INDO-GERMAN CENTRE FOR SUSTAINABILITY (IGCS)

IGCS INDO-GERMAN Centre for SUSTAINABILITY

GRANTEE EXPERIENCE REPORT

Indo-German Centre for Sustainabilty (IGCS)
IGCS Research Exchange, Grant Period 2023

experience report

Charlotte Draese

Experience Report on IGCS Research Exchange, Grant Period 2023

IGCS Grantee
Charlotte Draese

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Supervised by: Prof. Indumathi Manivannan Nambi

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

Starting/End date of the student exchange period
19.02.2023 – 05.03.2023

About the IGCS Grants

IGCS awards scholarships to students and researchers from India and Germany with excellent academic records, very good English, and intercultural communication skills. The scholarship consists of a mobility grant and an accommodation grant according to DAAD funding rates, as a rule. Learn more about the funding opportunities at IGCS here.

Experience Report on IGCS Research Exchange, Funding Period 2023

As a beneficiary of the IGCS scholarship, the participant has committed to sharing their valuable experience. This report is designed to encompass two distinct parts:

Part I: Written Testimonial

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. Weather events, which have not been extensively studied for potential risks, introduce a hazard associated with sediment particles carried by water in aquatic environments. Certain organic pollutants, partly toxic in nature, stick to sediment particles because of their lipophilic and semi-polar properties. These pollutants exhibit stability and resist easy 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 (ASEextraction, 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.

I kindly acknowledge the support and collaboration of Prof Dr. Indumathi (Department of Civil Engineering, IIT Madras), Prof. Dr. Klaus Reicherter (NUG, RWTH Aachen), Prof. Dr. Jan Schwarzbauer (LEK, RWTH Aachen), Dr. Catherine Chagué (UNSW Sydney), Christina Schwanen (LEK, RWTH Aachen) regarding the workshop at IIT Madras. Furthermore, in addition to those already mentioned, I would like to thank Prof. Dr. Frank Lehmkuhl (PGG, RWTH Aachen), Dr. Daniel Rosado (IGCS, IIT Madras) and Max Formen (PGG, RWTH Aachen) for the provided support during the fieldwork.

Part II: Digital Media

Grantees are invited to share their experiences in digital media, encompassing photographs, illustrations, or graphics within the context of the IGCS scholarship.

Figure 1: Sampling point Cooum river mouth (left); Sampling sediment samples with the Geoslicer (right)

Figure 2: Sampling point Adyar river mouth

Figure 3: Workshop “Flood Pollution and Climate Adaptation Transfer Workshop” Field Trip