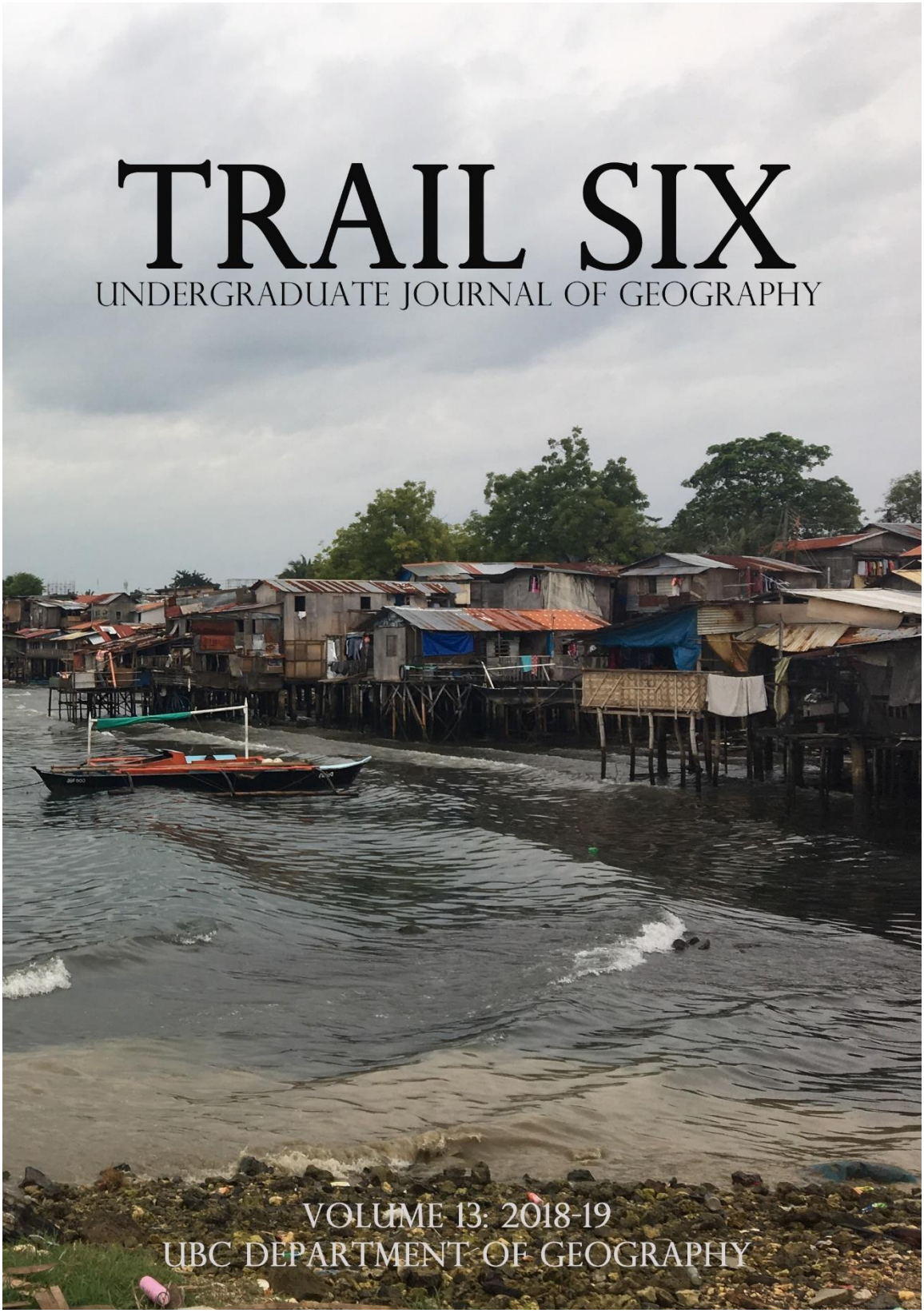
TRAIL SIX

UNDERGRADUATE JOURNAL OF GEOGRAPHY



VOLUME 13: 2018-19
UBC DEPARTMENT OF GEOGRAPHY

TRAIL SIX

UNDERGRADUATE JOURNAL OF GEOGRAPHY

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Geography Students' Association

Department of Geography

University of British Columbia

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Land Acknowledgment:

We acknowledge that UBC's Point Grey Campus is located on the traditional, ancestral, unceded territory of the Musqueam people. The land it is situated on has always been a place of learning for the Musqueam people, 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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FOREWORD

As I approach the end of my term as Department Head, it is my privilege to write this foreword for the 13th issue of the Trail Six journal. Every year I am struck by the remarkable quality of the research done by our students. The articles contained in this journal speak to the energy and commitment of each individual who has contributed, edited, and organized this publication.

Geography is, very much, a broad discipline. Often there is a tendency to separate our area of studies into the physical and social sciences. Yet the discipline, one of its most remarkable aspects, crosses subject boundaries easily and fluidly. This is reflected in the scope of scholarship presented within these pages. The discussion of climate change policy, the volcanic eruption of the Nevado Del Ruiz and subsequent loss of life, multisensory navigation, and conservation strategies with killer whale populations flow freely between themes that are deliberated upon in both our Science and Arts degrees.

The topics presented here are also timely and relevant. The role of borders, environmental racism, targeted ads on social media, issues around microplastics, and housing density are ones that impact all of us on a daily basis. The discussion around these subjects are vital to the health of our society and I encourage every reader to look at these articles and reflect on their own individual role within these systems.

I congratulate each author and the editorial team for a job well done. We are proud to host such outstanding talent and look forward to watching your future progress.

Marwan Hassan

Department Head

UBC Geography Department

LETTER FROM THE EDITOR

UBC's Department of Geography has established for itself a longstanding tradition of rigorous educational achievement. This history is due in no small part to the actions of its student body, who actively seek out opportunities to produce and reproduce ground-breaking knowledge, some of which finding its way into this very volume. As this year's editor-in-chief, I am beyond delighted at having the opportunity to present the 13th edition of the Trail Six journal. Trail Six has once again outdone itself in showcasing the Geography Department's best and brightest academics.

I would like to start off this issue by expressing my heartfelt gratitude. Volume 13 of Trail Six would have been a dream had it not been for the passionate work of those who have contributed. To the editors who spent many hours poring over details and reviewing countless submissions, to the faculty who took time out of their hectic schedules to share their wisdom, to the authors who have shown the fruits of their research in their pieces, I thank you all.

True to the name of Geography, our selection of papers this year take us on a journey around the globe. The subjects examined in the following pages cover an extensive variety of topics concerning both human society and the surrounding environment in a number of locations. Though these subjects reach far and wide in their scope, Trail Six has not forgotten the context in which it was formed. While Volume 13 investigates a plethora of cosmopolitan issues, articles featured in this volume also examine what is happening right in BC. From an urban exploration of the towering spires of Vancouver's condos, to the plastics that fill our oceans, Trail Six this year reminds us all that the discipline of geography begins wherever you are.

From all of us at Trail Six, we sincerely hope you enjoy this year's edition as much as we do.

Nigel Tan

Editor-in-Chief

Catastrophe of Nevado de Ruiz

by: ALEX BRIAULT

On November 13th, 1985, the small town of Armero, Colombia was destroyed by volcanic mudslides following the eruption of Nevado del Ruiz and over 22,000 people were killed. The eruption did not come without warning as the volcano stirred to life again one year prior. Colombia's lack of financial capital and in-country volcanologists combined with a severe lack of political will created the conditions that led to the 1985 disaster. To tell the story of the night of November 13th, 1985, this paper recounts the history of the Nevado del Ruiz volcano before detailing the events immediately following the eruption. Three key human errors are identified as having compounded to cause the disaster: 1) actions not taken until the last minute, 2) conflicting sources of information from key officials, and 3) a reluctance to implement low-technology monitoring systems. An assessment of how these errors ultimately caused the disaster in Armero is provided. Ultimately, this paper finds that the loss of life in Armero could have been prevented had officials followed through on their monitoring and disaster management plans and had the townspeople been properly informed of the risks of the eruption before it was too late to act.

Introduction

On November 13th, 1985, the small town of Armero, located 170 km northwest of Colombia's capital of Bogota and at the mouth of the Lagunillas River, was swept off the map by lahars generated by the nearby eruption of Nevado del Ruiz. Within hours of the main eruption over 22,000 people were killed and buried by lahars in the valleys below the volcano's peak while thousands more were left homeless and injured. The catastrophe was avoidable. Months of inaction by government officials, poor communication and distribution of information, and a reluctance to implement low-technology monitoring systems culminated in the deaths of the residents of the valleys under Nevado del Ruiz. It is important to note that this disaster did not happen instantaneously but was the result of three "stages": the reawakening of the volcano, the monitoring/assessment of the volcano and its hazards, and the eruption. To understand why this disaster happened, this article will examine the key events leading up to the eruption, the factors that contributed to the significant loss of life, and assess how the natural and human elements involved caused this event.

Reawakening of the volcano

Nevado del Ruiz erupted twice in recorded history, causing lahars that resulted in significant loss of life. In 1595, three Plinian eruptions killed 636 people as lahars swept down the valleys and in 1845 over 1000 were killed by lahars generated by an eruption (Augliere, 2016; Voight, 1990). After the 1845 eruption, the town of Armero was built on top of the mudflows which

provided fertile volcanic soil for the crops grown in the region (Graham, 1985; Voigt, 1990). The volcano was silent until November 1984, when climbers reported gas emerging from the summit crater (Augliere, 2016; Voight, 1990). A month later, on December 22, Nevado del Ruiz experienced three earthquakes and a small phreatic explosion in the crater which covered snow at the summit with fine ash and a thin sulfur veneer (Augliere, 2016; Graham, 1985; Hall, 1990; Voight, 1990). This activity prompted scientists from the regional power company to visit the crater on January 6, 1985, where they discovered that a new pit in the bottom of the crater had formed (Augliere, 2016; Voight, 1990). Following this discovery, a scientific commission to monitor the the Nevado del Ruiz volcano was formed in Manizales by the regional power company, regional corporations, and local government (Augliere, 2016; Voight, 1990). In February, newspapers began reporting on the ongoing seismic and fumarolic activity, and the first of several international experts arrived to inspect the volcano and help with monitoring equipment as Colombia lacked in-country volcanologists and experience in volcanology (Hall, 1990; Voight, 1990).

After his visit in March, United Nations seismologist John Tomblin concluded that the Nevado del Ruiz activity corresponded with expected events preceding an "eruption of magnitude" and recommended the immediate installation of portable seismographs and the creation of a volcanic hazards map (Voight, 1990, p. 352). In May, seismologist Minard Hall visited Manizales to evaluate the activity on Nevado del Ruiz and found that no monitoring activities had yet occurred and that there had been no attempt to evaluate the volcanic risk due to "other priorities and lack of funds" (Hall, 1990, p. 104; Voight, 1990). Hall advised authorities to begin a monitoring program which including regular temperature measurements of hot springs, repeated photographic documentation of the summit crater, and a land deformation study (Hall, 1990). Hall stressed the need for creating a volcanic hazard map and informed the Colombian Civil Defense that an eruption would likely trigger mudflows causing damage to down valley settlements (Hall, 1990). A request by the National Institute of Geology and Mines (INGEOMINAS) for international help to monitor the volcano resulted in monitoring instruments being sent from several countries (Voight, 1990).

Monitoring/Assessment of volcanic hazards

Beginning on September 6, 15-minute tremors roughly every 80 minutes continued until a strong phreatic eruption occurred at 1:30 pm on September 11 (Voight, 1990). The eruption lasted seven hours, causing ash fall in Manizales and Chinchiná; rock, ice, and firn avalanches; and triggering a lahar that travelled nearly 30 km down the Rio Azufrado (Barberi, Martini, & Rosi, 1990; Voight, 1990). No evacuation order was given but valley residents were alerted to the existence of the lahar (Voight, 1990). The September 11 lahar prompted the Civil Defense to advise that lahars were

the most probable and dangerous hazard facing the valleys leading out from Nevado del Ruiz for as far as 100 km (Barberi et al., 1990). The same recommendations specified Rio Azufrado, Rio Lagunillas, and Rio Guali as facing the highest risk (Barberi et al., 1990). At a meeting in September between the Civil Defense, the Red Cross, and INGEOMINAS, the tasks related to planning, monitoring, and disaster response were divided between the three groups (Voight, 1990). Per Voight (1990), the Civil Defense was to develop a management plan and identify tasks, like the creation of evacuation procedures that still needed to be done, the Red Cross assumed responsibility for emergency communications and disaster response, and INGEOMINAS was assigned responsibility for monitoring and hazard assessment.

Increasing media coverage of Nevado del Ruiz and the possibility of an eruption was heavily criticized by the Manizales Chamber of Commerce who believed the reports would cause economic losses while the Archbishop of Manizales said the news reports spread "volcanic terrorism" (Hall, 1990, p. 111). On October 7, INGEOMINAS produced a preliminary volcanic hazard map (Figure 1) and called for further observations using sophisticated sensing equipment (Graham, 1985). The map and accompanying report clearly showed Armero would be buried by mudflows caused by an eruption, but it was met by strong opposition from economic interests who argued the map would cause devaluing of real estate in the area surrounding the volcano (Villegas, 2003; Voight, 1990). When the map was published on the front page of the *El Espectador* newspaper on October 9, it lacked a scale and clear limits to lateral blast or mudflow hazards, the colouring of hazard zones was not explained, pyroclastic flows were emphasized over lahars (Hall, 1990; Villegas, 2003). Unlike the preliminary map, the published map falsely showed Armero outside the danger zone indicating it was not under threat from the volcano (Figure 2) (Hall, 1990; Villegas, 2003).

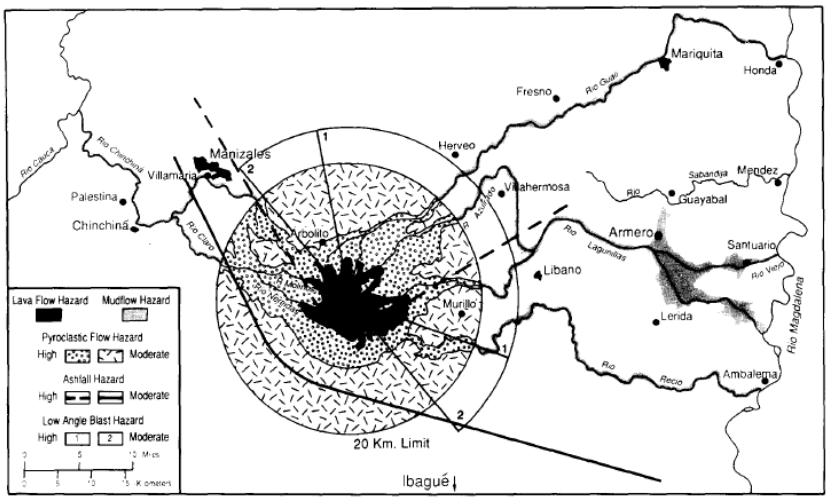
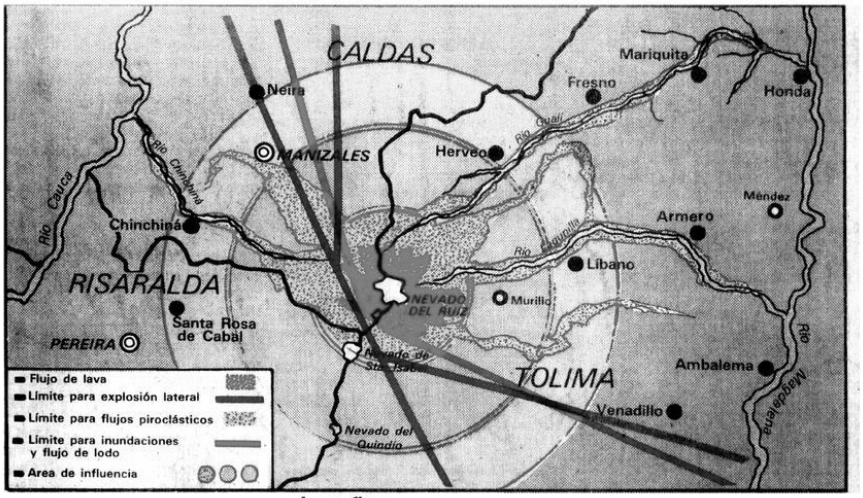


Figure 1. Hazard map prepared by INGEOMINAS on October 7 showing Armero at risk from lahars (Voight, 1990).



- Lava flow
- Lateral blast limit
- Pyroclastic flows limit
- Floods and mudflows limit
- influence area

Figure 2. Hazard map printed by El Espectador showing Armero outside of risk zone (Villegas, 2003).

A revised copy of the volcanic hazard map was set to be released on November 12, but a clash between guerilla fighters and the Colombian army at the Palace of Justice in Bogota, which left 100 people dead on November 6, caused the presentation to be rescheduled to November 15 (Graham, 1985; Voight, 1990). The revised map detailed the risk of lahars and showed that no safe zone of refuge existed in Armero and residents would have needed to travel over 1 km to reach the edge of the inundation zone (Voight, 1990). Sustained tremors began again on Nevado del Ruiz on November 10 and INGEOMINAS still claimed that Armero could be evacuated in two hours without danger on November 11 despite reports showing there was no safe zone of refuge within 1 km of the town and that any evacuation would be a major undertaking (Voight, 1990). The delay in releasing the revised hazard map and the continued insistence of a quick and safe evacuation would prove to be disastrous for the town of Armero when the eruption occurred on November 13.

The eruption, November 13, 1985

At 3:05 pm, a phreatic eruption that lasted 15 minutes emitted fine ash from the summit crater which was dispersed northeast for 50 km (Barberi et al., 1990; Voight, 1990). No evacuation order was given and the tremors, punctuated by small explosions, continued until the main eruption at 9:08 pm (Augliere, 2016; Voight, 1990). A previously planned meeting of the Tolima Regional Emergency Committee in Ibagué issued alerts to all police stations near the Guali, Azufrado, Lagunillas, and Recio Rivers by 5:00 pm with instructions to sound the alarm in lower reaches of

rivers if necessary (Voight, 1990). Ash began to fall on Armero between 3:00-4:00 pm which prompted some people to leave, but most of the 28,000-30,000 people in the main part of town remained (Angelo, 1985). Armero residents were advised by the mayor and town priest to stay indoors to avoid the ash and to remain calm via radio and loudspeaker announcements (Voight, 1990).

Nevado del Ruiz erupted in a magmatic-eruption at 9:08 pm, although only the explosions were heard because of heavy cloud cover and darkness (Barberi et al., 1990). According to Barberi et al (1990), the eruption occurred in five phases:

1. Beginning at 9:08 pm, dry pyroclastic surges
2. Emission of pumice flows
3. Emplacement of welded tuff
4. Plinian phase accompanied and/or followed by more pumice flows from 9:30-10:00 pm
5. Final emission of dry and wet pyroclastic surges

During the Plinian phase, a sustained column reached 27 km above the crater and magma erupted at a rate of 50 million kg/second although the catastrophic lahars were likely created as pyroclastic flows travelled over the ice cap (Barberi et al., 1990). An evacuation order was issued in Ibagué just after 10:00 pm although it was not received in time for Armero to be evacuated (Voight, 1990). Lahars travelling 30 km/hour advanced as surges as they were slowed by bridges in the valleys then sped up when the bridges failed (Augliere, 2016; Voight, 1990). The lahar moving down the Azufrado River was 30-40 metres high by the time it joined the Lagunillas River lahar and caused the landslide dam above Armero to break, sending floodwaters racing into town (Voight, 1990). The mayor of Armero continued his radio broadcast claiming there was no danger as the floodwaters arrived in town between 10:00-11:00 pm (Angelo, 1985). The first lahar reached Armero around 11:30 pm and covered the town in 2-5 metres of mud flowing at a rate of 8 m/second and lahars continued to flow until just after 1:00 am on November 14 (Voight, 1990). The lahars destroyed everything in their path (Figure 3): over 5000 homes, 50 schools, and two hospitals were destroyed which left 7500 people homeless (Augliere, 2016). The official death toll was 22,940 with 20,808 dead in Armero alone (Graham, 1985).

Figure 3. Armero following the lahars (Augliere, 2016).

Factors Contributing to the Catastrophe

Three key human errors compounded to cause the disaster following the eruption of Nevado del Ruiz. The various level of government involved in preparing for the eruption delayed acting until the last minute when it was too late for meaningful action. Conflicting sources of information from scientists, government officials, the media, and the church caused widespread confusion making many distrustful and reluctant to heed warnings. Lastly, the insistence on needing high-technology monitoring equipment instead of using available low-technology options slowed emergency planning and population preparedness.

Government Inaction

Government officials were aware of the risks presented by an eruption of Nevado del Ruiz but they were slow to act at all stages of emergency preparedness and avoided acting until the last possible moment out of fear of causing a false alarm (Voight, 1990). The political and economic costs of evacuating the areas at greatest risk were high as the evacuated populations would have needed to rely on government funding and resources due to overall low levels of income in the region (Voight, 1990). An evacuation order issued after the 3:05 pm phreatic eruption would have saved all lives below the volcano, but this evacuation would have been labelled a "false alarm" as there was no damage to any of the towns (Voight, 1990). Following the lahars, survivors said the lack of government action in clearing the landslide-dam above Armero was "symptomatic of government inattentiveness to the threat" (Graham, 1985).

Confusing Information

Information predicting an eruption and lahar paths was not lacking, but it was not widely distributed and the severity of the risk was downplayed by several parties. Scientists monitoring Nevado del Ruiz

repeatedly advised the need for evacuation and emergency response plans as early as March 1985, but the first volcanic hazard map was not produced until October. The map produced by INGEOMINAS clearly communicated the risks, but its poor distribution and assumption that the public understood the meaning of the map meant that it was not an effective mitigation tool (Villegas, 2003). Conflicting news reports and the improperly printed hazard map resulted in residents distrusting the information (Hall, 1990). After the phreatic eruption on November 13, the local priest and church in Armero insisted that there was no need for alarm during afternoon prayers and again later that evening over a loudspeaker (Voight, 1990). The mayor of Armero, via radio broadcast, continued to call for calm but not for evacuations as the ash fell and he continued this message until the first lahar destroyed the town's radio transmitter just before reaching the main part of town (Angelo, 1985; Graham, 1985; Voight, 1990).

Monitoring Technology

As a developing nation, Colombia did not have access to the sophisticated monitoring technology available in Europe and the United States, and government officials blamed this as a reason for the disaster (Graham, 1985). In 1985, Colombia had the fourth largest GDP in South America, but this was just 1.14% of the GDP of the USA (United Nations, 2016). Colombia lacked the financial, technical, and expert resources to monitor and manage the aftermath of the disaster; rescue operations relied heavily on US aid and helicopters because Colombia lacked the necessary equipment (Voight, 1990). According to Stoiber and Williams (1990), there was no evidence that a simple mudflow detection and alarm system had ever been called for or implemented. By implementing simple observation measures like direct observation, regular photographic monitoring, and note-taking, the lahars could have been detected when they formed, and watchers would have been able to sound manual alarms to alert the residents of the valleys below of the incoming hazard (Stoiber & Williams, 1990).

Understanding the Catastrophe

The catastrophe caused by the eruption of Nevado del Ruiz was the result of multiple human errors and lapses in judgement which culminated in the deaths of nearly 23,000 people. Armero, where over 20,000 people died, was a small rural town that lacked the resources necessary to adequately prepare for the events of November 13. The lahars reached Armero two hours and twenty minutes after the eruption which would have allowed for the two hours INGEOMINAS forecasted as needed for an evacuation (Augliere, 2016; Voight, 1990). If the evacuation order had been given and received by the town immediately following the eruption at 9:08 pm, the immense loss of life could have been averted (Barberi et al., 1990; Voight, 1990). Survivors from Armero reported that the commotion caused by the floodwaters released by the destroyed landslide-dam caused people to flee but that it was too late by then (Voight, 1990). The

continued assurance of safety by the town's priest throughout the day kept residents inside their homes and resulted in their refusal to evacuate when prompted by a firefighter sounding an alarm at 10:00 pm (Voight, 1990). The people of Armero were unable to overcome the "inertia of the 'be calm' advisories following the mid-afternoon eruption" and this "strongly influenced the crisis decisions of both officials and the general population" (Voight, 1990, p. 372).

The destruction of Armero serves as an important reminder of the need for communication and cooperation across all levels of government and among social institutions. Survivors criticized the government for its lack of action before the eruption in preparing areas at risk and for its mishandling of the rescue efforts while government officials claimed that townspeople ignored the notices of imminent danger distributed in the weeks before the eruption (Graham, 1985). The people of Armero faced conflicting sources of information leading up to the disaster which ultimately led to action only being taken when it was too late. Similar problems plagued rescue efforts in the day following November 13. Basic supplies like water pumps, cutting tools, and wooden planks to allow movement over the mud were lacking and rescue operations were managed from sites several towns away from Armero (Graham, 1985). The lack of a local emergency response plan meant that the military quickly took over, although the Colombian Defense Minister sent few soldiers to Armero because of the risk of losing soldiers in the mud during rescue operations (Graham, 1985). Had the Civil Defense, Red Cross, and INGEOMINAS accomplished their goals as set out in September and created a robust emergency plan, rescue operations may have been handled better and more lives may have been saved. The delay in action on the part of those responsible for preparing for an emergency continued to negatively impact the residents of Armero and surrounding towns in the days following the eruption.

Conclusion

On November 13, 1985, after nearly a year of activity, Nevado del Ruiz roared to life and erupted in a Plinian eruption which caused lahars to flow down the river valleys and destroy an entire town. Colombia lacked volcanologists and relied heavily on international expertise but delayed acting on the recommendations given until it was too late for the town of Armero. A lack of political will and conflicting sources of information left the residents of the valleys below Nevado del Ruiz unprepared and unaware of the extent of the risk looming above them.

Inaction by government officials due to an unwillingness to bear the costs of an evacuation in case of a false alarm led to an evacuation order being given too late to be acted on. Conflicting information from officials and the local church confused residents and kept most of them inside their homes when the lahars arrived. The role of low-technology monitoring methods was severely underestimated and this allowed the lahars to overcome settlements along the rivers without

enough warning or time to escape. The catastrophe that followed the Nevado del Ruiz eruption was the result of human action, and with timely implementation of appropriate mitigation measures, the townspeople of Armero would have likely survived.

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Organizing Logics in Climate Change Policy: Neoliberalism and Deflection Through Demand-Side Solutions

by: ADBO SOURAYA

Drawing upon Antonio Gramsci's theory of cultural hegemony, Michel Foucault's theory of normalizing power, and Saskia Sassen's methodology of de-nationalization and neoliberalism, this paper seeks to provide a theoretical account of the power relations existent in climate change policy. Specifically, these concepts will be used to identify and explain a phenomenon that continues to hinder effective greenhouse gas reduction through climate change policy: a cultural hegemony on individualistic demand-side solutions. In our neoliberal world, the state-level and international policy space is occupied by an emphasis on individualistic solutions that fail to target fossil fuel producers, who make up a disproportionately large share of annual and cumulative anthropogenic greenhouse gas emissions (Griffin, 2017). Considering the dire and immediate ramifications of failed climate change policy, it is imperative to recognize individualistic demand-side solutions as ineffective and to draw attention to the existent power framework under which such an ideology continues to subsist.

Introduction

In October 2018, the Intergovernmental Panel for Climate Change (IPCC) issued a report detailing the somber human and environmental impacts to be expected if immediate and drastic efforts to reduce greenhouse gas (GHG) emissions are not made (IPCC, 2018). Synthesizing the current body of science, the report stresses that the current policy target of a globally averaged increase of 2 degrees Celsius (relative to pre-industrial 1850-1900 levels) set at the Paris Accord in 2015 is insufficient to mitigate some of the worst effects of climate change, and instead favours a 1.5 degree Celsius target as a maximum. The report emphasizes the need for unprecedented changes in energy management, with rapid phase outs of fossil fuels and concomitant rapid ramp ups of renewable energy sources. It states that the next 12 years will be crucial in achieving the 1.5 degree Celsius target. However, given that policymakers have had decades to contemplate the impacts of anthropogenic activities on climate, and that the implementation of renewables and phasing out of fossil fuels remains almost non-existent, one is tempted to view climate change policy with cynicism. Why have these types of reports had such an insignificant effect on climate change policy?

The Global Environmental Outlook (GEO) report (2012), a comprehensive tool designed by the United Nations Environmental Programme (UNEP) to inform policy, refers to the oft-repeated drivers of anthropogenic climate change:

population growth, and an increase in global incomes. The basic assumption is that as the planet becomes increasingly crowded and affluent, GHG emissions increase logistically, and will continue to in line with economic and demographic projections. However, a recent publication has found that just 100 fossil-fuel companies have been responsible for 52% of all cumulative human emitted GHGs since the pre-industrial era (year 1751). It further explains that 100 corporations are responsible for 71% of cumulative emissions from 1988 to 2017 (Griffin, 2017). Griffin's report on the paramount contribution of fossil fuel producers runs contrary to the demand-side logic of analyzing incomes and demographics for perceived climate impacts. The intention of the present text is to argue that there exists a cultural hegemony—influenced by neoliberalism—in climate science and policy, which serves to blame the general public and argue for demand-side solutions, ignoring the immense concentration of accountability that is due from large fossil fuel companies. This paper will draw on concepts from Antonio Gramsci, Michel Foucault, and Saskia Sassen in order to characterize existing power relations and their implications in climate policy. Prior to the application of these concepts, I discuss what is meant by demand-side solutions in greater detail.

Logic of Demand-Side Solutions

I define demand-side solutions to refer to any propositions that position the burden of climate change on the individual consumer. In discussion, still, this generally refers to either population control, or shifting consumption patterns to more environmentally friendly options (especially in wealthier and transitioning economies). "Population control" discussions range from coercive state policy to the accessibility of women's education, which is an inverse function of fertility rate (UNEP, 2012). Climate friendly consumption habits are a reaction to increasing global GDP per capita (income) and can take many forms, such as a reduction in consumption of red meat, or choosing sustainable transportation more often (IPCC, 2018). Basic demand theory states that an increase in income and population will increase consumption in a market (in this case, GHG emissions are taken to be the market output) (Parkin and Bade, 2018).

There are several conceptual challenges to emphasizing population and income growth as the main drivers of anthropogenic climate change. In the 21st century, Africa will exhibit the majority of global population growth (UNEP, 2012). However, at a per capita level, most African countries contribute a negligible amount of GHG emissions. Indeed, the poorest 50% of the global population contribute only 10% of global GHG emissions, while the wealthiest 10% of the global population contribute 50% of emissions (Oxfam, 2015). It should also be recognized that income is ineffective for determining GHG contributions; for example, European countries of comparable income levels tend to contribute much less emissions per capita than North American countries (World Resource Institute, 2014). Likewise, four decades of stagnant real wages in the United

States does not correlate with four decades of stagnant GHG emissions (World Resource Institute, 2014; DeSilver, 2018).

Also mentioned in the IPCC (2018) report is the necessity of carbon pricing schemes, a popular example of which being the carbon tax. This market approach attempts' to endogenize the 'cost' of production-related GHG emissions into the price of goods (OECD, 2018). Carbon pricing is also a demand-side solution — as costs are positioned to be passed onto individual consumers — but unlike the approach of encouraging greener consumption, the choice to participate in a carbon tax does not exist once it becomes jurisdiction. This allows for the potential of wider scale adoption and more pronounced effects. One may cautiously conclude that effective carbon pricing can incentivize lower GHG alternatives (production and consumption) in the long run, as energy producers who do not attempt to gain market share in less carbon intensive energy risk ultimately losing market share to demand contraction. Unfortunately, an OECD (2018) report suggests that a carbon pricing gap — which evaluates the deficit between policy-oriented carbon prices relative to the necessary price to achieve national climate targets by 2030—reveals the current lack of robustness of such strategies; 2015 gaps for participating Canadian and US regions averaged at 65% and 75%, respectively.

A Cultural Hegemony and Disciplined Bodies

Despite these limitations, climate change policy is still quick to consider GHG emissions at the individual consumer level, rarely framing emissions in terms of producers—especially those that emit disproportionate amounts of GHGs. It is imperative to consider existent power relations to make sense of this phenomenon. The following two concepts are used in tandem to explain power relations. The first is that of a "cultural hegemony," a concept coined by Marxist philosopher Antonio Gramsci (Calhoun et al., 2012), wherein a prevailing ideology is posited and reproduced by the dominating class (who subsequently influence cultural institutions), and fosters what Gramsci called "common sense" amongst the dominated. Common sense innocuously manufactures consent of ideology by targeting the individual consciousness of the dominated class, which may lead to the uncritical adoption of an exploitative (or suboptimal) ideology.

Complementary to cultural hegemony is Michel Foucault's concept of disciplinary, or "normalizing" power (Calhoun et al., 2012). In *Discipline and Punish* (1977), Foucault states that the nature of power in contemporary society is socialized into the self, gradually internalized through the disciplines of cultural institutions. Normalizing power explains that when the common sense ideology of a cultural hegemony is continually represented in cultural institutions, it can become fundamental to the conceptions of individual bodies; not only implicitly manufacturing consent but also suppressing the imaginative capacity for alternative thought.

In climate change policy, common sense is manufactured by the discourse set out by policymakers and large global organizations (such as the aforementioned UNEP report). Goals are set for GHG reductions through demand-side solutions which implicitly shift the onus of climate change onto the individual. This common sense is re-enforced in cultural institutions such as universities and media outlets, and is ultimately internalized by individual bodies in a Foucauldian disciplinary sense. "Discipline" in this sense, I argue, is in the form internalizing self-blame from climate change, convincing those that are concerned with climate change to change individual behavior. Under these conditions, an individual who is conscious of climate change may, for instance, opt to reduce their red meat intake or bike to work as their disciplined contribution. However, by placing responsibility onto the individual, attention and accountability is shifted away from the governmental institutions and greatest contributors of GHG emissions. As a result, the individual might not engage in activities that could result in change at an institutional level, such as protesting for government regulation over the largest national polluters.

A survey conducted in Japan by Werfel (2017) supports this claim. Following the shutdown of the Fukushima power plant, an inverse relationship between reported household energy saving measures and the likelihood to support national carbon regulation was observed. In other words, households that reported greater numbers of energy saving items had correspondingly lower average rates of support for carbon regulation. In Gramscian terms, consenting to the common sense belief that the individual is responsible for climate change serves to preserve a dominating relationship in which disproportionately guilty fossil fuel companies are allowed to continue business-as-usual.

Implications in a Neoliberal Organizing Logic

It is important to recognize that the climate change agenda as we have conceived it has existed primarily in the era of the organizing logic of neoliberalism (Sassen, 2006). Neoliberalism, for Sassen, is the process of de-nationalization of the state polity and economy to global forces. A global project beginning in the 1970s, neoliberalism is characterized by several types of state reform: deregulation of markets, trade and finance liberalization, diminishing legislative functions with aggrandizing executive functions, privatization of the public sector and the subsequent dismantling of the welfare state, among others. For Sassen, de-nationalization can be seen in the United States' attempt to reform monetary policy through the introduction of a global settlement currency and abolishment of exchange controls. Exchange controls are a type of finance protectionism that allows national governments to moderate foreign currency exchange, reducing the risk of local currency volatility from speculators. Abolishing exchange controls is de-nationalization in action because it favours international interests over national interests.

Sassen's outline of the neoliberal de-nationalizing process has several important implications. Firstly, it positions the aforementioned cultural hegemony around individual self-blame in an appropriate context. This is because individualism is championed in neoliberalism: at a macro level through deregulation and privatization, and at a socioeconomic level by reducing the welfare state in appraisal of meritocracy. An example of this can be observed in Australia's agricultural development policy (Gray and Lawrence, 2001). Since the 1970's, policy has transitioned from protectionist—with significant public security for farmers—to an increasingly deregulated market, with fewer existing protections. Subsequently, the change of language in discourse implies a shift from reliance on the government to reliance on the individual farmer to ensure the success of their farm. Gradually, the burden of solving systemic problems shifted to the individual/firm level. Neoliberal organizing logic provides an environment in which the individual becomes accustomed to being responsible for the (potentially structural) problems around them—and is more easily persuaded to blame themselves for climate change, regardless of their actual contribution to it.

Neoliberalism also helps to explain why states have, for the most part, avoided supply-side (that is, producer oriented) solutions in and of themselves. Even if the state did possess the imaginative capacity to challenge fossil fuel producers, in a deregulated and de-legislative political economy it may lack the appropriate state power to do so effectively. This is particularly evident in Canada's recent national carbon tax strategy. A report by Canada's Environmental Defence (2018) proclaims that, on average, 80% of the emissions released from the oil and gas sector will be exempt from carbon taxing. In addition, the current federal government has increased existing subsidies to oil and gas, despite publicizing the intention to eliminate all fossil fuel subsidies in their election campaign. It is a hallmark of neoliberalism that some of the top private emitters can exempt themselves from national climate policy while consumers bear the responsibility.

Sassen's neoliberalism is explained as an ongoing de-nationalization process, which may help to explain a seemingly contradictory phenomenon. Several of the states that are actively engaging in climate reduction strategies also run partially or fully nationalized top emitting fossil fuel companies, or are known to provide subsidies to private top emitters (Griffin, 2017; UNEP, 2012; & Environmental Defence, 2018). For example, despite the intention to phase out coal-fired power in Canada in 2030 under the motivation of reducing emissions, federal and provincial fossil fuel subsidies are estimated to currently be at $2 billion CAD annually (Environmental Defence, 2018). It could be conceived that the motivations for these are remnants of the pre-neoliberal, national-state era of organizing logic. This contradiction is positioned to satisfy a globalist agenda which has come in stark contrast with

the still-dependent legacy of pre-neoliberal era artifacts (Sassen, 2006).

Conclusions

This paper has drawn upon the methodologies of Gramsci, Foucault, and Sassen in an attempt to explain how the greatest GHG emitters continue to successfully deflect responsibility for climate change. A cultural hegemony in climate policy — steeped in neoliberal logic — continues to spread the conception that the solutions to climate change are to address population growth and change individuals' consumer habits. Meanwhile, the rapidly transforming role of the state sometimes puts it in a contradictory scenario in which it invests in climate efficient technologies, while concomitantly protecting and incentivizing domestic emitters that are responsible for largest GHG contributions globally.

What ought to be the role of the individual in contributing to climate change and its solutions? Given pressing need to mitigate some of the worst impacts of climate change (UNEP, 2012), it is clear that individuals should actively challenge the common sense conception inherent in the demand-side argument, and unite as a counter-hegemony. This counter-hegemony needs to challenge their respective states to provide drastic and immediate regulation on top emitters, and open an agenda in global climate policy which considers specific producers as cumulative and current contributors of climate change in a way that will facilitate meaningful reduction.

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Cambridge Analytica, Microtargeting, and Power: "A Full-Service Propaganda Machine" in the Information Age

by: MATT CAMPOS

In March of 2018, whistleblower Christopher Wylie allegedly revealed that the UK tech firm Cambridge Analytica extracted data from approximately 50 million Facebook users, created psychological profiles, and relayed personalized political advertising to voters based on these profiles. The firm touted multiple messaging channels through TV media, social media advertisements, and search engine results. The firm also collaborated with conservative campaigns like the 2016 Trump campaign, the 2015 Ted Cruz primary campaign, and the pro-Brexit LEAVE.EU group. This paper analyzes Cambridge Analytica's microtargeting operations to understand how the firm attempted to influence voters and help conservative campaigns gain ground in key elections. My analysis draws on Steven Lukes' theory of the third face of power which suggests that an actor's actions may not actually be out of their own interest or accord. In this context, the third face of power can provide insight on how Analytica and their clientele sought to influence voters without the voters' informed consent. While the effectiveness of psychologically-targeted political marketing is doubted by academic research, further inquiry is warranted due to significant knowledge gaps. Nonetheless, the transnational and individualized nature of political microtargeting is noteworthy because it is enabled by Manuel Castells' space of flows, a series of digital information systems, telecommunications, and transportation networks which connect spatially-distant populations. By applying geopolitical theories to this case study, this paper suggests that Cambridge Analytica's operations capitalized on digital network structures by extracting and using voter data in a nonconsensual manner.

Introduction

As Manuel Castells anticipated, the Information Age has introduced a "space of flows" in which "we constantly interact, deliberately or automatically, with on-line information systems, increasingly in the wireless mode" without territorial congruity (Castells, 2016, p. 234). On social media sites, individuals' information has been harnessed and made extractable by companies with access to it. A number of media and computer technology companies have emerged as consultants to assist political campaigns with political marketing through diverse channels like TV campaigns and digital advertisements (Shea & Burton, 2006). One such organization is Cambridge Analytica, a UK-based subsidiary of the SCL Group. The SCL Group operated throughout the 90s and early 2000s to aid Conservative Party campaigns in Britain and presidential plus prime

minister campaigns in countries such as South Africa, Argentina, Thailand, and Italy (Issenberg, 2015). They sought to influence mass behavior through activities like military disinformation campaigns, social media branding consultation, and voter targeting operations (Vogel & Parti, 2015). Continuing the legacy of their parent company, Analytica presents itself as a data marketing and communications firm with commercial and political divisions. In their political sector, they tout to have "up to 5000 data points on over 230 million individual consumers" which they use to "[influence] the customer behavior with the use of behavioral sciences, predictive analytics, data driven solutions, and other technological benefits" (Cambridge Analytica, 2018). Their website states that the company sends targeted messaging through TV media, Facebook, Twitter, native advertising (which replicate the appearance and function of the media platform or website they appear in), and individualized search engine results (2018, para. 13). Breitbart-head Steve Bannon and Robert Mercer, a U.S. billionaire who has backed anti-"mainstream media" organizations, big data tech firms, and climate change denial groups (Cadwalladr, 2017), co-founded Analytica in 2013 and Mercer invested at least 15 million USD into Analytica (Rosenberg, 2018). Notably, the firm collaborated with the Leave.EU pro-Brexit group, the 2015 Ted Cruz primary campaign, and the 2016 Trump campaign (Nix, 2016; Vogel & Parti, 2015; Rosenberg, 2018). Their influence extends beyond these groups, allegedly operating in elections in India, Kenya, Mexico, and Malta (Punit, 2018; Dahir, 2018; Forbes México, 2018; Nesheim, 2018).

In March of 2018, the firm came under public and legal scrutiny (Satariano & Confessore, 2018) after whistleblower Christopher Wylie revealed alleged insider information on the company and called it a "full service propaganda machine" (Memoli & Schecter, 2018, para. 3). Him and future employees who came forward stated that Analytica used personal information without user permission from sites like Facebook to construct personalized political advertisements through microtargeting (Cadwalladr & Graham-Harrison, 2018; Lewis & Hilder, 2018). While Analytica CEO Alexander Nix denied that they had used Facebook data, he was later criticized by British MP's when emails between Analytica executives and their data source, Alexander Kogan, revealed otherwise (Channel 4 News, 2018). It is important to note that microtargeting is not a unique invention of Analytica. The Obama campaign used similar methods in 2008 and 2012 but with the informed consent of users (Ambinder, 2009; Murphy, 2012).

By administering a case study, I will discuss how Cambridge Analytica and their clientele aimed to psychologically and transnationally influence voter populations in the US. I will then refer to related research and insight on Analytica's impact to discuss the effectiveness of their tactics. Lastly, I will explore how the socially-connective elements of Castells' space of flows and the Information Age enabled Analytica to overcome geographical limitations to individualize their messaging. Through

these connections to geographical and political theories, I aim to illustrate how Cambridge Analytica acts in an extraterritorial manner through data mining and microtargeting, though the impact of these actions is doubted by scholars.

Digital Microtargeting and Power

This section sets out to understand the political implications of Cambridge Analytica's microtargeted political marketing by applying Lukes' third face of power. Lukes' theory focuses on how actions and inactions can drive decisions which individuals think are out of their own interest or accord - even if they are not (2005). Lukes situates this concept within Marxist analysis and false consciousness, referring to this face as "the power to mislead" which can take many forms from "straightforward censorship and disinformation" to the institutionalized ways judgement is infantilized (2005, p. 149). Christopher Wylie's characterization of Analytica's operations is in line with this, stating that the firm was "[playing] with the psychology of an entire country without their consent or awareness [...] in the context of the democratic process" (The Guardian, 2018, 0:40). Upon further investigation, the structure of Analytica's microtargeting scheme exemplifies most aspects of Lukes' third face of power.

As previously discussed, Cambridge Analytica devoted itself to influencing individuals by collecting data, constructing psychological profiles based on the information, and feeding users profile-specific political advertisements (refer to Figure 1). One mining method was a personality quiz in a Facebook app developed by Cambridge University academic Aleksandr Kogan. When the user (who had to be a US voter to be eligible) took the quiz voluntarily, their information and that of their Facebook friends would be extracted. Based on the data, a personality profile would be developed to measure "openness to experience, conscientiousness, extraversion, agreeableness, and neuroticism" (Hern, 2018, para. 10). To complete the profiles, upwards of 253 algorithms were produced per profile to use Facebook likes and quiz results to guess personality traits (Hern, 2018, para. 18). Using those profiles, Analytica targeted specific groups with messaging to get them to vote or stay home (Cadwalladr & Graham-Harrison, 2018). The advertising was not just individualized along political lines, but also by personality. These operations were similar to those used by previous political marketing organizations and studies (Murray, 2010; Zafarani, Abbasi, & Liu, 2014), but the formation of a psychological profile was mostly unique to Kogen's method. The system itself was specifically designed to influence voter behavior and exercise power by means of personality-specific advertising. This intent is reflected in their tactics in association with political campaigns.

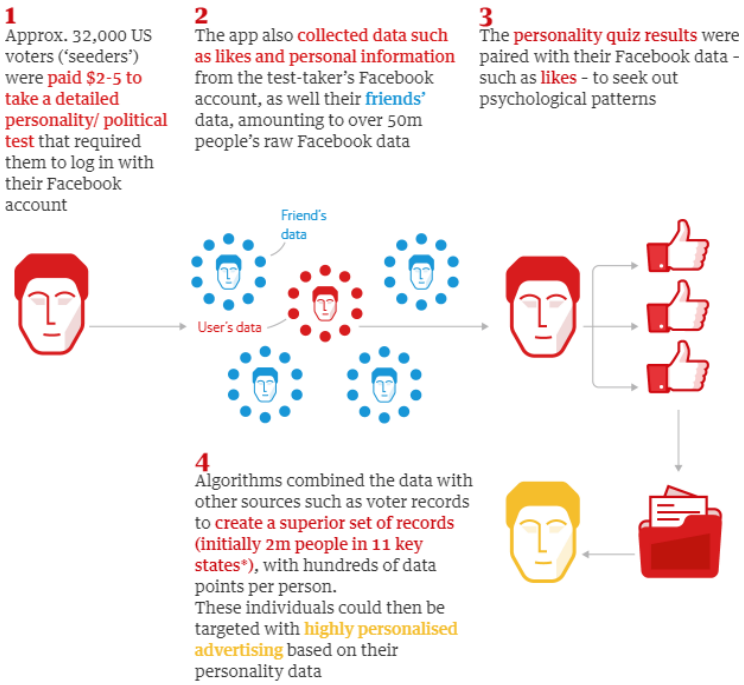

Figure 1. Diagram summarizing Cambridge Analytica's data mining and microtargeting process (Hern, 2018).

Reflecting on Analytica's collaboration with the Ted Cruz primary campaign in 2015, Alexander Nix said that they were able to cater to "specific individuals based on their unique profiles in order to get this relatively niche issue as a political pressure point to motivate them to go out and vote for Cruz" (2016, para. 8). In the 2016 election, these operations targeted potential Trump voters in 16 closely contested states to promote turnout (Persily, 2017). However, they didn't just aim to empower conservatives to vote for Trump; Analytica sought to disempower the opposition. They sent individualized advertisements to Clinton supporters, especially "white liberals, young women, and African Americans" to reduce turnout among those groups (Persily, 2017). For example, Trump's Campaign used "dark posts" which could only be seen by targeted groups in the Little Haiti district of Miami. These posts contained messages about the Clinton Foundation's failure to respond to the earthquake in Haiti, aiming to sway potential Clinton voters away from the ballot box (Grassegger & Krogerus, 2017). Analytica's microtargeting system indicates an effort to shape election results by capitalizing on identity politics and digital messaging channels. This attempted exercise of power is further clarified by applying Lukes' third face of power as a framework for analysis.

This scheme illustrates Lukes' 3rd face of power because the operation occurred without the full consent and knowledge of users. The analytical framework also relates to discussion around Analytica's operations with respect to false consciousness and disinformation. The aforementioned

Facebook quiz had not informed test-takers that their personal information was being used for political purposes (Cadwalladr & Graham-Harrison, 2018). In response to this, the Information Commissioner's Office, a UK data security watchdog, fined the firm for £500,000 for violating the UK's Data Protection Act of 1998 (Vincent, 2018). While this connection to Lukes is fairly clear, the issue of disinformation with respect to Analytica's operations is more uncertain. During a November 2017 meeting between Analytica executives, Mark Turnbull, managing director of CA Political Global, asserted that "It's no good fighting an election campaign on the facts because actually it's all about emotion" (Lapowsky, 2018, para. 7). While Turnbull later dismissed the role of "fake news" in their operations (para. 9), the firm's association with Russian disinformation campaigns continues to be discussed (Hendrix, 2018).

It is apparent that Cambridge Analytica and their clientele sought to influence the American electorate without their knowledge, exercising the third face of power. However, it is difficult to determine how successful their system was in actually influencing the outcome of elections. This is due to the ongoing nature of this case study and the fluidity of Lukes' 3rd face of power (Lukes, 2005). If people do not know that their behavior is being controlled, it may be challenging to test the impact of targeted advertising. Nonetheless, there is some academic research and expert opinion in personalized marketing which evaluates the effectiveness of the scheme.

Evaluating the Impact of Analytica's Personalized Advertising

Despite its rising popularity in recent years (Shea & Burton, 2006), the effectiveness of personalized political advertising has yet to be strongly supported. This is apparent in expert attitudes and previously conducted research, therefore the power of Analytica's strategy may be more theoretical than reflective of reality. However, limitations in past research point to areas of further study which may provide insight into microtargeting's impact on voter psychology.

Researchers studying political microtargeting at the University of Amsterdam and Tufts University doubt the effectiveness of Analytica's operations. Assumptions from digital data can lead to miscalculated voter profiles and personality traits are only weakly correlated with political values (Chen & Potenza, 2018). In fact, research suggests that education, not psychological traits like predisposition to authoritarianism, may be a stronger determinant for supporting candidates like Donald Trump (Cohen & Smith, 2016). So, mistargeted messaging due to reliance on a psychological model can undermine the effectiveness of Analytica's approach.

Moreover, microtargeted political marketing has been subject to empirical scrutiny. Personalized marketing systems have found mixed results when evaluated by research on select populations. One controlled study was conducted on University of Amsterdam students, analyzing reactions to personalized Facebook ads

in comparison to generalized ones (refer to Figure 2). It found that participants were less likely to share personalized ads and were more aware that the ad was trying to persuade them (Kruikemeier, Sezgin, & Boerman, 2016, p. 369-370). Responses to personalized Facebook ads were also found to not be significantly altered by awareness education with respect to how microtargeting works (p. 370). The study suggests that personalized marketing schemes like that of Cambridge Analytica may not be uniquely effective in spreading influence and impacting one's behavior without them knowing. This would undermine the ability of Analytica's microtargeting operations to exercise the third face of power and win elections for conservative candidates. However, it is important to note that the study's sample size consisted mostly of college students which is not representative of an electorate as large and diverse as the United States. The study's variables may alter with factors like age, familiarity with social media, and views on certain topics. For example, one statistical model indicates that a top variable linked to Trump support is belief in the "birther" conspiracy theory (Wyly, 2017, p. 17). A voter response analysis with a sample size that includes individuals with these beliefs may provide more insight on Analytica's impact in the 2016 presidential election. However, if the University of Amsterdam's results are replicated by future studies, evidence may continue to not strongly support personalized digital advertising. While microtargeting's ability to exercise power more effectively than generalized marketing is scrutinized by experts and empirical studies, there are knowledge gaps which warrant further research. Moreover, the trans-territoriality of Cambridge Analytica's system should be discussed for its implications to geographical theory.

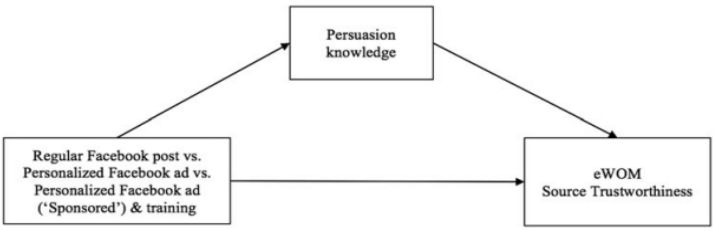

Figure 2. Experimental model used by University of Amsterdam study (Kruikemeier, Sezgin, & Boerman, 2016, p.369).

Castells' Space of Flows: A New Frontier for Political Persuasion

Applying Manuel Castells' theory on digital connections suggests that Cambridge Analytica's efforts were enabled by what he describes as the space of flows. Castells describes the space of flows as one which "links up electronically separate locations in an interactive network that connects activities and people in distinct geographical contexts" (Castells, 2016, p. 233). Cambridge Analytica's scheme

used this online connection to their advantage, gaining access to a massive pool of voters to extract from and market to. It is reported that the private information of over 50 million individuals was collected by Analytica (Cadwalladr, C. & Graham-Harrison, E., 2018). In their collaboration with Ted Cruz's 2015 primary campaign and Donald Trump's 2016 presidential campaign, the firm launched over 4,000 ad campaigns, placed 1.4 billion web impressions (ads/communications to individual users), and targeted 13.5 million voters in 16 electoral battleground states (Persily, 2017). Because the space of flows erodes the limitation of territorial congruity, a UK-based firm has been able to operate in the elections of other states. With its fragmentation and individualization, the space of flows also allows for the personalization of political messaging to alter voter behavior.

While digital microtargeting is not specifically discussed by Castells, his works recognize the role of personalization in political media and campaigning. He finds that marketing and polling can "test different political strategies on targeted groups of potential voters" (Castells, 2010, p. 377). Castells also recognizes the limitations of mass political marketing, stating that countries like the US "are full of examples in which a television advertising barrage was not enough to elect a candidate" (Castells, 2010, p. 374). Regardless of impact on voters, it remains apparent that political marketing firms are able to individualize their messaging due to the structure of the space of flows. Castells writes that "the Internet accelerates the process of fragmentation and individualization of symbolic interaction" (Castells, 2016, p. 234). Analytica's psychological profiling capitalizes on this fragmentation, relying on the individualization of identities to compile algorithms and target specific groups. Moreover, Castells' space of flows incites social change "from communicative action that involves connection between networks of neural networks from human brains stimulated by signals from a communication environment through communication networks" (2012, p. 219). Cambridge Analytica's microtargeting scheme illustrates how the digital space of flows can be used to harness the complex interaction between psychology, messaging, and political action to a group's benefit.

By referring to Castells, one can understand Cambridge Analytica as an attempted exercise of transnational power. Their efforts to influence voters capitalizes on the Internet as a unique medium for relaying digital messages according to personality-based preferences and segmented identities. This implicates social media as a medium through which operations are developed to influence political actions.

Conclusion

Shortly after Chris Wylie's account and undercover recordings by Channel 4 News, Cambridge Analytica announced closure on March 17th, 2018 (Watkins, 2018). Polls were conducted to assess whether or not Canadians would change their internet habits in response to the scandal. Almost 73% said that they would lower their usage, alter habits, or change their privacy settings and 38% said that their opinion of Facebook had worsened (CBC News,

2018). However, Facebook's quarterly rate of growth in monthly active users has remained largely unaffected by Wylie's denunciation (Statista, 2018). Despite the scandal's relative lack of impact on Internet use, the implications for this case study remain significant. First of all, it is found that personalized marketing firms have developed schemes to exert power over voters by means of non-consensual microtargeting systems. In Analytica's case, they sought to aid conservative campaigns in the US and UK by collecting data, creating psychological profiles, and targeting certain groups with messaging to influence voter turnout. Secondly, the actual success of psychology-based microtargeting is not strongly supported by empirical research. However, further investigation is warranted because of knowledge gaps in personalized political marketing. Lastly, by applying Castells' theory, it is apparent that the space of flows has allowed Cambridge Analytica to personalize and internationalize exertions of power over foreign elections. Regardless of the firm's actual impact on voters, it is apparent that they collaborated with campaigns to benefit certain parties by capitalizing on contemporary geopolitical and technological trends.

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The Invisible Landscape: An Analysis of Multi-Sensory Navigation

by: BRUCE PAGNUCCO

Across a wide range of disciplines, landscapes are typically analyzed in a visual sense. Only recently, however, have scholars taken a multi-sensory view when analyzing landscapes. Landscapes are not simply places limited to exploration by sight but are places to explore utilizing every sense. Without the ability to see, people with visual impairment evidently rely on the four main senses (taste, touch, sound, and smell) to navigate the world in which they live. This paper will explore the ways in which people with visual impairment utilize every sense to gain a heightened understanding of the world around them. In doing so, I will examine how multi-sensory capabilities impact the use of common mobility aids, such as guide dogs, canes, and human guides. In addition, I will analyze aspects of the built environment that both positively and negatively impact mobility. I argue that people with visual impairment must constantly adapt to the challenging landscapes that they encounter to navigate safely and freely through space.

Introduction

Richard Hartshorne once stated, "landscape is not a place, but a visual scene the product of a particular mode of representation" (Olwig, 2008, p. 1856). The 'particular mode of representation' referred to here is evidently that of visual representation. However, many aspects contributing to how someone feels within a certain landscape are not simply created through clicking a button on a camera. For instance, when an individual first climbs to the top of a world-renowned natural landmark, such as Mount Kilimanjaro, they are likely to immediately take out their camera and snap that perfect image to share with the world. That photograph, however, does not capture everything that occurred in the events leading up to the time at which the picture was taken. The photograph is merely a visual representation of the moment and fails to portray the depth of stimuli experienced in that moment.

The photograph does not capture the taste of the crisp, pristine air that softly floats down from the clouds above. It does not capture the feeling of blustery wind blowing back one's hair. It does not capture the sound of clicking cameras and proud voices bouncing from one corner of the peak to the other. It does not capture the burning smell of volcanic ash in the distance. Most importantly, the photograph does not capture the memories created by the photographer's sense of taste, touch, sound, and smell. Those who cannot see must rely on these four senses to a much greater extent than those who can, and because of this they must

navigate the world in a manner that is unfamiliar to most people. To gain a greater understanding of the unique multi-sensory life people with visual impairment experience, it is appropriate to first turn to the words of one of the most recognizable and awe-inspiring individuals the world has ever known, Helen Keller (see Figure 1).

Figure 1. Helen Keller's enhanced sense of smell compensated for her inability to see and hear.

"The sun does not shine for my physical eyes, nor does the lightning flash, nor do the trees turn green in spring, but they have not therefore ceased to exist, any more than the landscape is annihilated when you turn your back on it" (Keller, 2012, p. 44).

Her words made the world aware of how people with visual impairment experience and understand the world. Her words most importantly were written to inspire those with visual impairment to reach their full potential in life.

The Blind Poet

To understand how people with visual impairment experience and navigate the world, we can begin at the unofficial point when visual impairment was first recognized. One of the earliest, and most recognizable unsighted individuals is the author of the Ancient Greek epics, *The Iliad* and *The Odyssey*, Homer. Many who were inspired by Homer followed the basic principle that extraordinary achievement derives from overcompensation for original deficiency or infirmity (Kononenko-Moyle, 1980). This principle would later, in the early 20th century, become the foundation of the theory of compensation developed by Austrian doctor, Alfred Adler. Whereas Adler's theory was initially concerned with the phenomenon of organ failure, "in regard to compensation of an inferior organ by means of a second organ" (Kononenko-Moyle, 1980, p. 521), the theory can also extend to the matter of the loss of sight: "by means of greater activity on the part of the psyche, the inferiority of the eyes may be made good" (Adler, 1917, p. 4).

Perhaps the best-known example of the above-mentioned idea in practice is that of Homer, whose inability to see was compensated for by his extraordinary abilities as an author. The extraordinary ability that he possessed, as it pertains to the theory, is justified by the belief that Homer "could better 'see' the poetic text with his "mind's eye" (Kononenko-Moyle, 1980, p. 521). The 'mind's eye' was guided by an advanced memory, as "blind poets were believed to be better able to develop the faculty for memory, having been deprived of one of their senses" (Kononenko-Moyle, 1980, p. 521).

The above discussion on the 'Blind Poet' brings forth examples where blindness is viewed as an asset that enhances the brain. Yet this raises the question: how does blindness affect not only the way people with visual impairment think, but also the way that they move? This question will be analyzed through exploring the ways in which people with visual impairment use different senses to navigate through space.

The Seeing Eye

A pinnacle moment in the lives of those with visual impairment took place in 1916, when during World War I, the German Shepherd Dog Society proposed that the school provide guide dogs to serve the growing number of Germany's recently blind war veterans (Fishman, 2003). This proposal was made based on already knowing that they had successfully trained many dogs as message carriers in the past (Fishman, 2003). The dogs had already demonstrated the ability to navigate space-specific routes with ease on their own, and thus were viewed as suitable guides.

The subsequent introduction of guide dogs in Germany transformed and enhanced the lives of the visually impaired, as it provided them with a mechanism to see by proxy, and, in turn, achieve greater freedom of mobility. After the Potsdam guide dog school was profiled in the *Saturday Evening Post* in the United States in 1927, international interest in training guide dogs followed suit, so much so that "in 1929, The Seeing Eye was officially issued its certificate of incorporation and was thus established as the first school in the United States for the education of guide dogs and blind humans" (Fishman, 2003, p. 454).

The Human's Companion

Donna Haraway argues that humans and dogs mutually affect each other: "human life ways change significantly in association with dogs. Flexibility and opportunism are the name of the game for both species, who shape each other" (Haraway, 2003, p. 29). They shape each other through a relationship predicated not only on trust, but also on mutual dependence. The safety of the owner is dependent on the actions of the dog, while at the same time, the safety of the dog is dependent on the actions of the owner.

In a navigation situation, "the blind owner depends completely on

his/her dog for visual information and the dog does not know about the planned actions of its owner" (Fallani, Previde, & Valsecchi, 2006, p. 242). Thus, on a typical outing, the owner, not the dog, is the one with the destination in mind and because of this, has a hand in dictating where the two will find themselves. The owner too has the capacity to intervene when the dog is stalling for instance and "may need correction from their owner if distracted" (Williams, Hurst, & Kane, 2013, p. 4).

The two function as a single machine, performing in unison while influencing one another's every move. Like two wheels on a bicycle, the dog and the owner are constantly connected to one another as they travel through space. Guide dogs are trained to "touch the owner's leg with their muzzle when called and to keep strict contact with the owner's leg while walking" (Fallani et al., 2006, p. 255). This ensures the owner is aware of where the dog is throughout the trip and ensures they can quickly recognize when the dog is distracted or unnecessarily stalling due to being "overly fond of objects such as doorways or escalators" (Williams et al., 2013, p. 4).

Based on this information, it is apparent that the owner's sense of touch is most important when it comes to navigating space alongside a guide dog. Another common mobility aid is the cane, with which, once again, the owner's sense of touch is paramount. By selecting a guide dog as their primary mobility aid, the owner delegates some navigational control into the mind and paws of the living creature. The owner trusts that the dog will avoid dangerous obstacles on their journeys from place to place, whereas the cane user prefers to retain navigational control when navigating space.

Built Environmental Hazards

Experiential studies have showed that owner's individual preferences for mobility aids are based upon not only personal traits, but also specific built environmental factors. Participants in a study conducted at the University of Maryland argue that a cane is for obstacle detection and a dog is for obstacle avoidance (Williams et al., 2013). A test within the study involved observing where users of each mobility aid first walked towards upon entry into an empty room. Observations revealed that a cane user is likely to immediately seek out a wall, whereas a guide dog user will move directly toward the doorway (Williams et al., 2013).

The wall within the room in this scenario sends a tangible signal to the cane user to change direction to avoid crashing. It acts as a clear and obvious boundary indicator within this enclosed space, however what about within the open space of the sidewalk? What tangible features of the built environment act as boundary indicators within sidewalks?

Tactile paving is a system of "textured ground surface indicators found on public environments to assist

blind and visually impaired persons" (Lu, Siu, & Xu, 2008, p. 753). Tactile pavement much like a wall provides warning and guidance as to where the sidewalk ends (Ormerod et al., 2015). In countries such as Japan, tactile pavement known as *tenji burokku* is widely used in public areas to assist the blind and visually impaired to navigate more safely ("Barrier-Free," 2019). On the contrary, locally, tactile pavement is not included within the City of Vancouver's *Accessible Street Design* standards. The standards for sidewalk design regarding those with visual impairment are limited to basic length requirements and "information on the space needed by people when they are standing or moving" ("Accessible," 2018). The absence of tactile pavement within these standards reveals a failure on the part of policy makers in recognizing the safety of those with visual impairment.

Rural vs Urban Experience

When faced with situations in which space is limited, maneuvering through crowds with a guide dog is a challenge. Therefore, many dog users occasionally switch to using a cane when they anticipate a space, such as a concert hall, to be crowded (Williams et al., 2013). The same logic can be applied to virtually any crowded space within an urban centre. Urban areas are generally far more crowded than rural areas, therefore, a comparison between the experiences of the visually impaired when situated in the two geographically distinct areas is an effective way to further analyze their overall navigation of space.

In an urban environment it is easy to be overwhelmed by the multiplicity of loud noises, and even more so for people who are sight impaired and rely on sound stimuli to navigate safely. The high concentration of people and vehicles buzzing around can hinder accessibility to essential services, such as public transport. They may have trouble "finding locations, such as platform doors or gates, bus stops, and boarding areas; finding amenities like ticket booths or fare machines; and overcoming problems associated with finding the correct vehicle (especially identifying buses)" (Golledge & Marston, 2003, p. 475). Furthermore, without the ability to see exactly where sound is originating from, unexpected noise can be startling or disorientating.

In contrast, in a less crowded rural setting this overwhelming sense of confusion and fear is replaced by a subtle sense of peace and clarity. As one participant of a rural ethnographic study conducted in the Lake District of England describes: "you sort of switch off . . . it's brilliant, you know? Yeah, so you can listen to what is happening in the countryside, you can relax more" (Macpherson, 2017, p. 255). When roaming the countryside with a human guide the participants of this study felt that "it is just freedom really to walk unhindered with a guide" (Macpherson, 2017, p. 255).

The term "unhindered" is important, because it reveals the stark contrast that exists from the participants mentioned in the University of Maryland study. As when discussing the different reasons for preference of mobility aids, the discussion revolved around the obstacles present within the landscape. While, on the other hand, within MacPherson's study, the participant was afforded the freedom to walk unhindered through the British countryside alongside a trustworthy human guide. The two contrasting studies suggest that the quiet and open nature of rural landscapes enable a greater freedom of movement and feeling of comfort when compared to the noisy and crowded nature of urban landscapes.

Active for Life

Crowdedness and the presence of obstacles inhibit movement and thus crucially reduce the opportunity to engage in physical activity. In fact, research conducted by Longmuir and Bar-Or revealed "youths with . . . visual impairment are at particular risk of sedentary lifestyles throughout their lifespan" (2000, p. 48). This finding reveals how inaccessible the common landscape is to those with visual impairment. The common landscape inhibits activity, which in turn, decreases individual health and well-being. One remarkable human being, who is somewhat of an extreme outlier when it comes to this statistic, is Dustin Walsh. Dustin is a three-time Paralympian blind runner from New Westminster, British Columbia. His guide runner for 8 years, who ran alongside him at the 2008 Paralympics, is Steve Walters. I conducted a phone interview with Steve as part of my research and asked him about Dustin's life and career.

Dustin lost his sight completely at age six, but since then has developed incredible multi-sensory capabilities. An everyday example of this that Steve referred to was Dustin's enhanced sense of touch: "he knew exactly which shirt was which based on where the seams were, he knew whatever clothes he was wearing, he never wore anything inside-out, it was just amazing to me" (S. Walters, personal communication, November 27, 2018). This example directly relates to the theory of compensation introduced at the beginning of this paper. Dustin has clearly developed a sense of touch that more than compensates for his inability to see. I believe that Dustin knows more about the shirt than those who can see because sighted individuals take sight for granted while ignoring the subtle intricacies that can be identified through incorporating underutilized senses.

On the racetrack, Dustin continues to utilize a multi-sensory approach through his sense of sound. For Steve, a runner himself, learning to run involved "watching Olympic sprinters such as Ben Johnson and Donovan Bailey to see how they did it" (Walters, 2018). However, Dustin had to learn a different way, through muscle memory developed through verbal

guidance from his coaches to replicate certain techniques while on the track. He would consistently have to teach his legs to "pull through the stride in order to not contact the ground too long, because ground contact is friction" (Walters, 2018). This attention to detail was what was required to excel in a competitive sport in which he would "in most local races, compete against able-bodied runners" (Walters, 2018).

The theme of trust appears throughout this paper and is integral to Dustin and Steve's development of chemistry. During a race "a skate lace is wrapped around [Steve's] hand and Dustin's left index and middle finger (see Figure 2), and [Steve] is required to never run ahead of Dustin at any point in the race" (Walters, 2018). With this knowledge, it is abundantly clear that a comfortability with transferring navigational control and the ability to maintain mutual concentration are crucial to their success on the track. Dustin's ability to develop trust is once again remarkable. Performing synchronised motions with another individual is challenging when people can see each other's movements, but to have the ability to be in perfect synchronicity with someone who is invisible to them is simply extraordinary.

Figure 2. Dustin Walsh and Steve Walters (pictured: left to right)

Conclusion

My examination of how people with visual impairment navigate through landscapes has revealed a key flaw in the functionality of public space. I argue that the functionality of contemporary public spaces exposes a failure to recognize, on the part of designers and planners, the needs of people with visual impairment. People with visual impairment can commonly feel a sense of fear, nervousness, and detachment in crowded environments. Despite these challenges, people with

visual impairment persevere by eliminating senses that negatively harm the mind, body, and spirit through the ingenious utilization of senses that positively enhance the mind, body, and spirit.

Every section of this paper has included a discussion on the four traditional senses other than sight—taste, sound, touch, and smell. People with visual impairment seek to utilize all these senses to gain a greater understanding of the world around them. A world in which, if offered the ability to see, would perhaps not take it, because they "know the world for what it is" (Walters, 2018). Those who feel this way, like Dustin, feel a sense of comfort in this world, and that is the most important sense of them all.

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Bordered Becomings: Borders, bordering practices, and bordered bodies.

by: GILLIAN DER

The Borders in the contemporary moment are being asked to perform new, and increasingly violent, acts to secure state sovereignty and continuation. Since the signing of the Treaty of Westphalia, borders have existed to perform and maintain jurisdiction and sovereignty of a single decision-making body within the state; however, single decision makers within states no longer exist with the rise of a globalized economy and an international relations regime built on diplomacy rather than invasion. As such borders have shifted in who and how they maintain the continuation of the state. Civilians crossing borders are the new invaders of the contemporary moment and their bodies are marked as such through discourses of waste and wasting. The material consequences of marking migrants as invaders and waste is violent and leads to immense human suffering and loss of life. Borders as they have evolved over time need to be examined so to recognize how border have changed and how they might be reimagined to create a more just future.

A reflection on going home and questions that arise at the border

This summer I passed through the border checkpoint at Shenzhen, China. Leaving the autonomous region of Hong Kong and entering the People's Republic of China with my class, I made my way back to my ancestral lands for the first time to learn about the movement of not only my family but hundreds of thousands of migrants stretching across the globe and dating as far back to the early 1700s. This process of movement incited feelings of excitement, humility, and anticipation. I also felt an inescapable and all-consuming unease. The border was, for me, a space of fear, of dehumanized herding, and anxieties both for myself and the country receiving me. This border was not a homecoming. It was a space that dissected and differentiated me, marking entrants like me and my classmates as strangers, people to be watched, documented, and scrutinized. Simultaneously, I was creating this identity for myself, marking myself in the ways the Chinese State wanted me to. I had a visa, I filled in an entrance form, my retinas and fingerprints were recorded. Despite hundreds of years of familial connections to the land on the other side of the border I found myself crossing, I marked myself firmly as a visitor. Finally, when asked by the border officials if I had a Chinese name, I lied and denied having one out of fear of writing it wrong, scrutiny, and to some extent a deeper intergenerational fear of the state of China given my family's repeated history of escaping a

colonized, wasted, bombed, and murderous homeland.

I begin with this story both to ground myself in the regime of borders, bordering, and bordered bodies that I will take up in this essay. As the daughter of a migrant who fled political persecution, this is a deeply personal topic as much as it is an urgent academic and political critique. In the face of increased deportations (Harris, 2018), refusal of refugees (Brach 2016), legislation like Bill C-51[1] in Canada alone, - not to mention the atrocities being committed by the current United States regime (Grinberg et al. 2018; Yan 2018) - it would be foolish to ignore border politics.

In this essay, I will look at the ways that borders have been imagined by wealthy and powerful states to maintain their interests starting from the Treaty of Westphalia forward to the contemporary moment. By following specific and shifting bordering practices within this time frame I will establish that borders are not static and passive zones or lines crossed, but active players in migrant lives and nation building. I take the stance that borders are a process, actions, ways of seeing the world and are always in a state of becoming. By approaching the border at this scale - both geographically and historically- I am able to ask the central question of this essay: how have borders come to be, changed over time, and to what material end? Through this essay and by looking primarily at the US-Mexico border, I tease out the often slippery nature of borders: their porous points and their hardening, how they have been imagined and idealized in through Westphalian ideals and the reimagining and transformation of borders into diffuse borderlands pitting wealthy state powers against individual migrants in the contemporary moment. Finally I will demonstrate the embodied impacts of these kinds of bordering practices have on migrants through discourses of waste and the migrant - or bordered - body.

A brief history of border, sovereignty, and Westphalia as performance

To understand the implications of how current bordering practices in places like the US, Canada and the EU have on migrant bodies I want to begin with how these western powers have agreed to conceptualize the border historically. The border has been used by nations to define their control over space stretching back five thousand years (Jones, 2017, p. 5); as long as there have been states there has been some practice of bordering. For French theorist Etiene Balibar, this is expressed by "lines or zone, strips of land, which are places of separation and

[1] Bill C-15 or the Anti-Terrorism Act was introduced by former Prime Minister Stephen Harper with one section alluding to the deportation of presumed and broadly defined terrorists to the country of their parent's birth. The Liberal government under Justin Trudeau had promised to address problematic issues of C-51 with a new Bill C-59 but has not repealed this portion of the bill (Ling 2017).

contact or confrontation, areas of blockage and passage (…). Fixed or shifting zones, continuous or broken lines" (2002, p. 77). That said, Balibar cautions against a homogenous border regime and mentions how each border has a significant and specific history meaning borders are not enacted in the same way in every situation (Balibar, 2002, p. 77). So too, I would argue does each individual border crosser. I recognize that the expansive nature of this essay speaks to sweeping patterns in the ways that borders have shifted over time to focus with undue burden on the individual migrant. I highlight these statements from Balibar to underscore that the situations and shifts I explore in this essay are some of the many ways that bordering practices are enacted today.

For the purpose of the essay[2], I begin with the Treaty of Westphalia. Signed in 1648, this treaty marked the end of the Thirty Years War which saw european states agree on shared definitions of territorial sovereignty, established the right to make decisions, and control spaces within the delineated territory (Jones, 2017, p. 6). At its most basic level, this treaty ballooned the idea of minding one's own business into a full-scale international relations regime. The question of where one's own business stops, and another person's business begins thus becomes a central question. So too does the act of exerting control that extends fully to the edges of the delineated territory. The State therefore depends on clearly defined lines, or borders, to determine where its jurisdiction stops, and another state's jurisdiction begins. The revolutionary idea to use clearly delineated borders in order to keep states minding their own business placed importance on role borders in ensuring a state's survival. States became dependent on borders to contain them as much as borders relied on states and state control to define them. Westphalian ideals hinge on the ability to bound, to clearly say this is yours and this is mine; those people belong to you and these people belong to me. Borders then become the ideal method to maintain state sovereignty and peace between states.

Of course these borders are idyllic and in reality frail, porus and imperfect, as such, understanding borders as performances and performers of state power helps states and individuals conceptualize borders as perhaps more concrete than they really are. It is the ideas that are held around borders that help to obfuscate the realities of their frailty. For example, this is felt in the nativism and anxiety that surrounds discourses of borders and border crossings particularly at the US-Mexico border.

[2] Bordering practices have existed long before the creation of the Treaty of Westphalia therefore positioning it as the beginning of borders comes with the illusory nature that borders were not significant to state creation before this point in time. Additionally, I am wary of focusing on this specific treaty heralded as a starting point of borders when it might simply be an easy starting point for *European* conceptions of borders. European bordering practices should not become a synecdoche for global bordering practices.

Trump's ongoing lament and state of emergency over funding for a border wall in the interest of national security, for example, is a demonstration of the rhetorical process that enable states to extend their control to the edge of the border with the aim of maintaining a certain nationhood on the inside. Physical borders like walls are only part of the larger performance and process of bordering. Rhetoric works in conjunction to strengthen the physical walls by stating who and what belongs to whom and the right to govern people and resources with authority. As such, the anxious rhetoric around "illegal" immigration in the United States can be understood as a physical border failure and the enactment of a discursive border performance to fill in those gaps. By recognizing the state investment in borders as a means of maintaining jurisdiction and control and the anxious discourse that goes along with the upkeep of those border performances, we can begin to see gaps in the logics surrounding these idealized border systems in the contemporary moment.

I am not suggesting that borders have ceased to exist in a Westphalian ideal, nor am I saying they have been done away with all together. Rather, what I am calling for is a frank understanding of the flaws in Westphalian ideals so that we might come to recognize how these flaws have been filled in. The ways that these flaws have been filled in demonstrates a shifting of bordering practice over time. In some cases, borders which pit states against states have given way to cooperation and diplomacy. States are more inclined to solve issues with collaboration and diplomacy or under the pressure of transnational advocacy which challenges the strict geopolitical boundaries of Westphalia's this is yours and this is mine framework. This new border is influenced by international critique, interference, and diplomacy. This border makes room for the possibility of different or multiple authorities to exist within it. This diplomacy and multilateral cooperation however, does not fully resolve border anxieties of both perceived and real threats to nations. For wealthy elite countries who have access to diplomatic means of resolving geopolitical disputes, there are still major operations occurring to secure borders and the future of the nation behind them. The question then becomes what, or who, is seen as the major threat to sovereignty and state survival today?

The Rise of the Borderland, Biopower and Spaces of Exception

The border as idealized by Westphalia cannot withstand the contemporary moment and so the border has needed to transform. Reece Jones understands the role of borders as a means to safeguard resources and privilege within a state at the expense of the freedom of movement of others: "when passive expressions of power such as walled borders and property laws fail, physical violence is often the only means left to prevent undesired movement" (Jones, 2017, p. 8). Although this might not necessarily be

true of all borders, I find this to be poignant when discussing migrants from the global south entering wealthy elite nations like the US and Canada. This also helps to demonstrate the idea that as threats to nations' authority changed, be that perceived or real- so too have the practices and performances at the border. The burden of threat seems to lie on the shoulders of individual migrants and as such borders have become spaces s made to kill or at the very least seriously endanger them. I understand this turn toward diffuse spaces of violence as the production of a *Borderland* rather than the thin line conceptualization of a border as with Westphalian ideals. Gregory understands the concept of the borderland as a site is a contested space where competing powers collide or collude to produce violence (2017). It is important to recognize that the competing powers do not necessarily mean state to state powers. Additionally, these *powers* cannot necessarily be called powers on both sides due to the immense imbalances between the subjects. For example, consider the recent use of tear gas against migrants seeking asylum, many of whom are families with young children, at the US-Mexican border (Grinberg et al., 2018; Yan, 2018). So, the borderland is a space where powers or individuals compete, collaborate, and produce violence.

Biopower is central to implementation of the Borderland; biopower being the ability for the state to make live and let die (Gregory, 2018). Additionally, Giorgio Agemben mentions biopolitics as Borderlands are not necessarily spaces where people are expressly executed, but they are allowed to die there often with the assumption that they brought death on themselves in attempting a crossing (Razack, 2017). The deaths of migrants are understood as acceptable because it is on their death that the privilege and resources that Jones (2017) points to can remain firmly in the hands of those who occupy more economically developed countries. In order for biopower to be enacted and migrants to become killable, these borderland spaces must become spaces of exception. Agamben having coined the term, enunciates that it is the sovereign, "decides on the state of exception, has the power to decide which life may be killed without the commission of homicide" (Agamben, 1998, p. 142). In our case, the sovereign is the US state and those who may be killed are migrants crossing the borderland. Spaces of exception are not merely of exclusion but of abandonment and additionally where individuals are consistently and knowingly exposed to death (Gregory, 2004). In the case of the borderland, these dynamics are illustrated by Gregory as the "multiple horizons of danger within which the inhabitants of the borderland are forced to live" (Gregory, 2017, p.18).

In the context of the US-Mexican border, the Southwest Border Enforcement Strategy innated in 1994 was implemented to, "make it so difficult and so costly to enter [the

United States] illegally that fewer individuals even try" (Sundberg et al., 2004, p. 722). This was achieved by investing in deterrent infrastructure such as lights, fences, cameras and underground systems to detect tunnels to enforce the border specifically at common border crossing paths through cities (Sundberg et al., 2004; Jones, 2017). Unsurprisingly, border crossings are still happening but have been pushed into wilderness areas, national protected areas, national monuments, and parks (Sundberg et al. 2004) to which I will refer to as border protected areas. The physical geography and legal evacuation converge to produce the US-Mexican border as a space of exception. The harsh desert climate with minimal human presence in combination with misinformation from smugglers presents a palpable space of diffuse violence. Passing through the desert comes with the physical toll of minimal water access, extreme heat, little shade, intense temperature fluctuations and long traverses. On top of this harsh physical reality, smugglers often tell migrants that the crossing is not long and that migrants should not bring many supplies for fear it might slow them down (Sundberg, 2008). This diffuse violence in the landscape due to the closing of a previously porus section of the US Border and the physical toll of the desert on migrant bodies demonstrates how the borderland is a tactic used to specifically target the threat assumed to be migrants.

Borders needed to transform into diffuse borderlands in the contemporary moment to address the fears of a migrant invasion. That is not to say that migrants cannot be killed at clearly delineated borders.[3] People are regularly and routinely killed for crossing or attempting to cross borders. Borderlands become important because the state can assume some kind of innocence in the border deaths of migrants. This does two things at once, first the border crosser becomes a transgression, out of place and willing to bring death on themselves. Second, more economically developed countries maintain their position of power by creating a facade of benevolence and justice. Borderlands cement migrants as unworthy of taking up space in the nation, unworthy of life, simply because they cross.

Bordered Bodies: discourses of waste and the impact of borders on migrant bodies

"Disposability is a condition written on the body" – Shrene Razack (Razack , 2017, p. 2)

Balibar, attempting to be provocative, begins his chapter on the premise of the border by asking if it is possible to "imagine *being* a border" (2002, p. 75). For me, this question is not provocative at all rather a quotidian reality: I have always been a border.

[3] Sergio Hernandez Guereca was killed at the border between El Paso and Juarez in 2010 when he and two other friends rushed the border. American Border guards fired three twice across the border into Mexico killing the teenager (Jones, 2016)

Beyond a simple border, in many ways I live as a series of borderlands as well. As a mixed-race individual, the competing and colluding powers of east and west are evident in the ways my eyes shut and how my skin browns. More than that, the phenotypes I have inherited from my father collide with the white settler supremacy of Canada to place me and him as perpetual foreigners[4] despite five generations of living, working and raising families on this land. In the context of the Canadian state, our bodies cannot wipe our border crossings off us. Although my experiences differ greatly from those of migrants seeking asylum today, understanding that borders are embodied experiences highlights the material consequences of contemporary bordering practices.

My lived experience gives me some insight into the ways that borders, and border crossing can not be left behind. It is an event and action that is expressed and cast onto migrant and transcendent bodies. If borderlands are understood as extended geographic spaces, the collision and collusion of power over contested space, why should this space not include that of the migrant body? Discussions on borders are also inherently discussions of identities (Balibar, 2002). Who belongs where and to whom is central to questions of migration, borders and bordering practices. Eloquently put by Sundberg, "people's bodies become public sites of violence on which constructions of the nation and its boundaries take place" (Sundberg, 2008, p. 876). By reducing these questions down to the microcosm of the human body the material consequences of borders become better seen and felt.

Waste is a helpful way to understand these material consequences of crossing. At the US-Mexican border, discourses of trash surround the migration of border crossers through the border protected areas marking migrants as invaders and the nation under attack from… their garbage (Fig 1). For Sundberg, "discourses and practices of trash elaborated by a wide range of groups constitute moments of boundaries-in-the-making" (2008, p. 886). The presence of migrant waste in border protected areas plays into anxieties that American national heritage, that being pristine wilderness spaces and parks like those being passed through by migrants, need to be preserved and protected for future generations. Migrant waste therefore becomes a direct threat to the preservation of protected areas. In the cruelest of twists, many of the items reduced to trash by local groups are necessary for the survival of migrants crossing the desert (Sundberg, 2008). The need to

[4] The subject of the perpetual foreigner is an identity applied to non-white citizens of settler colonial states like Canada and the US. These non-white citizens are often asked to explain where they are from because their ethic appearance does not fit within the idea of who can be a citizen of a white settler state. Their citizenship and often long histories of habitation within the nation are not enough to overcome the implicit bias that citizens of the white settler state must look a certain way.

move through these border protected areas and leave things behind is of course created by the hardening of the border and legal abandonment created by the Southwest Border Enforcement Strategy. Marking the intimate personal items and survival items left behind as trash damaging the national heritage of Americans and marks migrants as threats to the nation. This is a practice of bordering the body, of identifying who can take up space in the nation and who is not worthy of doing so. It also reinforces the shift toward viewing civilian migrants as invaders and supports the expansion of the borderland where they can be killed.

Figure 1. Waste left behind by migrants in a border protected area (Sundberg, 2004).

It is not however, simply a conflation between things left behind and migrants as trash. The border for Razack, is a place where waste and product are dissected, where folks are deemed too much, redundant and therefore not permitted to be recognized or allowed to stay (2017). Migrant bodies are inherently wastable, in the process of becoming waste, and allowed to be removed like waste. This results in not only border killings, like all those who die on the journey across the Sonoran desert, but also the infliction of "Horrorism" where killing will not suffice unless killing is violent to the point of disgust (Razack, 2017, p. 2). This inflicted horror is imposed on migrant bodies is curriously also blamed on them (Razack 2017). Migrants' wasting is often accompanied by discourse that positions migrants as bringing this wasting on themselves (Razack, 2017).

Complicating this self inflicted wasting via death from border crossing, migrants are also running from a site, the global south, that is becoming waste. Widening global wealth gaps, the climate breakdown, and lingering effects of colonial and imperial

expansion are increasingly pushing the global south and their inhabitants into a state of waste within the eyes of border regimes aiming to maintain the wealth and privilege of their elite nations. When migrants run from these sites becoming waste, they come up against those sorting practices of the global north border mentioned earlier. Migrants can thereby be categorized as redundant and allowed to waste or die. The wasting of homelands follows migrants on their bodies

It is not enough, however, to simply become waste and die, waste also becomes a tool for further reinforcement of civilian migrants as invaders. Human waste as explored by Sundberg dovetails in interesting ways from the theories for Razack (2017) where the human body is waste. For Sundberg (2008), migrant bodies emanate contamination and waste via bodily excretions of blood and feces. Like the items left behind by migrants, their bodily secretions again render them as unworthy of a position in the nation they enter or more broadly, unworthy of rights (Sundberg et al., 2004). This is a very different idea from Razack (2017) and in this case, the bordered body is not only waste, fleeing waste, or in the process of becoming waste or redundant, they are also actively harming and contaminating the nation with the waste emanating from their bodies. When combined, these theories of waste and the border creates bordered bodies who cannot escape their bordered condition. They are thrust up against borders that pick and sort through which bodies are waste and which are product. If chosen as product or if they manage to find a way around the wall, they are subjected to discourses that label their bodies as agents of contamination to the nation. Even after crossing the border, migrants cannot wipe their border crossing from their bodies.

Transforming the border

Balibar predicts, “as soon as borders become differentiated and multiple one again- once they begin to constitute a grid ranging over the new social space, and cease to simply border it from the outside- then the alternative lies between an authoritarian, and indeed violent intensification of all forms of segregation, and a democratic radicalism which has its aim to deconstruct the institution of the border” (2002, p. 85). We are at tipping point of the border. Borders have not ended with the fall of Westphalia or an age of globalized diplomacy. Instead the object of deterrence has shifted onto the civilian and into unregulated spaces. Borders are now oceans, deserts, wide spaces of waste sorting with very dangerous consequences for migrants. As we move into an era of environmental unrest, we need to critically examine the anxieties that surround borders and our obsession with fearing civilian migrants to the point that they are killable and wastable. Borders have transformed in the past to reorient toward a globalizing world and recognizing this malleability how can we move forward to transform

them to fit a more just and resilient future?

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Today's Colonial Legacy: Environmental Racism on Reserves

by: MORIKA DeANGELIS

Canada's colonial legacy lives on in today's existing Indigenous reservations, through the concept of environmental racism. Environmental racism describes how certain, marginalized populations are subject to poor health and living conditions, in comparison to the national standard, due to the spatial representation of socially created racial hierarchies. With these concepts in mind, I recall the difference between Indigenous definitions of reserve land, as opposed to the Canadian federal government's understanding. These dichotomies are often overlooked, and are furthered in the attachment of specific geographies to bodies. For example, environmental racism requires the creation and existence of sacrifice zones, which then categorizes bodies within the zone to be sacrificial and sub-human. Through analyses of four geographic regions in Canada, I examine how Canada's colonial legacy is still realized in everyday life, through environmental racism on reserves. Through this discussion, I merge the colonial agenda of capital and land accumulation, with resource extraction and dehumanization of Indigenous peoples, to better understand how Canadian society and government policies reinforce pre-existing institutional racism into new projects and developments. Through a thorough examination of environmental racism throughout discrete time frames in different geographies, we can understand how colonialism is reinforced and folded into everyday life. With these themes in mind, I move towards recognizing past and present Indigenous resistance, as they relate to understanding the complex networks that create meaning for the land, and the continued fight towards institutional change in environmental policy.

Indigenous peoples in Canada who are currently living on-reserve are subject to the continued violence of colonialism, in the form of environmental racism. This violence has historic roots in the creation of reserve lands, and the policies imposed upon the land and people residing there. However when discussing reserve lands, it is important to recall the disconnect between the spatiality of reserves and the spatiality of Indigenous territories, as discussed by Sarah Hunt (2014, p. 70). Hunt's (2014) usage of the term colonialscape signifies the "representations of the space now called 'Canada', which perpetuate and manifest particular (colonial) expressions of power" (p. 72). In both Canadian society and academia, there is a tendency for these colonial expressions of power to be attached to particular bodies (in this case, Indigenous bodies) which result in continued harmful stereotypes. The term 'colonialscapes' reinforces a

necessary physical connotation to the unceded territories that the Canadian government continually renders imagined or otherwise.

I argue that the Indigenous peoples living on reserves are inordinately exposed to environmental hazards and poor living conditions that negatively impact health and well-being, as supported by the First Nations Regional Health Survey from 2002/03 (2005, p. 42-51). Reserve populations are exposed to resource extractive industries that result in a lived reality of environmental degradation and contamination. Environmental racism and its material impacts on marginalized communities are increasingly important fields of research, because they are visible examples of how oftentimes socially constructed racial hierarchies are manifested into tangible health and social issues. Hunt's (2014) discussion of the codification of *terra nullius* into Canadian law is important when analyzing the geographies of reserves and imagined geographies. How have reserves been imagined in a way that allows various resource extraction projects to continue? How are reserves and the geographic meaning of reserves embedded upon Indigenous peoples, in ways that allow legislative bodies to justify dangerous lived realities? Drawing upon de Leeuw et. al's (2012) work with thirteen First Nations communities in British Columbia, I will argue that Canada's colonial history and current social structures are significant determinants of health and well-being for First Nations. The racial hierarchies created by and reinforced through the reserve system has resulted in the continuation of the colonial concept 'terra nullius.' Corporations and legislative bodies continue to view reserves and the people residing in them as empty space, ready to be exploited for the good of the national economy. As Harris (2007) says, Indian reserves would not have existed had 'Indians' been seen as human. Reserves are conceptualized as both imagined communities and sacrifice zones, as "spaces of assumed violence" (Hunt, 2014, p. 71).

I offer analyses of the Mohawk Resistance (also known as the Oka Crisis) with the Mohawk First Nation, of Victor Mine by the Attawapiskat reservation, of Chemical Valley near the Aamjiwnaang reservation, of Chemical Valley near Sarnia, Ontario, and of Grassy Narrow's First Nations water crisis, as just some of the examples of environmental racism occurring on unceded territories. It is important to note that environmental racism is not a new phenomenon nor should it be situated to one particular time. Furthermore, current treaty territories, as defined by agreements between the Canadian government and Indigenous communities, are not necessarily ceded lands, due to uneven hierarchies of power.

Westra (1999) offers a helpful description of environmental racism: "Racism practiced in and through the environment. It refers to environmental injustice whereby, for instance, toxic

and hazardous waste facilities and business operations are sited with disproportionate frequency in or near poor, non-white communities" (p. 112). Building from Bullard's (2014) linkages of racism to "environmental planning and decision-making," I analyze how and why certain communities are disproportionately affected by environmental policies and development (p. 239). Although Bullard's (1994) definition of environmental racism pertains to the United States, his insights are still relevant to Canadian society: "Environmental racism refers to any policy, practice or directive that differentially affects or disadvantages (whether intended or unintended) individuals, groups, or communities based on race or color" (p. 1037).

The creation of First Nations reserves in Canada and treaty negotiations are unequivocally linked to a colonial agenda of resource extraction and settler needs. Treaty-making historically occurred with the aim of opening up land for settler use, and to relegate Indigenous people to certain geographic areas. The centuries-old colonial aim of separating Indigenous people from land autonomy is seen in the contentious ways that various non-renewable resource extraction projects or golf course developments are negotiated - or not negotiated at all.

Housing and Living Conditions on Reserves

According to the 2002/03 First Nations Regional Longitudinal Health Survey (2005), "the housing and living conditions faced by most First Nation people are significantly poorer than in the provincial and national general populations" (p. 44). I argue that most of the housing and living conditions on First Nations reserves are conditions that would not be accepted by a majority of Canadians living in urban centres. Why does this discrepancy exist and how it is being addressed by current government administration? Bullard (2014) suggests that "housing segregation and development patterns play a key role in determining where people live" (p. 240). Bullard (2014) says that urban development and the 'spatial configuration' of communities flow from the forces and relationships of industrial production which, in turn, are influenced and subsidized by government policy" (p. 240). With this in mind, it is evident that various levels of government give industrial production more priority than reserve infrastructures. The concept of *terra nullius* holds strong here, as Indigenous ties to reserve land are completely overlooked in favor of the federal agenda. The entire constellation of familial networks, spiritual ties, and legal ownership to land is nullified when the Canadian government enact policies that undermine Indigenous personhood.

Government policies regarding adequate sanitation and maintenance on reserves are also lacking, as the 2002/03 First Nations Regional

Longitudinal Health Survey (2005) discusses: "More than one fifth (21.8%) of adults report that they have no access to garbage collection services. Access to garbage services varies by the remoteness of the community" (p. 46). An extensive report by the Auditor General (2011) found that in 2003, there was a "significant housing shortage on reserves and the need for major renovations of about 44% of existing housing.

There is also a major disconnect between the water supply source and the existing water quality. As a country that is internationally lauded for having the largest fresh water supply, there is a horrific disparity between the water supply and quality accessible to most First Nations reserve, in comparison to the average Canadian household. According to the 2002/03 First Nations Regional Longitudinal Health Survey (2005), "water delivery by pipe from a local or community source is the primary source for the majority of respondents (63.2%). Of those, only 71.4% consider their water safe to drink, despite the fact that the water has presumably been treated" (p. 46). Thus, it is interesting to note how little support is placed on providing adequate water infrastructure, in comparison to the overwhelming amount of federal support given to industries that contribute to environmental pollution on reserves.

There is a major lack of sufficient policy regarding water quality and accessibility on reserves, which results in the increased likelihood of contamination, difficulty to access water, or insufficient treatment systems. According to the Human Rights Watch (2017), drinking water advisories "exist for 134 water systems - 90 of them in Ontario Province - in 85 First Nations reserves across Canada, as of January 2016" (para. 2). The Human Rights Watch (2017) report points to a number of issues with water infrastructure on First Nations reserves:

> "The lack of binding regulations on water quality on First Nations reserves; persistent under-funding and arbitrary budgeting for water system costs, including capital, operation, and maintenance costs; lack of support for household water and wastewater systems; worsening conditions of source water; and lack of capacity and support for water operators" (para. 4).

The timeline of the water crisis is appalling, considering that some communities have been under a water advisory for over two decades. The Neskantaga people are a community of approximately 350, where an entire generation has gone without being able to drink their tap water. In 2017, Neskantaga Chief Wayne Moonias said, "For more than 20 years we haven't been able to drink water from our taps or bathe without getting rashes" (para. 5).

Mohawk Resistance & the Mohawk Communities

Before delving into the details of the Mohawk Resistance, it is important to understand the historic meaning of the geography in question. The Mohawk people's protection of the land in question (the Pines) dates back centuries, as they had "planted 'tens of thousands of trees in the shifting sand'" to protect the soil from washing away, due to deforestation and heavy rain (Westra, 1999, p. 106). There is also a graveyard of Mohawk ancestors located on the land, some of whom had actually fought for the protection of the Pines. According to Westra (1999), "the municipality of Oka 'legally owns the cleaning in the Pines and calls it a municipal park," but the Mohawks argue that the land is theirs, and that they never sold it or gave it away" (p. 107). In this paper, I refer to the events as the Mohawk Resistance, as opposed to the commonly-referenced Oka Crisis, to reinforce the overall theme of Indigenous resistance and strength throughout time.

In 1961, a golf course was developed on the land claimed by the Mohawk people, without their consent or consultation. By 1989, the municipality of Oka made a decision to expand the golf course, without consulting the Mohawk people. This decision was led by the mayor at the time, Jean Ouellette, who "believed he had the law on side: the government had 'consistently denied the Mohawk land claims for 150 years'" (Westra, 1999, p. 107). Interestingly enough, at that time "the law did not require an environmental impact study for a recreational project in the municipality" (Westra, 1999, p. 107). The clear disregard for the Mohawk peoples' spiritual, political and material ties to the land has echoed throughout history, as they consistently find themselves fighting for land acknowledgment. The actions of the developer, the local Oka municipality, and the Canadian government speak to the larger disregard for the Mohawk people's political and legal ties to land, and Indigenous governance as a whole. The proposed golf club expansion resulted in the Mohawk peoples initiating a 78-day stand-off in protest. The development was later cancelled, but the land was officially purchased by the federal government. This ownership signifies that, to this day, Mohawk land recognition still goes unacknowledged.

The powerful display of united resistance by the Mohawk people inspired similar movements, such as Idle No More, and resulted in legislation and policy development, such as the Royal Commission on Aboriginal Peoples. (Doerr, 2006, para. 1). The Royal Commission addresses the importance of consultation with Indigenous communities, governance structures and jurisdiction, with recommendations pertaining to cultures, economy, values, governance, and land. (Doerr, 2006, para. 5-6). Considering that the Mohawk Nation has been resisting outside forces since colonial contact, the Royal Commission should be regarded as one of several

necessary actions towards decolonization.

Victor Mine & the Attawapiskat First Nations

Victor Mine, of the De Beers Group of Companies, is a diamond mine in Ontario, near the Attawapiskat reserve. Opened in 2008, the mine was promoted as providing employment to the surrounding region and an Impact-Benefit Agreement for the Attawapiskat First Nation community. However, the financial benefit had apparently not materialized for the community itself (Intercontinental Cry, 2010). Instead, the mine resulted in blockades and protests that received national attention.

Vicki Lean's acclaimed documentary film *After the Last River (2015)* traces a five-year journey of "the remote community…facing mounting environmental issues and an inability to directly benefit from resource revenues" (para. 1). Lean's (2015) analysis of the water quality of the river systems surrounding the reserve, show a correlation to the insufficient waste management practiced by Victor Mine. Lean's father, who is an environmental biologist, "was recruited by concerned community members and environmental groups to provide analysis of how mercury levels would rise with mining activity" (Lean, 2015, para. 1). Drawing once more from Bullard's concept of invisible communities, the film shows the De Beers company proudly celebrating their Canadian-mined, locally sourced diamonds, juxtaposed with images of the small community whose land has been exploited in return.

The Attawapiskat reserve has a history of environmental racism regarding their infrastructure, or lack thereof. There is insufficient housing, with issues of overcrowding, toxic mould and no running water for many homes. According to Water Canada (2012), "in 1976, AANDC (Aboriginal and Northern Affairs Canada) recommended that the community water should come from an inland lake (slough) just northeast of the community" (para. 4). However, this suggestion was uninformed and would have been scoffed at in a larger city, because the water source contained organic matter and sometimes had no flow. In 2016, the Attawapiskat First Nation had a state of emergency, when eleven young people attempted suicide within a 24-hour time frame (Spurr, 2016). This was not the first time: the community declared a state of emergency in 2006, due to "the deteriorating quality of drinking water"; in 2009, due to a number of homes being "contaminated by sewage"; in 2011, when there was a housing crisis; and in 2013, because of "rising sewage" that "forced the evacuation of the only hospital in the community" (Staff, 2016). As of now, the current response to the water crisis in Attawapiskat is a temporary "reverse osmosis (RO) system" where "residents can take jugs" to a water depot and "bring it to their homes for drinking" (Water Canada, 2012, para. 16). This is

a major issue when considering accessibility for disabled people, and during winter months. The temporary, band-aid solution of a clean water station located outside of residential homes, calls into question the general attitude of municipal, provincial and federal governments towards the health of reserve populations.

Recalling Lean's documentary film *After the Last River* (2015), there is growing access to literature and visual content that bring attention to the infrastructural issues on the Attawapiskat reserve. Lean's film (2015) has received national recognition and awards for its unfiltered perspective. Furthermore, the youth of Attawapiskat have formed powerful organizations focused on mental health, working to change the popular media-narrative of the Attawapiskat reserve as a site of pain (Edwards, 2017, para. 1-5). Keisha PaulMartin's experiences growing up in Attawapiskat brought her to organize "two major youth initiatives in the community: the Reimagining Attawapiskat project and the Pahsahwaytagwan "Sounding Echo" Youth Committee" (Edwards, 2017, para. 5). "Its aims include revisiting how media portray communities during crises and encouraging youth to become agents of change," placing power in the hands of youth to shape portrayals of their home (Edwards, 2017, para. 12). There is a continued need to rewrite negative portrayals of Indigenous reserves, as these overpower the networks of community, family and resistance that are present. Another youth from Attawapiskat, Jack Linklater Jr., discusses his involvement in the Youth Committee suicide awareness walk: " The media got it wrong, by telling the world how the community is when they don't really know" (Edwards, 2017, para. 23). The strength of these young people in sharing their stories and standing up for their community has not gone without recognition, as Canada's Minister of Indigenous and Northern Affairs, Carolyn Bennett, recently invited the Youth Committee to participate in conversations about mental health (Edwards, 2017, para. 34).

Chemical Valley & the Aamjiwnaang Reserve

Chemical Valley is the nickname given to the geographic region that lies south of Sarnia, a small city in southwest Ontario. Despite being a relatively small area, it is internationally known for having the worst air quality in Canada, according to a 2011 World Health Organization report (Jeffrey, 2011, para. 5). According to The Canadian Encyclopedia (2006), "Chemical Valley emits more dangerous pollutants than the entire provinces of Manitoba, New Brunswick or Saskatchewan" (Block & Elford, para. 14). The toxic air quality stems from a number of reasons, including "air pollution coming into south-western Ontario from the U.S.", but the prevailing reason can be linked to the "62 industrial facilities within 25 kilometres of the Aamjiwnaang reserve

and city of Sarnia" (Ecojustice, 2012, para. 12). According to Ecojustice (2012), "the Sarnia area is one of the most heavily industrialized in Canada, accounting for more than 40% of Canada's total chemical industry" (para. 12). Ironically, the heavy saturation of industry in this region is a source of pride for the municipality of Sarnia and the federal government. According to the Sarnia-Lambton Economic Partnership website (2018), "the Oil Springs Industrial Landscape is in the process of applying to be on Canada's Tentative List for UNESCO World Heritage Sites" (para. 2). In fact, in 1971, an image of Sarnia's industrial landscape even featured on the back of the $10 bill.

According to Maude Barlow, the Aamjiwnaang reserve, home to the Anishinaabe people, is "surrounded on three sides by toxic-belching industries and on the fourth by a Michigan coal plant" (The Council of Canadians, 2015, para. 2). Barlow (2015) said that "they [the Aamjiwnaang First Nation] are grappling with high levels of cancer, headaches, numbness and many other ailments" (para. 2). According to CBC, (2013) "forty percent of band members surveyed required an inhaler" (para. 14). In 2014 and 2015, Sarnia has seen over 500 industrial facility-related incidents, oftentimes including frequent spills of toxic chemicals (Craig et al., 2017, para. 40). Indeed, there are so many incidents that the municipality has constructed safety sirens in various regions of the city, to warn residents of possible emergencies. "The documents reveal the details of industrial leaks in Sarnia's Chemical Valley that released a range of emissions - from a valve left open for three months venting hydrocarbons in 2014 to particulate matter from a boiler stack falling onto cars that year, to a two-hour leak of hydrogen sulphide from tanks in 2015" (Cribb et al., 2017, para. 13). Not only is the air quality deplorable, but the water quality is severely lacking. A study by Ryerson University found that "the most important source of pollution [...] is the Sarnia WPCC (Water Pollution Control Center)." This is possibly due to human error and an aged sewer system.

Recalling Bullard's (2014) discussion on environmental racism, there is the additional aspect that most of the available jobs at Sarnia's large industrial facility would be in those dangerous and toxic industries (p. 245). Bullard (2014) mentions maquiladoras and job blackmail, which can be compared to the employment of Sarnia's population in industrial facilities, bringing even more health risks (p. 245).

The residents of the Aamjiwnaang reserve have formed multiple coalitions and research committees, in order to bring attention to the concerning levels of pollution. One such movement is the Aamjiwnaang Bucket Brigade, formed by resident Ada Lockridge, whose main goal is to "to collect air samples and reveal high levels of harmful chemicals in the air" (Baxter, 2018, para. 10-13). Lockridge discusses how the continued

efforts to analyze harmful pollutants has resulted in media investigations and judicial reviews (Baxter, 2018, para. 16). Lockridge's actions, in forming First Nations environmental and health committees in her community, have prompted the inclusion of residents in shaping government policies that impact Sarnia's industrial landscape (Baxter, 2018, para. 17). This is just one example of how legislation and institutional policies can be rewritten or changed entirely, to be more inclusive of the populations upon whom they impact.

Dryden Mill & Grassy Narrows First Nation

Asubpeeschoseewagong First Nation (hereafter referred to as Grassy Narrows First Nation) reside in the English River 21 reserve within Kenora, Ontario. The Kenora district also notably contains the Attawapiskat and Neskantaga reserves. The English River 21 reserve rose to international attention when it was discovered that the First Nations residents were undeniably being poisoned through mercury discharge from the Dryden Chemical Company. The paper mill plant was releasing waste into the nearby Wabigoon-English River system, which profoundly affected the quality of the water used by nearby communities and, in turn, affected the fish they consumed. The conscious decision to continue dumping toxic waste into a river system that directly affected a First Nations reserve, was not a one-time situation, but one that continued for nearly two decades (Porter, 2016). In this case, the environmental racism at hand involved not only the location of a toxic paper and pulp mill, but also the waste management practices which directly resulted in First Nations people being diagnosed with Minamata mercury poisoning (Troian, 2016, para. 1-3). This mercury poisoning bioaccumulates in the body through generations, serving as a terrible example of one of the ways that a colonial legacy of environmental racism can materialize in the human body (Harada, 2008).

The federal and provincial government have since been berated on an international stage, by organizations such as Amnesty International. According to Amnesty International (2017), "to date, there has been no clean up of the river system, no comprehensive assessment of the community's health needs, and no provision of specialized health care for the many who suffer from the devastating effects of mercury poisoning" (para. 10). Amazingly, the provincial government continues to include plans for resource extraction in the Grassy Narrows territory. This includes the "expansion of large-scale industrial logging" which is still included in the provincial government's forest plans (Amnesty International Canada, 2017, para. 12). Despite the international attention placed on Grassy Narrows First Nation and the issues surrounding mercury poisoning, there is a group of youth working tirelessly to shift the narrative placed

upon their territories. N'we Jinan is a "non-profit organization [..] aimed to create an environment where youth can express themselves musically and creatively (N'we Jinan Foundation, 2018). One such song is 'Home To Me,' written and performed by the youth of Grassy Narrows First Nation, attending Sakatcheway Anishinabe School (CBC Radio, 2017, para.1). The music video and lyrics recall Hunt's (2014) discussion of colonialscapes, as the youth subvert common narratives of Indigenous reserve land (as defined by the Canadian government) and highlight "a message of hope to their people: the land and their culture is where they find their strength" (N'we Jinan Foundation, 2017).

The cases discussed above are material examples of how "institutional racism influences decisions on local land use, enforcement of environmental regulations, industrial facility sitting, management of economic vulnerability, and the paths of freeways and highways" on reserve populations in Canada (Bullard, 2014, p. 240). Once again, Bullard's (2014) question of environmental racism in decision making draws from specific cases in the United States, but the overall message remains relevant to my argument: "The ideal site…has nothing to do with environmental soundness but everything to do with lack of social power" (p. 241). Bullard (2014) cites those decision-making bodies that follow a certain socioeconomic agenda, thereby excluding an 'invisible community' of people whose needs are placed below economic growth (p. 241). The reserves can be compared to sacrifice zones, which are geographic areas where certain lives are seen to be of lesser value than others, especially in the face of development. The creation of sacrifice zones requires systematic other-ing and dehumanization of Indigenous people in Canada, so that dispossession through development can be justified for national economic good. This concept leads into Blomley's (2003) discussion of law and the geography of violence, "the spatially defined environments in which we move…can serve to reflect and reinforce social processes and practices that code, exclude, enable, stage, locate, and so on" (p. 131). As Coulthard (2014) discusses, the institutionalized other-ing of Indigenous people has taken place through politics of recognition and historic assimilative actions. Some examples include the 1969 *White Paper* by Pierre Trudeau, which would have Indigenous people lose their reserves and treaties, essentially choosing to ignore land claims and self-determination. To use Hunt's (2014) fitting words, "anywhere and everywhere is *terra nullius*, as the empty lands imaginary can be seen as underpinning natural resource acquisition…as pipeline routes, fracking, and other extraction are shown to be occurring on unused or uninhabited lands" (p. 74).

However, Hunt's (2014) discussion of terra nullius prompts us to recall that Indigenous reserve lands are not empty: they are rich with

histories and ties to the people that occupy them, whether spiritual, material, legal or political. Mishuana Goeman (2008) points out "the multiple social and geopolitical meanings that make land a key concept in Indigenous political struggle," which is necessary in discussions regarding the politics of environmental racism on Indigenous reserves (p. 1). Therefore, when discussing Canada's colonial continuities in the form of environmental racism, it is essential that attention is placed on the work of Indigenous communities demanding accountability from the Canadian government, corporations and Canadian society as a whole. These positive actions further everyday actions of decolonization, working to disrupt the constraints placed upon Indigenous people since colonial contact, and the impact felt by the effects of environmental racism.

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Abundance of Microplastics in Barkley Sound, British Columbia

by: MICHELE (RIVER) WALTER & ROBYN PERRITT

Plastics have been turning up in our oceans for decades, but more recently in the form of microplastics: tiny filaments of plastic small enough to escape through porous filters at wastewater treatment plants and end up in our oceans. These microscopic fragments can be ingested by zooplankton and make their way up through the trophic levels, biomagnifying in large carnivorous fish and marine mammals. In this study, we investigated the problem at a local level in the marine environment around Bamfield Marine Sciences Centre in British Columbia. We compared the abundance of microplastic filaments found at three locations with different water sources and varying anthropogenic influence: Grappler Bay, Bamfield Inlet, and Trevor Channel. We also examined the vertical distribution of microplastics at one location to understand differences in microplastic density through the water column. Our spatial comparison showed that Bamfield Inlet had the highest concentration of microplastic filaments in the surface water, and our vertical comparison showed the highest concentration of plastics to be found at a depth of 10m. With our recorded observations, we have set a benchmark for future samples to be measured against so that the issue of microplastics pollution can be monitored.

Introduction

As humans, we use plastics in nearly every aspect of our lives. They are non-biodegradable, since natural decomposers do not digest plastic. Therefore, plastics persist as massive pollutants in marine environments (Desforges et al., 2014). Globally, anthropogenic plastic waste is found washed up on shorelines, in the open ocean, and in the deep sea (Browne et al., 2011; Desforges et al., 2014; McWilliams et al., 2017). Microplastics (plastic < 5 mm) in particular end up in ocean water in large quantities (McWilliams et al., 2017). These microscopic pieces are ingested by smaller organisms, make their way up trophic levels, and biomagnify in the bodies of larger organisms, including humans (Lusher et al., 2013). Microplastics enter the ocean from both marine sources such as shipping and fishing, and from land sources such as wastewater, runoff, and rivers. The highest concentrations are found near human habitation (Browne et al., 2011; Desforges et al., 2014). Factors that dictate the abundance and distribution of microplastics in the marine environment are governed by atmospheric currents, density of plastic, and proximity to urban centres (Desforges et al., 2014). Microplastics are a global concern. There is extensive research on the distribution of microplastic globally, with standardized testing in the United

States and the European Union (Rees & Pond 1995).

The Northeast Pacific Ocean is reported to have microplastics throughout the subsurface water, with a mean abundance several orders of magnitude higher than other regions of the North Pacific (including the North Pacific Gyre, the west coast of the United States, and the Bering Sea) (Desforges et al., 2014). Our study area is the ocean surrounding the Bamfield Marine Sciences Centre in Barkley Sound off the West Coast of Vancouver Island. It is part of the dynamic coastal environment of the Northeast Pacific Ocean. This coastline is influenced by high precipitation rates, westerly winds, and relatively strong coastal currents (Mote & Salathe Jr, 2010). Despite a relatively low population density, anthropogenic waste has been found throughout Barkley Sound (Keil et al., 2011; Davidson et al., 2014). Major industry inputs can come from commercial fishing and forestry, while households likely input sewage and grey water.

This study compares the quantity of microplastics near built environments to the amount found in an open ocean by examining at three locations in Barkley Sound. It also looks at vertical distribution of microplastics in one location to understand differences in concentration throughout the water column. Our research builds upon a study conducted on the abundance of microplastics in copepods in Barkley Sound by Davidson et al., in 2014. In addition to relationships we find between location and plastic density, our research aims to put in place a baseline that can be used for comparative studies in future years. If a time series is generated over the coming years, in Barkley Sound and in other locations, we can see how the state of our oceans is changing.

Materials and Methods

Research Site

Our research was conducted out of Bamfield Marine Sciences Centre, on the west coast of Vancouver Island in British Columbia, Canada (Figure 1). Three sampling sites were used to compare microplastic content in surface water:

- Site 1: The top of Grappler Inlet near the inflow of a small creek.
- Site 2: The mouth of Bamfield Inlet where water flows from a small residential area.
- Site 3: Trevor Channel, just outside of Bamfield Inlet, where currents bring water from across the Pacific Ocean.

A fourth site was used for examining microplastic distribution within the water column using multi-depth sampling. This site (Site 4) is located in Trevor Channel, to the northeast of the other sampling sites (Figure 2).

The materials used in this study included a 350-micron mesh plankton net and catchment container, a Model 2030R Mechanical Flowmeter, ten meters of rope, three one-litre holding

containers, a dissecting microscope, s-bend microscope slides, and pipettes.

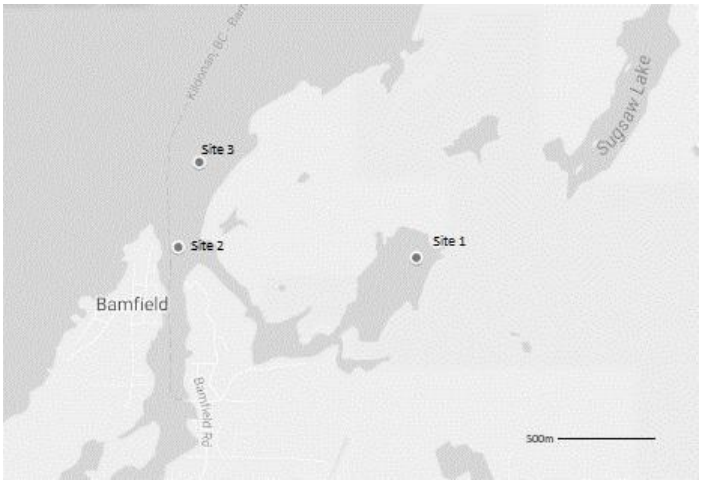

Figure 1. Research area off the west coast of Vancouver Island, where three sites were sampled in Grappler Bay (Site 1), Bamfield Inlet (Site 2), and Trevor Channel (Site 3).

Figure 2. Site 4 in Trevor Channel, where horizontal plankton net tows were done at different depths.

Field Method

Horizontal plankton net tows were done for two minutes each along the surface mixed layer at each of the three sites. This was done using a 350-micron mesh net equipped with a flow meter, which we deployed off the back of a single skiff. While the boat drove in circles, the net's line was let out, keeping the top edge of the net just beneath the surface of the water. Samples were transferred into one litre holding containers and transported to the lab for analysis. Flow meter start

and end readings were recorded for water volume calculation.

Laboratory Method

Compound microscopes were used to examine the samples for pieces of microplastic. We observed ten milliliters of sample water at a time, placed in s-bend microscope slides. From each site, ten of these subsamples were examined for filaments or fragments of unnaturally coloured material measuring under 5 mm in length. We identified pieces of microplastic in accordance with

the *Plastic Analysis Guide* in the appendix of Coyle et al.'s 2016 paper *LADI and the Trawl*. To ensure consistency in the identification of microplastic, each of our two team members examined half of the samples from each location. A control sample of tap water was also examined by each of the two team members to compare with field samples, since microplastic contamination from clothing could affect our samples.

Calculating microplastic concentrations

After summing the total number of microplastic pieces in each site's ten subsamples, we had the number of plastic pieces per 100 milliliters for each site. We used this to estimate the number of pieces picked up in each tow, using the volume of water in each site's sample container. The flow meter readings and net radius were used to calculate the volume of water that passed through the net on each tow so that microplastic concentration could be calculated (See Appendix A for details on the process of calculating microplastic density).

Examining distribution in the water column

A similar procedure was followed to collect samples from four different depths at a single location, where Trevor Channel meets the open ocean. The sample collection was done by another research team who used a 250 micron mesh net to do five-minute horizontal tows at the depths of 10, 20, 40, and 60 metres. Our team used these samples to repeat the laboratory analysis described above and calculate microplastic density at each depth for comparison. The quantity of plastics picked up on these samples cannot be used for comparison with the other three sites since a finer mesh net was used.

Results

The microplastic pieces observed in the lab were almost exclusively fibers and filaments, with very few beads or other shapes. The results provide a comparison between Trevor Channel where plastics may have travelled across the Pacific Ocean, and Bamfield and Grappler Inlets where human activity is likely a prominent source of pollution. Site 2, situated at the mouth of Bamfield Inlet, showed the highest concentration of microplastic fibres between the three sites (Figure 3).

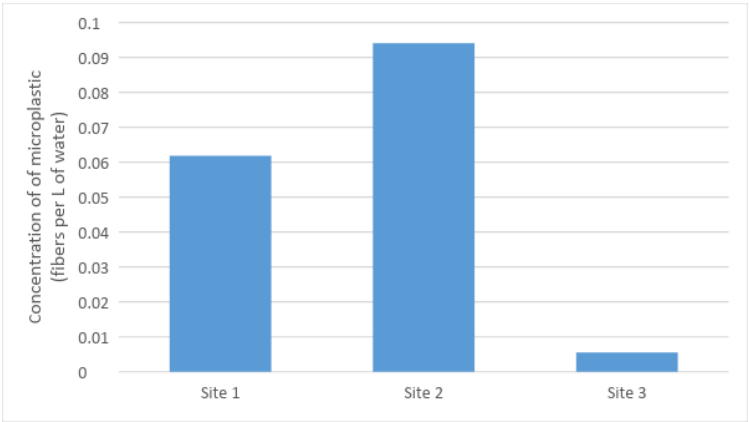

Figure 3. Concentration of microplastics in three sampling sites. Concentration is measured in number of fibres per litre of seawater.

Next, we look at the distribution of plastics in the water column by examining Site 4, farther into Trevor Channel. Figure 4 compares the density of microplastics found in samples collected from the depths of 10 m, 20 m, 40 m, and 60 m at this location. The large majority of plastics were found at a depth of 10 m below the surface (Figure 4).

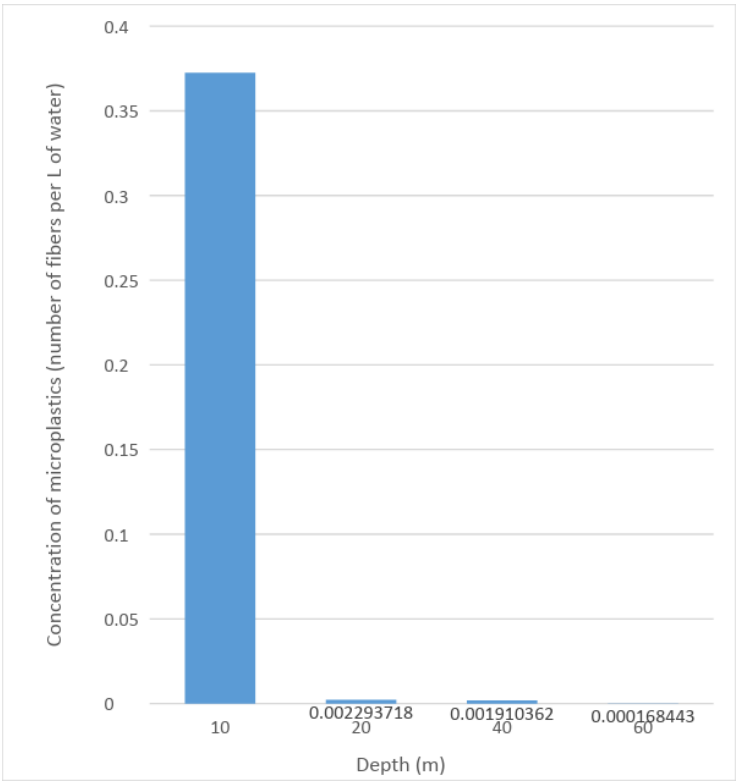

Figure 4. Microplastic density at four different depths in the water column at Site 4.

Discussion

The differences in the concentration of microplastics between the three sites is what we had expected to see based the work done by Desforges et al. (2014), which showed a lower concentration of plastics offshore of Vancouver Island compared to near the coastline. According to our findings, this difference between near-shore sites and more open-ocean sites is even measurable at the small scale. The lowest concentration of microplastics was seen in Trevor Channel where currents bring water from the Western Pacific Ocean. A great deal of dispersal is able to occur from the time this water picks up material off the coasts of Asia to when it arrives off North America.

Comparing our findings in Trevor Channel to our observations of the other two sites shows how proximity to human settlement appears to affect the concentration of microplastics in surface water, as found by Desforges et al. in 2011. We saw the greatest concentration of microplastics at the mouth of Bamfield Inlet, where any water treated by Bamfield's biological wastewater treatment plant has flowed into the ocean. Effluent from other facilities and individual households (treated or untreated) would also be mixing in with the water at this sample site. Sewage filters typically do not retain microplastics which can result in higher levels in the adjacent oceans (Browne et al., 2011).

The concentration of microplastics in the surface waters at the top of Grappler Inlet were lower than in Bamfield Inlet, but still significantly higher than in Trevor Channel. In the study done by Davidson et al., (2014 no microplastics where found in the copepods they sampled. This may be the result of the freshwater input from Sugsaw Creek, which may carry lower quantities of microplastics than the seawater. This likely creates a surface layer with less microplastics, since the less-dense freshwater tends to sit on top of more dense salt water. Different results might be found if similar research were conducted at the mouth of a river which flowed through a more heavily populated area. It would be interesting to compare our results with microplastic concentrations measured where the freshwater of the Fraser River enters the Pacific Ocean after flowing through Vancouver.

Looking at the vertical distribution of microplastics, the highest concentration was observed at a depth of 10 m. This could be expected because thin filaments tend to float rather than settle to the bottom. These results could also be explained by the geography of the sample location in Trevor Channel. Several rivers feed the channel, with one of them running through the town of Port Alberni. It is possible that microplastics are being carried in from the town and staying suspended in surface water that is less salty and less dense than the water in the channel. Alternatively, it could be that the plastics that have traveled into Trevor Channel from across the Pacific are being resuspended because of

upwelling and mixing in the relatively shallow shelf sea. However, these hypothesises would need to be verified with further study.

If we can assume that the problem of microplastics in near-shore surface waters in Asia is similar to what we see here, we can ask why the water coming in from across the ocean doesn't have a concentration of microplastics similar to what we find in our inlets. The North Pacific Gyre should be carrying those microplastics from Asian coasts to our coasts. We can hypothesize that downwelling may account for this. These tiny filaments could eventually settle toward the bottom and be found at deeper depths as they move away from shore. Another possibility is that a large amount of plastic is being consumed by organisms before it can turn up on the other side of the ocean.

The filaments that we observed during our analysis were often smaller than the zooplankton we observed in the same sample. Pieces this small can be ingested by zooplankton and make their way into higher trophic levels (Davidson et al., 2014). This is of particular concern to whales which need to consume enormous numbers of these tiny organisms in order to meet their caloric requirements. For example, the Eastern Pacific Gray Whale consumes about 1.9×10^7 to 7.5×10^7 zooplankton individuals each day (Feyrer, 2006), resulting in massive biomagnification.

Future research on microplastics

This study provides baseline data for abundance of microplastic in three study locations in Barkley Sound. It also allowed to us to understand microplastic variance by depth. It would be beneficial to document microplastic in the same locations every year to create a time series that could be used for comparative studies of microplastic quantities in future years. Future research could also focus on seasonality and abundance of microplastic to understand the influence of changing currents on distribution.

It is clear that as human consumption of plastic increases, the concentration of microplastics in our oceans will increase and continue to pollute our oceans globally. If past research on microplastic distribution is an indicator, providing a comparative study of the region will support the trend of increased levels. Future research could move towards understanding how to mitigate the introduction of plastic into our oceans. This can begin with a localized understanding of the main sources of plastic input. Globally, Browne et al. (2011) found that effluent from washing clothes was a primary source of microplastics across 18 sites. The future of microplastic research could move from studying quantity and distribution to how to best mitigate its introduction into the ocean.

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Appendix A

	pieces per 100mL	volume of sample	total pieces in sample	distance towed (m)	volume of water in tow (m^3)	concentration of plastic at site (pieces/m^3)	concentration of plastic at site (pieces/L)
Site 1	51	1L	510	42.03	8.250489	61.8145179	0.061814518
Site 2	69	1.35L	931.5	50.48	9.909224	94.00332458	0.094003325
Site 3	30	0.160L	48	44.15	8.666645	5.538475385	0.005538475

Table 2. summary of the steps taken in the calculation of microplastic density. Distance towed was calculated by multiplying the flow meter count by the constant given by the flow meter's manufacturer.

Anthropogenic Impacts on Southern Resident Killer Whales: Implications for Conservation Strategies

by: MIKA YASUTAKE, JENNIFER LIPKA, & SOPHIE VIDAL

Southern Resident Killer Whale (SRKW) populations are on a steep decline due to major threats such as reduced prey abundance, ocean pollutants, and marine noise from vessel traffic. An analysis was conducted to determine the geographical scope of these threats, as well as to identify critical disturbance areas using vessel traffic, pollution, and commercial fisheries datasets. The study was quantitative using GIScience and ArcGIS software, allowing for spatial data management such as unifying map projections, as well as spatial data analysis such as tabular and spatial queries, and spatial joins, and spatial data visualization. The results of the investigation are communicated in three maps from which it can be concluded that significant disruptions were found within SRKW habitats, suggesting the need for conservation strategies. As a result, the necessity of factors such as marine protected areas, banning of commercial Chinook harvests, lowered marine speed limits, revaluation of current waste management techniques, as well as the incorporation of pollution caps and water feature considerations in planning strategies of areas in and adjacent of the Salish Sea have been proposed. However, more recent and robust data sets are required for further research and understandings of SRKW impacts. Nonetheless, the rehabilitation of SRKW populations is critical for the protection and preservation of British Columbia's beautiful coastal ecosystem in the future.

Photo by: Brendon Bissonnette

Project Description

The coasts of British Columbia host a globally significant array of ecosystems and species whose sizes range from microscopic phytoplankton to the world's largest animal, the blue whale (Davis, 2017). Within this range lies Chinook salmon and the Southern

Resident Killer Whales (SRKW), also known as "orcas", both of which not only play a significant role in supporting ecological health, but are also powerful cultural icons of BC (Davis, 2017; "Salish Sea," 2018). However, their populations are on a steep decline, with only 75 SRKW left alive ("Help stop Salish," 2019). Research suggests that the three major threats SRKW face are reduced prey availability, ocean pollutants and acoustic disturbances from boat traffic (Raverty et al., 2017). Additionally, urban expansions and proposed projects such as the Kinder Morgan Trans Mountain Pipeline further threatens BC's marine wildlife, including the beloved SRKW. This project would increase the already immense tanker traffic by up to seven times its current load, consequently increasing the potential for oil spills and ecosystem disruption (Hunter & Prystupa, 2017).

Chinook salmon and SRKW are intrinsically linked in the marine food web, with both populations listed as endangered species (National Marine Fisheries Service, 2018). In this paper, a spatial analysis was conducted based on open datasets collected from DataBC and BC Marine Conservation Analysis (BCMCA) of Killer Whale distribution, Chinook salmon commercial catches, and tanker traffic, as well as contaminated properties. The datasets were acquired, parsed, filtered, and mined through geographic analysis to identify critical disturbance areas of SRKW based on fisheries catch values of Chinook salmon, as well as higher tanker traffic areas. The purpose of this project is to encourage SRKW population rehabilitation, while demonstrating the impacts that tanker traffic, pollution, and commercial fisheries have on the precious wildlife of our beautiful coasts. Our aim is to equip government and special interest groups, such as environmental non-profit organizations, with visual data representation in order to augment policy and decision-makers through the proposal of several conservation strategies.

Methodology

Data Acquisition

The data used for this project has been collected from DataBC and the BC Marine Conservation Analysis (BCMCA) websites. The sources of each dataset can be found in the "Table of Dataset" section of this report.

Data Management: Parse Filter

First, we needed to create a clean base map that would display the important information, much like preparing your canvas before you paint. We sketched out the map of BC using coastline and provincial boundaries data. In ArcGIS, the software for editing and displaying geospatial data, we matched up different layers of map data and cut out the area that was relevant to our study.

[Transformations of geographic coordinate systems were not required as the data collected was in unified NAD 83 datum. Data layers were consolidated to BC Albers Equal Area projection to facilitate calculations among the various datasets. In

addition, the base map of BC's provincial boundaries and coastlines were taken from 2016 census data of the Canadian atlas. Select by attribute was used to create a new layer from data with PRENAME = BC, allowing us to delete the original map while rendering a base map containing only data of BC.]

Then, we merged the data for all salmon fishing methods to have one variable to study. Imagine that you have blue paint that you bought from three different stores. Essentially, we blended all of them to have a bigger batch of blue paint. We decided that regardless of fishing method, the important factor that we are studying, is how much Chinook salmon will be gone from the ocean resources and out of orca diet. ArcGIS allowed us to join the different datasets onto one layer.

[For the three sets of commercial salmon fishing layers, data was acquired based on catch method (i.e., troll, seine, gillnet). Both troll and gillnet datasets were joined with the seine layer based on their FAID to have all Chinook fishing data on one layer.] Similarly, based on our research, we found that orcas are most affected by loud sounds created by large ships and frequent vessel traffic. To extract these traits from our data, we made a new category that included vessel traffic total time and size. [The acquired data for vessel traffic included categories such as quarters of the year, vessel length, and vessel age. We created two new columns in the attribute table to parse vessel traffic for total time and size.]

Based on the extent of information we had gathered and past studies, we delineated the area of work on our canvas by creating a new rectangle that would be our final project boundary. [A new layer generated by the edit toolbar was used to clip to all the other layers.]

Data Analysis: Mine

Now that the canvas was prepared, we needed to decide what features would make it on our final painting. The literature highlighted that Chinook salmon is essential to the SRKW's diet; therefore, we decided that we needed to add the amount of Chinook salmon kept as a result of fishing to our data. This would show areas where fishing is intensive and Chinook salmon population is being depleted. [In the attribute table of the commercial fishing layer, a new column named total_chinook was created for further analysis. Using field calculator we set the value to be chinook_kept for all three fishing methods (i.e., gillnet, seine, and troll) to obtain the total amount of Chinook kept in our data years.]

We also chose to include the total vessel traffic time in a year. The data obtained split the vessel traffic into seasonal quarters and other categories, so we had to render a summation of vessel traffic times within a given area. [Data was reclassified using the field calculator.] Then, we selected from the new category, vessel traffic for ships that are equal to or greater than 200m.

The final feature that we included is a pollution layer. We

couldn't find direct data for water pollution. However, we found land pollution data that allowed us to approximate for water pollution. We assumed that water flowing near areas of soil pollution would inevitably be contaminated. We drew in an approximate shoreline, then highlighted areas within 500m of water features (coastline, rivers, and lakes), and found pollution points that can be found within that area. These points were added as critical sites of pollution.

[An approximated coastline was created by constructing a 1m one-sided outside buffer of the provinces polygon. A double-sided 500m buffer was then added around all water features (i.e., coastline, rivers, lakes), which was then unioned and dissolved to create a new layer. Using select by location, all pollution points within the buffer were identified and concluded to be critical sites of pollution.]

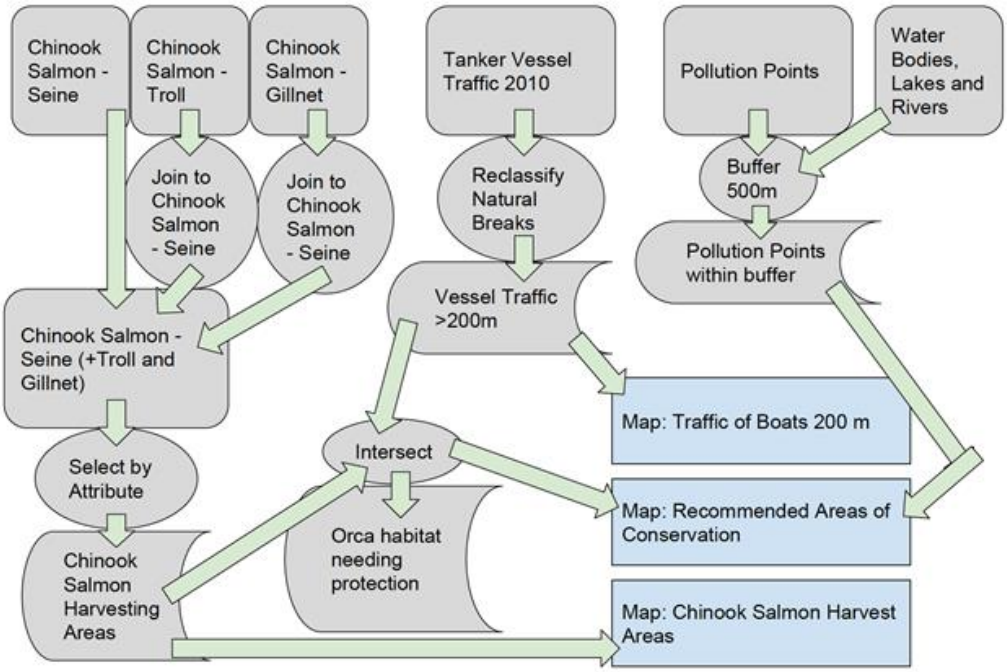


Figure 1. This flow chart image shows the different actions taken to each layer to create the maps.

Table of Dataset

Layer / datafile name	Source	Uses	Entity/data model	Attributes	Modifications
Chinook Salmon – Commercial Seine	BCMCA	To find where there is the most chinook caught	Vector/Polygon	CHINOOK_KE (Fished and harvested Chinook)	Attribute Join, Field calculator to get total_chin caught
Chinook Salmon - Commercial Troll	BCMCA	To find where there is the most chinook caught	Vector/Polygon	CHINOOK_KE (Fished and harvested Chinook)	Attribute Join, Field calculator to get total_chin caught
Chinook Salmon - Commercial Gillnet	BCMCA	To find where there is the most chinook caught	Vector/Polygon	CHINOOK_KE (Fished and harvested Chinook)	Attribute Join, Field calculator to get total_chin caught
Tanker Vessel Traffic 2010	BCMCA	To find the areas traffic for boats >200 m	Vector/Polygon	L6, L7: hours of traffic for vessels with length >200	Field calculator for tanker traffic for >200
Contaminated Properties	DataBC	To find areas of potential marine polution	Point Layer	Addresses	500 m buffer from coastline, rivers and lakes
Distribution of Killer Whales	DataBC	To get percentagest of areas impacted by fishing and tanker traffic	Vector/Polygon	Likely Killer Whale Distribution	Intersect and create new layer with Traffic, Intersect and create new layer with Salmon, Area calculation
Rivers and Lakes	Census Data 2016	Base map	Vector/Polygon	Rivers and Lakes	Buffer 500 m and create new layer
Washington Boundary and Coastline	Washing State 2016	Base map	Vector/Polygon	State Boundaries	None
Provincial British Columbia Boundary and Coastline	Census Data 2016	Base Map	Vector/Polygon	Provincial Boundaries, CT, DA etc.	Select by attribute' BC and deleted other provinces

Table 1. This table shows the descriptive attributes of the layers used to create the maps.

Chart of Area Totals

	Total (km2)	Traffic (km2)	Fishing (km2)	Traffic and Fishing Union (km2)
Orca Distrubution	9615	4831	5046	2999
% of Orca Distribution	100%	50.24440978	52.48049922	31.19084763
Recommended Areas of Conservation	-	19759	7301	3965

Table 2. This table shows the total square kilometers within each of the designated categorized areas.

Visualization Maps and tables: Represent

Our target audience is the government and marine conservation groups who would be interested in using our maps for policy implications and decision-making. Therefore, our representations were made in consideration of the public's range of knowledge levels.

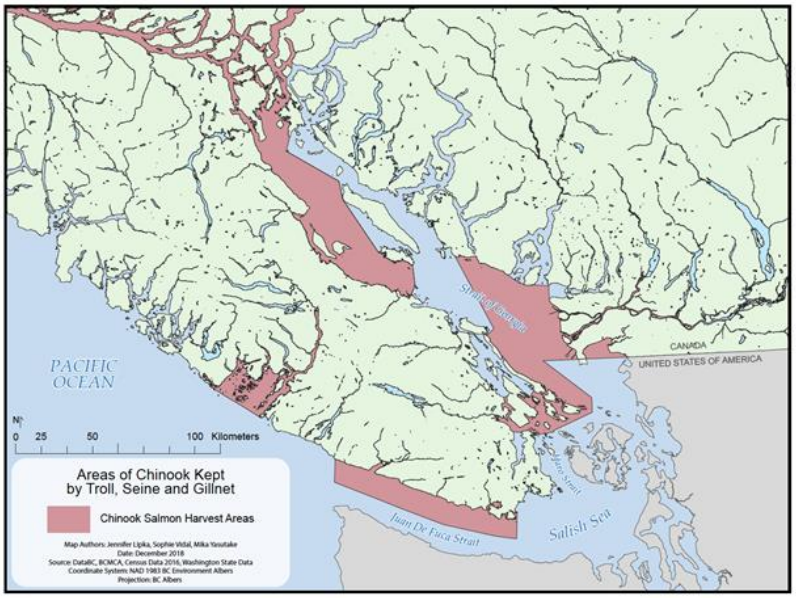
Map 1 identifies areas where commercial Chinook salmon fishing occurs with troll, seine, and gillnet fishing techniques, based on BCMCA datasets of 2001-2007 Chinook Salmon commercially caught. It demonstrates the significant geographical expanse in which Chinook fishing occurs within the Salish Sea and surrounding waters.

Map 2 demonstrates areas occupied by tanker traffic based on minutes per day within the Salish Sea and surrounding waters. It showcases the high density tanker traffic route through the Strait of Georgia, Haro Strait and Juan de Fuca Strait, as they predominantly enter or exit from the Pacific Ocean. The geographical context

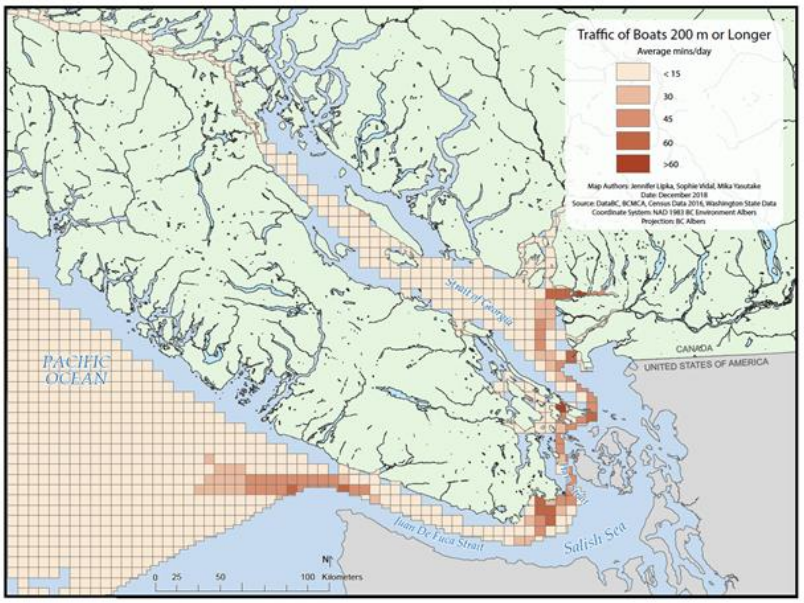
contributes to the density by funneling tankers through the area, creating a bottleneck effect. All noted values are based on 2010 tanker vessel traffic acquired from DataBC.

Map 3 highlights proposed orca protection areas, where regulations should be implemented to hinder or ban tanker traffic and commercial fishing, as well as monitoring strategies to ensure compliance. This map also showcases critical pollution points retrieved from DataBC's 2017 contamination sites dataset, based on their proximity of 500m to water features such as lakes, rivers, and coastlines within the project boundary.

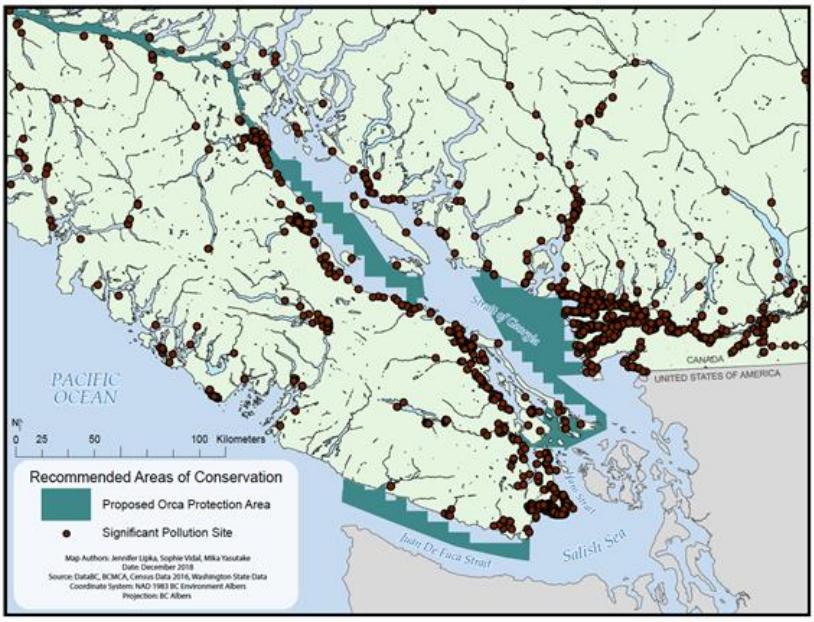
Map 1 - Map of Chinook Salmon Harvest Areas in BC from 2001-2007



Map 2 - Map of Vessel Traffic of Boats 200m or Longer in BC for 2011



Map 3 - Map of Proposed Orca Protection Areas and Significant Pollution Sites in BC



Results and Discussion

Three key factors have been identified as major threats to SRKW populations: reduced prey abundance, marine vessel disturbances, and anthropogenic contaminants (Raverty et al., 2017). As a result, our analysis was based on the intersections of these factors in conceiving strategies to

rehabilitate SRKW populations within the Salish Sea.

Endangered Chinook salmon are the primary food resource of the SRKW population, with orcas being their largest biomass consumers. (Fearnbach et al., 2018; Wasser et al., 2017; Chasco et al., 2017). It has been found that the river mouths of the Salish Sea and Puget Sound (among others) are critical hunting grounds for SRKW as some of the most crucial Chinook salmon stock return to these locations to spawn. (National Marine Fisheries Service, 2018).

A spatial analysis was conducted to identify areas of Chinook salmon harvest hotspots within orca distribution areas based on commercial catch data, where it was found that commercial fishing activities are conducted in 52.5% of critical SRKW distribution areas, as shown in Map 1. This finding shows that a significant portion of SRKW hunting habitats are disturbed while the abundance of prey are compromised due to increased competition within the area. The considerable Chinook harvest values by commercial fisheries of the region pose a significant threat to the livelihoods of SRKW, who require an estimated 190,000 - 260,000 adult Chinook salmon each year, whose population is also threatened (National Marine Fisheries Service, 2018; Chasco et al., 2017). Therefore, promoting the recovery of Chinook salmon populations is imperative to enhancing the population growth of SRKW (Wasser et al., 2017). Thus, we recommend the banning of all Chinook harvesting within SRKW distribution areas until both populations are rejuvenated to more robust levels. Despite the likely short-term consequences on commercial fishery revenues, access to other salmon varieties with significantly stronger populations carries the potential to cushion the impacts of a Chinook harvest ban. Compensating with the harvest of other salmon species is likely to have a positive impact on economic, social, and environmental sustainability for both SRKW and Chinook salmon species in the future.

Another significant threat to SRKW populations is marine noise pollution and other ecological disturbances stemming from vessel traffic. Research shows that exposure to noise at or above 180-dB likely results in significant behavioural, physiological, and/or hearing impacts on SRKW, such as reductions in time spent foraging and increased energy expenditures from vessel responses (Nowacek et al., 2012; Lusseau et al., 2009; Noren et al., 2009). As a result, the amount of noise generated by boats within the study area was extrapolated.

Although smaller vessels are more likely to get closer to SRKW individuals, studies have also shown that larger vessels generate low-frequency ambient noise capable of travelling longer distances underwater, masking killer whale communications while interfering with echolocation signals (Houghton et al., 2015; Ross, 2005). Large commercial ships weighing 54,000 tons and approximately 250 m in length, will create 188-dB of sound 1m away (“How does shipping,” 2017). Therefore, we

conservatively decided to focus our analysis on all ships greater or equal to 200m in length to extrapolate for the frequency of noise disturbance within the study area. In our vessel data, we found that columns L6 and L7 represent the correct length of ships where we were able to plot the accumulated hours that each area would be occupied. Our analysis showed that most ships funnel through the Strait of Georgia, Haro Strait and Juan de Fuca Strait, where at least one hour of tanker traffic was experienced every day of the year within those areas, as shown in Map 2. Furthermore, out of the estimated distribution of SRKW within the Salish Sea, we found that 48.3% was occupied by large vessel traffic for at least an average of 15 mins per day, demonstrating significant geographical disturbances of critical SRKW distribution zones.

Vessel speed is another important indicator of marine noise pollution, where greater speeds are correlated with greater disruptions (Houghton et al., 2005). In order to minimize marine disturbances caused by vessel traffic, we recommend that lower marine speed limits be established in critical SRKW distribution areas.

Both impact factors of commercial Chinook salmon fishing and large vessel traffic individually carry significant implications for SRKW livelihoods within the Salish Sea. Our analysis found 31% of orca distributions to be of critical threat due to the existence of both high vessel traffic and commercial fishing factors. Nonetheless, we found the DataBC killer whale area distribution datafile to be underestimated compared to other published reports and may be in part due to the fact that the data was derived from fisheries officer interviews. Consequently, critical disturbance areas were identified without heavy reliance on killer whale distribution data by intersecting regions affected by both commercial Chinook fishing and large vessel traffic within our entire study area. Thus, four critical areas that require immediate protection have been identified, as shown in Map 3. The total recommended conservation area is 3,965m^2, which may be argued to be a conservative value relative to the amount of protection SRKW requires for recovery. Nonetheless, we would like to recommend these areas to be implemented as marine protected parks as a strategy to rehabilitate SRKW populations to more healthy levels.

Another major threat to SRKW survival is pollution. In the Salish Sea, marine pollution has been found to not only stem from marine sources such as exhaust emissions, but also from terrestrial anthropogenic origins resulting in conditions such as increased marine nutrient levels and plastic debris. This carries significant environmental, physiological, and behavioural implications on the survival of both marine species and ecosystems (Davis & Murphy, 2015; Khangaonkar et al., 2018; Lundin et al., 2018). Therefore, based on the understanding of the ocean as the depositional basin of many natural cycles (i.e., hydrological, sedimentary, etc.), critical pollution sites were identified as point data, using the "select by location" tool to determine

significant terrestrial pollution sites located within 500m of coastlines, rivers, or lakes.

From our analysis, we found 3,276 points located within areas of high implication potentials for water features (i.e., coastlines, rivers, lakes) in our study area alone. However, the scope of our analysis was largely limited due to the lack of licensing and knowledge of hotspot mapping and network mapping. Nonetheless, many of the critical pollution points were found to be located in areas of the Lower Mainland, Fraser Valley, Victoria, and along the east coast of Central and South Vancouver Island, as shown in Map 3. As a result, this finding highlights the immediate need of redressing waste management systems in areas of higher population densities or incorporating planning strategies based on pollution caps and water feature proximities.

SRKW are key indicators of environmental health, while being a high trophic predator whose loss carries the potential for serious implications on the marine food web (Raverty et al., 2017). Orcas are not only significant to BC's coastal ecosystem, but also for economic revenue and cultural significance. Nonetheless, our analysis has found significant geographic disturbances within SRKW distribution areas caused by pollution, high vessel traffic, and commercial fisheries. Within the Salish Sea, conservation strategies of banning Chinook harvests, lowering vessel speeds, creation of marine protected areas, restructuring of current waste management strategies, as well as incorporating pollution caps and water feature proximities into municipal planning strategies, have been suggested. Protection of the SRKW carries the potential to bring significant benefits to all stakeholders. However, once lost, SRKW cannot be brought back. For this reason, the implementation of these conservation strategies are likely to bring positive benefits for SRKW, as well as other species of BC's coastal ecosystem in the future.

Error and Uncertainty

Much of the error and uncertainty surrounding our analysis emerged from the data that was collected. As data can be understood as information taken of a snapshot in time and as a tool that is used to make informed decisions, problems arise when historical data is used for policy and decision-making where contexts may have changed over time. Although the data of our study was collected from reliable sources of governmental and scientific entities, uncertainty and error may arise from the fact that most of the information used in our analysis is outdated (i.e., more than five years old). For example, the killer whale distribution layer is from 2011, while the Chinook salmon catch datasets were collected from 2001-2007. As a result, the robustness of our analysis and recommendations may be compromised by the age of the information used, rendering inaccurate results for today's contexts, especially in a time of frequent ecological disruptions and rapid climatic changes. However, due to the fact that data was collected in a time when SRKW populations were greater and pollution

and vessel traffic values were lower, it is likely that the extent of our recommendations may be too conservative for the adequate protection of SRKW species.

Moreover, not only are the datasets outdated, but the collection methods and ethics of some of these layers may also be questioned. These factors of uncertainty are epitomized by the killer whale distribution data and pollution layer. The killer whale distribution dataset was produced by the Ministry of Forests, Lands, Natural Resource Operations and Rural Development based on interviews that were conducted with fisheries officers without distinguishing specific species of killer whales. The method in which the vessel traffic data was collected is not mentioned, while the data is displayed in coarse resolution of 5 km by 5 km grid cells. Furthermore, the pollution layer lacked sufficient detail in its metadata, resulting in high levels of ambiguity in terms of the implications of the results. The ethics of the pollution dataset must also be acknowledged as it contains addresses of specific points of contamination, highlighting individual buildings including residential homes, possibly having implications for privacy impeachment. Moreover, inconsistencies within the data collection process were found. For example, the Chinook harvest datasets were collected across varying timescales, ranging from one year to six years; thus, having impacts on value reliability. Key sources of error and uncertainty have been identified as the lack of sufficient metadata and recent data, as well as controversial data collection methods and ethics.

Furthermore, our very own bias about the problem may have also impacted our GIS analysis as our concern for the whales comes from an environmentalist's perspective. Therefore, the approach of our analysis was largely shaped by our own bias and the way that the issue was perceived.

Nonetheless, wicked problems such as biodiversity loss are often complicated with a myriad of variables. As a result, uncertainty in our analysis may also arise from the fact that only three key threats were analyzed, while compounding factors such as the increase of marine pathogens, ocean acidification, and global warming may also be significant contributors to the decline of the SRKW species.

Further Research and Recommendations

Given the aforementioned error and uncertainty sources, multiple points of recommendations arise for further research. A significant limitation within our study was the lack of publicly available, robust and recent data, such as marine pollution and reliable SRKW distribution layers. As a result, the involvement of more stakeholders such as whale watchers and environmental entities is recommended for more rigorous and up-to-date data to be publicly available. Furthermore, frequent collaboration with the US government is called upon for more comprehensive data of waters surrounding the US and Canada. In doing so, this is likely to provide greater protection of our coastal ecosystems,

contributing considerable benefits for both parties.

Due to the nature of our skillset, a major constraint was experienced in reference to the depth of our analyses. In reference to the investigation conducted on critical pollution sites, a network analysis would have enabled the understanding of the most critical or impactful sites of terrestrial contamination leaching into marine environments, as well as areas where higher concentrations of marine pollution may exist based on urban watersheds. Furthermore, a multivariable analysis would enable greater understandings of the relationships between and amongst SRKW populations and its major threats. This would take into account the weighing of different factors, rendering a more robust and comprehensive analysis of the situation; consequently enabling more adequate conservation strategies with prioritized variables. Therefore, the incorporation of recent and rigorous data, as well as the use of more analytical tools is recommended for further research for the protection of SRKW species and the Salish Sea.

From our research, it appears as though multiple interacting forces (beyond the three factors of our investigation) are working against the SRKW. However, further research is required to delve into the intricacies of these factors and understand their interactions in impeding the growth of the SRKW population. In light of this cumulative effect, further research into what actions would best benefit the recovery of SRKW is required.

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The City from Above: Contributions of Condominium Towers towards an Urban Uprising

by: SABRINA OUYANG

The rise of condominium housing has transformed mechanisms of homeownership and driven densification in urban cores. With the proliferation of class structure and rising housing prices, these properties have redefined what housing signifies in an urban context. Outlining the role of condominium towers in the evolution of urban space, this paper describes the history of condo towers and the impact of their development, specifically in Vancouver. In particular, the increase in human density due to residential skyscrapers and the surge in downtown living is examined. The paper also explores the role of social media and the trend of "rooftopping" in relation to downtown's skyscrapers, providing an alternative perspective to the seemingly exclusive nature of these urban monoliths.

Figure 1. Condo towers in Yaletown and Olympic Village, viewed from a Cessna 172. Concord Pacific Place developments are visible at the left, near the BC Place stadium; the Olympic Village is on the shoreline of False Creek just above the center of the image. (Photograph by the author, June 2017.)

In a fast-paced urban environment where housing and human density have come to be central issues in politics and policy, condominium towers are revolutionizing the way people interact with local, regional, national, and transnational space — helping to reproduce an increasingly intricate global space of flows. Historically, civilizations saw the construction of towers as a demonstration of political power, superiority, and a method to rise above those around them. In the medieval era, towers served to fortify the security of castles and to barricade royalty and feudal lords from the

suffering of the surrounding masses. With the rise of industrialism in the nineteenth century, structures such as the Eiffel Tower were built as global spectacles to showcase technological achievement. However, it was only in the late nineteenth century — when steel-framed buildings first earned the term "skyscraper"[5] — that towers came to be regarded as suitable for routine commercial and office functions as well as residential use (Skysaver, 2018). Several decades of complex historical, geographical, and technological trends intersected — the upper floors of the first skyscrapers commanded lower rents until the widespread availability of fast, reliable elevators — eventually culminating in "hybrid" high-rise exchange and office towers that connected producers and consumers across globalizing commodity chains (Dennis, 2008; Holdsworth, 2018). In the residential domain, the introduction of condominium towers in the twentieth century began to unleash a subtle revolution by subdividing the ownership of space vertically as well as horizontally.

A condominium is a category of real estate in which the property is divided into several units — separately owned, with common spaces that are shared by the condo owners — and membership in a management structure. While often misinterpreted as a physical structure, condos are an "invented legal and social relationship among property owners" (Lippert & Steckle, 2014, p. 133). From its introduction, the condominium form of ownership has been seen as a "legal mechanism with enormous potential to effect positive social change" (Harris, 2011, p. 703; Vancouver Sun, 1966).[6] Over time, cities with expensive central-city housing markets have seen rapid growth in condominium ownership. Many stakeholders have come to value the role of condominium options in encouraging higher-density living, which enables increased efficiency in transportation and certain kinds of public services. Over the course of several decades, the proliferation of condo towers has transformed many urban cores from rental neighbourhoods to landscapes dominated by vertically-partitioned homeownership. Condominiums were first introduced in British Columbia with the Strata Title Act (1966) and then shortly thereafter in many other Canadian provinces (Rosen & Walks, 2015). The first condo development in British Columbia appeared in the Vancouver suburb of Port Moody in February 1968 (Harris, 2011). Since then, "the development of Vancouver's housing market [has often been] in the form of high-rise condominium towers in the central city and along rapid

[5] According to Skysaver, the earliest printed evidence for the term skyscraper appeared in *The Chicago Daily*, when referring to the Home Insurance Building, which opened in 1884 in Chicago and stood 10 stories high, at 138 feet.

[6] As noted by Harris (2011), a 1966 *Vancouver Sun* editorial suggested that the new Strata Titles Act "has special significance for Vancouver, with its downtown core crowded onto a small peninsula. It raises new possibilities for office and apartment developments above the Canadian Pacific Railway yards. Small investors will be able to participate in high-rise development, and it may bring back to the city more families who are attached to the idea of owning their own home. The possibilities it raises, of course, are limitless."

transit corridors" (Quastel, Moos, & Lynch, 2012, p. 1065). Many of the early condo developments, as observed by Ley (1996), have been built in or near the city's established middle-class districts. For a growing number of "new middle class" workers employed in postindustrial service occupations, condominium units enabled homeownership in inner-city locations that became attractive alternatives to the suburbs.

However, condominium towers are often built without going through valid public review and the negative impact of the developments on surrounding neighbourhoods are evaded. The drastic change that the buildings can impose onto neighbourhoods are left without consideration, and the lack of transparency regarding zoning regulations and construction impacts leave the community uninformed. In a *Vancouver Sun* article published in November 1972, Christy McCormick reported that sixty-one rental apartment buildings in Vancouver and surrounding conurbations were to be converted into condominium buildings (McCormick, 1972). More common was the demolition of old rental structures "to make way for new condominium buildings" (Harris, 2011, p. 709). The adaptation and annihilation of rental districts to make way for condominiums displaced tenants, undermining the localized sense of community in long-established neighbourhoods. In nearly all cases, new condominium units were sold at prices well beyond the capacities of displaced renters, driving gentrification in neighbourhoods through the influx of more affluent occupants.

As standard condo towers have evolved into luxurious residential skyscrapers, they have become vertical indicators of the intensified global-city competition that has become a pervasive dimension of planetary urbanization (Sassen, 2001, 2002). Along with the sky-high office towers of the corporate "command and control" centers of the global economy, elite luxury residential towers now help to define the skylines of today's competitive metropolises. These coveted homes are subject to transnational bidding wars and thanks to their preposterous prices, many are left vacant: "in a select — yet expanding — group of cities," "transnational wealth elites" use the high-rise home as a "safe deposit box, a place to store their excess capital safely" (Aalbers, 2019, p. 6; Fernandez et al., 2016). Localized blocks of eerily empty space stand in the shadow of the vertical bank vaults that have become omnipresent amidst planetary overaccumulation (Harvey, 2014). Consider the structure that is, at least for the moment, the tallest residential building in the Western hemisphere: 432 Park Avenue in Manhattan, New York, which boasts a height of 1,396 feet (426 meters). Current estimates imply that only half of the units are consistently occupied.[7] In New York, the number of apartments sold above the US$15 million price point increased by 47

[7] This is an estimation - in reference to current sale and rental listings for the building, available at https://streeteasy.com/building/432-park-avenue, one quarter of the units are currently unoccupied, and thus one half is an estimated fraction for those who reside in the tower full time as their primary residence.

percent between 2009 and 2013 (Municipal Art Society of New York, 2013, p. 16). For elites intending to live in the skyscrapers, verticality provides spectacular views and privacy far above the rest of the city — one is reminded of Jonathan Raban's (1974) portrayal of the "sky people" who live and work in the top floors of the global city — whereas investors and the coalitions of urban growth machines understand the vertical as a beckoning frontier of growth, a seemingly unlimited vista for the production of new urban assets. But in the same way Richard Sennett reacted to Raban's portrayal of London in the early 1970s as an historic juncture that exposed the illusions of modernity — Sennett (1974, p. 7) suggested that Raban "believes that, in the cities of the past, contrivances of façades was … the organizing principle of social life" — one can draw a present-day parallel between the modern prestige of residential high-rises to the noble towers of the medieval era, as both serve to fortify the distinction between social classes in the conurbation.

Vancouver's residential-dominant downtown is unique in North America. The prevailing pattern of twentieth-century urbanization in the U.S. and Canada created a downtown core serving as an economic center of office and retail land uses, with residential landscapes gravitating outward on an expanding suburban frontier (Kaplan, Holloway, and Wheeler, 2014, p. 117-132). Thanks to a late-twentieth century confluence of historical-geographical circumstance and public policy interventions, however, Vancouver has come to defy the traditional notion of "downtown," with residential density out-bidding office and retail functions. As a result of such developments, along with the retail and service establishments situated at the base of many of the condo towers, a more "activated socio-spatial environment" (Ranta, 2016, p.10) has been encouraged along many downtown streets. This unconventional framework for urban development and design was consolidated in the 1980s and 1990s, and subsequently transformed the city's skyline into a globally-recognized spectacle of architecture and urban design (Punter, 2004). A central node of this transformation, on the north shore of the tidal inlet False Creek, is Concord Pacific Place — a comprehensively planned mega-project that structures a "trans-pacific property transaction" (Olds, 1998, p. 377), connecting Hong Kong developers and investors with local municipal officials and buyers spanning the range from the metropolitan region to the vast diasporas of families and investors across East Asia (Ley, 2010). The land, a vast tract of former railroad switching yards and light-industrial structures, was cleared to host the World Exposition in 1986 — as part of a coordinated municipal and provincial attempt to rebuild the precarious economic base of a region heavily reliant on natural resource exports. In a transaction that local journalists dubbed "the deal of the century," the province sold one-sixth of the downtown core as a single parcel to Hong Kong billionaire developer Li Ka-Shing. Li Ka-Shing's son Victor, working with partner Terry Hui and negotiating with planners enabled by comparatively strong powers under the Vancouver City Charter, developed a

dense urban residential neighbourhood of condominium towers, townhouses, parks, boat marinas, and a pedestrian seawall (Harris, 2011). Concord Pacific Place evolved from, and now contributes to, a global "space of flows" (Castells, 2001, p. 582) that links major urban economies and societies in a dynamic and competitive trans-Pacific interdependency. Additionally, Concord Pacific Place is a catalyst for the immense increase in the city's downtown living, allowing many to gain access to the exclusive views of Vancouver's central district.

The luxurious vertical property ownership that has remade the core of the city over the past half-century is increasingly inaccessible to renters, poor and working-class immigrants, aspiring middle-class homeowners, and the indigenous families upon whose unceded lands the entire metropolis is built. Among all the peoples denied the privilege of regularly looking down upon the city, however, perhaps we can learn the most about urban change from those who are willing to live in the moment and have a seemingly insatiable desire to gain temporary access to these exclusive, elevated spaces of privilege. In recent years, Vancouver has become an epicenter of an increasingly popular, subversive activity: "rooftopping".

Defined in the *Urban Dictionary* as a transgressive activity "also known as buildering," and an "offshoot of urban exploring," rooftopping entails climbing onto the roofs of existing buildings, or the cranes of towers under construction — "preferably the higher the better. Done to take pictures or just for kicks." (CTV News, 2018; Urban Dictionary, 2009). The highest residential edifices of Vancouver's urban core have become prominent targets for rooftoppers. They boast their multitude of photographs and videos taken at the pinnacles of Vancouver's concrete jungle, flaunting their exclusivity in the cityscape. Typically, the subject of the shot is standing near the edge of the building or dangling their feet off of the side, demonstrating their dare-devilish achievements of athleticism, risk, and mischief. By doing so, they defy the constrictions of urban social control, severing boundaries and eroding public space. The publishing of these images onto social media launches condominium towers into yet another space of flows: the internet. Global recognition is regularly gained for radical behaviour captured on these exclusive spaces, and oftentimes, the images flaunt spectacular sceneries — in turn challenging rooftoppers in other cities to undertake their own attempts to break local boundaries. In this way, transgressive rooftopping highlights the speedy yet risky essence of luxury verticality, etching a "cities as systems within systems of cities" competitive dynamic within a transnational space of flows of people, images, and capital (Berry, 1964; Castells, 2001; Sassen, 2002). At the moment, the rooftopper who scaled the "Tallest Crane in Vancouver" at Vancouver House — the city's first residential tower classified by international real estate analysts in the "Super-Prime" luxury category — has more than 10,000 views on YouTube (YouTube, 2018).

The rise of residential condominium towers is reshaping the functions and skylines of cities around

the world. Condominium towers have evolved far beyond the pragmatic possibilities of innovative housing solutions. While uniting people spatially through increased human density, the towers segregate people vertically through intensified price-per-square foot competition and high-technology systems for access control and surveillance. The towers connect cities, corporations, and people transnationally through dynamic interdependencies of debt and investment, while serving as icons for city planning and transgressive artists pursuing social media audiences. As they weave residential life and representations of urbanism into the global space of flows, condominium towers serve as powerful catalysts in the ongoing urban uprising of contemporary planetary urbanization.

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Trail Six Editors

Nigel Tan

Editor-in-Chief

Nigel is a third-year environment and sustainability major who is extremely proud to have this opportunity to work with such an amazing group of writers and editors. He is constantly discovering and rediscovering new points of fascination within the myriad fields of geography, especially clean energy and environmental living. While he is unsure of where the future may lead, he hopes to one day be able to make contributions towards balancing sustainability and economic growth in society. Beyond academia, his hobbies vary greatly, from exploring urban cityscapes, to nature photography.

Andrew Butt

Andrew is a fifth (and final!) year Geography student in the Environment and Sustainability program. His passion about education, with a focus on bridging the gap between the environmental and social sciences, and love for the outdoors has driven him across the world. From Toronto where he was raised, to northern Canadian rivers, to the mountains of British Columbia, and to the wonders of overseas travel and culture, there is no telling where Andrew may end up next. He is always looking for new ways to get involved, and extremely excited to be part of the Trail Six team!

Jose Carvajal

Jose Carvajal is a fourth-year international student from Costa Rica. He is pursuing a degree in International Relations and Human Geography and on his downtime enjoys learning languages and walks to Jean Beatty park. He is currently interested in issues regarding environmental politics, class issues, the emergence of right-wing populism in the Global North and intersectional approaches to exclusion.

Jamie Chan

Jamie is in her third year of undergraduate studies majoring in Psychology and minoring in Human Geography. As an international student, she has spent the past few years travelling between Vancouver and Hong Kong, experiencing both the rich yet complex urban matrix that these cities have to offer. She aspires to explore the linkage between how cognitive processes studied in psychology would manifest in the greater context of society. In her free time, you would probably find her café-hopping around the city and eating her way through the semester. She's excited to be on board as Editor this year.

Richie Chan

Richie is a third-year undergraduate currently pursuing a major in Environment and Sustainability Geography and a minor in International Relations. He is the quintessential Vancouverite and loves hiking, biking, ultimate frisbee and anything that involves the outdoors. He hopes to do field work abroad in the future searching for solutions to many of the unanswered challenges that stem from the field of geography and is heavily invested in the idea of becoming a travelling nomad.

Phoebe DeLucco

Phoebe is a fourth-year Geography student, majoring in Environment and Sustainability and minoring in Urban Studies. She grew up in various countries in East and Central Africa and owes her interest in geography and fascination for different cultures, customs, languages, foods, etc., to her nomadic upbringing. Her interests include reading, writing, art, cities, travelling, and videos of unlikely animal friends. After graduation, Phoebe plans to expand on her urban studies minor and possibly pursue a masters in sustainable urban planning in hopes of one day planning a sustainable city in the developing world.

Carly Gardner

Carly is a fourth year Geography student in the Environment & Sustainability program. She is fascinated in the relationship between humans and the environment, particularly as we face the challenges of global climate change. In her free time, Carly can be found exploring cities and nature, trying out new hobbies and handicrafts, and searching for positive approaches to complex issues. In the future, she hopes to apply her background in urban studies and climate science to a career in environmental law and/or public policy.

Nicholas Hare

Nicholas is a fourth year Environment and Sustainability major. His academic interests include human ecology, political geography, and GIS. He enjoys volunteering with local nature and historical organisations. Nicholas loves sports such as soccer and running. He enjoys seeing the work that his fellow geographers produce and is excited to be returning for a second year of editing Trail Six.

Nicolo Jimenez

Nicolo Jimenez is a fourth year Political Science and Geography Honours student at the University of British Columbia. His research interests include sustainable and resilient development, political ecology, international migration, public management, and comparative politics. Upon graduation, Nicolo hopes to pursue graduate studies at the intersection of geography, politics, and theology. During his free time, he enjoys playing sports, listening to podcasts, and being in community. With a passion for student leadership and scholarship, Nicolo is a recipient of the Walter G. Hardwick Scholarship in Urban Studies and Katherine Brearley Arts Scholarship.

Maya Korbynn

Maya is a third year Geography student majoring in Environment and Sustainability and minoring in Urban Studies. She has extensive experience editing publications and reports, and has a technical writing background in engineering, business, and the humanities. She is interested in all things urban, and intends to pursue a Masters degree in Urban Design or Landscape Architecture so that she can better design urban spaces for more equitable interaction and increased sociability. When not reading about urban planning and architectural developments, she writes for a travel blog, skis, and works as a ferry captain.

Angela Liu

Angela is a second-year student in the Environment and Sustainability program with a minor in Environmental Science. She is also part of the Geography Students' Association as VP Administration. Angela is passionate about biodiversity conservation, ecology, and puns, and although the future is hazy, she hopes to pursue a path of research, but she would also settle for ice cream taste tester.

Josh Medicoff

Josh is a fourth year Human Geography and Political Science double major. Academically, his scope of study includes migration studies, political geography, urbanization, and security studies. Apart from school, he enjoys film, taking photos, biking around Vancouver, being celiac, and the brand Patagonia. Finally, please bear with him as he is beginning a slow transition into vegetarianism.

Aaron Obedkoff

Aaron Obedkoff is a fourth-year human geography student. His scope of study includes urban, political geography and English Literature. He is very proud to be part of a faculty with such a passionate group of students and is excited for another year with Trail Six. Outside of the library his interests include hiking, playing guitar and brewing kombucha.

Elana Shi

Elana is a second year Geography major in the Environment and Sustainability program. She is particularly interested in geomorphology and GIS, and aspires to work in conservation and sustainability efforts in the future. She joined Trail Six to engage in the field of geography, and also learn about what her peers are working on. Outside of school, she enjoys making crafts, going to beach clean ups, and has recently taken up mahjong.

Maddy Stewart

Maddy is in her third year studying Geography (Environment and Sustainability). She is incredibly interested in marine science, completing two study abroad programs in FIJI and the Caribbean with a focus on marine biology. Currently, she is working on a research project with SEEDS and volunteers at UBC's Beaty Biodiversity Museum. After completing her undergraduate degree, Maddy is interested in furthering her studies in marine geography specifically on tropical ecosystems.

Eva Streitz

Eva is in her fourth year of her Geography degree (Environment and Sustainability). While she doesn't know what she'll be doing after college, she does know that she is passionate about renewable energy policy and social justice. She hopes that someday she can help make a big shift towards a greener planet, but in the meantime, she will be skiing, climbing, and playing in the mountains.

Deanna Shrimpton

Deanna is a fifth-year Geographical Sciences major, concentrating in geomorphology, climatology and GIS, and working towards a designation as a professional geoscientist. She has spent much of 2018 working and playing with flumes in UBC Geography's hydraulics lab. Outside of learning about Earth systems processes, she likes reading books, hiking and playing board games.

Danielle Main

Editor and Layout & Design

Danielle is in her final semester before starting her graduate degree in UBC's Master of Sustainable Forest Management. Outside of academia, she enjoys winter sports, hiking, dance, Montana, anything mountain or plant related, and cinnamon buns from Grounds for Coffee.

Author Autobiographies

Alex Briault

Alex Briault is in her final year of her Geography degree majoring in Environment and Sustainability. A lifelong love of terrible natural disaster movies sparked her interest in the study of natural hazards and, through learning to cook, her passion for issues surrounding food waste developed. Though she will disagree, Alex likely drinks too much coffee. Outside of school, Alex has run 3 half marathons and will run a full marathon before graduation.

Abdo Souraya

Abdo is a fourth year LFS student, majoring in Global Resource Systems. His academic interests include nutrition, food security, and food economics, with the goal of contributing to the improvement of environmental and socio-spatial inequities in the global food system. Having recently completed an exchange in Holland, Abdo is currently re-tracing his roots in the Levant. When not launching into existential rants with friends, family (sorry mom), or the occasional stubborn non-flowering tomato plant, Abdo enjoys the great outdoors, finding new music, and practicing meditation.

Matt Campos

Matt is a Human Geography major and Arts Co-op student pursuing a career in urban planning and sustainability. Born in Boston and raised in a quiet New England suburb, he eventually developed an interest in Canadian cities and social policy, encouraging him to take Geography courses at UBC. Born to parents who work in artificial intelligence, data ethics, and international banking, Matt has been inspired to pursue research on global data governance. In his ongoing GIS and Urban Studies coursework, he investigates how cities can be equitably and sustainably planned while ethically utilizing data mapping tools. In his paper, Matt seeks to explore trends in global politics that he believes merit our attention.

Bruce Pagnucco

Bruce Pagnucco is a Human Geography major at the University of British Columbia. His academic interests include urban design and active transportation. Bruce is an outdoor enthusiast who savours every second he spends in the sunshine. He enjoys hiking, swimming, and playing soccer. Finishing his degree in May, he hopes to pursue a career in urban planning.

Gillian Der

Gillian is descendant from CPR workers and Head Tax payers on her father's side and settlers from the British Isles on her mother's side. Gillian's ancestry and cultural heritage continually inform her academic process and work. Gillian's work is situated at to crossroads of critical race theory and sustainability. She imagines a future where intersecting injustices such as borders and climate change might be collectively challenged. In her time away from UBC, Gillian can be found in Vancouver's Chinatown coordinating special projects such as campaigning for proportional representation and organizing an Asian vegetable centric CSA program with the hua foundation.

Morika DeAngelis

Morika DeAngelis is a fourth-year Geography and Urban Studies student, born and raised in Vancouver. Her research interests focus on environmental politics, sustainable urban development, and equitable design in public spaces. Her academic career was fostered through the opportunity to participate in exchange at Humboldt University in Berlin, and through volunteer experience in non-governmental organizations in Vancouver, including ISSofBC. She hopes to complete a Masters Degree in Urban Planning, because it combines a holistic, multi-disciplinary approach to designing for the generation of tomorrow. Her hobbies include finding the best pastries at Breka Bakery, hiking and running the Seawall.

Michele (River) Walter

River is a fourth-year Geography student majoring in Environment and Sustainability. Her degree focuses on using what she learns in academia to understand how her position as an immigrant-settler can be used to support climate and social justice movements. She has learned an immense amount from her conversations on the unceded xʷməθkʷəy̓əm (Musqueam) homelands that the University of British Columbia continues to be located on. As a Thai-Canadian she spent her childhood between Krung Thep (Bangkok) and Vancouver and constantly grapples with what role she can play within the commodified tourism that has now taken place in her country of birth.

Robyn Perritt

Robyn studies at Thompson Rivers University. She is passionate about whales and how they communicate with each other and with humans. Her co-authored paper on the abundance of microplastics in this journal is thanks to the course she took at the Bamfield Marine Sciences Centre on Vancouver Island.

Mika Yasutake

Mika Yasutake is a fourth-year student in the Environment & Sustainability Program, as well as the B+MM Dual Degree Program. With her unique academic background, she hopes to leverage businesses as a force for good in the near future with long-term sustainability as a core principle of development. Beyond the four-walls of a classroom, however, Mika can be found engaging in climate activism, or at the ocean where she's often left feeling smitten over a nice sunset.

Jennifer Lipka

Jennifer Lipka is a fourth year B.A. Geography Environment and Sustainability student. Her academic interests are in biogeography, GIS and pollinators. She is interested in learning about the relationships between plants and pollinators and how they are affected by climate and land use change. She has served as an executive member on the Geography Students' Association for the past two years (Vice President of Sustainability and Vice President of Academic). Her passion for education has led her into lecturing about organic gardening at VanDusen. She has a future goal of attending graduate school.

Sophie Vidal

Sophie Vidal is in her final year of studies in Geography at UBC, majoring in Environment and Sustainability, and with a strong background in Biology. Having lived and studied in both Shanghai and Vancouver, she is interested in studying how cultures and society shape cities and laws. In her free time, Sophie is an avid lover of giving city tours to unveil the invisible vestiges of history. She is also super passionate about her plants and strives to apply her learnings in her home and help others do the same!

Sabrina Ouyang

Sabrina is a third-year Biology major with a minor in Urban Studies. Her interest in the study of cities came naturally with her love of learning about different cultures and lived experiences, and she especially appreciates the multidisciplinary nature of the discipline. Through her time living in cities such as London, Shanghai and Vancouver, she has uncovered her interests in issues including urban sustainability and ethnic inequality. When she is not studying or stressing over school, Sabrina can be found brunching with family, backpacking in the BC backcountry or flying a Cessna 172 over the Georgia Strait.

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