

## Dr. Zia ul Haq

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### Academic/research profile summary

**Keywords:** Geospatial technologies, air quality management, anthropogenic emissions, atmospheric physics & chemistry, climate change & its socioeconomics, natural hazards assessment, statistical modeling, MATLAB, R, Google Earth Engine

1. Serving, as a **faculty member**, at university level teaching and research with 17+ year experience.
2. Contributed, as a **researcher**, to 67 journal publications (Q1=11; Q2=18) with 200+ cumulative impact factor, 700+ citations and 18 *h*-index
3. Won a project, as a **principal investigator & scientific director**, to establish Remote Sensing, GIS and Climatic Research Lab (RSGCRL), a national lab affiliated with the National Center of GIS and Space Applications, at University of the Punjab, Lahore. Since the establishment in 2020, the lab has achieved its targets well in time with 84 impact factor journal publications, 15 workshops, 43 webinars/seminars, 5 PhD theses, 63 MS theses, 39 BS theses, 2 international conferences, and 55+ International linkages & collaborations.  
<http://pu.edu.pk/images/Departments/crs/FactBook-RSGCRL-2022.pdf>
4. Contributed, as a **incharge director**, to establish Centre for Remote Sensing at University of the Punjab, Lahore, and start of MS and PhD in Remote Sensing Programmes.  
<http://pu.edu.pk/home/department/90096/Centre-for-Remote-Sensing>
5. Contributed, as a **chief organizer**, to organize an International Conference on Remote Sensing, GIS and Climate Change (RSGCC-2023): Applications, Strategies, Solutions & Education, 13-15 March 2023, University of the Punjab, Lahore, Pakistan. RSGCC-2023 included 94 oral presentations from 13 countries, 19 technical sessions, 36 poster presentations, 1 Geospatial Exhibition, 7 Workshops, 3 Panel Discussions, and 65 awards  
<http://rsgcc-2023.pu.edu.pk/index.html>.
6. Contributing, as a **team lead**, development of an interactive web portal of “*Digital Climatic Atlas of Pakistan (D-CAP)*” with five major themes of Landuse & Landcover, Atmospheric Chemistry, Atmospheric Dynamics, Future Climatic Projections, and Anthropogenic Emissions. Phase-I regarding generation of static maps has completed, while in Phase-II a web portal is being developed.
7. Contributing, as a **team lead**, development of an early warning system “*National Observatory for Transboundary Air Pollution (AIR-TRAP)*”.
8. Proposed, as a **team lead**, several policy recommendations and action plans including “*Air Quality Management (AQM) in Pakistan: An Integrated Approach*”, and “*Limiting Ambient Air Pollution and Smog over Lahore Region: Framework for an Informed, Intelligent and Dynamic Decision Support System (IIDDSS)*” to Provincial Disaster Management Authority, Government of Punjab, Pakistan.
9. Contributed, as a **reviewer**, publications in several journals including Environmental Pollution, Atmospheric Research, International Journal of Remote Sensing, Atmospheric Pollution Research.
10. Contributing, as a **lead guest editor**, publication of a special issue on “Satellite Remote Sensing for Air Quality Monitoring” in Applied Sciences Journal [https://www.mdpi.com/journal/applsci/special\\_issues/0H7K80V9Y1](https://www.mdpi.com/journal/applsci/special_issues/0H7K80V9Y1)

## Academic Qualifications

i- **Ph.D. in Space Science**, University of the Punjab, Lahore, Pakistan (2018); Thesis title: *An assessment of major Ozone Depleting Substances and their impacts on climate change using RS & GIS in Lahore, Pakistan*  
<http://pr.hec.gov.pk/jspui/handle/123456789/9439>

ii- **M.S. in Telecommunications and Computer Networks Engineering**, London South Bank University, London, UK (2003)

iii- **M.Sc. in Space Science**, University of the Punjab, Lahore, Pakistan (2000)

## Designation & Institution

- i. **Incharge Director**, Centre for Remote Sensing, University of the Punjab, Lahore.
- ii. **Principal Investigator/Scientific Director**, Remote Sensing, GIS and Climatic Research Lab (RSGCRL), (National Center of GIS and Space Applications), University of the Punjab, Lahore.
- iii. **Assistant Professor**, Department of Space Science, University of the Punjab, Lahore.

## Projects

**1- Research & Development Project:** Establishment of national lab "**Remote Sensing, GIS and Climatic Research Lab**" at Department of Space Science, University of the Punjab, Lahore under HEC sponsored project "National Center of GIS and Space Applications (NCGSA)" (*in progress*)

Designation/Role: Principal Investigator/Scientific Director  
Project start year: 2020  
Project Funding: Overall more than 100 Million PKR  
Funding Source: HEC  
Project Duration: 5 years

**2- Research Project:** "**Air Quality monitoring in Pakistan using Satellite Remote Sensing (SRS) and Geographic Information System (GIS) techniques**" (completed successfully)

Designation/Role: Principal Investigator  
Project start year: 2015  
Project Funding: 0.15 Million PKR  
Funding Source: University of the Punjab, Lahore  
Project Duration: 1 year

## Major Initiatives (lead role)

1. Development of Digital Climatic Atlas of Pakistan (D-CAP)
2. Development of National Observatory for Transboundary Air Pollution (AIR-TRAP)
3. Responsible and Responsive Society Programme
  - i. Institutional Capacity Building and Professional Development Programme
  - ii. Climate Ambassadors
  - iii. National Campaign on Climate Change (NC<sup>3</sup>)
  - iv. Faculty Development Programme in RS, GIS & Climatic Research

## Selected International Peer-reviewed Impact Factor Publications

### Themes: Remote Sensing of air quality, detection of hotspots, tracking, and health

1. Farrukh Rana, Saima Siddiqui, Zia ul-Haq, 2023. Investigating the Spatiotemporal Distributions of NO<sub>2</sub>, SO<sub>2</sub> and Their Association with NDVI in Lahore (Pakistan) and Its Adjoining Region of Punjab (India). *Journal of the Indian Society of Remote Sensing*, (proofs submitted)
2. Muhammad Khan, Salman Tariq, Zia ul-Haq, 2023. Variations in the aerosol index and its relationship with meteorological parameters over Pakistan using remote sensing. *Environmental Science and Pollution Research*, <https://doi.org/10.1007/s11356-023-25613-5>
3. Salman Tariq, Ayesha Mariam, Usman Mehmood, Zia ul-Haq, 2023. Long term spatiotemporal trends and health risk assessment of remotely sensed PM<sub>2.5</sub> concentrations in Nigeria. *Environmental Pollution*, <https://doi.org/10.1016/j.envpol.2023.121382>
4. Salman Tariq, Fazzal Qayyum, Zia ul-Haq, Usman Mehmood, 2023. Remote sensing of nighttime air quality over the megacity of Lahore, Pakistan. *Urban Climate*, <https://doi.org/10.1016/j.uclim.2023.101498>
5. Salman Tariq, Hasan Nawaz, Usman Mehmood, Zia ul-Haq, Ugur Korkut Pata, Muntasir Murshed, 2023. Remote sensing of air pollution due to forest fires and dust storm over Balochistan (Pakistan). *Atmospheric Pollution Research*, <https://doi.org/10.1016/j.apr.2023.101674>
6. Salman Tariq, Zia ul-Haq, Ayesha Mariam, Usman Mehmood, Waseem Ahmed, 2022. Assessment of air quality during worst wildfires in Muğla and Antalya regions of Turkey. *Natural Hazards*, <https://doi.org/10.1007/s11069-022-05592-5>
7. Salman Tariq, Zia ul-Haq, Hasan Nawaz, Usman Mehmood, 2022. Remote sensing of aerosols due to biomass burning over Kanpur, Sao-Paulo, Ilorin and Canberra. *Atmospheric Chemistry*, <https://doi.org/10.1007/s10874-022-09444-1>
8. Özgür Zeydan, Salman Tariq, Fazzal Qayyum, Usman Mehmood, Zia ul-Haq, 2022. Investigating the long-term trends in aerosol optical depth and its association with meteorological parameters and enhanced vegetation index over Turkey. *Environmental Science and Pollution Research*, <https://doi.org/10.1007/s11356-022-23553-0>
9. Fazzal Qayyum; Salman Tariq; Zia ul-Haq, Usman Mehmood, Özgür Zeydan. 2022. Air pollution trends measured from MODIS and TROPOMI: AOD and CO over Pakistan. *Journal of Atmospheric Chemistry*, <https://doi.org/10.1007/s10874-022-09436-1>
10. Salman Tariq, Hafsa Shahzad, Usman Mehmood, Zia ul-Haq, 2022. Summertime variability of aerosols and covariates over Saudi Arabia using remote sensing. *Air Quality, Atmosphere & Health*, <https://doi.org/10.1007/s11869-022-01276-y>
11. Salman Tariq, Fazzal Qayyum, Zia ul-Haq, Usman Mehmood, 2022. Long-term spatiotemporal trends in aerosol optical depth and its relationship with enhanced vegetation index and meteorological parameters over South Asia. *Environmental Science and Pollution Research*, <https://doi.org/10.1007/s11356-021-17887-4>
12. Salman Tariq, Ayesha Mariam, Zia ul-Haq, Usman Mehmood, 2022. Spatial and temporal variations in PM<sub>2.5</sub> and associated health risk assessment in Saudi Arabia using remote sensing. *Chemosphere*, <https://doi.org/10.1016/j.chemosphere.2022.136296>
13. Ayesha Mariam, Salman Tariq, Zia ul-Haq, Usman Mehmood, 2021. Spatio-temporal variations in fine particulate matter and evaluation of associated health risk over Pakistan, *Integrated Environmental Assessment and Management*, <https://doi.org/10.1002/ieam.4446>
14. Salman Tariq, Hasan Nawaz, Zia ul-Haq, Usman Mehmood, 2021. Investigating the relationship of aerosols with enhanced vegetation index and meteorological parameters over Pakistan. *Atmospheric Pollution Research*, <https://doi.org/10.1016/j.apr.2021.101080>
15. Salman Tariq, Sumayia Mehmood, Aiman Nisa, Zia ul-Haq, Usman Mehmood, 2021. Remote sensing of aerosol properties during intense smog events over Lahore (Pakistan). *Kuwait Journal of Science*, <https://doi.org/10.48129/kjs.v48i4.10407>
16. Salman Tariq, Zia ul-Haq, 2019. Investigating the Aerosol Optical Depth and Angstrom Exponent and their Relationships with Meteorological Parameters over Lahore in Pakistan. *Proceedings of the National Academy of Sciences, India Section A: Physical Sciences*, <https://doi.org/10.1007/s40010-018-0575-6>

17. Asim Daud Rana, Shahid Parvez, Zia ul-Haq, Syeda Adila Batool, Chaudhary, M. N.– Mahmood, K., Salman Tariq, 2019. Anthropogenic, Biogenic and Pyrogenic Emission Sources and Atmospheric Formaldehyde (HCHO) and Nitrogen Dioxide (NO<sub>2</sub>) Columns over Different Landuse/Landcovers of South Asia, *Applied Ecology and Environmental Research*, [http://dx.doi.org/10.15666/aeer/1705\\_1098911015](http://dx.doi.org/10.15666/aeer/1705_1098911015)
18. Shahid Parvez, Asim Daud Rana, Zia ul-Haq, Syeda Adila Batool, Ali, M., Salman Tariq, Mahmood, K., Bano, S., 2019. Investigating Contributions of Gases, Meteorological Parameters, And Aerosols Towards Tropospheric Ozone Variabilities Over Megacity LAHORE (PAKISTAN), *Applied Ecology and Environmental Research*, [http://dx.doi.org/10.15666/aeer/1706\\_1353313553](http://dx.doi.org/10.15666/aeer/1706_1353313553)
19. Zia ul-Haq, Asim Daud Rana, Salman Tariq, Khalid Mahmood, Muhammad Ali, Iqra Bashir, 2018. Modeling of tropospheric NO<sub>2</sub> column over different climatic zones and land use/land cover types in South Asia. *Journal of Atmospheric and Solar-Terrestrial Physics*, <https://doi.org/10.1016/j.jastp.2018.01.022>
20. Zia ul-Haq, Syeda Adila Batool, Salman Tariq, Asim Daud Rana, Khalid Mahmood, Muhammad Nawaz Chaudhary, 2018. Temporal and spatial variations of NO<sub>2</sub> over Saudi Arabia and identification of major hotspot areas during 2005-2014 by using satellite data. *Applied Ecology and Environmental Research*, [http://dx.doi.org/10.15666/aeer/1605\\_57575770](http://dx.doi.org/10.15666/aeer/1605_57575770)
21. Salman Tariq, Zia ul-Haq, 2018. Ground Based Remote Sensing of Aerosol Properties over a coastal mega-city of Pakistan. *Advances in Meteorology*, <https://doi.org/10.1155/2018/3582191>
22. Zia ul-Haq, Zertasha Ramzan, Salman Tariq, Syeda Adila Batool, Muhammad Ali, Javed Sami, 2017. Comparison of total ozone column observations from space-borne Ozone Monitoring Instrument with ground-based Dobson Ozone Spectrophotometer measurements at an urban location in Indo-Gangetic Basin. *International Journal of Remote Sensing*, <https://doi.org/10.1080/01431161.2017.1387306>
23. Zia ul-Haq, Salman Tariq, Muhammad Ali, Asim Daud Rana, Khalid Mahmood, 2017. Satellite sensed tropospheric NO<sub>2</sub> patterns and anomalies over Indus, Ganges, Brahmaputra and Meghna river basins. *International Journal of Remote Sensing*, <https://doi.org/10.1080/01431161.2017.1283071>
24. Zia ul-Haq, Salman Tariq & Muhammad Ali, 2017. Spatiotemporal Patterns of Correlation between Atmospheric Nitrogen Dioxide and Aerosols over South Asia. *Meteorology and Atmospheric Physics*, <https://doi.org/10.1007/s00703-016-0485-6>
25. Zia ul-Haq, Salman Tariq, Muhammad Ali, 2017. Spatiotemporal assessment of CO<sub>2</sub> emissions and its satellite remote sensing over Pakistan and neighboring regions. *Journal of Atmospheric and Solar-Terrestrial Physics*, <https://doi.org/10.1016/j.jastp.2016.11.001>
26. Zia ul-Haq, Muhammad Ali, Syeda Adila Batool, Salman Tariq, Zarmina Qayyum, 2016. Emissions quantification of refrigerant CFCs, HCFCs and HFCs in megacity Lahore (Pakistan) and contributed ODPs and GWPs. *Journal of Earth System Science*, <https://doi.org/10.1007/s12040-016-0724-8>
27. Zia ul-Haq, Salman Tariq, Muhammad Ali, Khalid Mahmood, Asim Daud Rana, 2016. Sulphur dioxide loadings over megacity Lahore (Pakistan) and adjoining region of Indo-Gangetic Basin. *International Journal of Remote Sensing*, <https://doi.org/10.1080/01431161.2016.1192701>
28. Zia ul-Haq, Salman Tariq, Muhammad Ali, 2016. Anthropogenic emissions and space-borne observations of carbon monoxide over South Asia. *Advances in Space Research*, <https://doi.org/10.1016/j.asr.2016.06.033>
29. Salman Tariq, Zia ul-Haq, Muhammad Ali, 2016. Satellite and ground-based remote sensing of aerosols during intense haze event of October 2013 over Lahore, Pakistan. *Asia-Pacific Journal of Atmospheric Sciences*, <https://doi.org/10.1007/s13143-015-0084-3>
30. Zia ul-Haq, Salman Tariq, Muhammad Ali, 2015. Atmospheric variability of methane over Pakistan, Afghanistan and adjoining areas using retrievals from SCIAMACHY/ENVISAT. *Journal of Atmospheric and Solar-Terrestrial Physics*, <https://doi.org/10.1016/j.jastp.2015.11.002>
31. Zia ul-Haq, Salman Tariq, Muhammad Ali, 2015. Tropospheric NO<sub>2</sub> trends over South Asia during the last decade (2004-2014) using OMI data. *Advances in Meteorology*, <https://doi.org/10.1155/2015/959284>

32. Zia ul-Haq, Asim Daud Rana, Muhammad Ali, Khalid Mahmood, Salman Tariq, Zarmina Qayyum, 2015. Carbon monoxide (CO) emissions and its tropospheric variability over Pakistan using satellite-sensed data. *Advances in Space Research*, <https://doi.org/10.1016/j.asr.2015.04.026>
33. Zia ul-Haq, Salman Tariq, Asim Daud Rana, Muhammad Ali, Khalid Mahmood, Shahid Parvez, 2015. Satellite remote sensing of total ozone column (TOC) over Pakistan and neighbouring regions. *International Journal of Remote Sensing*, <https://doi.org/10.1080/01431161.2015.1007255>
34. Salman Tariq, Zia ul-Haq, Muhammad Ali, 2015. Analysis of Optical and Physical Properties of Aerosols during Crop Residue Burning Event of October 2010 over Lahore, Pakistan. *Atmospheric Pollution Research*, <https://doi.org/10.1016/j.apr.2015.05.002>
35. Zia ul-Haq, Salman Tariq, Muhammad Ali, Khalid Mahmood, Syeda Adila Batool, Asim Daud Rana, 2014. A study of tropospheric NO<sub>2</sub> variability over Pakistan using OMI data. *Atmospheric Pollution Research*, <https://doi.org/10.5094/APR.2014.080>
36. Muhammad Ali, Salman Tariq, Khalid Mahmood, Asim Daud Rana, Adila Batool, Zia ul-Haq, 2014. A study of aerosol properties over Lahore (Pakistan) by using AERONET data. *Asia-Pacific Journal of Atmospheric Sciences*, <https://doi.org/10.1007/s13143-014-0004-y>

Themes: Climate change, meteorology

1. Adil Dilawar, Baozhang Chen, Zia ul-Haq, Muhammad Amir, Arfan Arshad, Mujtaba Hassan, Man Guo, Muhammad Shafeeque, Junjun Fang, Boyang Song, and Huifang Zhang, 2023. Investigating the Potential Climatic Effects of Atmospheric pollution across China under the National Clean Air Action Plan. *Remote Sensing*, <https://doi.org/10.3390/rs15082084>
2. Umra Waris, Salman Tariq, Usman Mehmood, Zia ul-Haq, 2023. Exploring potential impacts of climatic variability on production of maize in Pakistan using ARDL approach. *Acta Geophysica*, <https://doi.org/10.1007/s11600-023-01118-0>
3. Salman Tariq, Hasan Nawaz, Zia ul-Haq, Usman Mehmood, 2022. Response of enhanced vegetation index changes to latent/sensible heat flux and precipitation over Pakistan using remote sensing. *Environmental Science and Pollution Research*, <https://doi.org/10.1007/s11356-022-20391-y>

Themes: Air pollution-climate change-socioeconomics nexus: statistical modeling

1. Zia ul-Haq, Usman Mehmood, Salman Tariq, A. Hanif, Hassan Nawaz, 2023. Role of meteorological parameters with the spread of Covid-19 in Pakistan: application of autoregressive distributed lag approach. *International Journal of Environmental Science and Technology*, <https://doi.org/10.1007/s13762-023-04997-4>
2. Munawar Iqbal, Sohail Chand, Zia ul-Haq, 2022. Economic policy uncertainty and CO<sub>2</sub> emissions: a comparative analysis of developed and developing nations. *Environmental Science and Pollution Research*, <https://doi.org/10.1007/s11356-022-23115-4>
3. Salman Tariq, Usman Mehmood, Zia ul-Haq, Ayesha Mariam, 2022. Exploring the existence of Environmental Phillips Curve in South Asian countries. *Environmental Science and Pollution Research*, <https://doi.org/10.1007/s11356-021-18099-6>
4. Zia ul-Haq, Usman Mehmood, Salman Tariq Fazzal Qayyum, Ayesha Azhar, Hasan Nawaz, 2022. Analyzing the role of meteorological parameters and CO<sub>2</sub> emissions towards crop production, empirical evidence from South Asian Countries. *International Journal of Environmental Research and Public Health*, <https://doi.org/10.1007/s11356-022-18567-7>
5. Usman Mehmood, Ayesha Azhar, Fazzal Qayyum, Hasan Nawaz, Salman Tariq, Zia ul-Haq, 2021. Air pollution and hospitalization in megacities: empirical evidence from Pakistan. *Environmental Science and Pollution Research*, <https://doi.org/10.1007/s11356-021-14158-0>
6. Usman Mehmood, Amal Mansoor, Salman Tariq, Zia ul-Haq, 2021. The interactional role of globalization in tourism-CO<sub>2</sub> nexus in South Asian countries. *Environmental Science and Pollution Research*, <https://doi.org/10.1007/s11356-021-12473-0>

7. Fazzal Qayyum, Usman Mehmood, Salman Tariq, Zia ul-Haq & Hasan Nawaz, 2021. Particulate matter (PM<sub>2.5</sub>) and diseases: an autoregressive distributed lag (ARDL) technique. *Environmental Science and Pollution Research*, <https://doi.org/10.1007/s11356-021-15178-6>
8. Aysha Abid, Usman Mehmood, Salman Tariq, Zia ul-Haq, 2021. The effects of technological innovation, FDI and financial development on CO<sub>2</sub> emissions: evidence from G8 countries. *Environmental Science and Pollution Research*, <https://doi.org/10.1007/s11356-021-15993-x>
9. Usman Mehmood, Salman Tariq, Zia ul-Haq, 2021. Effects of population structure on CO<sub>2</sub> emissions in South Asian countries: evidence from panel estimation. *Environmental Science and Pollution Research*, <https://doi.org/10.1007/s11356-021-14976-2>
10. Usman Mehmood, Ali Imran, Aysha Abid, Salman Tariq, Zia ul-Haq, Rabiya Mazhar, Asim Daud, Khalid Mahmood, Munawar Iqbal, Adila batool, 2021. Nexus between greenhouse gas emissions, energy use and economic growth: empirical evidence from South Asian countries. *Polish Journal of Environmental Studies*, <https://doi.org/10.15244/pjoes/135879>
11. Usman Mehmood, Ephraim Bonah Agyekum, Salman Tariq, Zia ul-Haq, Solomon Eghosa Uhumamure, Joshua Nosa Edokpayi, Ayesha Azhar, 2022. Socio-economic drivers of renewable energy: empirical evidence from BRICS. *International Journal of Environmental Research and Public Health*, <https://doi.org/10.3390/ijerph19084614>
12. Usman Mehmood, Salman Tariq, Zia ul-Haq, Hasan Nawaz, Ammar Hameed, Shafqat Ali, 2022. Can financial institutional deepening and renewable energy consumption lower CO<sub>2</sub> emissions in G-10 countries: fresh evidence from advanced methodologies. *International Journal of Environmental Research and Public Health*, <https://doi.org/10.3390/ijerph19095544>
13. Usman Mehmood, Salman Tariq, Zia ul-Haq, Ayesha Azhar, Ayesha Mariam, 2022. The role of tourism and renewable energy towards EKC in South Asian countries, fresh insights from the ARDL approach, *Cogent Social Sciences*, <https://doi.org/10.1080/23311886.2022.2073669>
14. Usman Mehmood, Salman Tariq, Zia ul-Haq, Hasan Nawaz, Shafqat Ali, Ammar Hameed, 2022. Financial institutional and market deepening, and environmental quality nexus a case study in G-11 economies using CS-ARDL. *International Journal of Environmental and Public Health*, <https://doi.org/10.3390/ijerph191911984>
15. Usman Mahmood, Salman Tariq, Zia ul-Haq, 2022. Exploring the role of communication technologies, governance, and renewable energy for ecological footprints in G11 countries: implications for sustainable development. *Sustainability*, <https://doi.org/10.3390/su141912555>
16. Zia ul-Haq, Usman Mehmood, Salman Tariq, Ayesha Mariam, 2023. Defining the role of renewable energy, economic growth, globalization, energy consumption, and population growth on PM<sub>2.5</sub> concentration: evidence from South Asian countries. *Environmental Science and Pollution Research*, <https://doi.org/10.1007/s11356-022-25046-6>
17. Usman Mehmood, Salman Tariq, Zia ul-Haq, Hasan Nawaz, Shafqat Ali, Muntasir Murshed, Munawar Iqbal, 2023. Evaluating the role of renewable energy and technology innovations in lowering CO<sub>2</sub> emission: a wavelet coherence approach. *Environmental Science and Pollution Research*, <https://doi.org/10.1007/s11356-023-25379-w>
18. Atif Khan Jadoon, Ambreen Sarwar, Maria Faiq Javaid, Amna Shoukat, Munawar Iqbal, Zia ul-Haq, Salman Tariq, 2023. Estimating environmental efficiency of the selected Asian countries: does convergence exist? *Environmental Science and Pollution Research*, <https://doi.org/10.1007/s11356-023-26221-z>
19. Usman Mehmood, Salman Tariq, Zia ul-Haq, Muhammad Umar Aslam and Ali Imran, 2023. How Economic Growth Contributes to CO<sub>2</sub> Emissions in the Presence of Globalization and Eco-Innovations in South Asian Countries? *World*, <https://doi.org/10.3390/world4010014>
20. Usman Mehmood, Salman Tariq, Zia ul-Haq, Muhammad Saeed Meo, 2021. Does the modifying role of institutional quality remain homogeneous in GDP-CO<sub>2</sub> emission nexus? New evidence from ARDL approach. *Environmental Science and Pollution Research*. <https://doi.org/10.1007/s11356-020-11293-y>
21. Salman Tariq, Zia ul-Haq, Khalid Mahmood, Asim Daud Rana, 2018. Spatio-Temporal Distributions and Trends of Aerosol Parameters over Pakistan Using Remote Sensing. *Applied Ecology and Environmental Research*, [http://dx.doi.org/10.15666/aeer/1603\\_26152637](http://dx.doi.org/10.15666/aeer/1603_26152637)



22. Salman Tariq, Zia ul-Haq, Ali Imran, Usman Mehmood, Muhammad Aslam, Khalid Mehmood, 2017. CO<sub>2</sub> emissions from Pakistan and India and their relationship with economic variables. *Applied Ecology and Environmental Research*, [http://dx.doi.org/10.15666/aeer/1504\\_13011312](http://dx.doi.org/10.15666/aeer/1504_13011312)

Themes: Geospatial applications in groundwater assessment, solid waste management, hazards and on other topics

1. Salman Tariq, Hasan Nawaz, Fazzal Qayyum, Zia ul-Haq, 2021. A study of the passage of high-speed solar wind streams, their plasma/field properties and space weather effects of geomagnetic disturbances. *Journal of Astrophysics & Astronomy*, <https://doi.org/10.1007/s12036-021-09768-6>
2. Khalid Mahmood, Zia ul-Haq, Fiza Faizi, Salman Tariq, Muhammad Azhar Naeem, Asim Daud Rana, 2019. Monitoring open dumping of municipal waste in Gujranwala, Pakistan using a combination of satellite-based bio-thermal indicators and GIS analysis. *Ecological Indicators*, <https://doi.org/10.1016/j.ecolind.2019.105613>
3. Khalid Mahmood, Syeda Adila Batool, Fiza Faizi, Ch. Muhammad Nawaz, Zia ul-Haq, Asim Daud Rana, Salman Tariq, 2017. Bio-thermal effects of open dumps on surroundings detected by remote sensing - influence of geographical conditions. *Ecological Indicators*, <https://doi.org/10.1016/j.ecolind.2017.06.042>
4. Khalid Mahmood, Zia ul-Haq, Syeda Adila Batool, Asim Daud Rana, Salman Tariq, 2016. Application of Temporal GIS to Track Areas of Significant Concern Regarding Groundwater Contamination. *Environmental Earth Sciences*, <https://doi.org/10.1007/s12665-015-4844-2>
5. Khalid Mahmood, Adila Batool, Muhammad Nawaz, Zia ul-Haq, 2017. Ranking criteria for the assessment of municipal solid waste dumping sites. *Archives of Environmental Protection*, <https://doi.org/10.1515/aep-2017-0009>
6. Khalid Mahmood, Zia ul-Haq, Fiza Faizi, Syeda A. Batol, 2019. A comparison of satellite-based indices for hazard assessment of MSW open dumps using spatial analysis, *Waste Management & Research*, <https://doi.org/10.1177/0734242X18815963>

### **Book Chapters**

**Zia ul-Haq**, Salman Tariq, 2021. Impact of Biomass Burning on Surface-Level Carbon Monoxide over Lahore and Karachi and Their Comparison with South Asian Megacities. "Biomass Burning in South and Southeast Asia" 1<sup>st</sup> edition, Volume 2, Chapter 4, Edited by Krishna Prasad Vadrevu, Toshimasa Ohara, Christopher Justice - ISBN 9780367076047, <https://doi.org/10.1201/9780429022036-5>, published by CRC Press.

Salman Tariq, **Zia ul-Haq** (2018). Satellite remote sensing of aerosols and gaseous pollution over Pakistan. In Krishna Prasad Vadrevu, Toshimasa Ohara & Chris Justice (Eds.), "*Land Atmospheric Interactions in Asia*". (a project of NASA and University of Maryland, USA), [https://doi.org/10.1007/978-3-319-67474-2\\_24](https://doi.org/10.1007/978-3-319-67474-2_24), Springer Book ISBN 978-3-319-67473-5.

### **International Conference Papers Presented/Abstracts Accepted**

Salman Tariq, **Zia Ul-Haq** (2017). An analysis of aerosol properties and HYSPLIT model estimates for aerosol transport pathways over an Arctic location Oliktok point (Alaska) (70 °N, 149 °W). 2nd PACES Workshop, 27-29 June 2017, Victoria, B.C., Canada.

Salman Tariq, **Zia ul-Haq** (2016). *Aerosol optical depth and single scattering albedo variability over Arabian Sea during 2002-2015*. Climate and Ocean: Variability, Predictability and Change (CLIVAR) Open Science Conference, 19-23<sup>rd</sup> September, 2016, Qingdao, China.

Khalid Mahmood, Muhammad Asim, **Zia ul-Haq** (2015). *GIS-based ground water quality indexing in Lahore residence, Pakistan*. SMPR 2015/ISPRS International Conference on Geo-Information Modeling and Environmental Monitoring, 23-25<sup>th</sup> November 2015, University of Tehran, Kish International Campus, Kish Island, Iran.

**Zia ul-Haq**, Asim Daud Rana, Muhammad Ali, Khalid Mahmood, Salman Tariq, Zermina Qayyum (2015). *Carbon monoxide emissions and its spatial and temporal variability over Pakistan and adjoining regions using satellite*

*data*. 3<sup>rd</sup> International Symposium on Energy Challenges and Mechanics- towards a big picture (Session 07: Energy and Environment), 7-9<sup>th</sup> July 2015, Aberdeen, Scotland, United Kingdom.

**Zia ul-Haq**, Salman Tariq, Asim Daud Rana, Khalid Mahmood, Syeda Adila Batool, Abdur Rehman, (2014). *Dubai air show 2013 and spatio-temporal study of elevated levels of tropospheric NO<sub>2</sub> over UAE region by using satellite remote sensing technique*. 2<sup>nd</sup> International Conference on Environmental Science and Technology (ICOEST '2014), 14-17<sup>th</sup> May 2014, Side, Antalya.

### **Calligraphic & Illumination Exhibitions**

Calligraphic & Illumination Exhibition, 2009

Center for Conservation & Restoration Studies (CCRS), Kucha Pir Sharazi, Lohari Gate, Lahore.

Calligraphic & Illumination Exhibition (Solo), 2010

Lahore City Heritage Museum, Lahore, Pakistan. Collaborated by Lahore Museum.

Calligraphic & Illumination Exhibition (Solo), 2010

Alhamra Art Gallery, The Mall Road, Lahore, Pakistan. Collaborated by Lahore Arts Council.

Calligraphic & Illumination Exhibition, 2011

Alhamra Art Gallery, The Mall Road, Lahore, Pakistan.

Calligraphic & Illumination Exhibition (Solo), 2011

Government Postgraduate College, Gojra, Toba Tek Singh, Pakistan.

### **Professional Trainings**

- HCFC's Phase-out and Alternatives, Ozone Cell, Ministry of Climate Change, Lahore, Pakistan.
- Satellite Applications in Communications and Remote Sensing, SUPARCO & ISNET, Lahore, Pakistan.
- Project and Team Management, Diploma, BSY Group, UK.
- Projects in Controlled Environments (PRINCE2), Foundation Certificate, Office of Government Commerce, UK.
- Systems Analysis and Design, BTEC diploma, University of Westminster, London.
- Gemstones Identification, Diploma, Pakistan Gems and Jewellery Development Company, Lahore, Pakistan.
- Calligraphy & Illumination Course, Center for Conservation & Restoration Studies (CCRS)-NCA, Lahore.
- Oracle-8, Database Management, Professional training course, UET, Lahore, Pakistan.
- Fundamentals of Digital Signal Processing, Professional training course, Texas Instrument, Birmingham.
- Data communications cable installation and testing, City & Guilds certificate, UK Telecommunications Academy.
- Optical Fibre Installation and Testing, Single Mode, City & Guilds certificate, UK Telecommunications Academy.
- Network Infrastructure Installation, Professional training course, CNS, Bandford, UK.
- Foundation Economics, Foundation course, London School of Economic Sciences, London, UK.
- Optical Fibre Cable Installation and Testing, Professional training course, CNS, Bandford, UK.
- Network Associate, Routing and Switching, Professional training course, CORVET Systems, Lahore, Pakistan.