grew to enjoy the fast pace and the feeling of that there was always something to do. Despite being one of India's richest cities, most of the population lives in poverty. Although I never felt unsafe, I would advise staying alert in the central parts of Mumbai, where you will stand out as having much more money than most other people.

If I were to mention any significant cultural difference, I would say that the hierarchical structures are more pronounced compared to Sweden. For example, the students would stand up when professors entered the room. There were also moments when I was not sure how to meet the objectives set by my professor. In a similar situation at KTH, I would have discussed my concerns with the professor.

However, the PhD students in Mumbai advised me never to express my doubts but rather to meet the expectations to the best of my ability.



*Figure 4: The road on my way to the department.*



*Figure 5: Cows walking around campus.*



*Figure 6: Fort area in central Mumbai.*

### **Leisure and social activities**

In addition to the activities that were available on campus such as soccer, cricket and badminton, there were plenty of things to do in and around Mumbai. There were for example many places where you could do yoga and a national reserve next to the campus where you could go for a walk. The Indians were also incredibly welcoming, which led me to both go to yoga and join a group that regularly went for runs around the campus. Central Mumbai also offered a rich cultural scene, with Bollywood performances, films, and museums. However, as Mumbai is a very vibrant city there were also a lot of things to see by simply discovering the city by foot.

Toward the end of my trip, I also went to the Himalayas in the union territory of Ladakh. Although the journey was long, it was worth it, as it was one of the most beautiful places that I have ever visited. During my time there, I went to Nubra Valley, Pangong Lake and Khardung La. I also had the opportunity to visit a few Buddhist temples, which were some of the most memorable experiences I have ever had.



*Figure 7: Shooting of a Bollywood movie in central Mumbai.*



*Figure 8: Buddhist temple and town in Ladakh.*



*Figure 9: River in the Himalayas.*



*Figure 10: Road to Khardung La at 5500 m.*

### **Sustainability**

Including the round-trip flight to India, I must acknowledge that justifying my field study solely from a sustainability perspective is challenging. However, I firmly believe that the experience has given me an opportunity to forge relations and gain a deeper understanding of the issue – insights that I believe would have been unattainable without being physically present in India.

### **Other recommendations and observations**

Since many of the formalities were handled in person, I recommend bringing a few photocopies of your passport and some physical ID/passport photos. I did not expect to need mine, but I ended up using every single one. Other than that, I definitely encourage you to consider doing a field study in India!