

Hasan Akhtar

Research Fellow

Singapore Centre for Environmental Life Science Engineering (SCELSE)

Life Sciences Institute (LSI), National University of Singapore (NUS)

Science Drive 4, Block S1A, #06-08, Singapore 117543

Ph. No.: +65-86545791, E-mail id: hasanakhtar@u.nus.edu, hasanakhtar29@outlook.com

Employment

- Dec 2020– **Research Fellow**, SCELSE-LSI-NUS
National Research Foundation, Singapore, funded project- “Impact of management practices on soil carbon and nitrogen dynamics and greenhouse gas emissions from urban park soils” in collaboration with Austrian Research Centre for Forest (BFW), National Parks Board-Singapore, NUS Environmental Research Institute, and SCELSE, Life Sciences Institute, NUS.
- July 2014– **Junior Manager (Forest & Environment)**, Steel Authority of India Ltd.
July 2016 Assisted in preparation of EC, FC, CTE, and CTO seeking documents.
Prepared monthly environment monitoring and six-monthly EC compliance report, and water cess and monitoring report submission to SPCB, CPCB and MoEFCC.
- July 2012– **Junior Manager (Environment)**, Jindal Steel & Power Ltd.
July 2014 Coordinated management for solid and hazardous waste in steel and power plant.
Prepared and submitted annual returns of hazardous waste and fly ash, and monthly submission of solid waste and fly ash generation and utilization reports to SPCB, CPCB, and MoEFCC.

Education

- 2016–2021 **PhD** in Geography (Tropical Environmental Change) (Thesis under examination)
National University of Singapore, Singapore
Dissertation: Post-fire Carbon dynamics in the tropical peatlands of Brunei.
Thesis Committee: Dr Massimo Lupascu (Supervisor), A/P Sanjay Swarup (Co-supervisor), Dr Alexander R. Cobb (Center for Environmental Sensing and Modeling, Singapore-MIT Alliance for Research and Technology).
- 2010–2012 **M. Tech.** in Environmental Science & Engineering (Ranked 3rd)
Indian Institute of Technology (IIT-ISM), Dhanbad, India
Dissertation: Quantitative estimation of C sequestration in reclaimed coal mine overburden dump.
Supervisor: Prof. Subodh Kumar Maiti.
- 2008–2010 **M. Sc.** in Environmental Science (Ranked 1st)
University of Allahabad, India
Dissertation: Water quality assessment in an industrial area at Naini, Allahabad.
Supervisor: A/P Sumedha Chakma (Indian Institute of Technology, Delhi).
- 2004–2007 **B. Sc.** in Chemistry & Botany
University of Allahabad, India.

Refereed Journal Publications

- Akhtar, H.**, Lupascu, M., Sukri, R. S., Smith, T. E. L., Cobb, A. R., & Swarup, S. (2021). Significant sedge-mediated methane emissions from degraded tropical peatlands. *Environmental Research Letters*, 16 014002. <https://doi.org/10.1088/1748-9326/abc7dc>. (IF- 6.2)
- Lupascu, M., **Akhtar, H.**, Smith, T. E. L., & Sukri, R. S. (2020). Post-Fire carbon dynamics in the tropical peat swamp forests of Brunei reveal long term elevated CH₄ flux. *Global Change Biology*, 26(9), 5125–5145. <https://doi.org/10.1111/gcb.15195>. (IF- 8.6)
- Akhtar, H.**, Lupascu, M., & Sukri, R. S. (n.d.). Interactions of microtopography, root exudates analogues and temperature variation determine CO₂ and CH₄ production from fire-degraded tropical peat. (Under review in *Soil Biology & Biochemistry*). (IF- 5.8)

Papers under preparation

- Akhtar, H.**, Bandla, A., Lupascu, M., Sukri, R. S., & Swarup, S. (n.d.). Fire-mediated change in microbiome composition and functional pathways support long-term elevated CH₄ flux from tropical peat. (Target journal *Nature Biofilms & Microbiome*). (IF- 7.1)

Akhtar, H., Nguyen, C. T. T., Bandla, A., Ooi, Q. E., Zi, K. Y., Ghosh, S., Lukman, Z. B., & Swarup, S. (n.d.). Impact of management practices on greenhouse gas emissions from urban park soils. (Target journal *Science of Total Environment*). (IF- 6.6)

Akhtar, H., Bandla, A., Lupascu, M., Sukri, R. S., & Swarup, S. (n.d.). Root exudates compounds and rhizo-compartment microbiome control plant-mediated CH₄ transport in fire-degraded tropical peatlands. (Target journal *Scientific Reports*). (IF- 4.0)

Conference Presentations

Akhtar, H., Lupascu, M., Bandla, A., Sukri, R. S., Cobb, A. R., Smith, T. E. L., Swarup, S. "Investigation into plant-mediated CH₄ transport, peat incubation and microbial community composition reveals fire-degraded tropical peatlands as a hot spot of CH₄", 16th International Peatland Congress, Tallin, Estonia, 02 to 07 May 2021.

Akhtar, H., Lupascu, M., & Sukri, R. S. "Effects of microtopography, root exudates analogues and temperature variation on CO₂ and CH₄ production from fire-degraded tropical peat", European Geosciences Union, Vienna, Austria, 19 to 30 April 2021.

Lupascu, M., **Akhtar, H.**, Bandla, A., Sukri, R. S., Swarup, S. "Root exudates compounds and microbial community composition regulates CH₄ dynamics in fire-degraded tropical peatland", European Geosciences Union, Vienna, Austria, 19 to 30 April 2021.

Akhtar, H., Lupascu, M., Kulkarni, O. S., Bandla, A., Sukri, R. S., Cobb, A. R., Smith, T. E. L., Swarup, S. "Impact of fire on vegetation, soil microbes and CH₄ emission from a degraded tropical peatland", European Geosciences Union, Vienna, Austria, 04 to 08 May 2020.

Lupascu, M., **Akhtar, H.**, Smith, T. E. L., & Sukri, R. S. "Post-fire carbon emissions from degraded tropical peat swamp forests in Brunei", European Geosciences Union, Vienna, Austria, 04 to 08 May 2020.

Akhtar, H., Lupascu, M., Pavagadhi, S. A., Hong, M. P. C., Bisht, N., Sukri, R. S., Smith, T. E. L., Cobb, A. R., Swarup, S. "Effects of post-fire vegetation structure on CH₄ emissions from a degraded tropical peatland in Brunei", European Geosciences Union, Vienna, Austria, 07 to 12 April 2019.

Lupascu, M., **Akhtar, H.**, Smith, T. E. L., & Sukri, R. S. "Post-fire fluxes and sources of carbon in tropical peatlands, Brunei", European Geosciences Union, Vienna, Austria, 07 to 12 April 2019.

Lupascu, M., **Akhtar, H.**, Smith, T. E. L., & Sukri, R. S. "Post-fire fluxes and sources of carbon in previously burnt tropical swamp peatlands, Brunei", American Geophysical Union, New Orleans, Louisiana, USA, 11 to 15 December 2017.

Chakma, S., & **Akhtar, H.** "Quality assessment of surface & groundwater in Industrial area at Naini, Allahabad, India", International Conference on Environmentally Sustainable Urban Ecosystem (ENSURE), Indian Institute of Technology (IIT), Guwahati, India, 24 to 26 February 2012.

Awards & Distinctions

2016	NUS Research Scholarship for four years with stipend and tuition fee waiver from Ministry of Education, Singapore to pursue PhD at the National University of Singapore.
2012	Qualified National Eligibility Test (UGC-NET) for Assistant Professorship in Environmental Sciences, conducted by University Grants Commission, Ministry of Education, India.
2012	Ranked 3rd in order of merit in M. Tech (Environmental Science & Engineering), class of 2012.
2010	Ranked 1st in order of merit in M. Sc. (Environmental Science), class of 2010.
2004–2007	Volunteer for National Services Scheme (NSS), Ministry of Youth Affairs & Sports, Government of India.
2006	First prize for discus throw in NSS camp sports for unit-III of University of Allahabad.
2002	Ranked 1st in order of merit in All India Secondary School Examination (High School), class of 2002.

Teaching & Mentoring

- 2019–2021 Invited speaker on Graduate Research Seminar (Geography), NUS (January 2019, February 2020, February 2021).
- 2018–2019 Advisor for Honor Thesis of Lorraine Ong Xin Yi, NUS (Geography) undergraduate.
- 2017–2018 Teaching Assistant for **Water and Environment** (GE2229) with Dr Massimo Lupascu and Dr Denitza Voutchkova, Department of Geography, NUS.
- 2016–2017 Teaching Assistant for **Weather and Climate** (GE2228) with Prof. Matthias Roth, Department of Geography, NUS.

Conference & Research grants

- 2019 Financial assistance for the annual conference of European Geosciences Union from Graduate Studies Division, NUS – 2,000 SGD (~1430 USD).
- 2018 Funding for PhD fieldwork from Graduate Research Support Scheme, Faculty of Arts and Social Sciences, NUS – 3,900 SGD (~2800 USD).

Courses & Workshops

- 2017 Short course on “Radiocarbon in Earth System” at Max Planck Institute for Biogeochemistry, Jena, Germany, 24 to 29 September 2017.
- 2013 Workshop on “Co-processing of Hazardous Waste in Cement, Power & Steel Plants” organized by Central Pollution Control Board (CPCB), Jaipur, India, 18 to 19 October 2013.

Professional Membership

- 2019–2021 Student member of European Geosciences Union.
- 2020– Student member of International Peatland Society.

Date : February 16th, 2021

Place : Singapore.

15 JANUARY 2021

TO WHOM IT MAY CONCERN

STUDENT STATUS LETTER - HASAN AKHTAR

THIS IS TO CERTIFY THAT THE FOLLOWING PERSON IS/WAS REGISTERED AS AN NUS STUDENT:

STUDENT ID	: A0152146M
NAME	: HASAN AKHTAR
NRIC / FIN	: G1614977U
GENDER	: MALE
DATE OF BIRTH	: 15 JULY 1987
DEGREE/PROGRAMME	: DOCTOR OF PHILOSOPHY
SPECIAL PROGRAMME	: NIL
DEPARTMENT	: GEOGRAPHY
ACADEMIC LOAD	: PART-TIME
MAXIMUM CANDIDATURE PERIOD	: 01 AUGUST 2016 - 31 JULY 2021
PROGRAMME STATUS	: STUDENT IS CURRENTLY ENROLLED IN THE ABOVE PROGRAMME.
THESIS EXAMINATION STATUS	: STUDENT HAS SUBMITTED THESIS ON 06 JANUARY 2021. THESIS IS CURRENTLY UNDER EXAMINATION.
REMARKS	: NIL

THIS IS A COMPUTER-GENERATED LETTER. NO SIGNATURE IS REQUIRED.

**POSTFIRE CARBON DYNAMICS IN THE TROPICAL
PEATLANDS OF BRUNEI**

HASAN AKHTAR

M. Tech (IIT-ISM, Dhanbad, India)

M. Sc (University of Allahabad, India)

**A THESIS SUBMITTED
FOR THE DEGREE OF DOCTOR OF PHILOSOPHY
DEPARTMENT OF GEOGRAPHY
NATIONAL UNIVERSITY OF SINGAPORE**

2020

Supervisors:

Dr. Massimo Lupascu, National University of Singapore

Associate Professor Sanjay Swarup, National University of Singapore

Dr. Alexander R. Cobb, CENSAM, Singapore-MIT Alliance for Research & Technology

Examiners:

PhD Thesis Abstract

Tropical peatlands are one of the most C dense ecosystems in the world, storing 3% of global soil C on 0.25% of the total land area. However, over the past few decades, due to extensive drainage, deforestation, and fire, the extent of degraded tropical peatland areas covered with ferns and sedges has increased to approximately one-tenth of the total extent in Southeast Asia. Despite these, there exists a vast gap in our understanding of factors regulating the postfire C dynamics in these areas. Therefore, in this thesis, we examined the role of vegetation, physicochemical properties of peat and porewater, and microbial community composition in regulating the postfire carbon (CO₂ and CH₄) dynamics in tropical peatland in Brunei.

We recorded C fluxes (CO₂ and CH₄) in intact (C flux from peat surface only) and burnt (C flux from peat surface + sedge-mediated CH₄ flux) sites. We also recorded vegetation composition change at the burnt site. To ensure the spatio-temporal variability, the various measurements were spread over different fieldwork campaigns (August 2017 to July 2019) and across multiple sites, i.e., each site has transect ranging from 300–400 m with permanent plots at an interval of 100–150 m. Each plot has PVC collars (for C fluxes), sensors (for soil temperature and water table level) and piezometers to record field measurements and collect peat and porewater samples for physicochemical analysis and microbial community composition. We also conducted an incubation experiment and laboratory analysis to investigate the peat and porewater physicochemical properties, and microbial community composition regulating the C fluxes.

The main findings of this research are as follows: (1) the sedge-mediated CH₄ transport to the atmosphere significantly contributed >70% of the total CH₄ flux at ecosystem scale ranging from 0.78 ± 0.14 to 4.86 ± 0.66 mgCH₄ m⁻² hr⁻¹, and was strongly correlated with water table level, sedge cover and porewater properties (pH, salinity, cations, and anions); (2) microtopography, labile C inputs, and temperature significantly affected the CO₂ and CH₄ production in fire degraded tropical peat; (3) mesic (oxic) treatments acted as a strong source of CO₂ and mild sink for CH₄ compared to anoxic treatments acting as a mild source of CO₂ and strong source of CH₄; (4) we also observed a gradient across conditions, where flooded oxic conditions showed in-between values both for CO₂ and CH₄ production and temperature sensitivity, further reflecting the range of variations in on-site conditions in degraded tropical peatland; (5) microbial community composition, environmental variables, and methane fluxes significantly differed between burnt and intact sites with most significant differences in microbial community composition at deeper anoxic layer; (6) burnt peat was significantly enriched in *Bathyarchaeia* (methane-producing) and depleted in *Alphaproteobacteria* and *Gammaproteobacteria* (methane-oxidizing), further supporting the observed difference in CH₄ flux values between sites.