Fires and Public Health in the Brazilian Amazon

TIAGO BONOMO
Vancouver School of Economics

"Being a Solutions Scholar was very important for my academic formation in many ways, especially connecting with Scholars and people from different areas... [i]t constantly made me think outside the standard "economics box" and consider the implications of my research for the international community that is worried about climate change."

Can access to health services mitigate the impacts of natural disasters in the developing world? Tiago's job market paper documents the health consequences of forest fires in the Brazilian Amazon and examines whether access to public healthcare can mitigate potential adverse effects. Tiago links comprehensive hospitalization records with satellite information on fire locations and wind patterns to identify the causal impact of forest fires on health outcomes for individuals across all age groups. Upwind fires increase hospital admissions for infants and children, which are driven by increases in respiratory hospitalizations for infants and children under five and in circulatory hospitalizations for children from 6 to 12 years old. These effects are substantially more negative for municipalities with limited access to public healthcare services, particularly those with few community health centers. The findings suggest an essential role for healthcare delivery in mitigating the impacts of climate change.

Tiago Bonomo was supervised by Professor Claudio Ferraz (Vancouver School of Economics) and Assistant Professor Patrick Baylis (Vancouver School of Economics).

2023-2024 Solutions Scholar

Planting Trees, Cultivating Connection: Mini Forests as Connectors to Nature, Community, Social Cohesion and Local Environmental Care

KYLIE CLARK

Applied Science, School of Community and Regional Planning

Through the Solutions Scholar Program, Kylie Clark has prepared both a final academic report which will be used to submit her research to a peer reviewed journal, as well as a policy brief which can be used immediately to support practitioners.

Urban green space provides crucial environmental and social benefits, such as improved air and water quality, reduced flooding, enhanced biodiversity, and increased well-being. However, these benefits are often inequitably distributed, with marginalized neighbourhoods having less access to green space. The Miyawaki method, an innovative urban greening approach, involves planting dense, multi-layered native forests in very small areas. Although mini forests are valued for their ecological benefits, they also encourage significant community engagement, fostering social cohesion, local environmental care, and civic stewardship, making them a worthwhile investment. Kylie's study explored the potential for Miyawaki method mini forests planted in small urban spaces to improve urban green equity, climate resilience in marginalized neighbourhoods, and residents well-being.

Kylie was supervised by Assistant Professor Holly Caggiano (School of Community and Regional Planning) and Associate Professor Melissa Mchale (Forestry).

2023-2024 Solutions Scholar

Understanding Projected Heatwave Impacts on Demographic Groups in Different Climate Change Storylines

CUIYI FEI

Faculty of Science; Earth, Ocean, and Atmospheric Sciences

"Being selected as the first year Climate Solution Scholar is a valuable experience in my PhD life -- it gave me experience to write my own proposals, lead the research and reach out to/communicate with people in totally different fields."

Cuiyi's research explored how future heatwave projections would affect groups based on age, gender, and race demographics. She noted that the bias in climate model projections of heatwaves and surface temperature trends is primarily observed at regional spatial scales. However, demographic projections in various SSPs (Shared Socioeconomic Pathways) are typically constrained to human-defined country or provincial levels rather than natural climatological regions, underscoring the importance of county-level analysis for accurate local policy-making. This study used county-level population projections to examine demographic changes by age, sex, and race in the US affected by biases in heatwaves and surface temperature trends in CMIP65 climate models. The population affected by climate model biases on heatwaves and surface temperature trends is highly sensitive to various uncertainties—the internal variability can adjust the total vulnerable population by a factor of 2 to 10. In comparison, uncertainties due to different models are relatively small. The results suggest the need for detailed climate adaptation storylines that indicate the relative likelihood and magnitude of populations affected by climate model biases on extreme heat-related variables.

Cuiyi was supervised by Assistant Professor Rachel White (Earth, Ocean and Atmospheric Science) and Assistant Professor Ethan Raker (Sociology).

2023-2024 Solutions Scholar

Mitigation of Post-Wildfire Debris Flows Near Small Watershed Outlets

KAUSHAL GNYAWALI

Faculty of Applied Science, School of Engineering

"By documenting previously unrecorded, small but widespread debris flows affecting rural communities and First Nations in south-central BC, and utilizing numerical flow simulations, my goal is to develop a robust design methodology for sustainable and cost-effective earthen structures—such as engineered swales, ditches, and deflection berms—to mitigate debris flow impacts"

Post-wildfire sediment-laden floods in small watersheds are poorly documented events, and predicting required engineering parameters remains challenging. Existing empirical equations are biased towards larger watersheds and grossly overestimate discharge and sediment yield in small watersheds in south-central British Columbia (B.C.). Developing a workflow to correctly estimate parameters including discharge, velocity, sediment yield, and flow height of sediment-laden floods is crucial to appropriately design and install terrain-based mitigations like deflection berms and ditches at appropriate locations to mitigate the risk of sediment-laden flood hazards. This research builds resiliency in response to climate change and increasing occurrence of wildfires.

Kaushal's paper demonstrates a workflow to simulate post- wildfire sediment-laden floods in small watersheds through examination of a flood which affected a small watershed fan apex in south-central B.C.. The paper estimates the discharge hydrograph, then using Newtonian flow assumptions, simulates the sediment-laden flow height and velocity on a high-resolution fan topography. Post-event field observations and video records of flow during the event are used to calibrate anintegrated HEC-HMS and HEC-RAS model.

Kaushal was supervised by Professor Dwayne Tannant (School of Engineering)

2023-2024 Solutions Scholar

Investigating Opportunities for UBC to Support Cultural Burning as a Community-led Climate Solution in the Okanagan Valley, British Columbia

MIAH GODEK
Faculty of Forestry, Forest and Conservation Sciences

"For climate solutions to be effective at a local scale, they must necessarily be community-led and promote equity for human and non-human beings."

Intentional use of controlled low-intensity fire is an important tool for reducing the risk of catastrophic wildfires, and their subsequent carbon emissions, especially in fire-adapted ecosystems such as the Okanagan Valley. Prescribed fire is the settler use of intentional fire for land management objectives, whereas cultural burning is the Indigenous cultural practice of intentional fire for cultural values in addition to land management objectives. Both can be considered climate solutions as they reduce the risk of wildfire and can also be carried out at a local scale, directly impacting the climate resilience of rural and Indigenous communities.

Miah's research project investigated the barriers that a specific community in the Okanagan Valley faces to implementing cultural burning for cultural revitalization, ecological restoration, and climate resilience within government-managed areas that have historically had limited collaboration with First Nations. The second aim of her project was to initiate a collaboration between UBC and the community, which includes both Indigenous and settler members, to understand how UBC can support community- led initiatives for ecosystem restoration, cultural revitalization, and climate resilience through long-term research partnerships.

Miah was supervised by Assistant Professor Danielle Ignace (Forest and Conservation Sciences) and Shandin Pete (Earth, Ocean and Atmospheric Science).

2023-2024 Solutions Scholar

Four-Year Trends of Personal Mobility Devices in Metropolitan Vancouver: The Evolution of Mode Shares, Speeds, and Comfort in Off-Street Paths

AMIR HASSANPOUR
Faculty of Applied Science, Civil Engineering

"Micromobility or personal mobility devices (PMD) such as bicycles, scooters, and skateboards, with or without electric-assist, are increasingly popular for urban travel, which poses challenges in the constrained spaces of cycling facilities and multi-use paths."

Personal mobility devices (PMDs) offer an opportunity to address enduring challenges like traffic congestion, energy consumption, air pollution, and climate change. Encouraging a shift from driving to PMD use is essential, but it also brings challenges. The diverse range of PMDs often increases conflicts within the already constrained spaces of cycling facilities.

This study analyzed data from 12 sites across Metro Vancouver in 2019-2020 and 2023, revealing significant shifts in mode share, speeds, and user comfort. Conventional bicycles' dominance dropped from 91% to 74%, while motorized devices' mode share quadrupled. Average speeds on cycling paths increased by 11%, with self-balancing unicycles seeing a striking 10 km/hr speed increase which has a significant effect on path user comfort.

The findings underscore the pressing need for updated speed regulations, wider paths, and PMD-specific policies to address the challenges posed by the rise of personal mobility devices while maximizing their benefits.

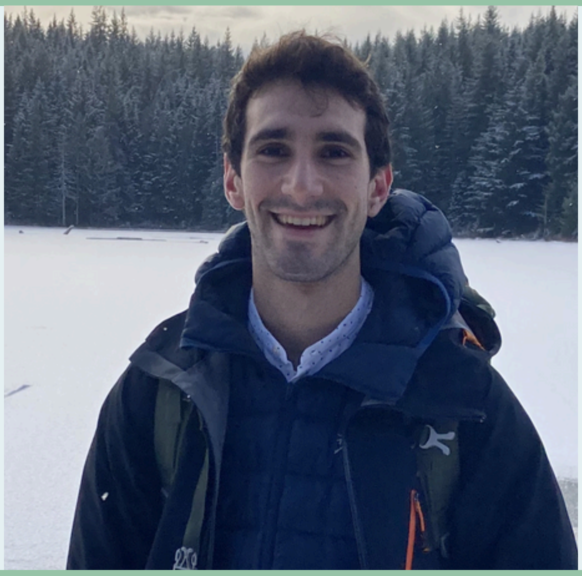
Amir Hassanpour was supervised by Associate Professor and Associate Head Alexander Bigazzi (Applied Science) and Assistant Professor Julia Harten (School of Community and Regional Planning).

2023-2024 Solutions Scholar

Learning on the Go: Experiences Researching Urban Stewardship Practices through Collaborative Interview

DANIEL SAX

Faculty of Forestry, Forest Resources Management (Urban Natures Lab)



"My goal was to introduce transparency into the process of conducting qualitative research. I wanted to show that the challenges, curiosities, and discomforts that emerge during research warrant equal attention to the successes and discoveries."

Daniel's work raises an essential question for the future of green cities: what might urban greening look like with an explicit orientation towards justice and equity? His project represents a paradigm shift away from common approaches to greening that frame its benefits in terms of neoliberal concerns — e.g., economic feasibility, human-centered livability — and instead heightens focus on the promotion of holistic biodiversity as well as environmental and social justice concerns. The project's approach is rooted in an ethic of collaboration and co-creation, taking inspiration from place-based and action research methodologies. The research is being conducted across two cities — Medellín, Colombia, and Vancouver, Canada — featuring a suite of methods intended to bring local stewards into conversation in the name of story sharing and solution-building. The insights produced through this work have the potential to influence novel approaches to urban greening that uplift justice-oriented, grassroots greening efforts and inspire greater collaboration across diverse knowledge holders and stewards.

Daniel was supervised by Assistant Professor Lorien Nesbitt (Forestry) and Professor Michael Brauer (Medicine).

2023-2024 Solutions Scholar

Raptor Habitat Suitability in Post-Fire Landscapes

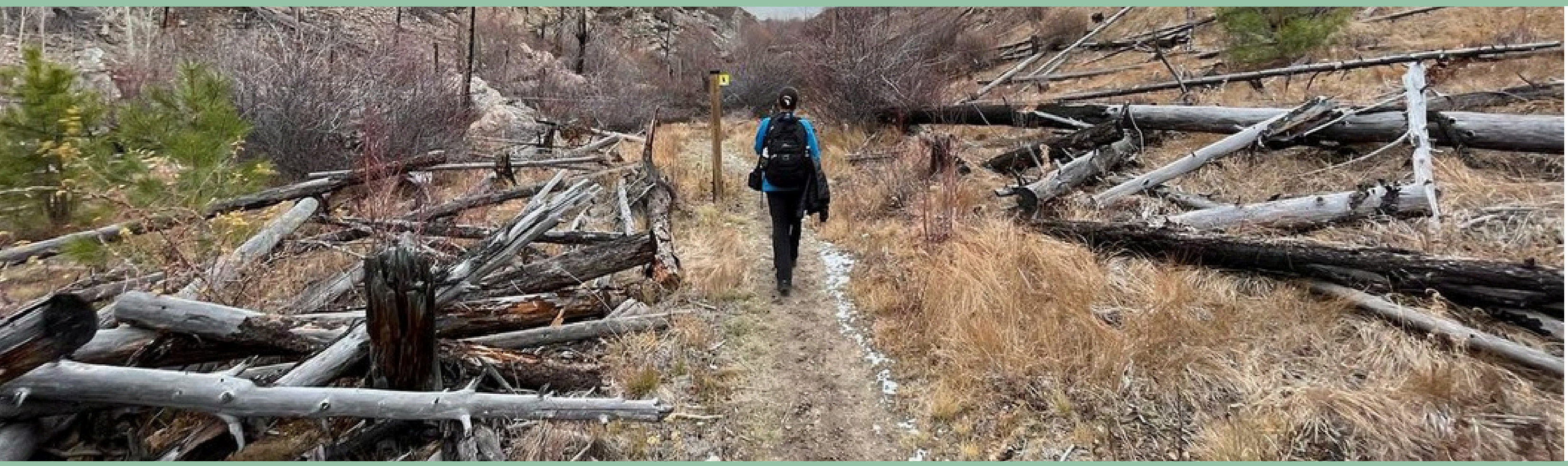
STEFFANI SINGH

Irving K. Barber Faculty of Science, Biology

"The [Solution Scholar] program connected me with UBC faculty and other graduate students conducting climate research in many different disciplines. By participating in workshops, seminars, and meeting with these researchers, I learned how to incorporate interdisciplinary perspectives in my research."

Steffani's research aims to uncover if and how owls in the Okanagan Valley use burned forests of varying post-fire ages. The Solutions Scholars program enabled Steffani to expand the reach of her research, undertaking more field work and including a broader range of raptors. Through Solutions Scholars workshops, seminars, and meetings, Steffani was connected with faculty and other graduate students, which she says taught her how to incorporate interdisciplinary perspectives into her research. Her initial findings show that raptors recolonize burned areas as soon as two years post fire and that they are more likely to occupy post-burned forests the longer it has been since burning. She found that cutting down dead stands from burned out areas, known as salvage logging, leaves raptors with nowhere to perch. By examining how these post-fire features affect raptor occupancy, policy makers and researchers can learn how to preserve the features that raptors need to live in our wildfire-affected landscape, and by extension maintain the ecosystem services these birds provide.

Steffani is supervised by Professor Karen Hodges (Biology) and Adjunct Professor Frank Doyle.



2023-2024 Solutions Scholar

Water Distribution Network (WDN) Modelling in the Face of Climate Change

AMIT SINHA
Faculty of Applied Science, Civil Engineering

"The Solutions Scholars program gave me the opportunity to showcase my research to the interdisciplinary cohort and get critical feedback, especially relating to presenting my research with brevity."

Amit's study examines the challenges faced by water utilities in managing the reliability of operations of water distribution networks (WDNs) amid climate change (CC)-induced stressors. The research provides a review of the overarching impacts of CC on WDNs and their consequential impact on its operations, such as increasing pipe failures due to accelerated pipe deterioration or aging and challenges in maintaining water quality. Further, hydraulic resilience analysis is applied on a real-life anonymized small-sized American water utility by simulating fire flow disruptions with systemic changes of infrastructure aging and decreased reservoir capacity. Results indicate that fire flow disruptions cause greater resilience loss than systemic changes. Pressure-Driven Demand Modelling (PDM) is found to be preferable to Demand-Driven Modelling (DDM) in assessing WDN resilience, especially during disruptions. The study underscores the need for resilience-focused strategies in WDN management and highlights the role of PDM in enhancing decision-making amid evolving climate-related challenges.

Amit was supervised by Professor Barbara Lence (Applied Science) and Professor Stephanie Chang (Institute for Resources, Environment and Sustainability, and School of Community and Regional Planning).

2023-2024 Solutions Scholar

Built Environment Factors and Barriers in Adaptation to Extreme Heat Experienced by Older Adults in Metro Vancouver

KATHERINE WHITE

Faculty of Forestry, Forest Resources Managament

Katherine used both qualitative and quantitative approaches to analyse what factors in the built environment are associated with indoor temperature and what barriers to cooling do households with older adult households face.

Extreme heat events are increasing in frequency and duration, and risks are pronounced in temperate climates, such as Vancouver, as local populations are less protected by physiological, behavioural, and built environment adaptations to hot weather. In BC, 619 excess deaths were attributed to the 2021 heat dome and older adults, especially those who were socially isolated, were at increased risk of death. As the majority of heat dome deaths occurred indoors, Katherine's work is focused on the indoor temperatures experienced by older adults in Vancouver. This project used qualitative data collected through a community science survey to examine the barriers and facilitators to cooling for older adults, with a focus on housing and neighbourhood characteristics. It was found that building and urban design (such as window design, building type and age), in addition to structural factors, affected both indoor temperatures and the barriers older adult experience in attempting to cool their homes.

Katherine was supervised by Assistant Professor Liv Yoon (Education) and Professor Michael Brauer (Medicine).

2023-2024 Solutions Scholar