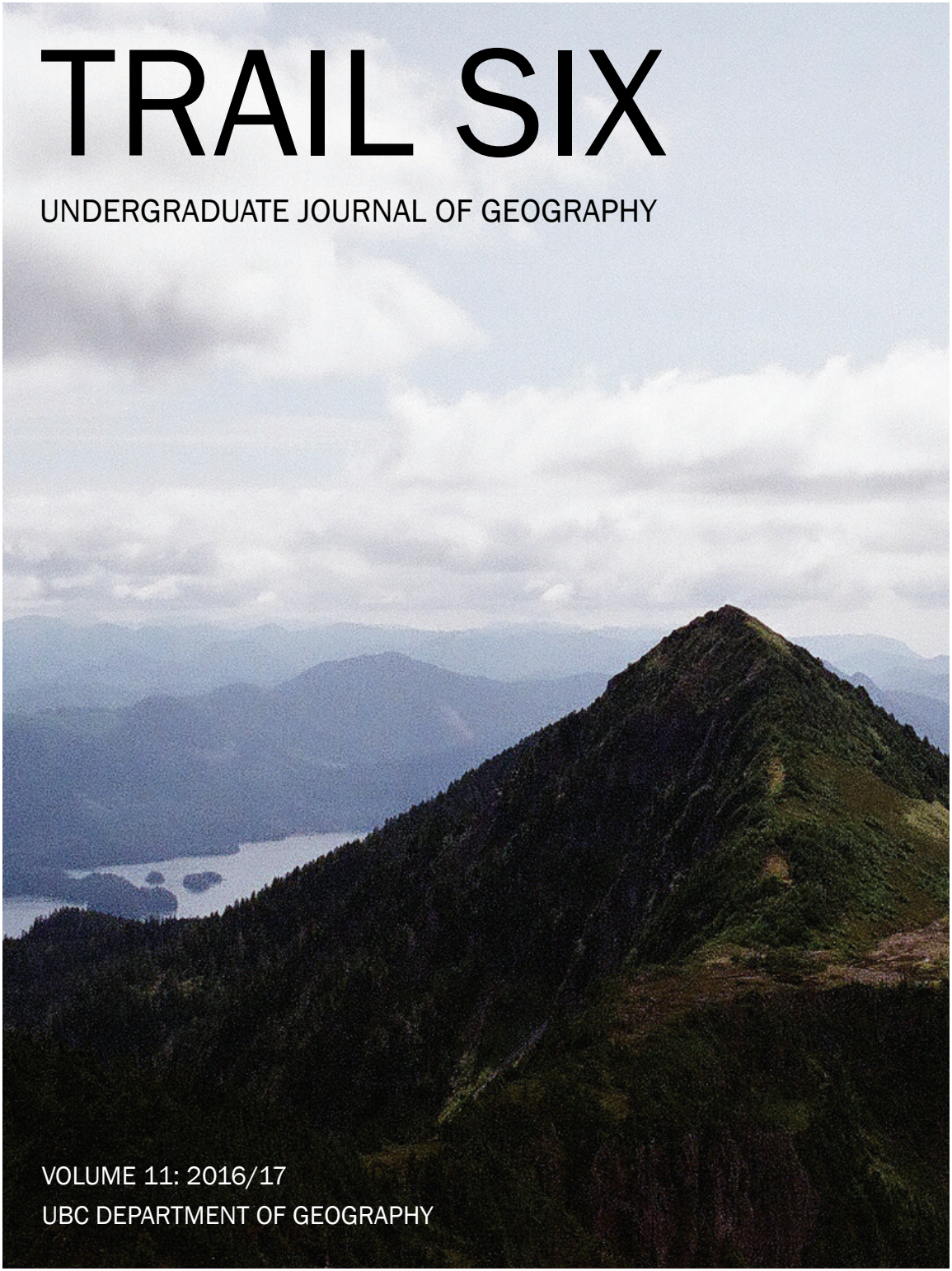
TRAIL SIX

UNDERGRADUATE JOURNAL OF GEOGRAPHY



VOLUME 11: 2016/17

UBC DEPARTMENT OF GEOGRAPHY

Looking west towards Slatechuck Mountain, Haida Gwaii.

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VOLUME 11 : 2016/17

GEOGRAPHY STUDENTS' ASSOCIATION
DEPARTMENT OF GEOGRAPHY
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Land Acknowledgment:

We acknowledge that UBC's Point Grey Campus is located on the traditional, ancestral, unceded territory of the 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

It is my privilege, as Department Head, to once again provide a Foreword for the annual issue of Trail Six. Since I first joined UBC Geography 1989, I have been continually awestruck by the outstanding work produced by our students. This publication is a fine example of the talent and community service that the authors, coordinators, designers, peer reviewers, mentors, and editors invest in our department. And because of their hard work, we all benefit.

This edition's discussions around Polish economic development, the Paris agreement, return migration policy, the privatization of water, and landslide threats reflect some of the broad interests of our students. The thoughtful comments on these subjects as well as on cyberterrorism, the 'quantified self', Vancouver car shares, and harvest boxes show some of the ways that students are engaging at local and/or personal levels on their research topics. They also have us reflect upon our own activities, values, and the community in which we live.

I congratulate each author and the editorial team for a job well done. This is the eleventh Trail Six publication and in every issue you impress the reader with your professionalism, enthusiasm, and skill – this issue is no exception.

Dr. Marwan Hassan

Department Head

Letter from the Editors

We are elated to share the eleventh edition of Trail Six, the University of British Columbia's undergraduate journal of geography. As an academic publication, it is imperative that we acknowledge the contextual circumstances that situate the research we promote. This year's edition of Trail Six follows a tumultuous period in global politics and the world economy. Students at the University of British Columbia's Department of Geography continue to generate critical research that is of relevance to the public sphere and academe alike, and this substance is finely captured by this year's journal. We hope that our collection of exemplary articles may initiate critical dialogue that allows our audience to develop a greater understanding of the topics that are addressed.

The interdisciplinary nature of the field of geography is reflected by the range of topics explored through these articles. We would like to thank each author for contributing inventive and compelling pieces that, collectively, have produced one of Trail Six's most dynamic editions to date. We are indebted to our editorial board, layout team, and faculty reviewers for upholding the stylistic and academic integrity of our journal with unparalleled tact; you form the backbone of Trail Six and your tireless efforts have paid off.

This volume addresses an assortment of local, regional, and global topics from the human and physical facets of geography. Situated at the intersection of the natural and social sciences, Trail Six continually seeks to disseminate innovative and original scholarship that appeals to the diverse intellectual palate of our readership. To encourage this, we are delighted to announce that content published across all eleven volumes of Trail Six has been made publicly available at trailsix.geog.ubc.ca. The digitization of our publication is founded on the principle that open-access research supports a global exchange of knowledge and cements its legacy at the University of British Columbia and beyond as a nationally-recognized academic journal. We hope you enjoy Volume 11 of Trail Six as much as we do.

Hyunsoo Kanyamuna and Nicole Rich

Editors-in-Chief

Development Ideal Versus Reality: The Relationship of Return Migration and Development

By Phebe Ferrer

When considering the potential of return migration in development, Van Houte and Davids describe it very well; "return is increasingly seen as the natural thing to do for migrants, while at the same time positive influences for the country of return are attributed to it" (2008, p. 1411). With recent shifts in theory and policy, return migration has been hailed as the natural, fix-all medicine needed to counteract the brain drain migrant-sending countries experience (de Haas, 2010; Hugo, 2012). Is return the key for development, and should it be required of migrants? This article argues that while return migration can impact development, the relationship of the two is complex and context-dependent. This article will explore the theoretical shift that has turned to prioritize return migration, as well as the conditions needed for return to successfully influence development, framed by two case studies of Cape Verde and Nigeria, which emphasize the importance of meeting these conditions in light of the optimistic view towards return. This article intends to highlight the importance of recognizing that it is a migrant's choice, whether direct or indirect, and not an automatic condition, to help develop their home countries (de Haas, 2010; Hasan, 2015). Understanding this theoretical shift and corresponding conditions are crucial if one is to prioritize return migration as the policy for governments to follow.

When considering the potential of return migration in development, Marieke Van Houte and Tine Davids describe it very well: "return is increasingly seen as the natural thing to do for migrants, while at the same time positive influences for the country of return are attributed to it" (2008, p. 1411). Indeed, with recent shifts in theory and policy, return migration has been hailed as the natural, fix-all medicine needed to counteract the brain drain migrant-sending countries experience

(de Haas, 2010; Hugo, 2012). Paul Collier, a renowned economist featured in an episode of Aljazeera Head to Head, similarly states of an obligation that refugees and migrants have in eventually returning to their countries to help rebuild and develop (Hasan, 2015). Knowing this fact, should return migration be a policy goal for destination countries, so that they may assist with the development of sending countries that have benefitted their economies with valuable labour? Is return the key for development for these sending countries; to enrich them with financial and human capital to better their economies and societies? Should return be required of migrants? In considering these questions, this article will argue that while return migration can have an impact on development, the relationship of the two is complex and heavily dependent on context, as well as on the assumptions inherent in migration and development theory. It cannot be automatically assumed to have a role in development, but rather must be analyzed considering key trends within a certain context.

The first part of this article will briefly explore the theoretical shift that has turned to prioritize return migration, and consider the conditions needed for return to successfully influence development. The second part will then present and analyze two case studies, namely of Cape Verde and Nigeria, which meet these conditions and display their effects on the development potential of return migration. Finally, the last part of this article will critically examine theoretical assumptions and framings of return, and cite areas for further consideration in future analyses of its relationship with development.

In migration theory, migration itself was initially seen as a one-way journey, with the assumption that "'those who left never returned'" (as cited in Eborka, 2014, p. 190). Any return to the home country would be seen as a failure as 'successful migration' was perceived as integration with the host country (Brandão and Zoomers, 2010). Until recently, return migration has been largely dismissed in development theories, which have instead been dominated by the overarching debate over whether migration benefits or harms migrant-sending developing countries (de Haas, 2010). Theories such as historical-structuralism and neoclassical theory hardly consider return in their arguments. For example, historical-structuralism argues that migration is inherently

damaging to developing countries, as underdevelopment in those nations continuously drives more out-migration of valuable skilled labour, leaving no room for return to the home country (de Haas, 2010). However, this is not to say that return was entirely neglected. Theories in the 1950s and 60s viewed return migrants as "important agents of change and innovation," and they were expected to bring back financial and human capital that would further drive the development already expected from migration (de Haas, 2010, p. 231). This optimism towards return would boom again in the 2000s as new evidence showing the positive effect of remittances emerged, thus renewing hopes for the benefits of return and encouraging more government policies towards this (de Haas, 2010). All in all, these theoretical trends portray the optimistic shift towards return migration that has given it the positive status it now holds in the development debate.

As for the actual success of return in influencing development, context largely determines this result. First, the more general assumption of success in migration is contingent on the migrants returning with better financial, human, and social capital than would have been possible in the home country (Brandão and Zoomers, 2010; de Haas, 2010; Van Houte and Davids, 2008). This mainly points to enhanced incomes, education levels, and social networks that result from migration. Any result other than an increase in these points would be seen as failed migration on the part of the migrant (Brandão and Zoomers, 2010). Development from return would then be driven by the productive investment of this capital into areas that would lead not only to personal investment but to national development (de Haas, 2010). For this success to occur, this article has identified three main conditions that need to be met, which have been derived from trends apparent in the literature. First, as a baseline, there must be strong foundational government policies which give migrants a sense of social and financial security, as well as the ability to translate their new capital into developmental contributions (Brandão and Zoomers, 2010; de Haas, 2010; Eborka, 2014; Van Houte and Davids, 2008). The migrant herself must then be in a situation where she is able and willing to contribute. This includes the consideration of factors like financial stability and whether her return was forced or voluntary (Brandão and

Zoomers, 2010; Eborka, 2014; Van Houte and Davids, 2008). Finally, the society in the home country must ideally be open to the change that these migrants will bring (Brandão and Zoomers, 2010; Van Houte and Davids, 2008). If the home society is resistant in accepting the new innovations and ideas that migrants bring then their new capital will be wasted. As the authors of the following case studies point out, "a lack of suitable local conditions in migrant-sending countries makes return migration a missed opportunity and a waste of potential" (Brandão and Zoomers, 2010, p. 287). Thus together, these three conditions can at least partially determine the development potential of return, depending on the extent to which they are fulfilled.

With these in mind, this article will examine two case studies to demonstrate the significance of considering context in return policies and goals. The first case, a study of migrants to Portugal from Cape Verde conducted by Frederico Brandão and Annelies Zoomers, showcases a relatively better scenario (2010). As per the first condition, the authors observe extensive governmental, as well as intergovernmental, policies targeted towards migrants that ensure stability and give large incentives to return and invest (Brandão and Zoomers, 2010). These include agreements with host countries to allow migrants to receive their pension earned abroad in Cape Verde, as well as special migrant savings accounts to encourage spending and investment (Brandão and Zoomers, 2010). With these kinds of programs, migrants were expected to greatly contribute to national development; however, as the study showed, these benefits were not fully utilized (Brandão and Zoomers, 2010). This can be explained by the second condition, where individual migrant experiences are taken into account. The benefits afforded to migrants were shown to be dependent on the amount of financial capital they gained, which is related to the length and nature of a migrant's stay in the host country (Brandão and Zoomers, 2010). Thus, policies like the pension plan and savings accounts only benefitted migrants who fit the criteria for these. For the former policy, it mostly benefitted older male guest workers who stayed in Portugal for 10 years and up, and for the latter it benefitted migrants who mainly worked abroad, as opposed to those who migrated to pursue higher education (Brandão and Zoomers, 2010). Therefore,

depending on the migrant's individual profile and migration, return programs can have varying success in generating and encouraging migrants' contributions. This can additionally be further hampered by a lack of willingness in the home society to accept the innovations migrants bring home. In this study, the authors noted significant resistance from the home society towards the new ideas migrants had to offer in the workplace, which wasted the potential of their human capital (Brandão and Zoomers, 2010). Thus, the context of the migrants' return in Cape Verde reduced their development potential, leading to a lost opportunity as the existing policies and societal attitudes towards return migrants did not effectively accommodate their needs and contributions to their home society.

The second study by Kennedy Eborka considering return migration in Nigeria displays a more negative scenario (2014). Where Cape Verde has an abundance of governmental policies affording security and investment opportunities, albeit with few results, Nigeria has an overall lack of such policies to incentivize migrants to return and invest (Eborka, 2014). Though there are established diaspora groups that engage with Nigerian migrants around the world, Eborka notes that these are not able to work in the significant way that governmental initiatives would otherwise be able to (2014). Additionally, migrants perceive little financial or social security at home, which further discourages their decision to return (Eborka, 2014). When considering the second condition, one striking aspect that sets Nigeria's case apart from Cape Verde is that the majority of returns are forced or involuntary (Eborka, 2014). Many migrants become stuck with failed asylum applications in other countries or are deported back to Nigeria for various reasons, and so they mostly unwillingly return home (Eborka, 2014). More "successful" migrants were observed to mostly choose not to return, because of the political instability and rampant corruption that they perceived would threaten their social and financial security (Eborka, 2014). The lack of government policies to help migrants with reintegration and investment back into their societies also builds on this, and so overall those who involuntarily returned home did not have a strong incentive to contribute to Nigeria's development (Eborka, 2014). Thus with the first two conditions unmet, with a

lack of foundational government policies and resulting unwillingness of migrants to contribute to their home societies, the third condition of an open society is rendered obsolete. While this aspect is not extensively explored, one can expect that with most return migrants being forced to return to an unstable society with no assurance for security or benefit, it no longer matters if the society accepts changes brought by migrants as these will almost automatically be diminished by instability in the country. Thus in the case of Nigeria, the conditions within the country not only discouraged return but negatively affected the actions of those who did, mostly unwillingly, return.

Overall, these case studies demonstrate that return migration does not necessarily result in positive development. These studies show that there is a need for good foundational and context-sensitive policies that encourage return, and more comprehensive data collection on return migrants and their contributions to national development. All the authors noted a lack of data in these cases which prevented an adequate understanding of this phenomenon, as it is currently not common for host countries to record the exit of return migrants, nor for home countries to evaluate their contributions (de Haas, 2010; Van Houte and Davids, 2008). Such information would surely benefit future studies and policies in this topic in understanding the frequency of return migration and its impact on migrant sending societies, and it ideally should be collected if return will be genuinely pursued as a policy goal.

Considering these cases and the actions needed if return will be considered as a tool for development, this article turns to analyze the theoretical assumptions behind return migration and highlight areas for further consideration. Firstly, all migration and development theories, whether optimistic or pessimistic about return, frame migration as labour migration, thus automatically connecting migrants' incentives with personal or national developmental outcomes (Van Houte and Davids, 2008). Considering that the development potential of return is heavily dependent on context, this type of analysis is arguably too deterministic, or in other words, very limiting in its automatic correlation of migrants' actions with sure developmental results. As was explored in the case studies, individual migrant profiles and migrations also impact the effects of return, and not all

migrants necessarily intend or are able to contribute to national development. Unlike the predictions of deterministic theories, migrants do not follow strictly rational models. Thus, rather than viewing return as an automatic responsibility for migrants, as Collier and other scholars propose, this article argues that it is important to recognize a migrant's choice, whether direct or indirect, to help develop their home countries (de Haas, 2010; Hasan, 2015). Agency is present in all cases of migration, even in highly limited situations like that in Nigeria (de Haas, 2010; Van Houte and Davids, 2008). In this regard, analyses that emphasize context while acknowledging major trends in return migration would greatly benefit future studies and government policies. One good example is the approach taken by Van Houte and Davids with their concept of 'embeddedness.' This concept recognizes that there are certain overall key trends that best cultivate contributions from return, alongside more specific circumstances that also influence outcomes, which in this case is the migrants' sense of belongingness in their home societies (2008). Lastly towards assessing government policies, this article argues that host country governments must employ more effective assistance programs that allow migrants to exercise more rights and maximize on their migratory experience, such as allowing migrants to apply for work during the asylum application process (Van Houte and Davids, 2008). This aspect highlights the importance of viewing migration as a two-way process, and that the success of development through return is reliant on the policies of both host and home countries, rather than just on the latter.

In conclusion, if return migration will be considered as the key towards the development of migrant-sending countries, then there must be a consideration for both the relative conditions and common trends that exist in return. Additionally, the existing assumptions in migration and development theory must be critically analyzed in how return is framed. Governments must also have and commit to effective government policies towards this end, including more comprehensive data collection to fully evaluate the impact of return on national development. Overall, return migration is a complex phenomenon that cannot be automatically related to development. However, if it will be focused on as the tool for development then it must be genuinely

pursued. The conditions necessary to make it a success, namely strong foundational government policies, return migrants that are able and willing to contribute to their home societies, and an openness in these societies to receive the changes brought by these migrants, must be accounted for; and the fact that return itself is just one among many factors in development should be a foundational principle in its implementation as policy.

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Digitized Belligerence

By Hyunsoo Kanyamuna

The prominence of the internet in 21st century life is indisputable. By virtually eliminating the physical restraints of time and space, the sophistication of digital technology has brought rise to the acceleration of development in both rural and urban contexts. The latter will serve as the focus of this paper, which uses the city as its site of analysis. The depiction of the internet as a panacea of social, economic, and political significance is largely unopposed. Consequently, it is easy to overlook its repercussions on contemporary social relations. Louis Wirth's concept of anomie, characterized by estrangement and social alienation within cities, informs this investigation into the sociological roots of acts of terror. By drawing connections between urban theory and security studies, this paper presents the internet as the breeding grounds for the digital manifestation of belligerence: cyberterrorism.

Introduction

Largely attributed to the exponential sophistication of technology, the way in which we view and interact with the world is evolving. Whether it be the simple act of checking for the time on a smartphone or tinkering with the complex mechanical systems underlying the hoods of our vehicles, the rising prevalence of technology is unparalleled and ultimately unavoidable. The emergence of the Information Age has created a 'space' that is free from the geographical conventions of 'place': the internet. The centralization of information online may be advocated for purposes of intelligence and efficiency, though, if compromised, the consequences risk being devastating. Though the internet as an entity may not be sentient, it directly projects the human experience. It serves as a virtually unregulated platform that hosts the physical world's range of ethical and moral principles. Like happiness becoming a smiling emoticon, terrorism becomes cyberterrorism. While proponents of innovation may frame technological advance as a panacea of social, economic,

and political value, this paper places an emphasis on its repercussions for a digitizing society. Gone are the spatial and temporal restraints of the physical world. In cyberspace, civilians, firms, and governments alike are targeted by terrorists who are no longer impeded by the friction of distance and time.

The international scholarly field of security studies has paid little attention to the social processes underlying the emergence of cyberterrorism. Studies on estrangement and the prevalence of social alienation within cities, developed by sociologist Louis Wirth in *Urbanism as a Way of Life*, will form the sociological foundation of this inquiry. Contemporary analyses tend to neglect the origins of cyberterrorism and the study of its sophistication in parallel with our growing dependence on technology. Instead, there is a disproportionate focus on the culmination of the cyberterrorist's agenda: the act of violence, the crime's fundamental motive(s), and how to prevent its recurrence. There is a tendency for scholars to dismiss the digitization of 21st century urban life as a key propagator of terrorist ideology, recruitment, communication, and operation. This paper will argue that the emancipatory power of the internet alleviates a by-product of the modern city: the state of anomie described by Wirth (1938) as "social disorganization in technological society" (p. 13), thereby creating favourable conditions for the development of the extremist ideology that is at the root of (cyber)terrorism. By drawing upon key ideas in urban theory and security studies, I attempt to bridge this gap between the city and the rise of cyberterrorism.

Part I: Urban Theory

The Internet and the City: Emancipation and Estrangement in the Virtual Public Sphere

Cities are often regarded as one humankind's greatest accomplishments. They are sites of governance, commerce, and innovation among other processes. They become a part of our identity as we assimilate into our communities, dictate our lifestyle through the provision of services and proximity to amenities, and set the stage for innumerable interactions with individuals like ourselves, each imbued with lives as idiosyncratic as our own. Unfathomably complex yet remarkably organized, the city is a phenomenon that exists at the core of urban studies scholarship and continually

captures the interest of academics across diverse disciplines. However, amid organized chaos and the adoption of neoliberal ideology, its inhabitant, the citizen, may feel reduced to a cog in a capitalist system.

Today, the Earth's landscape hosts a historically unprecedented degree of urbanization. According to the United Nations Department of Economic and Social Affairs' most recent *World Urbanization Prospects* report, more than half of the world's population currently resides in urban areas (Department of Economic and Social Affairs: Population Division, 2015). The organization's global population forecast for 2050 is expected to reach 66 percent urban, of which "90 per cent of the increase [is] concentrated in Asia and Africa" (Department of Economic and Social Affairs: Population Division, 2015). This trend is central to the concept of 'planetary urbanization,' a theoretical framework of global proportions that has gathered momentum in the field of urban studies. The unit of observation for this section is the city, which we will analyze in this context of planetary urbanization.

American sociologist Louis Wirth, a pioneering scholar of urban studies, presents the city as a site that lacks intimate characteristics. This paper applies Wirth's theoretical framework to a contemporary context, introducing a domain that has heavily influenced the urban landscape: cyberspace. Propelled by the growing pervasiveness of the internet and its accompanying technological innovations, cyberspace is construed as a new dimension that has been added to the city. With its introduction, the parameters of social, political, and economic processes must be redrawn to reflect the transcending of spatial and temporal restrictions.

Wirth's sociological study of the city is based on the relationships between three variables: (a) numbers of population, (b) density of settlement, and (c) heterogeneity of inhabitants and group life (Wirth, 1938, p. 10). The physical manifestations of each of these three factors are contributors to the sentiment of isolation that may be held by members of the urban populace. This behavioural phenomenon governs the social processes occurring in the city, guiding the urbanite's motivations for constructing relationships while simultaneously cultivating an emancipatory dynamic that stems from anonymity.

Numbers of population. The first

of Wirth's three variables is concerned with the aggregate size of a city's population. Because the city is dynamic and reflexive, the character of its inhabitants is shaped by its complexity. An array of socio-economic backgrounds, temperaments, and other external and internal traits circumvent the homogenization of the population. As the population size increases, the variance between urbanites grows exponentially. Though Wirth argues that such interactions are conducive to the "…sophistication and cosmopolitanism of the urbanite" (Wirth, 1938, p. 16), there are repercussions to this trend as well. Conflicting identities and interpersonal tension may arise alongside greater "potential differentiation" (Wirth, 1938, p. 11) between individuals. Instances of discrimination against race, national origin, skin colour, age, gender, disability, or religion consequently emerge from the creation of asymmetric power relations. This prejudice is frequently rooted in historical trajectories such as colonization or the slave trade and may be perpetuated by the sharing of a mutual identity between individuals. Empirical evidence exists to reinforce Wirth's observation of the city's differentiated populations, which is witnessed in the spatial organization of urbanites. For example, people belonging to a similar income tier tend to aggregate in the same neighbourhoods. Likewise, communities sharing the same language and ethnic or racial identity may convene in the same neighbourhoods, forming ethnic enclaves. This example is increasingly relevant as immigration to cities becomes more commonplace, for they are perceived as sites of opportunity and tolerance.

Density of settlement. Wirth's second variable accounts for the density of the city's population. As the total number of residents increases, the nature of the relationships held between one another undergoes a definitive change. Similar to how the sustenance of an ecosystem is regulated by the concept of the *carrying capacity,* certain features of the urban experience are compromised as population sizes trend upward. Unlike the self-correcting use of negative feedbacks in the ecological analogy (e.g. death, insufficient supply of food and habitat), population densities in cities are fueled by the self-interest of the urbanite. A combination of sticky economic and social motivators (e.g. job security and familial connections, respectively), particularly those unique to the area, add friction to

movement between cities. Subsequently, the population swells. As more people enter the city, the number of social interactions increases accordingly. Faced with a large and growing population, the size of the city becomes a "limit [to] the possibility of each member of the community knowing all the others personally" (Wirth, 1938, p. 11). The consequence of this occurrence is a lowered "mutual acquaintanceship," (Wirth, 1938, p. 11) where people are no longer familiar with all inhabitants of their community. Instead, the number of acquaintances increases immensely and, "of people whom they see and with whom they rub elbows in the course of daily life, they know a smaller proportion" (Wirth, 1938, p. 12).

Heterogeneity of inhabitants and group life. Throughout the life of the urbanite, one is bound to meet certain individuals in particular settings that dictate the nature of their relationship. For example, friendships formed with classmates in university are typically more informal than relationships held with colleagues in the corporate workplace. The latter regularly necessitates compliance with industry standards, including the expectation of a professional demeanour and respect for the bureaucratic hierarchy. This variance leads the urbanite to compartmentalize their relationships based on "status in the differentiated social groups that compose the social structure of the city" (Wirth, 1938, p. 16). As heterogeneity increases, boundaries between contrasting social groupings become more pronounced. For instance, the urbanite may carry a different demeanour at work than the one they may hold when socializing with classmates or meeting with members of their extended family. There is an inclination to keep these relationships separate from one another and, therefore, anonymity intensifies in the context of inter-class interaction.

Viewed in conjunction with the neoliberal capitalist ideologies that pervade the 21st century city's culture of consumption, Wirth's ideas are not unwarranted. As an entity acting upon its own self-interest, the urbanite's economic rationality is perpetuated by the phenomenon of globalization. As operators of capital flow and centres of financial activity, cities are nodes of power in the internationalized urban system. It is the localization of individual processes at the level of the individual, carrying the competitive disposition of the global economy, that project the need

for rational economic behaviour onto the city dweller. The hostility of competition in social and economic domains lead the urbanite to prioritize their own well-being, compromising intimacy in exchange for tangible benefit.

Between social and economic responsibilities such as shopping and running errands, the city facilitates the urbanite's ability to go through life unnoticed. Wirth explains how "the "superficiality, anonymity, and transitory character of urban-social relations" (Wirth, 1938, p. 12) lead them to forge relationships in accordance with their utility to their own lives. This modelling of the urbanite as *homo economicus* describes them as rational beings that act upon their own self-interest; one's economic benefit is a measure of their intrinsic value. This is emancipatory for the urbanite as they are freed from the "personal and emotional controls of intimate groups" (Wirth, 1938, p. 12-13). If a person no longer contributes to another's well-being, be it the advancement of their career or an increased accessibility to resources, their acknowledged existence may be dismissed or reduced to that of an acquaintance in the populous urban city. Under these circumstances, the urbanite loses the spontaneity of human relationships to the social constructs of the city, leading to the anonymized condition of "anomie" (Wirth, 1938; Bernburg, 2002) that is remedied by the internet. The seamless integration of routine information and system-based activities (e.g. banking, archiving, shopping, learning, etc.) has loaded the internet with substantive quantities of vital information that are targeted by perpetrators of organized crime and terrorist groups. Well aware of these communicative channels (Koerner 2016), terrorist organizations attract "significant numbers of recruits from abroad—including Western converts—entirely online, mostly using social media" (Atwan, 2015, p. 68). Lavish displays of power and wealth are associated with the high-risk lifestyle and are shared on high-traffic networks such as Instagram and Twitter (Greenberg 2015; Greenberg 2016; Finley 2016), appealing to marginalized or impoverished prospects who may be compelled to voluntarily partake in these activities. Similarly, expressions of brotherhood and comradeship appeal to previously-alienated prospects (Back, 2002; Bernburg, 2002); the very urbanites who have been consumed by Wirth's notion of anomie. Atwan (2015) aptly

describes this as the "mentality of the gang, the brotherhood of the streets… and 'us against them'" (pp. 68-69) that appeals to disenfranchised terrorist recruits.

Part II: Cyberterrorism

Enter Cyberspace: Creating the Breeding Grounds for Cyberterrorism

The internet has created a stateless, virtual territory upon which cyberterrorists may commit crime. Their targets may be civilians, firms, or governments, irrespective of socio-economic class and geographical location. As we turn to the internet for purposes such as social interaction, commerce, and entertainment, we advance the digitization of personal information and correspondingly, the expansion of complex data structures that hold our critical information. For the purpose of this discussion, I make use of the North Atlantic Treaty Organization's (NATO) definition of cyberterrorism: "a cyber attack using or exploiting computer or communication networks to cause sufficient destruction to generate fear or intimidate a society into an ideological goal" (Center of Excellence Defence Against Terror, 2008, p. 119). The issue lies in the fact that the security literature narrowly defines the extent of cyberterrorism. This narrow conception places a discrete focus on the act or manifestation of terror itself, dismissing the importance of analyzing the social processes underlying its fruition. It frames cyberterrorism as the act of people or property-targeted violence mediated by a computer system, including assaults on social infrastructure (e.g. educational institutions, hospitals, prisons, economic institutions, public data networks). To cover the extensive range of processes involved with cyberterrorism, this analysis makes use of a more broad conception of the term. By contrast, this definition is concerned with all processes directly and indirectly related to terrorism, including the recruiting, communicative, and operative stages.

The internet is now regarded as a goldmine for intelligence research, allowing for a policing approach that has both precautionary and adaptive potential. While online communication channels may be difficult to access, security authorities have developed technologies that effectively manage digital knowledge. This is important to note as it is often presumed that the development of these opposing systems

(i.e. terrorism versus security) are rooted in uneven landscapes of power. Stuart MacDonald (2012), an academic in the fields of criminal law, terrorism, and anti-social behaviour, echoes this sentiment, noting how "websites can be a vital source of intelligence, which is particularly important given the absence of informants in most cases involving Jihadist groups" (p. 2).

Use of social media by terrorist organizations. Abdel Bari Atwan (2015), Editor-in-Chief at the Arab news site Rai al-Youm, attributes the survival, expansion, and existence of contemporary terrorist organizations like Daesh to the pervasiveness of digital technology. In the context of cyberterrorism, the internet is abused as a medium for the facilitation of recruitment, propaganda, and radicalization processes. Social media networks serve as virtually unregulated platforms, allowing radical perpetrators to coalesce. The communication of terrorist groups online and by other computer-aided means is key to the formation and developmental stages of cyberterrorism. Much of this communication occurs on encrypted networks, beyond the surveillance and jurisdictional capacities of law enforcement agencies. Upon the deliberate publication of content online, its circulation is imminent and virtually unrestricted in terms of magnitude. A "self-sustained following" (Atwan, 2015, p. 69) emerges from this move, fuelled by the disseminating power of the internet. The systematic sharing of "images and videos of suicide bombings, raids, beheadings, and other grisly punishments and executions" (Atwan, 2015, p. 125) by Daesh is among the group's promotive tactics, simultaneously eliciting a response of fear and grotesque fascination from the human psyche (Snyder, 2015). Seeking infamy, the proliferation of evocative content across social media networks is key to Daesh's notorious profile. By virtue of episodicity, Daesh is able to circumvent desensitization and "threat fatigue" (Miller & Krosnick, 2004) through 'lone-wolf' terror and an unpredictable rate of incidence. The induction of a "sense of perpetual menace" (Burke, 2015, p. 217) marks the success of terrorism's intent which, returning to NATO's definition, is to "generate fear or intimidate a society into an ideological goal" (Center of Excellence Defence Against Terror, 2008, p. 119). This is appropriately framed by journalist Jason Burke (2015) as the "ultimate combination of terrorism and

media" (p. 243).

The unregulated internet. Limitations to security authorities' ability to intervene in cybercrime allows terrorist organizations to operate with their agenda undisturbed. These restrictions originate from the jurisdictional limits imposed by the rule of law (i.e. constitutional and territorial limits). Jurisdictional ambiguity is a complex political issue which has hindered the establishment of a diplomatic response to cyberterrorism. For example, the term terrorism yields "109 different definitions suggested by academics and others" (Burke, 2015, pp. 215-216) in the United States alone. Should an act of cyberterrorism be challenged in international courts, the punitive action would hinge on contrasting sociopolitical values that may conflict in the political sphere. International courts also possess "very limited powers making enforcement difficult" (Prasad, 2012, p. 10); their requests are mere suggestions that must be acted upon in local courts. Further, the execution of the crime and the planning processes underlying acts of cyberterrorism may extend across multiple jurisdictions, complicating issues of accountability. In this regard, the compartmentalization of the crime itself is problematic as each aspect of the act cannot be addressed in isolation from the rest. There is presently no universal standard upholding the governance of the internet and with the rise of cyberterrorism by both state and non-state actors, the issue commands urgency.

Conclusion

With the growing presence of terrorist organizations on social media, there is great potential for cyberspace to become a prime medium for the dissemination of political and religious extremism. A lack of regulation makes the internet an optimal platform for the incubation of terrorist ideology, while social networking has unlocked the ability to communicate instantaneously in an unrestrained and immaterial environment, both with people whom we are acquainted with in real life and with strangers. The internet hosts a variety of online communities (e.g. the blogosphere, forums, social networks such as Facebook, Twitter, and Instagram, etc.) where supporters of terrorist organizations may gather and communicate with one another. This creates inclusive environments which allow for the maturation and circulation of terrorist ideology - a stark contrast

to Wirth's discussion on the hostility of urban life.

Alongside our friends' Facebook posts are images and videos of beheadings, mutilation, and murder of the first degree, whose permeation into our news feeds are a part of the terrorist's agenda. Cyberterrorism is redefining fear as we know it and when we succumb to its perpetuity, we become the victim.

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Harvest Boxes and Beyond: Evaluating the Ability of a Produce Box to Address Food Insecurity in Surrey

By Adèle Therias

Produce boxes are an alternative source of healthy food often designed to address food insecurity, particularly among urban populations. This article evaluates the ability of the Harvest Box program to address food insecurity in Surrey, in order to determine whether another produce box program should be implemented or supported by the City of Surrey. Methods include secondary data analysis of other produce box programs, participant data, a questionnaire survey, and expert interviews. Key findings include the relevance of the neighbourhood scale for measuring food security and for implementing programs, the need for financially and geographically accessible alternative food options for low-income households, and the importance of improved communication with program participants, and between program organizers. A small-scale program focused on explicit needs of a neighbourhood is deemed to be the most sustainable option if another produce box is implemented.

Introduction

The Harvest Box was a non-profit driven program that brought fruits and vegetables to people in Metro Vancouver for over 10 years. It was originally based out of a school in Surrey and was eventually taken on by a non-profit organization called Help on Wheels ("About," n.d.). The boxes were distributed through the coordination of various pick-up points in the community, a number of which were coordinated by the City of Surrey beginning in 2005. The original "Value Box" was offered throughout the

duration of the program, and a "Local Box" option was added in 2011, which focused on sourcing local produce. While grants initially supported the staffing costs of the program, these grant requirements changed. This brought Harvest Box to rely exclusively on volunteer work during its last few years and created significant strain on resources and the volunteer staff. The program could not be economically sustained due to a decrease in participation and ended in April of 2016.

One of the goals of the City of Surrey is to strengthen the food security of its residents, which it defines as a state "when all community residents have access to a safe, affordable, culturally acceptable, nutritionally adequate diet through a system that maximizes community self-reliance, environmental sustainability and social justice" ("Sustainability Charter 2.0," 2016, p. 54). In 2016, the Harvest Box program did not appear to address the food insecurity felt by some residents of Surrey. Therefore, the Healthy Communities Section of the Parks, Recreation and Culture Department decided to conduct research on the program and determine whether a similar produce box model should be established. This article begins to address that inquiry by gathering input from experts in the area of food security, participants in the Harvest Box Program, and through observation of other existing produce boxes.

Literature Review

Food Security. The literature on food security varies widely. Food system issues have often been linked to isolated topics such as the impact of agriculture on the ecosystem, the need for more social programs, or negative impacts on producers (Gottlieb & Fisher, 1996). It was not until a sudden rise in the price of food in 2006-2008 that a fundamental shift occurred in food security discourse (Lang & Barling, 2012). The vulnerabilities of an increasingly globalized food system were revealed, leading to increased attention to the system as a whole, rather than drawing attention only to issues of insufficient production (Lang & Barling, 2012). A wide range of approaches focusing on the distribution of food have emerged and are developing a multifaceted urban understanding of the concept of food insecurity (Sonnino, 2014).

Community Food Security. One of those emerging approaches is Community Food Security (CFS), which takes into account numerous

components of a community, including "income, transportation, storage and cooking facilities, food prices, nutritious and culturally acceptable food choices" (Gottlieb & Fisher, 1996, p.196) to improve access to non-emergency and reliable options. In order to create systematic improvement, CFS has shifted the approach to food security by framing it as a right rather than an act of charity or a responsibility of welfare. This development has allowed for the politicization of food and the attribution of food insecurity to ineffective distribution rather than inefficient agricultural production (Morgan, 2014). The *Good Food Box* is one example of a program inspired by Community Food Security: this Toronto-based food security program is designed to provide "good food" for low income and marginalized communities (Johnston & Baker, 2005). Toronto's Good Food Box is a successful example considering its rise in participation: it was established in 1994, providing 40 boxes, and now distributes almost 4,000 boxes each month (Biberstein & Daalderop, 2008).

Urban Food Security. The rising awareness of urban food security requires new approaches to finding solutions, captured in the urban food question presented by Morgan (2014): "How to feed cities in a just, sustainable and culturally appropriate manner in the face of looming climate change, widening inequality and burgeoning world hunger?" (p. 1380). Limited choices of food outlets, great physical distance of food, and poor nutritional options have been documented in many urban and rural areas (e.g. Chicago and Rural areas of Texas; Gottlieb & Joshi, 2010). Many communities are found to have limited access to healthy food, whether due to the loss of large supermarkets in low-income neighbourhoods (Gottlieb & Joshi, 2010), inadequate public transit to food outlets (ibid), or the complex, often unsafe and unreliable food systems upon which the urban poor rely (Miewald & McCann, 2014).

The Role of Municipalities. In order to respond to these growing concerns, a new form of urban politics is rising to the challenge as cities become prominent players in changing food policy agenda. This is seen in the incorporation of Non-Governmental Organizations work into urban food policy development (Morgan, 2014). The involvement of municipal government into efforts towards food security can be seen as part

of a larger effort to bring the responsibility of eliminating hunger back to the state. This effort requires a fundamental shift in the approach to hunger, particularly the implementation of the universal "Right to Food" by the UN in 1948. Emergency food sources such as food banks are economically efficient in their distribution system and provide immediate relief that is necessary in emergency situations. However, they do not address systematic food insecurity and offer the inaccurate appearance that hunger is being solved (Riches, 2011). The solution? A larger role by government on all levels, particularly on the municipal level in an effort to create a healthier urban foodscape (Pothkuchi & Kaufman, 1999). A key example is New York's new urban food strategies. This includes supporting over 100 Community Supported Agriculture programs which strengthen direct links between producers and consumers (Morgan, 2014).

Food Security in Surrey. There is some existing research on the state of food security in Surrey. The *My Health, My Community* survey has identified the neighbourhoods of Newton and Guildford as areas with low food security, both of which are located in North Surrey. Newton is measured as 91.4% food secure and Guildford as 92% food secure (Fraser Health, 2015). However, there is limited data on the specific characteristics of Surrey that create this food insecurity and the most effective ways to address these barriers. Furthermore, there is a need for close analysis of the Harvest Box program's role in addressing these barriers. A study by Mielwald, Holben and Hall (2012) evaluates the role Surrey's Harvest Box plays in increasing fruit and vegetable consumption among participants and equates higher rates of produce consumption with improved food security. The study finds that participation in the program does increase fruit and vegetable consumption, but the authors note that maintaining participation is one of the biggest challenges of such programs. While inconvenience and expense were identified as the two main reasons for leaving the program, the authors did not look closely at the incentive for people to participate, the customer level of satisfaction with the program, or the program's strengths and weaknesses. These aspects will be explored in this article and can provide a more complete view of the effectiveness of the Harvest Box.

Methodology

A mixed-methods research approach was used in order to generate a well-rounded understanding of the effectiveness of the Harvest Box program and potential next steps to improve food security in the city.

Secondary Data Analysis. 12 Canadian Food Box programs were analyzed to observe patterns of goals, organizational structure, produce options, and delivery options. These boxes were chosen based on their mandates to provide food to a population that may not otherwise be able to access fresh produce. This data may lack details considering that not all organization information is available online, including funding structure and success of the program. Existing data on participation was generated from the registration database used by the City of Surrey. This data was analyzed to gather an overview of the program's evolution in terms of number and types of boxes purchased in each of Surrey's neighbourhoods. The data is limited in that it does not account for orders that were not placed through the city's database or locations.

Questionnaire Survey. A questionnaire survey was designed to gather input from past Harvest Box customers . The survey was promoted through the City of Surrey's advertising platforms, allowing for a random sample of respondents; a total of 45 responses were received and analyzed. These responses may be limited in their scope because it was not possible to directly contact past participants and only people connected to the city's communication platforms were reached. The main objectives of the questionnaire included determining the reason for participation in the program and measuring participants' satisfaction with the program. Quantitative analysis of the survey data involved the extraction of descriptive statistics and the creation of graphs for data visualization.

Expert Interviews. Four semi-structured expert interviews were conducted. Three of these experts were linked to the Surrey White Rock Food Action Coalition, whose vision is to integrate food policy into community decision-making to enhance community food security ("Vision," 2013), and one expert held a position with the Surrey Food Bank. One major goal of the interviews was to generate an understanding of the state

of food security in Surrey, including the portions of the city's population that are most affected. Another goal was to gather input on the strengths and weaknesses of the Harvest Box program. For analysis of the interview data, grounded theory was used as a framework to code the notes from the four expert interviews.

Analysis

Neighbourhood Level. The experience of food security varies greatly throughout Surrey. Therefore, the neighbourhood is a useful unit to measure levels of food security and to implement programs. Newton and Guildford are two neighbourhoods characterized by Surrey's biggest challenges to food security: a high proportion of newcomers, including immigrants and refugees, and a high rate of unemployment and underemployment. In Newton and Guildford, the overall number of Value Boxes sold over the years is higher than in all other neighbourhoods, suggesting that food insecure households made up a large part of Harvest Box participants (figure 1).

Surrey's population is constantly changing and growing as a result of its large number of newcomers. This makes it difficult for the organizations striving for improved food security to observe significant outcomes. One way to increase the impact of initiatives is to im plement programs at a neighbourhood level. Addressing food insecurity among

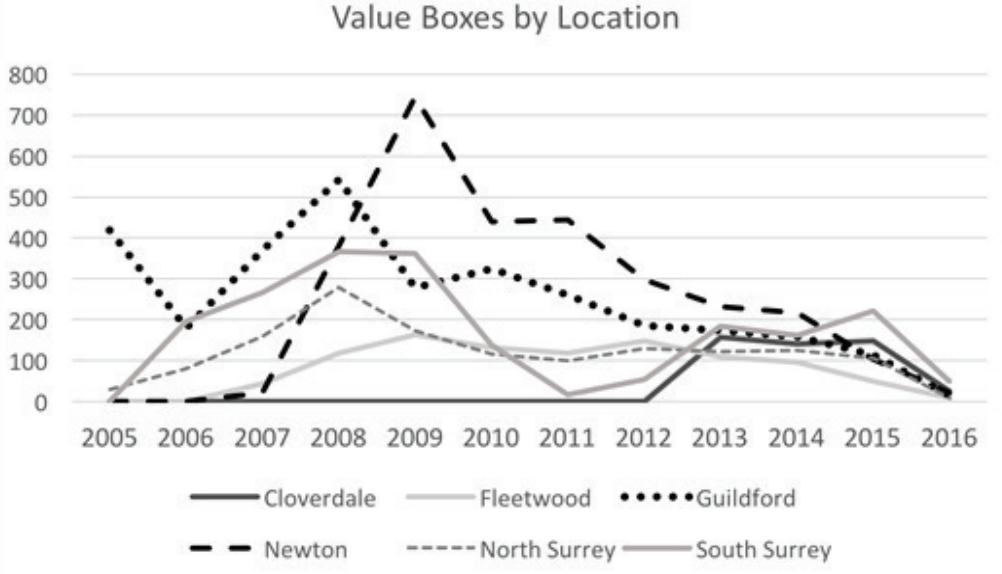

Figure 1: Value Boxes by Location

a low-income population requires understanding the many overlapping challenges (Morgan, 2014; Loopstra & Tarasuk, 2013). Considering that "almost half of food-insecure families are led by single parents" (Loopstra & Tarasuk, 2013, p. 58), the coordination of a food program with childcare or school locations may be one way to provide access to those families. Additionally, after the successful establishment of a small neighbourhood-scale program, it can be expanded. Several existing Good Food Box programs offer the possibility of starting a new pick-up centre based on sufficient interest and volunteer commitment from community members. This allows organizations develop community resilience by developing strong community relationships.

Access

Financial Access. Low income is the main barrier to food security in Surrey. In fact, 85% of survey respondents indicated "affordability" as a somewhat or very important reason for participation in the program (figure 2). The barrier created by low income requires many produce boxes to increase the affordability of food by providing boxes at the lowest possible cost. It also shapes the ordering process: all programs offer box-by-box orders rather than long-term commitment, as many low-income people are unable to pay very far in advance for a product. The Harvest Box was appealing because it promoted fruits and vegetables at an affordable price.

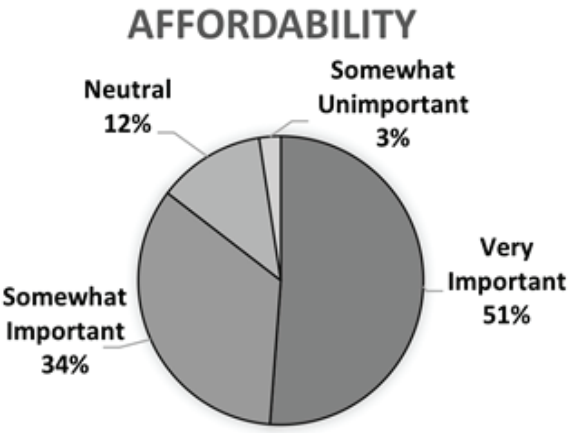

Figure 2: Affordability as Reason for Purchasing Harvest Box

Participation rose until 2009, after which the numbers of Value Box orders declined. This trend is closely linked to the change in the price of the box, which increased from $6 to $8 in 2008 and further increased to $9.50 in 2016, the final year of the program (figure 3).

This final rise in price limited the affordability for low-income households and the amount of produce provided for the price was in some cases not sufficient for households' needs. Offering different sizes is one way to improve the affordability

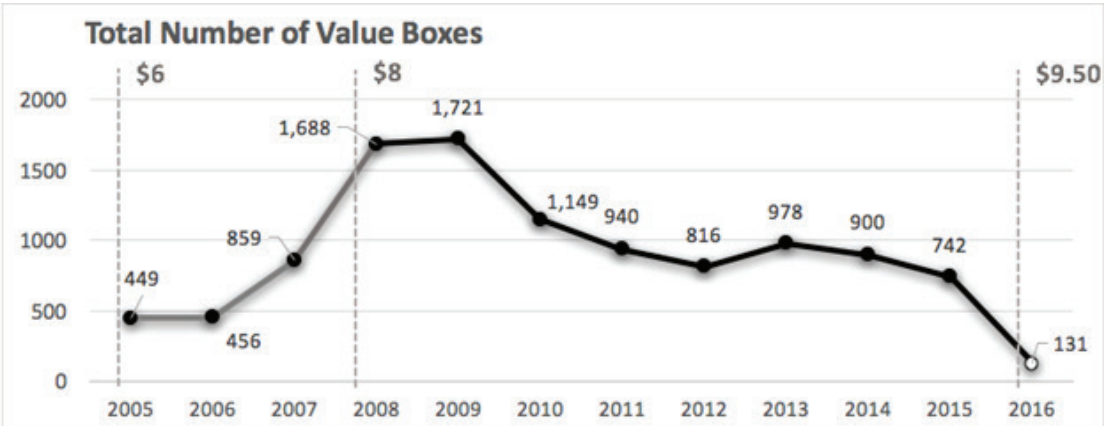

Figure 3: Total Number of Value Boxes from 2005 to 2016

of the box, as this allows households to tailor their choice to the needs of their family. Another common choice made by organizations is to offer local produce when it is available and affordable to supplement "conventional" produce. Embedding localization within a larger plan for social, economic and ecological sustainability rather than having it as an end-goal may allow for the program to more effectively sustain itself financially (Sonnino, 2014).

Geographical Access. Geographical access to healthy food is also a significant challenge to food security in Surrey. There are several existing "food deserts," defined as portions of the city where limited food outlets are present. Additionally, many lower income households rely heavily on public transportation options to reach food outlets. The Harvest Box seemed to offer a solution to the access barrier, as the boxes were delivered at convenient neighbourhood access points. In fact, 85% of survey respondents indicated convenience as a somewhat or very important reason for participation.

However, these locations were often not easily accessible by public transit or walking, and 12% of survey respondents found the pick-up location or time somewhat or very inconvenient, which suggests the lack of convenience as one reason for the ineffectiveness of the program. All produce box programs analyzed in the research deliver to several community pick-up locations, which vary in number: Toronto's program has 109 neighbourhood locations and counting, allowing it to reach numerous communities.

Communication

Produce box programs can play an important role in communicating health benefits and teaching about best food practices. The importance of communication extends to effective and accurate promotions. The Harvest Box was promoted at events, local recreation centres and with partner agencies, yet several survey respondents did not know about the program while it was running or were unable to place orders. Another limit to the Harvest Box's success was the lack of transparency and communication between Help on Wheels and the City of Surrey. For example, the contact person at the City of Surrey office did not know the origins of the produce in the boxes. This lack in communication, paired with loss of funding impacted the sustainability of the program. A transparent model that communicates the source of the produce, promotes healthy eating habits and effectively reaches the target population might have been more effective.

Suggestions for Future Programs

Experts and survey respondents suggested ways in which the program could be improved to better suit the needs of Surrey's population. A first suggestion is to improve the contents of the boxes. The survey results indicate the importance of prioritizing quality, quantity and variety/type of produce in the boxes: 52% of people who stopped ordering cited box contents as their main reason (figure 4). A second suggestion is to deliver to areas that are more accessible than grocery stores, where families are already going

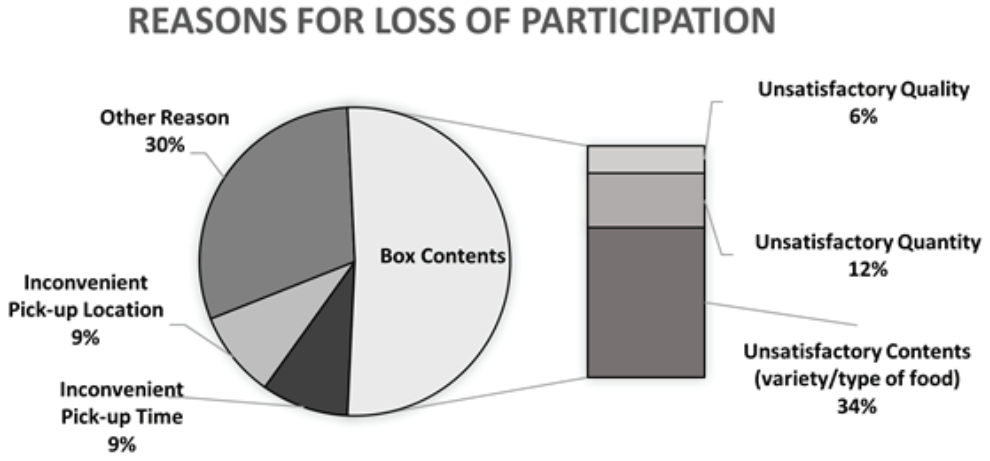

Figure 4: Reasons for Loss of Participation

such as recreation centres and schools or at a residence for a certain number of blocks.

The most common suggestion from experts is to create a plan to sustain the new program which would outline who will ensure its implementation and would identify the long-term source of funding. One way to support the program would be to subsidize it by marketing the food box to higher income households as well as low-income households (Miewald et al., 2012). Produce box programs in other cities develop partnerships with local businesses to aid in program delivery, and many are funded by organizations such as the United Way. As the program gains momentum, it can evolve to address ecological sustainability as well as the immediate need for improved food security in Surrey.

Conclusion

This article has highlighted key findings about food security in Surrey and the Harvest Box program. First, the neighbourhood scale is important to address food insecurity in Surrey. Second, the need to increase geographical and financial access is a key reason behind Harvest Box participation and lack thereof. Third, inadequate communication with program participants and between responsible organizations was a contributor to the end of the produce box program. If the City of Surrey chooses to pursue another produce box model, close research with target communities will be needed in order to develop a long term solution. Initial work with communities within Guildford and Newton would be appropriate considering their significant food insecurity. It will be important to gather additional input from people suffering from food security who did not access the Harvest Box program. Finally, researching available resources to draw upon and integrate will allow the City of Surrey to develop a sustainable model. The City of Surrey has a good foundation of research to continue striving towards food security, and if carefully planned another produce box could be a successful next step.

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Identifying Areas of Potential Instability: Vancouver North Shore Mountains, B.C.

By Daniel Ortiz de Montellano Taboada

The District of North Vancouver is positioned at the base of the North Shore Mountains, covering 160 km2 of land area. In 2003, a number of consultant reports were generated with the intent to quantify risk measures for the occurrence of debris flows (Sassa, 2008). Engineering plans surpassed financial capabilities and another more feasible plan was proposed aiming to reduce risk by implementing early warning systems (Sassa, 2008). Here, hillslope processes will be solely analyzed, locating areas potentially prone to landsliding; this is crucial in forecasting possible debris flows. By looking at the physical conditions of the North Shore Mountains, a model can be derived that allows for visualization of unstable areas as cohesion, depth, and relative saturation varies. The use of a 20 x 20 m resolution Digital Elevation Model permits the formation of a slope profile, wherein we can separate and visualize those areas that are either unstable or stable according to the Factor of Safety (FS) equation. The study area will be split into two parts: an upper segment representing characteristics found at elevations equal to and above 800 m, and a lower segment, representing conditions found below 800 m. The analysis suggests that much of the District of North Vancouver, as well as the ski-resort found on Grouse Mountain, is safe from landslide threats even during intense rainfall conditions that fully saturate the water table. Roads and public trails are mostly safe, but the analysis did identify locations where precautionary measures should be taken.

Introduction

Landslides are a natural re-occurring process throughout all mountainous landscapes. Topographic characteristics vary in distinct regions across Canada due to glacial processes that carved the

landscape over geologic time scales (Armstrong, 1990). The Cordilleran ice sheet ranged from Southern Alaska down to Northern Washington State, U.S.A. covering the Lower Fraser Valley approximately 11,000 years ago (Booth et al, 2003). The Coastal Mountains were depressed by the Cordilleran ice sheet, rebounding by isostatic uplift after its retreat (Valentine et al, 1978). Diagram 1 illustrates the physical characteristics of the landscape; the black dotted box outlines the conditions for the study area within the Lower Fraser Valley. The soil profile (Humo-Ferric Podzol) is broken up into three layers with the strongest layer nearer to the surface (Valentine et al, 1978). Coastal Western Hemlock is the predominant tree species in the study area (Hamann et al, 2005). Landslides have been documented further north of the watershed, in Jamieson Creek (Fannin, 2008). Successive high precipitation rain-on-snow events led to landsliding in both logged and unlogged areas (Fannin, 2008). A quantity analysis of partial risk was undertaken to devise a model looking at debris slide initiation, focusing mainly on soil and water infiltration characteristics (Fannin, 2008). Through acquisition of essential parameters and observations from this event, delineation of the most probable locations for landsliding within the Lower Fraser Valley North Shore Mountains can be constructed. This will permit visualization of unsafe areas that hikers, campers and the general public should avoid when taking a day's hike to either of the following peaks: Grouse Mountain, Crown Mountain, Dam Mountain, Mount Fromme, Coliseum Mountain, Mount Burwell, Mount Seymour and Mount Bishop.

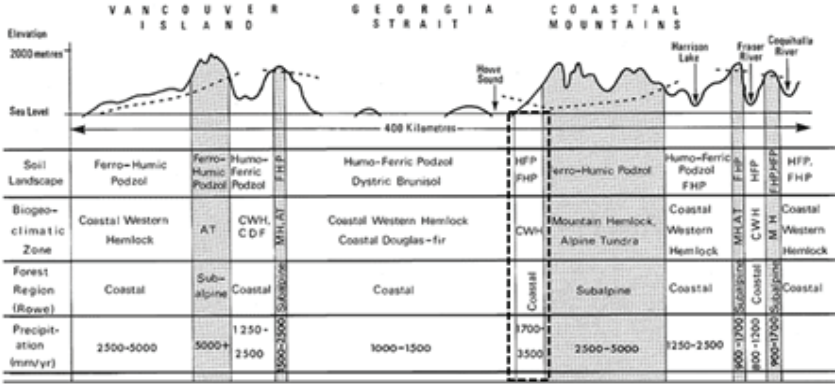


Diagram 1: Landscape morphology of Coastal Mountains, figure 3.3.1 (Valentine, 1978).

Methods

Slope stability model–deriving parameters. The model used varying parameters for cohesion (C), depth (d), and relative saturation (m), to assess the stability of slope faces. The values were derived from field and observed measurements taken from the Jamieson Creek debris flow events (Fannin, 2008). By comparing values used from the study to soil and tree qualities of the North Shore Mountains, quantitative values were formulated that are applicable to the study area. Coastal Western Hemlock tree root qualities show that vertical distribution of its roots tends to peak within approximately 20 -30 cm (Eis, 1974). The study at Jamieson Creek derived the mean depth of soil (d) to be 1.25 m at an elevation between 740 – 785 m; this value was obtained from field measurements. This value will be used in the FS equation when calculating stability for the lower segment, ≤800 m. Additionally, depth of the lower segment will exceed that of the upper segment given that talus and colluvium are found in higher quantities (Armstrong, 1990). Decomposition rates are significantly slower at higher elevations due to colder temperatures, preventing soils from building up rapidly. With close consideration of the above, the depth (d) value for the upper segment will equal 0.5 m, allowing Coastal Western Hemlock to inhabit the upper segment. From field measurements, it was derived that the soil strength was 0 kPa. The study at Jamieson Creek presented two cohesion values, one related to soil strength and another related to root strength. Due to the abundance of Western Hemlock below 800 m, a 'significant contribution' value of 7 kPa will be used (Fannin, 2008). To simplify the model, the value for root strength will be used interchangeably. Above 800 m, Western Hemlock are sparser and vegetation consists of both tree stands and areas where only surface vegetation are present. In this respect, the upper segment will take on half the cohesive properties of the lower segment, resulting in a value of 3.5 kPa.

Lastly, the study at Jamieson Creek accounted for both moisture content and groundwater values. The groundwater values range from 0.6 to 0.8, although these values appear to be quite high and could be a result of field measurements taken directly after the intense storm events. Moisture content has more representative values and these will be used instead. These values consist of either 0.15 or 0.25.

A relative saturation (m) value of 0.15 will be applied to the upper segment given that most precipitation in that area falls as snow. A relative saturation (m) value of 0.25 will be applied to the lower segment. Both values take into consideration surface runoff, water uptake by trees, and presence of understory vegetation. A relative saturation (m) value of 1 will be implemented for both segments, replicating an intense rainfall event that would fully saturate the water table. Constant parameters were also derived from field and observed measurements of Jamieson Creek, and are approximately the following; the middle friction angle (Φ) value used is equal to 46 degrees, unit weight of water (γw) is equal to 9.81 kN/m3 and the unit bulk density of the soil (γbs) is equal to 18 kN/m3.

Slope Stability model – obtaining failure slope angles. The following FS equation was used when obtaining slope angle thresholds.

$$FS = \frac{C + (\sigma - \upsilon)\tan\Phi}{\tau} \qquad (1)$$

The values for shear stress (τ), normal force (σ) and saturation (υ), were derived using the following equations.

$$\tau = \gamma b_s d \sin\beta \qquad (2)$$

$$\sigma = \gamma b_s d \cos\beta \qquad (3)$$

$$\upsilon = \gamma_w m d \cos\beta \qquad (4)$$

The formula was added into Microsoft Excel to aid in the identification of the threshold slope values needed for a landslide to occur; Table 1 shows how this was done.

Upper segment			Lower Segment		
Parameters					**Units**
Unit bulk weight of soil *(γbs)*	0		0		kN/m3
Cohesion *(C)*	0		0		kPa
Friction angle *(Φ)*	0	0.0000	0	0.0000	Degrees
depth *(d)*	0		0		m
relative saturation(m)	0		0		0 -1
unit weight of water *(γw)*	0		0		kN/m3
Stresses and pore pressure					
Shear stress *(τ)*	0.0000		0.0000		kPa
Normal force *(σ)*	0.0000		0.0000		kPa
Saturation *(u)*	0.0000	0.0000	0.0000	0.0000	pore pressure (kPa)
Slope (β)	**FS**	**Slope (β)**	**FS**		
	#DIV/0!		#DIV/0!		

Table 1: Modelling FS equation in Microsoft Excel.

The model was run a total of three times. The first run consisted of modelling both the upper segment (≥800 m) and lower segment (<800 m) to replicate study area conditions. The second modelled run utilized the same variables, but a value of 1 for relative saturation was implemented assuming intense rainfall conditions fully saturating the soil. The third was the control run, where the values for relative saturation (m), cohesion (C), and depth (d) were all equal to 0.01. This permitted modelling for conditions where there would be negligible soil layer, relative saturation and cohesion. After obtaining the results, the potential unstable slopes were modelled using ESRI ArcMap. From a 20 m contour shapefile layer of the study area, two new layers were created through 'select by attributes', one consisting of the upper segment and the other replicating the lower segment. Digital Elevation Models (20 x 20 m resolution) were derived, and from those, a slope profile was acquired for both segments.

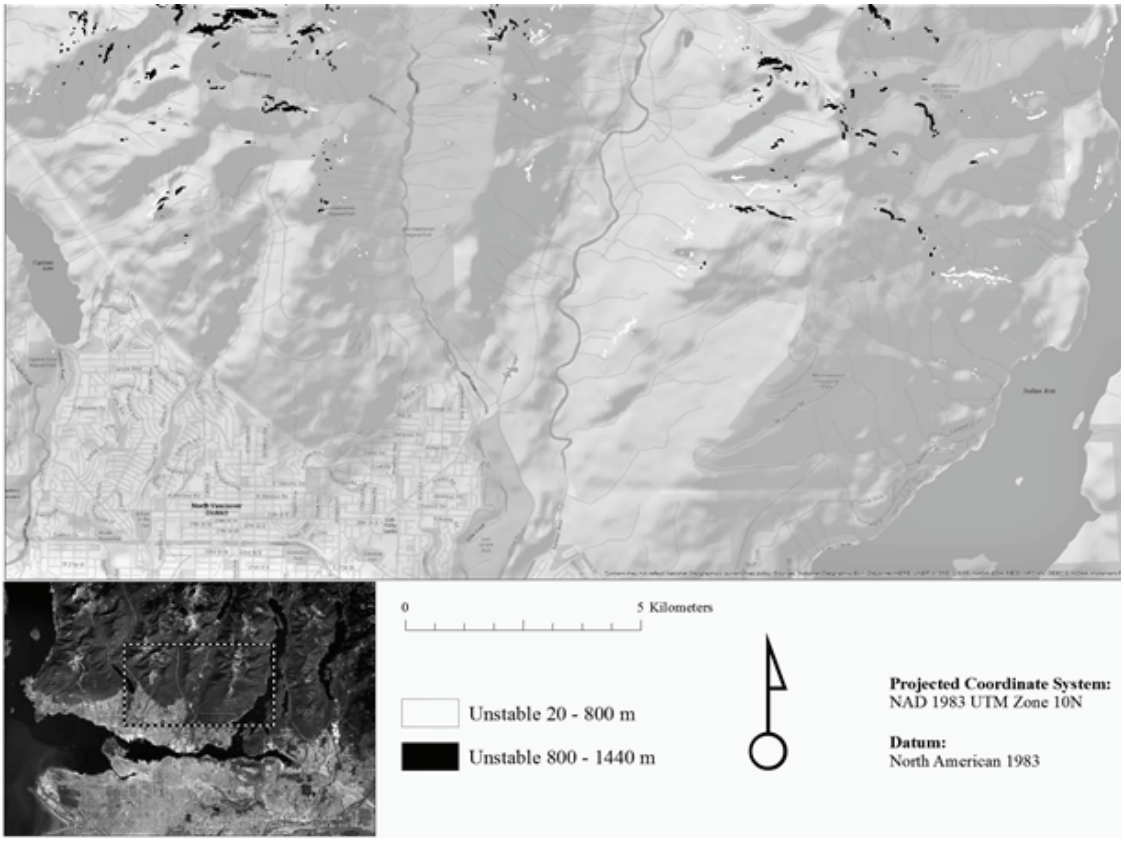
Results

After undergoing the analyses and running the model to replicate the study area conditions, the slope threshold values were derived. A total of three runs were carried out, and maps were created for each. The following provides a descriptive account of each of the runs.

Potential areas of instability – replicating study area conditions. Table 2 provides the values used to calculate the threshold slope angle for both upper and lower segments. The threshold slope value for the upper segment, 800 - 1440 m, is ≥60. The threshold slope value for the lower segment, 20 - 800 m, is ≥56. Map 1 delineates areas that are modelled as unstable, demonstrating the likely locations prone to landsliding. Nonetheless, due to shallow and unconsolidated soil, it could be expected that mass movements would take the form of shallow landslides, debris flows, and/or debris slides. It is visible from Map 1 that there is not one slope face that does not show signs of instability. The movement of unconsolidated material was essential in forming the Lower Fraser Valley's riverine landscape during the Holocene (Armstrong, 1990).

Upper segment			Lower Segment		
Parameters					**Units**
Unit bulk weight of soil *(ybs)*	18		18		kN/m3
Cohesion *(C)*	3.5		7		kPa
Friction angle *(Φ)*	46	1.0355	46	1.0355	Degrees
depth *(d)*	0.5		1.25		m
relative saturation(m)	0.15		0.25		0 -1
unit weight of water *(yw)*	9.81		9.81		kN/m3
Stresses and pore pressure					
Shear stress *(τ)*	7.7942		18.6533		kPa
Normal force *(σ)*	4.5000		12.5818		kPa
Saturation *(u)*	0.3679	4.1321	1.7143	10.8676	pore pressure (kPa)
Slope (β)	**FS**	**Slope (β)**	**FS**		
60	0.9980	56	0.9786		

Table 2: Values used to model the first run replicating study area conditions. Threshold slope angle is also given where FS < 1.



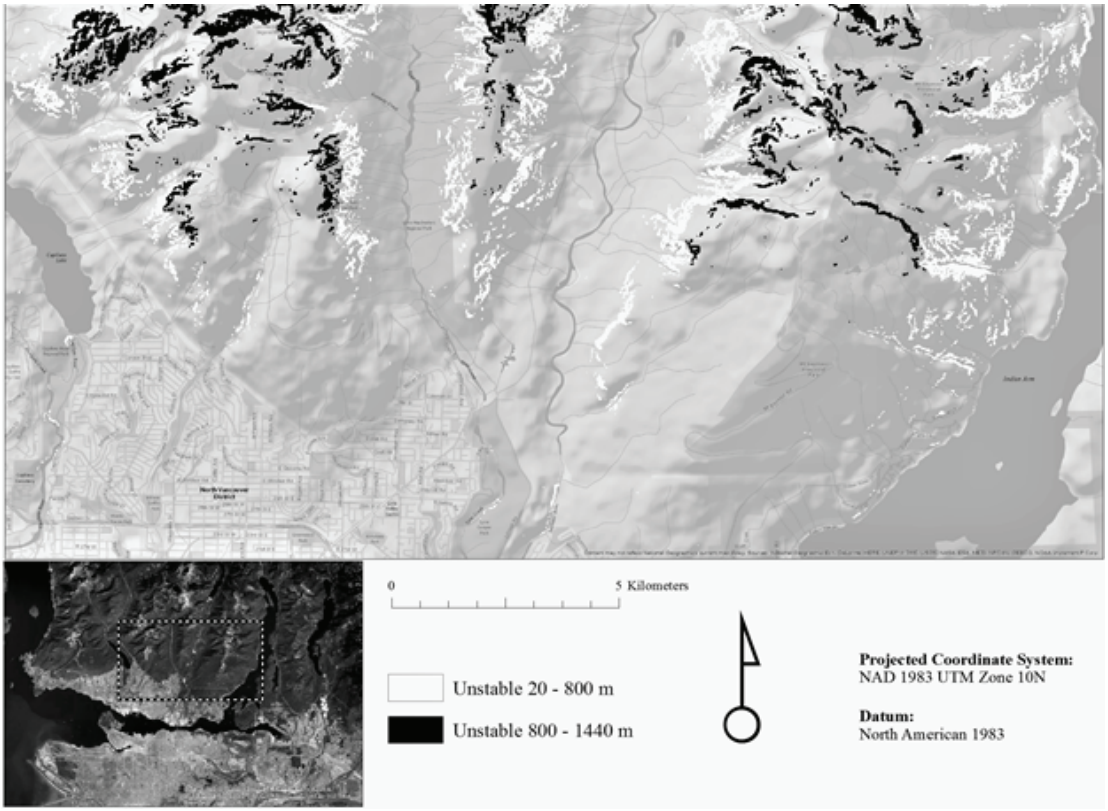
Map 1: First modelled run replicating study area conditions.

Potential areas of instability – replicating study area conditions assuming an intense rainfall event. The second model run was conducted to see the effects of extreme rainfall events, fully saturating the soil. The same values used in the first modelled run, for both lower and upper segments, were used in this case. However, a value of 1 for relative saturation (m) is applied to both segments. Table 3 provides the values used to calculate the threshold slope angle for both upper and lower segments. The threshold slope value for the upper segment, 800 - 1440 m, is ≥46. The threshold slope value for the lower segment, 20 - 800 m, is ≥42. Map 2 delinates areas that are modelled as unstable. These are the areas that are most likely to be prone to landsliding if an extreme rainfall event were to occur.

	Upper segment			Lower Segment		
Parameters						**Units**
Unit bulk weight of soil *(ybs)*	18			18		kN/m3
Cohesion *(C)*	3.5			7		kPa
Friction angle *(Φ)*	46	1.0355		46	1.0355	Degrees
depth *(d)*	0.5			1.25		m
relative saturation(m)	1			1		0 -1
unit weight of water *(yw)*	9.81			9.81		kN/m3
Stresses and pore pressure						
Shear stress *(τ)*	6.4741			15.0554		kPa
Normal force *(σ)*	6.2519			16.7208		kPa
Saturation *(u)*	3.4073	2.8446		9.1128	7.6079	pore pressure (kPa)
Slope (β)	**FS**		**Slope (β)**	**FS**		
46	0.9956		42	0.9882		

Table 3: Values used to model the second run replicating study area conditions assuming an intense rainfall event. Threshold slope angle is also given where FS < 1.

Extreme weather events, where conditions are favourable for slope instability, have a low probability of occurring over short time periods. Furthermore, higher elevations will be subjected to colder temperatures not allowing for precipitation to fall solely as water droplets. The run was modelled to predict a low probability event in Vancouver. If global economic activity and carbon emissions reside as normal, the region could experience warmer and wetter winters as a result of climate change (Romero-Lankao et al, 2014). Additionally, an extreme El Niño event could bring unusually warm temperatures to the region diminishing snow pack and initiating rain-on-snow events, increasing relative saturation of the soil. Since soil depth is shallow and it is known from



Map 2: Second modelled run replicating study area conditions assuming an intense rainfall event.

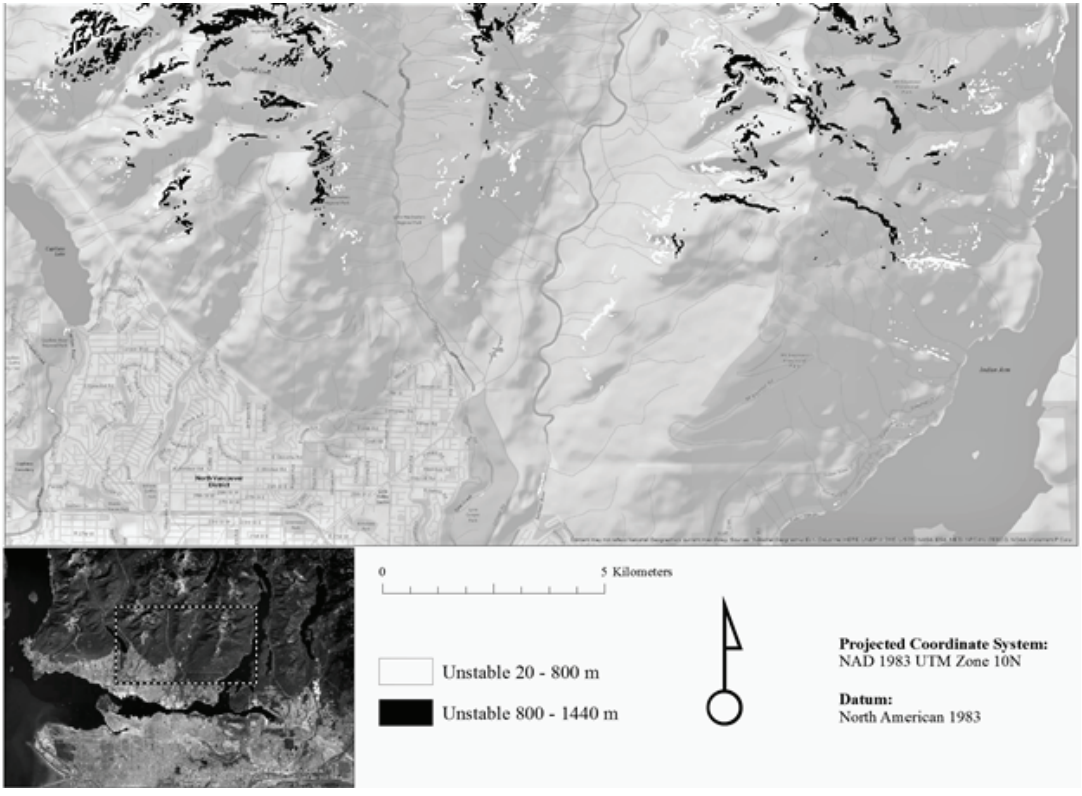
the study at Jamieson Creek that the soils tested had no cohesive properties, it is likely that conditions for instability will develop more frequently.

Potential areas of instability – control conditions. The control modelled run was carried out in order to see the effects of negligible cohesion (C), depth (d) and relative saturation (m). The value for the above parameters was determined to be 0.01. Table 4 provides the values used to calculate the threshold slope angle for both upper and lower segments. The threshold slope value for both segments, 20 - 1440 m, is ≥49. Map 3 delineates areas that are modelled as unstable. Results are similar to the first modelled run, however, the threshold slope value is 11 degrees lower and likely due to the negligible cohesion characteristics of the soil. Even though more areas are shown to be unstable, the hazard presented by these mass movements are not of the same magnitude as the ones presented in the

first modelled run conditions. The lack of an unconsolidated soil layer disallows debris slides and flows from forming, diminishing the risk associated with the event.

Upper segment			Lower Segment		
Parameters					**Units**
Unit bulk weight of soil *(ybs)*	18		18		kN/m3
Cohesion *(C)*	0.01		0.01		kPa
Friction angle *(Φ)*	46	1.0355	46	1.0355	Degrees
depth *(d)*	0.01		0.01		m
relative saturation(m)	0.01		0.01		0 -1
unit weight of water *(yw)*	9.81		9.81		kN/m3
Stresses and pore pressure					
Shear stress *(τ)*	0.1358		0.1358		kPa
Normal force *(σ)*	0.1181		0.1181		kPa
Saturation *(u)*	0.0006	0.1174	0.0006	0.1174	pore pressure (kPa)
Slope (β)	**FS**		**Slope (β)**	**FS**	
49	0.9689		49	0.9689	

Table 4: Values used to model the third run replicating control conditions. Threshold slope angle is also given where FS < 1.

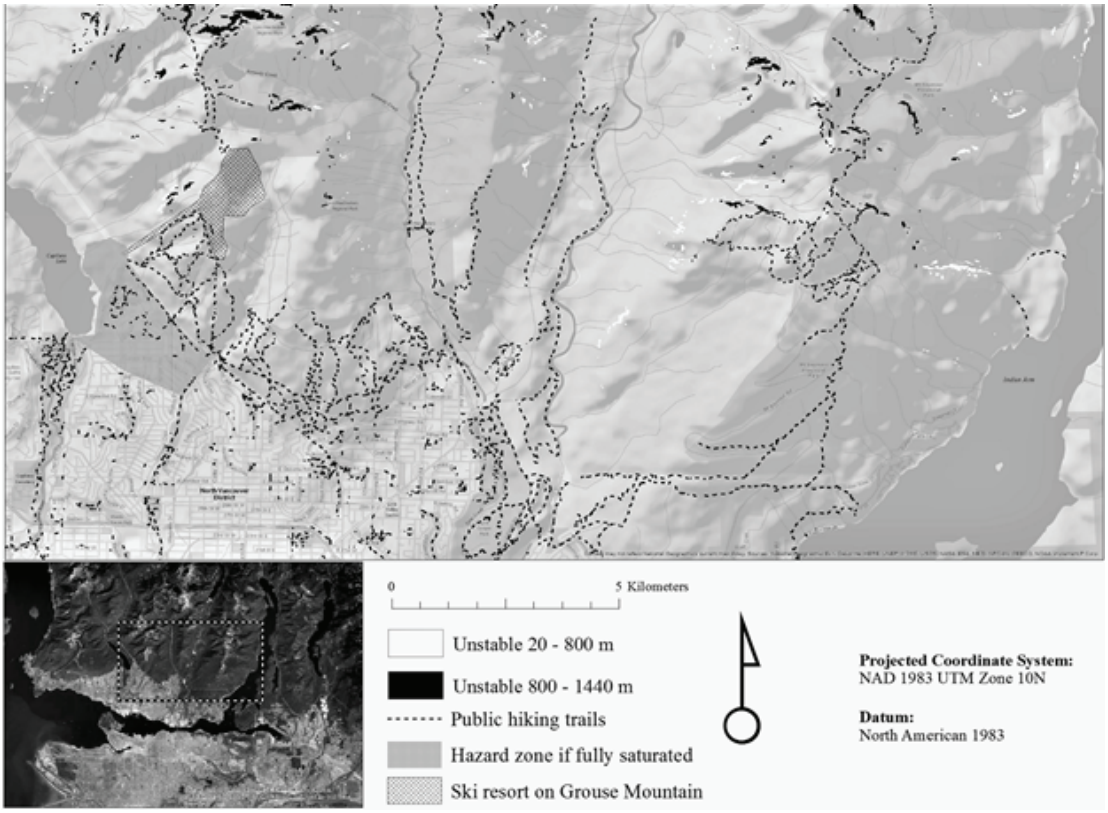


Map 3: Third modelled run replicating control conditions.

Conclusion

Discussion. The discussion will focus principally on the final map (Map 4), produced by modelling the likely conditions of the study area. It can be observed that the ski resort on Grouse Mountain, a highly populated attraction throughout the year, does not show signs of instability. Even when running the model imitating fully saturated conditions (Map 2), the area surrounding the resort does not show signs of vulnerability. Delineation of a vulnerability zone was produced given its exposure to potential mass movements. Attention should be redirected towards this area due to its vulnerability to risk. The slope face shows multiple signs of instability, making it hazardous for the tram facility and residences located near by. Nonetheless, projected growth for 2030 is not expected to occur further up the mountains, as it will mostly be concentrated within the District of North Vancouver as visible in Diagram 2. Roads that go up to some of the peaks also appear to be in safe zones, not posing risk to people who drive up. It is advisable to stick closely to official public hiking routes as these were chosen to be in locations where the slope was fairly mild (DNV Transportation plan, 2012). It is apparent that some routes are juxtaposed to zones of instability (Map 4). However, the slope layer has a 20 x 20 m resolution that may, to some extent, distort the precise location of unstable slopes relative to public hiking trails. It is always advisable to hike with a friend and stay alert of the surroundings, especially watching out for Black and Grizzly bears.

Diagram 2: The District of North Vancouver Transportation plan. Key growth areas.



Map 4: Final map. Areas of instability are the same as in map 1. Public hiking trails, ski resort on Grouse Mountain, and hazardous area when the soil is fully saturated, are identified.

Limitations. It is important to note that limitations are present within the model and the projected areas of instability. The resolution of the slope layer is 20 x 20 m, meaning that there may be slopes that are shown to be hazardous, but perhaps are not. The opposite is true as well, where there may be slopes that are considered to be safe, but could in fact be hazardous. No field data was acquired from the North Shore Mountains, and parameters were derived from field and assumed measurements from the study at Jamieson Creek. The depth (d) value for the lower segment was assumed, derived by looking at root characteristics of Coastal Western Hemlock. It is also apparent that the Factor of Safety equation lacked a wide range of parameters. Specific measurements for porosity (n), mineral density, unsaturated water content, unsaturated unit weight of soil, layer thickness, and vertical stress,

were not derived. Instead, the unit weight of water was kept constant as well as the unit weight of the soil. Peak and residual values for cohesion (C), friction angle (Φ), peak strength and residual strength were not calculated. Precise values and calculations for these parameters were excluded for simplicity of the model. The cohesive properties of soil and root strength were used interchangeably, even though there is evidence to show that the soils within this area may be lacking cohesive properties. Furthermore, the cohesion value of the upper segment was assumed to be half of the cohesive value of the lower segment, derived by assuming that trees will be much sparser at higher elevations only having half the cohesive properties. Ground water moisture values form the Jamieson Creek study were used as the relative saturation (m) parameters; the highest value (0.25) was applied to the lower segment, and the lowest value (0.15) was applied to the upper segment. This was concluded simply by assuming that the lower segment will experience more precipitation as water droplets, whereas the upper segment will experience most precipitation in the form of snow. Moreover, field measurements from the Jamieson Creek study were taken at an elevation between 740 m and 785 m. Hence, the values used may not be representative of the entire study area, resulting in a lack of accuracy when locating potential unstable slopes. Seasonal variability was not accounted for, thus, varying relative saturation depending on precipitation measurements was not abided for in the modeled runs.

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Shapefiles obtained from:

GeoWeb: District of North Vancouver GIS department (http://geoweb.dnv.org/data/)
- Contours 20 m
- Trails for public use

Software used to represent slope instability:

ESRI ArcMap. Version 10.4
Projection: NAD 1983 UTM Zone 10N

Poland: The Transition from a Command Economy to the Free Market

An Analysis of the Economic Developments from 1989-2016

By Kevin Wiens

The fall of the Soviet Union and the communist reign meant the necessary adoption of several national economies into the international stage. This paper will analyze the relative success Poland has achieved in its progression to an open market economy. Why is it that Poland has done significantly well, while other satellite states lag behind? Economically speaking, Poland has achieved far more success than its Eastern European neighbours recovering from communism, with growth continuing today. Poland's success measured against other nations is evident, but its success comes with consequences like regional disparity and polarization of wealth. This paper will historically examine Poland's post-war communist developments, and its economic transition after the fall of the communist bloc in 1989, continuing to today. This examination will help to explain why Poland suffers from internal wealth gaps and aim to provide answers as to why its wealth is not shared spatially amongst all socio-economic communities.

Introduction

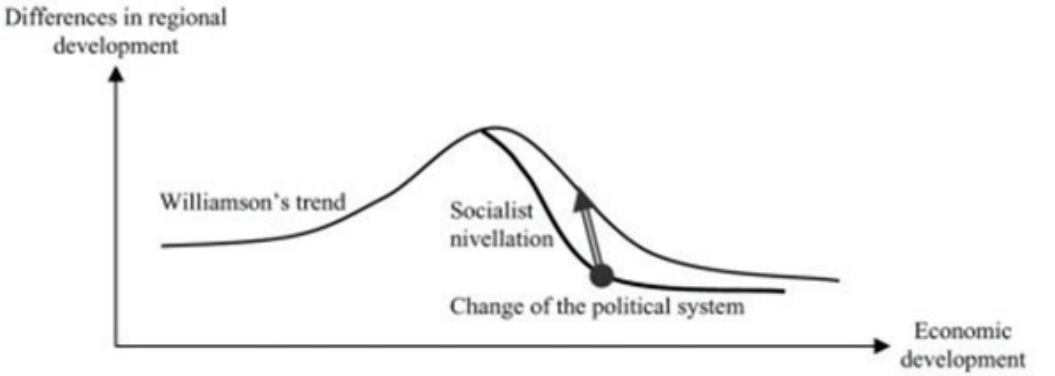
In 1989, following the collapse of the Soviet Communist bloc, Poland began its transition from a command economy to a free market economy. In this time, Poland has been crowned the "champion of growth" within Europe. In the following text I will analyze the transition, reform procedures, and efforts that Poland experienced and delivered to achieve this title. Analysis will focus on the economic programs embraced to shift away from a state-run economy and the resulting regional disparity. I

argue that Poland's substantial economic growth over the past 27 years is a result of embracing neoliberal policies that allow an open market to flourish at the cost of substantial income inequality and poor labor conditions. Economically speaking, with the exception of the USSR, Poland is the most successful post-communist nation, and its growth is continuing today. Shifting into a market economy is not an easy task, as many of the post-communist countries are far behind Poland. Poland's transition is worth noting for reference on implementing economic reform. Nations such as Cuba or Laos, who currently possess communist tendencies, could look to Poland for a possible strategy should they choose to fully transition.

Prior Research

The transition of the Polish economy has been widely acknowledged and studied by scholars worldwide. The first published book I will address is The Political Economy of Poland's Transition: New Firms and Reform Governments (2005). Geographers John E. Jackson, Jacek Klich, and Krystyna Poznańska analyze the dynamics of the Polish economy in the key transition years (1990-97) and examine the social and distributional costs of transition. Wolnicki, Kwiatkowski, and Piasecki's journal, J*obless Growth: A New Challenge for the Transition Economy of Poland* (2006) explains the sources of jobless growth in Poland, and discusses the economic system transition and integration into the European Union. I focus on the developments of poverty and migration of populations as potential sources of the regional inequality existing in Poland. With the attempt to predict the economic future of Poland, I use the Williamson Curve hypothesis (Figure 1.0). Williamson argues that in a catching-up country (Poland), there are growth pole regions in which capital and skilled workers are concentrated (Warsaw). As a consequence of a fast rise in productivity, growth accelerates in the central regions and is not matched in the periphery, resulting in disparities. Béla Szörfi analyzes this effect within the EU in her article *Development and Regional Disparities – Testing the Williamson Curve Hypothesis in the European Union* (2007). My contribution to this area of study is to point out/identify the origins of Poland's national economic growth and the unintended effects of social and income inequality. I apply the reform procedures

adopted, such as "shock therapy", to examine these developments and other factors that relate to its consequences. I emphasize the urban-rural income division, levels of poverty, and the negative realities of the job market within Poland. The application of communist economic history is necessary to understanding the realities today.



Source: own editing work on the basis of *Nemes Nagy* [2009], p. 327.

Figure 1.0. The Williamson Curve, applied with socialist transition characteristics. Source: Tanczos T., Zoltan E. The Testing of Williamson's Hypothesis in View of the Social and Economic Development of Microregions in Hungary. NOTE: Nivellation is defined as the lowering of something to a certain level. In this context nivellation means to move away from a socialist economic structure.

Data and Methods

In order to support my claims, data and research was obtained by organizations from the World Bank, the United Nations, Organisation for Economic Co-operation and Development (OECD), European Commission, and so on. The application of the World Bank and UN statistics will be useful to demonstrate yearly trends and developments of Poland's economy. Poland's economic structure, which is described by the scholars listed previously, couples the statistics provided by the World Bank and the UN to verify its success/failures. In addition, I utilize the OECD and EU reports as a comparison tool, to obtain a further understanding of economic development. I will keep comparisons among nations within a relative

geographic proximity. I only venture outside of Europe briefly to compare Poland to Canada, as it is my country of study. I also believe it is necessary to look at other former communist countries, and how they approached the post communist transition in the 1990s. It is important to obtain statistics of the historical aspects of their transition to recognize the process of economic development. In doing so, former European communist countries will be the main geographic focus of the regional dispersion of their national wealth.

Findings and Analysis

Poland's Communist Years: Failed Command Economy. The Dictionary of Human Geography defines a command economy as an economy in which the means of production are owned and controlled by the state and in which central planning prevails (2011). This is different from a free market where any increase in production quantity or quality would be due to an increase in surplus, rather than increased productivity. Poland operated under a command economy from their admittance into the Soviet Bloc in 1945 until the collapse in 1989. The command economy does not aim to generate large-scale profits or surplus because it seeks only to provide its society of what it needs for a sustainable life. There is no competition in a command economy due to state owned enterprises (SOE) dominating the economic scene. In order to operate a command economy, yearly goals are created by the state as motivation for workers. Within this framework, production goals are established in an annual operational plan, called the national economic plan (Glenn E. 1992). The state operates the means of investment and maintains a public ownership of industrial assets. The positive side of a state operated economy is that everyone has total employment. Ensuring that everyone is doing his or her part of the collective economy was crucial, but this system seems to generate a stagnant economy. Although countries operating in a command economy did see growth over the years following World War II, it was not the progress that was witnessed by free market economies of post war Europe (refer to Figure 2.0). For Western European countries, this post-war period was known as the "Great Acceleration" of economic growth (Steffen, Broadgate, Deutsch, Gaffney, Ludwig, 2015). As displayed in Figure 2.0,

Austria, France, and the United Kingdom saw tremendous growth following an open market ideology. The economic growth of Poland, Yugoslavia, and Hungary fell far below the western nations, validating the inability of a command economy to generate sufficient means of production to distribute wealth across a country. In addition, since most goods and services are produced by the government, the command economy failed to satisfy the commercial needs of the Polish people. The dismantling of command economies in Eastern Europe reflected an inability to produce goods in the mass quantities that people had come to expect because of difficulties in coordination and the lack of efficiency incentives (Gregory, Johnston, Geraldine, 2011). The socialist economies were proven unable to keep pace with the world economy of an open market. Consequently, several former Soviet Bloc countries, including Poland, began the process of westernizing their economies.

GDP Per Capita		Maddison Historical GDP Data			
1990 Int. GK					
	1950	1960	1970	1980	1989
U.K.	6,939	8,645	10,767	12,931	16,414
France	5,186	7,398	11,410	14,766	17,300
Austria	3,706	6,519	9,747	13,759	16,360
Poland	2,447	3,215	4,428	5,740	5,684
Hungary	2,480	3,649	5,028	6,306	6,903
Yugoslavia	1,551	2,473	3,755	6,063	6,193

Figure 2.0. GDP per capita comparison of select European countries from 1950-1989. http://www.worldeconomics.com/Data/MadisonHistoricalGDP/Madison%20Historical%20GDP%20Data.efp

Poland's Transitional Years: 1989 to late 1990s. In an attempt to protest of the status quo of working and social conditions, workers of Poland founded the solidarność, or Solidarity Movement in 1980. In 1989, after nine years of persevering through countless attempts of political suppression by communist leadership, Poland held a true democratic election. As a result, Tadeusz Mazowiecki became the prime minister of a government committed to dismantling the communist system and replacing it with a Western-style democracy and a free-market

economy (Glenn E. 1992). In 1990, with financial support from the International Monetary Fund (IMF), Poland introduced its first major restoration strategy: Shock Therapy (Jackson, et al. 2005). Also referred to as the Balcerowicz Plan, this meant a complete and immediate westernization of Poland's economy. The program included liberalizing controls on almost all prices, eliminating most subsidies, abolishing administrative allocation of resources in favor of trade, introducing free establishment of private businesses, and liberalizing the system of international economic relations (Glenn E. 1992). Through the Act of the Privatization of State-Owned Enterprises (1990), the process of dismantling of SOE put the majority of businesses in private hands through purchase or lease (Jackson, Klich, Poznańska, 2005). Jackson and colleagues believe that the most effective immediate reform was liquidation (2005), which would give citizens the ability to buy or lease-to-own the assets of the shop being liquidated. This contributed to the Polish economy by an immediate dismantle of SOE, and provided the framework for productive assets to enter the economy under private enterprises. This effectively put more money in the hands of individuals for a market economy to flourish in the coming years. However, the transitional phase was not all positive; it was marked by difficulties for many. Figure 3.0 shows the socio-economic hardships that many endured during the transitional phase.

Year	Unemployment (%)	Inflation (%)	Wages (1989 = 100)	GDP (1989 = 100)
1989	0.0	>250.0	100.0	100.0
1990	6.3	140.0	75.8	92.0
1991	11.8	70.3	75.5	85.6
1992	13.6	43.0	73.3	87.8
1993	16.4	35.3	73.0	91.1
1994	16.0	32.3	74.3	95.9
1995	14.9	27.9	76.4	102.6
1996	13.2	19.9	80.7	108.7
1997	10.3	14.9	85.5	116.2
1998	10.4	11.8		121.8

Figure 3.0 Poland's socio-economic transitional phase 1989-1998. Source: The Political Economy of Poland's Transition: New Firms and Reform Governments (2005).

At the unemployment peak in 1993, there were approximately six million Poles unemployed, coupled with the lowest wage in the transitional phase of just 73.0% of the 1989 level, this marked a tough year of transitioning economy. As evidently displayed in figure 3.0, the high unemployment rate and low wage did not last for long. In 1990, Poland's GDP per capita sat at $6,100, and by 2000 it had risen to $10,600, marking a 42% increase (OECD Database, 2016). In the same period, Poland's economic growth surpassed many Western nations, including the UK (36%) and Canada (31%). A useful reference for comparison is the developments of the Czech Republic, who also implanted shock therapy reforms following its break from the Soviet Bloc. In 1990 the Czech Republic's GDP per capita rested at $12,680 and by 2000 it had only reached $16,255 (an increase of 21%). While it is higher than Poland's GDP per capita, Poland's growth percentage in this period was unmatched by most of Europe, justifying its title as Europe's "champion of growth".

Continued Success: Poland's Economy in the 21st Century. From 2000 to 2014, the GDPper capita in Poland grew by 57%, reaching $24,952 (OECD Database, 2016). The European Commission of Economic and Financial Affairs claims that much of its success derives from the priorly mentioned shock therapy initiatives. At the same time, Poland's wage moderation and its relatively stable business environment attracted considerable foreign direct investment. In addition, billions of euros from the EU structural funds helped contribute to the improvement of Poland's infrastructure, and its human and productive capital (http://ec.europa.eu/, 2015). What's more, Poland's efforts to getting itself more involved in the international community was proven to be helpful to Poland's economic prosperity. In 1996, 1999 and 2004, Poland joined the OECD, NATO, and the EU, respectively. This was all in an attempt to further integrate itself into the global policy making circles, gaining more international influence for the Polish economy. The World Bank lists Poland as the eighth best economy within the EU (in terms of real GDP), and ranks Poland as the first in Central Europe. The WB attribute these levels of economic success to its strong private sector, internationally competitive export-oriented companies, as well as well-educated and skilled workers. Between 1990 and 2008, Poland

Figure 4.0. Eastern European GDP (USD) per capita growth (annual %) in 2015. Source: World Bank Database (2016).

growth in terms of GDP. In 2015, Poland's GDP per capita growth also saw significant strides compared to neighbouring countries (see Figure 4.0).

Central Wealth: Regional Disparity and Poverty in Poland. The unfortunate reality within Poland's economic success is that it came with substantial regional disparity. While Poland weathered the 2008 global financial crisis better than its neighbors (due to its domestic driven economy), it still resulted in income growth per capita for the bottom 40% falling behind the growth rate for the entire population (World Bank Database, 2016) shortly after the global financial crisis. Meaning economic recovery and growth after the crash was focused on the top half of the population.The European Commission attributes the unequal GDP per capita levels with the following: (i) a persistent gap between western and eastern Poland, (ii) increasing disparities between the fast-growing Warsaw region and the rest of the country, and (iii) rising intra-regional

differences, mainly due to the urban-rural divide (2009). The Williamson hypothesis can be directed applied to this case of Poland's growing regional inequality. Assuming the hypothesis is true, Béla Szörfi suggests the persistent disparities in employment, unemployment and labor productivity across Polish regions stem from different paths of restructuring in agriculture, human capital endowment and spatial concentration of investment in metropolitan areas (2009). Szörfi proposes that these inequality gaps could be diminished if government and international initiatives take more action. For example, she specifically claims investing human capital in Poland's lowest income regions, coupled with better transport connections could attract more foreign direct investment to these areas. Figure 5.0 displays the Gini index to show the wealth stratification amongst Poland's regions (with zero being complete equality and one being maximal inequality).

In 2016, Poland's Gini index was a fairly high 32.4, while other European nations such as Belarus (26.0) and the Czech Republic (26.1) experience much lower levels, comparatively. The contribution to GDP growth of the top

Measure	Region of Poland						Total
	Central	Southern	Eastern	North-western	South-western	Northern	
Mean income $\bar{y}_i$ [1000 PLN]	3.554	3.093	2.861	3.227	3.159	3.122	3.186
Population proportion p_i	0.218	0.208	0.168	0.154	0.107	0.145	1
Income proportion s_i	0.243	0.202	0.151	0.156	0.106	0.142	1
Gini index G_i	0.381	0.318	0.355	0.342	0.352	0.348	0.352
Stratification index Q_i	–0.025	0.054	–0.023	0.031	–0.001	0.005	
Within-groups term (Y–L)	0.093	0.064	0.054	0.053	0.037	0.049	**0.351**
Between-groups term (Y–L)							**0.006**
Stratification term (Y–L)							**– 0.003**
Within-groups term (D)	0.020	0.013	0.009	0.008	0.004	0.007	**0.062**
Between-groups term (D)							**0.042**
Transvariation (overlapping term) (D)							**0.249**

Figure 5.0. Decomposition of income inequality in Poland by region. Source: Alina Jędrzejczak. Income Inequality and Income Stratification in Poland (2014).

10% fastest growing regions was around 60% in Poland in 2010 (OECD Database, 2016). In the periphery regions, poverty remains a major area of concern. In 2013, 17% of the Polish population was below the poverty line (World Bank Database, 2016). Located primarily in the Eastern and Southern regions with a concentration in the rural areas, these populations do not have the economic and social opportunities that they would have if they were located in the center. A news article published on Radio Poland in 2014 stated that approximately 1.4 million Polish children were living in poverty, with those from large families and small towns suffering the most (http://www.thenews.pl/, 2014). It is clear that small towns and rural areas take the brunt of the unequal wealth distribution in Poland. In addition to poverty, this social stratification has also greatly impacted worker mobility and job stability in Poland. I now turn my analysis to the impacts Poland's economic growth have on employment.

Worker Mobility. As of February 2016, the seasonally adjusted unemployment percentage within Poland rested at 6.8%. Comparatively, the lowest unemployment rates within the EU at that time were

Figure 6.0. Poland possesses a higher unemployment percentage than Germany, Czech Republic, Belarus, and even Austria. Source: World Bank (2016).

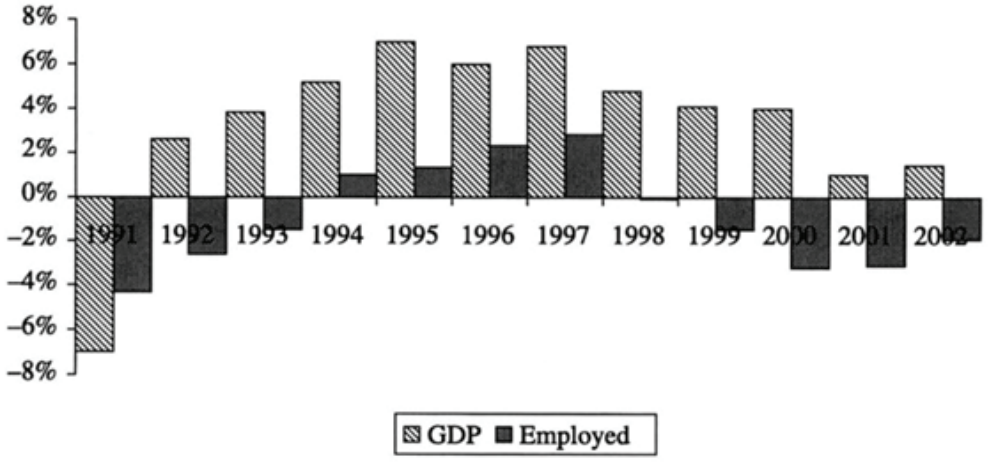


Figure 7.0. Poland GDP growth compared to Employment %. Source: International Journal of Social Economics (2006).

recorded in Germany (4.3 %) and the Czech Republic (4.5 %) (http://ec.europa.eu/). Figure 6.0 shows the map of Europe with the corresponding national unemployment rates . This will provide assistance in examining the geographical pattern of European unemployment. Poland's relatively high unemployment rate stems from its transitional phase, as shown in Figure 7.0. The figure shows the correlation between GDP growth and unemployment rates during the transitional years. Wolnicki, Kwiatkowski, and Piasecki collectively suggest that this high level of unemployment could be directly linked to the drop in the overall demand for labor due to the rise of labor productivity, which coincided with the high rates of GDP growth (2006). These figures have remained consistent in recent years, and labor mobility within Poland is problematic. Polish workers have relatively low job security compared to other European nations, which is coupled with a large service sector economy. Following the opening of the labor market within the EU, Poland was hit hard by a mass emigration of workers who went abroad for better work opportunities and wages. The European Commission's Annual report on labor mobility showed that more than 50% of the EU-28 citizens aged 15-34 who left their country of citizenship for another EU/EFTA or third country in 2012 came from Poland, Romania or the UK. In addition, Poland has one of the highest emigration rates amongst highly educated workers (6.2%)

within the EU. Much of this has to do with the regional disparity within Poland. Poland's overall wealth and investment was focused heavily on Warsaw and the center regions, leaving the periphery regions behind and neighbouring states with fewer employment and development opportunities.

Conclusion

Hindered by the two world wars, Poland has never been able to sustain long-term growth without the intervention from outsiders or internal conflicts. However, Over the past 27 years, Poland has seen unprecedented development economically. Since their break from communism in 1989, Poland has successfully maintained consistent economic growth, and integrated itself into the European community. Poland's transition from a command economy to a market economy was the most successful in world history. The implementation of shock therapy worked for Poland and provides an example for countries like Laos, North Korea, or Vietnam. Given all of the success and abundance of Poland's national wealth, it has been proven this wealth is not equally distributed amongst the population. Outside of the center, the possibilities for individual social and economic advancements are small. Without the necessary investment and attention to the problematic areas, social stratification of wealth will continue to dominate the small towns, rural, and periphery regions. Poland's ability to accumulate an abundance of national wealth is extraordinary, and thus rightfully deserves the crown as the "champion of growth" within Europe over the past quarter century.

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Political Geography and Subaltern Potentials of a Post-Paris World

By Tiago de Souza Jensen

Though the landmark 2015 Paris Agreement has been lauded as a breakthrough agreement on climate change, the process and outcomes of the Agreement should remain under critical scrutiny. This paper uses a matrix adapted from Harvey's "Space as a Key Word" in order to interrogate the evolution of the norms underlying the decisions institutionalized in the Agreement within a spatial context. In doing so, this paper will show that disenfranchised and deterritorialised peoples have little to no voice and power in the current international sustainability regime. If climate justice remains an aspiration of the international community, norms must shift to realize the needs and rights of such populations. We must continue to aim for deeper thought and more diverse discourse surrounding climate change and international agreements while remaining focused on the ultimate goal of locally-empowered sustainability movements.

Introduction

The 2015 Paris Agreement, signed by all Parties to the United Nations Framework Convention on Climate Change (UNFCCC), has been widely supported as a breakthrough effort in global climate negotiations. Despite outspoken support from prominent political figures on the international stage, outcomes of the Paris Agreement still require critical analysis. By situating post-Paris emissions in David Harvey's spatial matrix, I will demonstrate the importance of resituating Paris-related discussions in a historical context of society, space, and ideas about nature and political being (Harvey, 2006, p. 143). In doing so, I aim to show that disenfranchised and deterritorialised peoples have little to no voice and power in the current international sustainability regime. For this reason, norms must shift to realize

the needs and rights of such populations if climate justice remains an aspiration of the international community.

In "Space as a Key Word," David Harvey explores the importance of space in studies of politics and geography. In his article, Harvey builds a matrix (Figure 1) depicting how space is formulated and understood.

1-1	Material Space 1-2	Representations of Space 1-3	Spaces of Representation 1-4
Absolute Space 2-1	Cities, Mountains, Gated Communities 2-2	Newton, Descartes: Euclidean geometry, placement and positionality 2-3	Sense of power, security, command 2-4
Relative Space 3-1	Flows of commodities, people, information, capital; friction of distance 3-2	Einstein, Riemann: Non-Euclidean geometry, metaphors of situated knowledges, time-space compression 3-3	Tensions and exhilarations of space-time compression, speed, motion 3-4
Relational Space 4-1	Social relations, energy potentials, pollution concentrations 4-2	Liebniz, Deleuze: existentialism, cyberspace, quantum physics 4-3	Psychic states (vertigo, claustrophobia) 4-4

Figure 1. Harvey's combined matrix of spatial dimensions.

He follows the development of understandings of space through Newton, Descartes, Einstein, and Deleuze's work. Crucially, he traces the links between rational, logico-mathematical understandings of space framed against philosophical positions on reason to stress the importance of postmodern conceptualizations of space and knowledge. Though created as a demonstrative tool for Harvey's spatial theory, the matrix also has the potential to structure a spatial exploration of other topics. Creating a second matrix is thus a helpful tool in understanding how the Paris climate negotiations fit into a broader material, ideological, and philosophical project (see Figure 2).

1-1	Material Space 1-2	Representations of Space 1-3	Spaces of Representation 1-4
Absolute Space 2-1	Natural disasters, resources 2-2	Newton, Descartes: Euclidean geometry, placement and positionality 3-2	IPCC, Environmental stability, resource scarcity/plenty 4-2
Relative Space 3-1	Changing flows of resources and distributions; flows of commodities, people, information, capital; friction of distance 2-3	Einstein, Riemann: Non-Euclidean geometry, metaphors of situated knowledges, time-space compression 3-3	COP, Human (social, emotional) impact of creative destruction 4-3
Relational Space 4-1	Emissions concentrations, Social relations, development potentials, pollution concentrations 4-2	Liebniz, Deleuze: ecojustice, intergenerational equity 4-3	Psychic states (insecurity, objectivity, rationality) 4-4

Figure 2. Harvey and Lefebvre's spatial matrix from a sustainability-focused perspective.

This matrix is particularly important because spatial interpretations are neglected in analyses of spatial dimensions of sustainability discourse. Harvey states that "an event or a thing at a point in space cannot be understood by appeal to what exists only at that point. It depends upon everything else going on around it" (Harvey, 2006, p. 143). Similarly, Doreen Massey reminds us that space "is not a surface, but a constellation of on-going trajectories" (Massey, 2006, p. 94). In other words, material objects and places are intimately linked with processes, people, and objects in other places and times. These claims reinforce the critical importance of the spatial approach in evaluating norms of sustainability discourse; the constellation of spatial forms surrounding climate change, such as emissions, disasters, and development, are tightly linked to the way discourses about climate action are structured.

Moreover, the role of international norms in structuring sustainability discourse cannot be understated. As Finnemore and Sikkink assert, "customary international law is norms" (Finnemore and Sikkink, 1998, p. 916). In sustainability discourse, which is a discourse that upsets international norms of development and natural resource extraction, we must be attentive to how normality in discourse holds power. Massey reminds us that "for present [political] relations, it is precisely often 'normality' itself that must be challenged . . . it is normality that is the disaster" (Massey, 2006, p. 94). Looking at climate work and system change, Wallerstein notes that one of the primary mechanisms holding the international system back from this process is "the pervasiveness of an ideological commitment to the system as a whole" (Wallerstein, 1974, p. 404). Evidently, an exploration of the way the international system functions and the problems with its maintenance is an important part of any analysis of climate change and political economy. The matrix provides us with a useful tool to understand the relations between the material dimension of climate change and sustainability as well as the discourses and systems that surround the actual events.

Using the matrix also allows for a relational, critical analysis of the capitalist approach to sustainability. Maintaining capitalism as a target for critical analysis is important; the international capitalist system, which encapsulates both material objects and events as well as the discourses that structure the way those events are understood, must be viewed as dialectically related to those objects and events. Harvey shows us that "capitalist solutions provide no foundation for dealing with [problems] which are structurally necessary for the perpetuation of capitalism" (Harvey, 1972, p. 10). The sustainability problem is undoubtedly such a problem. Wallerstein also encourages a turn to Marxism(s) in order to pursue a fuller picture of social reality (Wallerstein, 1974, p. 388). Clémençon, in an analysis of the norms behind the Paris Agreement, tells us that this approach to sustainability "does not address fundamental problems with the global capitalist economic system" (Clemencon, 2016, p. 9). Consequently, without a Marxist, subaltern perspective, it is unlikely that productive critique will arise from analysis of existing regimes of truth.

Post-Paris Emissions and Spatial Geography

The sustainability matrix (Figure 2) aims to contextualize how different facets of the broad sustainability issue interact. A step-by-step movement through the matrix can illustrate how the matrix allows dialectical analysis of sustainability discourse. The first column of the climate matrix (1-2) relates to the realm of material trends and impacts. Record-breaking climate events (2-2) will continue to develop as the focus of international debate and media attention as have floods in India, typhoons in South East Asia, and hurricanes in the Gulf of Mexico. Though evidently devastating on a local level, the way catastrophic climate events are discussed on the international stage shapes how climate change is conceptualized.

Relative space and friction of distance (3-2), which refer to the way space is related to itself, has been decreasing as technology allows ever-faster global travel and interaction. In the context of climate change, this adds the new climate stressor of global travel, but also provides new opportunities for global cooperation. Looking, finally, at 4-2, we know "for every degree the average global temperature rises, so do the mass movements of population, the number of failed and failing states, and very probably the internal and international wars" (Dyer, 2008, p. 12). Consequently, the way different populations are represented on the world stage must be a consideration of climate negotiations. These material aspects of sustainability and climate change are the functional base of norm development and adoption. In this sense, we must view the urgency of climate change and the call for sustainability within the context of existing and projected change by placing them in the context of norm development and international discourse.

In the second column, the matrix explores representations of space, and how the preceding material themes are situated within the context of the international system. These representations (especially 3-3 and 4-3) speak to the politicised nature of all climate negotiations and the system of norms that set the boundaries of what is possible during negotiations. Representations of climate change and sustainability structure international discourse by delimiting how such events can and should be understood. For example, the discourse of material 'natural resources,' which reifies the

material environment as a resource to be extracted, dominates international conceptualizations of the commons. This notion resists the idea of 'limits to growth,' and human economic equilibrium (Meadows, Randers, and Meadows, 2006, p. 172), which signals an important representation of material climate space (Meadows, Randers, and Meadows, 2006, p. 296).

Success of norm entrepreneurs in mainstreaming ecological issues has perversely created an easy out for neoliberal policymakers. Rather than confront the true root of the crisis, that of ongoing modes of unsustainable production and consumption under capitalism, the climate crisis is cast as an unfortunate and perhaps unavoidable ecological process. In the context of the matrix, this involves a conceptual displacement. Instead of understanding the climate crisis in the context of capitalism and international political norms (column 3), neoliberal policymakers have a vested interest in maintaining the absolute nature of the climate crisis (column 1), which amputates the systematic nature of the crisis.

This process is clearly played out on the international stage. International policy organizations such as the IPCC and the COP frame the crisis as almost outside the scope of individual, society, state or international society-originated reform and until fairly recently, not of normative importance. For example, under 'Drivers of Climate Change' in the IPCC 5th Assessment Report, capitalism, political power, international norms, and other significant drivers of climate change are not mentioned, in favour of dehumanized pseudo-natural processes such as CO2 levels and ocean acidification (Stocker et al., 2013, p. 11). This is in part due to the great effort needed to mobilize support for scientific understanding of the climate in the first place, which allows us to understand the climate crisis as merely a material crisis (Hansen, 2009, pp. 239-241). Consequently, these selective representations of space have been constituted in such a way as to sideline radical change and envelop green discourse within existing problematic international norms. This process signals the significance of how international norms take hold of sustainability discourse.

Neoliberalism in particular has played a significant role in shaping this landscape of norms. Peck and Tickell note the importance of taking a process-based

view of neoliberal norms and remind us that there is no hegemonic global neoliberalism. Instead, compromises in norms and discourse development are critical to the norm adoption process (Peck and Tickell, 2002, p. 3). In the context of climate negotiations, states continually negotiate their positions within narratives of development and success in order to leverage unity and diplomatic power as is necessary (Clemencon, 2016, p. 5).

The Paris Agreement is perhaps the ultimate expression of the neoliberal discourse in politics as the emissions-trading scheme or marketization of the climate are ways to capitalise on climate change instead of addressing it as a crisis proper (Clemencon, 2016, p. 4). Burke et al. assert that the "continued commitment of the UNFCCC to market mechanisms is fetishistic and bizarre" (Burke et al., 2016, p. 510). With both developing and developed states accepting the neoliberal norms of the international regime as today's reality, these norms shape the global political reality, which leaves out any discussion of responsibility and accountability. Thus, I conclude that ongoing neoliberal approaches to climate management will strongly oppose any movement towards adopting a relational representation of space (4-3).

The third column speaks to the dialectical tension between material spaces and spaces of representation. This layer exposes assumptions about the relationship between nature and human society (including the construct of nature itself) as well as power relations that constitute international relations. These beliefs influence how climate change should be managed, how international power relationships are structured, and how processes of international justice are shaped, including for whose benefit.

At present, the taken-for-grantedness of state and population materiality, which stems from matter-of-fact support for the system in its current form, strips the nation-state of its epistemological heritage. Situated in its historical context, we understand that neocolonial and neoliberal states wield power over their subjects through diffuse cultural means, rooted in longstanding practices. Coulthard quotes Taiaiake Alfred in reminding us that colonial governance is constituted in part through a "fluid confluence of economics, psychology, and culture" rather than visible territorial aggression (Coulthard, 2006, pp. 455-456). In the same vein, agreements like

the Paris Agreement, which reifies specific values about how international society should work, arise through norms that validate and enforce a colonial, capitalist political arrangement. These international norms can result in negative social consequences at national and regional levels, which arise from a marginalization of deterritorialized people. Canadian treatment of First Nations, which involves the "enfranchisement" of Indigenous communities with the purpose of cultural and social annihilation, is a powerful example of the potential of these state projects (Anaya, 2014, p. 4).

As a result, many thinkers are now seeking political ways outside the current system instead of approaching reform . Daigle, for example, explores a movement for Indigenous self-representation "outside and/or alongside formal state and intergovernmental structures" (Daigle, 2016, p. 259). Boggs also calls for a diffuse anticapitalist movement, stripped of the charisma and vanguards of patriarchal revolutionary movements, shaped by "individuals and groups responding creatively with passion and imagination" to global crises (Boggs, 2011, p. 178). These are extremely important subaltern calls to action; not within or in partnership with the capitalist, colonial international sovereign state system, but outside of it, contesting its hegemony, and calling into question its ongoing value. Through these heterogeneous, localized movements, we can resist the hegemonic power of international norms and create new, sustainable futures.

Conclusion

This paper has explored the intensifying climate crisis using a Marxist spatial geographical perspective on post-Paris Agreement emissions. This perspective has allowed us to explore the ways material elements like emissions and the post-Paris Agreement itself mix with international norms, politics, and representation.

There are two potential ways of looking forward beyond the current limits of our statehood and societal organisation. First, self-determination, especially anti-colonial Indigenous self-determination in colonial contexts, should be a central part of climate change discourse. Second, because capitalism is the issue, the importance of abandoning capitalist modes of addressing the climate crisis is clear (Burke et al., 2016, p. 514). We need to begin reconsidering what rights non-

Anthropocentric ecology holds and how we want to penalise violence against these systems (Burke et al., 2016, p. 516). In addition, it is critical to continue holding space, capital, the State and the climate in dialectical tension with each other when undertaking sustainability projects to retain all possible avenues for thought and discussion (Boggs, 2011, pp. 59-71). With these principles in mind, we can aim for deeper thought and more diverse discourse surrounding climate change and international agreements while remaining focused on the ultimate goal of locally-empowered sustainability movements.

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The Quantified Self: Exploring the Ethics of e-Hancement Alongside The Rise of Planetary Urbanism

By Natasha O'Byrne

Technology of all sorts has become an omnipresent feature in the world's urban spaces, and the growing presence of self-tracking devices marks a shift in our use of technology from being largely extrospective to becoming deeply introspective. Gary Wolf and Kevin Kelly coined the term 'Quantified Self' to explain the phenomenon of people using means of personal data collection in order to quantify and track information about themselves. This article will focus on the integration of these tools and technologies into the physical and social landscape of the urban world. Questions will be explored of how self-tracking devices are changing our ability to connect with one another, what this change means for the experience of the human condition as we know it, and of what the implications of personal quantification are for urbanity as the notion of what it means to be human falls at a potential crossroads during this era of planetary urbanism.

Introduction

Technology has been interwoven into the modern environment in unprecedented ways. We use computers in virtually all aspects of life, and for years they have helped us to communicate with, travel through, and make sense of the world around us. But now we are turning our use of technology in the other direction—to look inwards at ourselves. A new field of personal analytics has emerged, with tools and apps used to self-monitor and self-analyze virtually every aspect of human life. Using these tools,

we can now produce, collect, visualize, and interpret data about ourselves in real time. Generally speaking, this data is used with the end goal of self-optimization, ergo; striving to become the best possible version of ourselves. Looking to Gary Wolf's notion of 'the Quantified Self' (QS), this article will focus on the integration of these technologies into the modern urban world, and what the implications of this movement have been in profoundly changing the very ways in which people learn about and reflect on themselves, on others, and on the world around them.

In what follows, this article will define what exactly the Quantified Self is and how it relates to Frederick Winslow Taylor's theory of 'Taylorism'—valuing efficiency over all else—being transferred from mechanical to social applications in the post-industrial urban world. The notion of the QS as a connected self will be explored, as will the difference between connectivity and true connection, rearing the question of whether or not we are losing innate elements of the human experience through our quest for optimization. As we move from natural enhancement towards artificial enhancement (or e-hancement), issues of ethics and morality will be explored. As self-trackers become nearly ubiquitous in the contemporary urban world, do we run the risk of creating an "egotistical world of self" (Wolf, 2009), and, if so, what are the implications for urban spaces as the notion of what it means to be human falls on the brink of a fundamental shift? We are constantly plugging in and logging on... but are we tuning out?

What is the 'Quantified Self'?

The concept of the Quantified Self (QS) was first coined in 2007 by Wired Magazine editors Gary Wolf and Kevin Kelly to describe the process of learning about oneself through the use of self-trackers and wearable data collectors. These technologies allow individuals to view quantified biometrics on an incredibly personal scale. As trackers such as the FitBit and Zeo, which monitor physical activity and sleep quality, respectively, become increasingly cheaper and more convenient, it simultaneously becomes possible for virtually anybody to get involved in the QS movement. Aspects such as caloric intake or activity level have been monitored since before the advent of these technologies, but to do so was a much more tedious task. Having to manually log each step, calorie, or hour

spent asleep required much commitment and energy. Enter the self-tracker: with the advent of auto-analytics, this information is automatically tracked, logged, and quantified for you in real time.

This notion of convenience ties into Nicholas Carr's work in highlighting the utilization of Frederick Winslow Taylor's theories on the efficiency of industrialization into the world of social sciences. Taylor was a mechanical engineer who sought to increase the output of industrial production. By recording and timing every movement of his machines, he was able to divide the total process into a series of smaller tasks. In doing so, he created a "set of precise instructions" for each worker to follow, which Carr denotes as a highly primitive algorithm (2010, p.62). Despite the incredible increase in factory productivity, workers complained of their reduction to being "little more than automatons" performing the "tight choreography" of Taylor's system (2010, p.62). This ideology of maximum efficiency was embraced by factory owners on a global scale, and thus not only revolutionized industrial production, but concurrently reshaped society at large as well, creating the beginnings of a "utopia of perfect efficiency" (2010, p.62). Taylor's assertion that "In the past man has been first, [and] in the future the system must be first" remains paramount today as we constantly crave more, and we constantly crave it faster. We are living in a world of maximums, and these maximums are now being carried over into our very selves as we turn to new tools and technologies in our quest for self-optimization.

In his Technologies of the Self, Michel Foucault discusses the various ways in which human beings have sought out knowledge about themselves, and to make sense of this knowledge as "truth games" (1988, p.18). Foucault views the human tendency of "being concerned with oneself" as a main principle of the city, and as a "main rule for social and personal conduct and for the art of life" itself (1988, p.19). However, this notion has evolved over time following transformations of moral principles in modern societies. The dominant philosophy in Greco-Roman culture was that one must know themselves in order to take care of themselves, whereas in modern culture the inverse is believed: one must take care of themselves in order to know themselves (1988, p.22). Could it be possible that we are currently moving towards the potential of a third philosophical era, in that

within the QS movement one must know themselves not only in order to take care of themselves, but to be the best possible version they can be? Here, biometrics act as a new kind of "truth game"—a new way for individuals to learn about themselves. Variables tracked by wearable sensors may appear to be minute or trivial in nature, but when viewed together can create a profoundly detailed and meaningful map of one's entire existence (Hesse, 2008). It is precisely this amalgamation that makes self-trackers so attractive to so many people. We can now pinpoint exactly what is making us unhappy, and we can change our behaviour to correct it. In other words, we can optimize our lives. After all "It's not about tracking what you do... It's about learning who you are" (Hesse, 2008, p.2).

Quantified Self as Connected Self

Despite the intimate nature of self-tracking, Gary Wolf insists that rather than being "overly individualistic" (2009), the QS movement is a social one, in that the true value of collecting data is found in the compilation and comparison of many individuals' personal information. He uses the term "macroscope" (2009, 2011) to describe the ways in which self-trackers allow us to see the "connections between things", in the same way that "the telescope is for seeing distant things [and] the microscope is for seeing small things" (2011). Using self-trackers to not only view our own most profoundly everyday nuances, but also to compare them to those of others allows us to view the bigger picture from a deeply sociological perspective.

As such technologies become tightly interwoven into our personal and social lives, we become increasingly 'turned on'—always aware, always live, always connected. However, we may be confusing this virtually omnipresent connectivity with real human connection—two concepts that, though alike in name, are very different. In his 2014 TED Talk, General Stanley McChrystal speaks of 'the illusion of being connected'. He states how the question 'are you connected?' now often results in glancing at your mobile phone to see how many service bars you have rather than to do with meaningful inter-human relationships. We have continual access to each other and to each other's information at all times, but are we losing out on real human connections?

General McChrystal goes on to speak of how technology once acted as our "servant", but has now evolved into being

our master. This echoes Foucault's notion of "a new pedagogical game", in which "a master [or] teacher speaks and doesn't ask questions, and the disciple doesn't answer but must listen and keep silent" (1988, p. 32). In this way, technology can be seen as a new pedagogical master of our time. We can all too easily follow the advice that our FitBits or SleepBots give to us without asking why or questioning the validity of said advice. For example Lauren Costantini (2014) speaks of self-trackers as giving us the ability to listen to what our bodies are telling us without needing to rely on experts, meaning that we can act as our own nutritionists, psychologists, and doctors. In this way, for as much as technology has the ability to connect people, it can just as equally isolate. Without real human connection, our entire worlds may begin to concern only our individual selves and morph into an "egotistical world of self", turning "warm flesh into cold arithmetic" (Wolf, 2009).

Costantini goes on to state that self-trackers can act as "training wheels [that] allow us to improve our lives" (2014). We can be healthier, smarter, and happier when we listen to the advice of our computers. However, when we fail to inject a level of agency into our use of these technologies, we edge a little too close to the point in which technology becomes 'master' in a Foucauldian sense. Costantini claims that technology is here to augment the human experience rather than to replace it, and that behavioural modifications that occur as a result of technologies remain present in our lives even after the technology is removed. However, in a 2014 study, Dawn Nafus looked at the effects that various self-trackers had on the everyday lives of participants. She found that while technologies did have (mostly positive) effects on the users, some recoiled back into pre-tracking habits when the technology was taken away following the experiments end. Some participants even experienced feelings of deeper disappointment in themselves for not keeping up with their 'optimal' lifestyles. Lacking the constant reminder of being told what to do in order to remain optimally healthy proved to effectively cancel out any progress made towards the perceived upgrading of the self during the experiment. Here we see the danger of technology crossing the threshold of no longer merely supporting human enhancement, but instead being the sole pillar on which it relies.

e-Hancing and the Erosion of Humanity

It is undeniable that auto-analytics offer the possibility for human enhancement. However, the act of achieving this enhancement through the use of technology sways on the hinge between natural and artificial means of progress. Obviously sensors and trackers are artificial to the extent that they are technologies and not natural forms, but they are also uniquely human creations, and, from the viewpoint of Costantini, such technologies act as a way to "expand our humanness" (2014). However, is there not an inherently moral distinction between natural forms of enhancement and artificial forms of e-hancement? To enhance humanness by natural means is to become a 'better' human through personal actions such as intense training or studying—both of which are often results of using biometric tools and data to supplement the process. To e-hance the human form is to use non-human tactics of improvement, similar to using certain drugs or steroids to improve one's physical form or capabilities. In this sense one could think of self-trackers as digital drugs that enhance the human condition, though ones that are not regulated and whose side effects are not clearly marked (Savulscu and Bostrom, 2015). Just as the use of steroids is deemed unethical in the world of athletics, should not the use of artificial means to enhance the human form without significant levels of human input or agency be similarly unscrupulous? This perception raises the question of at which point the use of personal data turns from ethical to unethical, and of how fluid this distinction can be. In other words, is the use of auto-analytics for the goal of self-optimization akin to 'playing God'?

One possible way to determine whether auto-analytics for e-hancement is ethical or not is to look at the individual traits that are being altered and whether or not they are fundamental to the creation of one's identity. For example, using a FitBit to lose weight will mostly likely not result in a seismic evolutionary shift, but when personal betterment moves into the realm of providing artificial non- or post-human abilities, questions of ethics arise (Savulscu et al., 2015).

For example, some of the most popular data trackers used today collect reproductive information. One such app called 'Glow' is described as an "ambitious enterprise that uniquely applies the power of data science to health [via] personal health tracking products [that] illuminate

health through data, and empower people with new information about their bodies" (Glow, n.d.). This statement exemplifies Wolf and Kelly's notion of the Quantified Self movement through the use of self-trackers in order to learn more about oneself. Even further, direct linkages can be drawn to Foucault's writings on 'truth games' and the tendency of 'being concerned with oneself' as a facet of contemporary humanism, especially in today's state of planetary urbanism.

What is peculiar about apps like Glow is that while they offer to improve the human condition, to do so is to inject technology into the very essence of human continuity: reproduction. Women now have access to information that will not only optimize their chances of conception, but will continue to monitor personal data throughout their entire pregnancy. While women around the world must undoubtedly celebrate technologies that allow them to experience pregnancy in the healthiest and easiest way possible, questions of ethics remain present. What about women who cannot access these technologies? What are the ethical implications of creating people who may not have otherwise existed? Will the optimization of pregnancy contribute to engineered eugenics? Through the use of fertility trackers, is the continued existence of our species being carried out via non-human or even post-human means?

There exists a dualistic view of the Quantified Self as occupying a hybrid space between humanity and technology. It can be argued that the use of self-trackers is merely utilizing an available technology and taking matters of personal health and self-betterment into your own hands, much like a 'do it yourself' approach to advancement. Conversely, is relying so heavily on robotics and algorithms really 'doing it yourself', or is technology 'doing' it for you, thus greatly reducing one's agency in their own lives? Are we playing a significant enough role in the 'doing' of self-optimization, or is it perhaps more aptly named auto-optimization?

Even further, issues of authenticity arise throughout the expansive use of self-trackers and data collectors. Perhaps the largest sociocultural concern, raised by Arthur Caplan, is whether or not happiness (or what is perceived to be happiness) achieved through artificially engineered means will lead to a "deformation of [the human] character" on a societal scale (Savulscu et al., 2009, p.9). Will a truly optimal self ever be achieved, or will

standards be continually raised alongside technological advance?

Interplay Between Urban Space and Cyber Space

As seen through the examples above, we can see how biometrics may hold the potential to acclimate the human condition. Vital not just to sociocultural norms and practices, any shift in the human experience is integral to critical urban theory itself. As noted by Neil Brenner, critical urban theory "emphasizes the politically and ideologically mediated, socially contested and therefore malleable character of urban space" through the "continual (re)construction as a site, medium and outcome of historically specific relations of social power" (2009, p.198). In the modern globalizing world, perhaps the most geo-historically prominent condition today is planetary urbanism. The urban is no longer a single contained space, but is rather a generalized process seen on a global scale and which "increasingly unfolds through the uneven stretching of an 'urban fabric', composed of diverse types of investment patterns, settlement spaces, land use matrices and infrastructural networks, across the entire world economy" (Brenner, 2009, p.205).

As urbanity becomes a process rather than a trait, Brenner notes how the distinction between social issues and urban issues becomes blurred, and that there now exists a need to consider the two in tandem, and perhaps as one in the same. Issues relating to the capitalist structure of the global economy have been the source of social unrest the world over, and in no place is this felt more so than in the city. Urban centres are sites of extreme capital accumulation, and are therefore at the crux of political and economic power, and indeed of the "reproduction of everyday social relations" (Brenner, 2009, p.206). What happens within the urban becomes what happens in the social, and vice versa. As we rely increasingly on technology, our cities become more mechanized, and technology becomes interwoven into the social landscape of humanity in unprecedented ways. Much like Marx's notions of critique as necessary to the "transcendence of capitalism" (Brenner, 2009, p.199), perhaps we have reached a time where critiques of technology must be made in order to solve our ever-growing reliance on computers and robotics.

In our quest to optimize the human experience, boundaries between what is human or engineered become less stark.

As we heed the advice of our computers without so much as a second thought, we simultaneously rely on each other less and less. This newfound reliance runs the risk of becoming so pervasive that it has the ability to shift the human condition into something akin to post-humanism, as it is "one thing to use a computer as a tool for behavioural therapy, and another to treat a computer as a life-guiding oracle, ego to our id, telling us how we feel and what we need" (Hesse, 2008). When human agency is removed from even the most mundane facets of life and given towards obeying the commands of our devices, do we run the risk of "treating the computer as a person... while we become the machines" (Hesse, 2008, p.5)?

A world of perfect people, almost divine in excellence, may sound too utopian to be true... and indeed, I believe that it is. After all, to err is human. Life is full of blemishes, but at least it is real. When data trackers become intrusive to the point of documenting the most trivial details of daily life, the entire picture can be mapped out in front of you. When you can see that good days contain A, B, and C, and bad days contain X, Y, and Z, one can easily make changes towards optimization simply by utilizing one's own information (Dancy, 2014). While a goal of total happiness sounds ideal, there are qualms over achieving this through artificial means. Debates over the superiority of robotics over humanity come to mind, particularly the notion that such superiority stems from the fact that robots lack the 'messiness' that is a deeply fundamental quality of humanity (Turkle, 2011). After all, robotics and technology can only provide structured and 'ideal' routines for us to follow, which are not usually compatible with the unpredictable nature of human life. As we utilize self-trackers for means of self-optimization, we inch closer to becoming robotic forms ourselves. Sherry Turkle states that robotics thrive within the cracks of humanity, which is both revealing and true, provided that the function of such technologies remain within these cracks and do not come to eclipse humanity itself.

Conclusions

To draw comparison between the use of FitBits and seeing humanity on the brink of a robotic revelation may seem a bit of a stretch, but is it really? Our ability to be satisfied by purely natural elements is quickly eroding as we turn to artificial

and engineered means of happiness. Mimicking Frederick Winslow Taylor's theories of efficiency, the human social world is becoming similarly focused on performativity and optimization over naturality and simplicity. We are connected to each other—or rather, to each other's online information—more freely and rapidly than ever before, but, as explained by General McChrystal, we run the risk of losing the distinction between connectivity and real human connection, which severs the contemporary urban human experience from previously innate elements of humanity. As we move towards normalizing means of e-hancement, an array of questions surrounding the ethics of engineered optimization emerge. Finally, as biometrics become a new social phenomenon, they concurrently become an urban phenomenon through the altering of sociocultural norms and practices surrounding the self.

In this era of planetary urbanism, we lie on the brink of the fusion of humanity and technology. Incredible developments can come from this new synthesis, though essential dangers, such as the inability for humans to resonate and feel compassion towards one another, can stem just as rapidly. Urbanity, as we learn through studies on critical urban theory, holds much potential for creating large-scale communities that are inclusive and just, so long as we critique current urban social issues in order to again restructure urban fabric to "excavate the emancipatory possibilities that are embedded within, yet simultaneously suppressed" (Brenner, 2009, p.203) by the very process of contemporary capitalist urbanism. Instead of increasingly relying on engineered means of betterment, perhaps we should be communicating and reflecting more with each other, as "we need to stop solving our humanity problems with technology, and start solving our technology problem with humanity" (Dancy, 2014).

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Vancouver Car Share Expansion

By Julius Rusko, Cecillia Wong, and Joey Mak

This project aims to study the spatial placement of how car share companies locate their car share parking, and to determine the best locations to expand this network in other municipalities in Metro Vancouver. The project contains two main parts, the first using reverse engineering to investigate the parameters that car share companies consider when locating their current parking locations. The resulting data creates a list of criteria used in the Multi-Criteria-Evaluation (MCE) in the next part of the project. In the second part, the MCE tool carries out a spatial analysis using the list of criteria from part one. The result of the MCE analysis shows suitable locations for car share expansion in Metro Vancouver and provides insight into the capability that GIS can achieve in analyzing current and future factors in the car share economy. These results will help assist Metro Vancouver to shift to more sustainable modes of transportation in the coming decades.

Introduction

Since its introduction 20 years ago, car-sharing in Vancouver has expanded from two locations to over 660 locations (Modo, 2016). Vision Vancouver's Transportation 2040 Plan, a long-term strategic vision for the city that will help guide transportation and land use decisions and public investments, will put pressure to expand car-sharing and increase the need for additional car-sharing parking locations in the near future. The plan calls for a shift in transportation mode share – the percentage of travelers using a particular type of transportation – by decreasing the percentage of trips taken in single-occupancy vehicles and increasing the percentage of trips undertaken in car share vehicles. (Vancouver City Council, 2012). This policy is situated in the broader shift to more sustainable transportation in Metro Vancouver. Under the mandate from the Board of Directors of Metro Vancouver, TransLink is a key stakeholder responsible carrying out policies that will shift the mode share to more sustainable transportation (Greater Vancouver Regional District Board, 2015). This shift

is expected to result in reduced road congestion, lessen the need for increased road capacity, and reduce carbon emission in the region (TransLink, 2016). Due to this exponential rise of car-sharing we decided to determine new parking locations in currently underserved regions of Metro Vancouver.

Methodology

1. Creation/Retrieval of Car Share Location Spots

Retrieval of location data for all car share parking locations is difficult due to the restrictions in privacy policies. Our group contacted all four companies, Modo, Car2Go, ZipCar, and Evo, regarding location data. Data for Modo was retrieved via email for all car spots, as well as the number of cars per location. The original data included latitude and longitude coordinates, allowing for easier plotting on the map. For all other companies, parking locations were plotted manually (Figure 1).

2. Buffer (Proximity of Car Share Locations)

In the Metro Vancouver Car Share Study – Technical Report (Metro Vancouver, 2014), a survey showed that the majority of users believe an acceptable walking duration to a car share spot is about eight minutes or 600 meters. This distance is incorporated into a buffer around our factors that we believe to be beneficial for car share users, which include:

- Health care clinics and hospitals
- Hello BC Tourism activities and attractions
- Transit stops/hubs

A 600m buffer around each point is created for each of these three layers. The three buffers are merged to create an overall Point of Interest (POI) layer.

To propose new parking spots for the companies, POI buffers without pre-existing parking locations are needed. Ideally, at least one parking spot should be located within a 600m radius from the POI feature. Out of 499 POI buffers, 238 have no car share parking spots within them. To ease analyses in the future, overlapping buffers were manually merged. The resulting location attribute assigned to a merged buffer is the most commonly known or frequently visited POI.

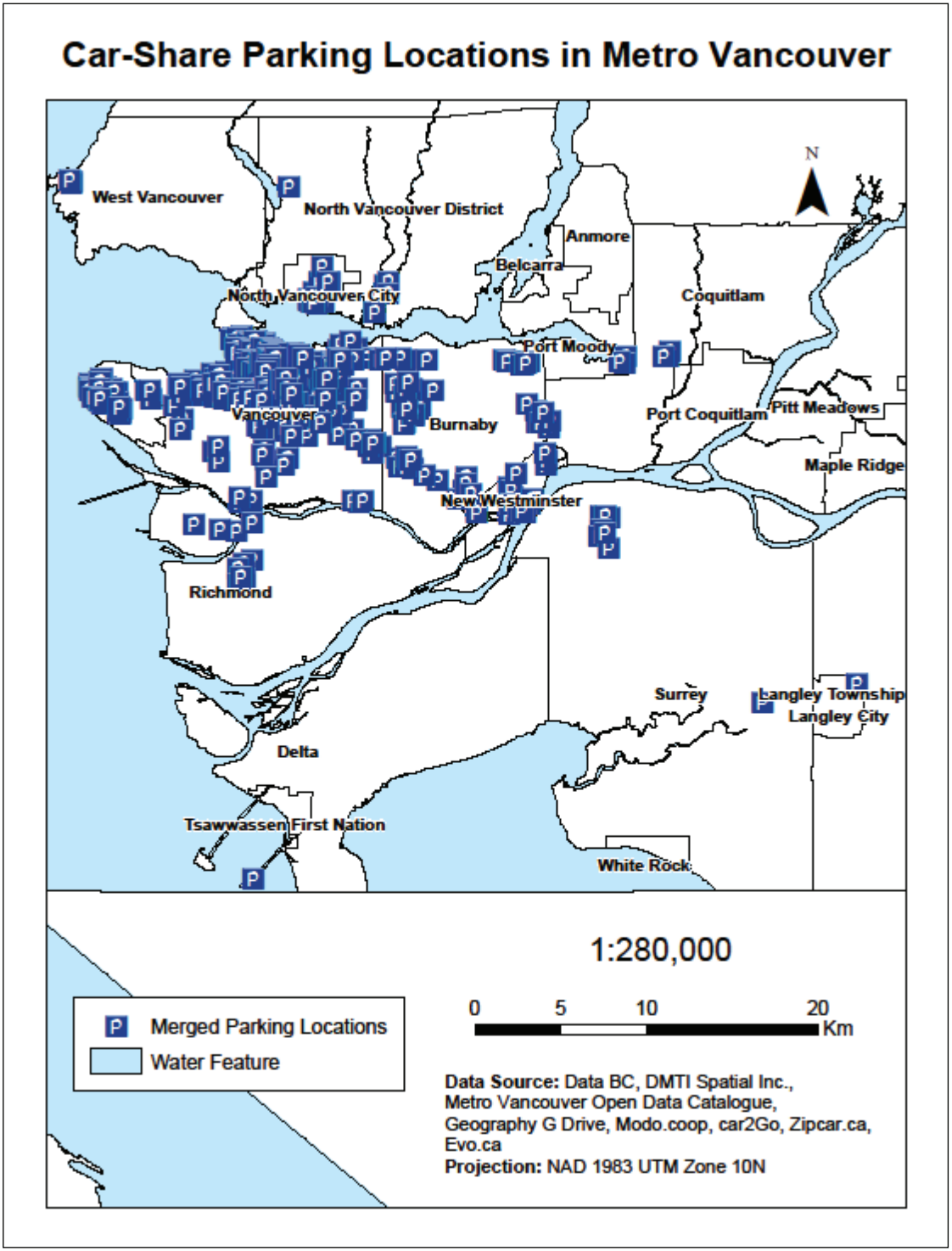


Figure 1. Map showing the merged points of all parking locations in the four companies.

3. Creation of Raster Data for Land Use, Population Density & Renter Percentage

Apart from the POI, important factors for consideration include: land use, population in residential areas and number of renters. For use in our Multi-Criteria Evaluation (MCE), these three factors are normalized and converted into raster format.

Land Use. The original 2011 Land Use data includes 24 land use types. For this analysis, similar types of land use are grouped. Six different classes were created for symbology purposes. The determination of weight importance between each class is determined using the Analytic Hierarchy Process (AHP). AHP is a theory of measurement, which derives ratio scales in both discrete and continuous comparisons (Saaty, 1987). A list of grouped land use types, as well as the corresponding weights, is as follows:

- Mixed Residential Commercial (0.4865)

  Includes mixed commercial, residential low rise, and high rise apartments.

- High Density Residential (0.2334)

  Includes residential high-rise apartments, low-rise apartments, and townhouses.

- Commercial (0.1389)

  Includes institutional, and Commercial.

- Low Density Residential (0.0820)

  Includes all other residential types such as mobile home park, single detached and duplex, rural, institutional, and non-market housing.

- Industrial (0.0416)

  Includes airport/airship, industrial, industrial extractive and rail, rapid transit, other transportation, utility, and communication.

- Prohibited Construction and Development (0.0175)

  Includes all other land use types which cannot be constructed on such as agriculture, cemetery, harvesting and research, lakes and other water, Port of Metro Vancouver, protected watersheds, recreation, open space and protected natural areas, road right-of-way, undeveloped, and unclassified.

Population Density in Residential Areas. The population dwelling counts in each Dissemination Area (DA) are downloaded as a table and joined to DA shapefiles. Using the edited Land Use layer, residential-only lands are extracted. The number and area of residential areas

within a DA are summed. The population density within residential areas can be found by dividing the number of persons by the total area of residential units within the DA, to give a density (in persons/sq m). To address the outlier shapefiles in the data, population density values are changed to 0.

Renter Percentage. The data for the number of renters per census tract (CT) is joined with CT shapefiles. The renter density is found by dividing the number of renters by total population per CT. Outlier shapefiles are addressed by changing the renter density value to 0.

4. Multi-Criteria Evaluation (MCE) and Assessment of Future Car Share Locations

Before creating the MCE output map, the three factors (land use, renter percentage, and population density within residential areas) must be normalized. All three raster layers are normalized using Fuzzy Membership. Fuzzy Membership is a tool that reclassifies any input data into a user specified scale, usually 0-1. Since larger values are of more significance in the raster layers, the Large Membership Type is chosen for both population density and land use. With the Large Membership type, this ensures that emphasis is given to larger input values in the set. In this project, areas with high population density and favorable land use have higher suitability. The Small Membership Type is chosen for the renter density, as errors in values occurred in several CT's when using the Large Membership.

Weighted importance of each of the three factors is chosen using the AHP method. After comparison of each factor, the weights are as follows:

1. Land use – 0.4600
2. Population density in residential areas – 0.3189
3. Percent of renters per DA – 0.2211

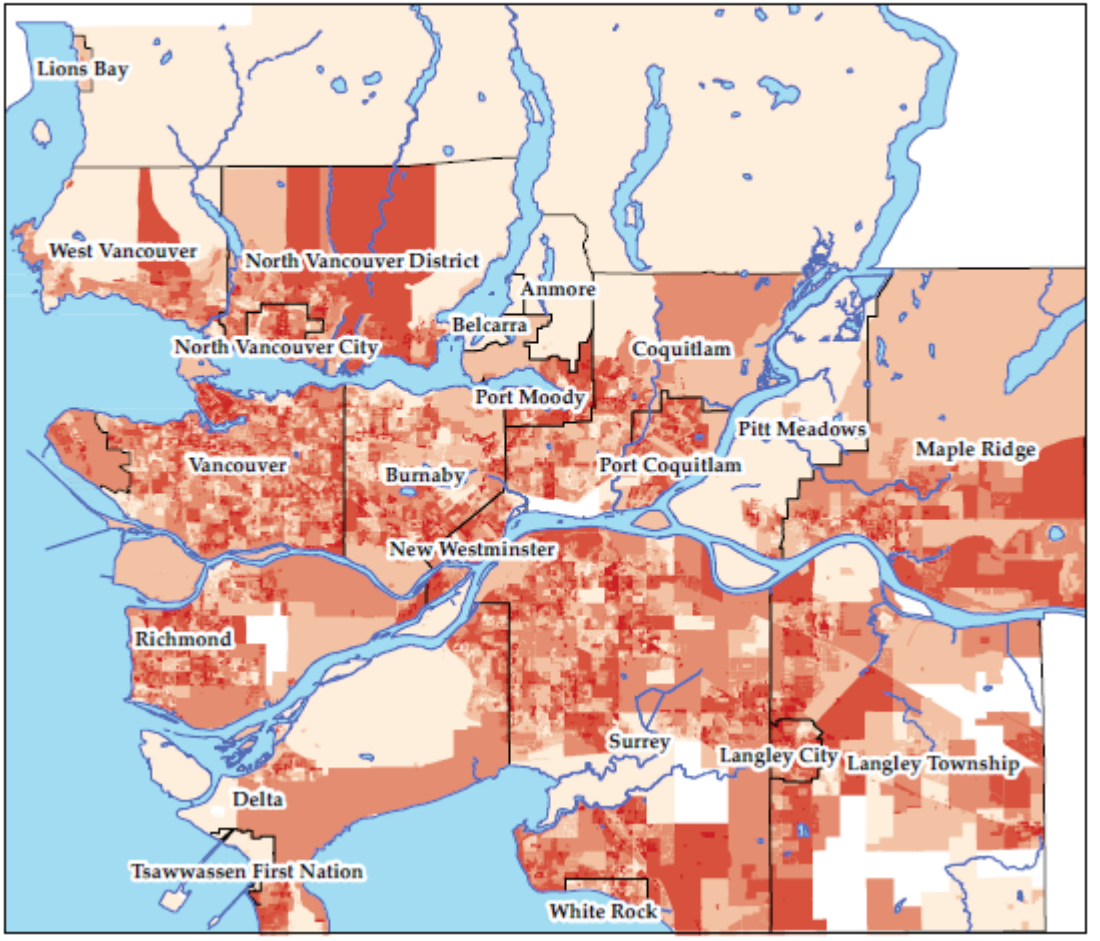
The final weighted map is created using Weighted Sum, where land use is given the highest weight in suitability.

Five areas with the highest MCE values are chosen to be the locations where car share is most in need. These five areas must also lie within the POI buffer. Locations where the MCE value is highest (~0.95) and within the POI buffer are considered to be a region in most need for a car share location.

Results

After performing the MCE

Multi-Criteria Location Analysis for Modo, Car2Go, Evo and Zipcar in Metro Vancouver



Levels of Preference in Proposed Car Share Locations (Based on Land Use, Population Density and Renter Percentage)

- High Preference
- Medium-High Preference
- Medium Preference
- Medium-Low Preference
- Low Preference
- No Data
- Lakes, Large Rivers and Other Water

N

1:340,000

0 5 10 20 Km

Data Source: Metro Vancouver Open Data Catalogue, Canadian Census Analyser (CHASS).

Projection: NAD 1983 UTM Zone 10N

Figure 2. Map showing the results of the Multi-Criteria Evaluation (MCE) for the possible car share parking locations. Factors include land use, residential population density in residential areas, and percent of renters. Darker areas signify areas with a greater need for car share services.

Results

After performing the MCE analysis, the areas with the highest MCE values were the most suitable areas where car share expansion should occur in Metro Vancouver. The top five locations in relation to their MCE values are shown in figure 2, organized by descending values.

Discussion

The top five locations for car share expansion are ordered by MCE values, with the first being the highest.

1. The location with the highest MCE value is in the City of Surrey along the north side of 104th Avenue and 149th Street. This is an area with a high population density. Three storey apartment buildings occupy four city blocks on the north side of 104th Ave, and two 20 storey high rises condo buildings occupy the south side of 104th Ave. All the buildings are located between 148th and 150th St. One block to the east on 140th Ave is the Guildford Town Centre, a large shopping mall that contains and is surrounded by a multifold of stores, restaurants, a movie theatre, banks, and services. Just outside the shopping mall is the Guildford Exchange bus station with connections to Surrey, Langley, and the SkyTrain Expo Line. All of these factors add up to make this the most sustainable location for car share expansion within Metro Vancouver. (Figure 3, MCE value: 0.963)

2. The area with the second highest MCE value is in the City of Coquitlam along Brunette Ave and Laval St. This area also consists of relatively high population density in the form of four storey townhouses along both sides of Brunette Ave, between King Edward St and Schoolhouse St occupying a total six city blocks. Two blocks west along Brunette Ave is Mackin Park which contains four baseball fields, two soccer/football fields, two tennis courts, a playground, water park, skate park, gardens, lawns, and treed areas. Also one block west from Brunette and Laval St is Places des Arts, an art centre and music school, with music, visual arts, dance, and theatre programs for

children and adults alike. One kilometer to the south there is a series of stores along Lougheed Hwy consisting of a Superstore, Canadian Tire, and Ikea, among other stores. These factors help make this the second most suitable location for a car share. (Figure 4, MCE value: 0.961)

3. The next area that has a high MCE value from our results is within the City of Surrey along University Drive and 108 Ave across from the Gateway SkyTrain station. In this area there are five high-rise condo buildings, all over 20 stories in height. Moreover, one block to the northeast of the Gateway SkyTrain station there is a large townhouse/condo complex, four storeys in height, occupying two city blocks. These residential buildings give the area a high population density, and as well as a high renter count. One block to the south lies a sports field complex containing three full-size baseball fields and a playground. Other factors that make this a sustainable location for a car share are the many stores and businesses situated on King George Blvd, one block to the east of the proposed car share location. Finally, the close proximity to the Gateway SkyTrain station and bus stops beneath the platform provide great connectivity to the rest of Metro Vancouver (Figure 5, MCE value: 0.926).

4. Our fourth highest MCE value is within the City of Vancouver at the intersection of SW Marine Drive and Cambie St. This area has experienced a quick rise in population density over the last year due to the completion of two high-rise condo buildings over 30 storeys, two high-rise condo buildings over 20 storeys, and two six-storey condo buildings that are attached to the taller main buildings. Further population density will increase over the next couple of years with four more high-rise condo buildings currently in construction as of December 2016. All these buildings are within a one block radius of the SW Marine Drive and Cambie intersection. This rapid increase in population density was spurred by the construction of the Canada Line, with a station located on the Southeast corner of the intersection (Vancouver City Council, 2012). In addition, behind this station is the Marine Drive bus loop providing local service along Granville, Oak, Main, and Marine Drive. Adding to the suitability of this area is the Marine Gateway district adjacent to the intersection that features shops, services, offices, and a movie theatre. These are the factors that make this are our fourth most suitable location

for car share expansion. (Figure 6, MCE value: 0.914)

5. Our fifth highest MCE value area is within the City of White Rock along Georges St, between Russell Ave and Thrift Ave. In this area, there is a 16 storey condo high-rise building on the west side of Georges St and on the east side of the street there are three city blocks of three storey apartment buildings. This concentration of residential buildings gives this area a high population density and a high renter count. Two blocks north of the high-rise building is the Semiahmoo Shopping Centre, the main shopping mall in White Rock. Also located outside the shopping mall along 152 St and North Bluff Rd are numerous bus stops that connect White Rock with the neighbouring cities of Surrey, Richmond, and Langley. Furthermore, four blocks to the east from Georges St at Russell Ave is the Peace Arch Hospital that serves White Rock and South Surrey. These are factors that contribute to making this the fifth most suitable location for a car share. (Figure 7, MCE value: 0.905)

All the suitable locations have a MCE value > 0.90 out of 1. This is the result of high population density (>0.061 persons/meter squared of DA), a high count of renters (>0.284 renters/ squared meter of CT), close to transit (less than 5 min walk), and 4 out of 5 locations near commercial businesses (5-10 min walk). Overall, the MCE analysis by weighted sum provides very useful results for situating suitability areas for car share expansion in Metro Vancouver. This expansion will be necessary in the coming years if Metro Vancouver is to achieve the goal of supporting sustainable transportation choices by 2040 (Greater Vancouver Regional District Board, 2015).

The next few pages contain figures 3-7 as mentioned above.

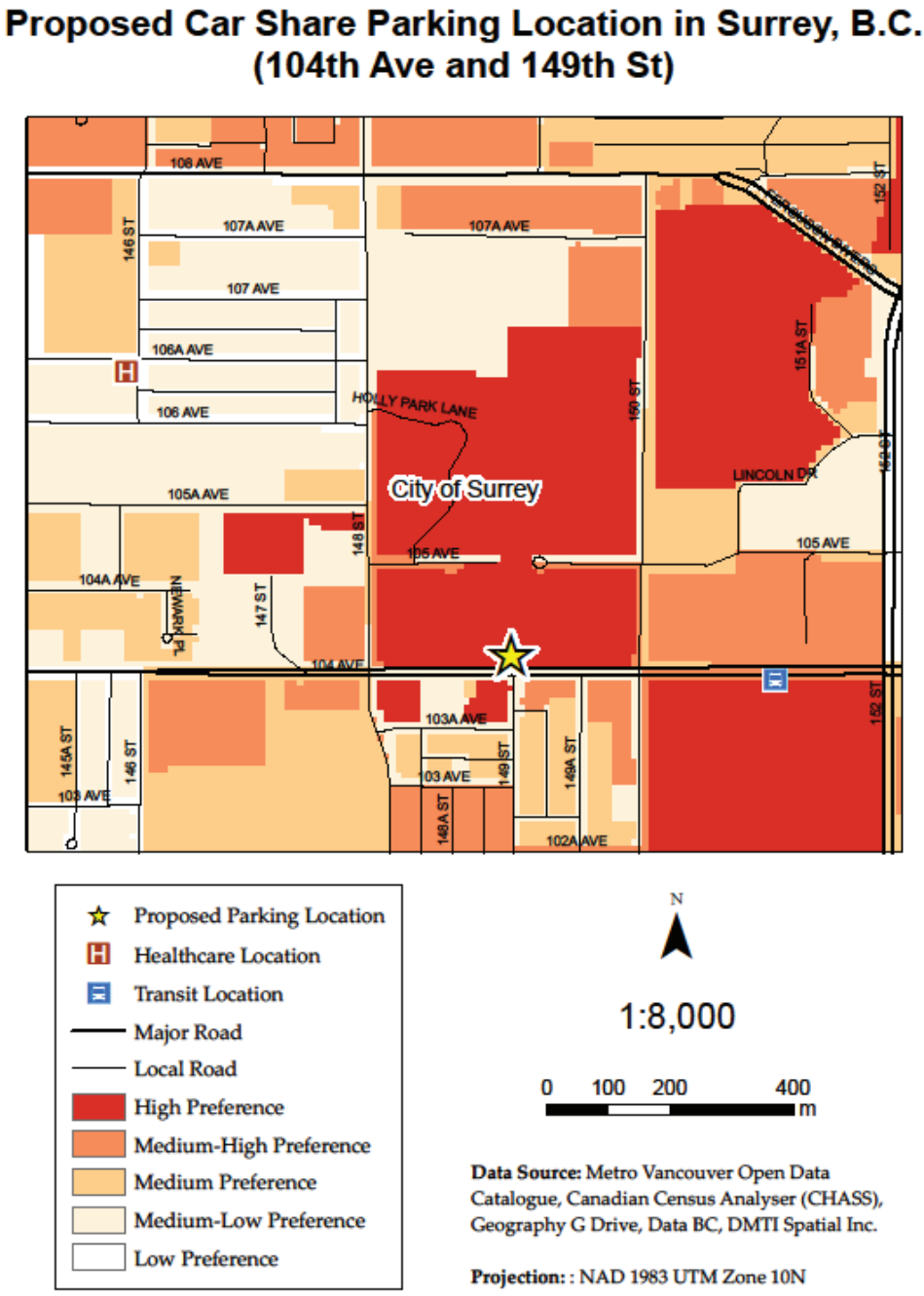


Figure 3. Map showing the first proposed car share parking location in Surrey. The spot lies on 104 Ave between 148th St and 150th St. This site has the highest MCE value. The majority of the land within the buffer is occupied by three storey apartment buildings along with two 20 storey high-rise buildings.

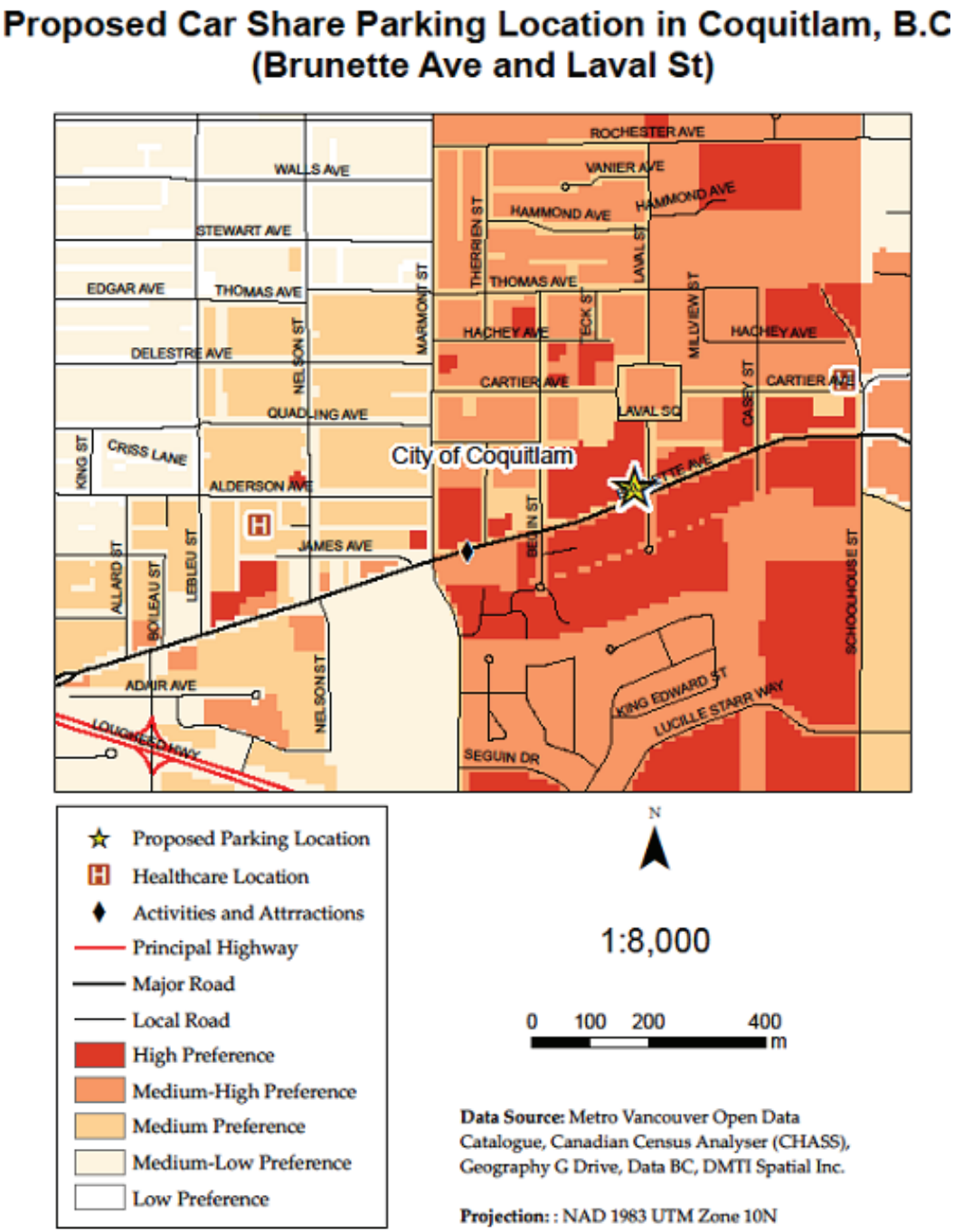


Figure 4. Map showing the second proposed car share parking location in Coquitlam. The spot lies on Brunette Ave and Laval St. This site has the second highest MCE value. Four storey townhouses lie on either side of the street.

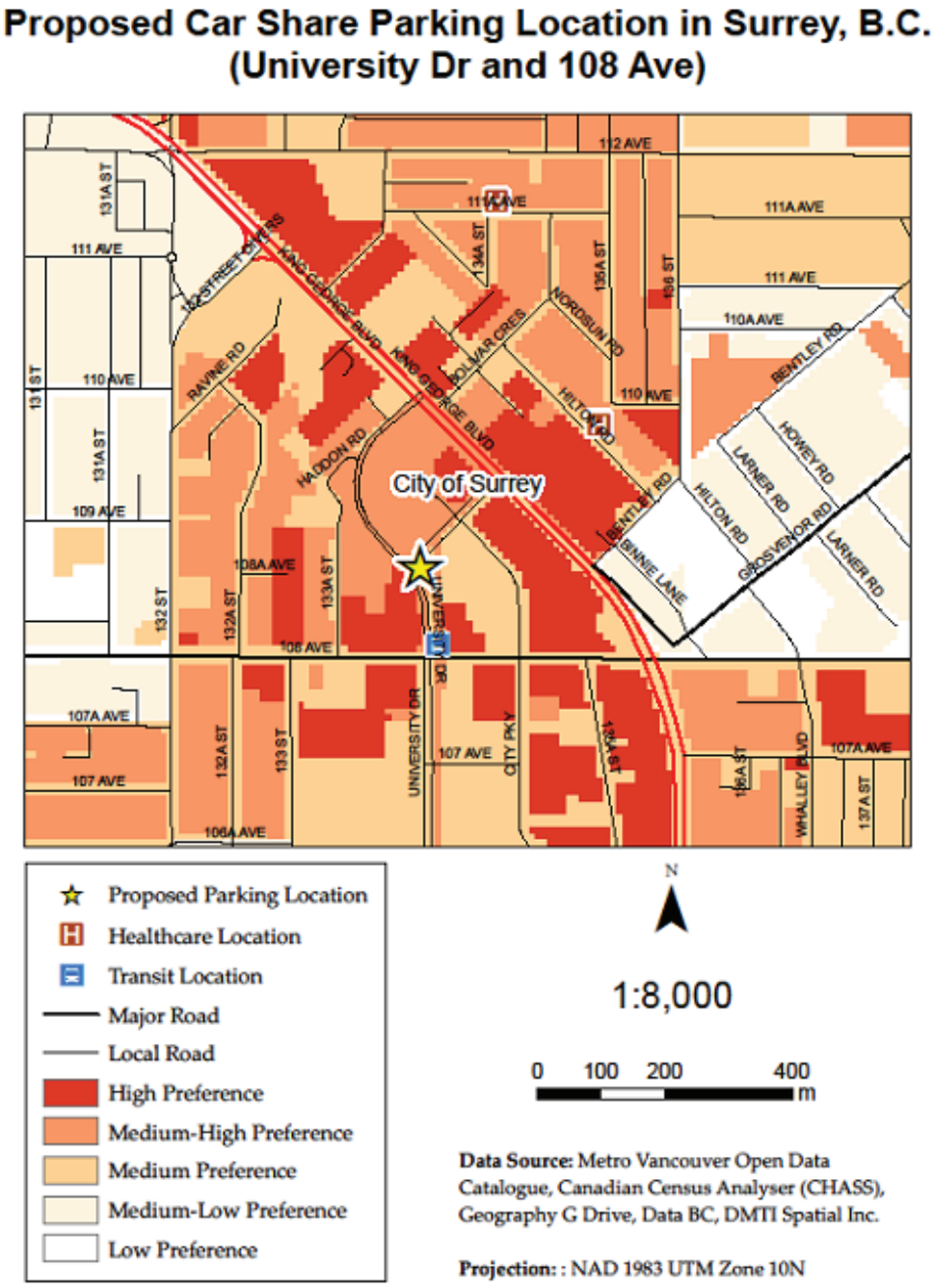


Figure 5. Map showing the third proposed car share parking location in Surrey. This spot lies on University Drive and Gateway Drive. This site has the third highest MCE value. The location lies in a parking lot beside the Gateway SkyTrain station and is surrounded by five apartment high-rises and a townhouse complex.

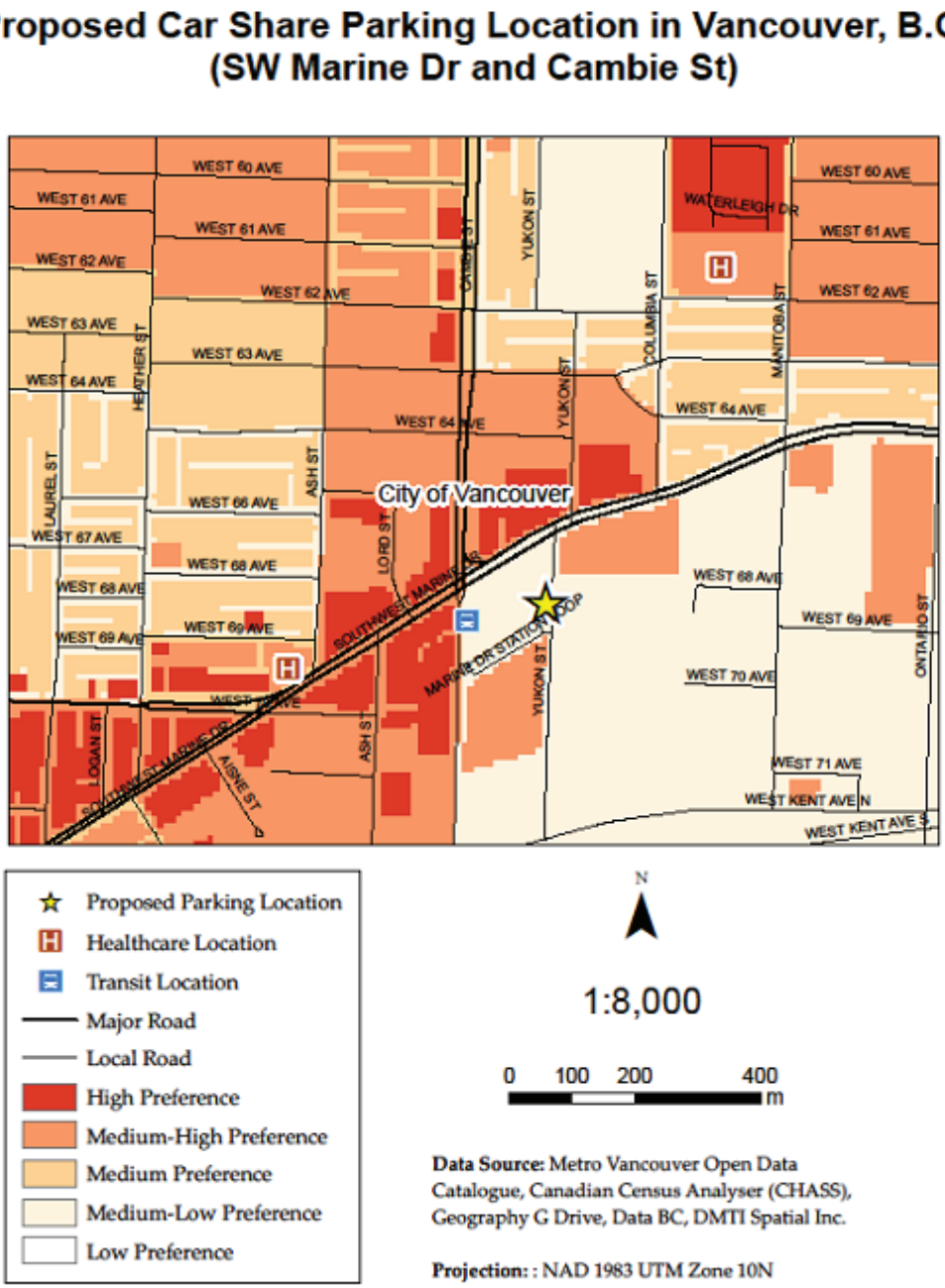


Figure 6. Map showing the fourth proposed car share parking location in Vancouver. This spot lies in the underground parking lot within the Marine Gateway District. This site has the fourth highest MCE value. Situated here is a high density population. Currently, three corners of the intersection of SW Marine Drive and Cambie St are occupied with six high-rise condo buildings with more under construction.

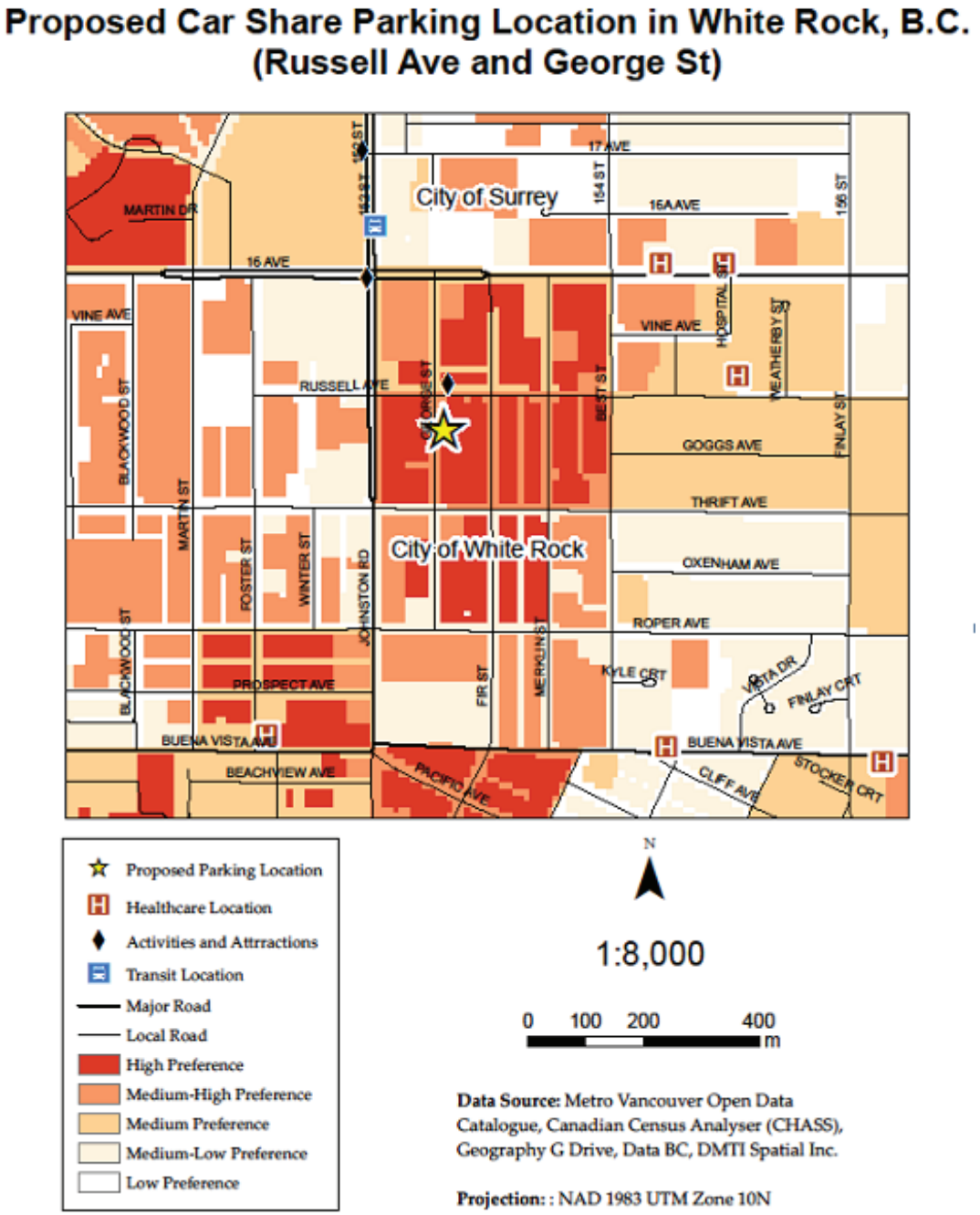


Figure 7. Map showing the fifth proposed car share parking location in White Rock. The spot lies on Georges St between Russell Ave and Thrift Ave. This site has the fifth highest MCE value. This location is within the vicinity of three city blocks of apartment buildings and is adjacent to a 16 storey condo high-rise building.

Errors & Uncertainty

In data collection stage, the modifiable areal unit problem (MAUP) occurs when converting vector data to raster. MAUP is a challenge "arising from the spatial analysis of aggregated data in which the results differ when the same analysis is applied to the same data, but different aggregation schemes are used" (Esri, 2017). The census data we used was collected through the smallest areal unit possible from Canadian Census Analyser. Some uncertainty was present when renter data was available only in census tract (CT) units, whereas the population data came in dissemination area (DA) units. The Multi-Criteria Evaluation tool needs the data to be raster format. Therefore, all census data had to be converted from vector to raster format. The boundaries of the DA and CT are very sensitive to spatial resolution. Even though we have chosen the smallest pixel size within the constraint of 10m, the pixel size doesn't fully account for the roughness of the conversion. There are boundaries that show straight lines rather than the original boundary shape.

Uncertainties present in the project include the suppression of census data in dissemination areas and census tracts that occurs when a table joins the spreadsheet data and the DA, CT polygon. Due to data quality issues, Census Canada removes some CT and DA in census data. Issues arose when the spreadsheet data was matched with the non-existent polygons, producing an area in the map with no data because only matching records are mapped.

In the manipulation of the population density data, extreme values were found in areas known to have low population density (e.g. District of North Vancouver or Bowen Island). The most extreme example was the data showing higher population density on Bowen Island than in Downtown Vancouver. As a result, for the completeness of the analysis, Bowen Island was removed from the MCE analysis and left as a field of no data.

The last error encountered was with the large DA in North Shore Mountains. The population, about 150 persons, resides in a very small portion of the entire DA. The error was corrected by changing the corresponding population density and number of renter data to 0, as well as using a Small membership type in order to fit the integrity of the result.

Further Study

The main objective of this research is to study the methodology of finding suitable car share parking locations in Metro Vancouver in order to set up a spatial analytic workflow for future study. A limitation in this study is that definitions of data vary depending on data source and type. This issue was encountered in the MAUP causing variable consistency of our results. In the future, if census data at smaller spatial units is available, more precise and reliable maps could be produced. The reliability of our research has room to improve providing car share companies' cooperation in sharing their decision making approach to car share parking locations. In addition, resource and time constraints put limitations on the analyses. In the future, by addressing these issues, further analysis will lead to the production of higher quality maps and better representations of the real world.

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GIS Data Sources

Activities and Attractions Listing – BC Data Catalogue, Destination BC Nov. 16, 2016

BC Health Care Facilities – Ministry of Health, Provincial Health Services Authority Nov. 16, 2016

Bus Loops – UBC Department of Geography

Census Tracts (Population, Renters) – Canadian Census Analyser, 2011

Dissemination Areas (Population) – Canadian Census Analyser

Land Use – Metro Vancouver Open Data Catalogue Jun. 11, 2015

Modo Parking Locations – courtesy of Kathrin Kilburn, received in JSON format

Municipal Boundaries – Metro Vancouver Open Data Catalogue Nov. 18, 2016

Rapid Transit [SkyTrain (Expo, Millennium, Evergreen Line), Canada Line] – UBC Department of Geography

RoadsLine – CANMap Content Suit v2015.3 DMTI Spatial Inc.

Sea Bus Terminals– UBC Department of Geography

Water Features – CANMap Content Suit v2015.3 DMTI Spatial Inc.

Trail Six Editorial Board

Editors-in-Chief

Hyunsoo Kanyamuna

A proponent of the principle that form follows function, Hyunsoo is a fourth-year Honours Geography student driven by innovation through design. Having spent time in Montréal and New York, his fascination with cities underlie his academic inclinations. With research interests at the intersection of the natural and social sciences, Hyunsoo's foci on urban morphology, industrial design, and intellectual property are inextricably connected. He enjoys exploring museums, growing his musical palate, appreciating architecture, and delving into novels. Alongside the Trail Six editorial board, Hyunsoo is delighted to showcase the exemplary scholarly work of undergraduate students at the University of British Columbia.

Nicole Rich

Nicole is a fourth year student with a focus in Human Geography. She enjoys exploring this topic, as she is able to bolster her knowledge concerning the endless interactions between land, people, and the importance of these relationships in the modern world. In her studies, Nicole has delved into urban and rural environments, and prefers to best expand this knowledge through travel. Next, she plans to trek to South America as her newest adventure. In the future, Nicole would like to work closely in communities to better the experience of those living in those space – no matter where that may be!

Editors

Niklas Agarwal

An innate sense of curiosity has shaped the way Niklas Agarwal has experienced the world. After questioning the role that cities could play in solving the environmental crises he decided to apply to UBC due to its leadership in sustainability. After living in two other countries (thanks co-op!) awd participating in CityStudio, Niklas will graduate in UBC in May 2018 having majored in Geography: Environment and Sustainability. He hopes to try at least once: working for the foreign service, being a planning policy wonk, working for a hip startup in Asia, electrifying small communities, and tree planting in rural Canada.

Naitong Chen

Naitong Chen (Nait) is a second year student pursuing a Statistics Major and a Human Geography Minor. Nait as a tennis official has had the opportunities to travel around the world and experience different cultures, which has encouraged his interest in Human Geography. Always fascinated by the inspiring ideas, being an editor for Trail Six is a much appreciated opportunity for Nait to communicate with the talented UBC Undergraduate Geography students and contribute to the UBC Geography community. Nait hopes to apply his mathematical skills in the field of Urban Geography in a career that remains unknown at the moment.

Mana Hashimoto

Born in Japan and raised in North Vancouver, Mana is in her fourth (but not final) year confronting the common misconception that all Geographers are good with directions. Tying in her International Relations Minor with her Human Geography Major, Mana is interested in topics about migration, demography and global cities. This year, Mana joined the Trail 6 Team as an editor, based on her great experience as one of the authors in last year. Offer Mana a bowl of Pho or a handful of gummy bears, and you will probably make a feature on her SnapStory as a token of friendship.

David Li

David Li is in his 2nd year studying in UBC. He intends to major in Geography, but is still unsure whether he will pursue a degree in Human Geography or in Environment and Sustainability. He decided to get involved with Trail Six hoping to learn more about the field of Geography, meet new people, and most importantly, have fun and learn as much as he can. He has no idea what kind of career he would like to pursue in the future, but hopes to be able to help improve this world as much as possible.

Rachel Loo

Rachel is in her fourth and final year of a double major in music and human geography. While she enjoys the degree of discipline required for playing the viola, she also likes the broad perspectives that she gains through geographic study. This is Rachel's third year working as an editor for Trail Six. In her spare time, she likes hiking, cooking, and knitting. Rachel is open to a variety of career paths but in the short term plans on heading to Northern BC and Alberta to plant trees and make money.

Cheryl-lee Madden

Cheryl-lee Madden, is a 3rd year Faculty of Arts, BA UBC undergrad. She is working on a Major in Human settlement Geography with a Minor: International Relations. Her work in Vancouver housing settlement issues surrounding Transit Orientated Development, TOD, keeps her busy. She will present this work in UBC Undergrad Research Opportunity – Research Experience – MURC this spring. An an avid open water swimmer, who loves Kitsilano beach and West End Vancouver walks on sea wall where you'll see her walking her pet Henry the Tortoise in the park. Visit Henry at YouTube "Secret Life of Henry".

Mielle Michaux

Mielle is a fourth year student in Human Geography who would like to make some maps. After working on a ship and in a bakery, she got into editing to let her pedantic side shine. She digs cartography, health geography, critical GIS, and pickles, and would

like to combine some (and hopefully all) of these in the future. As a geographer, she is drawn to new and interdisciplinary uses of geographical tools, and is excited to see creative work that pushes the boundaries of the field through her involvement with Trail Six Editorial Team.

Sebastian Miskovic

Sebastian is a fourth year Arts student majoring in human geography. He is the current President of The Ubyssey Publications Society, a UBC World's Challenge, Challenge competitor, and a returning editor from last year's issue of Trail Six. Having edited for the publication a year prior, the range of engaging topics drew Sebastian back in, to see through another issue. Sebastian plans on attending law school following graduation, to become a constitutional attorney specializing in civil rights and liberties. He also plans to amass the world's largest collection of finger puppets, a feat not easily achieved, but desperately pursued.

Natasha O'Byrne

Natasha O'Byrne is completing her fifth and final year at UBC as a Human Geography major with a minor in Sociology. Having grown up moving around the world on a yearly basis, Natasha's nomadic childhood sparked a deep interest in learning about the ways people respond to, navigate through, and are shaped by their surroundings. With a focus on urban development in the Global South, Natasha hopes to continue travelling in the future while pursuing further research and education in urban studies. Outside of school, she enjoys music, books, architecture, and all things edible.

Emilia Oscilowicz

Emilia Oscilowicz is a fourth year Environmental and Sustainable Geography major and Spanish Literature minor student. She is in her final semester at UBC and has only just returned this January from a semester abroad in Barcelona — time flies when she's having fun! This is Emilia's second year of editing and contributing to Trail Six and is excited to continue developing her professional and academic portfolio.

Julius Rusko

Julius is a fourth year student majoring in Geography (Environment and Sustainability). He is excited to be involved with Trail Six as an editor working to put together the next amazing volume of this fine journal. His interest within geography includes the changing nature of urban and transportation planning. In the future, he plans to go to graduate school with the intentions of becoming a planner in the great city of Vancouver; where he was born and raised. In his free time Julius enjoys playing hockey, soccer, hiking the North Shore Mountains, and travelling to new fascinating places.

Nathan Saade

Nathan is an undergraduate geography student at the University of British Columbia.

Jacqueline Siu

Jacqueline is a 3rd year geography student with a particular inclination towards urban studies and anything to do with cities. She loves the colour yellow, eggplants and personality quizzes (her Myers-Briggs type is ISTJ). In the future, she hopes to combine her education in geography and with her interest in cities to become an urban planner. Her personal philosophy in life is: "Enjoy your worries, you may never have them again." *Jacqueline is also a member of the Layout Team.*

Cynthia So

Cynthia So is a third-year student majoring in environment and sustainability. Her prior experience in working on an award-winning, student-led bilingual news magazine Xiao Hua (School Voice) and her desire to contribute to the UBC Geography community has encouraged her to become actively involved in Trail Six and the Geography Students' Association. Her greatest aspiration in the future is to become a strong advocate of zero waste and conscious consumption in Hong Kong. She also has hopes of becoming a lingerie designer and an educator of intersectional feminism, female sexual empowerment, and environmental, human and animal rights issues.

Akanee Yamaki

Akanée Yamaki is a fourth year Human Geography Major, Minoring in Art History. She is excited to be working with Trail 6 this year as a way to become more involved with the Geography department and as a way to learn about all the exciting new research being done in the department. When she graduates this coming May she hopes to pursue a future in community development and planning through art practice/programming combining her main areas of interest in a (hopefully) impactful way.

Layout & Design

Stella Zhou

Stella is a senior geography student graduating from the environment and sustainability program. She is passionate about social justice, community development and urban sustainability; hence she is aiming to continue her studies and pursue a future career in the field of community planning and urban social development. In her free time she enjoys travelling to different cities and go on some personal adventures around town. She's also a food lover, a Nintendo fan and likes chatting with people about their wonderful personal journeys.

Jacqueline Siu

Jacqueline is also an Editor for Trail Six (see p.108).

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