

**Professor. Dr. Zahid Mahmood Khan**

**Agricultural Engineering Department, Bahauddin Zakariya University, Multan**

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**Specialization:** Agricultural and Environmental Engineering

**CAREER HIGHLIGHTS**

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- **28 Years National and International Experience in Teaching, Research and Administration at:**
  - Agricultural Engineering Department, Bahauddin Zakariya University, Multan
  - Environmental Sciences Department, COMSATS, Abbottabad, Pakistan
  - Civil & Environmental Engineering Department, University of Waterloo, Ontario, Canada
  - Civil Engineering Department, University of British Columbia, Vancouver, Canada
- **SATHA Innovation Award 2018** for the **Design and Development of Low-cost and Energy-Efficient Air-conditioning System** at the Department Agricultural Engineering, BZU Multan, Pakistan
- **SATHA Innovation Award 2016** for the development of **MCTF WW Treatment System** at the Department Agricultural Engineering, BZU Multan, Pakistan
- **Best Paper Award NCAES-2016** at the 1<sup>st</sup> National Conference on Agricultural Engineering & Sciences, Multan, Pakistan.
- **Higher Education Commission (HEC) Approved PhD Supervisor for Agri/Civil Engineering and Expert Reviewer** for HEC National Grants and Pak-US Research Grants
- **Post-Doctoral Research at Civil & Environ. Engineering, University of Waterloo, Ontario Canada**, joint project with UW, Ontario; EnviroSim Ltd, Canada & DCWASA, Washington DC, USA
- **100+ publications (1500+ citations) in peer reviewed impact factor journals, and Conference proceedings** relating to the analyses of water & wastewater treatment processes, pollutant treatability, bio-adsorption and Industrial, Municipal and Agricultural Systems
- **Expert Referee/Peer Reviewer** for:
  - Journal of Environmental Management
  - Journal of Hazardous Materials
  - Water Environment Research
  - Water Environment Federation USA
  - Water Research
  - Journal of Environ Engineering & Science
  - Pakistan journal of Agricultural Sciences
  - Water Quality Research Journal of Canada, IWA
- **Actively contributed in Agri. Engineering Undergraduate and Graduate Syllabi and Labs** development, PEC Accreditation and Department Building through **PC-1** Preparation & Implementation.
- **Supervised 100+ BSc Agri. & Civil Engg** students at BZU, COMSATS IIT and U of Waterloo Canada
- **Supervised 25+ M. Phil/MSc Agricultural Engineering** students at BZU and COMSATS IIT

- **Supervised 5 PhD** Agricultural Engineering and Environmental Science students at BZU & COMSATS
- **Won HEC NRUP Grant of Rs. 4.575 M** for Agricultural Engineering BZU, Multan
- Extensively **reviewed & evaluated** Performance of Treatment Systems for Optimization, Capacity Re-rating using **GPS-X** Process Simulation Computer models & Operations Data at Policy & Planning Department, Regional Utility Planning Division, Greater Vancouver Regional District (GVRD), Burnaby, British Columbia, Canada
- **Developed a Pyrolytic Reactor System** for conversion of waste poly-bags into light oil and gas
- **Developed a Low Cost Wastewater Aerator and an innovative Maize Cob Trickling Filter (MCTF) Wastewater Treatment System** using indigenous materials for safe reuse of municipal wastewaters in agriculture
- **Winner of “Environmental Engg Research Award”** in PhD Civil Engineering UBC, Canada
- **Winner of “1<sup>st</sup> Position & Silver Medal Award”** in MSc Agri./Environmental Engg., UAF, Faisalabad
- **Winner of “1<sup>st</sup> Position & Talent Scholarship Award”** in BSc Agri. Engg. (1991), UAF, Faisalabad

## EDUCATION

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<b>Ph. D.</b>	<b>Civil Engineering</b>	University of British Columbia, Vancouver, Canada.	2005
<b>M. Sc.</b>	<b>Agri./Env. Engineering</b>	University of Agriculture, Faisalabad, Pakistan.	1995
<b>B. Sc.</b>	<b>Agricultural Engineering</b>	University of Agriculture, Faisalabad, Pakistan.	1991

**Post Doc Research** Civil & Environmental Engineering Department, University of Waterloo Ontario Canada, 2006. Validation of integrated modeling of wastewater treatment and sludge digestion processes.

**Ph.D. (Civil Eng) Thesis:** *“Occurrence & Treatment of Plant Sterols in Pulp & Paper Mill Effluents”*

**Supervisor:** Prof. Dr. Eric R Hall (Assoc. Dean & Ex Head Civil Eng. UBC)

**M.Sc. (Env. Eng) Thesis:** *“Fertilizer Leaching Under Variable Soil Tillth & Irrigation Depth”*

**Supervisor:** Prof. Dr. Jehangir Khan Sial (Ex. Dean Faculty of Agri. Engg & Tech. UAF)

## AWARDS & HONORS

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- 2018 **SATHA Innovation Award** for the development of **MCTF WW Treatment System** at the Department Agricultural Engineering, BZU Multan, Pakistan
- 2016 **SATHA Innovation Award** for the development of **MCTF WW Treatment System** at the Department Agricultural Engineering, BZU Multan, Pakistan
- 2015 **Award of Permanent Tenure as Associate Professor** at the Department Agricultural Engineering, BZU Multan, Pakistan
- 2014 **Award of Permanent Tenure as Assistant Professor** at the Department Agricultural Engineering, BZU Multan, Pakistan
- 2009-13 **Peer Reviewer:** Water Environment Research, Water Environment Federation, VA, USA
- 2007-13 **Peer Reviewer:** Journal of Environmental Management, Elsevier Publications, Inc. USA

- 2006-13 **HEC Approved PhD Supervisor, HEC Panel Reviewer** for National Research Grants
- 2008 Selected as **Assistant Professor (TTS)** at Agricultural Engineering, BZU, Multan, Pakistan
- 2006-07 HEC Appointed **Assistant Professor (PPSAP)** at Environmental Sciences, CIIT, Abbottabad
- 2005-6 **Postdoctoral Fellowship:** Civil Engineering, University of Waterloo, Ontario, Canada
- 2002-3 **Process Engineer:** Policy & Planning Dept., Greater Vancouver Regional District, BC, Canada
- 2002 **Peer Reviewer:** International Water Association 3<sup>rd</sup> World Water Congress, Melbourne Australia
- 1997 **Environmental Eng. Research Scholarship Award:** for excellence in Civil Engg, UBC, Canada
- 1995 **Silver Medal & 1<sup>st</sup> Position (3.99/4.00):** for excellence in MSc Agri/Env Engg, UAF, Pakistan
- 1994 **Vice Chancellor's Special Fund** for Research Promotion: University of Agriculture, Pakistan
- 1993 **National Talent Scholarship:** for excellence in Agricultural Engineering, Govt. of Pakistan
- 1991 **1<sup>st</sup> Position (GPA 3.88/4)& Merit Scholarship:** for excellence in BSc Agri. Engg. UAF, Pakistan

## PROFESSIONAL AFFILIATIONS

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Professional Engineer:	Pakistan Engineering Council, Islamabad, Pakistan.
PSAE Member & Focal Person:	Pakistan Society of Agricultural Engineers, Pakistan.
Member:	Water Environment Federation, Alexandria, VA, USA.
Member:	British Columbia Water & Waste Association, BC, Canada.
Member:	International Water Association, London, UK.

## PROFESSIONAL TRAININGS/CERTIFICATES

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| 1-Day training on “ <b>Sense of Ownership in Engineers</b> ” Organized by Agricultural Research Mechanization Institute (AMRI) Multan on May 14, 2022.   | 2022 |
| 2-Days training “ <b>Principles of Efficient Tractor Operation; Environmental impact of diesel exhaust, its remedies, and EPA standards</b> ” organized by Department of Agricultural Engineering at BZU                                   | 2022 |
| 1-Day training “ <b>Highly Efficient Irrigation Systems (HEIS): Designing Factors, Installation and Field Experiences</b> ” organized by Department of Agricultural Engineering at BZU   | 2022 |
| 1-Day CPD training workshop on “ <b>WinSRFR Model for Design and Simulation of Precise Surface Irrigation Systems</b> ” offered by Pakistan Engineering Council and Department of Agricultural Engineering at BZU, Multan on July 09, 2020 | 2020 |
| 1-Day Seminar on “ <b>Agricultural Equipment Industry Development</b> ” in Leisi International Forum 2020 in Jiangsu University held on May 08, 2020.  | 2020 |
| 1-Day 1st e-Seminar on <b>Agricultural Mechanization: Issues and Prospects in Pakistan</b> held on June 18, 2020. The title of Presentation is “Using Digital Agricultural technologies for site-specific nitrogen management” .           | 2020 |
| 1-Day <b>Outcome based education and development of self-assessment report</b> at Agricultural Engineering Department, FAST, BZU, Multan   | 2018 |
| 1-Day <b>Developing Technologies for Required Agro-Industry</b> by Department of Agricultural Engineering, Bahauddin Zakariya University, Multan.  | 2017 |
| 1-Day <b>International Seminar on Climate Change</b> by MNS University of Agriculture  | 2017 |
| 1-Day <b>Intellectual Property Rights and Patents Drafting</b> by the Faculty of Veterinary Sciences BZU, Multan and Pakistan Scientific & Technological Information Centre  | 2016 |

1-Day	<b>Role of Agricultural Engineering in SMART Agriculture</b> by the Faculty of Agricultural Engineering & Technology, University of Agriculture Faisalabad	2016
2-Day	<b>5th Invention to Innovation Summit 2016</b> by Pakistan Scientific & Technological Information Centre (PASTIC), Pakistan Science Foundation (PSF), University of Punjab (PU) and Institute of Research Promotion (IRP)	2016
2-Day	<b>Technologies for Agricultural Implements/Machinery</b> at the <b>4th Invention to Innovation Summit 2015</b> by Institute of Research Promotion, Pakistan Scientific & Technological Info. Centre, Pakistan Science Foundation, UMT and Punjab University. Lahore	2015
1-Day	<b>Developing Industry Driven Technologies Workshop</b> , organized by PASTIC & Institute of Research Promotion (IRP) at BZU, Multan on 23 Oct. 14	2014
2-Day	<b>Project Formulation Workshop</b> organized by Pakistan Science Foundation at BZU, Multan	2012
1-Day	<b>Parameters of Environmental Impact Assessment</b> by PEC and SEE Department, UAF	2009
1-Day	<b>Environmental Impact Assessment Techniques &amp; Report Writing</b> , Agri. Engg, BZU, Multan	2009
1-Day	<b>Energy, Health &amp; Env Mgt Industrial Operations</b> , Industrial Engg. UET Peshawar	2008
2-Day	<b>Hydel Power Potential in Pakistan</b> , International Workshop, UET Taxila, Pakistan	2008
1-Day	<b>Dedicated Research &amp; Education Pak &amp; USA</b> , HEC Workshop, NSF & PERN Pakistan	2008
5-Day	<b>Wind &amp; Solar Renewable Energy Workshop</b> , COMSTAS IIT Pakistan & OXiBrook Univ. UK	2007
1-Day	<b>Information &amp; Communication Technologies for Development</b> , HEC, CIIT & INIT Pakistan	2006
2-Day	<b>Technology based Development Strategies &amp; Options</b> , HEC, COMSATS, PTCL, PSF, Pak	2006
2-Day	<b>Project Management Principles &amp; Practices</b> , UBC Graduate Faculty, Canada & PMI USA	2004
2-Day	<b>Law &amp; Ethics Workshop</b> , Association of Professional Engineers & Geoscientists, BC, Canada	2004
2-Day	<b>Technical Writing &amp; Effective Meetings</b> , Policy & Planning, GVRD, Burnaby, BC, Canada	2002
3-Day	<b>Instruction Skills Workshop</b> , Teaching & Academic Growth, UBC, Vancouver, BC, Canada	2000
3-Day	<b>Presentation Skills Workshop</b> , Teaching & Academic Growth, UBC, Vancouver, BC, Canada	2000

## RESEARCH & PUBLICATIONS

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### A-Impact Factor Journals

1. RMA Kanwar, **ZM Khan**, HU Farid (2023) Fate of Biofilm Activity in Cascade Aerating Trickling Filter for Wastewater Treatment: Comparison of Two Types of Indigenous Support Media. *Biochemical Engineering Journal*, 108875  
(**IF = 4.446**)
2. Farid, H.U., Ayub, H.U., Khan, Z.M., Ahmad, I., Anjum, M.N., Kanwar, R.M.A., Mubeen, M. and Sakinder, P., 2022. Groundwater quality risk assessment using hydro-chemical and geospatial analysis. *Environment, Development and Sustainability*, pp.1-23.  
(**IF = 3.972**)
3. Naeem, Maira, Hafiz Umar Farid, Muhammad Arbaz Madni, Rameez Ahsen, **Zahid Mahmood Khan**, Aqsa Dilshad, and Huzaifa Shahzad. "Remotely sensed image interpretation for assessment of land use land cover changes and settlement impact on allocated irrigation water in Multan, Pakistan." *Environmental monitoring and assessment* 194, No. 2 (2022): 1-18.  
(**IF=2 . 860**)
4. Kanwar RMA, ZM Khan, HU Farid (2021) Modelling Based Performance Evaluation of Novel Cascade cum Trickling Filter Wastewater Treatment System. *International Journal of Environmental Science and Technology*.  
<https://doi.org/10.1007/s13762-021-03455-3>  
(**IF=2 . 540**)
5. Adil Naseer Khawaja, Zahid Mahmood Khan (2021) DEM study on threshing performance of "compression-oscillation" thresher. *Computational Particle Mechanics*, <https://doi.org/10.1007/s40571-021-00456-4>  
(**IF=2 . 105**)

6. Kanwar RMA, **ZM Khan**, HU Farid (2021) Enhanced contaminant removal from municipal wastewater using novel cascade cum trickling filter and multilayer adsorption bioreactor. *International Journal of Environmental Science and Technology*, 1-14. <https://doi.org/10.1007/s13762-021-03201-9> (IF=2.540)
7. Mehdi, S.N., Khan, Z.M., Farid, H.U. and Hussain, S., 2021. Investigating Compatible Drying Technique for Safe Utilization of Thar Coal, Pakistan. *International Journal of Coal Preparation and Utilization*, pp.1-22. 10.1080/19392699.2021.1958794 (IF = 2.697)
8. Kanwar RMA, **ZM Khan**, HU Farid (2021) Investigation of municipal wastewater treatment by agricultural waste materials in locally designed trickling filter for peri-urban agriculture. *Water Supply*, <https://doi.org/10.2166/ws.2021.075> (IF=0.900)
9. Hafiz Umar Farid, Ijaz Ahmad, **Zahid Mahmood Khan**, Allah Bakhsh, Muhammad Naveed Anjum, Aamir Shakoor, Assad Farooq (2021) Prediction and Maximization of Wheat Grain Yield in Semiarid Environment by Using Artificial Neural Networks. *Fresenius Environmental Bulletin*, 30(02A/2021) 1977-1987. (IF=0.553)
10. Ali A, HU Farid, **ZM Khan**, I Ahmad, MN Anjum, M Mubeen, A Shakoor (2021) Temporal Analysis for Detection of Anomalies in Precipitation Patterns over a Selected Area in the Indus Basin of Pakistan. *Pure and Applied Geophysics* (Accepted in press) (IF=1.586)
11. Muammad H Mahmood, Zahid M Khan, Muhammad Sultan, Zawar Hussain, Amman Ullah, Shazia Hanif, Yousaf R Taseer, Muhammad A Imran, Riaz Ahmad, Tallat Mehmood, Muhammad Aleem (2021) GIS assessment for groundwater quality of District Multan, Pakistan. *Fresenius Environmental Bulletin*, 30(09/2021) 10728-10737. (IF= 0.533)
12. M Arsalan, **ZM Khan**, M Sultan, I Ali, A Shakoor, MH Mahmood, M Ahmad, RR Shamshiri, MA Imran, MU Khalid. (2021). Study on adsorption equilibrium of adsorbent-refrigerant pairs for adsorption cooling system application. *Fresenius Environmental Bulletin*. 30(01/2021) 148-157. (IF= 0.533)
13. Shahzad H., H.U. Farid, **Z.M. Khan**, M.N. Anjum, I. Ahmad, X. Chen, P. Sakindar, M. Mubeen, M. Ahmad, A. Gulakhmadov (2020) An Integrated Use of GIS, Geostatistical and Map Overlay Techniques for Spatio-Temporal Variability Analysis of Groundwater Quality and Level in the Punjab Province of Pakistan South Asia. *Water*, 12(12)3555. (IF=2.250)
14. I Ali, J Li, C Peng, I Naz, M Qasim, **ZM Khan**, M Sultan, M Rauf, W Iqbal, HMA Sharif. 2020. 3-Dimensional Membrane Capsules: Synthesis Modulations for the Remediation of Environmental Pollutants - A Critical Review. *Critical Reviews in Environmental Science and Technology*. (Accepted article) (IF= 8.302)
15. S Noor, H Ashraf, M Sultan, **ZM Khan**. 2020. Evaporative Cooling Options for Building Air-Conditioning: A Comprehensive Study for Climatic Conditions of Multan (Pakistan). *Energies*, Vol. 12(11),3061. <https://doi.org/10.3390/en13123061> (IF= 2.702)
16. M Aleem, G Hussain, M Sultan, T Miyazaki, MH Mahmood, MI Sabir, A Nasir, F Shabbir, **ZM Khan**. 2020. Experimental Investigation of Desiccant Dehumidification Cooling System for Climatic Conditions of Multan (Pakistan). *Energies* Vol. 13 (12), 5530. <https://doi.org/10.3390/en13215530> (IF=2.702)
17. MN Ashraf, MH Mahmood, M Sultan\*, N Banaeian, M Usman, SM Ibrahim, MUBU Butt, M Waseem, I Ali, A Shakoor, **ZM Khan**. 2020. Investigation of Input and Output Energy for Wheat Production: A Comprehensive Study for Tehsil Mailsi (Pakistan). *Sustainability*. Volume 12, Issue 17, 6884. <https://doi.org/10.3390/su12176884> (IF=2.576)
18. T Islam, C Peng, I Ali, J Lid, **ZM Khan**, M Sultan, I Naz. 2020. Synthesis of rice husk-derived magnetic biochar through liquefaction to adsorb anionic and cationic dyes from aqueous solutions. *Arabian Journal for Science and Engineering* <https://doi.org/10.1007/s13369-020-04537-z>. (IF= 1.711)

19. A Shakoor, **ZM Khan**, HU Farid, M Sultan, I Ahmad, N Ahmad, (2020) Delineation of regional groundwater vulnerability using DRASTIC model for agricultural application in Pakistan. *Arabian Journal of Geosciences* 13 (4), 1-12.  
(Impact Factor = 1.240)
20. R Ahsen, **ZM Khan**, HU Farid, A Shakoor, Ali, And I. Ali (2020) estimation of cropped area and irrigation water requirement using remote sensing and GIS. *Journal of Animal and Plant Sciences* 30 (4), 876-884.  
(Impact Factor = 0.481)
21. Rana Muhammad Asif Kanwar, **Zahid Mahmood Khan**, Hafiz Umar Farid (2019) Development and Adoption of Wastewater Treatment System for peri-urban Agriculture in Multan, Pakistan. *Water Science and Technology*, 80(8), 1524-1537.  
(Impact Factor = 1.624)
22. Hafiz Umar Farid, **Zahid Mahmood-Khan**, Ijaz Ahmad, Aamir Shakoor, Muhammad Naveed Anjum, Muhammad Mazhar Iqbal, Muhammad Mubeen and Muhammad Asghar (2019) Estimation of infiltration models' parameters and their comparison to simulate the onsite soil infiltration characteristics. *International Journal of Agricultural and Biological Engineering*, 12(3): 84–91.  
(Impact Factor = 1.267)
23. Hafiz Umar Farid, Ijaz Ahmad, Muhammad Naveed Anjum, **Zahid Mahmood Khan**, Muhammad Mazhar Iqbal, Aamir Shakoor, Muhammad Mubeen (2019) Assessing seasonal and long-term changes in groundwater quality due to over-abstraction using geostatistical techniques. *Environmental Earth Sciences*, (2019) 78:386. (Impact Factor = 1.267)
24. Ali, I., Peng, C., Lin, D., Saroj, D.P., Naz, I., **Khan, Z.M.**, Sultan, M. and Ali, M., 2019. Encapsulated green magnetic nanoparticles for the removal of toxic Pb<sup>2+</sup> and Cd<sup>2+</sup> from water: Development, characterization and application. *Journal of Environmental Management*, 234, pp.273-289.  
(Impact Factor = 4.865)
25. Imran Ali Changsheng Peng, **Zahid M. Khan**, Iffat Naz, Muhammad Sultan, Mohsin Ali, Irfan A. Abbasi, Tariqul Islam, Tong Ye (2018) Overview of microbes based fabricated biogenic nanoparticles for water and wastewater treatment. *Journal of Environmental Management*, 15, 128-150 .  
(Impact Factor= 4.005)
26. Ali, Imran, Peng, Changsheng, **Khan, Zahid M.**, Sultan, M., Naz, Iffat. (2018). "Green Synthesis of Phyto-genic Magnetic Nanoparticles and Their Applications in the Adsorptive Removal of Crystal Violet from Aqueous Solution." *Arabian Journal for Science and Engineering*. DOI: 10.1007/s13369-018-3441-6.  
(Impact Factor= 1.092)
27. Qureshi, Waqar M., **Khan, Zahid M.**, Ahmad, F., Shoaib, M., Farid, Umar H., Khan, Alamgir A., Sial, J.K. (2018). "Design and Performance Evaluation of an Indigenously Developed Small-Scale Fish-Oil Extraction Unit; a Solution for Improving Fish Farm Environments." *Pol. J. Environ. Stud.* Vol. 27, No. 6 (2018), 1-8. (Impact Factor= 1.120)
28. Shakoor, A., Arshad, M., Ahmad, R., **Khan, Zahid M.**, Qamar, U., Farid, Umar H., Sultan, M., Ahmad, F. (2018). "Development of Groundwater Flow Model (Modflow) To Simulate The Escalating Groundwater Pumping In The Punjab, Pakistan" *Pak. J. Agri. Sci.*, Vol. 55(3), 635-644.  
(Impact Factor= 0.677)
29. Qamar, U., Azmat, M., Abbas, A., Usman, M., Shahid, Adnan S., **Khan, Zahid M.** (2018). "Water Pricing and Implementation Strategies for the Sustainability of an Irrigation System: A Case Study within the Command Area of the Rakh Branch Canal" *Water* 10(4), 509  
(Impact Factor= 2.069)
30. Ali, Imran, Changsheng, Peng, **Khan, Zahid-Mhamood**, Naz, Iffat, Sultan, Muhammad (2018). "An overview of heavy metal removal from wastewater using magnetotactic bacteria" *Journal of Chemical Technology and Biotechnology*, <https://doi.org/10.1002/jctb.5648>.  
(Impact Factor= 2.587)
31. Shoaib, Muhammad, Asaad Y., Khan, S., Khan, M.M., Sultan, T., B.Melville (2018) "A Comparative Study of Various Hybrid Wavelet Feedforward Neural Network Models for Runoff Forecasting, *Water Resources Management*," 32(1): 83-103.  
(Impact Factor = 2.644)

32. Hafiz U. Farid, Allah Bakhsh, Muhammad U. Ali, **Zahid Mahmood-Khan**, Amir Shakoor, Imran Ali (2018) Field Investigation of Aquifer Storage Recovery (ASR) Technique to Recharge Groundwater- A case study in Punjab Province of Pakistan, *Water Science and Technology-Water Supply*, 18(1):71-83. **(Impact Factor = 0.674)**
33. Muhammad Sultan, Takahiko Miyazaki, Shigeru Koyama, **Zahid M. Khan** (2018) "Performance Evaluation of Hydrophilic Organic Polymer Sorbents for Desiccant Air-Conditioning Applications", *Adsorption Science & Technology*, 2018, 36(1-2):311-326. **(Impact Factor = 0.609)**
34. Imran Ali, Changsheng Peng, **Zahid M. Khan**, Muhammad Sultan, Iffat Naz, Mohsin Ali, Hafiz U. Farid, Muhammad H. Mahmood, Rameez Ahsen (2018) "Removal of Crystal Violet and Eriochrome Black T dyes from Aqueous Solutions by Magnetic Nanoparticles Biosynthesized from Leaves Extract of *Fraxinus Chinensis* Roxb", *Polish Journal of Environmental Studies* **(Impact Factor = 1.120)**
35. Shoaib, M., Shamseldin, A.Y., Khan, S., Khan, M.M., **Khan, Zahid M.** & Melville, B.W. (2018) A wavelet based approach for combining the outputs of different rainfall-runoff models. *Stochastic Environmental Research and Risk Assessment*. 32 (1), 155–168. DOI: 10.1007/s00477-016-1364-x. **(Impact Factor = 2..668)**
36. Ali, Imran, Changsheng Peng, **Zahid M. Khan**, and Iffat Naz. (2017) Yield cultivation of magnetotactic bacteria and magnetosomes: A review, *Journal of basic microbiology*, 2017, 57(8):643-652. **(Impact Factor =1.580)**
37. Aamir Shakoor, **Zahid Mahmood Khan**, Muhammad Arshad, Hafiz Umar Farid, Muhammad Sultan, Muhammad Azmat, Muhammad Adnan Shahid and Zafar Hussain (2017) Regional groundwater quality management through hydrogeological modeling in LCC (West) Faisalabad Pakistan, *Journal of Chemistry*, 2017, 1-16. **(Impact Factor = 1.726)**
38. Imran Ali, Changsheng Peng, Iffat Naz, **Zahid M. Khan**, Muhammad Sultan, Tariqul Islam, Irfan A. Abbasi (2017) Phytogenic Magnetic Nanoparticles for Wastewater Treatment: A Review, *RSC Advances*, 2017, 7(64):40158-78. **(Impact Factor = 2.936)**
39. Mian M. A. Aslam, **Zahid M. Khan**, Muhammad Sultan, Yasir Niaz, Muhammad H. Mahmood, Muhammad Shoaib, Aamir Shakoor, Maqbool Ahmad (2017) Performance Evaluation of Trickling Filter-Based Wastewater Treatment System utilizing Cotton Sticks as Filter Media, *Polish Journal of Environmental Studies*, 2017, 26(5) 1955-1962. **(Impact Factor = 1.120)**
40. Hafiz Farid, **Zahid Mahmood-Khan**, Akhtar Ali, Muhammad Naveed Anjum, Muhammad Mubeen (2017) Site-Specific Aquifer Characterization and Identification of Groundwater Potential Areas in District Rahim Yar Khan, Pakistan, *Polish Journal of Environmental Studies*, 26(1):17-27. **(Impact Factor = 1.120)**
41. Imran Ali, **Zahid M. Khan**, Changsheng Peng, Iffat Naz, Muhammad Sultan, Mohsin Ali, Muhammad H. Mahmood, Yasir Niaz (2017) Identification and Elucidation of the Designing and Operational Issues of Trickling Filter Systems for Wastewater Treatment, *Polish Journal of Environmental Studies*, 2017, 26(6):2431-2444. **(Impact Factor = 1.120)**
42. Imran Ali, **Zahid Mahmood-Khan**, Muhammad Sultan, Muhammad H. Mahmood, Hafiz U. Farid, Mohsin Ali, Abdul Nasir (2016) Experimental Study on Maize Cob Trickling Filter based Wastewater Treatment System: Design, Development and Performance Evaluation, *Polish Journal of Environmental Studies*, 25(6): 2265-2273. **(Impact Factor = 1.120)**
43. Farid, H. U., Bakhsh, A., Ahmad, N., A. Ahmad, **Mahmood-Khan, Z.** (2016). "Delineating Site-Specific Management Zones for Precision Agriculture". *Journal of Agricultural Science*. Cambridge University Press UK 05/2015; DOI: 10.1017/S0021859615000143. 5(2015): 154(02) 273-286. **(Impact Factor = 1.186)**
44. **Khan, Zahid.**, Hall, E., and Khan, M. (2014). "Role of Secondary Sludge in the Removal of Phytosterols during Secondary Wastewater Treatment." *Journal of Environmental Engineering*, American Society of Civil Engineers. USA. DOI. 10.1061/(ASCE)EE.1943-7870.0000908 ISSN 0733-9372 E-ISSN 1943-7870. 141(5): 1-9 on-line

(Impact Factor = 1.396)

45. H Ali, N Iqbal, AN Shahzad, S Ahmed, **Zahid Mahmood Khan**, N Sarwar. (2014). "Agro-Management Practices for Sustainable Wheat Production Under Scarce Water Condition of Arid Climate" Turkish Journal of Field Crops. 19 (1): 70-78. (Impact Factor = 0.689)
46. **Mahmood-Khan Zahid** and Eric R. Hall. (2013). "Biological removal of phytosterols in pulp mill effluents." Journal of Environmental Management. 131: 407-414 (Impact Factor = 4.005)
47. **Mahmood-Khan Zahid** and Eric R. Hall. (2012). "Removal of individual sterols during secondary treatment of pulp mill effluents." Water Quality Research Journal of Canada. IWA publishing. 47(1):56-65. (Impact Factor = 0.556)
48. Siddique Maria, Farooq Rubina, **Mahmood Khan Zahid**, Khan Zarsher, and Shaukat S. F. (2011). "Enhanced decomposition of reactive blue 19 dye in ultrasound assisted electrochemical reactor", Ultrasonics Sonochemistry. 18: 190-196. (Impact Factor = 6.012)
49. Malik Amir Haider, Nasreen Sadia, Mahmood Qaisar, **Mahmood Khan Zahid**, Sarwar Rizwana, Jilani Ghulam, Bhatti Zulfiqar Ahmed, and Khan Afsar. (2010). "Strategies for low-cost water deflouridation of drinking water - a review of progress", Journal of the Chemical Society of Pakistan. (ISSN 0253-5106.) 32 (4): 550-558. (Impact Factor = 0.280)
50. Shah Sajid Hussain, **Mahmood Khan Zahid**, Raja Iftekhar Ahmad, Mahmood Qaisar, Bhatti Zulfiqar Ahmed, Khan Jamil, Farooq Ather, Rashid Naim, and Wu Donglei. (2010). "Low temperature conversion of plastic waste into light hydrocarbons", Journal of Hazardous Materials, 179: 15-20. (Impact Factor = 6.434)
51. Malik Amir Haider, **Mahmood Khan Zahid**, Mahmood Qaisar, Nasreen Sadia, and Bhatti Zulfiqar Ahmed. (2009). "Perspectives of low-cost Arsenic remediation of drinking water in Pakistan and other countries", Journal of Hazardous Materials, 168: 1-12. (Impact Factor = 6.434)
52. **Mahmood-Khan Zahid** and Hall E. R. (2008). "Quantification of Plant Sterols in Pulp and Paper Mill Effluents". Water Quality Research Journal of Canada. Vol. 43 No. 2-3: 173-181. (Impact Factor = 0.556)

## B-Other Journals

1. Hafiz Umar Farid, Muhammad Zubair, **Zahid Mahmood Khan**, Aamir Shakoor, Behzad Mustafai, Aftab Ahmad Khan, Muhamad Naveed Anjum, Ijaz Ahmad and Muhammad Mubeen (2019) Identification of Influencing Factors for Optimal Adoptability of High Efficiency Irrigation System (HEIS) in Punjab, Pakistan. Sarhad Journal of Agriculture, 35(2): 539-549. HEC X category
2. Sultan, M., Miyazaki, T., Mahmood, H.M., **Khan, Z.M.** (2018). "Solar assisted evaporative cooling based passive air-conditioning system for agricultural and livestock applications" Journal of Engineering Science and Technology 13(3):693-703 (HEC Recognized Journal-ISI Master List)
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67. Awais, H.M, M. Arshad, A. Shakoor, Z. Mahmood, H.U. Faid: Delineation of Spatio-Temporal Fluctuation in Groundwater Level and Its Impact on Tubewell Energy Nexus. International Workshop on Renewable Energy Technologies for Community Development in Pakistan, University of Agriculture Faisalabad, Pakistan & University of Kassel, Germany; [ISBN: 978-969-9035-11-1] 11/2015
68. Muhammad Sultan, Muhammad Hamid Mahmood, Takahiko Miyazaki, Shigeru Koyama, **Zahid Mahmood-Khan**, Abdul Nasir: Role of organic polymer sorbents in desiccant air-conditioning: Characterization of sorption properties and dynamic simulation. International Workshop on Renewable Energy Technologies for Community Development in Pakistan, University of Agriculture, Faisalabad, Pakistan; 11/2015
69. Muhammad Sultan, Muhammad Hamid Mahmood, Takahiko Miyazaki, Shigeru Koyama, **Zahid Mahmood-Khan**, Faizan Majeed: Desiccant air-conditioning for agricultural greenhouses –Role of solid adsorbents. International Workshop on Renewable Energy Technologies for Community Development in Pakistan, University of Agriculture, Faisalabad, Pakistan; 11/2015
70. Engr. Rameez Ahsen, **Zahid Mahmood-Khan**, Dr. Hafiz Umar Farid, Engr. Muhammad Hamid Mahmood, Engr. Muhammad Zubair, Engr. Imran Ali (2014) “Innovative Management of Land & Water Resources through Satellite Imagery and Current Land-Use Land-Cover Mapping of Multan Region” Paper Presented & Printed in Proceedings of the 1<sup>st</sup> Young International Engineers Convention (FYIEC-2014) on 18-20 April 2014 at University of Engineering and Technology (UET), Lahore Pakistan: p 185
71. Engr. Muhammad Zubair, **Zahid Mahmood-Khan**, Dr. Hafiz Umar Farid, Engr. Muhammad Hamid Mahmood, Engr. Rameez Ahsen and Engr. ImranAli (2014) “Calibration of TRMM Satellite Rainfall Data Using Actual Rainfall Rain Gauge Data of Punjab, Pakistan” Paper Presented & Printed in Proceedings of the 1<sup>st</sup> Young International Engineers Convention (FYIEC-2014) on 18-20 April 2014 at University of Engineering and Technology (UET), Lahore Pakistan: p 184



72. **Mahmood-Khan, Zahid** and Khan, Musharib. (2013). "Climate Change and Our Priorities" an article published in **Daily Pakistan Observer** on December 20, 2013.
73. Khan Musharib and **Mahmood-Khan, Zahid**. (2013). "Multimedia Environmental Problems" an article published in **Daily Times** on February 28, 2013.
74. Muhammad Shahid Rafiq, **Zahid Mahmood Khan**, Hafiz Umar Farid, Muhammad Hamid Mahmood, Mohsin Ali, Musharib Khan, Imran Ali and Jehangir Khan Sial. (2013). Pelletization of organic solid wastes for reuse in agricultural lands. September 23-25, 2013. Proceedings of the FEIIC 5<sup>th</sup> World Engineering Congress 2013, Islamabad, Pakistan.
75. Imran Ali, **Zahid Mahmood Khan**, Muhammad Hamid Mahmood, Musharib Khan & Mohsin Ali. (2013). Resolving trickling filter operational issues-I: Effect of temperature and organic loadings on indigenous media (maize cobs) trickling filter. September 23-25, 2013. Proceedings of the FEIIC 5<sup>th</sup> World Engineering Congress 2013, Islamabad, Pakistan.
76. Imran Ali, **Zahid Mahmood-Khan**, Muhammad Hamid Mahmood, Musharib Khan and Mohsin Ali. (2013). Use of Farm Waste Material (Maize Cobs) for Wastewater Treatment and Reuse. Environmentally Sustainable Development, 5<sup>th</sup> **International Conference** held on August 25-27, 2013, COMSATS Institute of Information Technology Abbottabad (Pakistan).
77. Musharib Khan, **Zahid Mahmood-Khan**, Muhammad Hamid Mahmood and Imran Ali. (2013). Development and Evaluation of a Low-Cost Aeration System for Wastewater with Zero Operational Costs. Environmentally Sustainable Development, 5<sup>th</sup> **International Conference** held on August 25-27, 2013, COMSATS Institute of Information Technology Abbottabad (Pakistan).
78. Mohsin Ali, **Zahid Mahmood-Khan**, Muhammad Hamid Mahmood, Hafiz Shahid Rafiq, Musharib Khan and Imran Ali. (2013). Treatment of Organic Solid Waste for Beneficial Reuse: A Step Towards Zero Waste. Environmentally Sustainable Development, 5<sup>th</sup> **International Conference** held on August 25-27, 2013, COMSATS Institute of Information Technology Abbottabad (Pakistan).
79. **Mahmood Khan, Zahid.**, Eric R. Hall, Jehangir Khan Sial and Musharib Khan. (2012). "Lab Scale Biological Treatment of Pulp Mill Effluent Sterols. (April 2012). **International Conference** on Water, Environment & Energy Nexus. CEWRE, University of Engineering and Technology, Lahore. ISBN 978-979-8670-05-4.
80. **Mahmood Khan, Zahid.**, Shoib, Muhammad., Sial, Jehangir Khan., and Rana, M Asghar. (2010). "Environment in Agriculture", **International Science Conference** on Utilization of Modern Agriculture Technology in Changing Environmental Perspectives. July 21-23, 2010. Faculty of Agriculture, Rawalakot. The University of Azad Jammu & Kashmir. Rawalakot, AJ&K, Pakistan. pp: 248.
81. **Mahmood Khan Z., (Assist Ed.)** (2009). **Environmentally Sustainable Development III. Volume: 1.** Environmental Sciences Department, COMSATS Institute of Information Technology, Abbottabad. Pakistan. (2009) pp:1– 353.
82. **Mahmood Khan Z., (Assist Ed.)** (2009). **Environmentally Sustainable Development III. Volume: 2.** Environmental Sciences Department COMSATS Institute of Information Technology Abbottabad Pakistan. (2009) pp:355–893.
83. **Mahmood Khan, Zahid.**, Inam, Muhammad Azhar., and Shoib, Muhammad. (2009). "Nitrate-Nitrogen Management for Groundwater Quality". Proceedings of the 1<sup>st</sup> **International Conference**

on Energy and Environment: Role of Energy Resources in Sustainability of Environment. February 26-28, 2009. Energy & Environ. Engineering Department, Quaid-e-Awam University of Engineering Science & Technology, NawabShah -47480, Sindh, Pakistan pp: 223-229.

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92. **Mahmood-Khan, Zahid**, and Hall, Eric. (2004). "Treatment and Control of Phytosterols: Potential EDCs in PPMEs". Presented at the Annual Graduate Scholars Competition, Pulp and Paper Research Centre, Vancouver, BC, Canada. October 1, 2004.
93. **Mahmood-Khan, Zahid.** (2003). "Lulu Island WWTP Secondary Treatment Process Model". Presented to Regional Utility Planning, Policy & Planning Department, Greater Vancouver Regional District, Burnaby, BC, Canada. May 21, 2003.
94. **Mahmood-Khan, Zahid.** (2002). "Modelling for Wastewater Treatment: GPS-X WWTP Process Models for Regional Municipal Utilities". Presented to Regional Utility Planning Division, Policy &

Planning Department, Greater Vancouver Regional District (GVRD), Burnaby, BC, Canada. October 03-04, 2002.

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## **PUBLISHED REPORTS & MANUALS**

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96. **Mahmood-Khan, Zahid**. (2009). "Digestion of Waste Poly-Bags: Clean Energy For Green Environment" a 1-day Seminar on **Clean Energy and Green Environment Theme** sponsored by Environment Protection Department at Multan Chamber of Commerce & Industry. April 16, 2009. , Government of Punjab, Environment Protection Department, Multan.
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98. **Mahmood-Khan, Zahid**, and Hall, Eric. (1999) "Naturally Occurring Endocrine Disrupting Chemicals (EDCs) in Industrial Wastewaters". The Watermark, BC Water & Waste Association, Canada.
99. **Mahmood-Khan Zahid**, and Hall Eric. (2002). "Quantification of Plant Sterols in Pulp and Paper Mill Effluents". PAPRICAN (Pulp & Paper Research Institute Canada) University Report (Part-I). McGill, UBC & École Polytechnique, Canada. PUR 791 pp: 1-20.
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## **RESEARCH PROJECTS**

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101. **Research Grant" of Rs. 4.575 M** from Higher Education Commission (HEC) of Pakistan under research project titled: "Development and Adoption of Wastewater Treatment Technologies for Safe Re-Use of Municipal Wastewater and Associated Bio-Solids in Multan region".
102. **Member Implementation & Monitoring "European Commission Participatory Solid Waste Management Project" for Bagh District, A J&K, Pakistan (Apr 2007 – Aug 2008)**: Member for monitoring & implementation of the European Commission "Participatory type Municipal Solid Waste Management Project for Bagh Town, A J&K, Pakistan". Project duration April 2007 to August 2008. Funds 0.6 Million Euro provided by European Commission in coordination with PIN (People in Need). Czek Republic, International NGO; Technical University of Braunschweig (TUB), Germany; ResCate (Spanish NGO); Lok Parya, NGO Pakistan; COMSATS IIT, Abbottabad and Bagh District Municipality A J&K, Pakistan.
103. Dr. Aamir Shakoor (PI) and **Dr. Zahid Mahmood Khan** (Co-PI) "Groundwater Vulnerability Mapping Using GIS Based DRASTIC Model" Funded by HEC. (PKR 0.340 million)
104. Project funded by BZU titled "Lab Scale Evaluation of Different Agricultural Wastes for Wastewater Treatment Application".

105. Dr. Hafiz Umar Farid (PI) and **Dr. Zahid Mahmood Khan** (Co-PI) “Precise Soil Nutrient Management Using Hand Held Sensor Measurements and Crop Yield Mapping” Research Grant Awarded by the Higher Education Comm. Pakistan (2018). Rs. 2.392 Million

## BOOK CHAPTERS

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106. Hafiz Umar Farid, Zahid Mahmood Khan, Aamir Shakoor, Muhammad Mubeen, Hafiz Usman Ayub, Rana Muhammad Asif Kanwar, Muhammad Bilal 2022. Water Resources in Relation to Climate Change. In: Jatoi W.N., Mubeen M., Ahmad A., Cheema M.A., Lin Z., Hashmi M.Z. (eds) Building Climate Resilience in Agriculture. Springer, Cham. [https://doi.org/10.1007/978-3-030-79408-8\\_10](https://doi.org/10.1007/978-3-030-79408-8_10)

107. Applied Irrigation Engineering published by UAF

108. Tariqul Islam, Ali, I., Changsheng Peng, Iffat Naz, ZM Khan, Muhammad Ahsan Amjed, 2019. Bio-Nanocomposites for Wastewater Treatment. Published by Elsevier, under “Aquananotechnology Applications in Ecosystems” series. <https://doi.org/10.1016/B978-0-12-821141-0.00008-2>

109. Imran Ali, Iffat Naz, Changsheng Peng, Kamel A. Abd-Elsalam, Zahid M. Khan, Tariqul Islam, Rashid Pervezi, Muhammad Ahsan Amjed, Aafia Tehrima, Irum Perveenj, and Shama Sehar. (2021) Sources, classifications, constituents, and available treatment technologies for various types of wastewaters: An overview. 1st Aquananotechnology, 2021 Elsevier Inc. <https://doi.org/10.1016/B978-0-12-821141-0.00019-7>

## Ph.D. Students Thesis Completed as a Major Supervisor

Sr.	Name	Thesis Title	Year
1	Rana Muhammad Asif Kanwar	Wastewater Treatment for Peri-Urban Agriculture using Hybrid Trickling Filter, Rana	2022
2	Qureshi, M.W.G.	Design and development of Indigenous system for Extraction of Oil from Fish Waste	2020

## M.Sc. Students Thesis Completed as a Major Supervisor

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### ➤ M.Sc. (Hons.) Agricultural Engineering

Sr.	Name	Thesis Title	Year
1	Engr. Muhammad Asif	Numerical Simulation of Membrane-Based Energy Recovery Ventilators for Air-Conditioning Application,	2022
2	Engr. Arsalan Tahir	Operational Optimization of Trickling Filter of Wastewater Treatment Plant	2021
3	Engr. H. Abdul Rehman Ali	Comparative Evaluation for Option of Chemical Disinfection of Secondary Effluent	2021

4	Engr. Sajjad Rasool	Laundry effluent characterization and treatment using Electrocoagulation	2019
5	Engr. Shahzeb	Grey water characterization and treatment using chemical coagulation	2019
6	Engr. Hassan Raza	Analysis of Methane production process by different sludges during anaerobic digestion	2019
7	Engr. Adnan Khalid	Tertiary wastewater treatment using filtration techniques	2019
8	Engr. Fahad	Application of agricultural waste material as low-cost adsorbent for water pollution control	2018
9	Engr. Ameer	Low energy aeration system for pre-treatment of wastewater	2018
10	Engr. Arshad	Lab scale evaluation of different agricultural waste materials for wastewater treatment application	2018
11	Engr. Waqas	Disinfection options for trickling filter effluent	2018
12	Engr. Ali Umar	The selection of tillage and planting systems for crop productivity enhancement in Multan region	2017
13	Engr. Iqbal	Adaptability of mechanized Maize picking in Pakistan	2017
14	Engr. Asif	Characterization of regional wastewater for potential reuse at farm in Multan, Pakistan	2016
15	Engr. Saeed	Management and design strategies for effective irrigation in Punjab, Pakistan	2016
16	Uzair Ahmad Sial	Ground Water Management in an agro Basic environment of Multan using GIS and Resistivity survey Techniques	2016
17	Engr. Arsalan	Performance variation & media degradation in the developed maize cob trickling filter wastewater treatment system	2014
18	Engr. Ahson	Use of cotton sticks as biogenic support material in trickling filter for municipal wastewater treatment	2014
19	Engr. Maqbol	Biological Nitrogen Removal from Municipal Wastewater Using Developed Trickling Filter	2014
20	Engr. Waqas	Composite indigenous sand filter water treatment system for onsite decontamination of waste	2014
21	Engr. Musharib	Development of a simple cascade system integrated with a settler for domestic wastewater treatment	2013
22	Engr. Hamid	Spatial assessment of groundwater quality of Multan Pakistan using GIS	2013
23	Engr. Zubair	Assessment of wheat and rice yield using calibrated satellite rainfall data in crop models	2013
24	Engr. Imran	Development and testing of trickling filter system for secondary treatment of domestic wastewater using indigenous filter media (Maize cobs) agricultural waste	2013
25	Engr. Mohsin	Characterization of treated & pelletized organic waste (sewage sludge & farm yard manure) for farm soil conditioning	2013
26	Engr. Rabia	Effectiveness of film-hole and conventional irrigation for cotton under flat sowing using different tillage practices	2013

27	Engr. Rameez	Seasonal estimation of cropped area and resulting irrigation requirement of Multan district using remote sensing /GIS	2013
28	Engr. Akhtar	Water productivity of transplanted rice under raised-beds and conventional farming	2013
29	Engr. Shahid	Preparation and testing of composted and pelletized Bio fertilizer using sugar press mud and poultry waste	2013

➤ **MS Environmental Science**

Sr.	Name	Thesis Title	Year
1	Sajid Shah	Conversion of waste plastic poly-bags into light hydrocarbons through pyrolytic technology	2008
2	Nada Mushtaq	Generation and collection of hospital solid waste at Ayub Medical Complex, Abbottabad, Pakistan	2008
3	Faiqa Masood	Hospital solid waste incineration and disposal at Ayub Medical Complex, Abbottabad, Pakistan	2008
4	Muhammad Awais Khan	Solid waste management approach in Nathia Gali, NWFP, Pakistan	2008

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**Ph.D./M.Sc. Students Thesis Completed as a Committee Member**

Sr.	Name	Thesis Title	Year
1	Maria Siddique	Development of an Industrial Wastewater Treatment System for Textile Industry Effluents (PhD)	2011
2	Zulfiqar A Bhatti	Sequential Two Stage Advanced Oxidation Process and Anaerobic Sludge Blanket as Low Cost Municipal Wastewater Treatment. (PhD)	2011
3	Farhana Maqbool	Quantification of the impact of solid waste disposal on the physico-chemical and microbiological water quality of Salhad Stream, South Abbottabad, Pakistan. (MS)	2008
4	Asim Yaqoob	Recovery of heavy metals by sono-electrolysis process (MS)	2008
5	Maria Siddique	Degradation and decolourization of reactive blue 19 dye. (MS)	2008

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1. **Supervisor BSc Agri Engineering Final Year Project & Report I (AENG 601) Completed (Jan 2009).** Shafqat Mannan & M Haseeb. *"BZU Wastewater Characterization"* Jan. 2009. Agri. Engineering BZU, Multan. 2009. pp: 30.

2. **Supervisor BSc Agri Engineering Final Year Project & Report I (AENG 601) Completed (Jan 2009).** Muhammad Faheem Amin & Muhammad Adnan Malik. "Design of Drip Irrigation System", Jan. 2009. Agri. Engineering BZU, Multan. 2009. pp: 35.
3. **Supervisor BSc Agri Engineering Final Year Project & Report I (AENG 601) Completed (Feb 2009).** Umair Illahi & Sohail Mumtaz. "Surface Water Quality Monitoring" Feb. 2009. Agri. Engineering. BZU, Multan. 2009. pp: 22.
4. **Supervisor BSc Agri Engineering Final Year Project & Report I (AENG 601) Completed (Feb 2009).** Faisal Mushtaq & Saqib Gill. "Groundwater Quality Monitoring" Feb. 2009. Agri. Engineering. BZU, Multan. 2009. pp: 30.
5. **Supervisor BSc Agri Engineering Final Year Project & Report II (AENG 602) Completed (Jun 2009).** Sohail Mumtaz, Muhammad, Umair Illahi, Muhammad Haseeb, Faheem Amin, Muhammad Adnan Malik & Shafqat Mannan. "Development of a Solar Water Heater using Indigenous Materials". Jun. 2009. Agri. Engineering. BZU, Multan. 2009. pp: 40.
6. **Supervisor BSc Agri Engineering Final Year Internship & Survey Camp (AENG 402) Completed (Jun 2010).** Asmar Habib, Numan Waheed, Abid Saleem & Waseem Ghani. "Pressurized Irrigation Systems: Drip, Sprinkler & Landscape Systems Design Installation & Marketing" Jun. 2010. Agri. Engineering. BZU, Multan. 2009. pp: 30.

## **PROFESSIONAL EXPERIENCE & EMPLOYMENT RECORD** \_\_\_\_\_

**PROFESSOR (Tenured): (JAN 23 - TO DATE)**

**PROFESSOR (Tenured) and Chairman: (OCT 19 - DEC 22)**

**ASSOCIATE PROFESSOR (Tenured) and Chairman: (MAR 15 - Oct 19)**

**ASSISTANT PROFESSOR (Tenured): (MAY 14 - MAR 15) and HOD (JUL 12 - MAR 15)**

**ASSISTANT PROFESSOR (TTS): (MAY 08 - MAY 14)**

*Department of Agricultural Engineering, Faculty of Agricultural Sciences & Technology. Bahauddin Zakariya University, Multan, Pakistan*

Taught Agricultural & Environmental Engineering courses to undergraduate and graduate classes. Assisted in establishing laboratories for the newly developing Agricultural Engineering Department and actively contributed for getting the BSc Agri. Engineering Degree program accreditation by the Pakistan Engineering Council, Islamabad. Started preparing research proposals for assessing surface & ground water quality in order to investigate low cost options for water/wastewater treatment that are particularly suited for regional needs. Supervised final year engineering students projects and reports. Reviewed undergraduate program and courses for the department and contributed in the development of undergraduate and graduate syllabi as well as launching of the departmental graduate program.

### **Courses Offered:**

**SEE-203** Environmental Engineering

**SEE-605** Environmental Management Systems  
in Industry

**I&D-204** Water Quality Engineering

**SEE-706** Biological Wastewater Treatment

- |   |  |
|---|--|
| <b>SEE-302</b> Industrial Pollution and its Control | <b>SEE-701</b> Physico-Chemical Treatment Processes for W/WW Treatment |
| <b>SEE-501</b> Water Supply and Sewerage            | <b>SEE-504</b> Farm Waste Disposal Systems                             |

**ASSISTANT PROFESSOR: (MAY 06 – MAY 08)**

*Environmental Sciences Department, COMSATS Institute of Information Technology, Abbottabad (HEC Appointed Assistant Professor under PPSAP program Jul 06 - Jun 07 at CIIT, Abbottabad)*

Conducted research in Municipal Wastewater Treatment, Solid Waste Management and Waste to Energy areas. Taught Environmental Science & Engineering courses to undergraduate & MS/PhD students. Arranged conferences and coordinated seminars regarding Environmental Issues particularly relating to water, solid waste and energy. Actively served in the Graduate Advisory Committee, Faculty Selection Committees, and the Board of Studies Meetings. Acted as Departmental Graduate Coordinator. Served as expert coordinating member in the *European Commission Funded* regional rehabilitation project for participatory Solid Waste Management in earthquake damaged Bagh District, A J&K. Supervised MS/PhD scholars' and undergraduate students' research projects/thesis. Reviewed and revised undergraduate and graduate courses for the department.

**Courses Offered:**

- |  |   |
|--|---|
| <b>ENV-351</b> Environmental Management Systems            | <b>ENV-342</b> Energy Sources & Technology            |
| <b>ENV-455/507</b> Research Methodologies in Env. Sciences | <b>ENV-631</b> Municipal & Hazardous Waste Management |
| <b>CIVL-407</b> Municipal & Sanitary Engineering           | <b>ENV-622</b> Wastewater Treatment                   |
| <b>ENV-503</b> Environment & Development                   |   |

**POST-DOCTORATE PROJECT ENGINEER (APR 05 – APR 06)**

*Department of Civil & Environmental Engineering, University of Waterloo, Ontario, Canada*

Implemented Anaerobic Sludge Digestion Project: a joint venture among Civil Engg. University of Waterloo, Canada, EnviroSim Ltd. Ontario, Canada and Washington DC WASA, USA. Evaluated anaerobic & aerobic digestibility of primary & secondary waste activated sludge from different Southern Ontario municipalities. Developed & conducted lab-scale anaerobic digestion experiments for analyzing digester performance, treatment capacity and calibration of sludge digestion models. Developed & modified different analytical protocols for characterizing municipal sludge and identifying the biodegradable and non-biodegradable solids for predicting the extent of sludge digestion/stabilization that can be attained. Helped in establishing the Departmental Environmental Eng. Laboratory, set up several instruments including Gas Chromatographs, flow-injection analyzer, TKN digestion apparatus & protocols, production, measurement & analysis of biogas. Supervised undergraduate & co-op students' environmental eng. research projects/thesis.

**INDUSTRIAL RESEARCH ASSISTANT: (Aug 03–MAR 05)**

*The Pulp & Paper Research Centre, University of British Columbia, Vancouver, BC, Canada*



Evaluated the performance of full-scale UNOX-AST treatment facilities at two British Columbia coastal pulp & paper mills. Designed & operated small-scale secondary wastewater treatment systems. Analyzed & monitored treatment capacity of specific pollutants. Conducted contaminant mass balances across the treatment systems. Examined specific organic contaminants' biodegradation & adsorption to activated sludge. Modified & developed analytical & treatment protocols for potential *Endocrine Disrupting Chemicals (EDCs)* from industrial effluents/ wastewaters. Planned & conducted iso-thermal adsorption experiments to study the bio-adsorptive capacities & behavior of organic pollutants like plant sterols in pulp and paper mill effluents, using inactivated biomass as an adsorbent.

**ASSISTANT PROJECT ENGINEER (FOR BRITISH COLUMBIA REGIONAL WASTEWATER TREATMENT PLANTS): (APR 02–JUL 03)**

*Regional Utility Planning, Policy & Planning Department, Greater Vancouver Regional District (GVRD), Burnaby, British Columbia, Canada*

Evaluated Municipal wastewater treatment systems under different loads & operational conditions. Reviewed preliminary & detailed design stages against the existing & expected operating conditions. Oversaw the performance of Greater Vancouver Regional District's Wastewater Treatment Plants. Investigated system bottlenecks through current & historical plant data analyses, population growth & site inspections. Analyzed process-train critical components to meet not-to-exceed Provincial Pollutant Release Permits. Developed & calibrated simulation models using GPS-X Wastewater Treatment Process Computer Model. Performed process optimization, capacity re-rating & de-bottlenecking for different modes of treatment plant operation. Assessed future expansion needs of regional municipal utilities for particular component upgrade & capital planning.

**TEACHING & RESEARCH ASSISTANT: (SEP 97–MAR 02)**

*Civil Engineering Department (Env. Labs.) University of British Columbia, Vancouver, BC, Canada*

Delivered lectures to Civil and Environmental Engineering Undergraduate & Graduate Classes. Served as Laboratory Instructor to Municipal/Sanitary Engineering students and evaluated Project Reports. Coordinated & conducted environmental sampling, sample preservation and analysis of water, wastewater & sludge samples for general & specific contaminants. Evaluated treatment systems & conducted batch testing for treatment system design & modifications. Studied applied laboratory instrumentation and performed environmental data analysis.

**LIBRARY ASSISTANT (PART-TIME) & COURSE WORK FOR M. E. CIVIL ENGG: (DEC 95–AUG 97)**

*Science & Engineering Main Library & Civil Engineering, University of British Columbia, Canada*

Mainly busy taking courses for Master of Civil Engineering at the University of British Columbia. Additionally, served as an Assistant Librarian on part-time basis at the Science & Engineering Main Library, University of British Columbia, Vancouver, BC. Provided circulation services at the Main Library to the university students, researchers and faculty members, searched different Science & Engg library data-bases for research articles, reviews & books. Maintained on-line library records and extensively used different library management computer systems for electronic data-bases' access and periodic updates.

## **RESEARCH FELLOW: (OCT 93–JUN 95)**

***Basic (Structures & Environmental) Engineering Department, University of Agriculture, Faisalabad, Pakistan***

Conducted field investigations to study the effect of fertilizer application (half split & full conventional) on NO<sub>3</sub>-N leaching under different soil tillage (sweep cultivator & chisel plow, followed by disc harrow) and irrigation levels (light-frequent 5 cm x 6, heavy-sporadic 10 cm x 4) using split plot randomized complete block design RCBD. Modified the design, coordinated local manufacturing and installed the sub-surface soil water sampling porous-cup devices. The devices were successfully used for sub-surface monitoring of fertilizer leaching in 24 field installations. Management practices for soil tillage, irrigation & fertilizer applications were recommended to significantly reduce NO<sub>3</sub>-N leaching and minimize the risk of subsurface & ground water nutrient pollution.

## **ASSISTANT ENGINEER (PRODUCTION & OPERATIONS): (FEB 91–SEP 93)**

***International Hosiery Factory, Faisalabad, Pakistan***

Supervised technical staff including machine operator technicians, production design master technicians and production operations of the mills and assisted in general repair & maintenance of different machinery. Coordinated production design changes & improvements according to clients' needs and prevailing market demands. Contributed in filling challenging date & quota sensitive orders. Other duties included inventory control, machine workload planning, work distribution and work-related travelling.

## **GRADUATE LEVEL COURSES COMPLETED**

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- Physical-Chemical Treatment Processes for Water & Wastewater
- Transport & Mixing of Pollutants in Aquatic Systems
- Advanced Open Channel Hydraulics
- Advanced Environmental Contaminant Analysis Laboratory
- Water-logging & Salinity Control
- Environmental Resources & Watershed Management
- Water Supply Engineering
- Design of Drainage Projects
- Soil Contamination & Remediation
- Computer Programming for Engineers
- Instruction Skills Workshop
- Biological Waste Treatment
- Environmental Hydraulics
- Air Pollution Control
- Advanced Fluid Mechanics
- Sanitary Engineering Laboratory
- Advanced Hydrology
- Irrigation & Drainage Engineering
- Soil Physics & Soil Mechanics
- Theory of Models
- Operations Research
- Experimental Statistics

## **TEACHING INTERESTS**

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- Unit Operations & Processes in Environmental Engineering
- (Municipal, Agri., Ind. & Hazardous) Solid Waste Management
- Advanced Contaminant Analysis Lab.
- Soil Contamination & Site Remediation
- Biological Wastewater Treatment
- Sludge Digestion Processes
- Irrigation & Drainage Engineering
- Water-logging & Salinity Control

- Research Methodologies in Environmental Engineering
- Energy Resources Utilization & Technology
- Farm Biogas Generation
- Environmental Management Systems in industry
- Low cost options for Water & Wastewater Treatment

## TEACHING OBJECTIVES

Zahid Mahmood Khan

Teaching is a noble and challenging profession with great responsibility. My main career goals include becoming **a good teacher and a committed researcher** to extend knowledge and pass it on to the students, other professionals and stakeholders in industry. I am interested to teach fundamental courses in Environmental Engineering and Energy Utilization including: physicochemical unit operations & processes for water & wastewater treatment, biological waste treatment, alternate energy resources, biogas production, digester control, and Environmental Management both at undergraduate & graduate levels. I intend to develop & teach undergraduate courses in Pollution Control & Environmental Management particularly relating to Liquid & Solid Waste Management & Treatment and Energy Resources Utilization. At graduate level, I am interested to develop Industrial Waste Management & Treatment, Alternate Energy and Contaminant Analysis Laboratory courses.

In conveying my teaching duties, I want to learn and benefit from experienced senior faculty and colleagues. I want to organize and structure teaching materials and manage the classroom environment to make it best suited for students' learning and concept development in an interactive manner. I intend to facilitate students for developing their insight and perspective through actively involving them in thinking processes to improve their understanding and prepare them for application of the delivered knowledge in field situations. I want to vary teaching techniques to improve teaching as well as learning by increasing students' participation through a combination of lectures, discussions, demonstrations, presentations and class activities. I want to promote students to build their confidence, boost problem solving skills, develop innovative approach and discover new knowledge as all this is the core of engineering and applied sciences education.

Environmental engineering especially involves the interactions of physical, chemical and biological components of our gas, liquid, solid and esthetic environment in correlation with community and receiving environment health.

My professional experience both as a field engineer and researcher with different national and international engineering firms as well as my teaching at various universities has prepared me and stimulated me to peruse a teaching profession in environmental science and engineering.

## RESEARCH INTERESTS

Zahid Mahmood Khan

My work and research experience has been mainly focused on **“liquid and solid waste management and pollution control”**. My goal is to conduct quality research and publish my work in leading research journals. I want to further my knowledge and contribute in the field of Environmental Pollution Control and Management particularly in water/wastewater quality engineering and solid waste management. I want to apply the core knowledge of environmental science and engineering to projects relating to municipal and industrial wastewaters, municipal and industrial solid wastes, refuse driven fuels, biogas from sludge digestion and innovative waste disposal and reclamation options.

Research is a field of inquiry and should be dedicated to scholarship, but I also want to focus my work on key issues in my target field through problem solving research programs. I definitely want to improve the existing knowledge base in my field and convey the best knowledge to students and related professionals and industry. I want to utilize available modern means to add and incorporate useful knowledge into present technology. I want to further explore hot issues relating to (industrial & municipal) wastewater treatment, sludge & bio-solids digestion, biogas production and solid waste management. Related project studies shall focus on innovative water & wastewater treatment approaches, enhancement techniques for sludge & bio-solids digestion, alternate energy resources utilization and solid waste management in environmentally friendly manners.

To develop and communicate new ideas and useful knowledge in the form of conclusions, concepts, models, theories and possible applications, I want to explore national and international donor agencies to secure research funding. I have worked in consortium projects: (i) Sludge Digestion & Wastewater Treatment Process Modeling Project funded by University of Waterloo Ontario Canada, DCWASA USA & Envirosim Canada (ii) Participatory Municipal Solid Waste Management for District Bagh AJ&K Pakistan, project funded by European Union. My current research project is dealing with developing low cost treatment package for municipal wastewater reuse in agriculture.

I aim to become an effective writer & presenter to enhance mutual benefits for professionals including myself and related community and industry. I believe institutional research programs must also focus on training graduate students and research scholars to produce outstanding professionals capable of performing independent research and develop research groups to work on major challenges in their fields. During graduate students' supervision, I want to give more contact time, hold weekly meetings with individual students to discuss progress and related issues and monthly meetings with research group to discuss common issues and share ideas to enhance understanding.

## REFERENCES

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## Ph.D. THESIS SUMMARY

Zahid Mahmood Khan

A gas-liquid chromatographic technique was modified for effective isolation, extraction and analysis of plant sterols from a complex mixture of pulp and paper mill effluents (PPMEs). Plant sterols are suspected endocrine disrupting chemicals (EDCs) that may exert adverse effects on normal growth of aquatic life. The procedure involved liquid-liquid extractions, optimum silylation (70°C, 4 h) and GC/MS analysis. The modifications reduced analytical time and improved method sensitivity and recoveries. The technique successfully detected and quantified six different sterols in primary and secondary effluents from two British Columbia mills. The UNOX-AST secondary systems at mills showed a variable (58-93%) sterols removal efficiency. Mass flows revealed that sterols removal did not relate to sterols biodegradation and 22-70% of the influent sterols could leave without biodegradation.

Two lab-scale bioreactors, used to investigate the behavior of sterols during secondary treatment, showed that biodegradation and bio-adsorption were two major mechanisms of sterols removal. The suspended growth systems achieved a high removal as well as biodegradation of sterols. Sterols biodegradation was sensitive to relatively small changes in process pH and solids and hydraulic retention times (SRT & HRT). The process conditions of 6.7±0.2 pH, 11-12 h HRT and 11 day SRT appeared to be optimal for sterols biodegradation and a robust and stable reactor operation. A small reduction in HRT & SRT quickly deteriorated biodegradation thereby increasing the contribution of bio-adsorption. Hence, the removal efficiencies did not fully reflect the loss of sterols biodegradation but a larger portion of sterols started discharging with effluent and waste sludge. This increased the probability of a pollutant spike release to the receiving waters and a discharge permit violation. The design & operation of secondary systems can therefore

be optimized for efficient control of pollutants like sterols by optimizing either their biodegradation or bio-adsorption. The latter may however, require further treatment of pollutant-rich excess sludge.

Bio-adsorption of major sterol fractions was further investigated using inactivated secondary solids as an adsorbent. Almost 80% of the adsorption equilibrium was achieved in 10-20 h and a more complete equilibrium took a few days. Increasing adsorbent dose increased the rate of sterols removal and a dose of 2000 mg/L inactivated biosolids removed > 80% sterols in 2-4 h. A fitted linear Freundlich model suggested two adsorption regions for each sterol tested. In the high adsorption region, the adsorptive capacity of inactivated biomass was in the order of > campesterol >  $\beta$ -sitostanol >  $\beta$ -sitosterol for a given  $C_e$ . In the low adsorption region the inactivated biomass had considerably less, but similar capacities for each sterol. The Freundlich capacity coefficient K and the intensity coefficient n were estimated in both regions for each sterol. The biphasic adsorption behavior of sterols suggests that for PPME sterol concentrations falling in the low adsorption region, a secondary treatment with simultaneous biodegradation is preferable. Optimum bio-adsorption can also be used for effective treatment of PPME sterols but only at higher concentrations that fall in high adsorption region.

## **M.Sc. ENGG. THESIS SUMMARY**

Zahid Mahmood Khan

Use of fertilizers and other agricultural chemicals has become an essential part of today's agriculture. A field investigation was conducted using split plot randomized complete design to study the effect of fertilizer application modes (half split & full conventional) on fertilizer leaching under two tillage techniques (sweep cultivator & chisel plow, both followed by disc harrow) and two levels of irrigation (light-frequent 5 cm x 6, heavy-sporadic 10 cm x 4). The total fertilizer application rate was 123.5 kg/ha. Porous cup devices for soil water sampling were designed locally built and installed to collect sub-surface samples at 30, 60, and 12 cm depths in each of the 24 field plots.

Active leaching of fertilizer in the form of nitrates was observed indicating not only the loss of costly fertilizers but also a potential source of groundwater pollution. Sweep cultivation with disc harrowing retained more fertilizer near the soil surface whereas chisel plowing enhanced fertilizer leaching due to deeper penetration and reduced soil densities and soil compaction. Compared with heavy irrigations, light-frequent irrigations reduced percolation and settled 9% less  $\text{NO}_3\text{-N}$  up to 120 cm depth. Split fertilizer applications resulted in 19% less nitrate leaching compared with normal application. About 5% more nitrate leaching was observed on tail ends of the plots compared with stream ends. Therefore  $\text{NO}_3\text{-N}$  leaching can be significantly reduced through careful management of tillage, irrigation and fertilizer applications. Such agricultural practices are important to minimize the risk of subsurface and ground water nutrient pollution.