

School of Environment, Enterprise and Development

ANNUAL REPORT

2024

Faculty of Environment
University of Waterloo

Message from the Director

I am pleased to present our 2024 Annual Report. 2024 was an important year as we initiated several major changes to address decreasing enrollment, improve student experience, and reduce delivery costs. This report highlights examples to showcase these efforts. In addition, the annual report celebrates the many accomplishments of our students, staff, and faculty.

One of the major milestones in 2024 was the launch of a new Course-based master's program in Sustainability Management. Designed to complement our existing research-based program, this offering leverages our current courses and resources to serve students seeking advanced education without a research-intensive focus. The program capitalizes on SEED's experiential learning focus and strong relationships with industry and community.

We also completed a major redesign of the Master of Development Practice (MDP) program to broaden its appeal and improve the student experience. The restructured MDP is now a 12-month, course-based professional program featuring four core courses, four electives, and a placement component. The revised program benefits from a partnership with the Balsillie School of International Affairs (BSIA), providing MDP students with access to BSIA-hosted courses and events, and strengthening recruitment efforts among policy-oriented applicants.

The Master of Environment and Business (MEB) online program underwent a comprehensive curriculum review to ensure alignment with key competencies and course continuity. Several core courses have already been revised, with additional updates planned for 2025.

In the latter part of the year, we began implementing broader structural changes across our programs. This includes reducing course duplication, increasing program flexibility, and enhancing collaboration with other units through shared and cross-listed courses. These steps not only improve the student experience but also support faculty-wide efforts to streamline graduate and undergraduate offerings, reduce reliance on sessional instructors, and improve resource efficiency.

Given the scale and pace of these changes, I want to acknowledge the dedication and resilience of our team. Faced with financial pressures, we responded quickly, supported each other, and demonstrated SEED's commitment to excellence. I am deeply proud of what we accomplished in 2024 and excited for the positive outcomes these efforts will deliver in the years ahead.

Jeffrey Wilson
SEED director

SEED Enrollment Trends

At the aggregate level, the school's enrolments have decreased over the past year and are down substantially when compared to 2022. Note, the table does not include our undergraduate program in International Development, which is being phased out. Of notable concern is the decline in enrollment in our Environment and Business Program. The decreasing enrolments have prompted a review of all programs that started in 2024 and will continue into 2025. Looking ahead, our Fall 2025 enrolments should be up across all programs.

Year	Programs							
Program	EB	BSFM*	MEDI	MEB	MDP	MES SUSM	PhD SUSM	Total
2024	451	64	14	50	5	36	70	711
2023	461	73	23	74	22	43	80	744
2022	538	46	23	73	22	64	82	857

**Joint program with SAF*

Graduate enrolments are down across all programs. The decline in enrolment in the three professional programs is concerning, and the viability of these programs is questioned if enrolment levels cannot be increased. The MES in Sustainability Management has declined by 7 students (reflecting many degree completions in that program) and the PhD in Sustainability Management has decreased by 10 students.

Faculty

Long time faculty member, Larry Swatuk retired. No new hires were made in 2024.

Staff

At the end of 2024, the school's administration team comprised of Jennifer Nicholson (Administrative Manager), Lianna Seebach (U/G Advisor-INDEV/ENBUS A-L), Cheri Oestreich (U/G Admin- ENBUS L-Z and 2+2), Jennifer Doucet (Grad Admin-MEB, MDP, MEDI), and Anastasiya Saparaliyeva (Grad Admin-SUSM). Our staff team is exceptionally strong, bringing experience and stability to SEED, which is especially important as we navigate the current financial situation.

Faculty Administrative Roles

In 2024, the following faculty members held administrative appointments within the School and the Faculty:

- SEED Director – Jeff Wilson (starting July 1), Neil Craik (January 1 – June 30)
- Associate Director Undergraduate Studies, - Dan Murray
- Associate Directors Graduate Studies - Jason Thistlethwaite /Heather Hall
- Co-Director, BSFM, SEED - Jennifer Lynes
- Program Academic Directors:
 - MEDI: Heather Hall
 - MEB: Komal Habib
 - MDP: Cameron McCordic
- MDP Field Placement Coordinator – John Abrahm
- Associate Dean, Work Integrated Learning – Mike Wood
- Associate Dean, EDIJ – Prateep Nayak
- Director, Waterloo Institute for Complexity & Innovation – Sean Geobey

Program Updates

SEED houses 8 programs, comprising three undergraduate programs (International Development, Environment and Business, and the new Bachelor of Sustainability and Financial Management); three professional graduate programs (Master of Development Practice, Master of Economic Development and Innovation, and Master of Environment and Business); and two graduate research programs in Sustainability Management (MES and PhD). As noted, the International Development program is being phased out. The school continued the cyclical review process for all its programs (except the BSFM) in 2024.

Undergraduate Programs

Environment and Business Program

Now in its 23rd year, the Environment and Business Honours co-op program currently has more than 450 students, including students from Nanjing University of Finance and Economics (NUFE) who complete the final two years of their degree at UW through our 2+2 program. With a program-wide focus on advancing sustainability in practice, the highlight of the program for many students is the eight-month capstone project that they complete in their final year. Students work in teams with a 'real-world' client to address a specific sustainability issue related to the organization. The co-op employment rate for the ENBUS program is 94.5%.

International Development Program

The school has closed the program to new admissions. The last cohort will be completing in 2026.

Sustainability and Financial Management

The BSFM program was approved in 2021 and is jointly run with the School of Accounting and Finance. The program provides students interested in the fields of accounting and financial management with a program that balances environmental courses with standard accounting and financial management courses, with the core of the program focusing on the emerging practices in the sustainable finance and accounting field. This program responds to the demand within these field for sustainability literacy and knowledge of the new tools that expand the assessment and management of financial assets to include natural capital, climate and biodiversity risks and the incorporation of social inclusion and equity in the day-to-day operations of businesses. The 2024 cohort had 64 students. SFM students have been active in several case competitions and in 2024 a team of five SFM students placed first in the Accounting for Sustainability International Case Competition.

Professional Graduate Programs

Master of Development Practice Program

The Master of Development Practice (MDP) was modified in 2024 to become a 12-month professional course-based program. The MDP is part of the Global Association of MDP Programs that currently has 35 programs in 25 countries. Experiential learning and field placements are an integral component of the MDP program with an ever-growing network of partners available at grass-roots organizations to international institutions. Since 2013, more than 100 MDP students have been placed with partner organizations overseas. As a member of the Global MDP Association, students enrolled in the University of Waterloo MDP program have had the chance to participate in discussions with experts on the future of sustainable development. The program has returned to an in-person format, with the opportunity to deliver field trips and access to field courses like Prateep Nayak's field course held in Chilika, India.

From April 20 to 26, 2024, a group of Master of Development Program (MDP) students traveled to Panama with Professor Larry Swatuk and PhD candidate Ivonne Morales to explore the water-energy-food nexus. During their time in Panama, the group met with the Deputy Administrator of the Panama Canal, Ilya Espino de Marotta, who shared the Canal's plans to address climate change challenges. The trip included meetings with various stakeholders, including the San Miguelito municipality authorities and the City of Knowledge, as well as visits to sites such as the Madden Dam and Merca, Panama City's main agricultural market. The goal was to understand how water, energy, and food are deeply interconnected and the importance of knowing the opportunities and challenges in managing these resources more efficiently."

Master of Environment and Business Program

The MEB program continues to offer a high-quality online professional course-based master's degree that can be completed part-time in two-three years or full-time in one year. With sustainability fully integrated into all courses, the program empowers current professionals to integrate sustainability into their own organization to take advantage of strategic opportunities or to apply business tools and strategies to advance sustainability across broader community contexts. The online MEB program has high flexibility, smaller class sizes and high instructor-to-student ratios, and offers an accessible opportunity to advance the sustainability knowledge and careers of our students.

The MEB program continues to see an evolution in terms of the students coming into the program and what each hope to achieve from it. This year the program saw a shift from students with a financial management background, to students with a traditional business background, but also to many students with engineering, science, environment, and geography backgrounds. These shifts mirror the greater global concerns from the business community and the environmental field on the need to integrate these two areas and reinforce the significant role the program plays in facilitating the emergence of future leaders in the field of sustainability management.

Master of Development and Innovation

MEDI is a three-term program with a strong focus on experiential learning and using the Kitchener-Waterloo region as a living laboratory to understand the innovation ecosystem and the underlying economic development processes that support it. As part of their course work, students often work with community partners to find solutions to economic development challenges faced by those partners. In Fall 2024, students visited the Working Centre, Lutherwood, Communitech, Velocity, and the City of Kitchener to learn about social innovation, brownfield redevelopment, strategic planning, and entrepreneurial ecosystems. Faculty and students attended the annual Economic Developers Council of Ontario Conference in Toronto where we connected with many of our alumni at the ECDEV UW booth. Our students also had exciting Capstone opportunities including internships with the municipal governments, the CSA Group, and the Commission for Environmental Cooperation.

Research Graduate Programs

Master of Sustainability Management Program

The master's in environmental studies in Sustainability Management continues to attract strong students that gain an applied research education while supporting the school's research. Student research is at the forefront of the sustainability transition including innovative work on energy systems, critical minerals and materials, lifecycle assessment, risk management, green finance, community resilience and wealth creation. The program is supported with scholarships from the University of Waterloo's Water Institute, SSHRC (Social Sciences and Humanities Research Council) graduate awards, Mitacs, and with professor research grants. Students in the program have published in the popular press, crafted policy papers, delivered conference papers, and some have authored in peer reviewed journals. Many graduates are continuing Ph.D. studies".

PhD in Sustainability Management

The school welcomed the seventh cohort of students to the new and innovative doctoral program (established in 2018). There remains robust interest in the program, which indicates the strong demand for a doctoral program in this newly emerging field, which trains students for the professional and academic markets in sustainability management.

Achievements and Impact

While it is not possible to summarize all the outstanding impacts made by our students, staff, and faculty over the past year, below is a small selection of highlights as an indication of the local, national, and international reach of our School.

Student Accomplishments & Awards

- **Maryam Ahmed** (PhD, 2024), Faculty of Environment Valedictorian.
- **Tia Driver**: Best Reviewer Award – ASAC Conference.
- **Yao Zhou**: SSHRC Graduate Scholarship- Master's Program
- **Stephanie Cortinovis** (GG Ph.D.): Recognized by Carbon Removal Canada as one of six "Notable Women" working in carbon dioxide removal in Canada.
- **Marianna Ottoni** - 1st conference presentation
- **Gurpreet Singh** - Space sustainability Award
- **Alexander Cha** - CGS Award
- **Leah Feor** - SSHRC PhD scholarship
- **Burgess Langshaw Power** (GG Ph.D.) - Cadieux Leger Fellowship (Global Affairs Canada)
- **Ruyel Miah/Navya Nair/Laura Murcia/Syeda Hasan** - R.S Dorney Memorial Fellowship
- **Asra Saeed** - Black Graduate Students EDI-RO Award
- **Adeboye Oyegunle** - DTCA S24-
- **Kaylia Little/Syeda Hasan/Jacqueline Ouellette** - DTCA F24

- **Karen Chen/Prashansa Kooshna/Joseph Scarfone/Duncan Willis** - Tri-Agency CGS -M
- **Karen Chen/Karlynn** - Caivan Future Cities
- **Navya Nair**, WYPW (World Youth Parliament for Water delegate), Young Water Sustainability Leader 2024, International Doctoral Research Award (IDRA) awarded by the International Development Research Centre (IDRC)
- **Yinghao Song, Ruyel Miah** – Mitacs Globalink Research Award

SUSM Graduate Student Thesis and Degree completions in 2024

- SEGMENTATION INFORMS THE GAMIFICATION OF SUSTAINABLE FOOD CONSUMPTION (University of Waterloo, 2024-01-18) **Modol, Sebastien**; Dias, Goretty
- Water Secure and Climate Resilient Ontario: Developing a Transdisciplinary Water Risk Management Framework and Decision Support Tool to Guide Multi-Sector Sustainable Water Management Policies and Strategies (University of Waterloo, 2024-04-03) **Sandhu, Guneet**; Weber, Olaf; Thistlethwaite, Jason
- Problematizing Eurocentric sustainability within the context of business management and exploring the pluriversality of sustainability (University of Waterloo, 2024-04-18) Patara, Saveena; Clarke, Amelia
- Analyzing Corporate Governance Mechanisms for Sustainability in Firms: From Concepts to Practices (University of Waterloo, 2024-04-24) **Bajwa, Muhammad Moaz Tariq**; Wood, Michael
- Student Perceptions of Green FinTech Adoption (University of Waterloo, 2024-05-14) **Zhetpisbayeva, Ainur**; Weber, Olaf; Caré, Rosella
- Assessing Adaptations to Global Transformational Events in Canadian Corporate Social Responsibility Practices (University of Waterloo, 2024-05-17) **Billedeau, David Benjamin**; Wilson, Jeffrey
- Assessing Differences in Household Food Insecurity Vulnerabilities Post-Cyclone Idai in Beira, Mozambique (University of Waterloo, 2024-05-30) **Sunu, Naomi Elikem**; McCordic, Cameron; Frayne, Bruce
- An Examination of the Social, Legal and Political Factors that Impact the Permitting Process for Wind Energy Transmission Line Projects in Canada (University of Waterloo, 2024-06-04) **Dykstra, Erin**; Feltmate, Blair
- Impact of Incorporating Corporate Sustainability into the Credit Risk Assessment of Nigerian Banks (University of Waterloo, 2024-06-19) **Makinde, Abolade** Olayinka; Weber, Olaf; Caré, Rosella
- Identifying the Institutional, Stakeholder, and Behavioral-Level Drivers and Barriers for Scaling the Green Bond Market (University of Waterloo, 2024-07-09) **Saravade, Vasundhara**; Weber, Olaf; Thistlethwaite, Jason
- Improving the Provision of Mental Health Care in Small-Scale Fisheries to Boost Livelihood Outcomes: A Case Study of Chilika Lagoon in India (University of Waterloo, 2024-07-17) **Priya, Astha**; Nayak, Prateep
- Analysis of the Impact of Fragmented Coordination During Natural Disaster Responses on Access to Drinking Water Following Cyclone Idai - Beira Case Study (University of Waterloo, 2024-07-19) **Judyn, Jerzy**; Frayne, Bruce; McCordic, Cameron
- Life Cycle Assessment of Municipal Solid Waste Management in the Region of Waterloo, Canada (University of Waterloo, 2024-08-13) **Chehab, L'Emira Lynn**; Habib, Komal
- Danger Ahead! How Canadians Respond to Information About the Risks of Eating Meat (University of Waterloo, 2024-08-28) **Pottage, Rebecca**; Lynes, Jennifer
- Three Tales in Journeys Towards Wisdom: Decolonial Impetuses in Social Innovation (University of Waterloo, 2024-08-29) **Ahmed, Maryam Mohiuddin**; Geobey, Sean
- The Feasibility of Applying Pescatourism to the Small-scale Fisheries in Japan (University of Waterloo, 2024-09-13) **Song, Yinghao**; Nayak, Prateep

- Cross-Sector Partnerships as an Implementation Strategy in Achieving Net-Zero Greenhouse Gas Emissions (University of Waterloo, 2024-10-17) **Isabu, Ebosetale**; Clarke, Amelia
- Integrating Sustainability and Nutrition through Dietary Pattern Optimization: A Life Cycle Assessment of Canada's Food Guide (University of Waterloo, 2024-10-17) **Guo, Xuyang**; Dias, Goretty
- Wetland Offsetting: A Policy tool for Sustainable Wetland Management in the Grand River Watershed? (University of Waterloo, 2024-10-24) **Movoria, Ejiro**; Swatuk, Larry; Thistlewaithe, Jason
- Neolocalism Strategies in Ontario Craft Brewing (University of Waterloo, 2024-10-24) **Bridges, Callum**; Geobey, Sean
- Attributing Corporate Carbon Mitigation Outcomes to Substantive Decarbonization Actions through Change Analysis (University of Waterloo, 2024-11-12) **Lin, Meijie**; Wilson, Jeffrey
- Transitioning from Vulnerability to Viability: Small-Scale Fisheries in Marine Protected Areas of Sri Lanka (University of Waterloo, 2024-12-12) **Niyagama Gamage, Nilushika Madhubhashini**; Nayak, Prateep Kumar
- Diffusion Of Technology in Vulnerable Communities: An Analysis of the Role of Technology in Making Small-Scale Fisheries Viable (University of Waterloo, 2024-12-18) **Yousaf, Muhammad Tahir bin**; Nayak, Prateep

Faculty Accomplishments and Awards

The lists below provide examples of faculty member awards, publications, and grants.

Awards, select examples

- **Komal Habib**, Faculty of Environment Best Performance Award & Waterloo Institute for Nanotechnology Research Leader Award
- **Amelia Clarke**, Highly Ranked Scholar by ScholarGPS, Mitacs Innovation Award
- **Neil Craik**, Awards Canadian Council for International Law, Scholarly Book Award – in 2023/4 (for Liability for Environmental Harm to the Global Commons)
- **Jeffrey Wilson**, Frontiers Planet Prize, National award with Mohamed Dardir and Umberto Berardi

Grants, select examples

The SEED faculty has continued to successfully attract research funding (~\$4 million in 2024) from major granting agencies, government agencies and private funders, including foundations, NGOs, and industry.

- **Goretty Dias**, Flax Fibre to Fabric: An Innovative Mission-Oriented Framework for Sustainable Agriculture Value-Chains, NSERC-SSHRC Alliance Sustainable agriculture research initiative
- **Cameron McCordic**, GRANT-Future Sustainable Cities in Southern Africa: Sustainable adaptations to rapidly intensifying cyclones, UW/SSHRC Explore
- **Sean Geobey**, Investment Readiness Program Evaluation, Mapping & Peer Learning – Mitacs - CCEDNet
- **Amr ElAlfy**, Bridging Worlds: Collaborative Solutions for Global Biodiversity Accounting and Reporting – SSHRC, Partnership Development Grant
- **Komal Habib**, NSERC Mission Alliance & NSERC Discovery
- **Jessie Ma**, NSERC, Discovery Grant, "Flexibility Products in Transactive Electricity Distribution Systems to Enable Deep Electrification and Accessibility
- **Amelia Clarke**, **Amplifying** the Positive Impact of Canadian Young People, SSHRC Connections

Journal publications, select examples

SEED professors and students (often in teams) continue to publish in a variety of high impact outlets, both academic and professional outlets, as well as contributing to industry and other forms of knowledge dissemination. In 2024, SEED faculty set a record for most academic publications in a single year. We have limited the list here to two per faculty member. For an exhaustive list please refer to individual faculty member Google Scholar pages or university profiles.

Cameron McCordic

- Rauf, M. A., McCordic, C., & Frayne, B. (2024). The challenges and opportunities of localizing the sustainable development goals in Canadian cities—a subsidiarity check. *Environment, Development and Sustainability*.
- **McCordic, C.**, Raimundo, I., Judyn, M., & Willis, D. (2024). The distribution of Cyclone Idai's water impacts in Beira, Mozambique. *Disaster Prevention and Management: An International Journal*, 33(6), 1-15.

Sean Geobey

- Petric, A., Parker, D., Geobey, S. & Wright, K. (2024). Making room for everyone: Assessing housing needs and suitability in Waterloo Region, Ontario via time, space, and equity lenses. *Canadian Planning and Policy / Aménagement et politique au Canada*, 2024(2), 43–80.
- Bajwa, M. M. T., Geobey, S., Weber, O., & Wood, M. O. (2024). The impact of workforce practices on firms' sustainability performance: An empirical study of Canadian listed firms. *Corporate Ownership & Control*, 21(1), 118–131.

Ameila Clarke

- McPherson, C.* & Clarke, A. (2024). Leadership and Climate Change Mitigation: A Systematic Literature Review. *Climate*, 12(12), 207; DOI: 10.3390/cli12120207
- Cornelius-Hernandez, T.* & Clarke, A. (2024). The Current State of Integrating Equity, Diversity, and Inclusion into Knowledge Mobilization: A Systematic Literature Review. *Equity, Diversity and Inclusion: An International Journal*. DOI: 10.1108/EDI-04-2023-0134

Neil Craik

- Cortinovis, S. R., Craik, N., Moreno-Cruz, J., Motlaghzadeh, K., & Schweizer, V. Scaling carbon removal systems: deploying direct air capture amidst Canada's low-carbon transition. *Frontiers in Climate*, 6, 1338647.
- Kasra Motlaghzadeh, Vanessa Schweizer, Neil Craik, Juan Moreno-Cruz, "Key uncertainties behind global projections of direct air capture deployment," *Applied Energy*, Volume 348, 121485

Rosella Carè

- Carè, R., Boitan, I. A., & Fatima, R. (2024). Central banks and climate risks: where we are and where we are going? *International Review of Economics and Finance*
- Carè, R., Fatima, R. (2024). Financial Market Misconduct: A Bibliometric Perspective. *European Financial Management*. 10.1111/eufm.12525

Jennifer Lynes

- Publication: Hajar Alviri*, Jennifer K Lynes, Komal Habib (in press), “Beyond green chemistry: A comprehensive review of how sustainability has been integrated into cosmetic research” *Global Sustainability*. Pre-print version online.

Amr Elalfy

- **ElAlfy, A.**, Elgharbawy, A., Driver, T., Ibrahim, A. (2025). Sustainability Disclosure in Gulf Cooperation Council (GCC) Countries: Opportunities and Challenges. *Green Finance*, 7(1), 40-83.
- **ElAlfy, A.**, Quigley, J., Tang, L., Al Hariri, Y. and Weber, O. (2024). Sustainability tweeting triumphs during the COP events: analyzing environmental, social and governance (ESG) communication on Twitter. *Journal of Asia Business Studies*.

Goretty Dias

- Arsenault, J. N., Tyedmers, P. H., & Dias, G. M. (2024). Changes in per capita and aggregate apparent consumption of livestock-derived foods in Canada from 1960–2020. *Environmental Research: Food Systems*, 1(2), 025009.
- Nishi, S. K., Kavanagh, M. E., Ramboanga, K., Ayoub-Charette, S., Modol, S., Dias, G. M., Kendall, C. W. C., Sievenpiper, J. L., & Chiavaroli, L. (2024). Effect of digital health applications with or without gamification on physical activity and cardiometabolic risk factors: A systematic review and meta-analysis of randomized controlled trials. *eClinical Medicine*, 76, 102798.

Jesse Ma

- B. Venkatesh, M.I.A. Shekeew, and J. Ma. “Feasibility-Guaranteed Machine Learning Unit Commitment: Fuzzy Optimization Approaches.” *Applied Energy* 379, 2025.
- J. Ma and B. Venkatesh, “Sizing Merchant Energy Storage for Maximum Revenues Considering Net Metering and Ancillary Services,” *IEEE Access*, vol. 12, pp. 2210–2223, 2024, doi: 10.1109/ACCESS.2023.3347338.

Komal Habib

- Tariq, M., Siddhantakar, A., Sherman, J. D., Cimprich, A., & Young, S. B. (2024). Life cycle assessment of medical oxygen. *Journal of Cleaner Production*, 444, 141126.

Michael Wood

- Zhang, Mingming, **Wood, M.O.**, Wilson, J., Wu, T. The Impacts of China's ETS on Firm Competitiveness: Evidence from the Power and Heat Production Sector. *Global Finance Journal*. Accepted for Publication on December 11, 2024.
- Sandhu, G., Weber, O., **Wood, M. O.**, Rus, H. A., & Thistlethwaite, J. (2024). Developing a transdisciplinary tool for water risk management and decision-support in Ontario, Canada. *Environmental Research Communications*, 6(7), 075014.

Prateep Nayak

- Bhattacharya, S., Das, B. K., Roy, A., Nayak, P. K., Saha, A., Parida, P. K., Lianthuamluaia, L., Mondal, K., & Chakraborty, S. (2024). Socio-Economic Profile and Vulnerabilities Assessment in Small-Scale Fisheries of Lower Gangetic Flood Plain Wetland: An Initiative Towards Achieving Wetland Ecosystem Sustainability and Community Well-Being. *Sustainability*, 16(21), Article 21.
- Bhattacharya, S., Das, B. K., Roy, A., Nayak, P. K., Saha, A., Parida, P. K., Lianthuamluaia, L., Mondal, K., & Chakraborty, S. (2024). Socio-Economic Profile and Vulnerabilities Assessment in Small-Scale Fisheries of Lower Gangetic Flood Plain Wetland: An Initiative Towards Achieving Wetland Ecosystem Sustainability and Community Well-Being. *Sustainability*, 16(21), Article 21.

Jeffrey Wilson

- Liu, Z., Zhu, H., Wilson, J., Adams, M., Walker, T., Xu, Y., Tang, Y., Wang, Z., Liu, T. and Chen, Q., 2024. Achieving China's 'double carbon goals', an analysis of the potential and cost of carbon capture in the resource-based area: Northwestern China. *Energy*, 130441.
- Ali, W., Wilson, J. and Frynas, J.G., 2024. Corporate governance mechanisms and carbon disclosure: A multi-level and multi-theory literature survey. *Corporate Social Responsibility and Environmental Management*, 1-20.