

HIRA ASHFAQ LODHI

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Research Interests

Modelling and mapping coastal hazards such as tsunami, cyclones etc. Assessing risk to coastal cities and communities.

Professional Outline

- Assistant Professor, Applied Physics at NED University of Engineering & Technology – (March 11, 2018 to date)
- Lecturer, Applied Physics at NED University of Engineering & Technology – (January 15, 2009 to March 11, 2018)

Education

- NED University of Engineering & Technology 2015-2020
PhD (APPLIED MATHEMATICS)
- NED University of Engineering & Technology 2011-2013
MS (APPLIED MATHEMATICS)-First Division
(**Research project:** Tsunami inundation modelling)
- University of Karachi 2007-2008
M.Sc (APPLIED PHYSICS) – First Division
(**Elective:** Electronics)
- University of Karachi 2004-2005
BACHELOR OF SCIENCE – First Division
(**Electives:** Physics, Math, Stats)

Trainings / Workshops / Conferences Attended

- a) Training workshop on "Indian Ocean Tsunami Ready Hybrid Workshop", Bali, 2022.
- b) International workshop on "Makran Subduction Zone Science Strengthening Tsunami Warning and Preparedness", UAE, 2022.
- c) Workshop on "Regional Standard Operating Procedures (SOPs) Workshop for NTWC, DMOs and Broadcasting Media in the Tsunami Warning Chain", Karachi, 2022.
- d) International training workshop on "National Tsunami Evacuation Planning Working Group Meeting and Regional Workshop", Karachi, 2022.
- e) International conference, "First South Asia Conference on Earthquake Engineering, (SACEE'19)" Karachi, 2019.
- f) IGCP-Project 639 (conference and field study) on "Sea level changes from Minutes to Millennia" Oman, 2016
- g) Training Workshop on "Coastal Hazard Assessment: Applications in Risk Assessment, Management and Mitigation" Colombo, 2015
- h) International conference on "Reducing tsunami risk in the western Indian ocean", Muscat, 2015.
- i) Workshop on "Communicating the effects of the 1945 Makran tsunami to increase awareness and preparedness of tsunami hazards in the Makran Region", Islamabad, May 2014.
- j) International conference on "Renewable Energy and Sustainability", NEDUET, 2013.

Publications

- a) Karachi effects of the Makran earthquake and tsunami of November 1945; mercury spilled, tide gauge impaired, seawalls overrun, boats displaced, mosque flooded. UNESCO Booklet, 2021.
- b) Tsunami heights and limits in 1945 along the Makran coast estimated from testimony gathered 7 decades later in Gwadar, Pasni and Ormara, Natural Hazards and earth System Sciences, Copernicus, <https://doi.org/10.5194/nhess-2021-53>.

- c) The role of hydrodynamic impact force in subaerial boulder transport by tsunami—experimental evidence and revision of boulder transport equation, *Sedimentary geology*, Elsevier, 2020. <https://doi.org/10.1016/j.sedgeo.2020.105745>
- d) 1945 Makran Tsunami: Validation through oral and written histories, First South Asia Conference on Earthquake Engineering (SACEE'19), Karachi, 2019.
- e) Assessing Tsunami Risk to Karachi Port through Simulation of the Currents that were reportedly produced by the 1945 Makran Tsunami, 16th World Conference on Earthquake Engineering, Chile, 2017.
- f) Promoting Survival of the next Makran Tsunami in the Indus Delta, poster presentation, IGCP-Project 639, Muscat, 2016.
- g) Numerical simulation of Makran tsunami in creeks of the Indus Delta, Pakistan, poster presentation, IGCP-Project 639, Muscat, 2016.
- h) Initial steps towards mapping urban limits for Pakistan, oral presentation, International conference on Reducing tsunami risk in the western Indian Ocean, Muscat, 2015.
- i) The impact of earthquake source parameters on the 1945 tsunami wave profiles and arrival times, poster presentation, International Conference on Reducing Tsunami Risk in the Western Indian Ocean, Muscat, 2015.
- j) Elders recall an earlier tsunami on Indian Ocean, *EOS Transactions*, American Geophysical Union, Vol. 95, P 485-492, 2014.

Projects and Collaborations

- a) Disaster Resilience Improvement in Pakistan. Ongoing project with the Department of Earthquake Engineering, NEDUET. It is Funded by Higher Education Commission of Pakistan. The study will be based on Probabilistic Tsunami Hazard Assessment and Seismic Hazard Assessment for the city of Karachi.
- b) Cause of overwash at British Virgin Islands, field studies and simulations. Ongoing project in collaboration with University of Basel, Switzerland. The project is to investigate the probable cause of overwash at Anegada, British Virgin Island through simulating fine and coarse clast sediment transport by historical tsunami events known in the region.
- c) Earthquake and Tsunami Hazard assessment of West Karachi and Gwadar with Department of Earthquake Engineering, NEDUET. The study was a UNDP led project funded by Government of Japan. During the project a detailed study of tsunami and earthquake hazard posed to the Western portion of Karachi city at micro-level and at macro-level for complete city of Gwadar were carried out.
- d) Modelling boulder transport by tsunami, Ph.D. project in collaboration with University of Emirates, Al-Ain. During the study a tsunami boulder transport model is developed by including impact force of tsunami front for subaerial clasts. The proposed model in conjunction with tsunami simulations is used to identify the possible cause of over wash at Anegada, British Virgin Island. Funded by Higher Education Commission (HEC) through National Center for Big Data and Cloud Computing.
- e) Coastal evidence for Puerto Rico Trench earthquakes and tsunamis in Anegada, British Virgin Island: Field study at Anegada, the project was to investigate the breaches in coastal sand ridges and inland fields of boulders. The field evidence is being used to test simulations of tsunami and of tsunami like bores from tropical cyclones. Funded by National Earthquake Hazards Reduction Program (NEHRP), USA.
- f) Collaborative research with University of Emirates, Al-Ain to study mathematical models for transportation of boulders by tsunami.
- g) Pakistan Tsunami: Field study along the Indus delta to investigate the unrecorded and verify the recorded history of 1945 Makran tsunami. Funded by US State Department, Office of foreign disaster assistance, USA.
- h) Tsunami Inundation Modelling: Numerical studies conducted for the cities of Gwadar and Pasni. It was an Oxfam GB led project supported by UNESCO. The study was carried out to develop inundation maps and very first risk maps for the two cities. A major outcome of the project was development of a tsunami evacuation map for the city of Gwadar. A training workshop was also conducted to train stake holders such as NIO, Navy, PMD etc. for risk mapping. Funded by Oxfam GB.

Post Graduate Projects Supervised

- a) Experimental studies on Effects of River Mouth Shape on Tsunami Characteristics, Supervisor MS Thesis 2021-2022.