

TRAILSIX

AN UNDERGRADUATE JOURNAL OF GEOGRAPHY

Volume 7: 2012/13



TRAIL **SIX**

AN UNDERGRADUATE
JOURNAL OF GEOGRAPHY

ISSN: 1916-0747

UNIVERSITY OF BRITISH COLUMBIA GEOGRAPHY STUDENTS' ASSOCIATION

TRAIL SIX EDITORIAL TEAM 2012-2013

Editors-in-Chief: Brittany Jang & Andrew Longhurst

Editors: Kate Beck, Maryam Bux, Andrea Eisma, Adam Fiss, Chester Hitz, Aaron Lao, Yida Lin, Pierson Nettling, Victor Ngo, Dannielle Piper, Victoria Tcherven, Ashley van der Pouw Kraan

Layout & design: Adam Fiss

Faculty reviewers: Dr. Trevor Barnes, Dr. David Brownstein, Dr. David Edgington, Dr. Brian Klinkenberg, Dr. Philippe Le Billon, Dr. Denver Nixon, Dr. Jamie Peck, Dr. Elvin Wylly

ACKNOWLEDGEMENTS: Catherine Aldana, Geography Students' Association, Doug Chan, Counter ClockWise Design & Production Group, Jennifer Hamilton, Sarah Hansen, Dr. Marwan Hassan, Dr. Graeme Wynn

All correspondence concerning Trail Six should be addressed to: trailsix@ubcgsa.ca

Trail Six
Department of Geography
University of British Columbia
1984 West Mall,
Vancouver, BC, Canada
V6T 1Z2

© UBC Geography Students' Association, March 2013

Cover photograph: Rio Sucio, Costa Rica (Andrea K. Eisma, 2013)

The opinions expressed herein are solely those of the individual authors.

CONTENTS

HOMELESS CITY: BODY POLITICS AND THE URBANIZATION OF CAPITAL

Emma Abdjalieva & Elvin Wyly 1

FROM THE FARMER: THE STORY OF HOW I BECAME CONVINCED THAT ORGANIC, LOCAL FOOD IS WORTH IT

Kate Beck 10

“THE CITY OF HARARE HAS LOST ITS GLOW”: OPERATION MURAMBATSVINA AND THE POLITICS OF SLUM CLEARANCE IN ZIMBABWE

Katharine Freed & Pierson Nettling 15

FIRE HALL RESPONSE TIME ANALYSIS IN SEVEN MUNICIPALITIES IN GREATER VANCOUVER USING GIS: HOW POPULATION GROWTH AFFECTS SERVICE AREAS

Yu Jia Guo, E. Conor B. McLellan & Elvia Willyono 22

BUSINESS AS USUAL: NEO-LIBERALISM IN DEVELOPMENT DISCOURSE AND HOW IT HARMS AFRICA

Aaron Lao 34

POWER, DISCOURSE AND BIOFUELS: THE POLITICS OF SUSTAINABILITY, LAND USE AND ENERGY CONSUMPTION

Stefan Raupach 41

RESOURCE MANAGEMENT IN JASPER NATIONAL PARK: SPATIAL ANALYSIS OF POTENTIAL PRESCRIBED BURN AREAS BASED ON TWO SPECIES AT RISK

Sarah L. Ravensbergen 48

CLIMATE INDUCED SEA LEVEL RISE: AN INVESTIGATION OF ADAPTATION STRATEGIES AND EROSION MITIGATION IN COASTAL REGIONS

Eva Y. M. Tong 58

THE FUTURE OF ECOTOURISM IN BRITISH COLUMBIA: A CASE STUDY ANALYSIS OF CULTURAL AND ENVIRONMENTAL COSTS AND BENEFITS

Diana Wade 65

RARE EARTH ELEMENT TRADE IN THE PACIFIC-RIM

Katherine J. Wills 75

LETTER FROM THE EDITORS

For the past seven years, *Trail Six* has been a fixture of the UBC Department of Geography, and we could not be more thrilled and honoured to continue this tradition and share this year's volume with you. We begin by acknowledging our authors, as *Trail Six* is nothing without the scholarship of the exceptionally talented and thoughtful undergraduates of our department. We must also extend a heartfelt thanks to the dedicated editorial team for their tremendous effort and commitment to the countless hours of reviewing and editing required to make the journal a success. And last, but definitely not least, we would like to thank the faculty and staff of the department for their enduring support, as well as the Geography Students' Association for their commitment to UBC Geography students and the annual production of *Trail Six*.

As an undergraduate journal, our aim is to support emerging scholars. As we celebrate the scholarship of newer scholars, it is also with great sadness that we mourn the loss of Neil Smith, who passed away this fall. His scholarship and activism have inspired many students, within the discipline of geography and beyond. The articles published herein are a testament to critical and rigorous scholarship, and students' dedication to not only observe the world but to change it.

We hope this edition of *Trail Six* adequately showcases the breadth of geography; may the articles stimulate your passion for geography and lead you to discover – and rediscover – the diverse and overlapping areas of study within the discipline. Without further ado, it is with great pleasure that we present the seventh annual edition of *Trail Six: An Undergraduate Journal of Geography!*

Brittany Jang & Andrew Longhurst
Editors-in-Chief
March 2013

FOREWORD

I have been asked, as Acting Head, to provide a Foreword for this issue of *Trail Six*, and I am happy and honoured to do so. Noting that this is Volume 7, I am reminded that *Trail Six* began, after an earlier false start, during my second tenure as Head of Geography. I welcomed the energy and commitment that enabled that start-up, and I am delighted to see that it has been maintained by members of the still-remarkable GSA. More than this, *Trail Six* has thrived. Since volume 5, issues have been made available to a global readership on the www, the quality of the production has improved, and this year as last the journal includes ten articles revealing the range and quality of research and writing by undergraduate geographers at UBC.

We should not forget that every issue of *Trail Six* is produced by student volunteers willingly giving their time (and considerable quantities of it) to the benefit of the community. As any journal editor knows, there are rewards both incidental and practical in such labour. One develops a new appreciation of topics formerly beyond one's ken, and has the satisfaction of seeing a job well done. On the more tangible side the process of putting together a journal such as this offers opportunity to learn a range of new skills (and hone old ones) from identifying goals, establishing and nurturing a team (because editors are always reliant on others, peer reviewers, mentors, people with design and programming skills and so on) and keeping the show on the road (because deadlines have an *uncanny* habit of sneaking upon all of us). Once again, though, the job has been done, done well, and done on time. Well done.

From park management to slum clearance, from the use of biofuels to the consumption of local organic food, from the trade in rare earth elements around the Pacific Rim to the harm inflicted upon Africa by neoliberal discourse, from adaptation in the face of rising sea levels to the use of GIS to estimate the effects of population increase on firehall response times, and from an inquiry into the future of ecotourism to a rumination on body politics and the urbanization of capital, this issue of *Trail Six* well represents the diversity of topics engaged by Geography undergraduates.

I congratulate – on behalf of the entire department – each of the authors whose precious words have made their ways through the review and editorial process and into handsome print. Seeing your own work in this polished form, available for the long term to a wide readership should be both a source of personal satisfaction; it also stands as a form of tribute to what you have undertaken and learned at UBC. Thanks too, to the editors, and others who contributed in important but less recognized ways to this publication. Keep up the good work and continue to fly the banner of UBC Geography high.

Graeme Wynn
Acting Department Head
UBC Department of Geography

HOMELESS CITY: BODY POLITICS AND THE URBANIZATION OF CAPITAL

by EMMA ABDJALIEVA & ELVIN WYLY

“a life – administering power...subjecting the body to precise controls and comprehensive regulations”

Michel Foucault (*The History of Sexuality*, Volume I, 260)

“...the new antihomeless policy ... was intended to ‘take back’ the parks, streets, and neighborhoods from those who had supposedly ‘stolen’ them from ‘the public.’”

Neil Smith (*The New Urban Frontier*, 221)

The physical body is part of the urban landscape; its presence defines space through distributions of rules to which the ‘body’ must adhere so as to perpetuate capitalist domination of the physical environment. The Foucauldian logic of disciplining mechanisms operating in conjunction with exercises of surveillance within a capitalist modus operandi of urban life can help illuminate processes that manipulate spaces and bodies in order to produce specific types of places. Disenfranchised cohorts of the urban population -- especially the homeless -- are then further isolated through a discipline of possible punishment if they infringe upon the productive capacity of the physical landscape. ‘Bodies’ are thus rendered as productive units within a logic of consumption and capital accumulation. In this essay, we analyze the homeless human body as a regulated and disciplined entity, whose control ensures the continued circulation of capital within an administrative field of urbanism devoted to ceaseless accumulation.

In the case of homelessness, “rules of property” (Waldron 1991, 296) allocate uses of space, prioritizing access to certain spaces for specific actors within the productive economy meanwhile establishing limits on individual freedom. Here, we look at these processes through a Marxist analysis of the Foucauldian state apparatus’ system of discipline and punishment. Through restrictive legislation the body of the individual is classified, controlled and punished within a regime of production and consumption. In this essay we examine ‘body’ politics through the “binary of the permitted and the forbidden,” (Foucault 1995,

183) pertaining to the spatial location and mobility of physical bodies amongst legally – delineated physical spaces.¹ We suggest the body exists within a normalizing and corrective environment of discipline and observation, which simultaneously homogenizes and individualizes each physical body -- thus compartmentalizing space and agency. The physical body of the homeless person can be understood as a regulated and disciplined entity, which is continuously deprived of power within physical space through the rhetoric and state-backed police practices that protect private property.

SPACE AND THE BODY

The human body is a profound site for analysis because it is precisely through the body that politics of identity and exclusion create a dialectical relationship of the self as posited in contradiction to the 'other', whether the 'other' is the state, an institution or another being. We look at the physical body as a site that can be contained and governed within domains of private and public space, where human activity operates within its confines. As the legal theorist Jeremy Waldron puts it, "No one is free to perform an action unless there is somewhere he is free to perform it" (1991, 296). It follows that every action is performed somewhere, over a specific material landscape. However, through material specificity and state-policed rules of private property, physical spaces are assigned uses for classified bodies. Property owners and pedestrians are thus juxtaposed against people on the street who are considered to be "perpetrator[s] of a chronic street nuisance," (Ellickson 1996, 1194) which is defined as "behaviour that violates community norms governing proper conduct in a particular space, over a protracted period of time, to the minor annoyance of passersby" (Ellickson 1996, 1175). Prime examples used frequently in citing a street nuisance are panhandling, bench squatting, sleeping, or performing 'private' bodily functions in public places. As a theoretical and political matter, however, there is almost no limit to the particular ways that homeless behaviors can be identified and classified as a 'nuisance.' There is extensive debate in contemporary legal literature, for example, on "linguistic differences between 'homeless' and 'street' people," (Ellickson 1996, 1192) which further complicates treatment of

this cohort of the population, both through legislation and processes of socialization. For the sake of clarity and simplicity, we will use the term 'homeless' throughout the essay to denote a person who does not have an option of sleeping in a socially prescribed residential space and thus has to sleep at night at an emergency shelter, on the street, in a park, on a bench, under a bridge, in a bus or train station or any physical space that is not assigned a residential role. We have to clarify that while the 'homeless' are not the only ones who engage in activities such as panhandling, squeegee-ing, bench squatting and begging, in this essay we will focus on these actions as performed primarily by the 'homeless'. However, quantitative studies that document the proportion or number of people engaging in the above identified street activities, as comprising the 'homeless' population in Canada at large and the province of British Columbia in particular, are still necessary.

Our particular concern in this essay is with control exerted over the body of the homeless through restrictive legislation pertaining to accessibility of specific spaces, conjoined with the rules of private property. We focus on attempts to legally restrict actions routinely performed by the homeless; these restrictions vary in severity and scope throughout the United States and Canada. In the U.S., such legislation includes attempts to pass a municipal law in San Francisco to "prohibit 'lodging' in public places such as streets, parks, and buildings," (Allen 1994) attempts to classify begging as "accosting someone [thus being] guilty of misdemeanor," (Allen 1994) and efforts in Washington to pass a law that would prohibit asking for money in exchange for washing windshields.

In Canada, on the other hand, data that we have been able to find is primarily concerned with panhandling, defined by the City of Vancouver by-law, as begging, “or asking for money, donations, goods or other things of value whether by spoken, written or printed word or bodily gesture for one’s self or for any other person” (Collins and Blomley 2003, 40). Various Canadian cities pass different by-laws concerning when, how and where panhandling can legally occur; the how pertains to the aggressive or nonaggressive demeanor while begging. For example, in Calgary, it is illegal to panhandle between 8:00 PM and 8:00 AM, Saskatoon between 9:00 PM and 6:00 AM, and so on (Collins and Blomley 2003, 43-44). Prohibitions also extend over specific spaces, where it is illegal to beg near banks, teller machines, transit stops, liquor stores, walkways and roadways (Collins and Blomley 2003, 43-44). Therefore the panhandling ‘body’ can express itself only within a particular time frame and specifically not around certain urban spaces. However, we propose that the nature of the legal restrictions is corrective rather than punitive; these codes aim to discipline, and thus function as normalizing means of socialization.

Processes of legal restrictions applied to the homeless most frequently concern their ability to freely act within specific public places, while the rules of private property impose limits on the premises that the homeless can access at all. That is, “there is no place governed by a private property rule where [the homeless are] allowed to be whenever they choose...at any time” (Waldron 1991, 299). However, a homeless person does not possess a private sphere anywhere, since ownership is a predicate of private property and thus requires capital -- or an income stream sufficient to sustain payments

on borrowed capital -- to acquire property rights (or else a sufficient income stream to rent from an owner who has purchased these rights). For the homeless, then, public space is the only domain in which they are permitted to perform both public and private activities. The most fundamental and discomfiting premise of private and public space for a homeless ‘body’, we suggest, is the perpetual and inescapable infringement upon individual freedoms -- including the most personal and (normally) private behaviors that must be performed in public spaces. “If one is not free to be in a certain place, one is not free to do anything at that place,” (Waldron 1991, 302) and so it follows that legal restrictions in public places and rules of private property create an unfree homeless ‘body’, potentially everywhere.

We live in an urbanizing world defined and structured by capital accumulation. The urbanized contradictions of capital accumulation and its hierarchical, upward redistribution of surplus value create extensive homeless populations even in the wealthiest cities of the Global North. In this context, we contend, that the legal restrictions placed upon the most disenfranchised people of the city have the effect -- in legal, symbolic, and material terms -- of denying their basic, fundamental human freedoms. To appreciate the scope and severity of these denials, we must examine the manipulation of the homeless body through disciplinary practices that make it fit into the material and rhetorical structures of capital accumulation.

DISCIPLINE OF THE BODY

The ‘homeless’ body is disciplined through “a mechanism that coerces by means of observation” (Foucault 1995, 170) to occupy

only certain spaces. Continuous surveillance of the 'homeless' body and the ability of the security apparatus, frequently represented by the police, ensures that as soon as a spatial violation occurs by the 'body' that is not supposed to be in a particular space, it is promptly removed and urged to relocate, oftentimes threatened with penalties of varying severity (scorn, a fine, physical coercion, arrest). Consequently, the 'body' of the 'homeless' is perpetually mobile: "wandering in public places" becomes "their only option" (Waldron 1991, 301). Surveillance gains importance in a disciplinary society inasmuch as it becomes necessary for the control and organization of economically productive activities and settings for consumption, which are at the heart of the circulation of capital. Production and private property require the existence of surveillance due to the very nature of the "function of capital" (Foucault 1995, 175). Surveillance becomes fundamental to preventing any loss of capital, or any loss of opportunities that speed up the circulation of money required to facilitate faster capital accumulation: everything and everyone is monitored to guard against the losses associated with the 'wasteful' use of time and productive space. The function of capital then becomes further accumulation of capital. According to Marx, "the general formula of capital as it appears *prima facie* within the sphere of circulation is M-C-M [Money-Commodity-Money]" (Marx 1995, 106). Money is first converted into a commodity through the process of industrial production, and the commodity is then sold and thus transformed again into money. As Marx writes, in such a formulaic, industrial circulation, the end goal is money or exchange-value. Such circulation is continuous, where, "the expansion of value

takes place only within this constantly renewed movement" (Marx 1995, 104). It can only be reproduced through careful surveillance of the process of capital accumulation -- as well as the bodies of workers and all other individuals embedded in the disciplinary matrix of capitalist society. Surveillance acts as a mechanism of security, through its management of possible mobile 'bodies' by arranging physical space where technologies of observation can easily operate (Foucault 2007, 1-54).

Now it is important to discuss the process of normalization in a disciplinary society. The 'homeless' body is constituted by legal frameworks and rules of private property that perform the role of normative institutionalization. While the final effect of laws or by-laws is the threat of punishment, in practice these codes operate by isolating individual actors or perpetrators, in order to "refer individual actions to a whole that is a field of comparison" (Foucault 1995, 182). This is fundamental to normalization, as it allows a single individual to be compared to a whole, which differentiates between each physical 'body' according to a prescribed principle or "minimal threshold, as an average to be respected" (Foucault 1995, 183). Fundamentally, we propose that not only does the law itself function as a normalizing principle, but also as a tool for preserving certain spaces because of their significance to the circulation and accumulation of capital. Don Mitchell, writing on the implications of anti-homeless legislation on social space, analyzes how globalization reinforces investment in fixed capital. Through the rhetoric of "annihilating space" (Mitchell 1997, 303), which forces "cities [to] do what they can to make themselves attractive [to] capital," (Mitchell 1997, 304) 'homeless' bodies

are forced to become invisible in public spaces, precisely because only public spaces that have been purified by the exclusion of homeless bodies tend to attract capital. The essence of the normalizing framework here is to preserve the aesthetics of any given city that wants to remain at a comparative advantage with capital investment. Essentially this entails creating a norm that stipulates that homeless people found sleeping on benches or begging for money on sidewalks is a deviation from a desirable aesthetic norm, and thus discouraged. The norm then seems to involve purification from city streets of those characters who have been unable to fit correctly or adequately into an urban field structured and reproduced by the circulation of capital. As Foucault puts it, "The power of the norm appears through the disciplines," (Foucault 1995, 184) that is, through an organizational effort of specifically 'identifying' bodies. This means that 'bodies' representative of certain economic conditions have more rights to be in more urban places, than those who have failed to mould into the economic order. Surveillance, then, comes to the forefront of the normalizing process, as it acts as an unobserved observer of social status.

The physical body is not simply an entity upon which surveillance is focused; surveillance encourages and guides the development of the 'correct' type of body with appropriately normalized behaviors and practices. In his chapter, "The body as an accumulation strategy" in *Spaces of Hope*, David Harvey writes that "the manner of production of space-time is inextricably connected with the production of the 'body,'" (Harvey 2000, 100) as the physical body is fundamental to the operation of social relations. Those relations themselves, however, are defined by the framework of time

and space wherein they occur. Social processes of space-time then produce the 'body'. If we further expand this point and fuse it with the Foucauldian process of normalization through a matrix of discipline and surveillance, it becomes clear that social processes dictate the norms within which certain types of physical bodies are socially produced. For us the significance resides in that capital accumulation directs social processes of space-time, while law functions to categorize bodies according to their contribution to capital accumulation; this is the essence of urbanism in the complex relationship of private property and public space. However, as Jeremy Waldron writes, "The legal relation involved [in the ownership of private property] is a relation between persons," (Waldron 1985, 314) therefore, when speaking about the in-accessibility of specific, privatized spaces, the discussion is not about that particular space, but who is not allowed to infringe on the liberties and rights of the owners of that specific property (Waldron 1985, 313-315); the relationship is between 'bodies'. The exacerbation of the annihilation of the 'homeless' body is then premised upon the rhetoric of private property -- which the 'homeless' body is not allowed to trespass -- and further constrained by anti-homeless laws that restrict the behaviors permitted in public spaces. Thus the 'homeless' body is continuously regulated in the confines of physical space.

It may seem a sweeping claim to propose that the administration of physical 'bodies' is premised on the rhetoric of capital accumulation and production. Such a bold assertion, however, makes more sense if we recall the historic emergence of capitalism and its reliance upon the "accumulation of men [who] made possible...the accumulation of

capital” (Foucault 1995, 221). According to Harvey’s Marxist analysis, capitalism evolves along an “evolutionary trajectory” (Harvey 2010, 123) through different forms of social organization that are interlinked with new technologies. These in turn alter human relations, both towards fellow men and to nature, as well as recreate daily patterns of consumption (Harvey 2010, 121-122). Harvey identifies several distinct activity spheres in which capitalism circulates, among which are “technologies and organizational forms, social relations, production and labour processes, [and] mental conceptions of the world...” (Harvey 2010, 123). Marx identifies these spheres as fundamental to his analysis of the emergence of the “factory system and the rise of a machine tool industry,” (Harvey 2010, 127) which in the eighteenth and nineteenth centuries were instrumental in propagating further technological development, nurtured by the expansion of a comprehensive administrative apparatus of capitalist political economy. With the re-spatialization of global factory systems in the last century -- with rising commodity production in cities of the Global South and the articulation of service-intensive postindustrial consumption circuits in many cities of the Global North -- the administrative apparatus has been redirected. In the consumption and real-estate-accumulation spaces of cities of the Global North, the new technologies of capitalist administration now include the legal codes, the surveillance cameras, and the police practices designed to produce particular urban spaces that administer bodies in ways that facilitate further capital accumulation.

These processes however, do not go unchallenged, and body politics are now at the heart of struggles over the right to the

city. Thus in a city like Vancouver where innovations in “foodie” culture have made the lunch-and-dinner-consuming body a lucrative accumulation strategy, restaurants are now on the front lines of the new urban frontier between gentrification and homelessness. The man who calls himself “Homeless Dave” was among many of those protesting outside the latest “trendy new eatery in Vancouver’s impoverished Downtown Eastside,” (Colebourne 2013) and the antipoverty activists picketing the restaurant handed out insurgent menus brilliantly crafted to question the annihilation of space by law. Among the items on the menu of “what to expect if you patronize this business”:

“Poor-Bashing Salad

Greens that are grown by real live neighbourhood poor folks in community gardens

Arugula, Radicchio, Ridicule, and Scorn

—

Greedy Pig

Your basic Landlord BLT -- Bugs, Leaks, and Threats of eviction

Served with a compulsory side of methadone

—

Seafood Linguine

Jumbo Shrimp, Aggressive Security Guards, and Clams in a Garlic Cream Sauce

Served with garlic bread and racism

—

Spicy Beef Fillet

Served with roast potatoes, increased policing, and wild chanterelle mushrooms....”

CONCLUSION

We suggest that “space subsumes things produced” (Lefebvre 2007, 73) and consequently, within an economic order premised on capital accumulation, it subsumes the biological ‘body’, which is tied to the capitalist conception of ‘body’ as a subservient entity of production, consumption, and productive consumption. Biological bodies of the disenfranchised are even more disciplined within this economic order than bodies of those deemed economically productive, since the latter have cash, credit, or wages from formally sanctioned labor to perpetuate the circulation of goods and services and thus the economic order itself. Mechanisms of surveillance and securitization then organize space through ‘body’ politics so as to further advance accumulation and to discipline those whose presence constitutes a barrier to accelerated consumption and accumulation. The physical body is thus made docile through the possibility of its punishment if spatial boundaries get violated. Rules of private property then function as a disciplining mechanism that never fails to direct specific physical bodies to designated physical spaces.

NOTES

ⁱTo claim that physical ‘bodies’ are allocated to specific physical spaces may seem an arbitrary notion. However, we propose that ‘bodies’ take on “an anatomic-politic[al]” role within a productive system of capital accumulation, inasmuch as the body’s political and economic roles are performed within landscapes of capital-intensive activities. However, it is precisely by being a biological subject in the first place that the ‘body’ can be harnessed into productive activity. Therefore, biological intervention with the ‘body’ identifies, quantifies

and manages its physicality within a productive landscape. As Foucault writes, “bio-power was without question an indispensable element in the development of capitalism...[through] the insertion of bodies into the machinery of production” (Foucault 1990, 139).

ⁱⁱJudith Butler is one of several philosophers and geographers writing on the necessity of looking at the role of the physical body in politics. Building on Hannah Arendt’s ‘space of appearance’ she writes that, “For politics to take place, the body must appear./...who we are bodily, is already a way of being ‘for’ the other...” (Butler, 2011).

ⁱⁱⁱBy material landscape we mean both geographically physical and economically productive space. It is inevitable to arrive at a discussion of resources when speaking of productive space and in this essay we theorize land as a material resource, that is, “an object capable of satisfying some human need or want” (Waldron 1985, 318).

^{iv}It is important to note here that these laws have been and are regularly challenged on the grounds of human rights violations, in as much as a legal restriction on begging for instance, can be interpreted as violating the freedom of speech, as per the First Amendment of the American Constitution.

^vIn our reading of Marx and Harvey, the most crucial issue here is the fundamental, self-perpetuating dynamic of surplus appropriation and profit accumulation that thrives upon further accumulation, consumption, and surplus value appropriation. Urbanization is at the heart of the reproduction of these relations -- “it plays a particularly active role (along with other phenomena such as military expenditures) in absorbing the surplus product that capitalists are perpetually producing in their search for surplus

value” (Harvey 2012, 6-7). The continuously expanding consumption of goods and services in ever-more-highly capitalized (i.e., expensive) urban environments is accelerated through faster mobility of bodies (e.g., tourist travel), commodities (transportation), and services/experiences (telecommunications systems, advertising and marketing, payment and credit systems). We propose that this intensifying circuit of accumulation and capitalization reproduces a transnational urban underclass of those without competitive advantage in an accelerating marketplace -- relegating people into severe poverty and homelessness.

^{vi} Mechanisms of security will thus operate on populations that exist within a planned space, which is organized on natural and artificial givens such as the physical landscape, water bodies, etc. Mechanisms of security function in temporal uncertainties and consequently deal with possibilities, which require norm-formation (socially acceptable decorum) through discipline (Foucault 2007, 19-21).

^{vii} This categorization is imprecise, and thus often must rely on various norms, assumptions, and stereotypes deployed to categorize bodies according to their estimated potential contribution to the circulation of capital. Current changes in information technology and socially-networked fusions of ‘real’ and ‘virtual’ urban space, however, hold the possibility for legally-sanctioned categorizations of greatly enhanced precision.

^{viii} Henri Lefebvre generates an interesting discussion on production of space, through the elaboration on space as a product of spatial practice, representations of space and representational spaces. In his analysis of capitalism, Lefebvre opens a conversation about theoretical and conceptual spaces, which

are imbued with symbolic representations and exist in a “dialectical interaction” with daily life. For Lefebvre, production, product and labour are intensely connected in the production of social space (Lefebvre 2007, 15, 69-75).

REFERENCES

- Allen, C. 1994. The ACLU Against the Cities. *City Journal*. Spring 1994. Accessed Online at <http://www.city-journal.org/article01.php?aid=1387>.
- Butler, J. 2011. Bodies in Alliance and the Politics of the Street. Lecture from the series *The State of Things*. Accessed Online at <http://eipcp.net/transversal/1011/butler/en/print>.
- Colebourne, J. 2013. Gentrification Protesters Picket Vancouver Downtown Eastside Restaurant. *Victoria Times-Colonist*. February 19.
- Collins, D., and N. Blomley. 2003. Private Needs and Public Space: Politics, Poverty, and Anti-Panhandling By-Laws in Canadian Cities. *New Perspectives on the Public-Private Divide*. Ed. Law Commission of Canada. Vancouver: UBC Press, p. 40-67.
- Ellickson, R. C. 1996. Controlling Chronic Misconduct in City Spaces: Of Panhandlers, Skid Rows, and Public-Space Zoning. *The Yale Law Journal*. Vol. 105:5, p. 1165-1248.
- Harvey, D. 2000. *Spaces of Hope*. Berkeley: University of California Press.
- Harvey, D. 2010. *The Enigma of Capital and the Crises of Capitalism*. New York: Oxford University Press.
- Harvey, D. 2012. *Rebel Cities: From the Right to the City to the Urban Revolution*. London and New York: Verso.

- Foucault, M. 1995. *Discipline and Punish*. New York: Vintage Books.
- Foucault, M. 2010. The History of Sexuality: Volume I. *The Foucault Reader*. New York: Random House Inc.
- Foucault, M. 2007. *Security, Territory, Population: Lectures at the College de France, 1977-1978*. New York: Picador.
- Lefebvre, H. 2007. *The Production of Space*. Oxford: Blackwell Publishing.
- Marx, K. 1995. *Capital: Volume I*. Moscow: Progress Publishers. Accessed Online at <http://www.marxists.org/archive/marx/works/download/pdf/Capital-Volume-I.pdf>.
- Mitchell, D. 1997. The Annihilation of Space by Law: The Roots and Implications of Anti-Homeless Laws in the United States. *Antipode*. Vol. 29:3, p. 303-335.
- Smith, N. 1996. *The New Urban Frontier: Gentrification and the Revanchist City*. New York: Routledge.
- Waldron, J. 1991. Homelessness and the Issue of Freedom. *UCLA Law Review*. Vol. 39:295, p. 295-324.
- Waldron, J. 1985. What is Private Property? *Oxford Journal of Legal Studies*. Vol. 5:3, p. 313-349.

FROM THE FARMER: THE STORY OF HOW I BECAME CONVINCED THAT ORGANIC, LOCAL FOOD IS WORTH IT

by KATE BECK

This article examines the commodity chain of organic, locally produced, Day Spring Tofu. This research was conducted through a series of interviews, including an Ontario-based soybean farmer, the producer of Day Spring tofu on Vancouver Island, and the Chef who serves this tofu on behalf of UBC Food Services. This product's commodity chain offers insight into the local, Canadian, and organic food movement which has become popular as a reaction to the globalization and genetic modification of our food systems. This article will argue that the local organic food movement is built upon, and sustained by, the interactions between individuals who are dedicated to the importance of anti-corporate, localized food production.

The first piece of advice I was given, as a first year student moving into university residence, was “beware of the cafeteria food”. As I began preparing to move into Vanier residence at the beginning of university, I dreaded the thought of eating mass-produced meals, wilted vegetables, and close-to-rotting fruit for a full year. Although a campus tour guide had boasted to me about UBC being the third most vegan friendly campus and the first certified fair-trade university in Canada, I was skeptical. When I see the words “locally produced” or “organic”, I usually choose to steer clear of the product. I believe these labels allow producers and distributors to substantially increase prices of products, and I think it is almost impossible to prove that these products really are organically and locally produced. However, the commodity chain of the tofu served at the Vanier cafeteria has proven that my skepticism about organic local products is completely uncalled for. Let me explain.

Day Spring Foods tofu (the tofu served in the Vanier cafeteria) is produced in Victoria and claims to contain only Canadian-grown, organic, GMO-free soybeans. This product is the epitome of the foods I do not trust, because really, who grows soybeans in Canada? As I conducted my research, however, I was able to trace the tofu as it was transferred from the hands of three key players in the commodity chain. I interviewed Marshall King, the manager and farmer of Organic Meadows Co-op in Ontario; Rob Ashton, the owner and product manager of Day Spring Foods; and Steve Golob, the Residence Chef at Place Vanier cafeteria. In this paper, I argue that Canada's organic, local food industry is built upon and sustained by the personal relationships between different players in the commodity chain. These players and the relationships between them create a system that is established on a solidarity and commitment to anti-corporate, organic food production. This system, which is based on trust and solidarity,



Figure 1. Map of the Commodity Chain of Tofu

increases the efficiency and profitability of the trade among players.

THE HANDS THAT BRING TOFU TO THE TABLE

I began to prove myself wrong from the very beginning of my research.

Soybeans can be grown in Canada. In fact, the soybeans used in Day Spring tofu are cultivated in Ontario, at Organic Meadows Farm Co-op (Figure 1).

Soybean seeds are sold by the co-op to one of 160 member farms, and then planted in early May. The crop requires warm and relatively dry weather, but needs little maintenance, other than occasional weeding throughout the growing season. The crops are harvested in mid-October, and stored until they are needed by the customer, in this case, Rob Ashton at Day Spring Foods. Rob places an order of the quality and quantity of soybeans he needs

with Marshall King, the manager of the co-op. Marshall contacts the growers, who clean and bag the beans. Marshall subcontracts a transport company, usually Transfreight, to pick up the beans to transport them to Vancouver Island where Day Spring Foods is located (Figure 1).

Within a week, the Ontario soybeans arrive at Day Spring Foods in Victoria. Rob Ashton produces tofu three days of the week -- Monday, Tuesday and Wednesday. The tofu is produced, pressed, and pasteurized to increase its shelf life. The rest of the week, Rob delivers the fresh tofu to food services and restaurants in Victoria and the lower mainland.

Every Thursday, Rob travels to Vancouver to deliver a week's supply of firm and smoked tofu to Steve Golob, the chef at Vanier cafeteria. The tofu is used everyday in a diverse number of dishes. Steve serves slices of the smoked tofu as a meat alternative at the sandwich bar,

and offers cubed tofu in the salad bar. The firm tofu is used in soup, vegetarian meals, Asian rice and noodle dishes, and pasta sauces.

MARSHALL KING - FARMER AND ORGANIC MEADOW CO-OP GRAIN MANAGER

Marshall King began working in the corporate world, but after many years he chose to return to the farming industry he has grown up in. Today, Marshall is a grain farmer and the grain manager of Organic Meadows Co-op.

Organic Meadows is a collective organization of Ontario farmers that is committed to providing consumers with high quality, organic, Canadian-grown products, while ensuring “fair and consistent returns to farmers” (Organic Meadows Mission Statement). The co-op has proven to be critical in forming relationships and encouraging communication between farmers and food producers. The co-op stores and markets grains after the harvest, which reduces operational costs for each farm, returning these profits to the farmers. This allows independent, organic farms to reach economies of scale and become economically profitable.

Marshall explains that the co-op gives farmers the opportunity to add value to their product, which is unheard of for farmers in large food producing corporations. “We’re a farmer owned co-op. Everything benefits the farm. The farmers have a say in what happens to their products, and then at the end of the day, the farmers get a cut of the profit.”

Although 95% of Organic Meadow’s profits are from milk, the co-op allows farmers to diversify their crops. This is how Organic Meadow farms began producing soybeans. “Most corporations squeeze the farmers out,

we give the farmers more control. We support farmers, even if they aren’t making large profits, because it all strengthens the organic movement.”

Soybeans are part of a three to four year crop rotation of other grains. Because each grain uses different minerals in the soil, rotating crops allows the soil to replenish itself of nutrients. Soybeans have nodules that contain nitrogen-fixing bacteria on their roots, thereby increasing nitrogen in the soil. For this reason, the farmers do not have to use nitrogen fertilizers, which allow the crops to grow organically. To continue producing organically, farmers plant the soybean plants close together in rows to crowd out weeds. Throughout the growing season, farmers use a number of different weeding processes, including the use of field cultivators and rotator hoes multiple times throughout the growing season, but never use pesticides or herbicides.

Finally, the co-op fosters interaction and communication between the farmers by holding meetings to discuss organic cultivation and storage techniques, by distributing monthly newsletters, and by providing forums for farmers to meet and collaborate. Increased interactions between these organic farmers improves production techniques, increases marketing of the product, and encourages a sense of trust within the co-op. Through open communication and solidarity in the co-op, each farmer can trust that other members are producing high quality, organic products that strengthen the reputation of the entire co-op’s brand and ensure the profitability of the business.

ROB ASHTON-DAY SPRINGS PRODUCER

Rob Ashton is the owner and Product Manager of the small, tofu-producing firm, Day Spring Foods, in Victoria, BC. Although his tofu has become very successful, it is sold in Noodle Box restaurants, and Save-On grocery stores throughout British Columbia, Rob has chosen to keep his business small. The limited size of his business improves the quality of his tofu, and also allows him to be more involved in transactions between his company, the soybean co-op, and his customers.

Rob explains that because of the size of his business (he has only seven staff), he is able to monitor production of tofu better than would a large food producer. If there is a problem in production, for example when the water content in the soybeans is too high, Rob is informed immediately, and is able to fix the problem before the tofu is sent to customers. “We get almost no complaints about quality, we just don’t send over crap.”

Although larger tofu producing firms have the ability to invest in more equipment and mass produce, which reduces costs of production, Rob makes sure that he takes advantage of being “the little guy”. Rob is able to deliver all the tofu himself, while large producers must hire food distributors to make deliveries. This reduces Rob’s delivery costs, and allows him to form relationships with his customers, which benefits his business.

STEVE GOLOB - VANIER CAFETERIA HEAD CHEF

Three years ago, the Vanier cafeteria received their tofu from Fresh Point, the largest food distributor in North America. After tasting Day

Spring Tofu at a meeting held by the Canadian Association of Foodservice Professionals, UBC Chef, Steve Golob, did a trial of the organic tofu in the cafeteria. Once the trial was over, a group of students from the Land and Food Systems 451, who had been consumers of the tofu during the trial, came to Steve and provided him with calculations that proved the cafeteria could save 23-30% of its food costs if it bought all of its tofu from Day Spring Foods. Steve then immediately began buying Vanier’s regular and smoked tofu from the small firm.

Although Steve began buying this product because of its low costs, he has continued to buy the tofu because of the relationship he has formed with the small business owner, Rob Ashton. Compared to a food distributor like Fresh Point, Rob is able to deliver the tofu himself, which has created a trusting relationship between the producer and the chef. On his deliveries, Rob makes sure to check quality and quantity of tofu stocks at UBC.

Compared to the larger food distributors, Steve trusts that Rob will provide Place Vanier cafeteria with the most efficient service. Because UBC Food Services serves an estimated 40-70 000 people per day, the efficiency and reliability of deliveries is critical. Rob has made sure that his business is reliable and flexible enough to meet the demands of UBC because the university is one of Day Spring’s biggest customers. Steve remembers a time when the cafeteria ran out of tofu by Sunday, and there was no planned delivery until Thursday. He called Rob, and Rob was able to bring him a fresh delivery of tofu by the next day. This would have been impossible if Steve was dealing with a corporate food distributor. When I asked to be put in contact with Rob Ashton, Steve assured me that Rob

would be in contact with me in less than a day. “If I ask him to talk to you, he definitely will, our wives our friends and everything. If he doesn’t talk with you, I’ll tell him I’m pulling the product.”

Me: If the price of Day Spring Tofu increased, would you switch back to buying tofu from Fresh Point?

Steve: No, no way. You want to know why? Quality and good service sells better than shit.

MY THOUGHTS AS THE CONSUMER

After researching the commodity chain of Dayspring tofu, I realized that my assumptions about organic locally produced food are wrong. The organic, locally produced food market is not a fake. Instead, it is a system of transfers between farmers, producers, distributors and consumers who are all dedicated to anti-corporate food systems that support the community, the environment, and the local economy. This system is built on and reinforced by the relationships formed between these economic players. Each actor also reaps economic rewards from the formation of these relationships. And so, if the other individuals in this system can trust that the soybeans and tofu they are receiving is completely organic, Canadian-grown, and high-quality, I can trust that the tofu I am eating from my cafeteria salad bar is too.

ACKNOWLEDGMENTS

First and foremost, I would like to thank Steve Golob, Rob Ashton, and Marshall King, the interviewees who became crucial to the development of this argument. I would like to thank Dr. Trevor Barnes, Dr. Victor Murray and Aaron Lao for the many hours of editing, proof reading, and idea bouncing that was

needed for this publication.

REFERENCES

- Golob, S., Vanier Place Head Chef, UBC Food Services. Personal interview, 29 Mar. 2012.
- King, M., Farmer and Grains Manager, Organic Meadows Farms. Phone interview, 30 Mar. 2012.
- Ashton, R., Owner and Product Manager, Day Spring Foods. Phone interview, 30 Mar. 2012.
- Organic Meadows Farm Co-op. 2013, *A Brief History*. http://organicmeadow.com/who_we_are/a_brief_history.
- Day Spring Foods. 2009. *Day Spring Soycraft Products*. <http://dayspringfoods.com/images/Products.html>.

“THE CITY OF HARARE HAS LOST ITS GLOW”: OPERATION MURAMBATSVINA AND THE POLITICS OF SLUM CLEARANCE IN ZIMBABWE

by KATHARINE FREED & PIERSON NETTLING

“The city of Harare has lost its glow. We are determined to get it back.”

Sekesai Makwavara, ZANU-PF appointed mayor of Harare, May 24, 2005 (Hartnack 2005)

In July of 2005 the government of Zimbabwe, under direction of President Robert Mugabe and his ruling political party – the Zimbabwe African National Union-Patriotic Front (ZANU-PF) –, initiated Operation Murambatsvina a slum clearance policy with the alleged purpose of “cleaning up” cities within the country. What ensued was a massive, militarized demolition project that forced the elimination of illegal housing and activities associated with the informal economy which displaced an estimated 700,000 people in cities across Zimbabwe. The destruction of the informal sector and eviction of vulnerable urban dwellers resulted in resounding social, economic, and political consequences. ZANU-PF claimed the purpose of Operation Murambatsvina was to reassert law and crack down on crime, however, political commentators and government watchdogs speculate the slum clearance initiative to be a smokescreen for the ruling regime and its reassertion of power against potential urban oppositional factions within Zimbabwe. This article highlights the political motivation behind the urban policy slum clearance within the discourse of power from a historical context. The politics behind slum clearances are not effective urban policies in combating slum development, and other forms of managing slum growth must be considered in developing new urban strategies.

On May 25, 2005, the government of Zimbabwe initiated a program designed to “clean up” its cities (Tibaijuka 2005, 2). Conditions in Harare, formerly “renowned for its cleanliness, decency and peace,” were now seen by many to be deteriorating and increasingly chaotic (Tibaijuka 2005, 95). The stagnate economy and convoluted legal system of Zimbabwe had led to the rapid increase of “slum pockets” in cities such as Harare, with the urban poor residing in illegal slum housing and working within the growing informal economy (Hughes 2007, 325; Potts 2006, 281; Kamete 2009, 903). In order to halt slum growth, President Robert Mugabe, and his ruling ZANU-PF, enacted an urban slum clearance program codenamed Operation Murambatsvina, which translates in Shona as to “clean up the trash” or “clear out the filth.” This was done in order to “restore order,” eliminating “disorderly [and] chaotic urbanization” within

the city centres of Zimbabwe (Tibajuka 2005, 20; Crisis Group Africa 2005, 1).

However, instead of restoring order Operation Murambatsvina succeeded in devastating the lives of Zimbabweans with an estimated 700,000 people becoming displaced and a further 2.4 million being either directly or indirectly affected by the government policy (Crisis Group Africa 2005, 2). Slum clearance policies are not unknown to Zimbabwe – as well as the rest of Africa and other parts of the world – and have been used as colonial urban management techniques or as instruments of modernist rationalism in governmental reaction to urbanization (Njoh 2009, 13; Kamete 2009, 898; Bigon 2008, 60). However, Operation Murambatsvina was remarkable in its brutality, devastation and scale (Potts 2006, 275). Historically, slum clearance policies such as Operation Murambatsvina, have consistently been invoked by proponents as a tool for social welfare and progress, yet underneath these claims of common good often rest the arbitrary demonstration of political agendas through the mobilization of state power. The intent of these programs focuses on the spatial purification and remaking urban landscapes to engineer society for the ruling regime (Fontein 2009, 371; Kamete 2009, 907; Heathcott 2008, 223; Njoh 2009, 13; Bigon 2008, 73).

Operation Murambatsvina demonstrates the necessity of finding alternative methods to forced eviction, displacement and criminalization in confronting issues of poverty, economics and housing. These methods of urban management fail to address the underlying, global and place-specific reasons behind slum growth within the concomitant rise of the informal economy. Although Operation Murambatsvina is the

result of Zimbabwe's specific political situation, the policies mirror the challenges faced by countries plagued by colonial histories with the imposition of neoliberal reforms.

THE POLITICS OF IMPLEMENTATION WITHIN A HISTORICAL CONTEXT

The economic, political and social turmoil of Zimbabwe long predate the implementation of Operation Murambatsvina. Zimbabwe, originally founded as Rhodesia, a colony within the British Empire in the late nineteenth century, served as a hinterland for mineral extraction and later as a “racist, capitalist super exploitation” focused economy constructed on agriculture and manufacturing (Raftopoulos and Mlambo 2009, 5). White-nationalist rule and other state-driven racist policies and practices led to a resistance movement in the 1950s and later civil war from 1965 until independence in 1980 (Raftopoulos 2009, 90).

Despite achieving independence for the newly independent Zimbabwe, the government, led by Robert Mugabe, did little to transform the existing historical colonial structures and its unequal distribution of wealth (Bond 2007, 165). The failure to address these legacies culminated with the continued economic crisis of the 1980s with the implementation of a Structural Adjustment Program (SAP) from the World Bank in 1991. The SAP promised economic growth through the privatization of state-owned enterprises and its controls on the market, the weakening of worker rights and trade unionism laws, and the curtailment social services and welfare (Bond 2007, 151). However, implementation of the SAP in 1991 only increased economic decline by exacerbating trade deficits and hyperinflation while agricultural and manufacturing outputs

plummeted. The collapse of the economy in the 1990s was also aggravated by persistent drought conditions, leading to increased social insecurity, ethnic tension, and mass migration to urban city centres (Bond 2007, 168). The continued leadership of President Robert Mugabe did little to help the growing social crisis. The policies of his ruling ZANU-PF, exemplified by the forced expropriation of white-owned agricultural land for redistribution, and the military involvement of Zimbabwe in the Democratic Republic of Congo's civil war, became increasingly erratic and unpredictable (Raftopoulos 2009, 203). As the new millennium dawned, Zimbabwe was in deep economic and social turmoil. It was within this context Operation Murambatsvina was launched.

REMOVING THE GLOW: IMPLEMENTING OPERATION MURAMBATSVINA

Operation Murambatsvina was initiated under the pretense of an urban clean-up campaign that indiscriminately and violently targeted all forms of illegal activity through arrests, evictions and demolitions. In justifying the policy, ZANU-PF invoked the "Regional, Town and Country Planning Act" an archaic, colonial-era legislation to centralize all aspects of urban planning to the federal level (Mpfu 2011, 181). Initially only used to target illegal activities, the government incorporated the removal of illegal dwellings and the homeless into its legislation (Bratton and Masunungure 2006, 27). Faced with having their homes burned or bulldozed by the military, urban residents were ordered to demolish their now illegal housing structures. Following demolition and eviction the evictees, who, according to the government, were on a journey to their new "homes" in rural Zimbabwe, were taken

by trucks and transported to makeshift transit centres on the urban periphery and given inadequate shelter for housing (Bratton and Masunungure 2006, 24). When the suspension of Operation Murambatsvina was announced in July of 2005, hundreds of thousands of urban residents had been affected, and nearly all of the Zimbabwean informal urban economy and housing supply had been eliminated (Kamete 2009, 898).

The enforcement of the official law was a significant blow to the people of Zimbabwe as the majority of the population was employed outside of what was officially deemed as the legal, formal economy. By 2004, an estimated 40 percent of all employment in Zimbabwe was in the informal economy with 70 percent of all urban dwellers classified as officially unemployed (Tibajuka 2005, 17-24). Furthermore, while the stringent and unrealistic housing standards of the government, coupled with the lack of access to public land, succeeded in impeding the growth of squatting communities and distinct slums, the policy drove the majority of the urban population to take up residence in illegal additions to legal dwellings, known as "backyard" extensions or "backyard shacks" (Fontein 2009, 382; Potts 2006, 282).

On an institutional level, the operation was successful in concentrating power within the central government and rendering the power of the local government redundant as the policy was initiated without local approve or insight. This clear breakdown of central-local government relations was largely due to lack of central government representation in urban centres (Kamete 2009, 917). Little power was now left in the hands of regional authorities to deal with the massive upheaval, resulting in

the further de-legitimizing the integrity of state institutions on the local level (Bratton 2006, 23). The role of the local government in providing basic social services such as education and healthcare was now severely curtailed due to the displacement of the urban population (Tibajuka 2005, 7). In providing education, an estimated 300,000 children were unable to attend school due to displacement, lack of public transport or classroom overcrowding (Tibajuka 2005, 7). For health services, where 24.6 percent of the adult population is infected with HIV/AIDS, access to adequate health services and antiretroviral drugs was already limited outside of urban centres before the implementation of the operation, further compromising the healthcare system and the HIV/AIDS epidemic after the mass evictions (Tibajuka 2005, 39; Duffy 2005, 29; Sambisa and Stokes 2006, 187; ActionAid International 2005; Dzimiri and Runhare 2012, 203; Bratton and Masunungure 2006, 26; Potts 2006, 278).

Furthermore, the consequences of Operation Murambatsvina were not only relegated to the informal economic sector, where nearly 76 percent of the population suffered from a loss of income source, but also within the formal economy (Potts 2006, 291). In Harare, office buildings deemed illegal for breaching urban policy were closed, affecting both informal and formal businesses (Tibajuka 2005, 36). The crippling of agricultural industry and retailing sector, which profited from selling to the informal sector disrupted local supply chains, also increased unemployment in the formal economy (Hughes 2007, 335).

LAUNCHING OPPRESSION? SLUM CLEARANCE AS A FAÇADE FOR ENTRENCHING POLITICAL POWER

Due to the extremely repressive, sudden and violent nature of Operation Murambatsvina within the context of political instability, the literature on the operation has come to view the policy of ZANU-PF to be a politically motivated project aimed at reasserting its own political power against potential oppositional factions within Zimbabwe (Tibajuka 2005, 7; Bratton and Masunungure 2006, 22; Kamete 2009, 903; Hughes 2007, 327; Dzimiri and Runhare 2012, 192; Fontein 2009, 372). The reassertion of power by Robert Mugabe and the ZANU-PF has led to government-sponsored violence, intimidation, and election fraud (Shale 2006, 113; Bratton 2006, 22). It was within this climate of growing spatial and ideological political polarization that led to international skepticism on the sincerity of Zanu-PF's declaration of Operation Murambatsvina as form of urban management (Fontein 2009, 372; Clarke 2008, 3; Hughes 2007, 372; Kamete 2009, 918).

Under the rule of Robert Mugabe, the government of Zimbabwe had many incentives for utilizing slum clearances as a political tool. Across the country support for the main opposition party, the Movement for Democratic Change (MDC), is urban concentrated in contrast to the traditional rural political base of ZANU-PF (Fontein 2009, 376; Potts 2006, 287). In displacing an urban population increasingly hostile to the ZANU-PF, Operation Murambatsvina politically neutralized "insurrectionary spaces" for political expression and protest against the ruling regime (Kamete 2009, 21).

Due to the intense political polarization, waning support for the ruling party, and the sudden reversal of stated policies and the history of government secrecy and deception, it is clear why a large percentage of the population viewed the government-issued statement of the rationale for the operation as political cover for the more pressing issues threatening the ZANU-PF (Fontein 2009, 373). The central government, under the direction of Robert Mugabe, enacted Operation Murambatsvina to legitimize the oppressive, authoritative power of the regime in demonstrating the “repressive and productive mechanisms” of the state through the implementation of slum clearance urban policies (Navaro-Yashin 2002, 154). However, slum clearance, particularly in a polarized, largely distrustful and chaotic climate not only does little to facilitate effective governance, but further undermines democratic structures. Instead of the changing official legal frameworks to solve systemic issues democratically, the Zimbabwean government, under the rule of Robert Mugabe, relied on the selective interpretations of historical legislation of “modernist planning doctrines of order, economy, aesthetics, and health” to meet its own political ends (Kamete 2007, 154).

REGAINING THE GLOW: THE CASE FOR EFFECTIVE, DEMOCRATIC URBAN SLUM MANAGEMENT POLICIES

The question of how to effectively manage rapid urbanization in the Global South is a global concern. Slums and informal housing is a by-product of overcrowding, poor conditions, and the absence of the state on the local, national, and international scales. The policy of urban slum clearance, as demonstrated in this article with Operation Murambatsvina, may resonate

with the UN Habitat Millennium Development Goals on the upgrading of slums, but these policies, when enacted, continually reproduce outcomes of oppression and displacement. However slum clearance, often implemented or imagined as a means to an ends approach to the elimination of slums and the informal economy, does not address or acknowledge the underlying causes of rapid urbanization. These causes must be discussed in order to have any significant impact on curtailing urban slum growth. Slums may be undesirable, but slum clearances as a solution only worsens the conditions of the urban poor and strengthens the position of the ruling political regime as a coercive policy tool in remaking the urban landscape and engineering society for its own political survival.

In the case of Operation Murambatsvina an estimated 700,000 people had their lives devastated by a large-scale crackdown on the slums and informal economy in Zimbabwe (Tibajuka 2005, 7). The slum clearance policy only exacerbated the existing problems; it did nothing to deflate them. In the end, Operation Murambatsvina was enacted by a corrupt and failing government without an adequate legal framework to justify its implementation. The sheer brutality and scope of Operation Murambatsvina lend important lessons to the consequences of slum clearance as an urban policy tool and the urgent requirement for an alternative approach to urban management in combating the growth of slums.

ACKNOWLEDGMENTS

The authors would like to thank Professor Jamie Peck for his suggestions and Brittany Jang for her unwavering conviction and devotion to the journal. Katharine would also like to thank

Pierce, for his amazing contribution, guidance and encouragement, her dear brother for his profound wisdom and steadfast support, and Amin Kamete, for being a beacon of hope within this world of darkness.

REFERENCES

- ActionAid International. 2005. *An in-depth study on the impact of Operation Murambatsvina/Restore Order in Zimbabwe*. <http://www1.umn.edu/humanrts/research/ZIM%20ACTION%20AID-Making%20Life%20Unbearable.pdf>.
- Bignon, L. 2008. Between local and colonial perceptions: The history of slum clearances in Lagos (Nigeria), 1924-1960. *African and Asian Studies* 7(1): 49-76.
- Bond, P. 2007. Competing explanations of Zimbabwe's long economic crisis. *Safundi: The Journal of South African and American Studies* 8(2): 149-181.
- Bratton, M., and E. Masunugure. 2006. Popular reactions to state repression: Operation Murambatsvina in Zimbabwe. *African Affairs* 106(422): 21-45.
- Clarke, J. E. 2008. Operation Murambatsvina: Urban governance in post-colonial Zimbabwe. MA thesis, Carleton University, Ontario.
- Crisis Group Africa. 2005. Zimbabwe's Operation Murambatsvina: *The tipping point?* Crisis Group Africa Report. <http://www.crisisgroup.org/en/regions/africa/southern-africa/zimbabwe/097-zimbabwes-operation-murambatsvina-the-tipping-point.aspx>.
- Duffy, L. 2005. Culture and context of HIV prevention in rural Zimbabwe: The influence of gender inequality. *Journal of Transcultural Nursing* 16(1): 23-31.
- Dzmiri, P., and T. Runhare. 2012. The human security implications of Operation Restore Order on urban habitation in Zimbabwe. *Journal of Human Ecology* 38(3): 191-205.
- Fontein, J. 2009. Anticipating the tsunami: Rumours, planning and the arbitrary state in Zimbabwe. *The Journal of the International African Institute* 79(3): 369-398.
- Hartnack, M. 2005. Harare blitz targets squatters. *The Guardian*, May 25. Online edition. <http://www.guardian.co.uk/world/2005/may/25/zimbabwe>.
- Heathcott, J. 2008. The city quietly remade: National programs and local agendas in the movement to clear the slums, 1942-1952. *Journal of Urban History* 34(2): 221-242.
- Hughes, K. 2007. Operation 'drive out the trash': The case for imposing targeted United Nations sanctions against Zimbabwean officials. *Fordham Law Review* 76(1): 323-386.
- Kamete, A. Y. 2007. Cold-hearted, negligent and spineless? Planning, planners and the (r)ejection of 'filth' in urban Zimbabwe. *International Planning Studies* 12(2):153-171.
- 2009. In the service of tyranny: Debating the role of planning in Zimbabwe's urban 'clean-up' operation." *Urban Studies* 46(4): 897-922.
- Mpofu, B. 2011. Operation 'Live Well' or 'Cry Well'? An analysis of the 'rebuilding' programme in Bulawayo, Zimbabwe. *Journal of Southern African Studies* 37(1): 177-192.
- Navaro-Yashin, Y. 2002. *Faces of the State: Secularism and public life in Turkey*. Princeton, NJ: Princeton University Press.

- Njoh, A. J. 2009. Ideology and public health elements of human settlement policies in sub-Saharan Africa. *Cities* 26(1): 9–18.
- Potts, D. 2006. ‘Restoring Order’? Operation Murambatsvina and the urban crisis in Zimbabwe. *Journal of Southern African Studies* 32(2): 273–291.
- Raftopoulos, B., and A. Mlambo. 2009. *Becoming Zimbabwe: A history from the pre-colonial period to 2008*. Johannesburg, South Africa: Weaver Press.
- Sambisa, W., and S. C. Stokes. 2006. Rural/urban residence, migration, HIV/AIDS, and safe sex practices among men in Zimbabwe. *Rural Sociology* 71(2): 183–211.
- Tibaijuka, A. K. 2005. Report of the fact-finding mission to Zimbabwe to assess the scope and impact of Operation Murambatsvina. *United Nations Human Settlements Programme*. Accessed on March 18, 2013: <http://www.unhabitat.org/documents/ZimbabweReport.pdf>.

FIRE HALL RESPONSE TIME ANALYSIS IN SEVEN MUNICIPALITIES IN GREATER VANCOUVER USING GIS: HOW POPULATION GROWTH AFFECTS SERVICE AREAS

by YU JIA GUO, E. CONOR B. MCLELLAN & ELVIA WILLYONO

This study examines the service area of fire halls in select municipalities of Greater Vancouver using the ArcGIS Network Analyst extension. Using census dissemination blocks, we explore how population density affects the service area of fire halls in order to inform long-range service planning. Using four-minute service buffers, we compare the fire hall service areas based on population figures for 2011 with the projected population increase for 2041. Results show that the fire hall service areas will be significantly reduced in 2041 due to population increase in all of the municipalities in our study area. Particularly, Surrey and Richmond, the municipalities that experience the most reduction in service area coverage, will also experience the highest population growth. We conclude that by 2041, a significant number of people will live outside of the four-minute service area in several municipalities, and that in order to mitigate this reduction municipalities will either have to relocate some of the existing fire halls or build new fire halls in order to maintain current levels of service.

INTRODUCTION

This study aims to conduct an analysis of fire hall response times of seven municipalities in the Greater Vancouver region: Vancouver, Burnaby, Coquitlam, Richmond, Delta, Surrey, and White Rock. The population for the region is projected to grow by 1.2 million residents between 2006 and 2041 for a total of 3.4 million residents (Metro Vancouver 2010; 2011). Accordingly, fire and rescue services will have to maintain sufficient levels of service in order to account for population growth. If the population of the region increases dramatically, how will this affect the response time of fire halls in Greater Vancouver? According to National Fire Protection Association (NFPA) standards,

a “first arriving engine company” should arrive within four minutes at a fire emergency incident, and eight minutes is required for “the deployment of a full first alarm” to suppress a fire incident (Esri 2007, 9). Similarly, the City of Toronto Fire Service has a stated goal of a four-minute response time for 90% of all emergency calls (City of Toronto 2005). With this in mind, we have obtained travel times for road segments in the Greater Vancouver road network and created service area maps to determine areas in Greater Vancouver that can be reached by fire crews within four minutes.

LITERATURE REVIEW

Many researchers have studied the relationship between fire hall locations, service area and

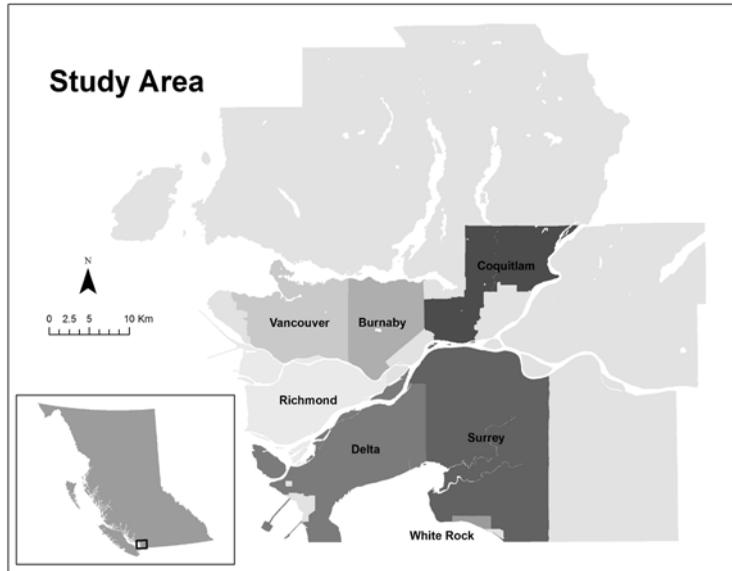


Figure 1. Study area: Seven municipalities in Greater Vancouver.

response times. The City of Ottawa conducted a comprehensive risk assessment to determine reasonable response times for identified risk areas in the city, and determined new fire halls locations required to accommodate future growth areas (City of Ottawa 2008). Using ArcGIS Spatial Analyst, variables such as population data and building parcels were used to estimate the risk level in urban and rural areas. Revelle et al. (1970) developed fire response models that did not take into account changes along the road network such as curved roads, one-way streets, or speed limits. In response, Yan et al. (2005) developed a model that could account for road variations in the road network to produce a more comprehensive and accurate analysis. They conducted a network analysis to calculate service area coverage for fire halls in China. Massam (1981) created a linear programming model to find the best location for fire halls to service the maximum amount of demand in the city of North York, Ontario.

Similar models have been developed by Waters (1977) and Halpern (1979). They examined the relationship between average response time, traveling distance, and the number of fire stations that exist within an area.

The fire hall service modelling presented in our literature review demonstrates how fire stations respond to particular areas of the population. As a result, population growth plays an important role in fire hall response time. Building upon Yan et al.'s (2003) model, we include population data and ask how population growth affects the overall service capabilities of fire service in a city. We adopt Mec et al.'s (2006) methodology conducted in Toronto, Canada for our study.

METHODOLOGY

The ArcGIS Network Analyst extension is able to create service areas that show the area of accessibility around individual facilities

where one can travel within a determined time interval. The distance that one can travel in every direction within a period of time constitutes a service area. For network analyses using road networks, parameters such as slope, shape, and topography of a street can influence the time required for a vehicle to arrive to a destination.

In our study, we model various population scenarios by generating fire hall service area based on population density. The road network shapefile for Greater Vancouver containing travel times was obtained from DMTI Spatial. The addresses of fire stations in our study area were obtained from the websites of the respective municipalities and then geolocated. Scenario 1 (see Figure 2) serves as a baseline that does not take into account population density and its impact on traffic congestion and response time.

In Scenario 2 and 3, we have borrowed the same assumption made by Mec et al. (2006) that states: as the population increases the road network will become more congested, which ultimately increases the time it takes to travel along a given road and thus reduces the service area. A reduced service area will exclude people who were originally within four minutes of a fire hall outside of the new service area. Using Statistics Canada population data for 2011 (Scenario 2) and projected population numbers for 2041 according to Metro Vancouver (2010; 2011), we show how population growth will impact current service areas in 2041 (Scenario 3).

For Scenario 2 (see Figure 3), a population density map was created at the census dissemination block-level. We reclassified population density into three classes: low (less than 3,000 people per square kilometer);

medium (3,000 to 20,000 people per square kilometer); and high (more than 20,000 people per square kilometer). Travel times for the road segments were then recalculated and adjusted based on the population density. Density-dependent congestion factors are based on Demographia (2006, 3). Travel times were not changed for areas in the low-density class, but rather based on the default times provided by DMTI Spatial. Travel times were multiplied by 1.25 for areas in the medium-density class, and by 1.5 for areas in the high-density class.

For Scenario 3 (see Figure 4), new travel times were calculated based on the projected population density for 2041. Using the 2011 and 2041 population figures, we calculated the percent change of the population and determined the corresponding new travel times (see Table 1). A percent change in the population of an area (x) in a population will result in the travel times being increased by 1.x (Mec et al. 2006, 13).

$$\text{Population growth rate} = (\text{future population number} - \text{present population number}) / \text{present population number} * 100$$

For example, the population of Burnaby was 223,218 in 2011, and the projected population in 2041 is 345,000. The percent change of Burnaby population from 2011 to 2041 is $(345,000 - 223,218) / 223,218 * 100 = 55\%$. Therefore, the multiplication factor used to determine the new traffic time for Scenario 3 is 1.55.

Once all the three scenarios were completed, we computed the number of people that fell outside of the four-minute response time in

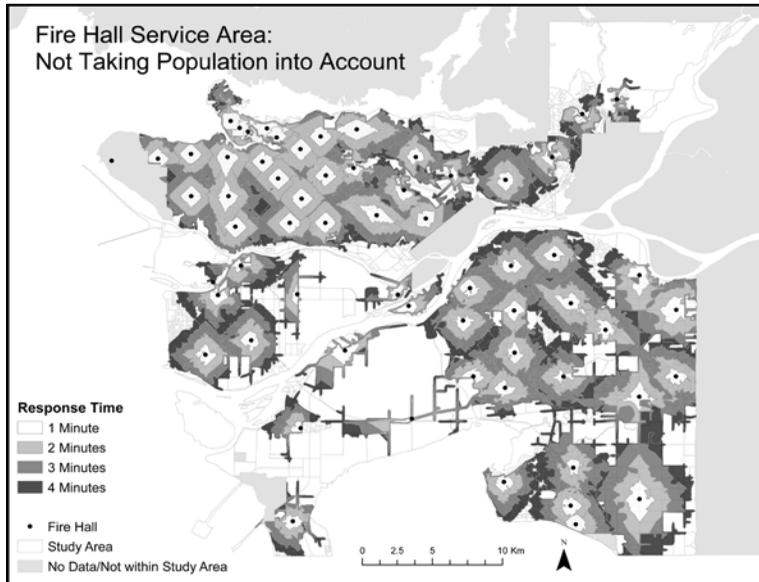


Figure 2. Scenario 1. Fire hall service area using the national standard time of four minutes. This map does not take into account population density.

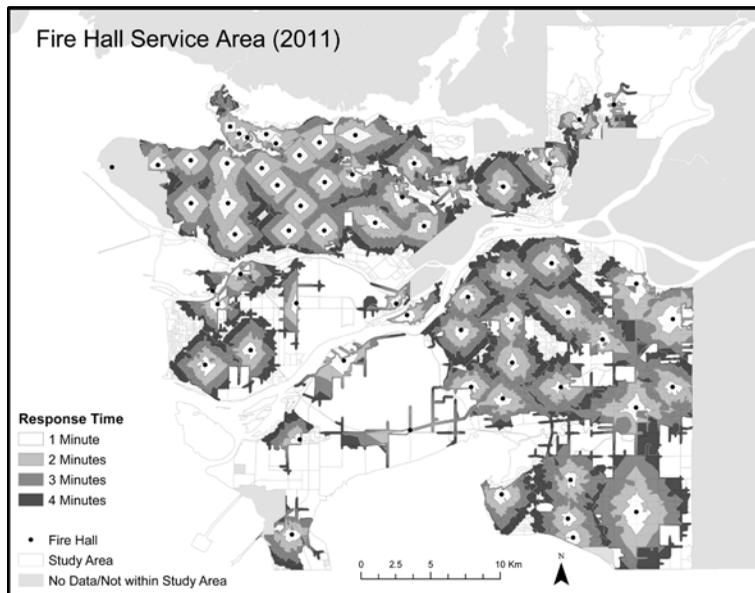


Figure 3. Scenario 2. Fire hall service area map taking into account population density in 2011.

Municipality	Total Population in 2011	Projected Population in 2041	Population Growth Rate (%)	Multiplying Factor
Burnaby	223,218	345,000	55	1.55
Coquitlam	126,456	224,000	77	1.77
Surrey	468,251	740,000	58	1.58
Vancouver	603,502	740,000	23	1.23
Delta	99,863	123,000	23	1.23
Richmond	190,473	275,000	44	1.44
White Rock	19,339	27,000	40	1.40

Table 1. Multiplication factors for calculating travel time in 2041.

Scenario 2 and 3. We were then able to compare the total population and the population density within the four-minute service area to the area outside of the service area.

Our methodology is a simplified approach, and consequently there are some areas of error and uncertainty. Due to the nature of the road shapefile, some roads were displayed with double lines. This produced difficulties in generating the service area for four fire halls in Vancouver (199 Main St, 1090 Haro Street, 895 Hamilton St and 775 Marine Way), one fire hall in Delta (7430 Vantage Way), two fire halls in Coquitlam (775 Mariner Way and 1300 Pinetree Way) and several fire halls in Surrey. As a result, these facilities were relocated to the nearest available intersections in order to generate a service area.

As outlined in our methodology, we reclassified the population densities into low, medium, and high classes to serve as the basis for calculating the travel times of the road network. These classes are arbitrary and loosely based upon Demographia (2006). Changing these class ranges would potentially result in different service areas. Likewise, the multiplication

factors we used when recalculating the travel times are arbitrary, which would ultimately alter the service areas as well.

Our assumption that as population increases by a certain percent, the travel time of the roads will accordingly increase by the same percent is simplified because the percent population increase is an average for the entire municipality. As a result, our methodology for the multiplication factor does not take into account areas of a municipality where the population may increase at higher or lower rates than the average for the entire municipality.

Other limitations of our analysis include the lack of actual traffic data. This data could have enabled a more robust analysis when creating and altering our service areas, especially when considering the major roadways throughout our study area. We also assume that the fire halls will remain where they are, and we do not take into account possible technological advances in fire service equipment. We also assume that fire service demand is homogenous throughout the study area. Despite high-rise or multi-unit dwellings possibly having more demand than single family homes, we assume that all building

types share the same risk. It should be noted that the municipalities that are outside of our study area would have their own fire halls that may be able to reach some of the areas within our study area that are shown to be outside of the four-minute service area.

RESULTS & DISCUSSION

Our analysis reveals how fire hall service areas change due to population growth, ultimately increasing the travel times along the road network. Figure 2 shows the service coverage when population is not considered using the default average travel time for each road segment. Figure 3 by contrast shows the service areas based on 2011 population figures. The difference between these two maps is not significant except in small areas where

the extent of the four-minute service areas is minimally reduced. This is simply due to the low multiplying factors we used.

The most significant difference between the three scenarios can be seen in Scenario 3 where we consider the projected population for 2041. In this scenario, we multiplied the travel times from Scenario 2 by a factor that was equal to the percent change in population for each municipality. In every municipality except Vancouver, which only lost coverage in relatively small areas in the center and the eastern portion of the city, many areas lost coverage. Richmond (25% of population not serviced in 2011 to 78% in 2041), Coquitlam (35% to 73%), Surrey (8% to 44%), and Delta (12% to 61%) in particular lost the most. For Richmond, Coquitlam,

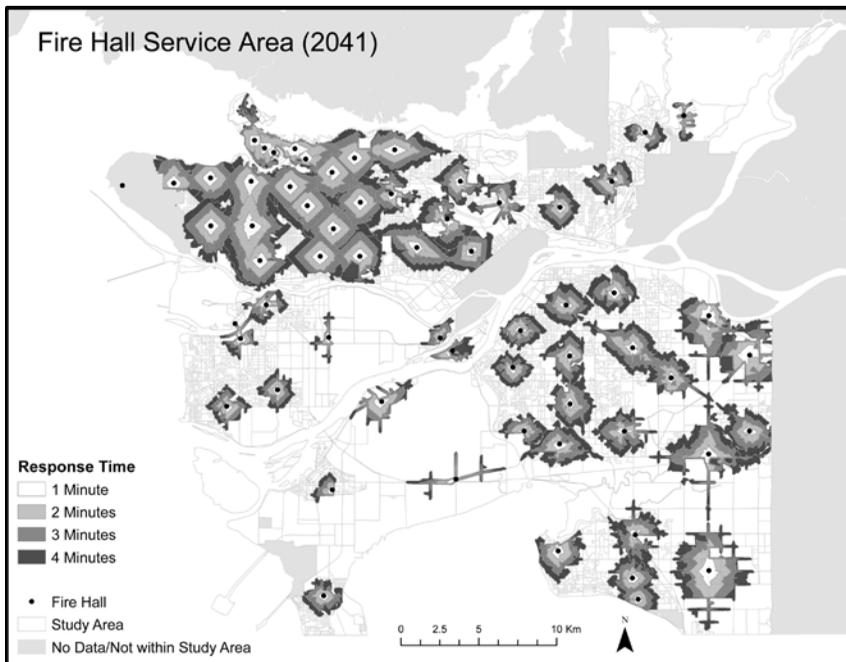


Figure 4. Scenario 3. Fire hall service area map taking into account population density in 2041.

and Surrey, this is as expected because these municipalities are projected to experience the highest population growth by 2041 (44%, 77% and 58% respectively). Similarly, Burnaby will experience a growth in population by 55% by 2041, although the number of people who will be outside the service area will not increase as dramatically as the others (9% in 2011 to 30% in 2041). Delta and White Rock will experience a population increase at lower rates (23% and 40% respectively), but both will lose a considerable amount of area within the service area, particularly Delta (12.0% in 2011 to 60.8% in 2041). A summary of population change and percent change in the number of people covered by the service areas can be seen

in Table 2 and 3 below.

The reason the service areas are significantly reduced in the 2041 population scenario is due to the use of higher multiplication factors. Regarding why Delta loses so much coverage area despite only experiencing a modest population increase of 23%, this could be due to another factor other than the altered travel times of the roads. It may be attributed to its suburban road network design or due to where the current population densities are higher and where the growth will occur. However, deeper analyses of these factors that influence service area change fall beyond the scope of this article.

Figure 5a and 5b show a comparison of fire hall service area and total population in 2011

Municipality	Population Not Served	Total Population	Population Not Served (%)
Burnaby	12,960	223,218	5.81
Coquitlam	43,827	126,456	34.66
Surrey	36,677	468,251	7.83
Vancouver	7077	603,502	1.17
Delta	12,002	99,863	12.02
Richmond	46,646	190,473	24.49
White Rock	814	19,339	4.21

Table 2. Population outside of service area in 2011.

Municipality	Population Not Served	Total Population	Population Not Served (%)
Burnaby	104962	345000	30.42
Coquitlam	162897	224000	72.72
Surrey	328950	740000	44.45
Vancouver	36540	740000	4.94
Delta	74773	123000	60.79
Richmond	211634	275000	77.96
White Rock	5271	27000	19.52

Table 3. Population outside of service area in 2041.

to 2041. Total population increases slightly in central Vancouver, east of Burnaby, the entire Richmond area, and parts of Surrey. By 2041, the fire hall service areas will only cover a small percentage of Richmond and cover only half of Surrey. In both 2011 and 2014, Coquitlam is mainly uncovered. For Figure 6a and 6b, we can see increased population density in these municipalities. Indeed, the service area of Coquitlam is almost fully covered in 2011 but half of the area is not covered in 2041.

Generally, parts of the region that are not covered by the service areas in all three population scenarios are due to the fact that there are no roads leading into those places. These areas are parks and recreational areas, open area or resource and industrial areas, or airports. A large proportion of open and resource area are particularly found in Delta where the service area is clearly confined to the corridors of the few roads that are present there. There is also vast parkland to the north of Coquitlam hence why the extent of the service areas does not reach these areas. Also, the southern and eastern parts of Richmond and small pockets of land in south-central Surrey are farmland areas, so the extent of the service areas will not reach these areas.

As seen in the total population and population density maps (see Figure 5 and 6) for both the 2011 and 2041 scenarios, it is clear that areas – mainly Coquitlam, Richmond, and Surrey – where population increase is projected to be highest will be outside the four-minute response time. By 2041, these three municipalities, along with Delta, will have half of their population living outside of an appropriate fire response area. Vancouver's coverage will only be reduced slightly; this could be due to the number and

strategic location of its fire halls, and its fine-grained road network. While Surrey has a larger number of fire halls, its suburban road network design and the placement of fire hall locations may impede service coverage. Thus, the main difference between Vancouver's and Surrey's coverage is the very high population increase in Surrey and the effect it has on the travel times.

From our analysis, it becomes clear that with population growth, road travel time will increase, slowing emergency response. However, the relationship between response rescue time and maximum area coverage is a complex topic. In a personal interview with the City of Surrey's fire chief, they mentioned that Surrey uses the software package Live Move-Up Module (LiveMUM) by Deccan International to calculate the response time and optimal station coverage for different fire scenarios (Garis 2013). Deccan International, a decision-support software company based in San Francisco, provides comprehensive software solutions for fire and fire service-based emergency medical service (EMS) under different scenarios. Their software offers applications such as a CAD analyst application that is able to support deployment planning based on various input of attributes such as historical time response, distance, topography, and the number of intersections for the roads in a system. The program can calculate and optimize real-time use of resources to arrive at an emergency destination zone from a given starting location. Analysts upload information including incoming calls and firefighters' performance in suppressing fire situations every six months to update the database of the software. In addition, firefighters use pre-emption systems to predetermine the time required for a traffic signal to change to a green light and strategically

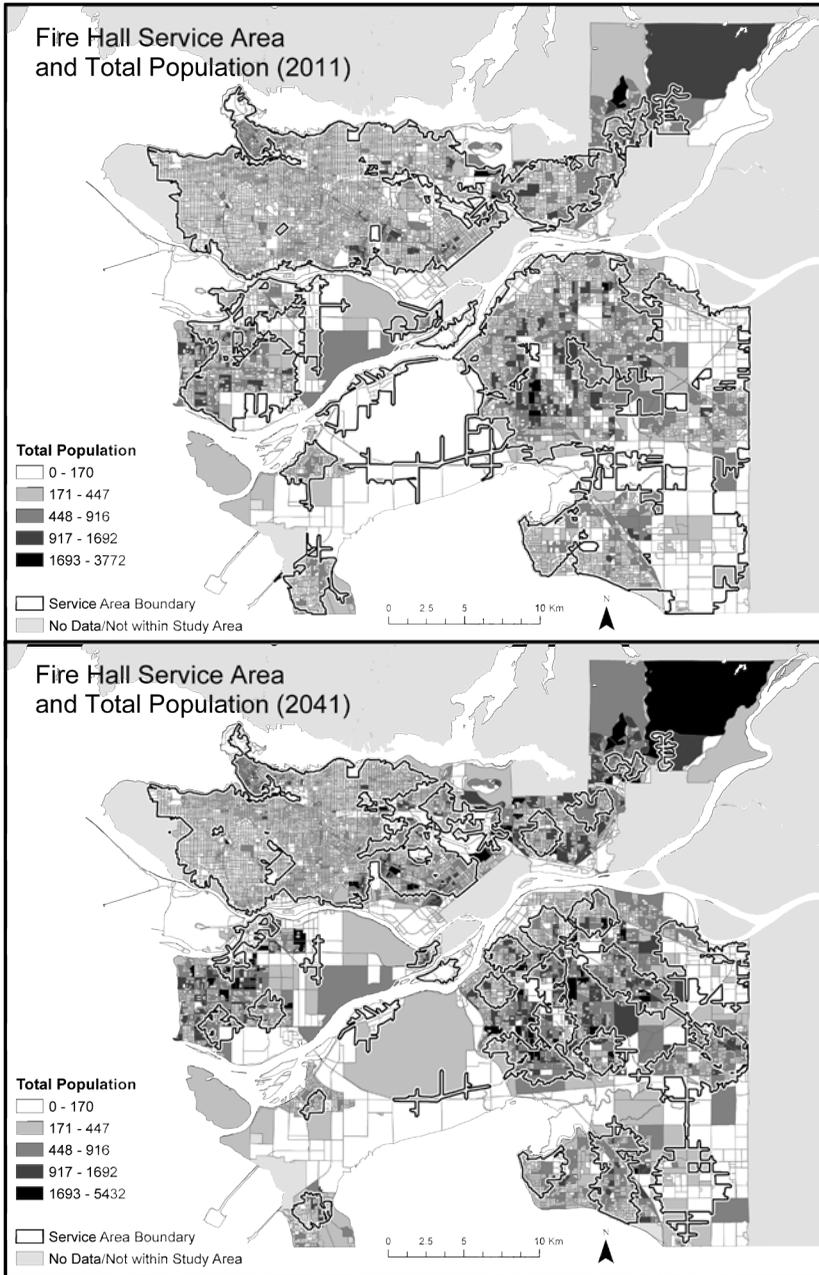


Figure 5. Comparison of fire hall service area and total population in 2011 with 2041. Total population per dissemination block is based on natural breaks classification for population in 2041.

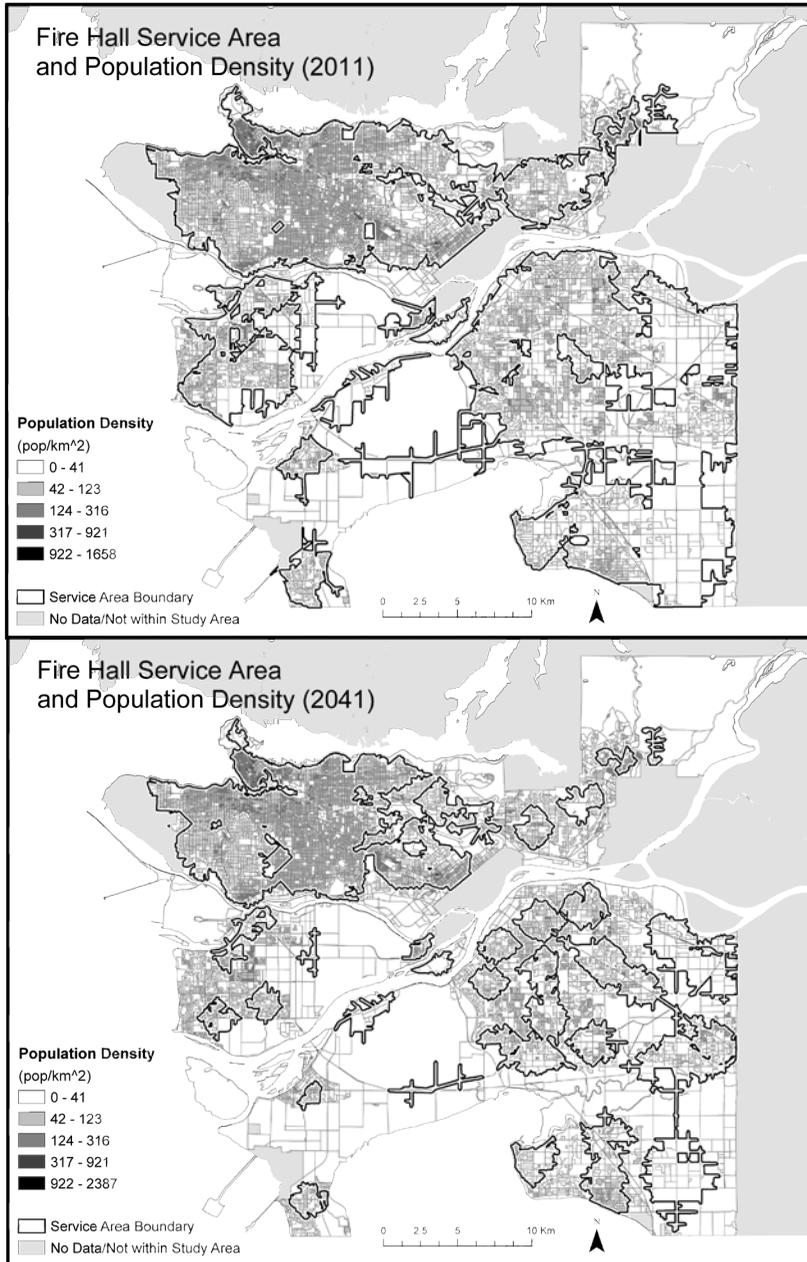


Figure 6. Comparison of fire hall service area and population density in 2011 with 2041. Population density based on natural breaks classification of standardized population density in 2041.

reposition the fire truck in order to design a more appropriate route.

According to the regional transportation strategy, more trips and routes are to be by walking, cycling, and transit by 2040 (TransLink 2008). These various options offer residents flexible ways to commute using non-automobile alternatives, ultimately limiting traffic congestion pressure. However, given our results, it is clear that some municipalities in Greater Vancouver will have to implement long-range service planning to mitigate the inevitable loss of coverage by their fire halls and work to eliminate the risk to people who live in underserved areas.

CONCLUSION

In our analysis we have created one to four-minute fire hall service areas in select municipalities in the Greater Vancouver region. Using Statistics Canada population data and DMTI Spatial road network data, we have shown how fire hall service areas are altered when considering population growth from 2011 to 2041. We have identified areas in the region that will be most affected in terms of fire response coverage due to population increase in the coming decades.

This project could be expanded and improved upon in a few ways. First, further analysis could provide suggestions for locations of new fire halls or potential relocation sites in order to maximize the service area coverage across the study area. Second, a detailed analysis of the road network design in each municipality could be conducted to see if this has an impact on travel times, where looking at current traffic data could also improve the travel time calculations, especially along the major roadways. Lastly,

including the other municipalities in the Greater Vancouver region would create a more comprehensive study of the region.

ACKNOWLEDGMENTS

We would like to thank Alejandro Cervantes for his helpful guidance and lab assistance for this study. We also appreciate our instructor Brian Klinkenberg and warmhearted editor Victor Ngo for their invaluable support throughout the editing process. Lastly, we would like to express our sincere gratitude to Surrey Fire Chief Len Garis for providing additional fire and rescue technology information.

REFERENCES

- City of Ottawa. 2008. Fire station location study - phase 1. Ottawa, Ontario: Community and Protective Services, City of Ottawa. <http://app06.ottawa.ca/calendar/ottawa/citycouncil/occ/2008/10-22/cpsc/02-ACS2008-CPS-OFS-0001.htm>.
- City of Toronto. 2005. Fire services division annual report 2005. Toronto, ON: Toronto Fire Services Division, City of Toronto. http://www.toronto.ca/fire/annual_report/pdf/tfs_2005_annual_report.pdf.
- Demographia. How urban density intensifies traffic congestion. <http://www.demographia.com/db-trafficintense.pdf>.
- Esri. 2007. GIS for fire station locations and response protocol, Esri White Paper. <http://www.esri.com/library/whitepapers/pdfs/gis-for-fire.pdf>.
- Garis, L. 2013. Personal communications. March 7, 2013.
- Halpern, J. 1979. Fire loss reduction: Fire detectors vs. fire stations. *Management Science* 25(11): 1082-1092.

- Massam, B. 1981. The fire-station location problem in North York, Ontario. Toronto, ON: Urban Studies Programme, York University.
- Mec, N., A. Brinklow, S. Chung, E. Kadri, and M. Sturk. 2006. Fire station location analysis: New fire station location study using Network Analyst in Toronto, Ontario. Toronto, ON: Department of Geography, University of Toronto. <http://proj.geog.utoronto.ca/ggr462/yr06-07/Grp03/report.pdf>.
- Metro Vancouver. 2010. Metro Vancouver 2040: Shaping our future. Burnaby, BC: Metro Vancouver. <http://public.metrovancouver.org/planning/development/strategy/RGSDocs/RGSAdoptedbyGVRDBBoardJuly292011.pdf>.
- Metro Vancouver. 2011. Regional growth strategy projections population, housing and employment: 2006-2041. Burnaby, BC: Metro Vancouver. http://public.metrovancouver.org/planning/development/EconomyIndustrialLands/EconomyIndustrialDocs/20110729RegionalGrowthStrategyProjections20062041_TH.pdf.
- Revelle, C., D. Marks, and J. C. Liebman, 1970. An analysis of private and public sector location models. *Management Science* 16(11), 692-707
- TransLink. 2008. Transport 2040. Burnaby, BC: TransLink. http://www.translink.ca/~media/documents/plans_and_projects/transport_2040/transport%202040.ashx.
- Waters, N. M. 1977. *Methodology for servicing the geography of urban fire: an exploration with special reference to London, Ontario*. PhD thesis, University of Western Ontario, Ontario.
- Yan, Y., Qingsheng, G., and Xinming, T. 2005. "Gradual optimization of urban fire station locations based on geographical network model." In *Proceedings of International Symposium on Spatio-temporal Modeling, Spatial Reasoning, Analysis, Data Mining and Data Fusion*, Beijing, 2005.

BUSINESS AS USUAL: NEO-LIBERALISM IN DEVELOPMENT DISCOURSE AND HOW IT HARMS AFRICA

by AARON LAO

Africa has come to be perceived as a continent of poverty and underdevelopment. As a result, it has been the subject of countless development and aid efforts by national governments and NGOs alike. Despite these initiatives, the situation in Africa has not changed substantially. This paper examines the implications of the discourse in the development field, and the prevalence of neo-liberal ideology in this discourse. Neo-liberal discourse can be found in structural adjustment, the policies of NGOs, and even academic writing. In light of this discussion, one must question the outcomes of development policy, and whether it marks Africa's emergence from a cycle of poverty, or if it continues to be business as usual.

Many in the Western world have come to view Africa as the continent of poverty and underdevelopment. As a result of this perception, the continent is “assisted” extensively through foreign aid, NGOs, and international actors in the development field. However, the persistence - and in some cases, worsening - of the problems affecting Africa should compel those concerned with development to re-examine the effectiveness of existing approaches. Discourse plays an important role in shaping the power dynamics that influence development and underdevelopment. As Foucault and others have noted, the images and language employed in development “naturalize and validate certain ideas and power relations” (Mawdsley 2008, 510). As the problems facing Africa persist, it is worth looking at what role discourse in the development field might play in perpetuating Africa’s marginalization.

The implications of development discourse are of concern because they can serve to either resist or support the existing power structures that have marginalized Africa economically. It is thus important to critique the discourses present in the field of development, particularly how it interacts with ideas of neo-liberalism, a dominant paradigm in contemporary international political economy. This paper examines the existing discourses about Africa in development, and how Western ideas of neo-liberalism have become embedded into development policy, whether in the form of structural adjustment, NGOs, or academic writing. In light of this discussion, one must question the outcomes of development policy, and whether it marks Africa’s emergence from a cycle of poverty, or if it continues to be business as usual.

DISCOURSE IN DEVELOPMENT

It is important to begin with an analysis of how Africa is represented in development discourse, as this informs the strategies the West uses in “solving” Africa’s problems. As many scholars have noted, the images of the continent pervasive in the West are generally negative. For example, Africa is generalized as a homogenous continent, one that is timeless, primitive and savage. It is supposedly in a state of perpetual poverty, conflict, disease, and underdevelopment (Mawdsley 2008). Essentially, Africa is a continent that is in despair, and in desperate need of development. Africans themselves are also depicted negatively. They are depicted as poor, sickly, needy, child-like, passive and silent, particularly in advertisements for charities (Kiesel 2006b). These images are pervasive in the West, oftentimes promoted by NGOs, aid organizations, and development groups aiming to raise awareness so as to assist Africa. Although the intent is to effectively raise awareness, these images of destitution contribute to naturalizing Africans as living in a “normal” state of impoverishment (Kiesel 2006b).

On the other hand, White subjects are constructed in contrast to black ones. They are portrayed as active saviors who have the power to lift the black population from poverty. They have the ability to give voice to Africans, change their lives, and save them from the depravity of Africa (Kiesel 2006a; Erickson 2012). The white subject is everything that the black subject is not: modern, as opposed to primitive; heroes, as opposed to victims; developed, as opposed to undeveloped (Manji & O’Coill 2002). To define each race so oppositionally recalls Orientalist discourse, which creates the subjugates and

imposes Western regimes of knowledge upon the Other.

These identities - the white savior and the powerless black victim - are clear in advertisements from NGOs such as World Vision and STAND. A World Vision video features black children asking questions in broken English such as “What is hope?” while white donors answer, expressing how meaningful it is to support World Vision. Similarly, A STAND campaign regarding genocide in Darfur urges Western donors to “Give voice to the voiceless,” because assumedly, the Sudanese are unable to speak for themselves (Erickson 2012). In both these advertisements, black subjects are disempowered, portrayed as children with no concept of hope, or as silent people. White subjects are shown to have the knowledge and ability to fix the black subject, by answering their questions and speaking for them. Further, discourse rarely acknowledges the actions Africans and local organizations are taking to improve conditions at home, thus perpetuating the idea of disempowerment (Richards 2004). Thus, the following narrative emerges: Africans are inferior, despairing and powerless, in contrast with the superior West, which has the knowledge and ability to help them.

The discourses implicated in the idea of development itself must also be interrogated. Such a model constructs the West as “developed,” the desirable end-point that other countries should strive towards. Africa, in contrast, is constructed as whatever the West is not; it suffers from “underdevelopment,” and the solution is simply “development” (Jones 2004). Thus, the idea of development legitimizes ethnocentric, Western conceptions of society,

and suggests that Africa must be made more like the West. Africa has no opportunity to “define its own ideal” (Matthews & Solomon 2003). The rhetoric is paternalistic and neo-colonial; instead of civilizing Africa to be like the civilized West, the goal is now to develop Africa to be like the developed West. As with colonialism, the message is that the West has “a role to play in Africa,” that intervention in Africa is justified to assist the continent in its development (Matthews & Solomon 2003, 7). Thus, the earlier narrative is extended: the West not only has the role of saving Africa, but also bringing Africa closer to the Western ideal of development.

Examining what development discourse does not mention is of equal importance; development discourse tends to ignore Western complicity in African impoverishment, from the imperial exploitation of resources to the support of non-democratic regimes (Shivji 35). White faces are generally omitted from depictions of depraved Africa in charity advertisements, or shown separately, suggesting a complete disconnect between Africa’s problems and citizens in the West - except for the donor-recipient relationship (Kiesel 25). The fact that Africans are naturalized as poor also veils Western complicity in creating underdevelopment; Africa is simply just always in poverty. This discourse can be seen in key policy documents. For example, the 1981 World Bank Berg Report on Sub-Saharan Africa blamed Africa’s internal policies and mismanagement for problems, ignoring external factors such as colonialism and predatory extractive resource industries (Owusu 2003). The 2005 report by the Blair Commission for Africa repeated the same omission, suggesting that little has changed over 24 years (Shivji 2006). As a consequence

of veiled Western complicity, key issues such as unfair trade policies by Western countries have remained unaddressed.

Taken as a whole, the series of discourses within development set the stage for neo-liberal intervention in Africa. Africans are naturalized as passive and poverty-stricken, requiring the help of the empowered, Western savior. Western complicity in Africa’s impoverishment and problems in the Western system are ignored. The West is constructed as representing the ideal - “developed” status - and as having the solutions. As a result, the West finds it imperative to intervene in Africa so as to develop the continent toward the Western ideal. This Western ideal that is imposed upon Africa by the discourse of development turns out to be neo-liberalism, an ideology which has become instilled in the field of development.

INSTILLING NEO-LIBERALISM IN DEVELOPMENT

The success of the Western world is often attributed to capitalism and neo-liberalism; the West is developed because of its industry, effective macroeconomic policy, and integration into the global economy (Moore 2000). This neo-liberal capital has been constructed to be “irreproachable and unchallengeable yet also... free and natural” (Moore 2000). The historical context is also significant. The resurgence in NGOs and aid initiatives in the 1980s coincided with “the emergence of ‘neo-liberalism’ as the dominant political-economic ideology in the West, epitomized by the rise to power of Margaret Thatcher...and Ronald Reagan” (Manji & O’Coill 2002, 577). Promoting neo-liberalism was especially urgent as “an expanding communist ideology...threatened to obstruct the continued growth” of Western capitalism

(Manji & O’Coill 2002, 575). Development thus became linked directly to economic growth; the resulting trickle-down effect would raise living standards for the broader population (Manji & O’Coill 2002). Neo-liberalism thereby becomes embedded in development discourse as the ideal model that developing countries should aspire to adopt.

A pervasive adherence to a hegemonic neo-liberal ideology is repeatedly made evident in development policies produced by international actors. Paul Collier, former director at the World Bank, suggests in *The Bottom Billion* that solutions include appropriate interventions in Africa and encouraging free trade. Jeffrey Sachs, Special Advisor to the United Nations on the Millennium Development Goals, recommends development aid to help African nations enter the global market economy. Two White Papers on Ending World Poverty released by the UK government in 1997 and 2000 had a similar emphasis on free trade, economic growth, private industry and opening the African economy (Slater & Bell 2002). The goal of “making markets work for the poor” reveals an underlying belief that development ultimately must come through neo-liberalism (Slater & Bell 2002, 353). Two 1993 reports from the World Bank on health care, “World Development Report: Investing in Health” and “Better Health in Africa”, both recommended a neo-liberal healthcare framework, even though most developed countries had no such system (Owon 1996).

Perhaps the most significant example of neo-liberal development policy is the series of Structural Adjustment Policies imposed by the International Financial Institutions in the wake of the 1970s’ “debt crisis” experience

by many Africa governments. The 1981 World Bank report on “Accelerated Development for Africa” outlined the organization’s neo-liberal priorities. The solution for Africa was trade liberalization, a downsizing of the state, and massive spending cuts (Shivji 2006). The World Bank required that developing countries needing loans make these changes. As a result, many developing countries were subjected to structural adjustment as well.

In all these policies, the problems facing Africa are all identified as internal: adverse environments, disease, conflict, and bad governance (Slater & Bell 2002). Consistent with the discursive patterns identified above, Western complicity in creating Africa’s challenges are ignored. Collier, Sachs, the White Papers, the World Bank, the International Monetary Fund, and the Blair Commission for Africa all disregard the negative effects of colonialism, extractive primary industry, structural adjustment, protectionism by developed countries, unfavorable terms of trade, etc. (Owusu 2003; Shivji 2006; Slater & Bell 2002). Furthermore, African voices critiquing neo-liberal policies are ignored. Instead, whenever neo-liberalism fails, international development groups claim that “it is better management [of the neo-liberal policies] that is required”. (Jones 2004, 394). For example, in the case of the Asian Tigers, the White Papers ignore the key role a strong state played in directing economic growth, as they does not conform with neo-liberal notions of the state not interfering in the economy (Slater & Bell 2002). As a result, neo-liberal policies are the generally the only solutions considered for Africa’s economic difficulties.

The discourses and narratives discussed earlier re-emerge in these development policies.

Due to the fact that the West is framed as the ideal, always with the right answer, the Western ideology of neo-liberalism is seen as the natural and inevitable path toward development. Additionally, criticisms of this neo-liberal system and Western complicity in creating poverty are ignored, as the West is constructed as the savior of the African people. Furthermore, problems facing Africa are attributed internally, to Africans themselves. This conforms with the idea that Africa is inherently impoverished, un-modern, and chaotic; the problem thus lies not with neo-liberalism itself, but with Africans' inability to properly implement and manage their countries. Once again, African voices were also silenced. The Organization of African Unity released two policy reports - the "Lagos Action Plan" in 1981 and the "Africa Priority Program for Economic Recovery" in 1985 - which identified external factors for African poverty and suggested an alternative "regional approach based primarily on collective self-reliance" (Owusu 2003, 5). However, these suggestions were ignored in favour of neo-liberal policies.

The rise of NGOs also contributes to the hegemonic focus on neo-liberalism in development. The rapid growth of NGOs in Africa is partly the result of discourse. They are the means by which the white subject is able to exercise their capacity to save Africa; NGOs are discourse made concrete (Manji & O'Coill 2002). These NGOs have a growing role in providing social welfare in African nations in place of the state; they provide healthcare, education, food, and more (Kamat 2004; Manji & O'Coill 2002). Neo-liberal structural adjustments such as down-sizing the state and reducing social services are able to occur, because the harms that result are minimized

by the services provided by NGOs (Manji & O'Coill 2002). Essentially, NGOs serve as a palliative that allows African states to undergo neo-liberal adjustment with less backlash. Of course, this is not an ideal solution, as NGOs are Western-run and non-democratic, and the African state becomes dependent on yet another external institution (Kamat 2004). Overall, there is a clear neo-liberal ideology running through development policy as a result of discourse within the field. The consequence is the perpetuation of a political economic system which marginalizes the African continent.

BUSINESS AS USUAL

Whose interests, ultimately, do these discourses and the resulting neo-liberal policies serve? The West has experienced continued growth over the last forty years, while African nations have remained stagnant, and in some cases, become worse. The West has benefitted from development policy in several ways. Firstly, structural adjustment and trade liberalization has eliminated subsidies for agriculture and protections for infant industries in Africa, while similar trade policies have remained in place in the West. This gives Western actors an advantage when trading with Africa (Shivji 2006). The project of neo-liberalization and integrating Africa into the global economy "is predicated on private capital, which in Africa translates into foreign private capital, as the 'engine of growth,'" so as to pay for industrialization, infrastructure, commercial agriculture and construction (Shivji 2006, 35; Storey 2000). The West is in a position to export capital, which benefits Western interests, as private commercial lenders can dispose of surplus deposits and Western manufacturers can develop new markets to which to export their

goods (Storey 2000). Structural adjustment also released resources for debt repayment, increasing the flows of money from Africa to the West (Storey 2000). Furthermore, due to the fact that neo-liberalism is a Western system of ideas, African countries become dependent on the West for their expertise. Western advisors are flown into African countries to serve in government, and are paid disproportionately high wages. This was the case in 1985, when “foreign experts resident in Equatorial Guinea were paid an amount three times the total government wage bill of the public sector” (Shivji 2006, 34).

Africa, meanwhile, has suffered as a result of neo-liberal policies. Countries that implemented structural adjustment saw de-industrialization and declines in a vast range of social indicators: “education, medical care, health, nutrition, rates of literacy and life expectancy” (Shivji 2006, 34). The cuts in social programs like education and healthcare are thought to have long-term generational impacts for the populations of these countries. Additionally, the forced elimination of tariffs and subsidies has negatively affected African countries. They are unable to protect their infant industries as China and India have been doing for their agricultural sectors, and governments have also lost a key form of revenue (Bond 2006).

Ultimately, what development discourse does is reinforce existing power dynamics. The problems which keep Africa underdeveloped extend beyond its internal national borders. Protectionism by developed countries, negative terms of trade, commodity price collapse, high interest rates, high debt servicing, currency fluctuations, dependency on extractive industries, colonialism, structural adjustment, agricultural

subsidies by the EU and USA, and restrictive intellectual property rights all play significant roles in creating Africa’s impoverishment (Mawdsley 2008; Owusu 2003). They are part of the current global neo-liberal system, and put African countries at a disadvantage from the onset. However, development discourse draws the focus away from these broader structural problems, thus removing any impetus for broad, structural change. Instead, the blame for underdevelopment is placed on the shoulders of Africans, who are naturalized as incapable and destitute. Discourse produced in the West will ultimately support and benefit Western interests. In the field of development, Western ideas are validated and privileged, the most important of which is that of neo-liberalism. Because the West is constructed as infallible and ideal in development discourse, neo-liberalism remains free from critique. As a result, the meaningful, transformational change that is required for Africa to succeed in the global economy - or merely enter on a level playing field - remains elusive.

REFERENCES

- Bond, P. 2006. *Looting Africa: The Economics of Exploitation*. London: Zed Books.
- Erickson, C. 2012. “Selling Poverty.” University of British Columbia. Seminar.
- Griffiths, I. and J.A. Binns. 1988. Hunger, help and hypocrisy: crisis and response to crises in Africa. *Geography* 73(1): 48-54.
- Jones, P. 2004. When ‘Development’ Devastates: Donor Discourses, Access to HIV/AIDS Treatment in Africa and Rethinking the Landscape of Development. *Third World Quarterly* 25(2): 385-404.

- Kamat, S. 2004. The privatization of public: theorizing NCO discourse in the neoliberal era. *Review of International Political Economy* 11(1): 155-176.
- Kiesel, T. 2006. Representation of Black people in Charity advertisements in Germany. Institute for Anthropology, University of London. Essay.
- Kiesel, T. 2006. White Charity: Whiteness and myth in German charity advertisements. Cultural Studies, University of London. Masters Thesis.
- Manji, F. and C. O'Coill. 2002. The Missionary Position: NGOs and Development in Africa. *International Affairs* 78(3): 567-583.
- Matthews, S. and H. Solomon. 2003. The necessity of a challenge to western discourses by the African renaissance. *Acta Academia* 35(2):148-168.
- Mawdsley, E. 2008. "Fu Manchu versus Dr Livingstone in the Dark Continent? Representing China, Africa and the West in British broadsheet newspapers. *Political Geography* 27(1): 509-529.
- Moore, D. 2000. Levelling the Playing Fields & Embedding Illusions: 'Post-Conflict' Discourse & Neo-Liberal 'Development' in War-Torn Africa. *Review of African Political Economy* 27(83): 11-28.
- Nkiwane, T. 2001. Africa and International Relations: Regional Lessons for a Global Discourse. *International Political Science Review* 22(3): 279-290.
- Owoh, K. 1996. Fragmenting Health Care: The World Bank Prescription for Africa. *Alternatives: Global, Local, Political* 21(2): 211-235.
- Owusu, F. 2003. Pragmatism and the gradual shift from dependency to neoliberalism: the World Bank, African leaders and development policy in Africa. *World Development* 31(10): 1655-1672.
- Power, M. 2003. Re-Imagining Postcolonial Africa. A commentary of Michael Watts' 'Development and Governmentality.' *Singapore Journal of Tropical Geography* 24(1): 49-60.
- Richards, R. 2004. An Analysis of the Representation of the Third World in British Charity Advertisements. *ANZCA04 Conference*. Sydney.
- Shivji, I. 2006. The Silences in the NGO Discourse: The role and future of NGOs in Africa. *Africa Development* 31(4): 22-51.
- Slater, D. and M. Bell. 2002. Aid and the Geopolitics of the Post-Colonial: Critical Reflections on New Labour's Overseas Development Strategy. *Development and Change* 33(2): 335-360.
- Storey, A. 2000. "The World Bank, neo-liberalism, and power: Discourse analysis and implications for campaigners." *Development in Practice* 10(3): 361-370.

POWER, DISCOURSE AND BIOFUELS: THE POLITICS OF SUSTAINABILITY, LAND USE AND ENERGY CONSUMPTION

by STEFAN RAUPACH

Biofuels development is often presented as a mitigation measure against climate change, yet its broader challenges and implications are often left unquestioned. This paper questions the motivation behind and effects of 'ecological modernization' through biofuels, as well as their use as a development strategy in the Global South. One should not just assume that all Global North intervention in the Global South is beneficial. If we do so, we risk perpetuating historical tropes that position the Global South as 'backwards' or 'uncivilized.' The scope of this paper remains mostly in the theoretical realm of sustainability and ecological modernization discourse but also uses a case study of Tanzania to illuminate some of the concrete effects of this discourse. Finally, it examines the discourses of biofuel consumption to draw out key differences between producer and consumer countries. The paper concludes that discourse, representation, and energy production and consumption are all intimately connected. Biofuels operate within a complex discourse that often has negative effects, and because of this, its development and consumption need to incorporate a greater understanding of local conditions.

National and international political bodies, as well as the general public, are becoming increasingly concerned about global climate change and energy security (Matondi et al. 2011). Many actors seek to address this concern through mitigation measures, including reducing carbon emissions through alternative energy sources and lifestyles. These interests have even been embedded into policy and political frameworks, such as the Kyoto protocol (Schreuder & Yda 2009). Discussions and policies about these issues often involve the notion of 'sustainable' alternative solutions, and biofuels supposedly fit within this. I am considering biofuels here in a very broad sense, and in doing so, I am ignoring the differences between first, second and third generations. Already integrated in the energy policies of Canada, the US, Australia,

Denmark, Finland, and many others, under the international energy agency of OECD countries, (Sims & Taylor 2008) global biofuels demand is expected to increase rapidly over the next 20 years (Mitchell 2010).

Biofuel development in Africa is situated within the discourses of ecological modernization and 'sustainable development,' in which it is claimed that biofuels will bring "agricultural development, technological progress, poverty reduction and social and economic justice" (Matondi et al. 2011). This discursive apparatus and the intensifying interest in biofuels more broadly raise fundamental questions. What exactly does sustainability mean and who controls its definition? Which groups of people benefit from sustainability, ecological

modernization and capital investment? How do biofuels fit within this framework and how is power exerted to both represent the African continent and control its land use policies? In this paper, I will address these questions by analyzing the geopolitics of the discourses, ideologies and representations that surround sustainability and biofuel development in Africa. I argue that an ideologically motivated discourse justifies this development and works to hide complexities and ambiguities of local processes, although ‘elite’ discourse and local processes are not necessarily separate entities. In doing so, it operates to simplify in order to allow and legitimize investment in Africa. Furthermore, through its operation, it maintains exploitative power relations between the Global North and Global South, while avoiding any major structural adjustments to the global capitalist system or value changes among consumers (Matondi et al. 2011). Biofuel and ‘sustainability’ discourses allow the public to support biofuels generally, without knowing the full implications of their production in specific regions. I will examine these issues first by exploring the discourses of ‘sustainability’ and ecological modernization. Then by applying these ideas to geopolitical representations of the African continent as an object of aid, and briefly discuss a case study of biofuel investment in Tanzania. Finally, I will look at the ways in which discourses and power dynamics influence biofuel consumption patterns.

DECONSTRUCTING SUSTAINABILITY

Given that ideas about sustainability are so pervasive in current society, it seems useful to unpack exactly what they mean. Sustainability is a highly ambiguous term and many different attempts have been made to define it. Most of

which contain some notion of maintaining both human and environmental systems and drawing meaningful connections between the two. Sustainability contains three distinct spheres: economic, social and environmental (Gregory & Johnston 2012). However, it is unclear which sphere should be prioritized and how the three should interact. A popular way to interpret the interaction between spheres is the philosophy of ‘sustainable development’. Sustainable development first began to become prominent in the academic and political lexicon with the UN Bruntland report of 1987. Here, sustainable development was defined as, “development that meets the needs of the present without compromising the ability of future generations to meet their own needs.”²¹ This logic assumes that economic growth and ecological problems can be reconciled (Matondi et al. 2011). Yet, it seems difficult and contradictory to sustain everything without making trade-offs and compromises (Gregory & Johnston 2012). Additionally, what exactly is it that constitutes a ‘need?’ Is the goal to promote economic growth and capital investment so that economic structures are sustained? Whose ecological environment, social systems and economy are being sustained? Because no priority is explicitly stated, ‘sustainable development’ and ecological modernization projects are able to use this ambiguity to prioritize the economic sphere, as can be seen in the context of Africa.

GEOPOLITICAL REPRESENTATIONS OF THE AFRICAN CONTINENT: ARABLE LAND AND ENERGY SECURITY

The ideological apparatus that operates behind biofuel development in the Global South is particularly evident in geopolitical representations of Africa. This apparatus works

in several ways. Firstly, political bodies, such as the International Energy Agency, argue that because of the global scope of greenhouse gas emissions and oil dependence, it is logical to examine these problems from an international perspective (Matondi et al. 2011). This rhetoric of a global problem justifies international interaction, trade and investment with nations in the Global South, where biofuels can be produced more cheaply (ibid). Secondly, this interaction is normalized through a return to Rostow's philosophy of stages of economic growth. Rostow argues that all countries can follow a series of key stages in a uni-linear path to economic prosperity (Rostow 1960). By extension, ecological modernization, and 'sustainable development' fit within this framework. Development projects of 'sustainable' products like biofuels can be seen as an important stage in the evolution of industrial transformation for developing nations in the Global South (Christoff 2009).

In this sense, Africa is portrayed as 'backwards' and needing to 'catch up' (Matondi et al. 2011). Furthermore, the World Bank uses economic rationale of 'yield gap' to justify agri-investments. The 'yield gap' occurs when "the amount that actual yields, on either irrigated or rainfed areas, fall short of potential production" (Deininger & Byerlee 2011). In Africa, it is argued that there is a high 'yield gap,' as there is a massive surplus of land suitable for cultivation. However, it's claimed that only a fraction of the land's potential is produced because it is owned by smallholders (ibid). In this context, World Bank logic argues that underutilized land can be more productive and profitable by using the "private sector to contribute technology, capital, and skills to increase productivity and output in the short to medium term" (Ibid).

Consequently, the solution is proposed through the discourse of the rational, advanced and technologically sophisticated Global North providing its 'expertise' to Africa in order to bring it into the next stage of development (Matondi et al. 2011). Additionally, there is a belief that ecological and environmental issues can be controlled from a distance, and scientifically monitored and mitigated on global scales. However, mapping and planning through satellite imagery is indicative of the ways in which this process is detached from local social context (ibid). Finally, with the rationale of top-down scientifically controlled development as a foundation, the Global North is able to legitimize itself as the savior of Africa through 'sustainable' economic interaction. It is able to justify foreign capital investment, and imposed control over land use policies in the name of 'sustainable development' and mitigation of climate change.

This control, legitimated by discourse and geopolitical representations, has concrete and often damaging effects on local African populations. Furthermore, it works within the broader frameworks of neoliberal capitalist forces, as well as the hegemony imposed over Africa by Global North nation-states and transnational corporations. The fact that it is impossible for the Global North to devote enough land to first generation biofuels without sacrificing food production or increasing food prices has lead it to consider Africa as a major focus for biofuel production (ibid). This is because the projected biofuel production growth to 2030 will require 35 million hectares of land, if current trends remain unchanged. In addition, this will demand 5.4% of arable land in the US and Canada, and 11.6% in the European Union.ⁱⁱ Domestic food prices are

another concern for countries in the Global North, as land used to cultivate fuel instead of food will increase prices (Clarke & Bettendorf 2008). In this way, actors and companies involved with food production have an interest in outsourcing fuel production so as to maintain status quo land uses and economic conditions in the Global North. In addition, the low costs of land and labour in Africa provide even further incentive for investment (Matondi et al. 2011). Ecological modernization through ‘sustainable’ biofuel development is presented as a win-win situation in which the Global North will gain biofuels for consumption, and African countries will gain “rural development, job creation and cash incomes for small-scale farmers,” as well as “spillover effects in terms of infrastructure, rural electricity, schools, clinics, and side-businesses from plantations and processing plants” (ibid). Africa does have ecological, economic and social problems and there is no doubt that improvements could be made. However, one should first consider what Africa is already doing in this regard and attempt to find ways for countries to make improvements from within, using local knowledge and conditions. One needs to question which groups are ultimately benefiting from investment in these countries and what is really being sustained. In this way, ‘sustainable development’ can be seen as a way for social and ecologically damaging effects to be outsourced and externalized. Additionally, it misses key nuances and complexities of local context, as is demonstrated by SEKAB’s investment in Tanzania.

CASE STUDY: BIOFUELS IN TANZANIA

SEKAB is a Swedish based biotechnology company that planned biofuel projects in Tanzania with the goal of creating ethanol

for the local market and exporting the surplus to Europe (Mitchell 2010). The projects were initiated 2005 and planned to cover approximately 200,000 hectares over 15-20 years (ibid). The large-scale nature of the projects failed to take into account local political, economic and cultural aspects of Tanzania, and this worked to aggravate issues of poverty, food and energy security, and negative economic growth in a number of ways. First, SEKAB made the decision to produce jatropha, despite its unproven productivity and poorly studied environmental impacts.ⁱⁱⁱ Second, in an area that was already food insecure due to the arid landscape’s vulnerability to water shortages and climatic changes, using the arable land for large-scale biofuel production was problematic for food availability (ibid). Third, SEKAB’s planning did not adequately consider local conditions and assumed ecological modernization and profit would occur simply by virtue of investment. For instance, even with a surplus production of cash crops such as biofuels, farmers are forced to sell their crops to middleman and must often choose between food, medicine, education or clothing (ibid). Finally, although there is potential for Tanzanians to consume their own biofuel, the vast majority will likely end up being exported to Europe and other foreign markets. This is because both domestic automobiles and the rural electricity grid are not compatible with biofuels (ibid). In this way, Tanzanians have no real control over their own livelihood or land use, as they are constrained by poverty, power relations and corporate investment. This leaves one to question what exactly is attempting to be sustained. The Tanzanian case is suggestive of the difficulty reconciling economic, social and environmental notions of sustainability. Furthermore, it is indicative that complexities

of local conditions are often not sufficiently worked into planning and policy of biofuel development.

DISCOURSES OF BIOFUEL CONSUMPTION

Energy consumption discourse operates through producers attempting to convey a notion of being environmentally sustainable or ‘green,’ while their products function in abstraction to the consumer. In this context, biofuel consumption is portrayed as an important aspect of sustainability, and a solution to climate change that is both logical and necessary. For instance, “most countries refer to the use of biofuels as a key strategy in their efforts to mitigate climate change” (Matondi et al. 2011). However, production and consumption of biofuels must increase significantly in order for this mitigation to be effective (ibid). Within this framework, as is seen by the case of Tanzania, there is a differential of power between the Global North and South. Biofuel production in the Global South is planned for consumption in the Global North (ibid). The fact that the EU and the US are quickly becoming large biofuel importers, under pressure from broad and expanding environmental values, reinforces this point (Mitchell 2010).

Because, economic motivations are a prime focus for viability of these projects there is a large incentive to market and advertise biofuels in order to make them profitable in the capitalist market. Furthermore, companies see the potential to associate their brand with ‘green’ initiatives, as environmental issues are increasingly thought of as a serious problem. Market research has shown that consumers now prefer buying ‘green’ products over ‘non-green’ products, especially if the prices

are similar (Lippert 2011). In this sense, the discourse of ‘green’ has become hegemonic. However, a changing social understanding and definition of consumption does not mean that all products portrayed as ‘green’ are completely environmental and socially friendly, or cease to be connected to harmful processes. Yet, certain companies are attempting to perpetuate the hegemonic understanding by engaging in a process is called greenwashing, which occurs when a company represents itself as more environmentally friendly than it really is (ibid). For example, there are approximately 5 million flex-fuel vehicles in the US, which can be fueled by 85% ethanol fuel blend.^{iv} While these cars do produce less fossil fuel emissions and are attractive to consumers, positioning them all as ‘green’ is somewhat misleading. Complex processes that occur beyond simply the scale of the vehicle are being ignored in the consumer consciousness. At the most basic level, many flex-fuel vehicles are being filled with gasoline because the public is not adequately educated on proper usage.^v On a more complex level, environmental damage is created by the large amounts of energy needed to produce both biofuels and vehicles, as well as to transport them to markets. This is especially true if the biofuels have to be transported from Africa. Furthermore, buying a flex-fuel vehicle just to appear ‘green’ as a consumer, or buying one and still driving frequently still attaches a person to broader ecological and economic processes of production, transportation and disposal. But ‘green’ and ‘sustainable’ discourses allow a removal from this fact, and make corporate land acquisitions, forest conversion and contested technologies more publicly accepted (Matondi et al. 2011)

In this way, notions of ‘green’ and

‘sustainable’ products occupy a liminal space in the consumer system, as they are paradoxically connected to both ideas of environmentalism and ecologically damaging material ambition (Benton-Short & Short 1999). Despite all of this, biofuels are legitimized and justified through environmental modernization’s belief in technological salvation from environmental problems and the discourse of ‘sustainable development.’ They operate within the context of the attempt to achieve ‘sustainability’ without any major changes to consumer values or power relations (Matondi et al. 2011). Biofuels, then, ‘save’ the atmosphere in one area through the reduction of greenhouse gases, while simultaneously degrading the ecological and social systems in another. As has been demonstrated in this paper, the location of these events is highly related to structural power and the uneven relationship between the Global North and South.

CONCLUSIONS: EXAMINING AND SITUATING DISCOURSE

Both biofuel production in Africa and biofuel consumption in the Global North serve as examples of the ways in which discourse and geopolitical representations justify political and economic processes, and maintain a structural power framework and a consumption ideology. It should be noted that my analysis has involved generalizations and simplifications of complex processes over large geographical areas, and much more that I have outlined is likely going on at local, national, and international scales. Also, while important issues, I did not delve into the nuances of different types of biofuels, smallholder biofuel farming, or the contributions of domestic processes of ethanol production in the Global North. Finally, I am not claiming

that biofuels should cease to be researched and developed, or that African countries don’t have the potential to benefit from this development. Rather, that these issues need to be carefully examined and properly situated in both their local and wider contexts in a way that is sensitive to economic processes, governance, discourse, representation and consumption.

ACKNOWLEDGMENTS

I would like to thank Philippe Le Billion, Ashley van der Pouw Kraan, Andrew Longhurst and Brittany Jang, for their valuable comments and editing, which have allowed this essay to be what it is today.

NOTES

ⁱ Our Common Future, Chapter 2: Towards Sustainable Development - A/42/427 Annex, Chapter 2 - UN Documents: Gathering a Body of Global Agreements.” UN-documents.net. 1987. Web. 10 Nov. 2012.

ⁱⁱ *Climate Change, Biofuels and Land*. Rep. Food and Agriculture Organization of the United Nations, n.d. Web. Feb. 2013. <ftp://ftp.fao.org/nr/HLCinfo/Land-Infosheet-En.pdf>. Table on p. 2

ⁱⁱⁱ *Jatropha: Wonder Crop?* Rep. Friends of the Earth, May 2009. Web. Nov. 2012.

^{iv} *Freedom Fuels: Renewable Fuels from a Global Perspective*. Dir. Martin O’Brien. Vimeo.com. Mofilms, 2007. Web. Nov. 2012.

^v *ibid*.

REFERENCES

- Benton-Short, L., and J.R. Short. 1999. "Selling the Environment or Selling Out?" *Environmental Discourse and Practice*. Oxford: Blackwell. 196-207.
- Christoff, P. 2009. "Ecological Modernisation, Ecological Modernities." Ed. P. Stephens, A. Dobson, and J. Barry. *Contemporary Environmental Politics*. UK: Routledge. 179-201.
- Clarke, R., and J. Bettendorf. 2008. "Biofuels." Organisation for Economic Cooperation and Development. *The OECD Observer* 267: 49-50.
- Deininger, K., and D. Byerlee. 2011. *Rising Global Interest in Farmland*. Rep. The World Bank.
- Food and Agriculture Organization of the United Nations, n.d. *Climate Change, Biofuels and Land*. <ftp://ftp.fao.org/nr/HLCinfo/Land-Infosheet-En.pdf>. Table on p. 2
- Friends of the Earth. 2009. *Jatropha: Wonder Crop?*
- Gregory, D., and R. Johnston. 2009. "Sustainability." *Dictionary of Human Geography*. 5th ed. Hoboken, NJ, USA: Wiley-Blackwell. 737-39.
- Habib-Mintz, N. 2010. "Biofuel Investment in Tanzania: Omissions in Implementation." *Energy Policy* 38(8): 3985-997.
- Lippert, I. 2011. "Greenwashing." *Green Culture: An A-to-Z Guide*. Ed. K. Wehr. Thousand Oaks, CA: SAGE Publications, Inc. 421-30.
- M. O'Brien. 2007. *Freedom Fuels: Renewable Fuels from a Global Perspective*. Mofilms.
- Matondi, P., Bvumiranayi, K. Havnevik, and B. Atakilte, eds. 2011. *Biofuels, Land Grabbing and Food Security in Africa*. London: Zed.
- Mitchell, D. 2010 *Biofuels in Africa: Opportunities, Prospects, and Challenges*. Herdon, VA, USA: World Bank.
- Rostow, W. W. 1960. *The Stages of Economic Growth, a Non-Communist Manifesto*. Cambridge: University,
- Schreuder, Y. 2009. *The Corporate Greenhouse: Climate Change Policy in a Globalizing World*. London: Zed.
- Sims, R., and M. Taylor. 2008. *From 1st to 2nd Generation Biofuels*. Rep. International Energy Agency/OECD.
- United Nations. 1987. "Our Common Future, Chapter 2: Towards Sustainable Development - A/42/427 Annex, Chapter 2 - UN Documents: Gathering a Body of Global Agreements." *UN-documents.net*.

RESOURCE MANAGEMENT IN JASPER NATIONAL PARK: SPATIAL ANALYSIS OF POTENTIAL PRESCRIBED BURN AREAS BASED ON TWO SPECIES AT RISK

by SARAH L. RAVENSBERGEN

Jasper National Park is located in the Rocky Mountains of Alberta, Canada, close to the British Columbia border. Due to the growing concern of rapidly disappearing places of 'wilderness', the area is coming to be seen as a refuge for species that are facing increased threats outside the park, in particular habitat loss and fragmentation. Two examples of such species include the Southern Mountain Woodland Caribou population, and the Whitebark Pine tree, which are listed under the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). However, the conservation management plans of these two species potentially conflict. Fires in the park are increasingly viewed as a crucial part of the Whitebark Pine's recovery strategy. Meanwhile, park management has also recognized the direct and indirect negative effects of fire on the already stressed caribou populations and habitat. Future management plans for the park and for species at risk will ultimately depend on the value that park managers and visitors attach to different species. The objectives of this study are: (1) to examine the spatial distribution and overlap between Whitebark Pine and Woodland Caribou in the park, and (2) to identify potential areas to be designated as prescribed burn areas for increased Whitebark Pine regeneration which would not negatively impact caribou populations. In order to carry out my analysis I used Arc Map 10.1 to perform a Multi-Criteria Evaluation (MCE) to identify these areas. While the results indicate much spatial overlap between the habitat of these two species, small areas totalling approximately 44 877ha (greater than 4km away) and 30 633ha (greater than 14km away), from caribou habitat, were identified as possible burn areas. The results highlight that although in practice an extremely difficult task, managing for multiple and potentially conflicting values within the park is possible.

INTRODUCTION

Objectives and background

The objectives of this study are to examine the spatial distribution and overlap between two species at risk in Jasper National Park: Whitebark Pine (*Pinus albicaulis*) and Woodland Caribou (*Rangifer tarandus caribou*). Furthermore, this study will attempt to identify

potential prescribed burn areas defined as the "controlled application of fire to a specific land area to accomplish planned resource management objectives" (Ministry of Forests 2008). These prescribed burn areas would positively contribute to the regeneration of Whitebark Pine while not negatively impacting Woodland Caribou habitat. Under COSEWIC, the Whitebark Pine is listed as endangered,

while Woodland Caribou included in the Southern Mountain population are listed as threatened (Government of Canada 2009). The two species can be found in sub-alpine and alpine areas within the park. Whitebark Pine grows on high elevation exposed ridges and slopes (Wilson and Stuart-Smith 2002), while the three Southern Caribou herds within the park (Maligne, Tonquin and Brazeau) migrate between alpine and sub-alpine areas depending on the season. The fourth herd, the Northern A la Pêche group, migrates between Jasper National Park and Willmore Wilderness Park (Parks Canada 2011a). While fire and other natural disturbances play an important role in maintaining healthy Whitebark Pine populations it is widely recognized that, in the short term, fire within and near caribou habitat can have a range of negative impacts on the animal (Robinson et al. 2010b).

THE ROLE OF 'NATURAL' AND PRESCRIBED FIRE

Fire suppression during the last century has had multiple effects on the park's landscape and ecology, including a shift to more even-aged composition of forest vegetation (Shepherd et al. 2007). More recently, Parks Canada has recognized the important role that natural disturbances, such as fire, play in the long-term health of forests. As a result, Jasper National Park now aims to "achieve annual burning of an area that would eventually emulate 50% of the ... average long-term fire cycle" (Shepherd et al. 2007, 130). Other objectives are fulfilled when these aims are reached, including the restoration of ecological integrity, controlling mountain pine beetle outbreaks, and reducing risk of catastrophic fire events within and near the park (Robinson et al. 2010b)

WHITEBARK PINE AND FIRE

Whitebark Pine is increasingly recognized as a keystone species in high elevation forests. However, it is in decline throughout its range largely due to the effects of fire suppression, mountain pine beetle outbreaks, and White Pine blister rust (Parks Canada 2012). Prescribed burning is increasingly advocated as a management tool for the species since fire plays an important role in tree regeneration and overall health of the population (Gould 2011). As a pioneer species establishing first after a disturbance, Whitebark Pine benefits from small and large scale disturbances, such as fires, that create canopy gaps. As succession takes place and other vegetation grows in, Whitebark Pine can be out-competed by other species that grow well in its shade. Thus, fire suppression has been seen as one of the main factors contributing to the Pine's decline. Further, the species has co-evolved with the Clark's Nutcracker bird which has a unique seed dispersal method that benefits from fire. The regeneration of the trees relies on the birds opening the cones and stashing the seeds in suitable areas. Furthermore, approximately half the seeds are forgotten by the birds and these seeds ultimately form the basis of Whitebark Pine regeneration (Wilson and Stuart-Smith 2002). The Clark's Nutcracker has been found to prefer to stash seeds in open spaces with rich exposed mineral soil, such as those created by fire (Parks Canada 2012; Wilson and Stuart-Smith 2002). The knowledge of the process of Whitebark Pine regeneration contributes to the current approach used for the species' management. The argument that "a prescribed burn program... must be an integral part of Parks Canada's Whitebark Pine ecosystem conservation strategy" (Wilson

and Stuart-Smith 2002, 19) is actively shaping policies for Whitebark Pine management.

WOODLAND CARIBOU AND FIRE

Woodland Caribou are threatened by altered predator-prey dynamics, increased predator access, human disturbance, habitat loss, and small population threats within the park (Parks Canada 2011a). Caribou are a unique species that have generally been found to prefer older forested habitat, with stand ages ranging from 75 – 150, and 225 - 300 years at higher elevations with gentle slopes. Caribou are specialists, and this selection of habitat largely reflects their main source of food (lichens), which is a slow growing species most abundant in older forest (Shepherd et al. 2007). For these reasons, fires within caribou habitats have been found to be detrimental to the health of the species' both directly by destroying their main source of food, and indirectly by increasing the overlap between caribou and wolves (Robinson et al. 2010a). In the past, fires within caribou habitats would not have had such profound consequences for the population, as they could relocate to another area. However, resource extraction and other threats contributing to habitat loss and fragmentation threaten the species livelihood outside the park. Therefore, relocation to avoid prescribed burn areas is an unlikely possibility for caribou today (personal correspondence with Layla Neufeld). However, there are some positive potential consequences of prescribed burning for caribou: burning small areas and reducing ladder fuel decreases the likelihood that a 'naturally set' high severity fire could wipe out larger portions of caribou habitat (personal correspondence, Layla Neufeld). Furthermore, there is evidence that fire increases the suitability of the forest for lichen cover in the long term;

however, the habitat would be unsuitable by caribou for at least 75 years (Shepherd et al. 2007). Given the decline in caribou population and the number and magnitude of threats already faced, waiting 75 years for suitable habitat is not an ideal situation. The current Parks Canada conservation strategy reflects these conclusions by stating that, fire should be used only "in areas away from caribou habitat to maintain a safe distance between caribou and their predators" (Parks Canada 2011a). However, the Park also acknowledges that prescribed burns could be used "to guard against large fires within caribou habitat" (Parks Canada 2011a).

METHODS

Multi-Criteria Evaluation (MCE) analysis was used to identify the best potential areas for prescribed burns, using Esri ArcGIS. MCE's are a useful tool to address management issues that must consider multiple and potentially conflicting criteria and values. They generally involve the following five steps:

Determining important criteria

In identifying the best suitable sites for prescribed burn areas I considered sites in relation to three criteria which include proximity to: caribou habitat, known existing Whitebark Pine plots and water (major lakes and rivers). Due to the overlapping nature of Whitebark Pine and caribou habitat, water was included as a natural fire break; it was important to take natural breaks into account when considering areas that are most suitable to burn in a continuous landscape. Furthermore, development such as Jasper town-site, roads and ski areas were not included in this first MCE layer because Whitebark Pine exists at fairly high elevations and is unlikely to overlap

with areas of high development.

Creating and normalizing layers to a common scale

First, caribou habitat was represented by a layer showing kernel density representation of year-round caribou distribution. Second, due to the lack of accurate spatial data on the distribution of Whitebark Pine throughout the park, two data sources were merged to ensure a more accurate representation of where Whitebark Pine currently exists. The first dataset used contains information on where Whitebark Pine is predicted to exist based on specific biophysical site attributes. The second dataset used existing research and monitoring coordinate locations of Whitebark Pine within the park. Four plots were missing Universal Transverse Mercator coordinates and their coordinates were estimated using descriptions of their location and Google Earth. Using two datasets ensured that the Whitebark Pine ELC areas identified as potential places to burn in later steps were closer to existing seed sources. Moreover, the proximity to existing seed sources is important as recent literature suggests that Clark's Nutcracker are more likely to cache seeds in burned areas close to their home range (United States Department of Agriculture 2011). Third, and finally, the water layer (including only larger lakes and rivers) was created from a vector land cover feature class.

For each layer, a separate Euclidean distance representation was created at a 10m raster resolution. This surface covered the entire park and categorized areas as having high or low values depending on whether they were near or far from the criteria. For instance, the caribou Euclidean distance representation categorized areas within and close to caribou habitats with

low values, and areas farther from the habitat with high values. I then normalized the layers to a common scale from 0 to 1 so they could be overlaid and compared using the Fuzzy Membership spatial analysis tool of linear type.

Determining weights for each layer

To determine weights for each layer I used an online demonstration from Make It Rational's Collaborative Decision Making tool (Make It Rational 2012). Using a weighting process wherein every criterion is compared to every other criterion—in order to determine how much weight each layer should be given—I weighted caribou habitat at 77.02%, proximity to existing plots at 16.18%, and proximity to water at 6.8%. As I was most interested in identifying potential burn areas outside of caribou habitat, I weighted the caribou layer most heavily.

Conducting an overlay using MCE algorithms

I conducted a linear weighted overlay using ArcMap's Weighted Sum tool, with the output at 10m raster resolution. The final weighted MCE map ranks all ELC areas predicted to contain Whitebark Pine based on the criteria previously identified: proximity to caribou habitat, proximity to known existing Whitebark Pine plots, and proximity to water as a natural break. A hill-shaded digital elevation model (DEM) was used as a background to show generally where the plots were located in the park, and the estimated elevation. Each research and monitoring plot is symbolized based on the project type (blister rust monitoring site, cone caging site, PhD research site, or incidental field observation).

Performing a sensitivity analysis

A sensitivity analysis is important in any

MCE, as it shows the effect that different weighting schemes have on the results. In reality, determining weights for each layer can be a controversial step, as the weights assigned depend on what is valued most. In this case, I performed a sensitivity analysis using the same input layers with equal weights.

RESULTS AND DISCUSSION

Using a MCE process, I identified approximately 44,877ha (greater than 4km away) and 30,633ha (greater than 14km away) from caribou habitat for potential prescribed burn areas. Caribou have been found to “strongly [avoid] areas between 10km and 18km from burn boundaries depending on the season” (Robinson et al. 2010a, vii). However, the buffer distances of 4km and 14km have recently been identified by researchers as significant. Robinson et al. recommend that fire within 4km of caribou habitat be closely evaluated (2010a). The distance beyond which fire has few direct effects (although indirect habitat loss through increased interaction between wolves and caribou can still occur (Robinson et al. 2010a) has been recognized as 14km.

All Whitebark Pine ELC areas are symbolized from lightest to darkest where light is least fitting the MCE criteria, and dark is best fitting the MCE criteria. Whitebark Pine plots inside or within 1km of the Whitebark Pine ELC areas have been symbolized. All Whitebark Pine ELC areas have been included on the map whether or not they have demonstrated Whitebark Pine presence in reality. This decision was made for two reasons: first, it is extremely likely that there are Whitebark Pine stands within the park that have not been identified, and therefore many of these areas have the potential to contain Whitebark stands, and second, and

most importantly, park management indicates an interest in burning small areas of potential Whitebark Pine habitat in order to increase the regeneration and habitat area. Therefore, these Whitebark Pine ELC areas may potentially be suitable habitat and good potential burn areas whether or not they contain Whitebark Pine at this time.

Areas with known Whitebark Pine are symbolized as the best areas to burn; however, this may not be desirable in all cases. For instance, the resilience of the Whitebark Pine population may be increased if some plot locations with healthy, mature trees are left as seed stock (such as cone caging sites, and other areas where the trees have demonstrated higher resilience to threats such as blister rust). Further, it may be unwise and undesirable to burn sites that are used as long-term monitoring stations or for active research.

The areas within the park identified by the MCE as the most suitable place for a prescribed burned was the central-eastern part of the park, as seen in the inset map of Figure 1. These areas have the highest values, because they are far from caribou habitat and near water which can be viewed as a natural break. In particular, the areas closest to the incidental field observation plots show high MCE values and therefore would be good potential places to burn; in fact, some of the identified areas are located in areas which have been recently prescribed burned, such as the 2003 Syncline Ridge burn. Furthermore, it may be more acceptable from the perspective of park users to burn in this region because of the lower density of publicly advertised trail systems, with the exception of the eastern section of the North Boundary trail.

Nonetheless, a discussion of possible sources

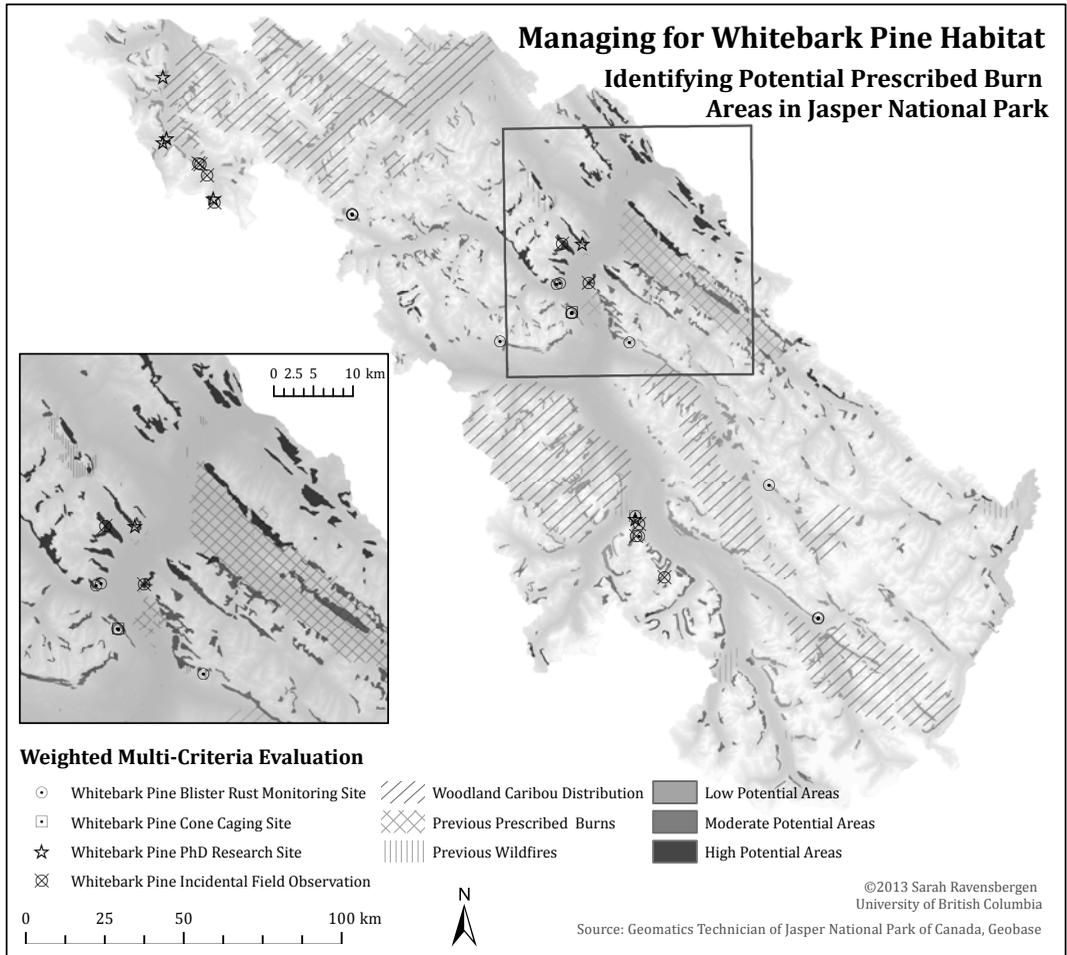


Figure 1. Weighted MCE results.

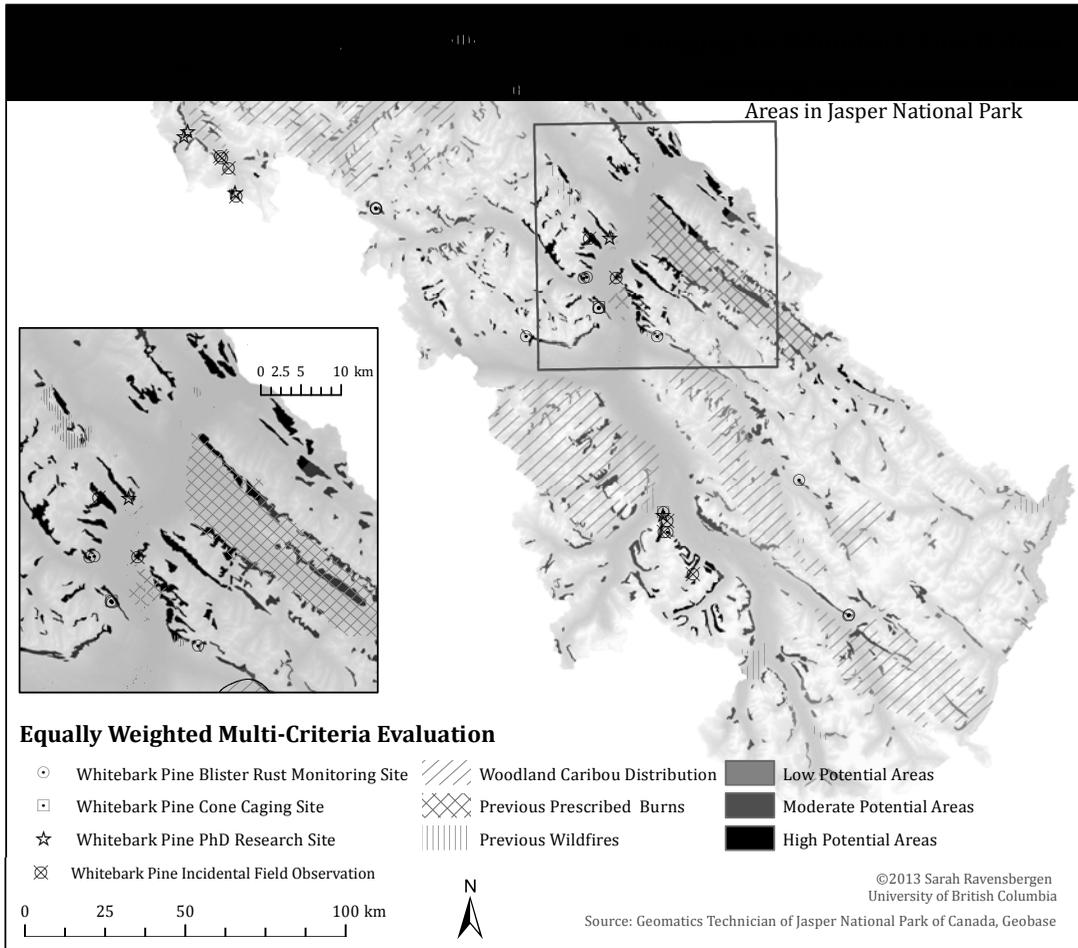


Figure 2. Equally weighted MCE results (sensitivity analysis).

of error is important in any analysis, and the largest and most obvious source of error in this research is in the datasets containing information about the current distribution of Whitebark Pine. While the ELC feature class is useful for predicting the presence of Whitebark Pine based on general landscape characteristics (Wilson and Stuart-Smith 2002), the information is not up to date (current as of 1982) and may not accurately represent today's distribution of the species (Befus 2012). I attempted to account for the inaccuracies within current data sets by assigning more weight to areas closer to known existing plots. However, the plot data I had access to was recorded as points, not areas, which also adds to the inaccuracy of predicting the presence of the species, and the extent of a stand in a given location. Further, the plot data does not represent all Whitebark Pine stands within the park, but only those stands that park managers, scientists, residents and visitors have identified.

The equally weighted MCE (see Figure 2) shows that there are many Whitebark Pine ELC areas within caribou habitat that fit other criteria used in the analysis (whether or not they are close to water and existing Whitebark Pine plots). This is especially the case in the northwest corner of the park. However, the North Boundary trail is also located in this area and it may be undesirable to burn near existing infrastructure, as the scenery of the 'wilderness' is so highly valued in that area.

CONCLUSION

Given the lack of accurate data on the present distribution of Whitebark Pine (until very recently) and the possibility of error in some of the data sets used, the results of this research will be most useful to park managers if overlaid

with more accurate distribution maps currently being produced (Befus 2012). The variability in health, age and abundance of trees within stands of Whitebark Pine also necessitates the careful examination of each potential prescribed burn in as much detail as possible. Overall, these results indicate that there is a large amount of overlap between the habitats of these two species. Management objectives may still need to make trade-offs between fire management objectives and caribou restoration efforts; however, there is a significant amount of area that can be prescribed burned without directly negatively impacting caribou populations.

ACKNOWLEDGEMENTS

A huge thank you to Dave Smith, Heather Daw, Layla Neufeld, Brenda Shepherd, and Paul Langevin of Jasper National Park for providing data and support; to Lori Daniels from the Faculty of Forestry at UBC for her invaluable insights; and to Alejandro Cervantes-larios, Jose Aparicio and Brian Klinkenberg of the UBC Geography Department for GIS assistance and support.

REFERENCES

- Befus, Andrew. n.d. "Characterizing Whitebark and limber pine habitat in Alberta: Mapping highly localized tree species across a large study area." Paper presented at *Spatial Knowledge and Information – Canada*, March 4, 2011, in Quebec. http://rose.geog.mcgill.ca/ski/system/files/fm/2011/ABBEFUS_SKI_ABSTRACT_FINAL.pdf
- Gould, Joyce. "Conservation of endangered five needled pine in Alberta parks: Parks division, Alberta tourism, parks and recreation." Presented at *BC Protected Areas Research Forum*, Vancouver, British Columbia,

- December 7, 2011. http://www.unbc.ca/assets/bc_protected_area_research_forum/joyce_gould_wbp.pdf
- Government of Canada. 2009. "COSEWIC wildlife species search." http://www.cosewic.gc.ca/eng/sct1/index_e.cfm
- Make it Rational. 2012. "Decision making software." <http://makeitrational.com/demo>.
- British Columbia Ministry of Forests, Lands and Natural Resource Operations. 2008. "Prescribed fire." <http://bcwildfire.ca/prevention/PrescribedFire/>
- Parks Canada. 2011a. "Conservation strategy for southern mountain caribou in Canada's national parks." <http://www.pc.gc.ca/eng/pn-np/mtn/caribou/index.aspx>
- Parks Canada. 2011b. "Woodland caribou in Jasper national park." <http://www.pc.gc.ca/eng/pn-np/ab/jasper/natcul/natcul4.aspx>
- Parks Canada. 2012. "Whitebark pine." <http://www.pc.gc.ca/eng/pn-np/mtn/feuveg-fireveg/veg-veg/pin-pine.aspx>
- Robinson, Hugh S., Mark Hebblewhite, Nicholas J. DeCesare, Jessie Whittington, Layla Neufeld, Mark Bradley, Marco Musiani. "The effect of fire on spatial separation between wolves and caribou." *Rangifer*, 20, no. 1 (2010a): 277-294. <http://septentrio.uit.no/index.php/rangifer/article/view/2276/2117>
- Robinson, Hugh S., Mark Hebblewhite, Nicholas J. DeCesare, Wibke Peters, Marco Musiani, Byron Weckworth, Allan McDevitt. "Modeling relationships between fire, caribou, wolves, elk and moose to aid recovery of threatened Southern Mountain Woodland Caribou in the Canadian Rocky Mountain national parks." *Report for Parks Canada*, 2010b. <http://www.cfc.umt.edu/heblab/PDFS/Parks%20Caribou%20Fire%20Report%20Final%20Sept%202010%20Revised%20Version%20Small.pdf>
- Shepherd, Landon, Fiona Schmiegelow, Ellen Macdonald. "Managing fire for woodland caribou in Jasper and Banff national parks." *Rangifer*, 17, no. 1 (2007): 129-140. <http://septentrio.uit.no/index.php/rangifer/article/view/326>
- United States Department of Agriculture Forest Service, Pacific Northwest Region. 2011. "There's no place like home: Clark's nutcracker home ranges and Whitebark pine regeneration." <http://ecoshare.info/wp-content/uploads/2012/01/Clarks-nutcracker-sheet-4-homerange.pdf>
- Wilson, Brendan C., G. Jon Stuart-Smith. "Whitebark pine conservation for the Canadian Rocky Mountain national parks." *Report for Parks Canada* (2002). <http://www.whitebarkfound.org/publications/ParksCaWBP%20Conservation%20Plan%2002-11.pdf>

Appendix A. Metadata

Name of Data Layer	Organization	Source	Uses	Entity Type	Data Model
Caribou Year-round Kernel Density	Ecosystem Geomatics Technician, Jasper National Park	Unknown	Input to MCE	Areas	Vector
Whitebark Pine Ecological Land Classification Feature Class (including Whitebark Pine ELC eco-sites)	Ecosystem Geomatics Technician, Jasper National Park (Ecological [Biophysical] Land Classification of Banff and Jasper National Parks, 1982)	Unknown	Joined with research and monitoring locations of Whitebark Pine, input to MCE	Areas	Vector
Research and monitoring locations of Whitebark Pine: health transect locations and stand locations	Park Ecologist, Jasper National Park	Geo-referenced from Excel spreadsheet coordinates and Google Earth	Joined with Whitebark Pine ELC eco-sites, input to MCE	Points	Vector
Water (major lakes and rivers)	Geobase (Land Cover, Circa 2000)	Unknown	Input to MCE	Areas	Vector
Fire Perimeters	Ecosystem Geomatics Technician, Jasper National Park	Unknown	Included in final maps for reference	Areas	Vector
Elevation	Ecosystem Geomatics Technician, Jasper National Park (Geobase Canadian Digital Elevation Data)	Unknown	Included in final maps for reference	DEM	Surface

CLIMATE INDUCED SEA LEVEL RISE: AN INVESTIGATION OF ADAPTATION STRATEGIES AND EROSION MITIGATION IN COASTAL REGIONS

by EVA Y. M. TONG

Coastal cities are at increasing risk of coastal flooding due to encroaching shorelines while ongoing research speculates an unprecedented increase in recent years. In response, this article begins to look at methods distinct from traditional approaches of technological and engineered defensive infrastructure. Through the use of case studies, we look at the implementation of innovative approaches to flood defence and mitigation. By separating case studies into three categories—(1) Floatable Development, (2) Floodable Development, and (3) Living Shorelines—we evaluate each on the basis of costs, benefits and disadvantages. While the research is limited to strategies which are structural in origin, this research found a specific need to seek methods that accommodate the changes of sea level rise as opposed to protective strategies. Besides being more cost efficient and having low impact, we find that accommodation provides longer term solutions. Although managed retreat seems to be the logical response, often the displacement of populations becomes an issue technically, socially, politically and economically, thus strategic retreat may prove to be a better option. However, the most economical option would be climate-wise development planning that limit and prevent new developments in areas at risk. Mixed/integrated strategies are also considered a valuable option, especially in situations where development already exists.

INTRODUCTION

Through the twentieth century, there has been a growing concern regarding human induced climate change. As the global climate continues to change as a result of increasing amounts of carbon dioxide in the atmosphere, the world struggles to understand and address its implications. At a more local level, municipalities may be impacted by increased pressures to integrate and adapt, but are held back due to obstacles such as broad adaptation policies that lack specific guidance.

In recent studies, while an increase in sea level rise is expected, research suggests an unprecedented increase in the rate of sea level rise from the years 1993-2009 with a mean rate of 3.3 ± 0.4 mm/year (Nicholls & Cazenave 2010). This could lead to further implications, as current recommendations for planning and design in British Columbia only project a 1 meter increase by the year 2100 (Ministry of Environment (MOE) 2011), thus highlighting the growing vulnerabilities of coastal and delta regions. While human development impacts reduce the resilience of delta plains, this further

exacerbates the effects of sea level rise. In addition, as sea levels continue to rise, traditional methods of technological and engineered defensive structures will become increasingly expensive and difficult to maintain (City of Port Coquitlam 2010). It is for these reasons that we seek other methods of adaptation and mitigation.

The purpose of this article is to investigate innovative approaches to flood defence and erosion mitigation through the use of case studies to address the rising sea level in coastal British Columbia. By looking at methods of adaptation separate from technological and human engineered structures, we find a potential for low impact, cost effective strategies.

While this study may not set definitive guidance for coastal mitigation and adaptation to BC, by careful evaluation of three distinct case studies, I will conclude with recommendations of adaptation and erosion mitigation strategies.

METHOD

To separate the sea level rise adaptation strategies we looked at the case studies individually to fit the categories: (1) Floatable development includes structures not with fixated heights, but instead heights are varied in the onset of floodwater; (2) Floodable development is determined by its capacity of holding or storing water temporarily; and (3) Living shorelines being structures designed to use living organisms to reduce shoreline erosion.

Many technological and structurally engineered strategies were eliminated due to both cost and purpose. While the case studies we looked at are adaptation strategies, their purpose included multi-functional options,

whereas engineered structures - such as dykes, barriers and levees - are built for the sole purpose of withstanding rising sea levels.

FLOATABLE DEVELOPMENT

Floatable development seems to be the direction of the future as it allows continued urbanization in flood prone areas, without the consequences of sea level rise. This adaptive coastal development works with the water, allowing structures to float on the surface, making it invulnerable in times of flooding and changing tides. Often addressed as Aquatecture (Pasternack 2009), or amphibious housing (English 2009), such housing is often anchored to the ground, shore or sea floor. While some projects have been based in New Orleans after the disaster of Hurricane Katrina (Fenuta 2010), others have gained international status, such as the LIFT housing based in Bangladesh (Prosun 2011).

Already prone to flooding, the delta city of Dhaka, Bangladesh is burdened with draining large amounts of water and heavy monsoon seasons, in addition to immense pressure of rapid urbanization and migration that further aggravate environmental degradation. Thus, Prosun (2011) suggests Low Income Flood-proof Technology House (LIFT housing) as a solution, built on buoyant foundations that float in the onset of a flood. In an effort to eliminate the rebuilding process and provide housing with basic amenities, LIFT housing would not only be affordable for the urban poor using indigenous materials and local skills, but would also be considered as a low impact solution. Drawing on examples of Noah's Arc Project, the Maasbommel Project, and the Buoyant Foundation Project, the space is designed to hold eight families. The service spine of the

shared area will act as a vertical guide to the amphibious buoyant housing which is achieved by two methods. Firstly, by a hollow ferrocement foundation, and secondly by a bamboo frame foundation filled with recapped water bottles. While this design is innovative and provides solution to both urban poor and flood prone housing, the implementation is its weakness. To find architects, developers and engineers with the knowledge to create such buildings in a low income area may prove to be near impossible. However, with the proper resources, workers, and funding this development will prove to be a key example for future urban planning, urban development and housing in coastal areas. Advantages of floating development include their ability to accommodate the uncertainty of high tides and flooding events, and increases resilience to flooding events. In the case of LIFT housing, not only does it allow for low-income multifamily housing, but it reduces the time, energy and cost spent towards rebuilding a home. However, the practicality of the project being implemented in the developed world also has limitations, including a higher standard of living. Buoyant foundations in the developed world must account for sewage, gas and electric needs. Make it Right FLOAT housing in New Orleans accounts for some of these variables by implementing self sealing “breakaway” connections that disconnect utility lines when the house begins to rise (English 2009).

Unfortunately, buoyant foundation housing, or LIFT housing specifically, has its limitations as coastal infrastructure like its vulnerability to withstand multiple factors of wind and wave action (Prosun 2011). In adaptations of buoyant foundation in developed countries, limitations also include a predetermined maximum height, thus the inability to accommodate

unprecedented changes if sea level rise. Finally, not much is known of the long term consequences of floatable developments, especially with its interactions with salt water and high density cities. Speculations in the future of floatable housing are undetermined and we may still find that a secondary type of mitigation is necessary in adapting to sea level rise.

FLOODABLE DEVELOPMENT

Floodable developments are structures that are designed to withstand flooding or to retain storm water. The Staten Island Blue Belt Project for example, is an effort to protect an area of New York City’s natural resource and to reduce the risks of flooding from storm water (The Staten Island Bluebelt 2007). The project was initiated to: provide and construct storm water detention ponds; enhance and create streams, ponds and wetlands; as well as to separate storm and sewer infrastructure. By temporarily storing floodwaters, wetlands protect downstream property owners from flood damage, but also control storm water discharges, preventing flood prone areas. Thus, creating retention areas for ocean surges or heavy rainfall, where water can be contracted and stored as an example of “Low Impact Development.”

In an attempt to create multi-use urban infrastructure that accommodate storm waters in a high-density setting, parks and underground parkades have been speculated by the Dutch (Aerts et al. 2009). In densely populated urban areas, space for open water storage is limited, as are spaces for multifunctional use as the global trends continue to change. One adaptation proposed in the Netherlands is to use public spaces such as playgrounds or sealed parts of underground parking lots to temporarily store

excess water to reduce flooding in flood prone areas. In Rotterdam, for example, a water plaza can store water in times of peak events, but is used as a playground under normal conditions. Secondly, sealed garage reservoirs can act similarly in the case of extreme events and are large enough to store 50% of the expected volume of water that falls in one storm in central city of Rotterdam (Aerts et al. 2009).

Floodable development could be effective in small scale low impact situations and while experimental, have the potential to work better in urban environments than in agricultural or rural areas. Storm water retention infrastructure and ponds, however, pose a magnitude of hazardous effects. These hazards include pollution of heavy metals and organic chemicals, sediment build up and bacteria, which become a huge threat to any population without proper treatment to the water in storage areas. As a result, besides outreach management to include these hazards, there is the need for emergency communication tools to prevent misuse or entrapment in flooding zones.

LIVING SHORELINES

Wetlands are a natural feature of our shoreline, and have the ability to absorb floods, slow erosion and provide habitat. Since the 1800s, wetlands within San Francisco were diked and filled for development. Through an analysis of the economical impact, it was found that without the wetlands, there was an increase in urban runoff and higher impact stemming from high tides and storm surges. With the collaboration of federal, state and regional funding, the South Bay Salt Pond Wetlands Restoration Project began (Bay Area Council Economic Institute 2011). Furthermore, certain organism populations along the coast

- such as oysters - provide a breakwater effect that prevents erosion and degradation of shorelines. Interestingly, the Florida Oyster Reef Restoration Program, as a secondary affect of protecting the oyster habitat, will stabilize an estimated 1500 meters of eroding shoreline, threatened by rising sea levels and storm surges (Gregg 2010).

In a study by Scyphers et al. (2011), an experiment was devised to examine the ecological effects of constructing sub tidal breakwater oyster reefs for coastal and estuarine shoreline protection. It was found that along the shores with no oyster reef barriers was a 40% higher shoreline retreat compared to the one mitigated with oyster reef breakwaters. By providing quantifiable results, the study strongly demonstrated the ability for these biogenic structures to reduce water velocities and to increase sedimentation rates by enhancing propagule settlement and retention.

Unfortunately, living shorelines pose the greatest accumulation of cost. While initially projects will not take much funding, they require space and time to work. In addition, continued management, monitoring and time makes these projects financially draining. Since the beginning of the South Bay Salt Pond Restoration Project in 2003, a status report filed by the project itself totalled a public/private investment of \$183 million and in the future will continue to accumulate in cost to maintain (Bay Area Council Economic Institute 2011).

RECOMMENDATIONS

Managed Retreat is the most logical response to encroaching shorelines and further subsidence and inundation, however there are enormous challenges that encompass technical, social,

political and economical aspects. While the economic cost of relocating one building may outweigh the cost of rebuilding in a flood-prone area (Round Table 2011), the cost of relocation increases with the number of assets present, like infrastructure such as roads and utilities. Thus, the practicality of relocating a building let alone an entire metropolitan area such as Greater Vancouver becomes implausible. Furthermore, the social and political implications of managed retreat become overwhelming as property values are taken into consideration (City of Vancouver 2012). Even at a local level, municipal taxes will be affected by the retreat of developed land as it removes a portion of the tax base, while the cost of attainment of land makes retreat an even more unattractive option.

Consequently, the more practical option may be climate-wise development planning, limiting the further development and construction in areas at risk of flooding (Round Table 2011). However, given the opportunity, strategic retreat that enables rebuilding in areas not prone to flooding becomes a more manageable option, such as New Orleans after Hurricane Katrina. In a cost-benefit analysis including potential and accumulating costs and management between strategic retreat and climate wise planning, the British Columbia Ministry of Environment found strategic retreat yielded higher economic benefits as the cost of rebuilding is invested in less risky areas (Round Table 2011).

Finally, in most situations where development already exists, a mix or integration of options provide longer term solutions to climate induced sea level rise and flooding. While many methods alone have several shortcomings, an integration of methods that overlap might eliminate individual vulnerabilities.

LIMITATIONS

Unfortunately for the purposes of this research, only adaptation strategies that fit the three categories were taken into consideration. Additionally, the strategies examined were all structural in origin and adaptation strategies should not be limited to infrastructure. As such, recommendations for future research include looking into the impacts of sea level rise in aspects of agriculture and transportation.

CONCLUSION

By the mid-century, Canadians will find that 3,000 to 13,000 homes will be affected by flooding and in British Columbia an estimation of 8,900 to 18,700 homes will be at risk of permanent flooding from sea level rise and temporary flooding by storm surges (Round Table, 2011). Furthermore, an increasing reliance on human engineered infrastructure puts locals more at risk to sea level rise.

Traditional adaptation strategies that often encompass the construction of seawalls and other engineered defences are only temporary short term alleviations, but can be problematic in operational costs, maintenance and interference with coastal ecosystems (Round Table 2011). Through careful assessments of different adaptation strategies internationally, we find several innovative approaches to mitigation that are both low impact and cost effective. In addition, a general theme we find across these strategies is the aim of accommodating sea level change rather than protecting and resisting against it. Thus, it is not necessarily innovative strategies that we should seek, but rather planned adaptation strategies that seek to accommodate changes in climate induced sea level rise.

ACKNOWLEDGMENTS

I would like to thank Dr. David Brownstein for his guidance and instruction throughout the study; to Tina Neal from the Ministry of Environment for your insight and support; and finally to Brittany Jang for her assistance in editing.

REFERENCES

- Aerts, J., Major, D. C., Bowman, M. J., Dircke, P., & Marfai, M. A. 2009. *Connecting Delta Cities*. New York: VU University Press.
- Bay Area Council Economic Institute. 2011. Executive Summary to the policymakers of San Francisco. <http://www.bayareaeconomgy.org/media>
- City of Port Coquitlam. 2010. Report to Committee. *City of Port Coquitlam*, 1: 1-3.
- City of Vancouver. 2012. BC (British Columbia) Assessment - Property Tax - City of Vancouver. *City of Vancouver*. <http://vancouver.ca/fs/treasury/assessment.html>.
- English, E. 2009. Amphibious Foundations and the Bouyant Foundation Project: Innovative Strategies For Flood Resilient Housing. *International Conference on Urban Flood Management*. Lecture conducted from UNESCO-IHP and COST Action C22, Paris, France.
- Environment Agency. 2012. Thames Barrier. *Environment Agency*. <http://www.environment-agency.gov.uk/homeandleisure/floods/38353.aspx>.
- Fenuta, E.V. 2010. *Amphibious Architectures: The buoyant Foundation Project in Post-Katrina, New Orleans*. M. Arch. Thesis, University of Waterloo. Canada.
- Flood Protection in Richmond. 2012. *City of Richmond*. www.richmond.ca/safety/prepare/city/hazards/flood.htm.
- Gregg, R. M. 2010. Alligator River National Wildlife Refuge/Albemarle-Pamlico Peninsula Climate Adaptation Project | *CAKE: Climate Adaptation Knowledge Exchange*. CAKE: Climate Adaptation Knowledge Exchange. <http://www.cakex.org/case-studies/682>.
- Ministry of Environment. 2011. Climate Change Adaptation Guidelines for Sea Dikes and Coastal Flood Hazard Land Use. Draft Policy Discussion Paper. *BC Ministry of Environment*, Project No. 143111, 1-44.
- Nicholls, R.J. and A. Cazenave. 2010. Sea-level rise and its impacts on coastal zones. *Science*, 328, 1517-1520
- Pasternack, R. 2009. *Aquatecture: Waterbased Architecture in the Netherlands*. Architecture 590. M. Arch. Thesis, University of Waterloo. Canada.
- Prosun, P. 2011. *The LIFT House: An amphibious strategy for sustainable and affordable housing for the urban poor in flood-prone Bangladesh*. M. Arch. Thesis, University of Waterloo. Canada.
- Round Table on the Environment and the Economy. 2011. *Climate Prosperity*. The Economic Impacts of Climate Change for Canada.
- Scyphers, S. B., Powers, S. P., Heck Jr, K. L., & Byron, D. 2011. Oyster Reefs as Natural Breakwaters Mitigate Shoreline Loss and Facilitate Fisheries. *PLoS ONE* 6(8): 1-12.

City of New York. 2007. *The Staten Island Bluebelt: A Natural Solution to Storm Water Management*. NYC Environmental Protection. http://www.nyc.gov/html/dep/html/dep_projects/bluebelt.shtml.

THE FUTURE OF ECOTOURISM IN BRITISH COLUMBIA: A CASE STUDY ANALYSIS OF CULTURAL AND ENVIRONMENTAL COSTS AND BENEFITS

by DIANA WADE

Ecotourism in British Columbia shows potential as a viable option to meet economic needs of remote, northern, and First Nations communities while maintaining culture, tradition, and environmental sustainability. This article analyzes case studies from three different regions in British Columbia in terms of socioeconomic, sociocultural, and environmental costs and benefits to determine the viability of ecotourism for the future. The case studies range from wildlife viewing of grizzly bears at Knight Inlet, to First Nations cultural and environmental tourism by the Tl'azt'en people in central northern British Columbia, and the Gitga'at people on the mid-west coast of British Columbia. While wildlife viewing of grizzly bears shows short-term benefits to grizzly populations, concerns about long-term welfare of the grizzly population emerge. In contrast, First Nations tourism proves to be a possible solution to support local First Nations economies after resource depleting industries such as fisheries and clearcut logging. However, issues arise surrounding how First Nations and governments should manage ecotourism enterprises with a methodology that protects First Nations interests and supports the economy for the future.

INTRODUCTION

As British Columbia's natural resources deplete under exploitation, there is a need for alternative industries to help support the economic needs of northern, remote and First Nations communities. Ecotourism in British Columbia may be a viable option if culture and tradition can be maintained along with environmental sustainability. This article will provide a look at these conflicting interests through examination of ecotourism case studies in British Columbia. Many First Nations people with deep cultural roots are located in or near these communities. Therefore, to stay on their traditional territory, new economic enterprises

must be created to support local economies. With depleted stocks of natural resources and current trends towards environmental sustainability, these communities are turning to ecotourism as an alternative industry. Limited research within communities has taken place within the past decade to determine costs and benefits of ecotourism to culture and the environment.

Ecotourism is a complex term embodying many different, and sometimes conflicting characteristics. Although Che (2004) suggests the "eco" in ecotourism stands for economics (214), ecotourism is commonly interpreted from an ecological perspective, and is used as a term

that includes environmental benefits, nature-based activities and experiences, and provides economic and social benefits to the community (Turner et al. 2012; Kutzner et al. 2009; Che 2004; Nepal 2004). Tourists should come away with an increased appreciation of, and commitment to protecting, the environment for the future as well as an increased understanding of local ecology and traditional culture of the area (Che 2004). Successful ecotourism fosters healthy working relationships between the environment and society with multifaceted benefits.

Ecotourism is primarily thought of as a tool for economic growth in developing countries, especially when resources were/are overexploited in a region, and an alternative economic industry is needed (Che 2004). Currently, ecotourism is the fastest growing sector of the travel industry with over 40% of the United States population participating (Cusack & Dixon 2006; Nevin & Gilbert 2005a, 454; Che 2004, 212). Although Canada has much potential for ecotourism, the challenge is to achieve sustainable development that provides for the future of the economy while sustaining natural resources and cultural traditions (Che 2004).

For the purposes of this article, I turn to the recent research of peer-reviewed case studies in three different locations of British Columbia. The first case studies consider grizzly bear (*Ursus arctos horribilis*) viewing where feeding takes place at a salmon spawning channel in Glendale Cove on Knight Inlet in the Pacific mid-coast region of British Columbia (Nevin & Gilbert 2005a; Nevin & Gilbert 2005b). Compared to the other case studies on ecotourism, this one is relatively close to major centres such as Vancouver and Victoria (Figure

1), increasing its accessibility for tourists.

The second case studies are located in the central interior of British Columbia (Figure 1) at the heart of the Tl'azt'en First Nations territory. The Tl'azt'en people wish to consider tourism as an alternative industry to forestry in their territory (Kutzner et al. 2010; Nepal 2004). Kutzner, et al. (2010) consider tourists' preferences with regard to indigenous ecotourism creating a perspective from the outside in, whereas Nepal (2004) researches the First Nations' perspectives from within the community creating an inside out perspective. The third case study is centred on the northern coast of British Columbia (Figure 1) in the Gitga'at First Nations territory. The main industries in this area have been commercial fishing and clearcut logging. The Gitga'at First Nations are interested in expanding the ecotourism sector in their area to help sustain their community economically (Turner et al. 2012).

GRIZZLY BEAR ECOTOURISM

Grizzly bears are a charismatic species that draw tourists to British Columbia's scenic rainforests and coastlines for trophy hunting and viewing. Recently wildlife viewing ecotourism was introduced to the tourism sector in British Columbia (Nevin & Gilbert 2005b). It is estimated that British Columbia was home to approximately 15,000 grizzlies in 2012, with an estimated 250 grizzlies occupying the Knight-Bute area used for commercial grizzly viewing (Ministry of Forests, Lands and Natural Resource Operations 2012). This population is neither listed as "threatened" nor closed to hunting (Ministry of Forests, Lands and Natural Resource Operations 2012).

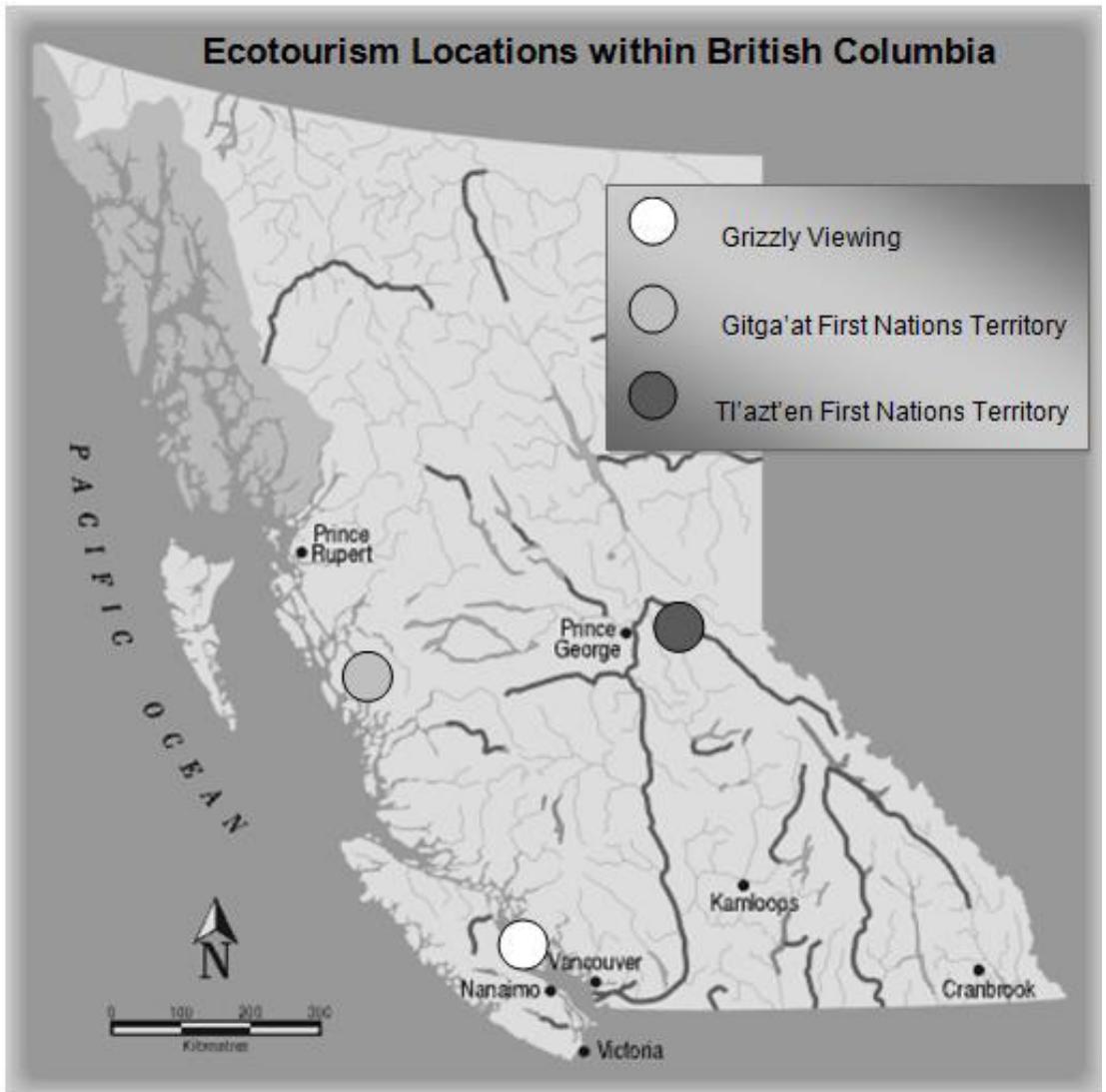


Figure 1. Ecotourism locations within British Columbia (Adapted from BC Parks, n.d.)

Study results show activity of large male bears decreased before the arrival of the first viewing groups in the morning, and females with cubs avoid feeding when there is a high presence of males, but did not appear concerned with people viewing. (Nevin & Gilbert 2005b). Feeding sites are usually dominated by large males (Nevin and Gilbert 2005a). Nevin and Gilbert (2005a) argue that negative encounters between adult male bears and humans during the hunting season have a negative effect on the behaviour of male bears, causing them to behave more aggressively towards humans and to avoid contact if possible. The authors suggest this particular form of wildlife viewing might lead to grizzly bear population growth by increasing safety of feeding grounds for females with cubs (Nevin & Gilbert 2005a; Nevin & Gilbert 2005b). The results of this study lack deeper insight for future issues that may arise from impacts to population growth.

GITGA'AT ECOTOURISM

Isolated communities, such as the Gitga'at First Nations on the northern coast of British Columbia, are turning to ecotourism to support their community. The dominant industries in this community are commercial fishing and logging, which are not sustainable in terms of resource availability, and are resulting in large numbers of unemployed and underemployed people within the community (Turner et al. 2012). The Gitga'at labour participation rate dropped 13.5% compared to a drop of only 0.8% for the total working age population in British Columbia over the past decade (Statistics Canada 2006a, 15). If an alternative sustainable industry cannot be found, the Gitga'at will be forced to move from their traditional lands to seek

employment, breaking up the community and resulting in a loss of traditional culture and way of life. Ecotourism has potential to preserve Gitga'at traditions, promote environmental sustainability, and improve the economic wellbeing of the community.

However, a study consisting of a series of comprehensive interviews and focus groups with members of the Hartley Bay community uncovered potential negative impacts that may arise as a result of ecotourism (Turner et al. 2012). A limitation of this study was that members of the Gitga'at community living outside of traditional lands were not included and may have had differing opinions and perspectives. Previously, overfishing and clearcut logging have taken place within the Gitga'at territory without consultation or consent of the Gitga'at people (Turner et al. 2012). The Gitga'at would like to be fully responsible for any ecotourism business that is implemented in their area, so their community receives the total profit and wages. Formerly, large profits have been made by commercial fisheries and logging companies with the Gitga'at receiving employment as their only economic return. The Gitga'at have a variety of tourism products currently listed on their website ranging from wildlife and cultural tours to outdoor activities such as kayaking, hiking, hot springs and campground accommodation (Gitga'at Nation 2004). Gitga'at tourism is community owned and run, which indicates agency and autonomy among the Gitga'at First Nations. This is a precedent setting case that may inform future projects in other locations. If successful, this ecotourism enterprise could serve as a template for other First Nations communities.

TL'AZT'EN ECOTOURISM

Like the Gitga'at, the Tl'azt'en First Nations are turning to the economic potential of ecotourism to support their community. The Tl'azt'en are a predominantly forest-dependent First Nations community located 250 kilometres northwest of Prince George on 656,000 hectares of land described as a "relatively pristine natural environment" (Nepal 2004, 175). In the last decade the Tl'azt'en population on nations lands dropped by 8.3% indicating they may have been forced from their territory to seek employment (Statistics Canada 2006b, 8).

Although ecotourism appears to be an industry that could improve the economy of the Tl'azt'en community, the Tl'azt'en people posed some serious concerns (Nepal 2004). The unique culture of the Tl'azt'en would be showcased to attract tourists. However, the influence of tourists in the community could erode existing culture. Although the Tl'azt'en would like to share their culture with tourists, there are also elements such as sacred grounds, burial sites, and traditional rituals the Tl'azt'en would like to keep separate from ecotourism businesses (Nepal 2004). This demonstrates the importance of the First Nations role in development of ecotourism that meets both the needs of the community and the tourists. Additionally, the Tl'azt'en have concerns regarding pollution, wildlife disturbance and culture loss for youths (Nepal 2004).

The Tl'azt'en echo some of the same concerns as the Gitga'at regarding who will profit from the ecotourism industry. They are concerned that the ecotourism industry could end up controlled by outside companies offering little more than employment to the Tl'azt'en people

(Nepal 2004). Allowing an outside company to manage exploitation of First Nations' culture and tradition would be unethical. The Tl'azt'en First Nations' concerns are well founded considering their experience with resource exploitation occurring throughout their territory without their consent or opinion. It is not surprising they are concerned their culture and traditions could be exploited without their consent. Ecotourism would be mutually beneficial for both tourists and the economy, providing outsiders with a unique opportunity to learn more about Tl'azt'en culture and traditions directly from First Nations people.

COST-BENEFIT ANALYSIS

Socioeconomic

With depletion of many natural resources within British Columbia, such as fishing and logging, alternative environmentally sustainable industries are needed for the future. Previously, ecotourism was used mainly in developing countries as a method of meeting economical demands while preserving areas of rich biodiversity that are often the traditional lands of aboriginal groups (Zeppel 2006), but Che (2004) argues for the use of ecotourism in developed countries as a sustainable alternative to resource extraction in resource dependent areas. Resource dependent areas of British Columbia are usually located in scenic natural environments with unique wildlife, vegetation, and indigenous cultures to showcase, making these areas prime targets for a shift to ecotourism.

Although grizzly bear viewing tours operate near traditional Tlowitsis Nation territory, tours are not run with specific aboriginal involvement like the other two case studies.

Grizzly viewing tours do not offer a chance for tourists to learn about anything beyond basic wildlife and vegetation information. In fact, the Knight Inlet Lodge, which operates the grizzly viewing tours, appears quite commercialized. This company offers deluxe lodge stays with gourmet meals coupled with bear and whale viewing, inlet cruises, rainforest walks, and sea kayaking (Knight Inlet Lodge 2012). While the Knight Inlet Lodge does offer guests an exciting ecotourism experience, there is no mention of a direct economic benefit for the community beyond employment.

Common to the Gitga'at and Tl'azt'en were concerns of who would be managing and benefiting the most economically from ecotourism in their communities. Both First Nations groups have experienced commercial logging and/or fishing operations in their territories which have provided them with employment for their people, but have not given the community an opportunity to own and financially benefit from a successful industry (Turner et al. 2012; Kutzner et al. 2009; Nepal 2004). By offering ecotourism in their communities, both the Gitga'at and Tl'azt'en people would be sharing their culture and traditions. Therefore, they should be entitled to ownership and the financial benefits of ecotourism within their communities.

Nevertheless, there may be some difficulties associated with start-up and management of ecotourism businesses. Ecotourism product development and management must be guided by individuals with knowledge of and experience in the tourism industry. If the individual, or team of experts, is from outside the First Nations community, it is vital to ensure they work with the best interests of the

specific First Nations community at heart. The danger is that an outside source could attempt to manage and run the entire ecotourism operation, thus acquiring the profits to which the First Nations community is entitled, and eliminating opportunities for autonomy and leadership within the community.

The University of Northern British Columbia provides an example of a Community-University Research Alliance with the Tl'azt'en people. Their goal is to explore the costs and benefits of ecotourism alongside the Tl'azt'en First Nations to increase their awareness and knowledge of the many elements involved in ecotourism implementation (Tl'azt'en Nation and the University of Northern BC 2005). This is the type of consulting First Nations will benefit most from. It creates an equitable partnership in which the longevity of the ecotourism industry will be carefully considered. Evidence of the credibility of this Community-University Research Alliance is seen through the work of Kutzner et al. (2010), which examines tourists' preferences for aboriginal ecotourism products. This method of research unveils valuable information, such as tourists' preferences for nature over culture, which remedies the concern of First Nations regarding keeping some aspects of their culture private from the public eye (Kutzner et al. 2010).

Sociocultural

Culture would be one of the main ecotourism products offered by the Gitga'at and Tl'azt'en people. To share their culture and traditions with people outside their communities brings possible drawbacks as well as benefits. Kutzner et al. (2010) argue, "...with the strangers' gaze invading the space of indigenous inhabitants, comes the potential for a myriad of cultural

impacts from acculturation to commodification, exploitation to loss of identity” (99). These are serious issues and concerns for First Nations people and lead to the paradox whereby community survival within traditional territory requires an economic enterprise that simultaneously exploits that very community. The addition of ecotourism and infiltration of the community by tourists from outside the First Nations territory brings in new cultural elements, and will undoubtedly change the dynamics of the community. The challenge for First Nations people is to maintain their own traditions while sharing their knowledge with tourists who visit specifically to learn and explore the region’s culture.

As well as possessing unique cultures and traditions that can be shared with tourists, First Nations territory of the Gitga’at and Tl’azt’en is beautiful, remote, and seems pristine to visitors. Kutzner et al.’s. (2010) discovery that tourists prefer experiencing the environment and nature over learning about First Nations’ culture and traditions indicates ecotourism with an emphasis on nature is likely to be more successful than ecotourism with an emphasis on culture. However, it is imperative to keep in mind that an overemphasis on nature may also lead to the erosion of culture, or increased protection of traditional lands forcing First Nations people from their territory.

A move towards creation of ecotourism industries within First Nations territory, with an emphasis on nature, allows First Nations people to maintain a boundary between culture and traditions and the ecotourism industry. Keeping sacred sites, burial grounds, and ceremonial rituals off limits to tourists was expressed as essential by both the the Gitga’at

and the Tl’azt’en people (Turner et al. 2012; Nepal 2004). Some off limit areas may not be an issue as tourists indicate a preference for nature ecotourism (Kutzner et al. 2010). Nevertheless, ecotourism will still have a more direct impact on the dynamics of the community than employment in the commercial logging or fishing industries as tourists will be attracted into the community for lodging, dining, and sightseeing rather than First Nations people leaving the community to seek employment.

Environmental

Throughout these case studies there has been a lack of importance placed on environmental impacts as consequences of ecotourism. Grizzly viewing focuses mainly on positive impacts to bear populations due to increased feeding times for females with cubs without the presence of large male bears. The immediate reaction of researchers is to see this as a positive impact, which it may be, but Nevin and Gilbert (2005a; 2005b) fail to provide deeper research to justify their claims. It is true that grizzlies are a threatened species in some regions of British Columbia, but is an impact that results in limited feeding times for large male bears, and increased feeding times for females with cubs, really a benefit? Undoubtedly bear populations may grow at first, but will salmon populations be able to sustain larger bear populations in this area? Salmon populations can be a variable resource in British Columbia, fluctuating in number unpredictably each year as a result of global climate change (Richter & Kolmes 2005). Additionally, if food resources and/or feeding times for large male bears decrease, health of large male bears may be impacted (Rode et al. 2007). If large male bears decrease in health, reproduction may decrease, thus resulting

in more changes and a possible decrease in population on a longer timescale as well as genetic bottlenecks. Ecosystems are fragile, and any change has a cascade effect that is often hidden initially (Folke et al. 2004).

Much emphasis is placed on the cultural impact of ecotourism for the Gitga'at and Tl'azt'en First Nations, but potential environmental impacts are not discussed in detail. Nevertheless, environmental sustainability is also addressed as part of ecotourism, both through sustainable resource use (Turner et al. 2012) and awareness of environmentally sensitive tourism practices (Nepal 2004). The environmental impacts of ecotourism are extremely important to decisions made about what types of ecotourism are implemented within an area. Bringing more people into an area will increase demands for basic services such as water and power. Likewise, allowing tourists to traverse the natural environment will have negative impacts on the vegetation and wildlife, as will the necessary tourism infrastructure such as trails and rest areas (Arocena et al. 2005; Buckley 2004).

CONCLUSION

Ecotourism is a viable long-term option for British Columbia providing economic, environmental and cultural needs are met along with continued research and monitoring (Cusack & Dixon 2006). Research partnerships between universities and First Nations (Kutzner et al. 2010; Tl'azt'en Nation and the University of Northern BC 2005) to investigate the costs and benefits of ecotourism are an excellent example of the in-depth consulting process necessary for ecotourism to be successful. Providing impartial counselling prioritizing aboriginal best interests is difficult to do in a market economy. Naturally, a healthy economy

is also important to First Nations (Turner et al. 2012; Kutzner et al. 2009; Nepal 2004), but the interests of sensitivity to and preservation of their culture and community must also be taken into account. First Nations risk cultural and environmental exploitation by partnering with tourism companies.

Another consideration is whether government regulation and monitoring is beneficial to the development of First Nations ecotourism. This is beyond the scope of this article, but I offer some brief suggestions. Perhaps governmental and First Nations regulations surrounding the ownership and management of ecotourism would help to ensure ecotourism in remote areas benefits local communities rather than corporations and large tourism companies. Additionally, regulations could be used to ensure existing ecotourism, such as privately owned hunting and fishing lodges, are required to employ a certain percentage of local people from the communities they operate in, participate in preservation of the environment and local culture, and give back to the community financially. If the government employed a team of consultants whose jobs were to assist the First Nations and remote communities in implementing and maintaining ecotourism businesses, this would help to ensure local people and First Nations would not be exploited in the process, and ensure the success of the ecotourism business.

Continued research and careful monitoring of natural environments, cultures and economies that are part of ecotourism is essential. Although there are many important aspects to consider for the wellbeing of ecotourism in British Columbia, it is necessary to recognize from an environmental standpoint that ecotourism is

an improvement on previous land uses which exploit resources, such as clearcut logging and commercial fishing. The recommendations and cost/benefit analyses discussed in this article highlight methods that can be implemented to conduct ecotourism sensitively with the best interests of local communities, their economies, and the environment at heart. Ecotourism conducted in a sensitive manner will prove to be a viable option for British Columbia.

ACKNOWLEDGMENTS

Thank you to Professor Denver Nixon for his insight, suggestions and criticism, Victoria Tcherven and Yida Lin for their thoughtful editing, and *Trail Six* for this opportunity to publish my work.

REFERENCES

- Arocena, J. M., S. K. Nepal, and M. Rutherford. 2005. Visitor-induced changes in the chemical composition of soils in backcountry areas of Mt Robson Provincial Park, British Columbia, Canada. *Journal of Environmental Management* 79: 10-19.
- BC Parks. n.d. *British Columbia heritage rivers system* [map]. http://www.env.gov.bc.ca/bcparks/heritage_rivers_program/images/map/map.gif.
- Buckley, R. 2004. *Impacts positive and negative: Links between ecotourism and environment in Environmental impacts of ecotourism*. Oxfordshire, UK: Cabi Publishing, 5-14.
- Che, D. 2006. Developing ecotourism in First World, resource-dependent areas. *Geoforum* 37: 212-226.
- Cusack, C. and L. Dixon. 2006. Community-based ecotourism and sustainability. *Journal of Sustainable Forestry* 22(1-2): 157-182.
- Folke, C., S. Carpenter, B. Walker, M. Scheffer, T. Elmqvist, L. Gunderson, and C. S. Holling. 2004. Regime shifts, resilience, and biodiversity in ecosystem management. *Annual Review of Ecology, Evolution, and Systematics* 35: 557-581.
- Gitga'at Nation. 2004. *Gitga'at people of the cane*. <http://www.gitgaat.net/index.html>.
- Knight Inlet Lodge. 2012. *Knight Inlet Lodge*. <http://www.grizzlytours.com/%20bear-watching-tours-bc.php>.
- Kutzner, D., P. A. Wright, and A. Stark. 2009. Identifying tourists' preferences for Aboriginal tourism product features: Implications for a northern First Nation in British Columbia. *Journal of Ecotourism* 8(2): 99-114.
- Ministry of Forests, Lands and Natural Resource Operations. 2012. *British Columbia grizzly bear population estimate for 2012*. http://www.env.gov.bc.ca/fw/wildlife/docs/Grizzly_Bear_Pop_Est_Report_Final_2012.pdf.
- Nepal, S. K. 2004. Indigenous ecotourism in central British Columbia: The potential for building capacity in the Tl'azt'en Nations territories. *Journal of Ecotourism* 3(3): 173-194.
- Nevin, O. T., and B. K. Gilbert. 2005a. Measuring the cost of risk avoidance in brown bears: Further evidence of positive impacts of ecotourism. *Biological Conservation* 123: 453-460.
- Nevin, O. T., and B. K. Gilbert. 2005b. Perceived risk, displacement and refuging in brown bears: Positive impacts of ecotourism? *Biological Conservation* 121: 611-622.

- Richter, A. and S. A. Kolmes. 2005. Maximum temperature limits for Chinook, Coho, and chum salmon, and steelhead trout in the Pacific Northwest. *Reviews in Fisheries Science* 13(1): 23-49.
- Rode, K. D., S. D. Farley, J. Fortin, and C. T. Robbins. 2007. *The Journal of Wildlife Management* 71(3): 929-939.
- Statistics Canada. 2006a. 2006 Aboriginal community data initiative: *Hartley Bay Band*. http://www.bcstats.gov.bc.ca/applications/aborprofile/Reports/Hartley_Bay_Band.pdf.
- Statistics Canada. 2006b. 2006 Aboriginal community data initiative: *Tl'azt'en Nation*. http://www.bcstats.gov.bc.ca/applications/aborprofile/Reports/Tlazten_Nation.pdf.
- Tl'azt'en Nation. 2010. *Tl'azt'en Nation*. <http://www.tlc.baremetal.com/>.
- Tl'azt'en Nation and the University of Northern BC. 2005. *Tl'azt'en ecotourism stream*. <http://cura.unbc.ca/ecotourism.htm>.
- Turner, K. L., F. Berkes, and N. J. Turner. 2012. Indigenous perspectives on ecotourism development: A British Columbia case study. *Journal of Enterprising Communities: People and Places in the Global Economy* 6(3): 213-229.
- Zeppel, H. 2006. Indigenous ecotourism: Sustainable development and management. *Ecotourism series* 3: <http://site.ebrary.com/lib/ubc/docDetail.action?docID=10157915>

RARE EARTH ELEMENT TRADE IN THE PACIFIC-RIM

by KATHERINE J. WILLS

This article discusses the commodity chain of rare earth elements and their geopolitical significance in the Pacific-Rim. Rare earth elements are critical components of high technology and modern industry, and have evolved as a strategic resource that has several geopolitical implications for the United States, China, and Japan. The geopolitics of natural resources have taken centre stage in the discourse of national security and the rare earth industry is vital to the transition to green technology, economic stability, and military defence. China has a geographic advantage in the rare earth industry because of its abundant reserves and a cheap supply of labour. China has control over 58 percent of the known global rare earth reserves, and controls about 97 percent of the global rare earth element market. The rare earth industry has had significant environmental consequences in China, due to the rapid development of mining and processing rare earth elements. Recently, China has reduced its number of permitted export quotas to avoid over-exploitation of its strategic resource. In response, the US and Japan have filed a complaint with the World Trade Organisation protesting China's restrictions over rare earth elements. It is believed that the global supply of rare earth elements will continue to diversify as countries realize the significance of rare earth elements to their national security.

“To see the world in a grain of sand.”

William Blake

The first line of William Blake's poem, “Auguries of Innocence,” begins with: “To see the world in a grain of sand” (Blake and Baskin 1968). The purpose of this article is also to see the modern world in a grain of sand, in particular grains of sand containing rare earth elements. It first discusses the nature of rare earth elements, and then discusses the commodity chain of rare earth elements and their geopolitical and economic significance in the Pacific-Rim. A commodity chain is: “a collection of interrelated economic activities and industries that produce a particular kind of product or service” (Gregory et al 2009, 101). Rare earth elements are classified as the family of lanthanides on the periodic table. They

are critical components of high technology and modern industry and require intensive extraction processes (Hurst 2010).

This article argues of the geopolitical significance rare earth trade in the Pacific-Rim and focuses on the implications of the rare earth industry for the United States, China, and Japan. Traditionally, national security is perceived as soft power or hard power, meaning either military force or diplomatic authority; however, the geopolitics of natural resources such rare earth elements have recently taken centre stage in the discourse of national security. Currently, national security is interwoven with trade and economic stability, as well as a reliable source of energy. High technology has also evolved as a critical component of national security. The rare earth industry, an integral part of

high technology, is vital to green technology, economic stability, and military defence. The transition to green technology, economic stability, and military defence are all major components of national security. China has a geographic advantage in the rare earth industry because of its abundant rare earth reserves and its relatively cheap supply of labour, which in turn has led to rapid and “dirty” industrial development due to extensive mining practices. China has a monopoly over the rare earth industry, and this has been amplified since China reduced the number of its export quotas to avoid over-exploitation of the nation’s rare earth reserves. Rare earth elements have evolved as a strategic resource with critical geopolitical implications, particularly for the US, China and Japan. The national security of these countries depends on a secure and stable supply of rare earth elements.

Rare earth elements are used to manufacture high technology products that are important to the national security of the contemporary state. The high-tech industry can be categorized into three distinct spheres: high-tech consumer goods, green technology, and military defence (Hurst 2010). The trade of high-tech consumer goods are an important source of revenue for most countries in the Pacific-Rim, and green technology is critical in the transition from dependence on fossil fuels to alternative sources of energy. Rare earth elements have several military applications from satellites to missiles. Respectively, these spheres are integral to economic prosperity, energy security, and military might. They may be elemental, but they remain an integral part of national security.

Rare earth elements are diverse and have different properties that are indispensable to

high technology. At the present, the rare earth elements used to produce permanent magnets are particularly valuable. Permanent magnets are prevalent in rare earth technology because they are able to generate greater magnet power in much smaller sizes. Permanent magnets, in contrast to electrical magnets, are able to produce their own magnetic field, which is particularly important in the high-tech industry (Hurst 2010). Magnet technology can be employed in numerous high-tech applications. The primary rare earth magnets are the samarium cobalt magnet and the neodymium-iron-boron magnet. The benefit of the samarium cobalt magnet is that it is able to maintain its magnetic strength at exceptionally high temperature, which makes it ideal for military applications (Ibid). These military technologies include precision-guided munitions, which are implemented in missiles, ‘smart’ bombs, and aircrafts. The neodymium-iron-boron magnets are principally applied to green technology and consumer goods.

Rare earth elements are used in several modern and everyday devices such as cell phones, flat screen televisions, speakers, computers, hybrid vehicles, and even refrigerators (Eggert 2011; Hurst 2010). In addition to high-technological applications, rare earth elements are used as catalyst in petroleum refineries. Nevertheless, rare earth elements remain vital to the transition from conventional fossil fuels to more renewable sources of energy (Hurst 2010). The applications of rare earth elements are ubiquitous and are major components of the modern economic system. However, a stable supply of rare earth elements remains paramount to the economic prosperity, energy security, and military defence technology. A stable supply of rare earth elements is a matter of national security because of the

high-technological applications. The desire for high-tech products for consumer goods, green technology and military defence technology has increased the demand for a cheap and abundant supply of rare earth elements (Eggert 2010). The core states rely on China to provide them with a cheap supply of rare earth elements.

The term ‘rare earth’ is a misnomer, because rare earth elements are actually not that rare. They are found in small concentrations in the Earth’s crust. They are not found in clusters, which makes the process of finding and mining rare earth elements labour-intensive and expensive (Goonan 2011; Hurst 2010). According to the US Geological Survey (USGS), rare earth elements are predominantly found in the elements such as monazite and bastäsite. The largest bastäsite deposits are found in China and the US, while the largest monazite deposits are found in Australia, Brazil, China, India, Malaysia, South Africa, Sri Lanka, Thailand, and the US. There are many other elements known to contain rare earth elements, but monazite and bastäsite are the most common elements (Hurst 2010). China has a geographic advantage over other countries in the world. It controls almost 58 percent of the known global rare earth reserves. The US, on the other hand, controls just 9 percent of the global rare earth reserves. The percentage of these reserves in the US might appear relatively small next to China, but even these rare earth reserves give the US a geographic advantage over most other countries in the world that do not have the same geology and infrastructures to process rare earth elements. Historically, the US has dominated the rare earth industry. For instance, the Mountain Pass mine in California was the biggest supplier of rare earth elements in the world until the 1970, when China became

the main player in the rare earth element industry (Hurst 2010; Yu 2012). An abundant supply of cheap rare earth elements has enabled China to develop a monopoly over the industry. Currently, China controls about 97 percent of the global rare earth element market (Hurst 2010).

Rare earth mining operations are different from other mining operations, and comprise of complex and expensive procedures that requires capital. First, the ore containing the rare earth elements must be removed from the ground following standard mining procedures. The ore is then crushed into gravel, and then processed through a grinding mill to produce a fine sand or silt. At this grain size, the mineral containing the rare earth elements is separated from the nonessential elements. In the case of bastäsite, it is separated from other elements through a floatation process. During the floatation process, an agent is added to the solution and then bubbles are blown from the bottom of the tank. The bastäsite sticks to the bubbles forming froth at the surface, which is then skimmed off the top. The rare earth elements must then be divided into their respective categories; as, each element is unique and therefore requires a different extraction technique. Once the rare earth elements are in their pure groups (oxides) they can be processed into metals and alloys. Alloys, such as the neodymium-iron-boron magnet, have important high technological applications that can be applied to green energy and defence technology. It takes a minimum of ten days for the ore to be removed from the ground and processed into an oxide (Hurst 2010). A cheap source of labour is required to decrease the production costs associated with the production of rare earth elements, and it increases the demand for rare earth elements

produced by Chinese state-owned enterprises. China's abundant rare earth elements reserves and a supply of cheap labour provide an inexpensive source of rare earth elements to the global markets.

China's former leader, Deng Xiaoping, led China further away from traditional Marxism towards a market economy, and he realized the political and economic importance of moving the world economic system. Policies reflected his aspirations for China to move from the bottom rank to the top rank of the world economic system. Consequently, the Chinese government perceives rare earth elements as a vital component in its quest for economic development. In 1987, Deng Xiaoping exclaimed, "There is oil in the Middle East; there is rare earth in China" (as quoted Hurst 2010, 11). China's gamble in developing the rare earth industry appears to have paid off. It is important to acknowledge that China would not have been able to establish a monopoly over the rare earth industry without a cheap source of labour and an abundant supply of rare earth elements. Together, they have enabled China to produce a commodity that is competitive in global market.

China's abundance in rare earth elements and a cheap supply of labour also provide it with the opportunity to develop and establish a place for itself in various high-tech industries, and it has implemented policies to promote research and develop in order to climb the ladder of the global high-tech industry. For instance, in 1986, scientists encouraged Deng Xiaoping, China's leader at the time, to establish the National High Technology Research and Development Program (Hurst 2010). China's Ministry of Technology and Science states that the purpose

of the program was to:

Gain a foothold in the world arena; to strive to achieve breakthroughs in key technical fields that concern the national economic lifeline and national security; and to achieve 'leap-frog' development in key high-tech fields in which China enjoys relative advantages or should take strategic positions in order to provide high-tech support to fulfil strategic objective in the implementation of the third step of China's modernization process (as quoted Hurst, 2010, 6).

This demonstrates China's desire to become a global leader in the high-tech industry. Rare earth elements are critical to "gaining a foothold in the world arena" and remain an important strategic resource (Hurst 2010, 6).

In the late 1950s, China began extracting rare earth elements from Bayan Obo, Baotou, previously an iron-ore mine. Currently, Baotou produces sufficient rare earth elements to provide China with the energy capacity to become the world's leader in harvesting wind energy (Pond 2010). Since the establishment of Bayan Obo, China has expanded its rare earth mining operations and as production of rare earth elements almost doubled between 1978 and 1989 (Hurst 2010). The movement to expand rare earth mining operations were encouraged by the policies implemented during Xiaoping's rule. China recognizes the significance of rare earth elements to high-tech industry and their importance to economic, military, and energy security, which is why China strives to diversify their supply.

The global prices of rare earth elements decreased in the 1990s when China flooded the global market with a cheap and abundant supply

of rare earth elements (Goonan 2011). This reduced the revenue of other competitors, such as Molycorp, which is a US mining corporation that owned Mountain Pass, the only rare earth mine in the US. These low prices drove many producers out of business, and at one point, China almost bought out Molycorp. China's National Offshore Oil Corporation, a Chinese State Owned Enterprise, offered a bid of \$18.5 billion dollars in 2005. The government encouraged US-based Chevron to increase their counter bid to reduce concerns about the future security of US energy. China did not acquire Molycorp, however, it continued to dominate the rare earth market (Hurst 2010; Yu 2012).

Although China has about 57 percent of global rare earth reserves, its rare earth industry faces many challenges. There is concern within China that if the country continues its unsustainable management practices and poor regulation then it will be left without rare earth elements in addition to a plethora of social, environmental, and economic problems (Hurst 2010). The rare earth mining and extraction process and requires stringent regulation in order to prevent environmental hazards, but China has been lenient in its regulation to produce a cheap commodity for the global market. The consequences of the production process of rare earth elements are invisible to the consumer. The lack of rare earth mining regulations has had a negative impact socially and environmentally (Hurst 2010). Because China is preoccupied with supporting a growing population and future economic growth, it has neglected the social and environmental consequences of a rapid development of the rare earth industry.

Many companies ignore their social and

environmental responsibilities in order to reduce production prices of rare earth elements and in order to remain competitive in the global market (Hurst 2010). The aerial view of Bayan Obo in Inner (Nei) Mongolia shows the physical impact on the land, but it does not show the ground level social and environmental repercussions of the mining operations. For instance, many young individuals working in the mines have died from cancer, and it is suspected that the radioactive materials in the mines are to blame. There are also 5,387 residents in Baotou that suffered from black lung disease (Hurst 2010).

Furthermore, much of the wastewater from processing rare earth elements is placed in uncontained tailing ponds. These tailing ponds contain toxic and radioactive constituents such as thorium. Rare earth mining operations in Baotou have been accused of contaminating potable water, which is not only used for everyday activities, but also to irrigate crops. Much of the wastewater from processing the rare earth elements emptied into the Yellow River and travels 2092 kilometres through heavily populated areas and flow into the Yellow Sea. About 150 million people in China depend on the river as their main source of water (Hurst 2010). One resident along the Yellow River said, "In the Yellow River, in Baotou, the fish all died. They dumped the waste—the chemicals into the river. You cannot eat the fish because they are polluted" (as quoted Hurst 2010, 17). The lack of stringent regulations for rare earth mining operations have dire consequences not only for the local residents, but also for much of China's population due to pollution of rivers and streams. There is little incentive to make the rare earth mining process more environmentally friendly because of associated costs.

There is also concern in regards to the illegal mining activities that are resulting in severe environmental impacts (Hurst 2010). The rare earth elements from illegal mines are smuggled out of the country to international buyers that are searching for a cheaper supply. Hurst writes, "In 2008, approximately 20,000 tonnes of rare earth were reportedly smuggled from the country. Meanwhile, during that same year, according to official custom statistics, China exported 39,500 tons of rare earth oxide. This means that smuggling accounted for one-third of the total volume of rare earths leaving China" (Hurst, 2010 p. 15). Smuggling is harmful to China's rare earth industry because it reduces the market price and depletes the resource at a faster rate, which threatens the development and economic prosperity of China's high-tech industry. China has implemented several policies in attempt to reduce the amount of rare earth elements smuggled from China each year, but smuggling of rare earth elements remains prevalent (Hurst 2010). Furthermore, the policy-makers in China are now paying attention to the unsustainable development of the rare earth industry. Not only are they tuning into the environmental and social consequences of the rare earth industry, but also the policy-makers are focused on protecting China's reserves in order to sustain its own future economic growth and the demands of a growing population (Hurst 2010).

The geopolitical significance of the rare earth industry is better comprehended in the context of Immanuel Wallerstein's model of the modern world economic system. In *Modern World Systems*, Wallerstein discusses the hierarchy of the modern world economic system, and identifies structural patterns of uneven development (Wallerstein 2011). The

world system depends on a division of labour, in which some groups within the system are able to exploit the labour of others in order to receive a greater portion of the surplus from global economic activity. The world economies are divided into the core-states, and the peripheral areas that provide raw materials to the core. Core states have technology-based production. The semi-periphery is situated between the core and the periphery and has characteristics of both the core and peripheral areas (Wallerstein 2011).

In the context of Wallerstein's model of the world economic systems, traditionally, China would be categorized as a periphery while Japan and the US would be considered part of the global core. China provides an abundance of cheap rare earth elements to the US and Japan, and then the US and Japan apply these to high technology production. The price value of rare earth element increases when applied to high technology. This gives core states an economic advantage over the peripheral areas. Often, the core areas exploit the peripheral areas for their economic gain, while exhausting the resources in the peripheral areas as well as leaving behind a legacy of social, environmental, and economic problems. It can be said that the world economic systems is an unsustainable model of development. Recently, China has taken preventative measures against the demands of the core states in order to protect itself from over-exploitation. This model of the world economic systems is critical to better understand the geopolitical significance of the rare earth industry in the Pacific-Rim, and implications for the United State, Japan, and China, and it emphasizes the importance for core states, like the US and Japan, to have a stable supply of rare earth elements.

In terms of Wallerstein's world systems theory, it can be argued that China is no longer a peripheral area, but it has climbed the world economic system to the rank of the semi-periphery. China has looked across its borders to invest in rare earth mining operations elsewhere. China has made several direct investments in Australia's rare earth element reserves. The Australia government remains cautious to not allow Chinese investors to also establish a monopoly over its own domestic resources. Often, countries are sensitive to China's desire to mine their own rare earth elements, especially when it already has the largest rare earth reserves in the world (Hurst 2010). These countries realize the geopolitical significance of rare earth elements and the impact they have on national security.

China has taken action to reduce the export of rare earth elements, largely because of its growing internal demand and concerns of protecting itself from overexploitation of core countries such as the US and Japan. This reduction of rare earth exports has initiated a dramatic response from the international community has caused market prices to increase dramatically. Between 2009 and 2010, the overall price of rare earth elements increased by 1,500% (Martin 2011). Without the guaranteed supplies from China, international commodity chains have become increasingly fragmented and vulnerable (Eggert 2010; Eggert 2011; Hurst 2010). China's rapidly growing population and economy means that there is an increasing demand for rare earth dependent technology such as cell phones. As of 2009, China had 670 million cell phone users or approximately fifty percent of China's entire population (Hurst 2010) China has also established policies to increase the presence of green technology such

as wind turbines, and it has been estimated that green technology will soon become the largest consumer of rare earth elements (Hurst 2010). China has not only reduced export quotas, but has also established rare earth stockpiles to ensure a supply for the future needs of the country (Hurst 2010), and the restrictions of rare earth elements are likely to continue causing geopolitical tensions and vulnerabilities for many countries in the future (Eggert 2010). Currently, China remains an unstable supply for the US and Japan.

The restriction of rare earth element exports influences the US, Japan, and China's sense of national security. These countries are concerned about having a stable and secure supply of rare earth elements to plan for their future national security needs. In recent years, China has invested a lot in the development and expansion of its military and high-tech industry, and has implemented the quotas on rare earth exports with the intention of protecting future national security needs. The US and Japan, on the other hand, would like to secure the future of their militaries and high-tech industries, and to continue reducing dependency on fossil fuels and investing in alternative sources of energy. The rare earth export quotas imposed by China threaten the US and Japan's sense of national security.

On March 13, 2012, the US and Japan announced that they had filed a case against China's restriction of rare earth element exports with the World Trade Organization (WTO) (BBC 2012). China's restriction of rare earth exports inhibits Japan's production of high-tech commodities, which are crucial to Japan's economic prosperity. In 2006, Japan imported 90 percent of its rare earth elements from China,

and according to the Times newspaper, Japan receives about a third of rare earth elements through smuggling (Hurst 2010). The US is more concerned about its energy security and military defence. In the case filed with the WTO, the United States and Japan argued that China's rare earth element restrictions are violating the free trade terms, which are essential to WTO membership. President Obama stated, "If China would simply let the market work on its own, we would have no objections" (BBC 2012). The reduction of China's rare earth quotas has serious repercussions for the US, Japan, and China's sense of national security.

The case filed with the WTO will likely take several years to process. In the meantime, the US and Japan will strive to establish a stable supply of rare earth elements and build stockpiles to reduce the impact of future restrictions and ensure national security. Currently, Japan is investing in rare earth ventures in Vietnam and India, while it strives to secure supplies in Australia (Hurst 2010). Japan has also invested in rare earth recycling programs. If the market prices of rare earth elements continue to increase, then the recycling of rare earth elements will become more economically viable. The US, on the other hand, has invested in mines in Australia, and South Africa. These investments require hundreds of millions of dollars and time to be realized (Hurst 2010). The US has also provided incentives for Molycorp to re-open its Mountain Pass mine in California. The US investment in the expansion of its rare earth industry demonstrates their concern of China's control of the rare earth market and what it means for its national security. The country's economic stability, military defence, and sources of energy depend on a reliable supply of rare earth elements, which is why the

US is developing its own rare earth industry.

It is believed that the global supply of rare earth elements will continue to diversify as countries like the US and Japan realize the significance of their own rare earth elements reserves for their national security. The commodity chain of rare earth elements and their geopolitical significance in the Pacific-Rim is a matter of national security for the US, China, and Japan. The rare earth industry is a critical component of the high industry; therefore, rare earth elements are vital to economic stability, the transition to green technology, and military defence. China has a geographic advantage in the rare earth industry because of its abundant rare earth reserve and cheap supply of labour, which has resulted in poor working conditions and extreme environmental degradation in rare earth mining operations. China's monopoly of the rare earth industry threatens the political influence of the US and Japan. The restrictions imposed on rare earth trade might be necessary for China's long-term development, but it is problematic to the national security of the US and Japan. In the long term, these core states will have to diversify their supply of rare earth elements to satisfy growing demands.

REFERENCES

- BBC. 2012. US, EU and Japan challenge China on rare earths at WTO. *BBC News*, March 13. <http://www.bbc.co.uk/news/business-17348648>
- Blake, W., & Baskin, L. 1968. *Auguries of Innocence*. New York: Printed anew for Grossman Publishers.
- Eggert, R. G. 2010. Critical Minerals and Emerging Technologies. *Issues In Science & Technology* 26(4): 49-58.

- Eggert, R. G. 2011. Minerals go critical. *Nature Chemistry* 3(9): 688-691.
- Gregory, D., Johnston, R., Pratt, G., Michael, W., & Sarah, W. 2009. *The Dictionary of Human Geography. 5th ed.* West Sussex: Wiley-Blackwell.
- Goonan, T. 2011. Rare earth elements—end use and recyclability: Scientific Investigations Report 2011–5094. *US Geological Survey*, Reston, Virginia: 1-15.
- Hurst, C. 2010. China's rare earth elements industry: What can the West learn? *Institute for the Analysis of Global Security*. Washington DC: 1-42.
- Martin, R. 2011. The \$1 billion rare-earth gamble: How an American company is trying to break China's monopoly on high-tech minerals. *Fortune* 164(9):122.
- Pond, E. 2010. Urbanism on the steppe. *World Policy Journal* 27(4): 41-47
- Wallerstein, I. 2011. *Modern world-system I: Capitalist agriculture and the origins of the European world-economy in the sixteenth century*. Berkeley: University Of California Press.
- Yu Shujun. 2012. Rare earth resolution. *Beijing Review* 55(13): 36.

