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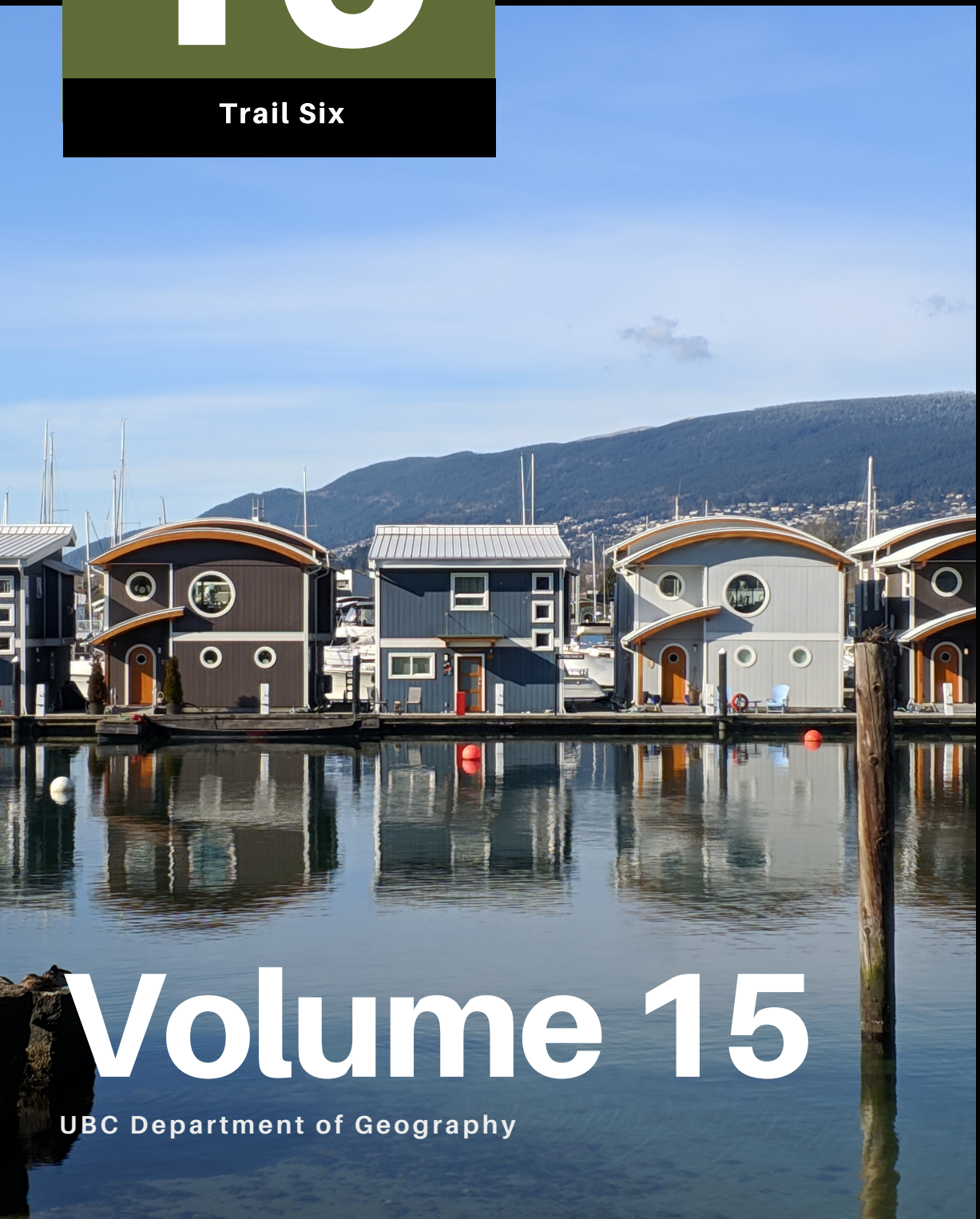
Trail Six

Undergraduate Journal of Geography



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Land Acknowledgment:

We acknowledge that UBC's Point Grey Campus is located on the traditional, ancestral, unceded territory of the xʷməθkʷəy̓əm (Musqueam) people. The land it is situated on has always been a place of learning for the xʷməθkʷəy̓əm community, who for millennia have passed on in their culture, history and traditions from one generation to the next on this site.

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UBC Department of Geography & Geography Students' Association

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FOREWORD

In the best of years, *Trail Six*, is an immense accomplishment, reliant on the hard work of a dedicated team of volunteer student editors. This year, during the pandemic, the geography building has been closed to undergraduate students, students and faculty are more than usually stressed, isolation is a common experience, and almost all communication and collaboration has been via telephone or computer. And still, this beautiful, lively and engaged issue of *Trail Six* has been created. Let me extend a huge thank you to *all* of the students who submitted papers for consideration (34 in total, including those whose papers were not included), and to the reviewers (each paper went through two thorough rounds of reviews). Most especially, I thank the editorial team for your persistence, enthusiasm and optimism, in bringing this issue into being.

The articles remind me why I love geography as a discipline, and the incredible strengths of our faculty and students. They demonstrate the range of methods and subjects taught and learned, and their relevance to diagnosing and creating solutions for some of the most pressing issues of our age. They demonstrate the strength of a discipline that thinks, by its very nature, in complex interdisciplinary ways.

There is a cluster of papers that address significant environmental themes, immediately relevant to our region and globally. In Mckenzie Witschi, Lia Laureen Schulz, and Nathan Herrington's paper, we learn about a critical mismatch between the environmental impact assessments of the Trans-Mountain Expansion Pipeline, one created for the National Energy Board, another for the Tsleil-Waututh Nation. This paper raises the challenging political questions: whose knowledge is valued and to what end? In another paper, Nigel Tan and Yulin Hu model the distribution of the rough skin newt in the region, using volunteer-contributed newt observations and the tools of GIS. Given that amphibians are highly valued bio-indicators of ecosystem health, this analysis helps to identify future conservation priorities. Papers are also alive to the new challenges of managing and regulating

our world at a global scale in a time of climate emergency. Cassandra Torres outlines the challenges of creating frameworks to regulate climate geoengineering, such as solar radiation injection, given that actions taken by one nation affect us all.

Other papers make us think hard about how ideas move in the world, within colonial histories and through new technologies. Earl Joshua Jamora details how representations of wet markets in China are rooted in Orientalist assumptions and urban fallacies that have colored and distorted public health discussions during the COVID-19 pandemic. Lia Laureen Schulz also examines communication during the pandemic, presenting a nuanced and balanced assessment of the potentials and pitfalls of the distribution of information through social media. Michelle Kadzirange traces a history of one-sided and negative representations of African cities emanating from the Global North, and turns instead to creative practices of Afrofuturism, in film and art, that imaginatively represent African cities as vibrant and complex spaces of creativity and hope.

The urban is not surprisingly a critical focus of a good number of papers. Sara Jafroudi documents, through sophisticated quantitative methods, the uneven use of Stop-Question-Frisk (SQF) policing policy in two neighbourhoods in Brooklyn, New York, theorising this difference through a close analysis of race and the production of urban space. Sabrina Ouyang thinks the city in relation to evolutionary theory. Lisa Juliet Besnier challenges the privileging of a certain kind of urban space in queer theory, locating this in outdated conceptions of cities and suburbs. They urge new understandings of the different forms that queer spaces can take. It has become apparent during the pandemic that cities too will need to be rethought. These papers give me such faith that the students in Geography at UBC are well placed to do this.

Geraldine Pratt

Department Head

UBC Department of Geography

LETTER FROM THE EDITORS

This year, the whole world was faced with the challenges of the COVID-19 pandemic, and the Trail Six journal was no exception. Conducting a project such as this entirely online was a new experience for us all, and I am inspired by all of the innovative suggestions and solutions developed by our team to mitigate the obstacles with which we were faced. Despite the hardships presented by the pandemic, this team persevered and produced truly exceptional results.

This year's selected papers show the breadth of the field of geography and discuss some of the most relevant topics of this time. The field of geography allows us to tackle a wide range of issues from several perspectives and it is inspiring to see such a variety of critical research topics being explored. I am proud to share the diverse undergraduate geography research at UBC. Finally, I would like to express my sincere thanks to all of our editors, authors, layout team, faculty reviewers, my Geography Students' Association team, and Angela, my co-Project Manager, for your time, hard work and dedication to this project.

Ashley Harris

Editor-in-Chief

The publication of the 15th edition of the Trail Six Undergraduate Journal during this tumultuous year is an indication of the boundless academic curiosity, intellectual rigor, and resilience of students studying the nuanced and complex discipline of Geography. In the beginning of the year, COVID-19 stood as a nearly insurmountable barrier that has forced many undergraduate journals to postpone their 2021 publications, with Trail Six facing a similar fate. It was through the passion and dedication of all those involved that we were able to have a publication rivaling, or perhaps even surpassing the capacity of previous iterations.

It's difficult to express my infinite gratitude to the people who have devoted so much of their time to making this publication such a resounding success. Thank you to my outstanding team of editors and layout designers, who have dedicated countless hours towards the revision and improvement of our submissions. Thank you to our authors who brought forth papers that unveil new perspectives on critical geographical issues, and thank you to the faculty who have taken time out of their busy schedules to bestow their knowledge upon the next generation. Thank you.

I am incredibly proud to be showcasing this exceptionally diverse sample of the scholarship that touches on topics ranging from the reimagining of queer and Black spaces to the climate modelling of amphibian species distributions. I am honoured to be bringing you the pinnacle of undergraduate geographical academia at UBC, and I hope you enjoy reading our volume as much as we enjoyed making it.

Angela Liu

Editor-in-Chief

Urbanisation in Africa and Afrofuturism

by: MICHELLE KADZIRANGE

Discussions around urbanisation are often from a Global North perspective; when they include urbanisation in Africa, they often from an implicitly neocolonial Western perspective. Two major conceptual approaches that have emerged around Global South urbanism are modernisation theories and the World Systems Theory, both of which generally understand urbanisation of the Global South in terms of, or in comparison with that of the Global North. As a result, many African scholars argue that the study of African urbanism by Western scholars is a form of political and economic colonialism. Whilst it can be argued that Western theories and models of how cities form and emerge are useful, the application of these ideas to cities in the Global South often fails to recognize the consequences of making such comparisons: A universalised Northern city deems the Southern city as failing, the antithesis of 'civilisation', and moreover neglects the diverse realities of all regions of world urbanisation. This paper argues that specific ideas and expressions like Afrofuturism become an important tool to not only break down essentialism colonial imagined geographies, but also to provide alternative ideas from the perspectives of black scholars, artists, city planners and citizens. By analysing representations of cities in films like Black Panther (2018), and digital cityscape artworks, this paper illustrates how African cities can be viewed and imagined by black people.

Urbanisation in Africa and Afrofuturism

Some scholars argue that the future of the world's urbanisation will be in Africa (von Noorlos & Kloosterboer, 2017). Yet, as with many other continents and regions in the Global South, mainstream urban studies around the process of urbanisation in Africa have largely been dismissed. If there are discussions, it is often from the perspective of cities and city regions of the Global North and neglects the works of African urban scholars (Myers, 2018). Many postcolonial theorists have thus debated the limits of perceiving African urbanism through the economic base theory (as conceptualised in the context of modernisation or World Systems theories). However, postcolonialism alone is insufficient to understand the phenomenon of African urbanism. Thus, the cultural movement of Afrofuturism can help raise fundamental questions within the dialogue around African and Black

urbanism. For example: Do Global South cities have to look like and follow the same spatial urban patterns and systems as the Global North? How are cities in the Global North connected to cities in the Global South? Can cities in Africa redefine what it means to be a city in the ever-challenging dynamics of globalisation? Therefore, the aim of this paper is to illustrate how theories of urban geography can be both useful and problematic in explaining the history, present and future trends of urbanisation in Africa. Instead, the cultural movement of Afrofuturism can be a way in which we can both understand and imagine the possibilities of African and Black urban spaces around the world.

Urbanisation Theories of Africa: Modernisation Theory, World Systems Theory and Postcolonial Theories

Modernisation theories emerged in the wake of WWII when many Western scholars believed that in order for "Third World'' countries to become urbanised, they needed to follow the economic and industrialisation trajectories of Western states (Pacione, 2009). Therefore, modernisation theory articulates a dichotomy between the so-called "traditional" society and the new metropolitan one: Traditional societies are inert, economically simple and against innovation, whilst modern societies are cosmopolitan, welcoming to change and characterised by complex division of labour (Nils, 2018). Some urban geographers further contend that cities are fundamentally built on the idea of agglomeration, which involves the pull of people, economic activities and other engagements. The primary force driving this agglomeration is division of labour in which "social and economic life is organised and reorganised" (Storper & Scott, 2016, p. 1116). Thus, from this argument, *all* cities must develop through this essentialised process of agglomeration, industrialisation, and the classic stages of economic growth (Rostow, 1990, 1991).

However, some scholars argued that viewing urbanisation in the Global South from a purely economic and developed vs. underdeveloped perspective was fundamentally flawed: The contemporary global orders of society, politics and economy could only be understood through the geopolitical histories of colonialism. Thus, in the 1970s, Immanuel Wallerstein formulated his World Systems Theory, arguing that cities in the Global North needed to be situated in relation to low-income countries via

the context of the global economic and political systems (Chirot, 2015). This theory emphasises the fundamentally exploitative nature of capitalism in relation to colonialism and its consequences.

Ananya Roy argues that urban geography theories must be based on ones with both "specificity and generalizability;" whilst also being located and dis-located (Roy, 2009, p. 820). Roy further states that these concepts, and the scholarly literature around economic agglomeration do not account for other ways in which cities can emerge: urban geographers often pay more attention to the financial and information flows of urban networks, resulting in global maps of cities and city regions leaving out those that are deemed irrelevant in the system of economic globalisation (Roy, 2009). other scholars, (like) Jane Jacobs (1996), contend that postmodern cities are still highly racialised because they are structured by colonialism, despite contrary claims that metropoles are highly multicultural and devoid of racism and discrimination. For example, modern cities of South Africa that were established through colonialism, such as the township of Soweto, still have explicitly racialised spaces today (Jacobs, 1996). This has also occurred in Britain, even as its imperial powers declined, because the power dynamics of colonialism determined who was allowed to migrate into which cities, how they would be integrated into the labour market, and what their living conditions would be like (Jacobs, 1996). The legacy of colonialism has given rise to such racialised geographies in cities of both the Global North and the Global South. Therefore, to believe that only contemporary cities in Africa have been directly affected by colonialism, would be a mistake and a misunderstanding of the dynamics of colonialism and its ongoing (historical, social and geopolitical) implications.

Afrofuturism: A dialogue between reality and fiction of African and Black urban and contemporary cities

Whilst it can be argued that Western theories and models of city formation are fruitful, the application of these ideas to cities in the Global South often fails to recognise the consequences of the negative portrayals of said cities. Hence, ideas and expressions such as Afrofuturism become an important tool to not only break down essentialised colonial narratives, but also to provide alternative visions from the perspectives of Black scholars, artists, city planners and citizens. Afrofuturism allows us to see how urbanisation in the

Global South and the Global North are interconnected and in constant dialogue with one another, raising questions around the impulse to benchmark or compare urbanisation in the Global South. Moreover, through Afrofuturism a more dynamic and decolonial discourse can begin to emerge around how Africans themselves might re-imagine urban spaces, and ultimately how cities are defined in the 21st Century.

Afrofuturism has used science fiction, technology and culture to express, understand and celebrate particular visions of Black culture (Strong & Chaplin, 2019). It is a way of imagining possibilities through a Black perspective (Nicholas, 2018), and "explores the Black experience across the African Diaspora" by providing an alternative narrative for understanding Blackness and Black identity (Strong & Chaplin, 2019 p. 58). Although it began in the US, it has increasingly become a form of expression and understanding throughout Africa and has become an important bridge of dialogue between Africa and the African diaspora. Afrofuturism often fuses tradition and ancestral history with characteristics of modern society in order to portray the aspirations for the future (Strong & Chaplin, 2019). This is important to the debates within urban geography and specifically urbanisation in Africa, because the connections between pre-colonial pasts, fictionional-possible worlds, and present urban contexts, as imagined through Black or African people, are rarely engaged in dominant discourse.

How then are Global South cities typically portrayed? Ananya Roy argues that the slum has become the representation of the Third World city and that this has serious consequences: Slum cities in the Global South are often portrayed as places of immense poverty, despite also being spaces for enterprise and innovation (Roy, 2011). For example, the popular film *Slumdog Millionaire* (2008), though widely praised by global audiences, received strong criticism from many in India who rejected the depiction of Mumbai as a violent-stricken place of slums (Roy, 2011). Subaltern urbanism, Roy contends, is associated with poverty, as a place of the dispossessed, and a place of entrepreneurship, whilst being contextualised as a "colonial wound" (Mignolo, as cited in Roy, 2011, p. 230). Similarly, African cities tend to be portrayed as dystopian, poverty-stricken urban landscapes by Western entertainment media. For instance, films such as *Blood Diamond* (2006), *Beasts of No Nation* (2015), *Queen of*

Katwe (2016), may each be of different genres, yet they all share similar themes: They take place within urban African landscapes of poverty, suffering, underdevelopment, which ostensibly need help. There may be nothing wrong with having films carefully and contextually depict the lived struggles and experiences of people in certain African cities or slums. However, these images of 'Otherness' in which African cities are positioned as failed urban systems and the antithesis of contemporary Western metropoles, creates a universalised, colonial narrative that is constantly produced and reproduced. Thus, the lack of diversity in the ways (real or future) African cities can be perceived, distorts the fact that they are and can be places that *work*, places that are sources - not just beneficiaries - of innovation and creativity.

Furthermore, these representations around urbanism in the Global South are troubling due to the consequences that result from this othering. One of the effects of the slum city being the poster child of Global South urbanism is the highly controversial tourism of these slums (Roy, 2011). Poverty tourism has become a popular activity where many people from the West/Global North visit villages or other remote areas in the Global South, particularly in Africa. Yet cities - slum cities and shanty towns in particular - have become popular destinations in this circuit. Tourist businesses such as Moafrika Tours, market these landscapes (in this case, part of Soweto, South Africa) as "sprawling impoverished suburbs that remind us that many have not escaped the shackles of poverty," even as they sit juxtaposed with "modern urban belts that showcase an upwelling of wealth and prosperity" (Moafricatours.com). In context, this creates an image of people trapped in time and space of poverty, unable to muster compliance with a singular trajectory of prosperous development via state benevolence or capitalist competition.

Despite these short-sighted and often negative representations of African cities, there are several African artists who, through their artwork, try to deconstruct and change this narrative. AbdouMaliq Simone argues that "a more generous point of view concedes that African cities are works in progress, at the same time exceedingly creative and extremely stalled" (Simone, 2004, p. 1). Depictions of cities in films like *Black Panther* (2018) - one of the most prominent popular examples of Afrofuturism in recent memory - help break down this barrier by illustrating not only how African cities might be

viewed by Black people, but how they can be *imagined* by Black people. This is why *Black Panther's* city of Wakanda and its social and aesthetic representations were received with such praise and appreciation: They not only addressed the lack of positive images of African and Black urbanism, but they also expressed the radical imagination of what these places could look like and how they might function. Here, at last, was a world in which Blackness was its own being, not a denigrated dialectical analogue of Whiteness.

There are several African artists who, through their artwork, offer hopeful, aspirational urban landscapes that challenge us to rethink what a city is, and why they might look as they do (Nicholas, 2018). For example, in his collaborative drawings with Wale Oyejide, Nigerian graphic designer Olalekan Jeyifous illustrates the boundaries of architectural representation across various African cities (Jeyifous, 2015). What is fascinating throughout the images is that they integrate futuristic technological urban landscapes with present day features of the cities of Johannesburg, Lagos, and Nairobi. Such portrayals encourage us to examine how cities in African countries could be places of innovation and potentially, systems that can work regardless of entrenched ideas surrounding their underdevelopment. Likewise, they subvert the persistent narrative of African slums and cities as failed productions of space.

As seen here, Afrofuturism involves not only reimagining urban spaces, but also reflecting and drawing inspiration from existing features and material-aesthetic histories of African cities. This was also the case with *Black Panther*'s Wakanda. The city featured architectural buildings that were inspired by the minarets of the mosques of Timbuktu, which were built when Mali was part of a sprawling, prosperous empire in the 14th century (Boissoneault, 2015; Duval Smith, 2015). Like the illustrations of Oyejide and Jeyfous, the film also drew inspiration from metropolis cities of Nairobi, Johannesburg and Lagos (Sisson, 2018). It must be noted that imagining how urbanism - not just in Africa but worldwide[1] - may have emerged if

[1] African cities may bear a material lack of development in terms of Western cities, but how might the forms and finances of "Western" cities have been shaped differently without the colonial foundation of Africa's labor and riches?

slavery and colonialism had never occurred is simply impossible. This is one of the limits of Afrofuturism, yet, this imagining is precisely the source of its subversive, assertive power. To ignore the importance of this expression for reshaping conversations around urbanism in Africa and Black diasporas would be to greatly undermine the potential of storytelling and artistic expressions to inform discourses of urban geography. If urban geography in the 20th and 21st centuries has expanded beyond the limits of positivist inquiry and theories of economic agglomeration, this is one way it can continue to do so.

The New City: Systems of Continued Social Inequality in African Urbanisation

Although it is important to engage with the new and innovative ways that cities are constantly changing in Africa, it is also necessary to be mindful of the potential problems that may arise, even with some novel approaches to development. Some countries in Africa have set out to create brand new cities, established out of certain socio-political visions via master planning (von Noorloos & Kloosterboer, 2018). Creation of 'new cities' has a paradoxical aspect in that to do so on conceptual and materialist (rather than historical) premises follows the same path of some socialist state cities in their emergence. Likewise, it defies theories (such as the economic base theory) that have long accounted for cities emerging from economic agglomerations. 'New cities', with their explicit privatisation of urban spaces, become economic processes that from the outset determine who can and cannot have access to them. This is because many of these new city projects are increasingly directed towards middle- or upper-class Africans and, most importantly, foreign expats (von Noorlos & Kloosterboer, 2018). Thus, these government city projects create high-modernist urban enclaves juxtaposed with more quotidian or slum-like spaces, reinscribing the latter's subalter status. These new cities thus function as exclusionary processes. Some scholars have criticised these highly utopic city designs in Africa, such as Watson, who argues that such plans are a form of "speculative urbanism" (Watson, 2013, as cited by von Noorlos & Kloosterboer, 2018, p. 1225).

African city plans, in this way, become both symbols and facilitators of the divide between the upper-middle/ elite classes that occupy them, and the poorer people that they exclude. As some have argued, these cities are little more than "large-scale

private real estate investments" (von Noorloos & Kloosterboer, 2018, p. 1228) that do not take into account urban social inequality (Futurecapetown, 2014). These new cities are typically funded by banks creating a scenario in which neoliberal capitalism is used as a tool in funding and bidding for these cities, rather than being a *by-product* of the process of capitalism and free markets. This is the case with the HOPE (Home Office People Environment) City Project in Ghana. On one hand, the designs and concepts around the city are heavily inspired by traditional, ancient cities of Ghana, fused with contemporary spatial patterns of cities from the Global North (Ocran, 2015). However, it is important to understand who this city is being built for: It is intended for people in technology fields, as an imagined major tech-hub for Ghana (Ocran, 2015).

As such, urbanism in Africa does feature a provocative interplay between both state-socialist and Western urban systems, differentially influenced by both history and ongoing globalisation. This raises interesting implications for the future of urban studies and understanding how cities come about.

Conclusion

Urbanism in the Global South, and particularly in Africa, cannot be viewed as separate from urbanism elsewhere, in the Global North, as was proposed by Immanuel Wallerstein. Indeed, there is much to learn from the embodied history of World Systems theory itself. After serving in the U.S. Army in the early 1950s, Wallerstein pursued graduate work and won a Ford Foundation fellowship to study and travel in Africa; he later reflected, "I credit my African studies with opening my eyes both to the burning political issues of the contemporary world and to the scholarly issues of how to analyze the history of the world system." (quoted in Genzlinger, 2019). Half a century after Wallerstein's revelation, Afrofuturism promises valuable education for new generations of urbanists seeking to understand the complex transnational evolution of "racially structured social formations" (Hall, 1980, p. 191) of an urbanizing planet.

Representations of these urban systems in the Global South have real consequences because perpetuating stereotypes around the 'Other', or of African urbanism as a dystopic space, both reifies these identities and helps circumscribe the realm of possibility for imaging African cities and Black futures. Afrofuturism offers one way of pressing against and beyond these representations by integrative re-

visioning of material histories and futures. The stakes of this are more than just imaginative, but are in fact material. African cities are not just systems of economic productivity and spatial production. Animated by much more than neocolonial and neoliberal theories of development and modernisation, they are lived experiences, with real people, who, just like people in metropoles of the Global North, are capable of innovative and creative ways of shaping the way their cities - and perhaps others - might flourish.

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The Centaur State: Stop-Question-Frisk in Neoliberal New York City

by: SARA JAFROUDI

As a global city positioned with dynamic, shifting currents of competition and neoliberal structural transformation, New York City has undergone cycles of worsening, grotesque class polarization over the past two generations. The multiple waves of entrepreneurial governance reinvention following the City's 1975 fiscal crisis have simultaneously undermined economic and social security while legitimating punitive attempts to impose a new moral order on the urban poor. Despite fragmented and contradictory evidence, "Broken Windows" theory and "Order Maintenance Policing" became spatially explicit ideological justifications for the punitive imposition of the neoliberal project. In this paper, I use the New York Police Department's Stop-Question-Frisk database to analyze two neighborhoods in Brooklyn, where we observe the vivid, localized manifestation of Loïc Wacquant's influential theory of carceral neoliberal urbanism as a "centaur" state — of a governmentality built on the self-perception of liberal freedom backed by increasingly punitive and paternalistic forms of social control.

Introduction

A key tenet of the neoliberal project is the "penal activism of the state" (Wacquant, 2009, p. 310). The success of neoliberalism as an economic and political framework that champions deregulation, privatization, welfare devolution and laissez-faire capitalist innovation, is inextricably tied to the growing influence and assertion of the penal sector via its constituent features; "the police, court, and prison" (Wacquant, 2009, p. 310). Despite its overarching prevalence, neoliberalism is not felt in a spatially ubiquitous manner. Those most vulnerable to the retrenchment of the social safety net and the process of deindustrialization are those most at risk of being engulfed by its "authoritarian moralism" (Wacquant, 2009, p. 311). Driven by this neoliberal attribute of authoritarian moralism, the "broken windows" theory and the zero-tolerance movement have served to mobilize the penal sector and its reach in the everyday lives of the "post-industrial proletariat" (Wacquant, 2009, p. 304) through a broad, evolving consensus of what constitutes criminal behavior (Wacquant, 2009). New York City's Stop-Question-Frisk (SQF) program, coming "directly out of the framework of broken windows theory," (Camp and Heatherton, 2016, p. 57) is

but another example of the "punitive containment of urban marginality" (Wacquant, 2009, p. 304). As will be highlighted further in this essay, the extent to which the neoliberal project is paternalistic is spatially variegated; thus, the system carries the capacity to reproduce inequality, and deepen existing economic and racial cleavages (Wacquant, 2009). This paper seeks to investigate the extent to which neoliberalism, at a local and supralocal scale, is liberal or paternalistic, and how these attributes are spatially distributed. This paper will also outline how the broken windows theory has served to mobilize the punitive imperative of the neoliberal project.

This essay will first explore the empirical discrepancies of the broken windows theory in order to assess its internal validity (Ansfield, 2020). Next, it will highlight how its successor, the quality of life movement, fostered a hyper-punitive attitude in response to the increasing social insecurity and class polarization following the 1970s fiscal crisis in New York City (Vitale, 2009). Moreover, this essay will conduct a comparative spatial analysis of two census tracts in the Brooklyn borough to evaluate the spatial discrepancies of the SQF program (Vieyra, 2016). This essay broadly seeks to examine how neoliberalism has "erected a centaur state [which] presents itself with radically different faces" (Wacquant, 2009, p. 312).

The Complex Upbringing of SQF: A Problem Child of Broken Windows Theory and the Quality-of-Life Movement

The decades preceding SQF in New York City were characterized by concerted efforts to protect the interests of the middle and upper classes by enforcing "a new moral order on the poor" (Jefferson and Vitale, 2016, p. 13). Urban policing tactics in New York City can be traced back to a seminal piece written for *The Atlantic* by George Kelling and James Wilson in 1982, entitled "Broken Windows: The Police and Neighbourhood Safety" (Camp and Heatherton, 2016, p. 57). Later, this became known as the "broken windows" theory (or to critics, the broken windows "hypothesis") and permeated mainstream political discourse, becoming an "ideological justification" for the "criminalization of communities of color" (Jefferson and Vitale, 2016, p. 134-136). The essence of the article can be best captured in this quote; "police officers tend to agree

that if a window in a building is broken and is left unrepaired, all the rest of the windows will soon be broken" (Kelling and Wilson, 1982). Kelling and Wilson's provocative argument achieved apparent legitimacy on the basis of seemingly powerful empirical evidence, as illustrated in this excerpt:

> "Philip Zimbardo, a Stanford psychologist, reported in 1969 on some experiments testing the broken-window theory. He arranged to have an automobile without license plates parked with its hood up on a street in the Bronx and a comparable automobile on a street in Palo Alto, California. The car in the Bronx was attacked by 'vandals' within ten minutes of its 'abandonment.' The first to arrive were a family—father, mother, and young son—who removed the radiator and battery. Within twenty-four hours, virtually everything of value had been removed. [...] The car in Palo Alto sat untouched for more than a week. Then Zimbardo smashed part of it with a sledgehammer. Soon, passersby were joining in. Within a few hours, the car had been turned upside down and utterly destroyed." (Kelling and Wilson, 1982).

The original purpose of this study was not a lesson about morality, but rather to determine "the relationship between community anonymity and vandalism" (Ansfield, 2020, p. 115). The details from Zimbardo's study, which were intentionally filtered out by Wilson and Kelling, are destabilizing to the validity of their theory (Ansfield, 2020). For instance, in the case of the Bronx car, the "first 'vandals' were not youth of color but a white, 'well-dressed' family" (Ansfield, 2020, p. 115). This deliberate empirical discrepancy played a role in the "racial mattering" of the theory, or the "blending [of] matter and racial symbolism" (Ansfield, 2020, p. 119). Despite claiming colorblindness, this theory was ultimately a "racial project" (Ansfield, 2020, p. 119). Likewise, Wilson and Kelling's statement that the Palo Alto Oldsmobile remained untouched until Zimbardo "smashed part of it with a sledgehammer" was inconsistent with Zimbardo's study (Ansfield, 2020). In fact, the Palo Alto car remained fully intact; Zimbardo described "one passer-

by even lowering the hood" to protect the motor (Ansfield, 2020, p. 115). After a week, Zimbardo and his graduate students relocated the car to the Stanford University campus, where they "primed" the car by breaking the windows and continued to destroy the Oldsmobile (Ansfield, 2020, p. 115). However, Wilson and Kelling distorted the details of Zimbardo's study to reaffirm their broken windows hypothesis (Ansfield, 2020). Despite its fallacious evidentiary basis, the broken windows hypothesis became a powerful, persuasive discourse that paved the way for 'quality of life' policies and what became known as 'Order Maintenance Policing' (OMP) (Vitale, 2008a).

On July 6, 1994, the newly-elected mayor, Rudolph Giuliani and police commissioner William Bratton, released *Police Strategy No. 5: Reclaiming the Public Spaces of New York* (Smith, 1998). Described as a "fin-de-siècle of American revanchism," (Smith, 1998, p. 2) the report called on "[aggressive] panhandling, squeegee cleaners, street prostitution, 'boombox cars,' public drunkenness, reckless bicyclists, and graffiti" as behavioral manifestations of disorder and the collapse of social control (Bratton and Giuliani, 1994). The report also explicitly mentioned the broken windows essay, claiming that "disorder is indeed the first step in [...] 'the downward spiral of urban decay'" (Bratton and Giuliani, 1994). The broken windows "theory-turned-policy" effectively assumed form in a cohesive policy regime called the quality-of-life movement (Kelley, 2016, p. 25). The following decade brought institutional support for "a zero-tolerance campaign to target visible signs of disorder" (Shepard, 2008, p. 524) and a punitive turn which dismissed issues of social welfare for corporate welfare while emboldening the authority of local law enforcement (Smith, 1998).

In order to understand what was, according to Bratton and Giuliani, the "decline in public order [which had] occurred over many years," (1994) it may be worthwhile to assess the political shifts in the preceding decades. New York City's submission to neoliberal economic restructuring reached a breaking point during the fiscal crisis of the 1970s (Vitale, 2008). Facing decreased tax revenue as a result of "white suburbanization" (Jefferson and Vitale, 2016, p. 135) that compounded the effects of decades of job losses from deindustrialization, the

city was forced to surrender its fiscal and managerial autonomy to a group of business leaders (Vitale, 2008a). The new dominant financial coalition of entrepreneurial governance imposed their own interpretations of the city's fiscal failure and how to deal with it effectively (Vitale, 2008a). They placed blame on "too many social services for the poor [...] and not enough services for the wealthy and middle classes'' (Vitale, 2008b, p. 103).What followed was massive cutbacks in social services and welfare (Vitale, 2008a). To begin with, between 1969 and 1980, "the city lost more than 330,000 of its 825,000 manufacturing jobs" (Vitale, 2008b, p. 106). From 1969 to 1987, the proportion of the city's population living in poverty increased from ten percent to twenty-five percent (Vitale, 2008b). Worsening polarization, in 1990, "welfare payments were worth only 63 percent of what they had been in 1970" (Vitale, 2008, p. 107). Meanwhile, the Midtown Development Plan, which afforded subsidies to luxury real estate and office space developers, resulted in a tax loss of over $1 billion dollars a year between 1982 and 1988 (Vitale, 2008b). Likewise, between 1974 and 1994, New York City's corporate tax rate decreased from 10.1 percent to 8.85 percent; this one percent decrease entailed an annual revenue loss of $100 million (Vitale, 2008b). While windfalls were being afforded to elite segments of the population, the carceral state began to assert itself in the lives of the precarious segments of the population (Wacquant, 2009). In the words of Neil Smith, "what distinguishes New York is that the loss of [...] 'entitlements' is matched by a parallel assault on rights" (1998, p. 1).

Broken windows theory, the quality-of-life-movement, and order-maintenance policing evaded the roots of disorder, while providing a powerful, popular ideological justification in using punitive force to respond to the visible symptoms of larger, elusive structural processes (Camp and Heatherton, 2016). To borrow from Neil Smith, "[criminality] is spatialized, postmodernized even, insofar as the sign and symptom are the same thing" (1998, p. 3). Quality of life interventions and order maintenance policing fail to address the "neoliberal reorganization of the city's finances following the 1970s fiscal crisis" in establishing a "permanent austerity governance" (Vitale and Jefferson, 2016, p. 135) which oriented itself towards the dissolution of social welfare in favor of a market-driven system providing

gratuitous profits to the city's elites (Vitale and Jefferson, 2016). The spatially variegated impacts of deindustrialization and the retrenchment of the social safety net that were manifest on the streets in the form of "untreated mental illness, economic displacement, and mass homelessness" (Vitale and Jefferson, 2016, p. 135) were met by the "new government of poverty" (Wacquant, 2009, p. 294) through the rollout of zero-tolerance policing tactics which offered "relief not to the poor but *from* the poor" (Wacquant, 2009, p. 295).

Two Tales of Brooklyn

In this section, I conduct a comparative spatial analysis of two census tracts in Brooklyn, New York City – one in Brownsville and the other in Williamsburg (Figure 1). This analysis will assess the spatially differential deployment of SQF policing tactics and how green space, as a political tool, can serve to explain the differences observed. By addressing patterns of policing data in relation to socio-demographic variables, this analysis seeks to elaborate on Loic Wacquant's proposition that neoliberalism presents itself with "radically different faces at the two ends of the social hierarchy" (Wacquant, 2009, p. 312).

Figure 1. Williamsburg (left) and Brownsville (right). Source: author's adaptation from NYC Open Data portal.

Brownsville

The first census tract under consideration is FIPS code 36 047 091200 in Brownsville, Brooklyn. Nestled between the Marcus Garvey Village to the west and the Van Dyke Houses to the East, this tract encompasses the New York City Housing Authority (NYCHA) Brownsville development, several dozen mid-rise brick public housing towers built in the 1940s and 1950s. The transformation of the wider Brownsville neighborhood from 90 percent white in 1940 to 90 percent black and Puerto Rican by the early 1960s reflects the wider spatial evolution of American urbanism, particularly 1) housing discrimination in the rest of the city, 2) average local rents remaining about a third lower than Manhattan, and 3) the displacement of poor Black and Latino residents during Manhattan's urban renewal program (Pritchett, 2001). In 2010, a year before the SQF program peaked with nearly 700 thousand stops across the City, the Census of Population and Housing indicated that the neighborhood was 74 percent Non-Hispanic Black, and 24.6 percent Hispanic/Latino/a/x.

The overlap of New York City's ruthless class disparity and SQF's spatial clustering can be observed clearly in the case of Brownsville (Fagan et al., 2010; Vieyra, 2016; Vitale, 2008a, 2008b). In 2017, the median household income in Brownsville was 67 percent below the citywide median. Meanwhile, the poverty rate, compared to the citywide rate of 17.9 percent, was 39.9 percent in Brownsville. In the case of our particular census tract, NYPD officers reported a total of 26,373 SQF stops between 2007 and 2013; this was the highest frequency of all of the 2,144 census tracts across the entire metropolis. Of all the stops in this Brownsville tract, 23,651 – 89.7 percent – were Non-Hispanic African American. The racialized nature of these data reflects the neighborhood history of urban renewal and the nexus of class and racial segregation in American public housing, but this is only a partial explanation. In an ethnographic study of the community, Francisco Vieira (2016, p. 218) describes "the number of police officers, police patrols, [and] tactical units" as being an immediately striking feature of the neighbourhood. Vieyra (2016, p. 223) explains that SQF is not randomly

deployed; rather, there are clear indications of "racial clustering." So far as paternalistic policing goes, the census tract under consideration had the City's second-highest frequency of stops justified by officers as "inappropriate attire for the season." Such an arbitrary and subjective criterion is congruent with Wacquant's (2009, p. 292) "centaur state" whereby "poverty has not receded, but social visibility and civic standing of the troublemaking poor have been reduced."

The police presence in Brownsville is more than just a matter of neighborhood optics. A logistic regression of SQF stops between 2007 and 2013 testing for the likelihood that a stop in Brownsville would be made on the premise of suspected marijuana possession compared to a stop in the rest of the city yielded statistically significant results ($p = <0.0001$) (Table 1). After controlling for a wide range of factors in the NYPD's SQF dataset, an individual in Brownsville is 1.40 times more likely to be stopped for being suspected of marijuana possession compared with otherwise identical people elsewhere in the city (Table 1). The same model yielded another disparity: non-Hispanic blacks, compared to whites, are 1.174 times as likely to be stopped for the same reason (Table 1). In light of the very close fit of model predictions with observed outcomes (Table 2), these results provide stark, fine-grained support for previous research (e.g., Harcourt and Ludwig, 2007) that has investigated the racially disproportionate impact of misdemeanor charges for smoking marijuana in public view (MPV). In 1993, a year prior to initiation of zero-tolerance policing, the police were making 10 MVP arrests per police precinct each year; by 2000, the police were making an average of 2 MVP arrests per day (Harcourt and Ludwig, 2007). The rampant rollout of zero-tolerance policing tactics was thus accompanied by a massive spike in misdemeanor arrests (Harcourt and Ludwig, 2007). These racial disparities were reflected in a 2003 study which found that, though comprising 25 percent of the population in New York, African Americans and Hispanics accounted for 52 percent and 32 percent of MVP arrests respectively (Harcourt and Ludwig, 2007). My model documents that, even after giving every benefit of the doubt to officers for their justifications, the pretext of marijuana

possession became steadily more severe for several years after Harcourt and Ludwig's (2007) study – from a low odds ratio of 0.568 in 2007 to a high of 1.529 in 2012, compared to the reference year of 2013. However, there has been "no good evidence that the (MPV) arrests are associated with reductions in serious violent or property crimes in the city" (Harcourt and Ludwig, 2007, p. 166), warranting skepticism of the motivations behind these policing strategies.

```
proc logistic data=nypd.jafroudi;
        class x_age year x_month x_time;
        model rv_mrj=rx_asn rx_nhb rx_ntv rx_bhs rx_whs rx_unk rx_oth sx_f sx_z
        csxbulge csxcasng csxcloth csxdescr csxdrgtr csxfurtv csxlkout csxobjcs csxvcrim
csxnumbr       o_pers
        xa_rept xa_inves xa_proxm xa_evasv xa_assoc xa_cgdir xa_incid xa_time xa_stsnd
xa_other
        notunif x_age year x_month x_time
        brwnsvl
        / expb rsquare parmlabel;
        output out=nypd.fit p=pbad;
        units csxnumbr=SD;
        title "Marijuana Model";
        run;
```

Figure 2. SAS code for logistic regression of SQF stops for suspected marijuana possession.

Table 1. Logistic Regression of SQF Stops: Crime Suspected, Marijuana Possession.

Variable	Parameter Estimate	Pr > ChiSq	Odds Ratio
Intercept	-3.8895	<.0001	0.020
Race: Asian	-0.0762	0.0004	0.927
Race: Non Hispanic Black	0.1599	<.0001	1.173
Race: Native American or Alaska Native	0.015	0.7687	1.015
Race: Black Hispanic	-0.0878	<.0001	0.916
Race: White Hispanic	-0.0929	<.0001	0.911
Race: Unknown/Unreported	0.00152	0.9685	1.002
Race: Other	-0.1823	<.0001	0.833
Sex: Female	0.2257	<.0001	1.253
Sex: Unknown/Unreported	-0.0442	0.111	0.957
Reason for Stop: Suspicious Bulge	-2.6452	<.0001	0.071
Reason for Stop: Casing a Victim or Location	-2.6921	<.0001	0.068
Reason for Stop: Wearing Clothes Commonly Used in a Crime	-1.8218	<.0001	0.162
Reason for Stop: Fits a Relevant Description	-1.7595	<.0001	0.172
Reason for Stop: Actions Indicative of a Drug Transaction	1.2612	<.0001	3.530
Reason for Stop: Furtive Movements	-0.9182	<.0001	0.399
Reason for Stop: Suspect Acting as a Lookout	-1.44	<.0001	0.237
Reason for Stop: Carrying Suspicious Object	-0.4659	<.0001	0.628
Reason for Stop: Actions of Engaging in a Violent Crime	-2.4238	<.0001	0.089
Number of Reasons Cited for Stop	1.162	<.0001	2.737
Other Persons Stopped/Questioned/Frisked	0.2279	<.0001	1.256
Additional Circumstances: Report from Victim/Witness	-0.2378	<.0001	0.788
Additional Circumstances: Ongoing Investigations	-0.7566	<.0001	0.469
Additional Circumstances: Proximity to Crime Location	-0.0324	<.0001	0.968
Additional Circumstances: Evasive/False/Inconsistent Responses	0.0123	0.1236	1.012
Additional Circumstances: Associating With Persons Known for Their Criminal Activity	-0.0874	<.0001	0.916
Additional Circumstances: Changing Direction at Sight of Officer/Flight	-0.0134	0.079	0.987
Additional Circumstances: Area Has High Incidence of Reported Offense	0.0335	<.0001	1.034
Additional Circumstances: Time of Day, Day of Week, Season Corresponding to Reports of	0.1991	<.0001	1.220
Additional Circumstances: Sights and Sounds of Criminal Activity	0.2323	<.0001	1.262
Additional Circumstances: Other	0.2735	<.0001	1.315
Officer not in uniform	-0.5602	<.0001	0.571
Age: Under 15	0.0523	0.0262	1.054
Age: 15 to 18	0.2827	<.0001	1.327
Age: 19 to 21	0.2135	<.0001	1.238
Age: 22 to 25	0.1199	<.0001	1.127
Age: 26 to 30	0.00397	0.8009	1.004
Age: 31 to 40	-0.2067	<.0001	0.813
Age: 41 and over	-0.5659	<.0001	0.568
Year: 2007	-0.4807	<.0001	0.618
Year: 2008	-0.4381	<.0001	0.645
Year: 2009	-0.2098	<.0001	0.811
Year: 2010	0.0986	<.0001	1.104
Year: 2011	0.2144	<.0001	1.239
Year: 2012	0.4247	<.0001	1.529
Month: January	-0.2877	<.0001	0.750
Month: February	-0.2318	<.0001	0.793
Month: March	-0.1388	<.0001	0.870
Month: April	-0.0418	<.0001	0.959
Month: May	-0.0128	0.1713	0.987
Month: June	0.0885	<.0001	1.093
Month: July	0.105	<.0001	1.111
Month: August	0.1956	<.0001	1.216
Month: September	0.193	<.0001	1.213
Month: October	0.1324	<.0001	1.142
Month: November	0.0301	0.0041	1.031
Time: 3-6 pm	0.1398	<.0001	1.150
Time: 6-9 pm	0.2929	<.0001	1.340
Time: 9 pm - midnight	0.2794	<.0001	1.322
Time: midnight-3 am	0.00704	0.3478	1.007
Time: 3 - 6 am	-0.6414	<.0001	0.527
Brownsville Census Tract, FIPS 360470912.00	0.3383	<.0001	1.403
Total Number of Observations	3,605,337		
Total Number of Dependent Outcomes	140,562		
Percent Concordant	86.3		
Max-Rescaled Pseudo-R-squared	0.269		

Source: Author's Analysis of Data disclosed in New York Police Department, *Stop, Question, and Frisk Database* .

Table 2. Detailed Evaluation of Fit for Model of Stops for Suspected Marijuana Possession

Probability Range	Number of Observations	Average Model-predicted Probability	Observed Frequency of Stops for Suspected Marijuana Possession	Interval Error Rate
0-4.9%	2,872,106	0.0131	0.0128	-1.8
5-9.9%	368,141	0.0702	0.0680	-3.1
10-14.9%	144,201	0.1222	0.1364	11.6
15-19.9%	77,901	0.1727	0.1902	10.2
20-24.9%	47,268	0.2232	0.2272	1.8
25-29.9%	31,295	0.2733	0.2681	-1.9
30-34.9%	21,566	0.3234	0.3073	-5.0
35-39.9%	14,644	0.3733	0.3489	-6.5
40-44.9%	9,613	0.4229	0.3945	-6.7
45-49.9%	6,022	0.4729	0.4321	-8.6
50-54.9%	3,770	0.5235	0.4724	-9.8
55-59.9%	2,634	0.5739	0.5019	-12.5
60-64.9%	2,189	0.6245	0.5646	-9.6
65-69.9%	1,834	0.6738	0.6303	-6.5
70-74.9%	1,222	0.7231	0.6620	-8.5
75-79.9%	701	0.7712	0.6904	-10.5
80-84.9%	205	0.8172	0.6878	-15.8
85-89.9%	23	0.8618	0.7826	-9.2
90-94.9%	2	0.9056	1.0000	10.4
95-99.9%	-	.	.	N/A

Source: Author's Analysis of Logistic Model Results in Table 1.

Figure 3. Model of stops made on the basis of suspected marijuana possession.

Williamsburg

The next census tract which will be considered is FIPS code 36 047 055700 in Williamsburg, Brooklyn. This site was chosen to analyze the relationship between "green gentrification" (Gould and Lewis, 2017) and low SQF activity. This census tract was considered "eligible for gentrification" (Beck, 2020, p. 252) in 2009 based on Lance Freeman's widely cited criterium (Freeman, 2005, see: p. 471-472). The revitalization of Bushwick Inlet Park is a key aspect of this analysis (Figure 4).

Unlike Brownsville which witnessed an exodus of white residents, the area nearest to the East River in Williamsburg became a "little whiter, and a little wealthier" (Gould and Lewis, 2017, pg. 124). During the period between 1990 and 2014, the percentage of white dwellers increased from 49.1 percent to 74.6 percent, while the percentage of Black dwellers decreased from 10.1 percent to 5.5 percent (Gould and Lewis, 2017, p. 124).

Simultaneously, the property values increased by 189 percent compared to the rest of Brooklyn which saw only an 80 percent increase (Gould and Lewis, 2017, p. 124). I will discuss this in reference to the 2005 Waterfront Rezoning Agreement, which enabled green space and property development in the area, and was negotiated "in the context of this dramatic, site-specific demographic shift" (Gould and Lewis, 2017, p. 129).

In the 1980s, the deindustrialized shoreland of the Greenpoint-Williamsburg waterfront was largely regarded as "dilapidated wasteland" (Gould and Lewis, 2017, p. 122). As it became evident that deindustrialization was not a mere event but a lasting economic reality, conversations about the waterfront shifted from "protecting the remaining industry" to "quality-of-life enhancement for urban residents" in the form of "green residential growth centers" (Gould and Lewis, 207, p. 122). In 2003, following debates by community activists to re-industrialize the area, Mayor Bloomberg, whose "neoliberal economic doctrine [was known to] have exacerbated social inequalities of all kinds," (Brash, 201, p. 49-50) silenced land-use debates by introducing an industrial to residential rezoning plan the 2005 Waterfront Rezoning Agreement (Gould and Lewis, 2017).

The Bushwick Inlet Park, or "the centerpiece of the Greenpoint-Williamsburg Waterfront," is what differentiates this rezoning plan from a typical example of gentrification to what is known as "greened gentrification" (Gould and Lewis, 2017, p. 125). This could be understood in the context of Harvey Molotch's urban growth machine theory, where "those at the top of local power structures [...] set the limits within which decisions affecting land use, the public budget, and urban social life come to be made" (Molotch, 1976, p. 309). In the case of Bushwick Inlet Park, the growth coalition proposed "parks, ball fields, esplanades, and bike paths" for the site to supplement residential developments (Gould and Lewis, 2017, p. 125). Essentially, the public investment in green amenities "[subsidized] the enhanced values of private investments in housing" (Gould and Lewis, 2017, p. 125).

While it is hard to prescribe a causal link, some broader patterns can be examined to draw inferences about the relationship between green gentrification and SQF activity. In 2009,

there were a total of 66 terry stops, of which, 49 escalated to a frisk. To measure the relationship between low-level policing and gentrification in New York City, Brenden Beck conducted a longitudinal study from 2009 to 2015 and found that "when more white people moved into the typical gentrifiable neighborhood, police made fewer street stops [...] but more order maintenance arrests'' (2020, p. 265). Drawing a distinction between the two types of low-level policing, Beck stated that "[stop] and frisk is sometimes conflated with order-maintenance policing" but they differ in that order-maintenance policing "focuses on making arrests for quality-of-life offenses like disorderly conduct, property damage, or trespassing" whereas SQF is premised on "reasonable suspicion" (Beck, 2020, p. 247). In considering the "gentrifying" nature of this census tract, this is consistent with Molotch's argument that "[t]o promote growth, [...] the police force should be oriented toward protection of property, and overt social conflict should be minimized" (1976, pg. 20).

Figure 4. Bushwick Inlet Park (Source: City of New York)

Discussion

Both census tracts exemplify the neoliberal state; one in which it presents itself as a "quasi-correctional" container, (Jefferson and Vitale, 2017, p. 138) and the other as an economically self-fulfilling "privileged domain" (Loughran, 2014, p. 62). In order to clarify the connection between broken windows theory and the concentration of SQF in minority communities (Fagan et al., 2010), it may be worthwhile to address one factor which is commonly overlooked: the spatial explicitness of said theory (Brown and Herbert, 2006). In Wilson and Kelling's essay, the only scale articulated is that of the neighborhood (Brown and Herbert, 2006, p. 761). In this manner, it works to ostensibly convey a symbolic message, whereby "the local scale is the most important one for addressing crime" (Brown and Herbert, 2006, p. 762). This spatial bias embedded in the broken windows logic partially illustrates the disparate concentration of SQF activity in the case of Brownsville. In the Williamsburg census tract, it could be argued that the relatively low SQF activity hinged on the steady implementation of situational crime prevention, where space is designed and manipulated to convey a sense of defensibility (Brown and Herbert, 2006). The broken windows theory explicitly "[allows] for some deviance to persist in otherwise healthy communities" on the condition that "perpetrators are kept to 'their place'" (Brown and Herbert, 2006, p. 760). For example, Wilson and Kelling define "regulars" as "both 'decent folk' and some drunks and derelicts who were always there but who 'knew their place'" (1982). In doing so, a socio-spatially laden distinction is drawn between "controllable insiders and dangerous outsiders" (Brown and Herbert, 2006, p. 760). The liberal side of the centaur state works to eradicate the opportunity for crime by creating defensible spaces and allowing some room for deviance in certain areas (Brown and Herbert, 2006; Wacquant, 2009), while the paternalistic side asserts itself by "turning targeted spaces into quasi-correctional complexes" (Jefferson and Vitale, 2016, p. 144).

In 2013, the Stop-Question-Frisk program was ruled unconstitutional by judge Shira Scheindlin on the basis of racial discrimination (Matthews, 2013). During its course, of the 3,464,775 people who were stopped and

questioned, nine-tenths were innocent (Wyly et al., 2013). With clear spatial clustering in minority neighborhoods (Fagan et al., 2010; Vieyra, 2016), the mostly innocent targets endured "collective punishment [in] the fabric of everyday life" (Camp and Heatherton, p. 27). The SQF program, both as an extension of the broken windows logic and as a carceral apparatus of the neoliberal state, effectively consolidated the "neoconservative politics of punitive social control" (Jefferson and Vitale, 2016, p. 135). Considering that the emergence of deregulation, privatization, and liberalisation closely paralleled the growing assertion of the court, police, and prison (Wacquant, 2009), it is difficult to avoid the conclusion that the laissez-faire freedoms promised by neoliberalism and its punitive imperative "are defined in relation to each other" (Massey, 1994, p. 112). The broken windows theory, despite lacking internal validity, became a prevalent ideological justification to manage segments of the population which bore the brunt of deindustrialization and welfare devolution. Explicit spatial differentiation through that framework served to justify the disparate deployment of urban policing along discrete racial and socioeconomic cleavages.

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The Ambivalence of Social Media in Risk Communication: Reinforcing Vulnerability in the Pursuit of Resilience

by: LIA LAUREEN SCHULZ

This paper situates social media within informational theory in order to explore the ways in which it shapes resilience and vulnerability to natural hazards. The analysis finds that social media represents a contradictory tool of risk communication based on the digitisation, diversification and instrumentalisation of information. While the conversion of data into a digital format allows for more global access to information, it also exacerbates existing inequalities and recreates them in a digital context. The diversification of information mirrors that ambivalence: On the one hand, social media platforms empower vulnerable populations to raise their voices and gain influence as modern actors in state-dominated fields; on the other hand, competing perspectives and over-exposure to information lowers the general credibility of available sources. Lastly, social media has proven to be a powerful instrument to guide public perception. As such, it holds the potential to be manipulated, either in support of or in opposition to effective risk communication, thereby adding to an increasing polarization in the public discourse. As a result of these factors, social media constitutes an equivocal way to communicate risk in times of crises, as exemplified by the COVID-19 public health pandemic.

1. Introduction

A. Relevance and Rationale

Natural disasters, including biohazards, have "far-reaching consequences for the safety and well-being of individuals and communities" (UN University, 2011). This state of vulnerability is illustrated in the aftermath of the global COVID-19 health pandemic. More than a hundred years after the influenza pandemic of 1918 that claimed over 50 million deaths (Merchant & Lurie, 2020), the novel Coronavirus has surpassed a global death toll of around 2 million victims (Overberg, Kamp & Michaels, 2021) and caused worldwide anti-corona protests. With the means of communication having progressed from mail, telephone or direct interactions to "more than 2.9 billion individuals [using] social media regularly and for long stretches of time" (Merchant & Lurie, 2020, p. 1), the severity of both the virus itself and the misinformation surrounding it is put into perspective. The fact that protective behaviour is indispensable to

ensure the safety of both individuals themselves and those around them highlights the necessity to implement uniform compliance with preventive measures (CDC, 2020). To this end, the optimisation of risk communication has become a crucial and urgent imperative as it determines what is regarded as a risk and shapes society's perception of its safety (Royakkers, Timmer, Kool, & Est, 2018).

This paper will argue that the use of social media (SM) as a means of risk communication enables the capacity to increase both the resilience and vulnerability of target populations. To begin with, SM will be situated into its current context of technology, social determinants of health and the COVID-19 health crisis. The subsequent analysis will then be structured into three main attributes of SM - the digitisation, diversification and instrumentalisation of sources - and discuss how each of them contributes to the overall ambivalence of SM by simultaneously potentiating the adherence and non-adherence to COVID-19 restrictions.

Terminological and Conceptual Clarifications

A population's level of *vulnerability* (Schneiderbauer & Ehrlich, 2004) is defined by their exposure to physical, emotional or spiritual attack and the lack of mechanisms for support and defence (Mani, 2002). It is specified by its socio-cultural, economic and political variables and characterised as multidimensional, dynamic, scale-dependent and site-specific (Brown, 2020). The variables that make populations less vulnerable add to their *resilience*, more specifically, their ability to mitigate hazards, contain disaster effects and regenerate (Brown, 2020). Resilience is considered a complex notion, one that can take the form of a process, an outcome or a trait, and is determined by a combination of "biological, psychological, social and cultural factors" (Southwick, Bonanno, Masten, Panter-Brick & Yehuda, 2014). Crucial for building and strengthening individual and community resilience is effective *risk communication* (InTeGrate, Carleton University, 2020), which helps to enhance emergency response planning and preparedness.

The rising level of human intervention with the environment puts into question the extent to which hazards can continue to be described as "natural" (Brown, 2020). This consideration is reinforced in the case

of COVID-19 due to the relative uncertainty of the origin of the virus: While a zoonotic source has been suggested, it is highly unlikely given the limited contact between humans and bats. Instead, another animal species, possibly domesticated, poses a more realistic alternative, thereby leading to an anthropogenic cause of the disease (Numbers).

B. Contemporary Context

a) Social Media and Technology

The ambivalence of SM can be traced to the underlying ambivalence of technology, giving rise to both positive and negative impacts. As one of the main drivers of anthropogenic climate change (McMichael, 2013), globalisation plays a relevant role in the intensification and frequent occurrence of natural hazards that "disproportionately affect the health of vulnerable population groups" (MacLean, 2020). Technology has become essential in predicting, forecasting and adapting to such hazards - a key example being risk communication. To optimise and enhance risk communication in the 21st century, SM has transformed into an indispensable tool. By enabling a technology that facilitates the dissemination of ideas and information worldwide, it played a crucial role in providing both information and social contact for people online throughout the COVID-19 pandemic, thereby significantly raising their resilience.

However, one of the major technological challenges posed to society today is the lack of internet jurisdiction by the state, described by President Macron as "an agora without rules" (Mallet, Khalaf & Hall, 2021). Even though the anonymity on SM primarily points to a legal issue (De La Chapelle & Fehlinger, 2018), it also hints toward the bigger picture of mistrust, disinformation and lack of accountability. As digital dependence increases, these technological concerns become more challenging, most recently due to the "COVID-19 pandemic [having] provoked massive, immediate, and unprecedented changes in population use of digital technologies and media" (Guitton, 2020).

b) Social Media and Determinants of Health

Social determinants of health (SDH) are defined as "the broad range of personal, social, economic and environmental factors that determine

individual and population health" (Government of Canada, 2020). As such, they reflect the idea that health goes beyond physical safety and instead involves a multi-sectoral and holistic perspective on well-being. Such an idea has been emphasised during the recent COVID-19 pandemic, with most measures meant to avert or minimise the transmission of the virus taking place outside the health sector, whilst constituting SDH (Ataguba & Ataguba, 2020). Examples hereof encompass social distancing, quarantining, school closure, hygienic practices, travel restriction, making use of personal protective equipment, tracing and isolating suspected cases, and full lockdowns in states or regions. The authors Ataguba argue that these approaches' effectiveness is predominantly contingent on the effectiveness of risk communication (2020), because it is the representation and perception of a risk, rather than the risk itself, that influences an individual's behavioural response to hazards (Glik, 2007). This also draws a crucial link between health and SM, as we begin to capture the relevance of online communication platforms in the dissemination of knowledge and their impact on individuals' level of vulnerability.

2. *The Ambivalence of Social Media in Risk Communication*

Having ascertained the relevance and embeddedness of SM in today's society, it becomes important to understand how SM contributes to risk communication through different features and characteristics. To that end, the following discussion will analyse the digitisation, diversification and instrumentalisation of sources of information during the COVID-19 outbreak. By considering both their advantages and disadvantages, this paper aims to highlight the ambivalence of SM's effectiveness in risk communication and how it furthers the resilience and vulnerability of individuals and populations.

A. Digitisation

As a key companion of advancing technology, the digital transformation is commonly referred to as *digitisation* and describes the transition from analog files to digital formats. In the 1990s, society underwent a process of mass conversion, thanks to which digitisation has become entrenched in our day-to-

day lives. This is exemplified by our use of digital technologies for fundamental services and products and our increasing reliance on digital systems in social spheres (Royakkers et al., 2018). This already high consumption of digital media intensified massively during COVID-19 (Global Web Index, 2020), which caused an abrupt shift toward pursuing activities, such as schooling, working and entertainment, remotely and online. As SM became a part of everyday life, it also integrated into risk communication (Hornmoen, Backholm, Goldgruber, & Steenson, 2018) and made it more complex by introducing new platforms, technologies and actors (Jumbert, 2018); thus offering better transferability, usability and accessibility (Savić, 2019). It moreover revealed the possibility for a proactive two-way dialogue between authorities and the public, instead of the traditional top-down communication of information. This increased connectivity and potential for datafication enables the immediate addressing of concerns, mobilisation of groups, collection of data on harmful crisis developments or rumours and help for those in need; all in all, responding to both information and emotions (Hornmoen et al., 2018) in order to build resilience. This global exchange of ideas and digitisation of information sources therefore significantly contributed to the improvement of hazard preparedness, adaptation and mitigation, with SM allowing information to be shared more quickly, broadly and efficiently (Malecki, K. M., Keating, J. A., & Safdar, N., 2020).

However, the digital sphere brings risks that are rooted in geopolitical and economic uncertainties: How far had digitisation actually advanced? The IMD World Digital Competitiveness Ranking 2020 clarifies that it is predominantly industrialised countries that have undergone profound digital changes and are best equipped with knowledge, technology and future-readiness. In contrast, nations in the Global South rank lowest in terms of digitisation, with sub-Saharan African countries lagging far behind (Cámara & Tuesta, 2017). The International Digital Economy and Society Index (I-DESI) 2020 moreover demonstrates a consistency of countries scoring lowest in the *Use of Internet Services* and *Human Capital* categories (Foley, Sutton, Potter, & Gemmell), thereby illuminating to the fact that the navigation of digital or

computerised spaces is contingent on the skills necessary for it. The reality is that people experience 'digital inequalities': different conditions in terms of ability and access to connected devices or networks that negatively influence their level of resilience by impeding their capacity to ensure their well-being (Beaunoyer, Dupéré, & Guitton, 2020). This digital exclusion is caused by further entrenched social inequalities. It reinforces other SDH like work, social ties and education, which in turn reinforce the already restricted access and usage of technology, resulting in 'digital vicious cycles' (Beaunoyer et al., 2020). With deteriorating isolation and dependency on SM for information and social interaction amidst the COVID-19 crisis, digital inequalities have not only exacerbated but "represent a major risk factor of vulnerability for exposure to the virus itself" (Beaunoyer et al., 2020, p. 1). The contrasting ideas of SM as a bilateral channel versus a digital barrier of entry in risk communication accentuate the dual potential for increased vulnerability and resilience.

B. Diversification

The rapid empowerment of new actors participating in digital spaces inevitably resulted in a diversification of information sources. As a consequence, information has become increasingly diffuse and instantaneous, as "the assurance of discrete and verifiable sources of information, a pillar of modern democratic governance, is confronted by new and increasingly varied sources of information" (Jumbert, 2018, p. 1). In this new communication landscape, modern actors compete with conventional ones, e.g. governmental bodies and news outlets, to shape threats and crises. This over-abundance of contradictory information "makes it hard for people to find trustworthy sources and reliable guidance" (Merchant & Lurie, 2020). As sources of information increase and culminate to so-called 'infodemics', their credibility therefore decreases and consequently lowers adherence to protective measures (Lep, Babnik, & Beyazoglu, 2020), thereby inflating vulnerabilities and potentiating disasters. Even though infodemics are not spatially restricted, they particularly apply to rural communities in nations in the Global South, which disproportionately rely on informal and unverified channels, like SM and word-of-mouth communication (Ataguba & Ataguba, 2020). A COVID-19 study in

Slovenia found that infodemics yielded alarming results when official sources of information received equivalently low levels of trust as mass media and SM from the sample group (Lep et al., 2020). The fact that medical professionals in contrast scored highest in credibility (Lep et al., 2020) further indicates that governmental expertise is perceived as entirely separate from scientific expertise, even during a pandemic, when collaboration between these two fields becomes essential for survival. This drastic lack of institutional trust can be attributed to two factors: Firstly, the sheer and overwhelming number of users on SM circulating disinformation in contrast to a relatively small number of experts attempting to disseminate accurate information, and secondly, the algorithms that frame the narrative of our 'news feed' and content on SM that are based on sensationalism and engagement rather than relevance (De la Garza, 2020). Such factors provide the breeding ground for panic, social unrest and conformity to group behaviour, incentivising individuals to imitate irrational actions previously promulgated on SM. The following snow-ball effect leading to panic-buying and similar overreactions during the pandemic reverses the efforts for effective risk communication and exacerbates the unequal distributions of vulnerability and resilience (De la Garza, 2020).

These grave risks of fast-spreading misinformation during the COVID-19 crisis elicit the question: What advantages can the diversification of digital sources pose to risk communication? Population vulnerability is particularly high in states with corrupt and inefficient governmental authority, where trust and credibility are practically non-existential (Ataguba & Ataguba, 2020). Conversely, such conditions simultaneously have the potential to offset unequal power dynamics by initiating social justice through other actors. This potential is illustrated with the NGO *Information for Development Trust* (IDT), which called attention to the insufficient infrastructure and institutional trust in Zimbabwe through the use of investigative journalism (Masuku, 2020). Disclosing the news and their demands for more state action and accountability on SM proved to be highly effective in that it concentrated public pressure and created a space for public discourse. This exemplifies how communication

apps also raise transparency, initiate conversations at different levels and effectively counteract social isolation (Beaunoyer et al., 2020) and suffering. These features are essential to effective risk communication (Ataguba & Ataguba, 2020) and, as argued, are simultaneously enhanced and restricted with the use of social media. For that reason, the diversification of sources plays a decisive role in determining (and altogether lowering) the degree of credibility, whilst increasing social empowerment by expanding the number of sources available to be consulted.

C. Instrumentalisation

By identifying SM as an instrument, we can investigate its potential to be manipulated. This poses both the opportunity to optimise, control and utilise it in order to raise awareness and motivate personal action during times of crises as well as the challenge to confront, withstand and defy the ongoing polarisation and ambiguity of information, that jeopardises effective risk communication and individual resilience. It is notably the perception of risk, rather than the risk itself, that dictates public response to hazards (Glik, 2007). Malecki's 'hazard and outrage' framework suggests that hazards and their perception take place in the context of key factors and emotions, co-aligning with SDH, that shape public outrage and influence collective behaviour. Considering the cultural evolution taking place and the velocity and mode by which knowledge is conveyed nowadays, he concludes that "SM has rapidly become a major driver of what the public understands and responds to" (Malecki, 2020, p. 2). As such, public perception in the digital age has turned into an unpredictable hazard itself, one that can determine the degree of adherence to preventive measures and is exceptionally susceptible to SM. The awareness of the polarisation deriving from this has put increasing pressure on internet regulation and corporate interference. Therefore, companies have begun to integrate these public concerns and chosen an aggressive stand against misinformation about the coronavirus, because "moderating such content runs less risk of angering users than acting as referee on more politically sensitive disinformation" (De la Garza, 2020). Whatsapp displayed this initiative by setting a limit to the number of contacts that a previously forwarded message

can be sent to (Ataguba & Ataguba, 2020). However, this mission is facing challenges from the beginning on, due to the deceptive content circulating faster than SM platforms can contain it.

Nonetheless, besides propagating uncertainty, this unprecedented level of instant knowledge dissemination also "give[s] us the tools we need to make smart decisions" (De la Garza, 2020). In light of the successful manipulation of SM in the name of misinformation, we therefore conclude that SM can equally become a critical and strategic tool in the name of accurate information during the evolving pandemic. However, the insight into how SM "can be harnessed to optimally support emergency response, resilience, and preparedness is not well understood" nowadays (Merchant & Lurie, 2020, p. 1). To that end, the World Health Organisation (WHO) published the 'Risk Communication and Community Engagement' flyer, which acknowledges the asymmetry of risk perceptions between different populations and formulates a collective approach and generic trajectory to pursue throughout this health crisis. A second framework for how to integrate SM platforms into risk management suggests seven essential steps: Directing people to trusted sources, counteracting misinformation, using SM as a diagnostic and referral tool, enabling connectivity and psychological first aid, advancing remote learning, accelerating research and, lastly, enabling a culture of preparedness (Merchant & Lurie, 2020). Specific functions on platforms like Facebook, Google, Youtube, WhatsApp and Twitter are already being shaped and used accordingly. In line with this argumentation, the disease communication researcher Khudejah Ali notes that a healthy level of anxiety-infused sensationalism could in fact facilitate and strengthen public engagement, and therefore help in the optimisation of risk messages during disease outbreaks (Ali et al., 2019). The imperative is to combine fear with useful and accurate information to transform it into a far-reaching and engaging tool.

Overall, it can thus be said that despite increasing contradictions and polarisation in 2020, one can recognise SM's potential to support recuperation and resilience if used effectively in risk communication.

3. Conclusion

The previous analysis of the digitisation, diversification and instrumentalisation of information demonstrates that effective risk communication and SM play important roles in shaping vulnerability and resilience in society today. With the, at times, coalescing and, at other times, differing purposes, it became clear that SM can be utilised as both a tool of diffusion and contradiction as well as a "powerful and actionable" instrument (De la Garza, 2020) to improve and advance risk communication, emergency preparedness and protective behaviour. This shows the danger of ambivalence presented by the use of SM, but also emphasises that the outcome is contingent on the intent..

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The Atmosphere: The New Frontier of (Climate) Geopolitics

by: CASSANDRA TORRES

As greenhouse gasses continue to rise and the effects of climate change are felt worldwide, new technologies such as solar geoengineering are being explored to address the climate crisis. The emergence of these technologies has shifted power relations and driven competition for their development. This paper builds on the commander of the world theory put forth by John Evelyn and Halford Mackinder and proposes a new theory within contemporary politics. This new theory states that the atmosphere has become the newest frontier of the 21st century and competition over its control has begun through geoengineering technologies. Additionally, this paper explores the origins of solar geoengineering and calls for international regulation on the development and testing of geoengineering technologies.

The Atmosphere: The New Frontier of (Climate) Geopolitics

"Whoever commands the atmosphere commands the world's climate, and Whoever commands the climate of the world commands the riches of the world, and Whoever is master of that commands the world itself."
- Cassandra Torres (2020)

Climate change has slowly begun to dominate the political discourse in the past few years. Scientists have linked anthropogenic climate change as a consequence of rising CO2 emissions to extreme weather events, famine and conflict (Harvey, 2018). Humanity's impact on this planet is so profound that geologists have suggested a new epoch must be declared – the Anthropocene (Crutzen, 2006). On a warming planet, all countries will be impacted by climate change, but the burden and benefits will not be distributed equally. Faith rests on human ingenuity and our ability to develop technologies to address the climate crisis. Contemporary proposals to address climate change involve at least one form of existing or imagined technologies to avoid catastrophe (McLaren & Markusson, 2020; IPCC, 2019). Recently, geoengineering technologies that would allow the human species to control the climate have been dominating the narrative.

In this paper, I will expand on the work of John Evelyn and Halford Mackinder, intellectual thinkers of the field of geography, to propose a new theory relevant to contemporary politics, where the emergence of geoengineering technologies has driven competition over the control of the atmosphere. A shift between power relations has begun, and domination of the atmosphere will drive competition among current world powers. I will begin by exploring the Heartland Theory and then proceed to develop the concept of the atmosphere as a "new frontier" of the 21st century, followed by a brief description of current global geopolitics and their evolution under a 'climate' agenda focused on geoengineering of the atmosphere. Solar geoengineering, a new technological approach proposed to cool the planet through solar radiation reflection, and its origins will then be explored to understand current geopolitics. This paper focuses on solar radiation injection (SRI) as a form of geoengineering. Outside the scope of this analysis are carbon removal techniques such as iron fertilization and carbon capture.

The New Frontier: The Atmosphere

Early in the 19th century, the discipline of political geography and formal geopolitics emerged and scholars began to examine political power in relation to occupation and control of territory over a geographic space (Painter, 2008). Shortly after the beginning of the Industrial Revolution in the United Kingdom, Evelyn argued that world power was at the hands of whoever dominated the ocean.

"Who rules East Europe commands the Heartland:
Who rules the Heartland commands the World-Island:
Who rules the World-Island commands the World" - Halford Mackinder (1919)

The Heartland Theory has been adapted to the prevailing political sphere of the time. Mackinder sketched three different Heartland theses himself, redefining the Heartland's boundaries in 1904, 1919, and 1943 (Knusten, 2014). The Heartland thesis has had a significant influence on geopolitical thinking. It has set the foundation for many other theories to be built upon, such as Spykeman's Rimland Theory and Haushofer's Geopolitik (Mackinder, 1962: xx).

The Heartland thesis is a geographical and technological-based theory, and as demonstrated by Mackinder, the Heartland Theory must be contextualized within current global politics. This updated theory I propose steers away from geographic determinism and instead draws on Mackinder's observation on the importance of technologies and how they lead to a shift in power relations. Having conquered land and sea, geopolitics has become three-dimensional, extending vertically into the atmosphere (Dalby, 2015). The composition and amount of greenhouse gas emissions (GHGs) have become spatialized, commodified and available for conquest. Mackinder's observation of new technologies' ability to reorganize power relations is of significant importance. With further technological advancement and the development of atmospheric technologies, we can expect a shift in power relations, as repeatedly seen in the past with transportation technologies.

Current Climate Geopolitics

Climate change has been gaining momentum and moved into 'high politics' which regard all matters vital to the survival of the state (Oberthur, 2016) (See Painter, 1995 for a comprehensive review of the term 'high politics'). Climate conventions seeking global cooperation to address GHGs first emerged in 1972 with the Kyoto protocol (Oberthur, 2016). In the following years, environmental issues dropped further down the political agenda and global climate action stagnated while GHG emissions continued to rise (Baskin, 2019). In 2019 and 2020, millions of citizens around the world have taken to the streets demanding action on climate change. The climate crisis discourse has re-entered the political sphere and even made it to the ballot in some nations, as seen in the United States, Canada.

Nonetheless, commitments made in the Paris Agreement are not ambitious and realistic enough to keep us below a 2 degrees increase in global temperature, which scientists state is essential to avoid irreversible damage (IPCC, 2019). The latest international negotiations have failed and extreme weather events have further increased in intensity and frequency (Oberthur, 2016). More people are being displaced by 'natural disasters', and governments have identified that unmitigated

climate change could have severe consequences for international security (Baskin, 2019).

Geoengineering and its Geopolitics

As the window to stay below 2 degrees Celsius of pre-industrial level closes, technologies such as solar geoengineering are receiving increasing scientific and political support (Corry, 2017). Solar geoengineering involves injecting sulphur particles into the atmosphere to mimic a volcanic eruption. This would produce an albedo effect and increase the amount of incoming light being reflected thus decreasing global temperatures (Dalby, 2015; Keith 2000; Corry, 2017).

The origins of climate geoengineering date back to the Cold War, where atmospheric science research was a priority for both the US and the USSR (Keith, 2000). The race to develop the technology began. At that time, the study of the atmosphere was referred to as weather control by the USA and climate and weather modification by the USSR. The USSR's interest laid in warming Russia to access the Arctic Sea, whereas the US was concerned about precipitation enhancement (Keith 2000). Advancement in atmospheric technology did occur, and during the Vietnam War, the US carried out a cloud seeding campaign over Vietnam. The Popeye Operation entailed the manipulation of atmospheric technologies for military purposes to disrupt North Vietnamese military supplies. By flying more than 2600 sorties, the US intended to extend the monsoon season over certain regions of the Ho Chi Minh trail to cause landslides and disrupt roads.

Weather modification was soon identified as a tool of warfare. Following numerous dialogues, an international treaty was signed by both the US and the USSR at the Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Techniques in 1977, banning the use of weather modification techniques for purposes of damage or destruction (Keith, 2000). It was not until the early 2000s that the exploration of geoengineering technologies was reintroduced (Baskin, 2019). Since the Pentagon's recommendation on developing geoengineering technologies, symposiums, workshops, and undergraduate degrees on geoengineering have emerged (Baskin,

2019). One thing was made clear during the Cold War; control of the atmosphere was sought to obtain geopolitical dominance. Geoengineering today and moving forward is desirable to some governments because they increase geopolitical dominance over other nations while allowing them to continue to be economic world powers.

Significant uncertainties around solar geoengineering remain, and strong opposition to the technology has been expressed internationally. Models have predicted that the implementation of solar radiation injection (SRI) could have negative consequences; evidence suggested that alterations to weather patterns could cause drought in South America, Asia, and Africa, threatening billions with starvation (Gunderson et al., 2019). The effects of geoengineering would be irreversible and, once implemented, would lock humanity into a constant reliance on sulphur injections. If SRI were to stop, its predicted temperatures would increase twice as rapidly (Scranton, 2015). If–or when–solar radiation management is implemented, it would only address the rise of global temperatures. Other current environmental problems such as ocean acidification, sea-level rise and biodiversity loss would still require global cooperation (Baskin, 2019). In addition, there are concerns over the technology's potential to become a weapon of war (Baskins, 2019; Szerszynski, 2013; Dalby, 2015).

Currently, no universally agreed-upon framework exists to regulate the development and testing of geoengineering (Edney and Symons, 2014; Baskin, 2019). The need for international control on weather modification technologies has been identified since the 1960s (Keith, 2000). Still, 70 years later, an international regulatory body and policies on geoengineering have failed to materialize. Consequently, an unauthorized iron fertilization experiment was carried out by the private sector on the West Coast of Canada in 2012 (Dalby, 2015). These emerging geoengineering technologies such as SRI must come under international public control rather than national or private (for-profit or non-profit) control. The Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Techniques should be extended using

the precautionary principle to all uses susceptible of harming countries and the environment. A blanket ban on 'at-scale- experiments and development within an international commission evaluating and controlling research projects in this domain.

Without an international agreement, the emergence of such technologies is likely to cause future conflicts, given their extensive global impacts (Baskins, 2019; Keith, 2000; Szerszynski, 2013; Dalby, 2015). Evidence of political tensions has begun to re-emerge. The United States National Oceanic and Atmospheric Administration (NOAA) has begun measuring aerosol levels in the atmosphere to create baseline data in order to detect when other countries start using geoengineering in secrecy (Flavelle, 2020). Unlike the previous 'atmosphere' race, this one will include more players seeking to develop the 'human-saving' technology (Edney and Symons, 2014). Engagement with solar geoengineering has been seen in the United Kingdom, Russia, Germany, France, the United States, and most recently in India and China (Baskin, 2019).

Differences in attitudes towards solar geoengineering have been expressed between the developing and developed world (Baskin, 2019). The unwritten international consensus implies that geoengineering is a Plan B, and only if all things fail will solar geoengineering be considered (Corry, 2017; Edney and Symons, 2014; Gunderson et al., 2019). Despite this implicit understanding, funding for this dangerous technology continues to occur and has been increasing. As recent as October of 2020, the US Congress allocated $4 billion US dollars to NOAA for solar geoengineering research (Flavelle, 2020). Private corporations, non-profit organizations and individuals have also taken an interest in this technology. SilverLining, a non-profit organization, has recently donated $3 million to higher education institutions and research centers to advance SRI (Flavelle, 2020). Bill Gates has been a strong supporter of solar radiation management (SRM) as a technological solution and has donated more than $4.6 billion US dollars for solar geoengineering research, reviews and assessments (Vidal, 2012). He is one of the major philanthropic donors of the Stratospheric Controlled Perturbation Experiment (SCoPEx), a

project that aims to improve our understanding of solar geoengineering through a number of environmental experiments (Harvard, n.d.; Keutsch, n.d.).

Why invest so many resources on a plan B? The answer lies in political and economic power. Geoengineering provides a potential climate solution and allows humanity to continue with business-as-usual without systemic change. It is an illusionary fix that encourages and allows the continued burning of fossil fuels. It permits/enables the biggest emitters/world powers to continue to emit while alleviating them from accountability. After all, they are the ones developing these human-saving technologies. It is also not surprising that many of the organizations supporting geoengineering, though not all, are those whose interests lie in protecting oil companies, the wealthy, and free-market ideologies (Gunderson et al., 2019). Solar geoengineering management allows the reproduction of the contradictory relationship between capital accumulation and climate stability (Gunderson et al., 2019). Most importantly, geoengineering brings political power, the very same that the founders of geopolitics understood as the occupation and control of territory and geographic space (Painter, 2008). In other words, the biggest emitters attempt to remain in power through the same mechanisms that allowed them to get there, the development of new technologies.

Conclusion

Mackinder's Heartland Theory has been criticized on philosophical, ethical, political and ideological grounds (Mackinder, 1962: xx). Others have warned of the dangers of determinism. Moreover, it reproduces imperialism and the anthropocentric view of humanity above all. Nonetheless, geopolitical imaginations provide a way of understanding the world and emerging power relations. While the Heartland Theory may be contested, Mackinder's observations remain true today. The emergence of new technologies might result in a shift in world politics, and thus, the Heartland will continue to be re-imagined as technologies emerge.

"Whoever commands the atmosphere
commands the world's climate, and
Whoever commands the climate of the world
commands the riches of the world, and

Whoever is master of that commands the world itself."
- Cassandra Torres (2020)

Both Evelyn and Mackinder foresaw the massive wars that would result from the application of their doctrines and yet neither was able to mobilize public power (in its various forms) to avoid them. This time needs to be different. Addressing the climate crisis is at the forefront of this new atmospheric race, however, the goal is not to address climate change but to control the atmosphere. Atmospheric technology was initially developed for political advantage and has intentionally been used in the past to pursue a nation's military interest. Humankind has been trying to dominate the atmosphere since the Cold War. Whoever owns and rules over this global scale technology will control the atmosphere and thus command the world.

The race is even more appealing than it had been in the past as only one power can emerge given there is only one atmosphere. Implementing solar geoengineering technology would allow humanity to shape the future of the Earth's climate system. The unilateral action of a state or a corporate enterprise will directly impact other state(s). The effects and benefits of climate change and geoengineering technologies will be disproportionately distributed allowing for only a few individuals, corporations and governments to advance their political and economic power while others lose out of the deployment of these technologies. In order to ensure that this power can be used in a way that fosters the most equitable outcome for the whole of humanity and life on Earth, international regulation and an enforcement body guided by the precautionary principle must be implemented.

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The Space of Flows, Orientalism, and the Urban Fallacy: COVID-19 and the Dual Identity of Wet Markets

by: EARL JOSHUA JAMORA

In early 2020, wet markets suddenly gained international attention, as certain governments and media made contentious speculations about them being sites of zoonotic disease transmission (see, e.g., Kang & Walzer, 2020; Maron, 2020; Neuman, 2020). The Huanan Seafood Wholesale Market specifically became known as the purported source and epicenter of the coronavirus, which eventually led to the COVID-19 pandemic (Woodward, 2020). While such negative accounts of wet markets as a purveyor of disease continued to spread globally, wet markets themselves continued to open and reopen, maintaining their role as a central source of food for communities across Asia Pacific. Why was this the case? This paper aims to address this contradiction within English-speaking, North American contexts by presenting various forces and tensions that obscure a more holistic, nuanced, and complete understanding of the underlying systemic issues surrounding wet markets, global issues, and zoonotic disease transmission. First, I analyze and situate wet markets with respect to Manuel Castell's axes of spatial transformation, presenting the dual identity of wet markets as a consequence of these conflicting and complementary processes. Next, the concept of urban Orientalism is applied to wet markets, presenting a potential fourth bipolar axis of urban spatial transformation — that of the tension between the geographic imaginary of the double Orientalized objects and the Occidental subjects. Lastly, I introduce the urban fallacy and apply it to chief medical advisor to the United States President, Dr. Anthony Fauci's comments on wet markets, highlighting the ways these dynamics and forces play out in discourses on wet markets.

Wet Markets

Because the term "wet market" may carry different meanings depending on its context and user, there is a need to clarify here what I mean by "wet market." Based on the definition used in Mele et al. (2015), wet markets are places with a large quantity of concentrated vendors, located in typically open-air or partially sheltered spaces. Wet markets are known for selling generally unrefrigerated "wet" ingredients, such as seafood, fresh

vegetables, and meat, as well as "dry" ingredients, such as grains, rice, spices, and dried goods. On the other hand, live animal markets are markets where vendors stock live animals for slaughtering on the spot for a customer. Typically, this entails fresh seafood and sometimes fresh chicken. Most rare are wildlife markets, which are any markets where vendors sell or trade undomesticated animals. These categories are not always distinct and may overlap when applied to individual markets. For example, some markets are live animal markets, but not wildlife markets. A market may be a wildlife market, but not a live animal market. In fact, the Huanan Seafood Wholesale market had a section where wild animals were sold, making it not just a wet market, but more accurately, a wildlife market (Beech, 2020; Hui, 2020). For most wet markets, however - "an everyday destination for many Chinese people," — this is not the case (Beech, 2020). The conflation of these categories in the mind of the global observer is both the source and symptom of greater conflictual processes of making meaning and exercising power (Zhu & Zhu, 2020; Roe, et al., 2020).

Castells: Three Bipolar Axes of Spatial Transformation

In Castells' (2001, 2002) network society, material or conceptual spaces are interrelated, complementary, and also contradictory. How are wet markets situated within these tensions? Manuel Castells illustrates the tensions and dialectics of 21st century spatial transformations with three bipolar axes: *function, meaning, and form*.

Function

The first bipolar axis described by Castells (2001, 2002) is *function*, expressing the dialectic between global processes and local experiences. The city is simultaneously a technological, economic, and institutional network as well as a physical place, with meanings attached to material realities. When positive cases of COVID-19 were traced back to Huanan Seafood Wholesale Market (Woodward, 2020, February 26), wet markets became generalized as a major point of contention in global processes. The meaning of the city, and of the market in the city, was stretched from the local to the global, and in so doing, became distended. Chinese foodways, in the global mind, became interlinked with disease transmission;

the ramifications of which spread from a Wuhan stall, to all Asian market stalls, to everywhere.

Meaning

Castells' second bipolar axis is *meaning*, expressing the dialectic between individuation and communalism (2001, 2002). It relates to the formation, negotiation, and contestation of identities in terms of individual and communal cultures and spaces. The meaning and identity of wet markets are expressed and understood differently via the *communal* actions of the communities that are directly and materially tied to wet markets than by the gaze of the distant globalized observers. The same divergence is true of the *individualized* voices (e.g. political leaders, health officials, authors and journalists for media outlets) voices that govern its identity on global network flows.

For reasons that are out of the scope of this paper, the headlines and articles from individualized voices of North American news outlets have had a tendency to tie together or frame wet markets as a direct cause of the COVID-19 pandemic, such as in *Global News*' "The role of China's wet markets in the coronavirus outbreak" (D'Amore, 2020, January 22), and *National Geographic*'s "'Wet markets' likely launched the coronavirus. Here's what you need to know." (Maron, 2020, April 15), when this generalization may not necessarily be the case (Mizumoto et al., 2020). The tendencies towards conflation, lack of clarity, or misuse of the term "wet market" with other related terms like "live animal market" and "wildlife market" have enabled critical misapprehension and judgement, as evidenced in the *Globe and Mail*'s "China's coronavirus outbreak exposes perils of country's exotic wildlife trade" (Yu, 2020, January 23), *CBC*'s "Experts call for global ban on live animal markets, wildlife trade amidst coronavirus outbreak" (Jamieson & Manasan, 2020, February 17), and *NPR*'s "Why They're Called 'Wet Markets' — And What Health Risks They Might Pose" (Beaubien, 2020, January 31).

These headlines of North American origin are in contrast with more locally-informed community perspectives and experiences of wet markets, which may lean towards a more positive understanding of wet markets in various ways: as a type of food retailer that persists amidst

increased availability of more commercial options (Goldman et al., 1999); because of its socially important role as a public meeting place (Mele et al., 2015); as a purveyor of "freshness" in food for even the most discerning shoppers (Zhong et al., 2020); and a readily available source of affordable food (Zhong et al., 2018) from vendors or producers you may personally know (Paska, 2013, June 3).

Form

The third and most notable bipolar axis Castells describes is *form* (2001, 2002), which expresses the dialectic between the space of flows and the space of places. *Spatial form* is both the collection of symbolisms from which an agent or actor makes meaning as well as an interface for interactions. Form shapes the interactions and relationality that take place in a space, yet simultaneously form is constituted by the connections, symbolic meaning, power, and relations that coalesce within it. The *space of flows* is an expression of a spatial form defined by transterritorial networks that link people and groups together electronically, economically, and politically into an interface of communication. On the other hand, the *space of places* is a spatial form defined by physical proximity and primarily articulated through physical interfaces. These are the bases for social interactions and the formation of a communication system, though one that is not readily separable from relations of presence.

The space of places of wet markets is defined by the relationality and material reality of the physical interface. A wet market is a place with a physical location and an address; but more importantly, the farmers, fishers, vendors, customers, administrators, and other entities (including plants and animals) that constitute the wet market. It is made up of relations whose subjects are physically present and whose lives and cultural comprehensibility are generally proximate — they are, in a word, local. Within the context of the information age and the COVID-19 pandemic, however, the meaning of a wet market also needs to be co-opted, translated, appropriated, and coded into mediums that can be communicated through channels of the space of flows, such as news articles, photographs, documentaries, and YouTube videos.

The Dual Identity of Wet Markets

The meaningfulness of "wet markets" must simultaneously navigate the codes and symbolisms, the competing logics, and the double system of communication that characterizes the tension between space of place and space of flows. These tensions of function, meaning, and form serve to distend these two meanings beyond that of the knowledge of a place and an acquaintance with it. Through these tensions, the comprehension of "wet markets" by global outsiders is divorced from its meaning to locals as it switches from being a source of nutrition and community interactions to a representation of danger and risk. The simultaneously competing and co-existing logics of these three dialectics have created a *dual identity* of wet markets, with one's meaning connected to its role in the space of places, and the other distorted and appropriated as a spatial form in the space of flows. The latter bears a contradicting identity from its digital and media representation that is almost unrecognizable from its local experience. In effect, as the processes of the space of place and the space of flows diverge from each other, wet markets continually become a space displaced from its material place.

Urban Orientalism: A Fourth Bipolar Axis

Orientalism, as coined by Edward Said, describes the dichotomous and dualistic system of ontologies and epistemologies in discourses, based on Foucault's regimes of truth that relate to the production of a discourse, and regimes of knowledge that relate to power and discipline (Haldrup & Koefoed, 2009). The functioning of Orientalism lies in interactions and uneven power relationships between "the Orient, the Orientalist, and the Western consumer" (Haldrup & Koefoed, 2009, p. 39). First, the process of Orientalization occurs, whenre the "Orient" is identified as an object of study and subsequently othered by the Orientalist, the (typically) outside observer who studies it. Second, the Orientalized subject of study is assimilated into an existing Western discourse of knowledge to be consumed by a Western audience. Lastly, it is decontextualized into a "truth" that is shaped by the inherited system of knowledge, and participates in the cyclical reproduction of

Orientalist knowledge (Haldrup & Koefoed, 2009).

Urban Orientalism is an application of the process of Orientalization to a metropolis, from the viewpoint of a system of epistemology based on dominance, difference, and power (Angotti, 2012). While "Oriental" is an antiquated word, the process of Orientalism continues to occur in discourse and power surrounding wet markets — for example, in *Wall Street Journal*'s "Abolish Asia's 'Wet Markets,' Where Pandemics Breed" (Kang & Walzer, 2020, January 27), and in *NPR*'s "U.S. Pressures China To Close Wet Markets Thought To Be Source Of COVID-19" (Neuman, 2020, April 23). This viewpoint centers the West such as to situate its urban world in opposition to the narrative of the inferior, developing, and less important Eastern urban world. From this vantage point, authors all too readily work from and extend colonial, imperial, and neocolonial modes of thought — in short, ways of thought that reinforce the cultural hegemony of the West. The justification (taken to be self-evident) of preserving global public health from the threat of a now-Orientalized illness both manifests and reinforces the naturalization of colonial, Orientalist hierarchies.

A Geographic Imaginary

Angotti (2012) describes the urban fallacy as, "the notion that the world's problems are caused by big cities or that they will be solved when everyone lives in big cities" (p. 5). At the core of this fallacy is the attribution of the city as the source of issues and problems that manifest within it, deflecting away from the social, economic, and ecological processes that make possible the things that take place within cities. Dr. Anthony Fauci, director of the United States National Institute of Allergy and Infectious Diseases, illustrates how the discursive tensions and forces on wet markets play out with the urban fallacy in the TV program "Fox & Friends":

> [Presenter Brian Kilmeade] "We have to find out how this disease started, and it's believed we can say this: from the wet markets in China. Are you calling for this — because this is the second major

> disease that's poisoned the world from this area — are you calling for the closure of the wet markets that has for sale monkeys, bats, and horrible things like that?"
>
> [Dr. Anthony Fauci] "Well, I am no authority to call for anything, but I can certainly tell you how I feel! [laughs] I think they should shut down those things right away. I mean, it just— it, it boggles my mind how when we have so many diseases that emanate out of that unusual human-animal interface that we don't just shut it down. I don't know what else has to happen to get us to appreciate that. And I think there are certain countries in which this is very commonplace. I would like to see the rest of the world really lean with a lot of pressure on those countries that have that. Because what we're going through right now is a direct result of that." (Transcription of Nelson, 2020, April 3)

The process of urban Orientalism plays out when Dr. Fauci is prompted with an excessively simplified presentation of wet markets as a threat, a danger, and an inherent risk through the logic of "banning" or "abolishing" them. However, it is Dr. Fauci's response to this provocation that relegates wet markets to the wrong end of the imaginative geography. Rather than a long urban tradition of markets as known by those who have lived among them, wet markets are othered and polarized against American cultural food norms when he refers to them as "that unusual human-animal interface," framing them as an exoticized relic of the underdeveloped, disorganized, and uncivilized other urban world. This othering treatment is extended to the countries where wet markets are located, which are left unnamed in this quotation and alluded to using the term "certain countries." He then places these unnamed countries in opposition to "the rest of the world" by calling for "a lot of pressure" against them — an allusion to hegemonic political practices. Dr. Fauci's statement on wet markets introduces an extension of the urban fallacy to wet markets through a lens of Orientalization: he places blame on these universalized sites as an

epicenter of outbreaks, rather than identifying the systems and conditions from which a given outcome could have taken place. It is simply the location of the problem's manifestation that is blamed, as opposed to the nuanced relationships and the dynamics that encompass, shape, and otherwise make sense of the location and the phenomena that purportedly emanate from it.

Conclusion

The tensions between the spaces of flows and the spaces of places, the process of urban Orientalism, and the proliferation of the urban fallacy directed to the dual identity of the wet market create a discourse that fails to address systemic issues. The politicized rhetoric of Western, globalized media and medicine to shut down wet markets leaves underlying systems unaddressed by ignoring questions of community health, the multifunctionality of food systems, and the valence of multi-scaled governance & power structures. For example, what is the connection between biodiversity, exploitation, poverty, and zoonotic disease? Will banning wet markets actually lead to the end of the global bushmeat trade system? These questions and more are crucial to better understanding the social-ecological systems that help constitute these places, and the rhetorical dynamics that presume to interpret them. While wet markets are being framed as the problem that must be eradicated, this paper examines the forces behind the proliferation of this perspective. Rather than being the logical and rational response towards global public health, I suggest that this perspective has particular roots in a distorted identity of wet markets, urban Orientalism's knowledge systems dynamics, and the urban fallacy, which each work together as barriers to a productive and fruitful discourse.

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Darwin in the City: Evolution and Self-Perception in the Urban Noösphere

by: SABRINA OUYANG

In the Anthropocene, natural processes of evolution have been disrupted by anthropogenic mechanisms. With the increasing integration of technology into healthcare and scientific research, the broadening of scientific knowledge has driven the 'bio-gentrification' of humanity. The inequalities reproduced in capitalist institutions contribute to the gentrification of humanity's biological composition. Meanwhile, technological advancements in genetic engineering offer prospects of an artificial evolution – reaching its apotheosis in the modern movement of transhumanism. The resulting manifestation of social Darwinism is a display of how social processes perpetuate inequalities through biological means. In this paper, I argue that select advancements of scientific knowledge have and continue to "naturalize" social inequalities in cities, pervading the planetary noösphere and what we know about ourselves. There has been extensive examination of how humans will change science, but what I ask here is how science changes us.

Introduction

Life is subject to the natural laws of evolution. As the Anthropocene progresses, the natural course of evolution is increasingly disturbed by the consequences of human actions, both inadvertent and deliberate. Cities in particular, as hubs of human interaction, concentrate and magnify anthropogenic forces that are capable of shaping evolutionary patterns (Miles et al., 2019; Geddes, 1915; Mumford, 1956; Batty, 2018). Cities are also epicenters of information and conscious thought. This noösphere, defined as a global dimension of human thought and consciousness (Lévy, 2000), is perceived as the successor in the progression of the planetary biosphere, sustained by the awareness of sentient beings. Today, the noösphere exists largely in the urban realm as an extension of digital technology and virtual worlds. However, the urban noösphere is rooted deeply in the fundamental biology of those who are conscious, and the human state of sentience is a product of our evolutionary history. Competition has been favoured in

applications of evolutionary theory, and the key link between biology and urban studies is the framing of gentrification as intensified human competition. I argue that Darwin's evolutionary theory manifests in the city through gentrification and sociological inequalities, shaping how we view ourselves and those around us.

Genetics and Evolution

The concept of evolution, although existing before Charles Darwin, was not prescribed its contemporary definition until Darwin published his 1859 treatise *On the Origin of Species*. Through Darwin's work, evolution was understood to be a gradual process of change in species over time, caused by competition that sifted and sorted those characteristics of species best able to promote survival. This process was termed *natural selection*. Evolutionary biology continues to be an area of active research, and some scholars examine the possibilities of novel ecological contributions to the process. Others, such as Thomas and Eric Clark (2012), take a retrospective view on how Darwin's theory has been molded and perhaps even corrupted by the continuation of his work.

Modern knowledge of evolution is built on the science of genetics. At the most fundamental level, evolution is the change in gene frequencies from one generation of organisms to the next. The study of genes is the foundation for the field of genomics, which involves the sequencing and analyzing of whole genomes (International Human Genome Sequencing Consortium, 2001). This century's genetic revolution was mobilized by the launching of the Human Genome Project in 1990, which sought to sequence and map every gene of the human DNA. While ambitious, the project was completed in 2003 and gave researchers the ability to read the human genome (Collins et al., 2003). The project simultaneously commodified information about the prospect of life, epitomized by the current popularity of commercial genetic testing (Parry, 2013). In the midst of this deeper understanding of genetics, the potential of anthropogenic impact on evolution has increased.

The present-day city is an intricate menagerie of human interaction. Adaptive evolutionary change in the city is occurring rapidly, and co-evolving with anthropogenic

environmental changes at all scales, from the local to the planetary (Harvey, 2011). Contemporary urbanization is an unprecedented acceleration of human intervention. Just as humans engineered the cities we live in, genetic engineering now opens the possibility of manufacturing our own selves and future generations. Yet, genetic engineering is mired in ethical concerns, receiving profuse attention for its high potential of corruption. There are a multitude of possibilities for its application, including the commodification of humanity through the production of designer offspring. Aldous Huxley's (1932) eugenic vision in *Brave New World* is thus brought to life in the modern day, materializing in a world of capitalist institutions and inherent inequalities. While such dystopian projections were merely a product of imaginative science fiction in the twentieth century, scientists are now enabling a previously inconceivable future with the inauguration of Clustered Regularly Interspaced Short Palindromic Repeats (CRISPR) gene manipulation technologies.

CRISPR was discovered by Spanish graduate student Francisco Mojica in 1993 and later described by Mojica in 2003 as a method of genome editing for adaptive immunity (Lander, 2016). Since the discovery of CRISPR, it has demonstrated vast potential in fields as diverse as agriculture and medicine, with potential applications in crop gene alterations and disease treatments. It was in 2012 when a group of biologists made a breakthrough in uncovering the breadth of CRISPR's gene editing capabilities (Wang, 2017). The group, led by Jennifer Doudna at the University of California, Berkeley, discovered Cas9, a "CRISPR-associated" protein that has been consequential in the reduction of both the time and cost of CRISPR gene editing (Jinek et al., 2012). This was significant, as improving the duration and affordability of genomic alteration fueled the commodification of the process and its wider use in multiple applications. The potential of this biotechnology to eradicate anthropogenic diseases is counterbalanced by ethical dilemmas associated with the very real possibilities of altering the character of the human race (Hofmann, 2018).

The role of technological advancements in the biological evolution of human beings forms the

basis of the transhumanism movement. Propelled by the belief that science and technology can allow the human race to evolve beyond its mental and physical limitations (Lipowicz, 2019), transhumanists contend that technological advances in genetic engineering and artificial intelligence now make it possible to achieve fundamental enhancements to humanity (Bostrom, 2003). Followers of the movement strive to postpone their own demise, oftentimes with health fads and medical procedures. Like everything else in the age of monetization, life extension technologies have bred a marketplace of their own, with the wealthy being willing consumers. As a result, transhumanism has become increasingly popular among the business and technology magnates of Silicon Valley: those with the financial means to pursue innovations promising longevity or immortality. Notably, Raymond Kurzweil, the director of engineering at Google, envisions transhumanism through the materialization of a "human-machine civilization" (Kurzweil, 1999, 2012). Despite the enthusiastic proclamations of its advocates, transhumanism's vision of artificial intervention to engineer human nature has placed it at the center of contentious ethical debates. What is indisputable is that the movement's emergence demonstrates the exponential acceleration in humanity's capacity to artificially alter the trajectory of evolution. Yet transhumanism's goal for homogeneity is a direct assault on the ecological diversity that is desired in nature. If there is a uniform standard for what the desirable qualities of an improved human are, the result would be a genetic pool that promotes uniformity rather than diversity, and what we sacrifice in the process may be a sense of individualism and identity.

Bio-Gentrification and Social Darwinism

Biological studies have had a steady place in the city, with fields such as urban ecology integrating inquiry of the natural and urban environments. Situating evolutionary biology in the context of the city is not a novel conception. Rather, it has been investigated for many decades, from the prosocial behaviour of social groups (Marris, 2011) proliferating in the city to the effects of anthropogenic activity on human evolution (Miles et al., 2019). The evolutionary biologist David Sloan

Wilson has applied evolutionary theory to urban life (Marris, 2011), displaying the reciprocal relationship of biology and urbanism. While the evolutionary process was previously thought to be slow, there is now widespread recognition that urbanization has the ability to affect "observable evolutionary change in as little as two generations" (Johnson & Munshi-South, 2017; Kinnison & Hendry, 2001). This testimony to the force and power of human innovation has resurrected popular movements of past generations, such as eugenics, which sought to use selective breeding as a means of improving the genetic makeup of the human population (Daar, 2017). Embedded among the revival of such movements is the idea that human fallibility must be targeted and improved. As a result, the human race has become a target for reconditioning, with decision makers likely uncovering "undesirable" qualities in the lower social classes. This is the latest manifestation of social Darwinism, the theory that we as people are subject to the same natural selection as other organisms, displaying the inequalities inherent in the systems that lay the groundwork for our urban lives.

With CRISPR, seemingly simple substitutions in the genetic code will inevitably have a more large-scale impact. For centuries prior to today's possibilities of genetic engineering, human societies have been deeply unequal, with stark divisions of caste, race, and ethnicity in terms of access to health care, education, social capital – and all of the consequent benefits for enhanced quality and duration of life. But there is little doubt that genetic intervention will exacerbate such inequalities. Transnational concentration of wealth is intertwined with concentrated sites of advancing genomic science. Doudna, the lead researcher in CRISPR-Cas9 technology, holds the Li Ka Shing Chancellor's Professorship in Biomedicine and Health at the University of California, Berkeley (Doudna, 2020). Her sponsorship by Li Ka Shing, the 35th richest person in the world as of April 2020 (Forbes, 2020), attests to the evolutionary interdependence of scientific innovation and capital accumulation, and poses questions about the groups that benefit from scientific inquiry. Endowments from the rich to academic institutions are a prevalent practice and one that is unlikely to terminate due to the

exorbitant costs of scientific exploration. As such, the privileged stratum of society has primary jurisdiction over the academic inquiry that they finance, and this seems to remain the case with CRISPR research.

We must consider who would benefit if the CRISPR technology were to be regularly implemented on humanity, as it is a valid prospect that those who fund the research will have an influence on the kind of phenotypes that scientists would strive for. The resulting gentrification of the human race will propel Darwin's theory of evolution in an urban context, with the survival of the "fittest" being the survival of the upper class. The competition of organisms is ingrained in Darwin's theory of evolution, and it is generally understood that Darwin's theory of natural selection was inspired in part by his reading of Thomas Malthus' *Essay on Population* (Vorzimmer, 1969). The revelation of Darwin's theory of Natural Selection being accredited to Malthus is troubling due to the class discrimination encapsulated in Malthus' work. Malthusian thought had inherent classism, blaming the poor and attributing events such as the resistance of the Irish during the Potato Famine as undisciplined behaviour of those debased by their self-inflicted suffering (Ross, 1998). While it may not have been the intent of Malthusian theory to deepen social inequalities, the applications of his doctrine were nonetheless to the detriment of the poor. When adopted into social policy, Malthusian thought vindicates the unfair treatment of those who are already in a vulnerable position. In the modern day, this inequity has manifested in the city through bio-gentrification.

Karen Murray coined the term "bio-gentrification" to describe the relationship between gentrification and the public policies of "social mixing" (Murray, 2015). Examination of that connection captured how urban processes play out in a biological way to the affliction of the disadvantaged. And while Murray identified the hierarchical societal powers at play, what she had unwittingly done with her conception of bio-gentrification is justify the unjust urban practice with science. The idea that inequality is naturalized (Wyly, 2018) due to gentrification being a natural evolution excuses the ubiquitous nature of social inequity. However, the naturalization of

inequality is nothing new, as seen when early theorists of the Chicago School approached the city with the biological metaphor of an "urban jungle" (Warf, 2006). This particular analogy, influenced by the prevalence of social Darwinism in the early 20th century, justified the displacement of urban ethnic groups by equating social processes of ethnoracial segregation with the ecological processes of 'invasion and succession' observed in plant species. Naturalizing explanations for inequality legitimizes and entrenches structural disadvantage since nature is generally seen as a force beyond human control. Unbeknownst to the Chicago School, these theories previewed how systemic biases would continue to discriminate in our modern society.

Self-Perception in the Urban Noösphere

The emergence of an interconnected planetary human consciousness as another layer of Earth's biosphere came in the 20th century from the minds of Vladimir Vernadsky, Édouard Le Roy, and Pierre Teilhard de Chardin (de Chardin, 1956). Beyond his roles as a geologist and paleontologist, de Chardin was an ordained Jesuit priest whose teleological vision was derived from his desire to understand the affiliation between God, man, and the universe (Fuchs-Kittowski & Krüger, 1997). For de Chardin, evolution involved progressive changes on four levels, only two of which – cosmogenesis and biogenesis – could be described by traditional science (Delio, 2012). It was through his recognition of humans' unique characteristics of consciousness and self-reflection that he perceived a revolution in the course of evolution. The resulting conception of the "noösphere" described the global sphere of human thought, aggregating individual minds into a cybernetic collective of wisdom, memory, culture, and spirituality. The concept of the noösphere has become wildly popular among Silicon Valley entrepreneurs and investors (Lanier, 2017), and some analysts go so far as to describe de Chardin as a transhumanist – creating a fascinating linkage between a previous century's zeitgeist of evolutionary progression towards global communications, and contemporary visions of life beyond the constraints of natural evolution.

Beyond de Chardin's definitions of evolutionary planes, current studies of genetics in evolutionary processes enrich our understanding of self-reflection and awareness. In particular, Thomas and Eric Clark's (2012) analysis of evolution and sustainability highlights the distorted and excessive individualism that supplements the understanding of genetic evolution. Clark and Clark (2012) document how the exclusive focus on individual-level genetics mistakenly reinforces an individualistic and divisive conceptualization of evolution – obscuring the powerful forces of networked relations that shape generational changes. The scientific framing of individual importance neglectfully shaped a society of difference and competition, rather than reinforce the elements of collaboration and community found in nature. It was an affirmation of the ties between developments in research and our understanding of self. Ultimately, reciprocal influence between biological and social thought has naturalized and exacerbated inequality (Clark & Clark, 2012). Such tendencies are most vivid in the field of sociobiology, defined by Edward Osborne Wilson (1975, p. 4) as the "systematic study of the biological basis of all social behaviour." Our behaviour and interaction with others shape our self-perception, and self-perception theory proposes that our comprehension of our own character is a product of the same inferential process that we use for the judgment of others (Bem, 1972). As such, our understanding and thoughts are altered by factors relating to biological processes acting both on us and our environment. First of all, our perception of others' actions and our own responses is a by-product of the prosocial behaviour exhibited in living organisms. The development of this prosocial behaviour was a result of the benefits that collaboration provided in natural selection. In terms of the spatial factor, urban ecology shapes our built environment, which determines our input of sensory data on a daily basis. This input shapes our understanding of the world around us, influencing our culture and relationships. In both of these ways, our presence in the planetary noösphere is tightly interwoven with our survival in the biosphere.

Another account to consider is that understanding oneself is evolutionarily advantageous (O'Mara &

Gaertner, 2019). In turn, self-perception involves consciousness, the fundamental basis of de Chardin's (1956) noösphere. In today's era of technological acceleration, artificial intelligence, and the 'smart cities' of an evolving 'planetary Silicon Valley' (Townsend, 2013; Zukin, 2021; Lanier, 2017), consciousness occupies a central role in the techno-utopian prospects for augmenting human life. Even when biology fails, those with the financial means strive to live on by transferring their consciousness to the digital realm. Much of our value as humans, and what differentiates us from other primates, is our consciousness and intervention in the noösphere. Our existence in this intangible dimension of connectivity allows us to better understand our place in the world but is also implicated in the drive to improve humanity. In the pursuit of evolutionary purity, the imperfections that define humanity itself are dissected and condemned, imposing harsh negative consequences on our perceptions of ourselves and others while the advancing scientific frontiers promise enhanced longevity for a favoured few.

Interpersonal relations will be fractured by the persistence for transcendence and inequalities will be worsened with the pursuit of an unattainable ideal of perfection for humanity. Those who don't meet the measures of this ideal will come to be seen as inferior and society would disintegrate into additional strata of class and standing. Hierarchical thought will privilege the illusion of a single, uniform standard of human genetic perfection, leading to ethical debates over the homogenization of individual human identities. Yet the illusory singularity will periodically give way to a kaleidoscope of diverse, competing standards of perfection as genomic science unravels the double helix of heredity and environment. While humans are the ones to gain from these technological advancements, all of the possibilities will come at the cost of scientifically legitimated inequalities in the world of different kinds of humans, and different relations of humanity with the natural world.

Conclusion

Perhaps this urban evolution will occur much more rapidly than Darwin could have ever imagined. The technological advancements of CRISPR showcase both the potential for human intervention into 'natural' evolutionary

trajectories and the very real dangers of encoding today's intergenerational sociopolitical injustices into the source code of human life itself. The uncomfortable reality is that widening inequalities are perpetuated in the city through biological means. Inequalities reproduced through competition at the heart of both evolutionary theory and political economy are materializing through 'bio-gentrification' and the management of populations unable to adapt to the quickening pace of innovation, capitalization, and monetization. Technological advances in genomics research and medicine manifest in the simultaneous refinement of public health interventions, and political struggles over stratified access to the latest advances. Meanwhile, public discourse on personal genetic testing, CRISPR, and related innovations circulate in the expanding noösphere of planetary urban consciousness – reshaping our self-perception of our evolutionary trajectory and the kinds of humans we wish to become.

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Long-Term Sustainability and Climate Change: Exploring Environmental Impact Assessments of the Trans-Mountain Expansion Project

by: MCKENZIE WITSCHI, LIA LAUREEN SCHULZ, & NATHAN HERRINGTON

The Trans-Mountain Expansion Project (TMX) has been controversial since its conception, initiating debates regarding the prioritization of economic gains against environmental costs, Canada's adherence to international climate agreements and the extent to which this project can achieve reconciliation with Indigenous peoples. This paper analyzes to what extent the Environmental Impact Assessments (EIAs) of the TMX, including those conducted by the federal government and Indigenous Nations, considered long-term sustainability and climate change. We found the assessments by the federal government reflected their broader policy that sustainability can be achieved while furthering economic development in the oilsands. However, this reasoning hinges on the price of oil remaining at $80/barrel and continued reliance on fossil fuels, thereby ignoring Canada's commitment to the Paris Climate Agreement. On the other hand, the independent assessment of the TMX by the Tsleil-Waututh Nation follows a reciprocal vision of long-term sustainability which encompasses traditional laws and knowledge. Despite numerous British Columbian First Nations objecting to the construction of the TMX, this project has proceeded with the support of the federal government, which reflects a significant power imbalance between Indigenous knowledge and colonial governance. From this analysis, we conclude that the TMX is unsustainable and moving forward is a step backwards in addressing the climate crisis and advancing reconciliation with Indigenous peoples.

Introduction

The Trans-Mountain Expansion Project (TMX) will duplicate the existing pipeline from Edmonton, A.B. to Burnaby, B.C., increasing its capacity to transport crude from 300,000 barrels per day to 890,000 barrels per day for export to refineries in Asia (Trans Mountain, n.d.). The project was purchased from Kinder Morgan by the Canadian federal government under the Trudeau administration in 2018, a decision justified as a means to expand Canada's economy in the short-term to support a transition to a more

sustainable one in the future (Wherry, 2019). The TMX was first submitted for an Environmental Impact Assessment (EIA) in 2012 under the Canadian Environmental Assessment Act (CEAA, 2012) and construction began in 2019. In this paper, we question the extent to which the assessments for the TMX considered long-term sustainability and climate change, focused specifically on two elements of the project's EIAs. The first element is the adherence to global climate change agreements on greenhouse gas (GHG) emissions versus developing the oilsands, and the second is the recognition of traditional ecological knowledge (TEK) in consultation with Indigenous communities. Sustainable development, as defined by the 1987 Brundtland Report, is "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." However, applying this definition to the TMX is complicated by different visions of sustainability held by the multiple stakeholders in this project. One perspective is centered on economic growth and the other on traditional subsistence use of the land and its resources with the protection and rights of Indigenous communities at its core.

Therefore, this paper will evaluate the long-term sustainability of the TMX in the eyes of two stakeholders, the federal government and Indigenous peoples affected by this project. These two groups have vastly diverging views; one is apparently underpinned by the goal of economic sustainability, and the other is based on TEK. Although the National Energy Board (NEB) conducted a local EIA for the TMX, they focused solely on GHG emissions produced by the construction and use of the pipeline itself, excluding both upstream and downstream emissions caused by the expansion. This omission is representative of the federal government's insistence that it is possible to promote oil sands development and sustainability at the same time (MacLean, 2018). Moreover, there is a biased valuation of knowledge in EIA where Indigenous traditional knowledge, which is passed on orally through generations, is often disregarded. The United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) acknowledges that Indigenous communities around the world are disproportionately vulnerable

to climate change (UN Department of Economic and Social Affairs: Indigenous Peoples, n.d.). In a colonial nation-state like Canada, Indigenous communities face significant challenges in their interaction with its laws and participation in its institutions, including in the development of EIAs. This imbalance in power relations has caused a lack of proper consultation and an unjust system in terms of how these assessments are ultimately acted upon.

Part I: Expand the Oilsands *and* Protect the Environment?

The EIA for the TMX conducted by the NEB followed CEAA 2012 and found that the project was "not likely to cause significant adverse environmental effects" (NEB, 2016, p. 3). The NEB reached this conclusion after weighing the economic benefits of the project with the environmental harms it would cause, which included impeding the recovery of the Southern Resident Orca, significant GHG emissions from related marine vessels and high consequences for large spills which were deemed unlikely (NEB, 2016). The TMX was approved but is held to 156 conditions laid out by the NEB, eight of which are related to air quality and GHG emissions. In particular, Condition 142 states that Trans Mountain, the federal Crown corporation in charge of this project, must provide offsets for all GHG emissions generated from the project's construction (Canadian Energy Regulator, n.d.).

Yet, the major flaw of the NEB's assessment for the TMX is that it did not consider upstream and downstream emissions from the pipeline. "Upstream" emissions refer to those which occur due to the extraction and refining of bitumen in the Alberta oilsands, which would eventually be transported by the pipeline. "Downstream" emissions are those which are emitted post-transport, for instance while producing petroleum-based goods or fueling vehicles (Government of Canada, 2019). The NEB was requested to consider these effects but declined under ruling No. 25 on July 23rd, 2014. With regards to upstream effects, the NEB argued that the TMX does not rely on any developments upstream and that any, "environmental changes caused by such upstream production is indirect" (NEB, 2016, p. 160). However, an independent review of upstream GHG emissions was conducted by Environment and Climate

Change Canada (ECCC) on November 2016 and found that with the TMX's increased capacity, the increase in upstream GHG emissions could range from 13 to 15 megatons of carbon dioxide equivalent per year (ECCC, 2016). Moreover, the ECCC stated that the degree to which the emissions were enabled by the TMX itself depended on the expected price of oil, other pipelines being built, and costs of other transportation modes. They mention that these emission estimates were likely to be enabled by the TMX if Canadian oil prices decreased to $60-80 per barrel (ECCC, 2016). The average price of Western Canada Select for the year 2020 was $40.04/barrel (Alberta Government, 2021). Therefore, if the price of Canadian oil remains low, those predicted upstream emissions will be directly enabled by the construction of the TMX.

An independent analysis found that the total GHG emissions of the TMX, including both upstream and downstream emissions, for its fifty-year lifespan would consume 100% of Canada's share of the 1.5 degrees-Celsius goal laid out by the Paris Climate Agreement (Donner, 2016). Therefore, the question remains: How can the federal government justify this development and be committed to sustainability? When approving the Kinder Morgan TMX in 2017, Prime Minister Trudeau argued that his government was "determined to balance economic development with environmental protection" (McCarthy, 2017, para.15). This justification stems from Canada's broader climate change policy that they will use wealth generated from oil development to finance a new, greener economy (MacLean, 2018). However, this ideology fundamentally protects the oil industry in Canada, as it neglects the urgency of the climate crisis. Those revenues gathered from fossil fuel projects to pay for renewables could very well be obtained by efficiently capping and pricing carbon pollution (Jaccard, 2020). Moreover, the calculations that the TMX would provide $46.7 billion dollars for governments in Canada in the first twenty years of expanded operations (Trans Mountain, n.d.) depended on profitability estimates made while Kinder Morgan still owned this project. This has prompted a coalition including the Union of B.C. Indian Chiefs and West Coast Environmental Law to release a

petition demanding the federal government release an updated cost estimate for the TMX to allow citizens to better assess its economic viability (Bellrichard, 2019). Recently, the Canadian Centre for Policy Alternatives released a report concluding that the federal government should reconsider their commitment to the TMX given that the COVID-19 pandemic has lead to a short-term drop in oil demand, and with the expansion of five other existing pipelines and the competition of the Line 3 project, Canada would have enough pipeline capacity until 2040 without the TMX (Thurton, 2020). Therefore, the EIA of the TMX did not adequately consider sustainability given that it omitted upstream and downstream emissions, and the federal government's agenda to make profits while simultaneously protecting the environment appears to be contradictory and unfeasible.

Part II: Sustainability Through the Eyes of Traditional Ecological Knowledge

Traditional ecological knowledge is a broad term which encapsulates the living and complex Indigenous ontologies and epistemologies which place respect, reciprocity, and relationality as central tenants in interacting with nature (Wilson & Inskter, 2018). As such, the guiding principles of TEK serve as a framework for sustainability for many Indigenous nations, which fundamentally differs from the NEB's perspective of economic sustainability. This is particularly evident in the independent impact assessment by the Tsleil-Waututh Nation, published in May 2015, entitled "Assessment of the Trans Mountain Pipeline and Tanker Expansion Proposal," which grounds its evaluation of the TMX on holistic variables, rejecting cost-benefit analyses. This approach encompasses traditional laws, duties, and relations to the environment, as well as expert knowledge and evidence. A key factor of the Tsleil-Waututh Nation's assessment was a sacred stewardship obligation to, "protect, defend, and steward the water, land, air, and resources of our territory" (TWN Sacred Trust, 2015, p.3). This definition warranted the Tsleil-Waututh Nation to withhold their consent to the TMX.

This vision of sustainability, put forth by the Tsleil-Waututh Nation and supported by numerous other B.C. First Nations, was largely ignored in the

decision making process for the TMX. This reflects broader epistemological obstacles in incorporating TEK into Canadian EIA processes including a problematic perception that so-called "scientific," western knowledge is superior to and at odds with TEK, and that legislation was not developed to allow for equitable knowledge sharing (Eckert *et al.*, 2020). Internationally, the importance of conducting community-involved science to gain a comprehensive understanding of climate change and put forward effective sustainability strategies has been acknowledged in a United Nations-backed report in *Science*, which asserted that "expanding the range of effective solutions and scaling them globally requires scientists to engage actively with communities" (Lubchenco & Gaines, 2019, p. 911). However, despite scholarly literature indicating the importance of incorporating TEK to reach sustainable decision making, the EIA process of the TMX reflects significant shortcomings with regards to Indigenous consultation. To begin with, the final EIA report for the TMX was released in 2016 under the legal regulations of CEAA 2012 in which the "recognition of rights, respect, cooperation and partnership" with Indigenous communities was not yet mandatory, as it is now in the current federal Impact Assessment Act (IAA 2019), as stated in the preamble of Bill C-69. This proves to be a strong disadvantage for Indigenous peoples, as they were not given the opportunity to contribute to one of the most crucial documents for the approval of the project. This conflict culminated in December 2019, when the Tsleil-Waututh and Squamish Nations, the Coldwater Indian Band, and a coalition of smaller Indigenous Nations from British Columbia legally challenged the TMX, expressing that they had not been adequately and meaningfully consulted in front of the Federal Court of Appeal (Kestler-D'Amours, 2020). The immense impacts of an oil spill and non-consideration of upstream and downstream effects, especially concerning increased GHG emissions and climate change, were of particular relevance to the communities (TWN Sacred Trust, 2015). The appeal got rejected, based on the argument that their submissions "essentially [posited] that the project cannot be approved until all of their concerns are resolved to their satisfaction" (Kestler-D'Amours,

2020, para. 27). This statement highlights a flawed understanding of Canada's duty to consult and diminishes the weight attributed to Indigenous peoples' right to FPIC, as entrenched in IAA 2019 (DeRochie, 2018).

The Tsleil-Waututh Nation's independent impact assessment was the first step to thoroughly integrate the concerns for climate change, consolidate Indigenous demands, and claim their rights. The assessment found a number of major concerns with the project, including the consequences of an oil spill in the Burrard Inlet that could endanger their livelihoods as well as that of future generations (TWN Sacred Trust, 2015), which poses a clear contradiction to sustainability rooted in respectful, reciprocal, and relational interactions with the environment. Consequently, Indigenous ownership over the TMX has been proposed and is currently being negotiated in order to simultaneously address current and future Indigenous, socio-economic, and environmental problems (Corfield *et al.*, 2020). However, the essential question remains: how should the federal government proceed to ensure long-term sustainability? As Eugene Kung asserts, the federal government needs to aim for higher than the minimum when consulting with Indigenous communities which starts with recognizing inherent rights, implementing UNDRIP, and respecting free, prior, and informed consent (Kung, 2018).

Conclusion

Through this study, we have explored the considerations of long-term sustainability and climate change with regards to the impact assessment of the TMX. By considering the upstream and downstream impacts on global climate and the lack of compliance with the conclusions of the impacted Indigenous communities, we determined that the NEB's EIA ultimately does not consider either long-term sustainability or climate change. It is also clear that the vision of 'sustainability' that is considered when deciding the future of this project is up to which knowledge is valued more than another: traditional ecological understandings versus economic and political judgements. If this discrepancy is to be mended, EIA processes need to better consider and repair the imbalances of power and privilege that exist between traditional governance

and colonial governance. While some assessments concluded that the project was unsustainable and shouldn't proceed, the systems that act on the decision do not give power to the voices behind it. To conclude, the TMX is an inherently unsustainable project and moving forward is a step backward in addressing the climate crisis and advancing reconciliation with Indigenous communities. As long as the Canadian government will not accept "no" as an answer, meaningful action will not be taken toward lasting and equitable sustainability.

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Modelling Species Distribution & Climate Change Niche Response of *Taricha Granulosa*

by: NIGEL TAN & YULIN HU

Amphibians are highly valued bio-indicators of ecosystem health due to their sensitivity to environmental change. In North America, , with their amphibian populations and range are being key identifiers for North American freshwater biomes. In this study, we use Maxent and several GIS programs to model the present-day distribution of the rough skin newt, Taricha granulosa, as well as predict habitat niche changes in 2050 and 2070 under the Intergovernmental Panel on Climate Change's climate schemes Representative Concentration Pathway (RCP) 4.5 and 8.5 in the Pacific Northwest region. We used records containing more than 11,000 volunteer-contributed newt observations as well as several environmental and bioclimatic variable layers to inform our analysis. Our results indicated that only 4.6% of the total present-day study area contained suitable newt habitat. Under both climate change pathway prediction models, suitable habitat area was predicted to double by the year 2050 to >9% before settling at approximately 8% in 2070, though overall, the degree of suitability somewhat drops. When accounting for land use types and urban human activity, we calculated that instead of a doubling in habitat area, the growth in Washington and Oregon will be only 11%, suggesting that conservation activity may be required in the future.

Background

Taricha granulosa, or the rough skin newt, is a common species of small newt that is abundant in the Pacific Northwest and frequently found in shallow ponds and damp rainforests. Its natural distribution lies along the Western coast of North America, from Northern British Columbia down to California, with the majority of the populations centered on the stretch from Oregon to Haida Gwaii (Marks & Doyle, 2020). As amphibians, newts are extremely sensitive to environmental changes, making them excellent bio-indicators of ecosystem health and functionality. As such, modelling newt habitat niche response to various

environmental impacts can provide key insights into ecosystem resilience as a whole.

Species distribution modelling (SDM) is the practice of using machine-learning algorithms and geographic data to predict the likelihood of a given species appearing in a location based on observed sample data and selected environmental variables (Fitzpatrick *et al.*, 2013). This is done for the purpose of analyzing species range extent, as well as species habitat response to various environmental changes over space and time by creating presence probability prediction maps. By far the most popular SDM modelling software, Maxent operates on the principle of maximum entropy to create presence-based species range maps using observed samples and environmental rasters (Phillips *et al.*, 2006). Maximum entropy models assume that, without the presence of ecological constraints, a species will have a distribution as widespread and uniform as possible (Duan *et al.*, 2014).

In our study, we modelled the distribution of the rough skin newt in British Columbia, Washington, and Oregon. To do this, we used decades of citizen science newt observations and several bioclimatic and environmental variable layers to model newt range in present-day conditions and over the course of various climate change schemes in Maxent. Results were overlaid with land cover and use to identify habitat constraints caused by human development. This study aimed to identify whether warmer climates would impact rough skin newts to determine whether or not the species may require special conservation in the face of anthropogenic climate change.

Data

Data Source	**Layer**	**Notes**
BISON Project Database (Biodiversity Serving Our Nation)	12,453 georeferenced records of *Taricha granulosa* sightings in British Columbia, Washington, and Oregon	Contained data such as: • scientific name • common name • observation location & date • coordinates • state/province

		• observer name/affiliation/contact

WorldClim	• Historical climate average (1970-2000) for present day distribution
	• CMIP5 (Coupled Model Intercomparison Project) climate projection data for future presence predictions
	• World DEM (Digital Elevation Model)
		• All data in EPSG4326 (WGS84), 30 arc second (900 m^2) resolution GeoTiff format
		• Selected bioclimatic variables for our study area (BC, WA, & OR)
		  • Annual mean temp
		  • Mean diurnal range
		  • Isothermality
		  • Max temp
		  • Min temp
		  • Temp annual range
		  • Mean temp of wettest quarter
		  • Mean temp of driest quarter
		  • Mean temp of warmest quarter
		  • Mean temp of coldest quarter
		  • Annual precipitation
		  • Max precipitation
		  • Min precipitation
		  • Coefficient of precipitation variability
		  • Precipitation of wettest quarter
		  • Precipitation of driest quarter
		  • Precipitation of warmest quarter
		  • Precipitation of coldest quarter

GADM (Database of Global Administrative Districts)	• Canada provincial boundary base map • United States state boundary base map	• All data in .shp ShapeFile format

USGS (United States Geological Survey)	• Gap Analysis project Land Use Rasters • WGS84, 30 km^2 raster in GeoTiff format • Land cover rasters for Washington and Oregon	• Originally contained 33 land cover classes • Filtered to wetlands, forests, and related land cover classes

Methodology

Data Preparation

The *Taricha granulosa* sample data downloaded from BISON contained more than 12,400 recorded newt sightings in the Pacific Northwest. To prepare the data for Maxent, all columns were deleted except for species name, x-coordinate, and y-coordinate. Fields removed included time and date, identity of observer, organization of observer, state/province, county, and city. The next step was to filter out all entries that were missing coordinate data. The list was narrowed down to 11,394 entries and reformatted as a CSV file.

Current Distribution

All spatial data and environmental variables were converted to ASCII text raster format using QGIS 3.12.1. *Taricha granulosa* data was added to Maxent as the sample data, while all eight converted environmental variables files were used as environmental data. The output was set as an ASCII file with a cloglog distribution, and the sample radius was set to -9.

Future Distribution Prediction

The jackknife test on the current distribution model showed that 97.4% of informational importance came from annual mean temperature, minimum temperature, and maximum precipitation, with all other variables accounting for less than 1% each. As such, the predictive models were run with only the three key variables for efficiency.

The environmental data used for the predictive models were climate schemes from the Geophysical Fluid Dynamics Laboratory's Coupled Physical Model 3. This dataset models the atmosphere's climate from 70 m above the Earth's surface to 80 km at the top end (GFDL, n.d.)

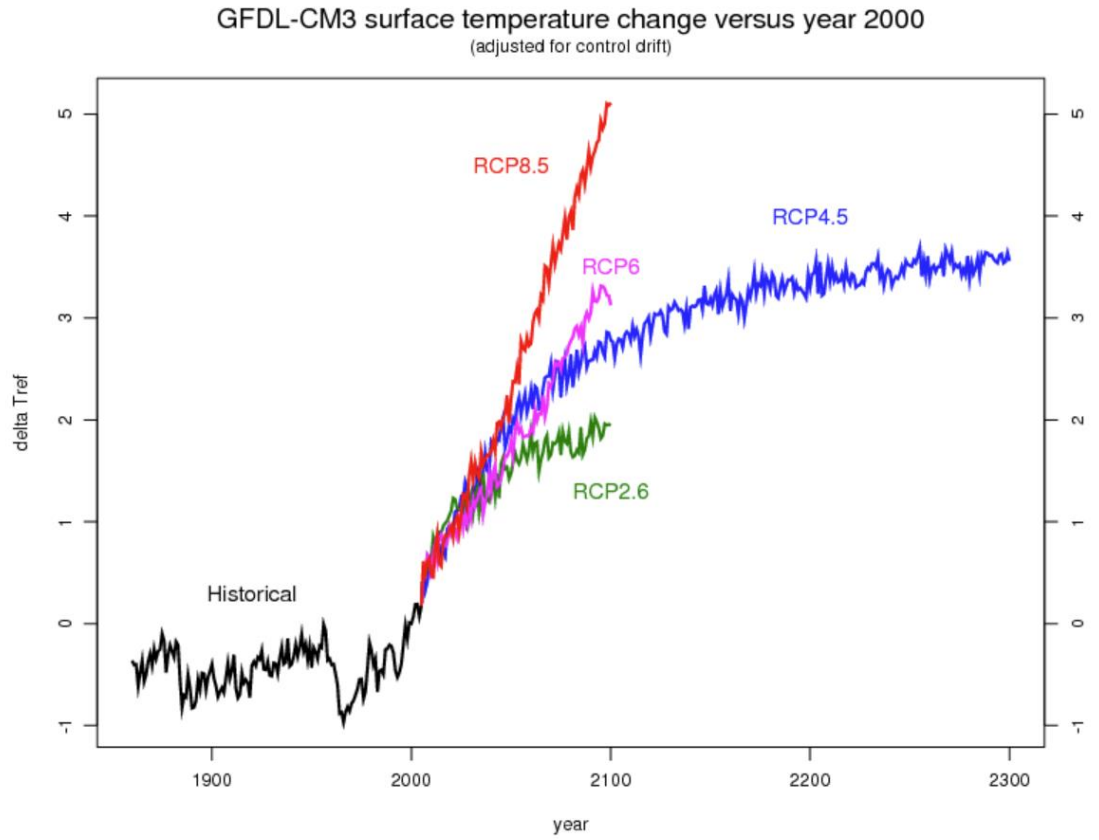

Figure 1. Geophysical Fluid Dynamics Laboratory Coupled Physical Model 3 Climate Model Pathways.

For future predictions, we used Representative Concentration Pathways (RCP) 4.5 and 8.5. These are climate projection models approved by the Intergovernmental Panel on Climate Change which detail potential climate change scenarios over the next century. RCP 4.5 models a greenhouse gas emissions peak at around 2040 before declining gradually. RCP 8.5 presents a worst-case scenario where emissions slow in growth over time slightly with technology but never peak. These two pathways were chosen as 4.5 is a highly likely scenario, while 8.5 presents the worst possible climate change landscape. Four models were created: RCP 4.5 and 8.5 in 2050, and RCP 4.5 and 8.5 in 2070.

After running the Maxent models, the output ASCII rasters were imported into ArcMap 10.6 and projected into UTM Zone 10N.

When analyzing the Maxent results in conjunction with land usage, we used Quick Stats from ENVI 5.3 to

check the score distribution of all of our RCP 4.5 and RCP 8.5 outputs within our study area (BC, WA, and OR). ENVI's Quick Stats describe the total number of pixels, the pixel's digital number (DN) value with its corresponding count, and its percentage of the entire raster data. In this case, we chose the pixels that have DN values greater than 0.7 as areas with good prediction accuracy. A value of 0.7 was selected as it is above 0.5, which is often regarded as the minimum threshold to constitute a habitat in species distribution modelling (Duan *et al.*, 2014). Since the Maxent models are a cloglog distribution, a value of 0.7 lies at the upper end of the curve where change is greatest. Furthermore, 0.7 is also the value used by Kalboussi and Achour in their model of snake distribution (2018).

To exclude lands with high human activities or terrain unsuitable for newts, we used a 30 m land cover raster dataset from the USGS's Gap Analysis Project. We filtered habitat niches to include only those that scored higher than 0.7 for our 2000, 2050, and 2070 RCP 4.5 results. To identify the land cover types, we joined the land cover raster with the corresponding land use classifications. We extracted the "Temperate Flooded & Swamp Forest", "Tropical Flooded & Swamp Forest", "Warm Temperate Forest & Woodland", "Cool Temperate Forest & Woodland", and "Temperate to Polar Freshwater Marsh, Wet Meadow & Shrubland'' classes based on ideal newt habitats; places such as urban, shrub, crop fields, and alpine were all excluded from the land cover data. Lastly, we identified the overlapping raster pixels of Maxent results and preferred land cover types to generate habitat niche maps for the three time periods.

Results

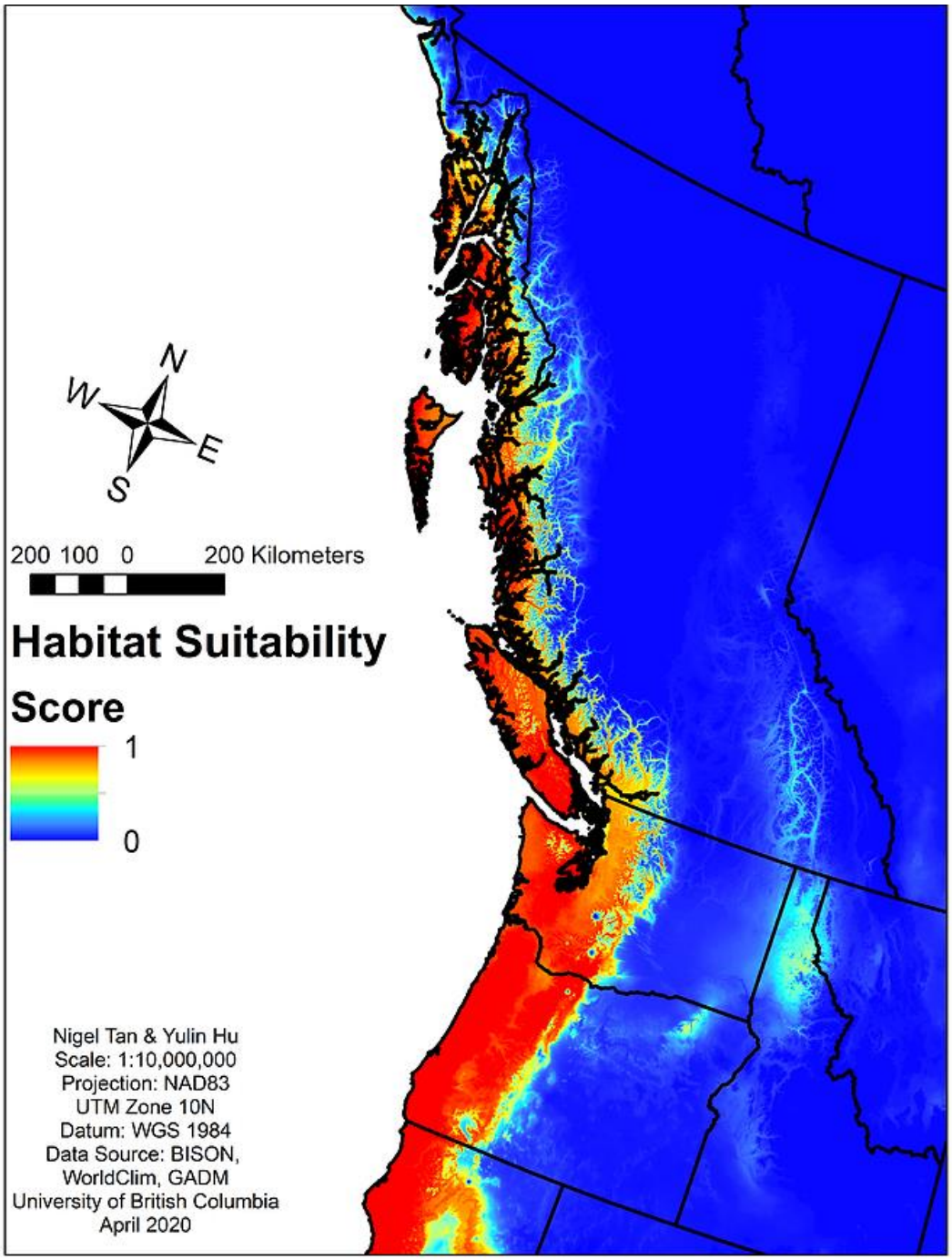

Figure 2. Current habitat suitability based on present day environmental variables.

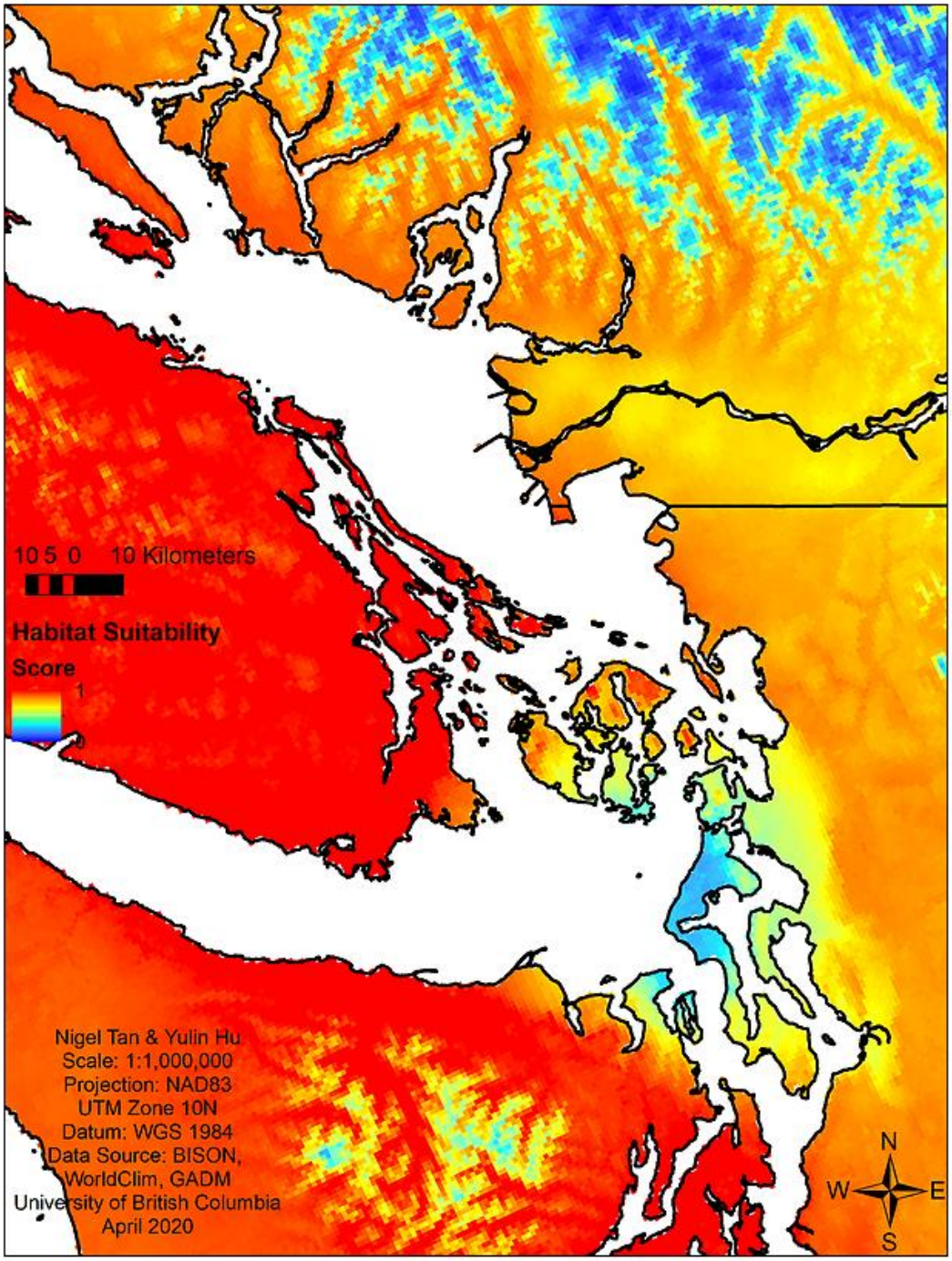

Figure 3. Metro Vancouver/Puget Sound Zoom of present day habitat suitability.

For the current distribution, Maxent utilized 1,881 presence records as training samples, while a total of 11,881 records were used as total presence points for creating the overall model. All Maxent models were outputted in complementary log-log (cloglog) distribution format. A form of generalized linear model representing a Poisson distribution (Van Horn, 2015), cloglog models are most accurate for modelling bivariate responses and are well suited for Maxent prediction (Kitali *et al.*, 2017).

Our present-day distribution model had an area under curve (AUC) score of 0.918, which indicates excellent prediction accuracy and continuous species distribution (Kalboussi & Achour, 2018). This is likely attributed to our extremely large sample size; Maxent is designed to work with samples as small as 15-30 (Phillips *et al.*, 2006), which is miniscule compared to our sample size (n=11,394).

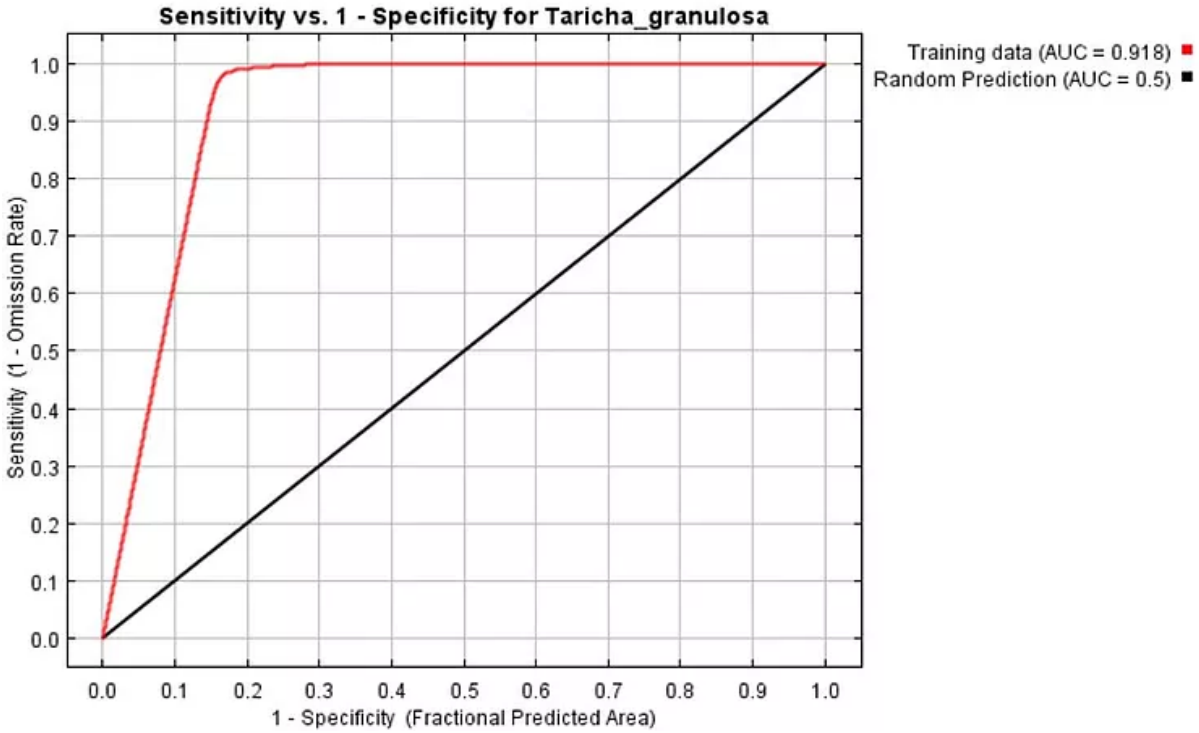

Figure 4. Sensitivity Chart of Model and AUC Score.

Variable	Percent Contribution	Permutation Importance
Precipitation max	54.9	13.3
Annual Mean Temp	27.6	33.5
Min Temp	14.7	50.6
Precipitation min	1.3	0.8
DEM	1	0.8
Precipitation	0.3	0.3
Max temp	0.2	0.7

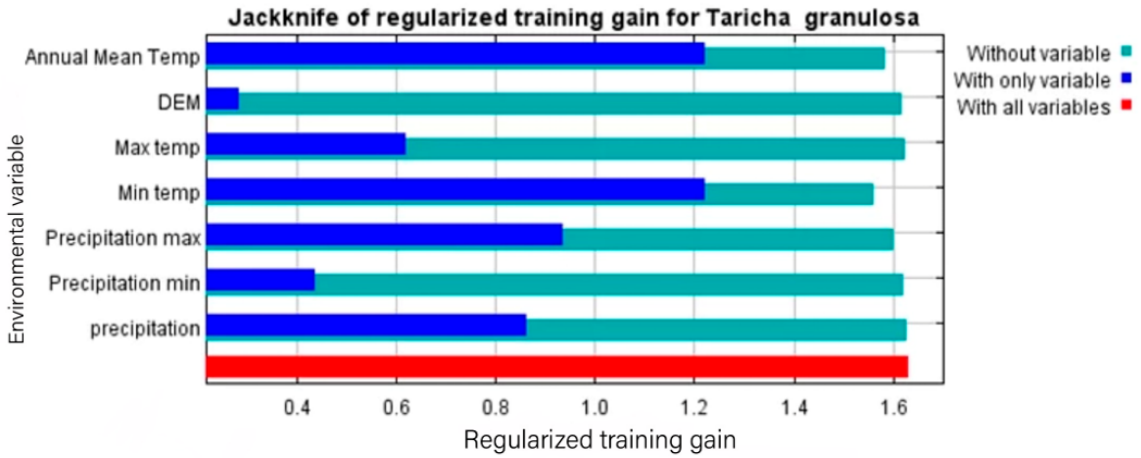

Figure 5. Jackknife and Percentage Contribution Test.

As described earlier on, Maxent provided a jackknifing analysis that calculates the relative importance of each variable for predicting the presence probability of rough skin newts. As shown by the analysis, Min Temp was by far the most important indicator, contributing to more than 50% of the total Maxent analysis, followed by Annual Mean Temp and Max Precipitation (Fig. 5). This indicates that the newts are unable to tolerate conditions below a certain temperature, which likely impacts their ability to overwinter. The jackknifing also shows that Annual Mean Temp had the highest isolated gain, meaning that it had the most useful information, even though it contributed only 33% of the information (Fig. 5). Meanwhile, Min Temp had the highest gain change when used in isolation compared to when used in conjunction with other variables, implying that it provided the most unique information that Maxent was able to source from the environmental variable datasets. Elevation has been shown to be of little importance, which is logical as rough skin newts are known to be relatively equally distributed at a variety of elevations from sea level to 2,800 m (Marks & Doyle, 2020).

The maps themselves are shaded on a stretched gradient from blue to red, where blue represents a 0 on the habitat suitability scale and red represents a 1. A value of 0 implies a completely unsuitable habitat where the species is highly unlikely to be found, while 1 means a perfect environment with extremely high presence probability. Our results indicate presence probability is greatest along the coastlines and islands, with high concentrations around Vancouver Island and the Puget Sound areas.

Comparing the map of present-day distribution to the 2050 and 2070 maps using RCP 4.5 (next page, Fig. 6 upper), there seems to be an overall increase of suitable habitat zones.While habitat zones in general seem to be growing, the overall suitability score seems to be lower, with less deep red zones and more orange zones appearing, especially on the mainland. There are certain exceptional areas, as shown on the zoomed in maps (Fig. 7), where the Metro Vancouver area becomes more suitable in 2050 while Vancouver Island becomes less suitable under the RCP 4.5 climate change scheme.

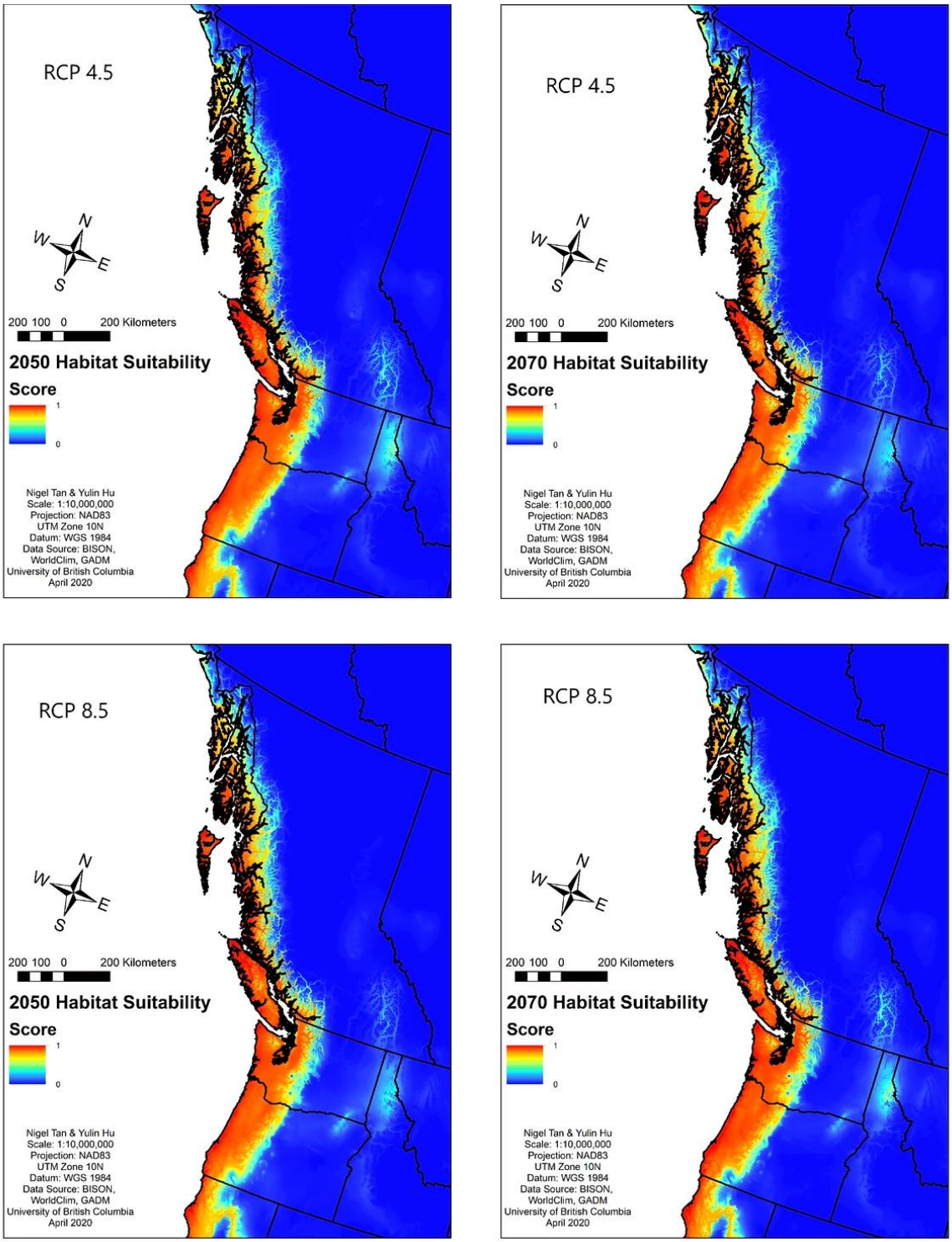

Figure 6. RCP 4.5 & 8.5 Habitat Predictions for 2050 and 2070 based on environmental variables.

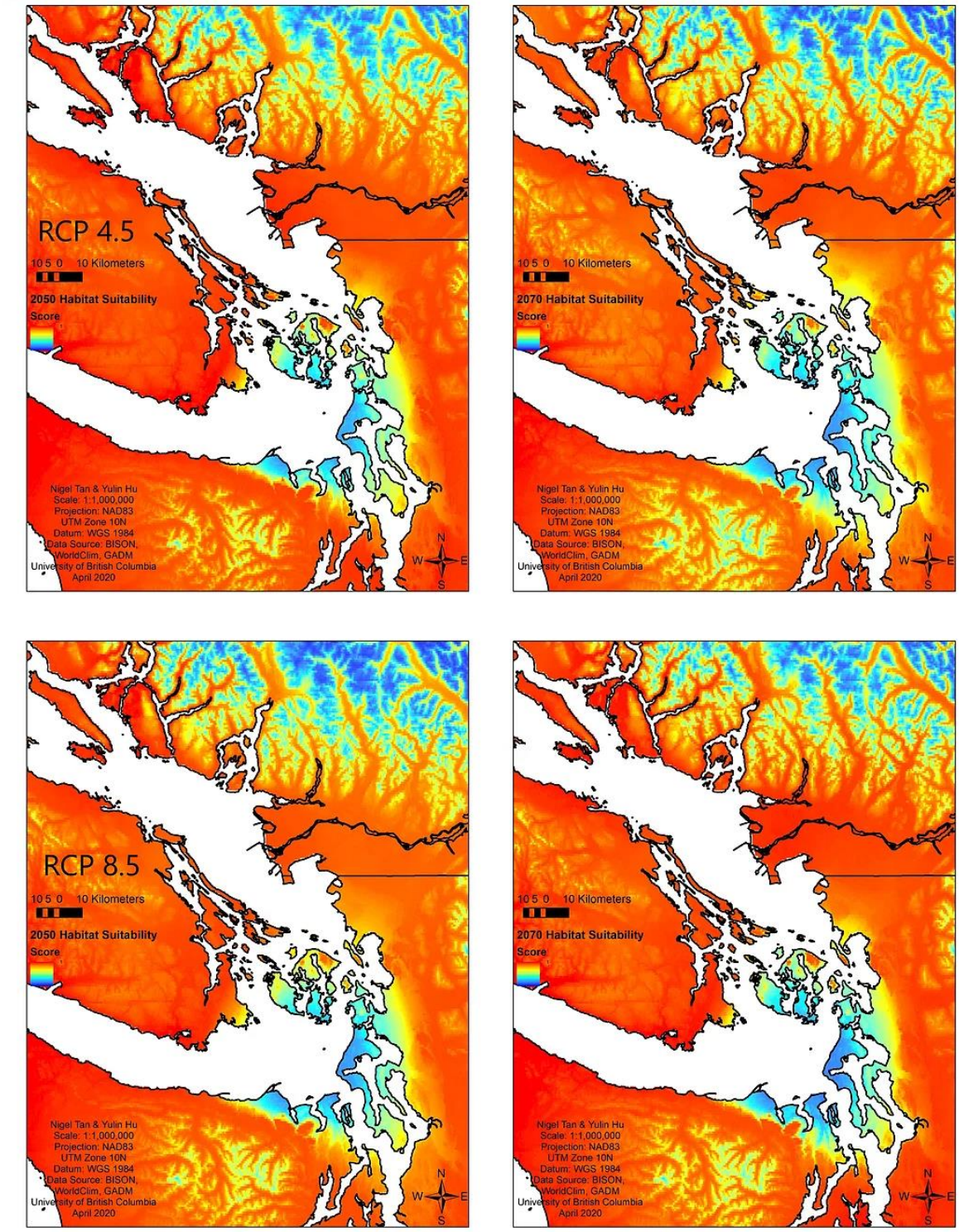

Figure 7. Zoomed in map of southern Vancouver Island/Puget Sound showing habitat suitability predictions.

Suitable Habitat Cells (Score > 0.7)					
	Current (2000)	2050 RCP 4.5	2070 RCP 4.5	2050 RCP 8.5	2070 RCP 8.5
Cell Count	120,143	245,982	216,317	241,520	228,026
%	4.60	9.42	8.28	9.25	8.73
Total Cells	2,611,810				

Figure 8. Habitat Cell Count.

Based on the current distribution model, only 4.6% of the study area, or 120,349 raster cells, was considered to be suitable habitat zones (Fig. 8). Although, under all climate change schemes, habitable zones saw drastic increases. In the RCP 4.5 scheme, potential rough skin newt habitat rose to more than 9% of the area in 2050, or more than 240,000 cells, an increase of more than 100%. However, this falls to just over 8% of the area by 2070, dropping to 216,317 cells. This trend remained even under the far more extreme RCP 8.5 climate model, with a slightly less intense rise in 2050, and a more gradual drop by 2070. Overall, it appears rough skin newts tend to be more receptive to warmer climates, which is supported by the minimum temperature being a key indicator for the Maxent models.

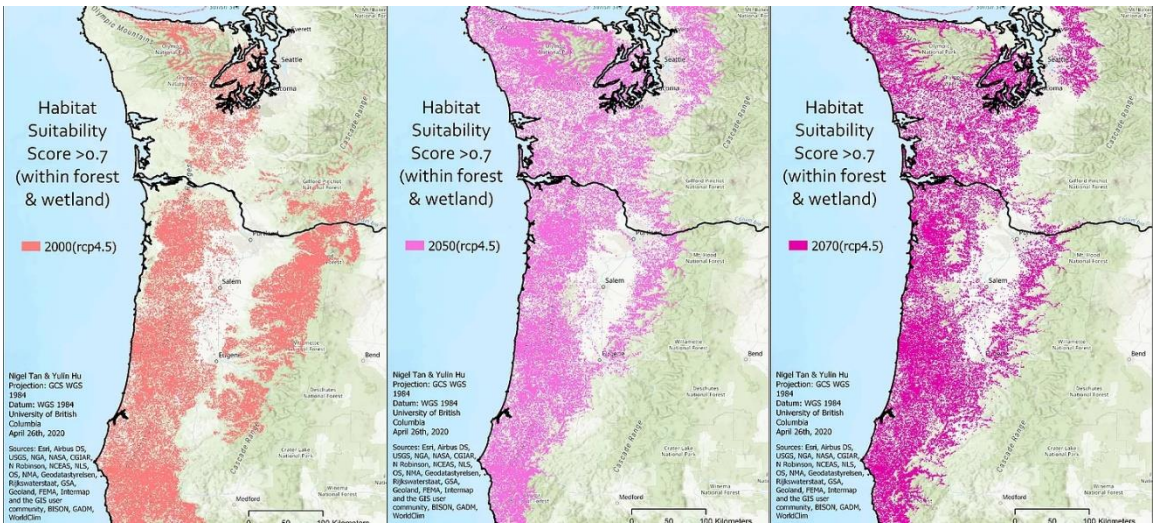

Figure 9. Suitable Habitat Cells with Forest & Wetland Overlay.

The Maxent models indicate the predicted habitat niche of newt in the Pacific Northwest will double in 2050 due to climate change. However, the identified habitat niches are mostly located in coastal areas where human activities are high, meaning that actual usable habitat land is far more constrained (Fig. 9). Rough skin newts can only survive on land in damp forests, but forest expansion levels are questionable under climate change schemes. Many scholars have used different types of models to predict future forest fire occurrences under climate change. For example, Wotton *et al.* (2010) used two general circulation models (GCMs) to project future fires across Canada, and their models suggest an increase in fire occurrence of 25% by 2030 and 75% by the end of the 21st century. Although we cannot conclude that forest cover will decline in the near future due to increased fire frequency, it will be more challenging to assume that forest cover will increase in the next few decades. In our hypothesis, we assume the forest cover will not change in the next half-century, which might be the best possible scenario.

Using the land cover data from the USGS, we calculated the number of Maxent pixels (>0.7) that overlap with our selected types of forest covers to create an improved Maxent raster, and compared the results over our three time periods in Washington and Oregon.

Number of Raster Pixels with Scores > 0.7 within WA & OR			
	2000	2050	2070
Original Maxent	81,655	110,011	90,904
Improve Maxent	62,270	69,191	57,996

Pixel Increase from 2000 to 2050 (%)	
Original Maxent	34.72
Improve Maxent	11.11

Figure 10. Habitat Pixel Increase in US States.

As the table suggests, in our original Maxent model, the pixels that represent newt habitat niches in Washington and Oregon increased 34.72% from 2000 to 2050. However, after we excluded land cover classes such as urban areas and barren lands, the increase in pixel number dropped to 11.11% (Fig. 10). This finding indicates that our raw Maxent models are not telling the full story, and that the potential expansion of newt habitats may not be as optimistic as the original numbers suggested. Further studies are required to improve this model.

Study Limitations

One key limitation of this analysis was the use of CMIP5 climate projection data, which has since been rendered obsolete by CMIP6 (CMIP Phase 6, 2020). However, the use of CMIP6 data, which replaces the RCP model with the more flexible and holistic Shared Socioeconomic Pathway model, was not an option as the data was not available in 30 arc second resolution. The Maxent software requires all input environmental variable layers be of the same projection and resolution. As such, we were unable to use a coarser resolution when the current distribution model was already completed using 30 arc second resolution rasters. Additionally, RCP climate data projects temperatures only, and does not include future precipitation prediction. Our study was based on the assumption that precipitation would remain relatively stable with climate change, which may be unlikely for large parts of the study area. Further analyses are necessary to quantify the effect of precipitation change on newt habitats.

Another limitation present in our study was the lack of land use type variables in the Maxent models. As we were unable to source land use rasters at acceptable resolution scales, the Maxent was constructed using only climate variables from WorldClim. For example, Kalboussi and Achour (2018) found in their Maxent analysis of snake species that the most important variable was “Distance to streams”, which accounted for nearly 60% of prediction importance. As a result, there are areas where the output rasters show habitable zones in what appear to be bodies of water. While rough skin newts far prefer wetlands and certain individuals may spend the entirety of their lives underwater (Marks & Doyle, 2020), they tend to dwell only in very shallow areas, and would normally only be found near the edge of streams,

ponds, and lakes. Furthermore, our variables do not account for potential sea level rise, which may eliminate many potential habitat cells along low-lying coastlines.

A third limitation lies within our sample data. Because it is volunteer-contributed citizen science data, newt samples from BISON are subject to high degrees of sampling bias due to certain locations being more popular for people and more frequently visited, leading to higher observation counts. This leads to skewed presence data where counts are higher not necessarily because newts are more likely to be found in an area, but rather because more observers are there to record them. There is also the distinct possibility that the same individuals have been counted multiple times by different observers, which inflates count values. This in turn leads to flaws in the resulting Maxent model (Kalboussi & Achour, 2018). One potential way to rectify this would have been to filter out repeat samples found in the same area. However, this would have been difficult to do accurately, as different samples had differing levels of specificity and significance with regards to coordinate georeferences. Furthermore, imperfect spatial filtering would run the risk of skewing data even more. As a consequence of being volunteer-contributed data, the *Taricha granulosa* observations may have been impacted by observers mistakenly recording sightings of other similar Taricha newts that occupy somewhat different habitat niches in overlapping geographical ranges.

With regards to our land cover analysis, we only covered Washington and Oregon due to a lack of data availability. British Columbia land cover data sourced from DataBC was not as precise and lacked the land cover classification details present in the USGS data, so we only focused on the Washington and Oregon states. As such, it is unknown to what extent human land use will impact newt habitat niches in Canada.

Conclusion

Currently, rough skin newts are one of the most common amphibian species in the Pacific Northwest. Our Maxent models have shown that although they are an abundant species, their habitat niche occupies only 4.6% of the area. In the face of climate change however, it seems that newt distributions will double by 2050, though overall suitability of habitat

niches will decline. After accounting for human land use constraints, in Washington and Oregon, this drops to a mere 11% increase in those regions. To better understand habitat niches of *Taricha granulosa* and conserve them in the future, we recommend further study in the area. While we have presented a preliminary model, more detailed analyses should be carried out that accounts for land use variables, sea level rise, and other environmental variables. For example, a 2017 study on the impacts of salinity and temperature on rough skin newt egg survivability found that ambient water salinity made a large contribution to egg hatching rate (Hopkins, French, and Brodie, 2017), which is a variable unaccounted for in our study.

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Global Understandings of Queer Space: A Critique of Metronormative Discourse

by: LISA JULIET BESNIER

Up until recently, much of spatially situated queer scholarship was predicated on the idea that queer space is inherently urban. This focus on the urban, termed "metronormativity", has only recently begun to be questioned. This work synthesizes recent queer 'metronormativity' scholarship, critiquing the dominant 'metronormative' imaginary in two ways. Firstly, it addresses the outdated assumptions about the urban within 'metronormative' thinking, as well as complicates the urban-non-urban binary through an examination of the contemporary diversification of suburban space. Second, it considers the formation of queer space through the lens of planetary urbanization. As a result established notions of both what can be considered queer space and urban space are questioned, allowing for a more global and nuanced consideration of queer geography.

Introduction

LGBTQIA2S+ space has long been associated with the urban, from the iconic Castro district of San Francisco to Vancouver's Davie Village (Ghaziani, 2014). However, understanding today's queer spaces requires a more nuanced approach, as the questions of what is queer, and what is urban, are far from straightforward. This paper will approach these complex questions through a multifaceted critique of 'metronormativity', the dominant lens through which much of queer studies has, until recently, approached matters of geography and space. It will more specifically address how 'metronormativity' is complicated by the suburban as well as global understandings of urbanization, presenting examples of queer spaces and communities excluded by 'metronormative' discourse. This paper serves as a starting point to explore more complicated and fluid definitions of what the city, and queer spaces, are. It is important to note that the scope of this discussion is situated within and is therefore limited to its North American context.

To understand the following literary critiques of metronomative discourse, it is essential to first define the term "metronormativity". Coined by Judith Halberstam, this term describes the unique perception of the urban held

by many queer theorists, where urban space is seen as the only reasonable place for queer people to be and to live authentically (Tongson, 2011, p. 5). This creates a "narrative of migration", where queer people are thought of as being inherently drawn to urban spaces, particularly large urban centers (Tongson, 2011, p. 5). Queer cultural emphasis on "coming out" is thus linked to this narrative of migration, equating authenticity and queer visibility implicitly with the urban (Tongson, 2011, p. 5). 'Metronormativity' also actively excludes the potential for a queer suburban, and lumps together the rural and the suburban within that exclusion. This approach is also visible outside of explicitly queer examinations of the urban – It has informed much of how urban studies has approached queer spaces and communities as well, as a central shaping force for our understanding of queer people and their lives. Only recently have scholars begun to question the dominant 'metronormative' discourse, arguing for new understandings of queer suburban space (Bain & Podmore, 2020; Podmore & Bain, 2020; Tongson, 2011).

Suburban Diversification

There is undeniably a historical basis for this understanding of queer communities and spaces. Designed for the needs of the nuclear family, suburbs deliberately excluded communities of people who did not correspond to this normative model (Tongson, 2011). The suburb was based on the active and legal exclusion of the racialized other in the form of racial covenants and "whites-only" policies, but it also conceptually and physically excluded all individuals who fell outside of the format of nuclear family, be it on the basis of age, marital status, or non-normative sexuality (Phillips, 2010, p. 222; Tongson, 2011). City centers contrastingly accommodated the formation of "gayborhoods," LGBTQIA2S+ enclaves that concentrated queer businesses, meeting places, and households (Ghaziani, 2014; Gorman-Murray & Nash, 2019, p. 136). Urban space has also long been associated with queer activism (Bain & Podmore, 2020), and it has been argued that the formation of 'gayborhoods' was always fundamentally political, and allowed for mobilization and consolidation of resources (Ghaziani, 2014; Bain & Podmore, 2020; Phillips, 2010).

This perceived singular-poled spatial consolidation of queerness arguably no longer reflects our current

reality. Suburbs became far more diverse places in the latter half of the 20th century, particularly post-1970 (Tongson, 2011; Phillips, 2010; Nicolaides & Wiese, 2006). Previously excluded queer individuals began to move to the suburbs, encouraged by an increasing acceptance of types of households different from the commercialized heterosexual nuclear family (Nicolaides & Wiese, 2006). This migration was more recently bolstered by an increase in legislative protections for queer individuals and households in suburbs at the municipal and regional level (Ghaziani, 2014). Suburban communities also became increasingly heterogeneous as a result of a shift of racialized and working class individuals to cities' peripheries (Phillips, 2010). This was not a perfect integration: there are still strong tensions present in queer suburban life, particularly for queer people of color (Tongson, 2011). Yet it has become increasingly clear that in the wake of suburban diversification, "suburbanism is no more a single way of life than is urbanism" (Phillips, 2010, p. 222).

Homonormativity, Normativity, and Urban Exclusion

Despite this evolution of the suburbs, and the diversity of populations encompassed by the category of queer, 'metronormativity' persists, with its dependence on rigid understandings of what queerness and queer spaces are and can be. Urban spaces are often still considered the only spaces where individuals can be openly and authentically queer, with suburbs and rural places cast as contrastingly normative spaces (Tongson, 2011). It is assumed that non-urban queers are forced to either conceal their gender expression and sexuality or conform to cis-heteronormative relationship dynamics, family structures, and ways of living (Tongson, 2011). This can be particularly tied to "homonormativity", a term first introduced by Duggan (2002) in her essay "The New Homonormativity: The Sexual Politics of Neoliberalism." Rather than seeking to advance queer interests and ways of being, 'homonormativity' identifies a form of sexual politics that encourages LGBTQIA2S+ individuals to conform to dominant social norms and uphold heteronormative institutions. The result is a "demobilized gay constituency and a privatized, depoliticized gay culture anchored in domesticity and consumption," (Duggan, 2002, p. 179). 'Metronormative' discourse often associates 'homonormativity' with the

suburbs, which are assumed to be devoid of queer spaces, at least outside of the private home (Tongson, 2011). Much of the focus of queer scholarship outside of urban city centers has resultingly been on family units of 'homonormative' LGBTQIA2S+ suburbanites, who harbor the typical middle class "suburban dream" deeply tied to commodities and institutions: career advancement, home ownership, and marriage (Gorman-Murray & Nash, 2019, p. 139).

Beyond these evolutions and complications to 'metronormativity', the terms queerness and normativity are not so easily defined and often have a complex and entangled relationship to one another. Homonormative ways of being certainly reinforce mainstream, neoliberal interests (Eng et al., 2005). However, definitively rejecting homonormative LGBTQIA2S+ people as not being queer misunderstands the contested nature of the term, and risks erasing realities of marginalization and positionality determined by the intersections of various complex identities in addition to sexuality and gender (Eng et al., 2005; Tongson, 2011). What is accepted by the social mainstream and what is normative is also itself a source of much debate. Traditional institutions such as marriage and the nuclear family have arguably lost popular relevance, including in the suburbs, which have seen an increase in unmarried residents and a normalization of dual-income and single-parent families over the past fifty years (Nicolaides & Wiese, 2006). Normativity has also come to embrace the trappings of communities generally understood as alternative, particularly in the context of gentrification (Tongson, 2011). Tongson (2011) points specifically to the recent emergence of a "creative class" of urban professionals, who superficially embrace bohemian lifestyles while pursuing fundamentally bourgeois goals of financial and professional success (p. 8). As the 'creative class' has come to redefine normative standards of living, occupation of queer spaces and consumption of queer culture have become desireable markers of cosmopolitanism for normative individuals (Ghaziani, 2014). This is exemplified by the urbanist Richard Florida's reliance on what he calls a "Gay Index" as a way to quantify the success and desirability of certain gentrified cities and neighborhoods, quantitatively measuring the number of gay people in a metropolitan area (Tongson, 2011, p. 10). The result is that

normativity manifests in complex and sometimes contradictory ways across diverse locations, but remains firmly grounded in consumerism and the accumulation of capital, particularly in the form of property.

It is crucial at this stage to address the inherently classist dimension of this focus on the urban, as the question of who can indulge the 'metronormative' ideal, and who it benefits, is particularly relevant. Queerness exists at the intersection of many identities, and not all LGBTQIA2S+ people are able to access the city in similar manners (Eng et al., 2005). The diversification of the suburbs can also be understood as a displacement of people of color from inner-city communities to the periphery: a displacement that upper-class, predominantly white queers have been complicit in (Tongson, 2011). As Harvey (2008) argues in his article "The Right to the City'', urbanization has always been a "class phenomenon" (p. 24). Urbanization and urban restructuring have always come at the cost of the most vulnerable communities in society, and have often resulted in the removal of the lower class from urban spaces (Harvey, 2008). The result is that queer suburbanization is uneven, and that the mentronormative narrative of migration devalues those most marginalized by society – lower-class, racialized LGBTQIA2S+ individuals. On this basis alone 'metronormativity' appears deeply flawed.

Queer Space and Planetary Urbanisation

Building on this work's exploration of 'metronormative' discourse's disconnect from reality, oversimplification of queer space, and constitutional classist operation, there is yet another fundamental challenge that can be presented here. 'Metronormativity' is dependent on a dichotomy between the urban, and the rural and suburban periphery (Tongson, 2011). This can be seen in the spatial binary within the 'metronormative' narrative of queer urban migration. If cities are the destination of queer migration, then the starting point is a rural or suburban space. Urban studies theorists have instead argued for a far more global and interconnected approach to the urban. As global forms of economic interaction have reshaped national and urban economies, so too the process of "globalized urbanization" has reshaped cities themselves (Brenner & Keil, 2016, p. 668). The resulting urban

spaces require an entirely new understanding of cities in place of previously adopted concepts developed by Chicago School theorists, who emphasized the categorization of regions within metropolitan areas (Brenner & Keil, 2016). Today's cities are often not so neatly bounded, particularly as suburbs take on increasingly more characteristics of the urban and morph into "edge cities", raising the question of what can be called suburban and what can be called urban (Phillips, 2010, p. 226). One of the key characteristics of recent urbanization has effectively been the decentralization and expansion of city regions, resulting in what the recognized urban studies theorist Manuel Castells has termed "metropolitan regions" (2016, p. 231). Contemporarily, urban economic forces and processes of urbanization act on and influence spaces further and further beyond the bounds of metropolitan areas, resulting in new forms of global and even planetary connectivity (Brenner & Keil, 2016).

The 'metronormative' queer imaginary seems desperately outdated when considered from a global lens, and the urban-suburban divide increasingly irrelevant (Brenner & Keil, 2016). Applying theories of planetary urbanization would seemingly require us to change and complicate the scales at which queer geographies are explored (Angelo & Goh, 2020). This does not necessarily mean that the categorizations of urban and suburban spaces should be abandoned entirely. Distinguishing between traditional city cores and their surrounding areas proves important for discussing issues of gentrification and displacement within city regions. However, suburban space should be understood not just in relation to the immediate urban, but as being part of a global network interlinked by the "space of flows": physical and virtual networks of communication and transportation (Brenner & Keil, 2016; Castells, 2016, p. 233). Gaining a fuller understanding of the formation of queer space requires looking at the role of intra and inter-urban forces, and considering the ways in which these forces might manifest locally (Brenner & Keil, 2016; Angelo & Goh, 2020). This expanded approach allows for a consideration of the increasingly diverse manifestations of queer space and queer living today.

Non-Metronormative Queer Spaces

One example of this is the current forms of LGBTQIA2S+ community in Vancouver, a city-region reshaped by the globalization of urbanization. International real estate speculation and ongoing gentrification have resulted in the city having one of the most prohibitively expensive real estate markets in the world (Bain & Podmore, 2020). To draw on Castells' (2016) terminology and Angelo and Goh's (2020) recent thoughts on the planetary urbanization debate, this can be understood as the impact of the 'space of flows' in the Vancouver-specific "space of places" (p. 234), as the role of the bounded city proper as a node for international business and investment has been prioritized over its function as a residential space for local lives. As Bain and Podmore (2020) detail in their recent article "Relocating Queer: Comparing Suburban LGBTQ2S Activisms on Vancouver's Periphery", the outcome has been that LGBTQIA2S+ activism and community in the Vancouver metro area has shifted away from urban space, and is concentrated instead in the peripheral municipalities of Surrey and New Westminster.

The inner suburb of New Westminster serves as an example of the increasingly urban qualities of the suburban, as the downtown of the municipality has recently seen the emergence of its own autonomous 'gayborhood'. This development has certainly been assisted by New Westminster's relatively dense infrastructure, a likely result of the city's history as the former capital of British Columbia and subsequent development as a commercial hub (Downtown New Westminster Business Improvement Association). The New Westminster 'gayborhood' consolidates resources and allows for queer visibility similarly to traditional urban villages, but complicates the enclave-based approach adopted by 'metronormative' discourse. While 'gayborhoods' are largely defined by the presence of explicitly LGBTQIA+ businesses and community spaces (Ghaziani, 2014), those in New Westminster are not queer-owned but rather queer-friendly, temporarily queering space through the frequent hosting of drag shows and "rainbow" trivia and karaoke nights (Bain & Podmore, 2020). Queer spaces manifest in an even more ephemeral manner in Surrey, a low-density outer suburb (Statistics Canada, 2017). With a largely decentralized queer population,

LGBTQIA2S+ activists in Surrey have instead worked across the municipality to form what Bain and Podmore (2020) term "micro-public spaces" (p. 14). Diverging entirely from the 'gayborhood' model entirely (Ghaziani, 2014), public spaces are instead temporarily queered through events such as Surrey Pride and community groups aimed at LGBTQIA2S+ youth (Bain & Podmore, 2020). The result is a far more ambiguous and transient queering of space than is accounted for by 'metronormativity'.

An even more radical understanding of queer space can be approached through considering virtual, online space. The increasing interconnectedness afforded by the Internet and other communication technologies has allowed for a decentralization of the urban and urban life (Castells, 2016). It has resultingly been argued that the role of cities might be replaced entirely by a virtual 'space of flows', particularly with regards to sexuality (Hubbard, 2018). Various forms of non-normative relationships and encounters have shifted into digital space, including heterosexual ones, as long distance relationships are maintained through tools such as video calling and sexual exchanges and transactions take place online (Hubbard, 2018). This has allowed for an expansion of queer sexuality beyond inner-city 'gayborhoods' into decentralized suburban space (Gorman-Murray and Nash, 2019). Virtual networks have also played a role in the globalization of queer community, culture, and socio-political organizing, as public life has shifted to the digital realm (Castells, 2016): a shift likely been accelerated by the COVID-19 pandemic and the resulting loss of physical public spaces. Social networks allow for the creation of delocalized social communities for sexual minorities and interest groups (Hubbard, 2018), and platforms such as Instagram have allowed for the global sharing of queer culture and history, as well as its commodification (McKinney, 2020). These interactions are not entirely detached from space, and are further informed by local access to infrastructure and communications technologies, freedom of information and communication, and existing localized social networks (Hubbard, 2018). However, they radically expand the scale at which queer communities can be considered and should be considered, offering new ways of studying queer space.

Conclusion

Having reviewed the failings of 'metronormative' discourse, it is clear that a more nuanced, intersectional, and global understanding of queer space is needed. New forms of queer space, such as the cases of New Westminster and Surrey, blur the lines between what is urban and what is not, what is queer and what is not, complicating 'metronormative' and binary-oriented urban theoretical narratives. Consideration of virtual queer spaces requires a rejection of 'metronormitivity' entirely, as communities and relationships can be formed anywhere and across any distance in a global, decentralized manner. These examples certainly do not encompass the full diversity and heterogeneity of contemporary queer spaces, but they do serve to show the need for a more global understanding of the local, and queer lives and living.

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Zelda is a third-year student majoring in Honors Geography and minoring in Art History. She grew up in Auckland, New Zealand and spent most of her childhood sailing and racing on the Waitemata harbor. She is interested in the ways Geography and Art History intersect to produce unique opportunities that foster accessibility to galleries and museums amongst the wider public.

Max Kittner

Max Kittner is a fourth-year human Geography major and urban studies minor. Raised in the Washington, DC area, he has been riding the Metro since before he could remember. From a family of artists, Max found his niche dreaming of fictional cities and drawing their maps, distracting him from the struggle of fifth-grade math. Little did he realize that his distractions in class would drive a passion for urbanism, planning and transport.

Lilla Bond

Lilla is a fourth-year student majoring in Human Geography from Stratford-Upon-Avon in the UK. Having gone on exchange to the University of Hong Kong, her interests and research have frequently explored the topics of Hong Kong, China and the Belt and Road Initiative. Lilla is the co-founder of the networking venture 'I Know a Girl', which aims to empower and connect students to professionals. In her free time, if she's not watching or talking about Formula 1, Lilla enjoys spending time at the beach, skiing with friends and practising yoga.

Nica Derakshannia

In her final semester in the Geography, Environment and Sustainability program, Nica is dipping her toes in a myriad of things to keep herself busy. In her spare time during this new age, she can either be found re-watching her favourites movies whilst knitting yet another scarf, taking a stroll along the river by her home or perfecting her cheesecake recipe.

Krista Spurlock

Krista is a fourth-year International Relations major, originally from California. Her academic interests include human geography and political science, specifically understanding the history and development of modern borders and movement of peoples. In her free time, Krista enjoys catching up on sleep, taking her dog to the beach, and going on day trips to Ikea.

Mukta Chachra

Elana Shi

Elana is a fourth-year Geography major in the Geographical Sciences program. She is particularly interested in biogeography and GIS, aspiring to work in conservation and sustainability efforts in the future. She joined Trail Six to engage in the field of geography and learn about what her peers are working on. In her time off, she volunteers with the Pacific Spirit Park Society in Vancouver and various organizations back home in Honolulu.

Maria Paula Serrano Ortega

Maria Paula is a fourth-year student majoring in Geography: Environment and Sustainability and minoring in Creative Writing. Her dual concentration stems from the importance she considers communication to have on the degree to which citizens understand the nature of environmental issues as well as the degree to which they are drawn to pursue significant action and demand political change. Maria Paula is passionate about sustainability, social justice, and feminism and spends her free time enjoying the arts and creating new digital media projects, whether that be in writing, photography, or film. In the future, Maria Paula aims to work in policy or with NGOs in sustainability and environmental justice projects.

Authors

Michelle Kadzirange

Michelle is a fourth-year student from Harare, Zimbabwe, majoring in Geography (Environment and Sustainability). Throughout her studies she has engaged in fascinating topics ranging from environmental justice, to urbanism in the Global North and South. Her passion for protecting the environment began in high school whilst learning about the impacts of climate change on vulnerable communities in remote areas across southern Africa. She hopes to work in the field of public policy to help empower women globally through climate change resiliency. Her second passion is music and in her spare time if she's not belting out Bohemian Rhapsody, she's practicing drawing comics, which is currently a struggle, but a worthwhile endeavor.

Sara Jafroudi

Sara is a fifth-year Environment and Sustainability major and Geographical Information Science minor. She enjoys learning about topics related to climate change, spatial inequality, GIS and computer programming. She is currently working with the Hydrogeoscience for Watershed Management research group where she is doing research on the interaction between geologic, hydrologic and climatic phenomenon at a variety of spatial scales in order to assess the impacts of anthropogenic climate change. Although she says she does not have time for hobbies, she will occasionally play piano or snowshoe.

Lia Laureen Schulz

Lia Laureen is a third-year Human Geography major in the dual degree program with Sciences Po (BA Economy and Society) and the Sauder School of Business for a Master in Management. She is currently active as an undergraduate researcher in the Climate Justice Research Collaborative and supporting the Fairy Creek movement for the protection of old-growth forests on Vancouver Island. Lia has a keen interest for engaging with challenges and opportunities surrounding international relations, sustainability consulting and urban planning. In her time off, she enjoys camping in the backcountry, sketching out ideas and cooking delicious vegan meals.

Cassandra Torres

Cassandra is a fifth-year Environment & Sustainability major at UBC. Cassandra is also a former editor of Trial Six. Her research interests lie in the social components of the causes and impacts of natural disasters. She is passionate about transforming traditional emergency responses to be more equitable and inclusive for all. She is also interested in climate geopolitics and analyzing the power dynamics that exist behind the implementation of new technologies. You can usually find her outdoors exploring new trails and catching sunsets at the beach.

Earl Joshua Jamora

Joshua Jamora is in his second year in the Global Resource Systems program in the Faculty of Land and Food Systems. A 1.5 generation immigrant to Canada, he has spent time in Davao City, Winnipeg and Vancouver. His academic interests surround urban migrant foodways, diasporic community resilience, and climate migration. In his free time, Josh knits, learns languages, and plays instruments. He

also enjoys getting lost and finding his way again — whether it's in a new hobby, a cool place or a good conversation. Josh is thrilled to be contributing to this year's edition of Trail Six as a first-time author.

Sabrina Ouyang

Sabrina is in her final year as a Biology major with a minor in Urban Studies. Having lived in cities such as Vancouver, Shanghai, and London, she naturally developed an interest in the multidisciplinary fields of urban ecology and legal design. She will delve further into these topics as she enters law school in the fall. Sabrina is thrilled to join Trail Six once again as a contributing author and is in awe of the breadth of her fellow authors' research. Beyond academia, Sabrina enjoys singing Broadway musicals, discussing anything MCU-related with her friends, and catching the sunset as often as she can.

Mckenzie Witschi

Mckenzie is in her final year of the UBC Sciences Po Dual Degree Program and is grateful for all that she has gained from majoring in Environment and Sustainability. She hopes to carry this knowledge into reciprocal and respectful future research.

Nathan Herrington

Nathan, who is not an expert at surfing *yet*, graduates in 2021 with a degree in Human Geography and aspires to contribute to international climate justice efforts. Alongside his fellow authors, he recognizes his privilege to learn on the traditional, ancestral, and unceded territory of the Coast Salish peoples, and is committed to uplifting Indigenous voices in our scholarship.

Nigel Tan

Nigel is a recent graduate from the Geography Department with a major in Environment & Sustainability. He is currently expanding upon his passion for geography by pursuing a Master of Geomatics for Environmental Management. Nigel has also have had the honour of serving as Trail Six's Editor in Chief previously and is proud to return as a contributing author. Academically, he is deeply interested in the fields of clean energy and marine conservation. Beyond the academic realm, Nigel enjoys reading the news and playing video games.

Yulin Hu

Yulin is a fourth-year Environment & Sustainability student in the Geography Department at UBC. While he is interested in a wide variety of topics, his greatest fascination is with urban planning, and the ways in which modern megacities are designed. In his free time, Yulin is an avid photographer.

Lisa Juliet Besnier

Lisa Besnier is in the first year of the Bachelor of Design program at UBC, studying architecture, landscape architecture and urbanism, with an anticipated minor in Urban Studies. Prior to coming to UBC, she was a student at Macalester College in Minnesota, where she explored subjects ranging from environmental science to printmaking. Her academic interests include spatial justice and queer theory, topics she hopes to one day apply to the work of designing better cities for a rapidly changing world. In her free time, she can be found reading, sketching interesting trees, or attempting to make the perfect cup of coffee.

Layout & Design

Matt Campos

Matt is a fourth-year Human Geography major from a suburb near Boston in the United States. In high school, he loved going to the city with his friends, enjoying the history, local eateries and stunning ocean views that Boston had to offer. He continues to channel his passion for cities and community development by taking classes in urban research and regional planning. Specifically, his interest lies in how to use mobility data and geographic information systems to improve access for those who need it most. Outside of his academic activities, Matt worked as a development and sponsorship assistant for UBC's Faculty of Applied Science. In his spare time, he enjoys film, going on relaxing runs in the park, singing, and writing short stories.

Nina Skaanig

Nina Skaaning is a fourth-year UBC student studying commerce with a specialization in marketing. Born in sunny Fort Lauderdale, she moved to Vancouver at a young age and has been relentlessly pursuing copywriting and editing roles on topics ranging from sustainability and innovation to technology

since 2017. Outside of the classroom, she likes to relax by binging her favourite reality tv shows or camping in the backcountry.

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