

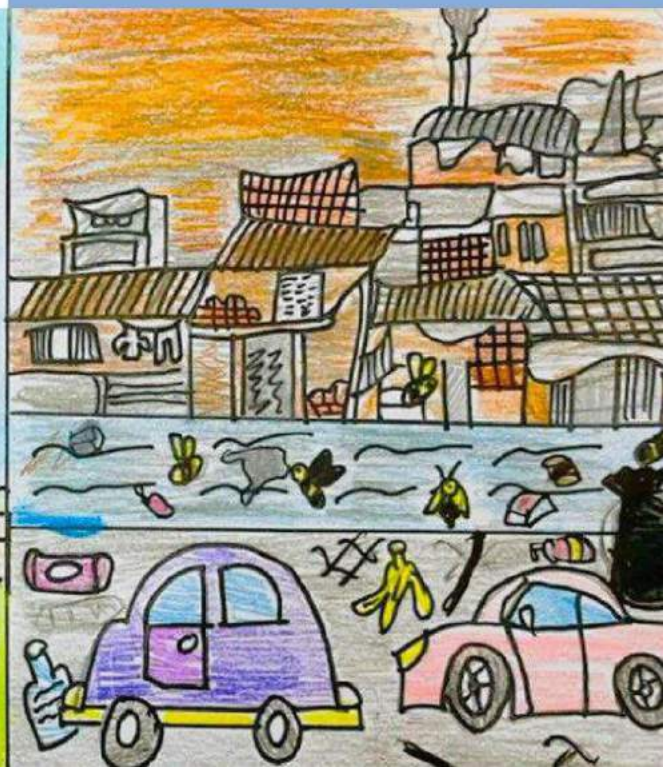
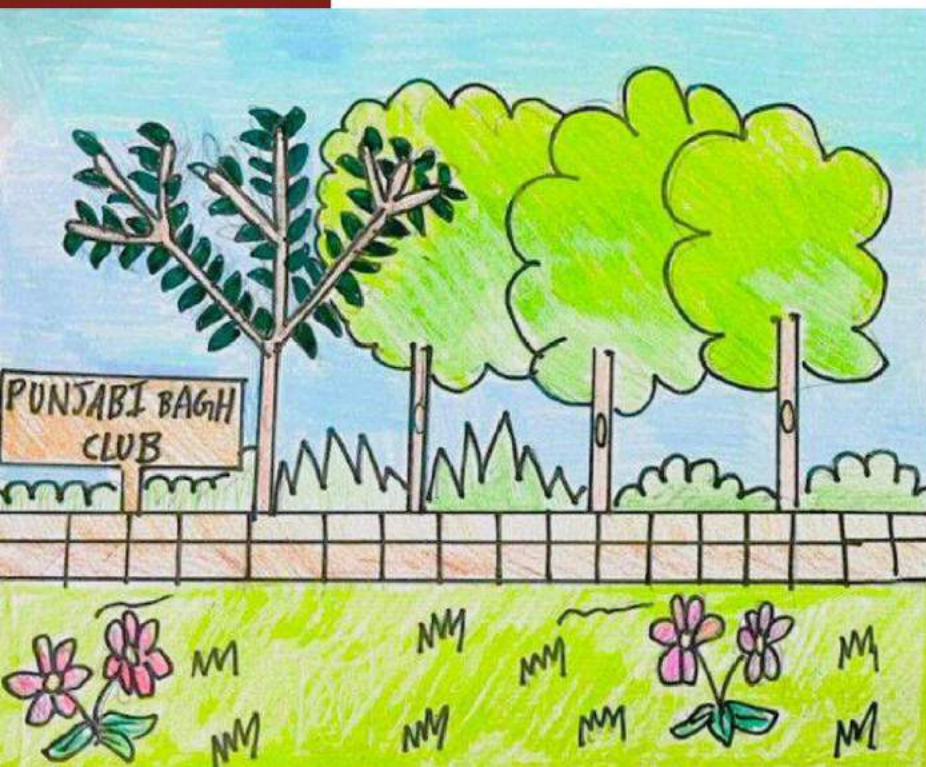
IGCS EXPERIENCE REPORT 05/2023

Indo-German Centre for Sustainability (IGCS)
at IIT Madras, Chennai



experience reports

Charlotte Draese



Experience Report on IGCS Fellowship

Fellow

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Project theme

Coastal and estuarine sediment archives for flood-induced pollution in subtropic/tropic areas

Starting/End date of the research exchange period

19. February – 05. March 2023

Inviting IIT-Madras Professor

Supervisor: Prof. Indumathi Manivannan Nambi
Department of Civil Engineering
IIT Madras, Chennai 600036

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Zurück zur Erde: A Workshop on Human-Nature Relationships and Sustainability for Students and Teachers

Co-organized by Goethe Institute and the Indo-German Centre for Sustainability (IGCS)

Blog post IGCS scholarship

Densely populated coastal regions in the subtropics and tropics are particularly vulnerable to floods, which are expected to occur more frequently as climate change progresses. A so far poorly studied hazard of these weather events is posed by the sediment particles that are distributed with the water flows in the aquatic environment. Some organic partly toxic pollutants adhere to the sediment particles due to their lipophilic and semi-polar properties and are stable towards degradation. Hence, a remobilization of contaminated sediments is potentially dangerous for humans and the environment.

The highly polluted Adyar and Cooum river systems in Chennai were selected for this research project since they are periodically flooded due to rainfall during the monsoon. The aim of the project was to identify suitable accumulation areas where the particles deposit undisturbed in low velocity areas and form temporary archives of the flood and pollution history. Additionally, an initial reconstruction of the river pollution history was created, and suitable indicators were identified to reflect the relevant input pathways of anthropogenic pollution (agriculture, urban area, industry).

Furthermore, following a sampling campaign from 2019, water and sediment samples were taken from the same sampling sites, to investigate changes over time.

Intensive sampling of the estuaries and floodplains of the rivers and the Muttukadu backwater has successfully been carried out in February 2023. To obtain samples from an intact stratigraphic profile a Geoslicer was used. Sedimentological characteristics (grain size, total organic carbon, trace element content) were determined in the laboratories of IIT Madras in Chennai. Following the research trip, geochemical analyses of organic substances were carried out at the Institute of Geology and Geochemistry of Petroleum and Coal at the RWTH Aachen University. Quantification of substances is performed after initial preparation (ASE extraction, fractionation via liquid chromatography) with GC/MS analysis.

Due to the time-consuming geochemical preparation, analysis and evaluation, no clear results to the research question have yet been concluded. It was challenging to locate sinks in which fine-grained material was deposited, which resulted in sampling mainly sandy materials. Flood layers were

identified in some cores. Furthermore, elevated levels of PAHs and PCBs have been detected, probably originating from a variety of sources like industries, agriculture, and motor traffic in the river basin.

The decision to conduct my research project in India derived from the interesting setting of the river systems in Chennai. The periodic floods caused by the monsoon offer a great potential to study the influence of floods on the remobilization and distribution of anthropogenic pollutants. In

addition, effects are more easily identified because the basic pollutant loads in Cooum and Adyar river are high compared to German rivers of comparable size. Highlight of the trip was the productive and inspiring collaboration with the Indian colleagues from IIT Madras. Furthermore, using the Geoslicer gave me the opportunity to expand my expertise in sampling methods which is particularly suitable for studying sedimentary archives, a focus of my research.



Fig 1: Sampling Point Cooum River Mouth



Fig 2: Sampling sediment with the Geoslicer



Fig 3: Sampling point Adyar river mouth

About the IGCS Grants

Through its scholarship program, IGCS is committed to supporting students and researchers whose projects benefit from a research exchange to India or Germany, helping to further knowledge and understanding of key sustainability issues. The scholarships consist of mobility and accommodation. IGCS fellows receive a one-time travel fund of up to 1.075 euros, as well as a monthly scholarship that covers travel and living expenses in accordance with DAAD funding rates. And now, with the new internship scholarship program launching in 2023, even more opportunities for practical work experience will be available to Master's students at German and Indian universities. If you're passionate about sustainability and eager to gain hands-on experience in this exciting field, we encourage you to [apply](#).