

GRANTEE EXPERIENCE REPORT

Indo-German Centre for Sustainability (IGCS)
IGCS Research Exchange, Grant Period 2024

scholarship report

Manikandan Subramanian



IGCS Grantee

Manikandan S

Home Institute

Department of Environmental Sciences, University of Kerala, India

Home Supervisor

Dr. Jaya D S

Host Institute

Unit of Neotectonics and Natural Hazards, RWTH Aachen University, Germany

Host Supervisor

Prof. Klaus Reicherter

Research Topic

Interstitial Water-Sediment Characteristics from The Tsunami Affected Areas of Kayamkulam and Edava-Nadayara Estuary, Southwest Coast of Kerala, India.

Focus Area

Water Management

Starting/End date of the student exchange period

01/10/2023 – 31/12/2023



The poster features a smiling woman with a backpack against a red background with a white mandala. The IGCS logo is in the top right. The text reads: 'Grants For Students and Researchers', 'Conduct Research on sustainability topics in India or Germany', 'APPLICATION OPEN', and 'Floating deadline for the year 2024'. At the bottom, it says 'For more information: <https://www.igcs-chennai.org/grants/>'. Logos for DAAD, Ministry of Education and Science and Technology, Federal Ministry of Education and Research, RWTH Aachen University, CIAU, and TU9 are listed at the bottom.

As a beneficiary of the IGCS research exchange scholarship, the grantee has committed to share the outcome of their stay in the host institution. This report is containing a detailed summary of their work, findings and expected outcomes:

Part I: Research Brief

My collaborative research with Prof. Klaus Reicherter delves into the interstitial water-sediment characteristics in the aftermath of tsunamis along the Kollam and Alappuzha shoreline, located on the Southwest Coast of India. Interstitial water, found between particles in rocks and sediments, plays a crucial role in facilitating the exchange of dissolved species within aquatic ecosystems.

The devastation caused by the tsunami in Kollam and Alappuzha districts, resulting in loss of life from Arattupuzha to Alappad, underscores the urgency of understanding these phenomena. Subsequent natural disasters, including the Ockhi cyclone in 2017 and flash floods in 2018, further impacted the southwest coast of India. The objective of our study is to assess the interstitial water-sediment characteristics in the tsunami-affected regions of Kollam and Alappuzha. We collected four core sediment samples from the Kayamkulam estuary and two from the edava-Nadayara estuary for analysis.

Then the core samples were subsampled at 5 cm intervals to analyse grain size, loss on ignition (LOI), carbon, nitrogen, sulfur content, as well as major and trace elements within the sediments.

Interstitial water was extracted from the cores, and subsequent physicochemical analyses, including pH, electrical conductivity (EC), NH₄-N, nitrate, nitrite, fluoride, chloride, and sulfate concentrations and heavy metals (Cr, Cu, Fe, Ni, Mn, Pb and Zn) were conducted. Interstitial water results exhibit the concentrations of Hg, Pb, and PO₄ were below detectable levels (BDL) in all interstitial water (IW) samples. Cr was BDL in all samples except IW3, which had high concentrations of Fe, Ni, Mn, Zn, and NH₄-N. Fluoride, chloride, and sulfate levels were very low in IW1 compared to the other samples. Statistical analysis indicates that at 25 cm depth of S2 (S2e), LOI, Na, Mg, Al, Cu, Zn, and Pb are high. High concentrations of Co, As, and Cd were recorded in S2b, S2c, and S2d. Sample S1a showed a high C/N ratio, with all segments in the core 1 ranging between 9.36 and 16.98. This sampling location (S1) is where the Achenkovil River empties into the Kayamkulam estuary. TN, TC, TOC, and Cr were high in S3, while Ca was high in S3a. High concentrations of Ce and Ti were present in S6. The concentration of major and trace elements was recorded as the following trend

Cd>As>Co>Cu>Pb>Ni>Cr>Zn>Ce>Mn>K>Cl>Mg>Ti>Ca>Na>Fe>Al>Si.

This study highlights significant spatial and depth-wise variability in the chemical composition of estuarine sediments, influenced by both natural processes and possible anthropogenic activities. Elevated levels of certain metals and elements at specific depths suggest episodic events or changes in sediment sources, potentially including tsunami deposits, riverine inputs, and localized pollution. The distinct geochemical signatures observed in different samples can help in reconstructing past environmental conditions and identifying areas impacted by specific events or processes.

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.

