

APPENDIX D-1



March 5, 2019

James Gunvaldsen Klaassen
Barrister & Solicitor | Ecojustice
520-1801 Hollis Street, Halifax, NS B3J 3N4

Dear Mr. Gunvaldsen Klaassen,

Please find below comments on the document “Replacement Effluent Treatment Facility Project,” prepared by Dillon Consulting for North Pulp Nova Scotia Corporation, and submitted for environmental assessment, in accordance with Part IV of the Environment Act.

My comments are based on my training, research and experience as an Associate Professor, Endowed Chair in Sustainability and Environmental Health, Director of the Environmental Science program, and as a Senior Research Scholar with the Healthy Populations Institute at Dalhousie University in the fields of environmental epidemiology and health geography. I hold a Ph.D. in Population Health Science from the University of Ottawa and have conducted research in the area of air pollution epidemiology for more than a decade. I have also participated as a Co-investigator on a Canadian Institutes of Health Research-funded project to evaluate the health and environmental conditions of residents in Pictou Landing First Nation (PLFN) which employed a two-eyed seeing approach to evaluate environmental exposure and community health status in the community.

Given my background the following comments explore the potential for health-related impacts arising from the project and ongoing operation of the pulp mill, and form a response to the following questions:

1. Please identify the portions of the materials filed by Northern Pulp as part of its registration package on which you are qualified to comment based on your expertise.

I have reviewed specific sections of the Registration Document as they relate to my expertise, including Sections 1-7, Section 8.1 on air emissions, Section 8.2 on noise, and Sections 9.1, 9.2.1, and 9.2.4.1 on health effects.

2. Within the portions of the materials identified in your response to question 1, what is your opinion with respect to the major findings and conclusions expressed in the materials?

Section 6.7, Page 117: Concerns by community members living in Pictou Landing First Nation (PLFN) and others were raised about perceived high incidence of cancers. The use of the 2018 NSCCP report (Saint-Jacques et al., 2018) is not an adequate response to this concern for several reasons. The report estimates cancer incidence for the county (Pictou) and not for sub-regions within the county or for populations surrounding the mill. In addition, the report does not provide detailed reporting of specific cancers that could be linked to ingestion of weakly-chlorinated compounds, such as bladder, pancreatic and other cancer sites, via consumption of marine or terrestrial food sources, or the inhalation of fine particles from stack emissions.

Saint-Jacques N, Dewar R, Nauta L, MacIntyre M. 2018. Nova Scotia Cancer Incidence and Survival. Statistics Update: Focusing on 2011-15. Registry & Analytics, Nova Scotia Cancer Care Program, Nova Scotia Health Authority.

Section 9.1: The Registration Document identifies two main sources of emissions or discharges that may result in potential human exposure to toxins, including air emissions from the replacement ETF and existing mill and the marine treated effluent diffuser. The evaluation does not include the estimation of human health impacts, even if low risk, arising from contamination of ground and well water supplies due to leakage from the effluent pipe from mechanical or connection failures at drain valve locations.

Regarding effluent characteristics the report claims that the actual chemical composition, including specific substances in the treated effluent and their associated concentration, are not known with certainty until operations begin. However, it is well within the capacity of the proponent to develop emission/effluent models with varying degrees of uncertainty associated with chemical composition. What is known is that the effluent will contain low but detectable levels of chlorinated by-products, some of which are high toxic, mutagenic and that can bioaccumulate even in small amounts.

The registration document refers to a toxicological report authored by scientists with Toxikos (2006) that reported negligible risks to human health from consumption of marine-based food sources exposed to effluent discharge near the diffuser. However, the report does not include assessment of chlorinated aliphatic compounds which may still be present at low concentrations even under modern effluent treatment conditions. The reason provided for this omission is the notion that modern kraft pulp production uses chlorine dioxide as a bleaching agent which results in significant reductions in chlorinated residual compounds in effluent.

However, although concentrations of chlorinated compounds have decreased significantly from levels generated by mills employing elemental chlorine as a bleaching agent, they have not been eliminated by the use of chlorine dioxide (Bajpai, 2015).

Bajpai P. Green Chemistry and Sustainability in Pulp and Paper Industry. Switzerland: Springer International Publishing, 2015.

Toxikos. 2006. Human Health Risk Assessment – Bell Bay Pulp Mill Effluent. Prepared for: Gunns Ltd. Prepared by: Toxikos Pty Ltd., Toxicology Consultants. TR081205-RJF. July, 2006.

Section 9.2.1: The registration document identifies three exposure pathways, including inhalation, ingestion and dermal absorption. However, it is now well recognized, supported by a substantive evidence base, that exposure to harmful or beneficial characteristics of the environment may also occur through visual and aural routes leading to physiological impacts, eg. via damage to hearing, or the development of psychological impacts leading to increased stress response and mental health challenges. The development of (perceived) community illness (e.g. cancer incidence) in PLFN offers an interesting case example of how contamination of the environment, particularly environments with long-standing valued ecosystem components (VECs), e.g. hunting, fishing, recreational and spiritual values, leads to a severing of community connections to the surrounding environment and a real or perceived impact of contamination on health in the community. Additional impacts may also arise in the broader community, particularly among the fishing sector which may experience challenges with the sale of products sourced from locations near the effluent diffuser.

Section 9.2.4.1 : The registration document outlines the identification of Chemicals of Potential Concern (COPC) in air emissions associated with different aspects of the project. Specifically, the report evaluates emissions regulated in Nova Scotia under current air quality regulations and existing approvals for the emissions of fine particles. These pollutants include, and are limited to, carbon monoxide (CO), hydrogen sulphide (H₂S), nitrogen dioxide (NO₂), sulphur dioxide (SO₂), total suspended particulate matter (TSP), and fine particulate matter (PM_{2.5}). According to the report, ambient air monitoring data for the last three years show no exceedances when assessed against current Nova Scotia Air Quality Regulations, other than the occasional instances of excess H₂S releases. However, the report provides no data or discussion with reference to speciation of particulates, specifically fine particles (PM_{2.5}) which may have significant health impacts at any level above background.

Much of the epidemiological literature on the association between fine particles and human health impacts employs measurements of particle mass of a specific aerodiameter as a fraction of air volume, and as a function of exposure. However, not all particles and their associated chemical composition are created equally; those arising from emissions associated with the creation of kraft pulp will have chemical signatures and composition that differs from other sources. Typical *speciation methods* will enable detection of particle- and gas-phase organic and carbonyl compounds, metals, as well as determination of air toxics typical to emissions from pulp and paper operations using recovery boilers. Although there are several sources of air emissions, including fine particle emissions, within the study area, speciation of fine particles would provide data on the fraction of PM_{2.5} associated with mill operations and the potential for human exposure to air toxics characteristic to kraft pulp operations.

Section 9.2.4.2: In addition to air emissions, human exposures to mill emissions are possible via ingestion of marine organisms exposed to substances released at the location of the effluent diffuser (Page 495). Of greatest concern would be chlorinated COPCs such as chlorinated aliphatic hydrocarbons, chlorinated organics and metals such as cadmium and mercury. In addition to chlorinated compounds, the effluent is likely to contain endocrine disrupting compounds such as androstenediones and other substances with androgenic or estrogenic properties. These substances may interfere with endocrine balance critical to fish or reproduction of other marine organisms, thus affecting associated populations relevant to commercial and recreational fishing operations. The proposed Environmental Assessment follow-up and performance monitoring program should include monitoring programs of marine species relevant to human exposure pathways.

3. What is your view as to the reliability of the underlying research conducted and relied upon in reaching the findings and conclusions? What if any information gaps or data gaps exist within the materials? If so, what impacts, if any, do those gaps have on the data and on the reliability of the conclusions that can be drawn, or are drawn, from that data?

I am confident in the reliability of the underlying research conducted and relied upon in supporting the findings and conclusion presented in sections of the Registration Document reviewed for the purposes of developing the comments in this letter. However, there are instances of statements and conclusions made in the document that are not well supported by the evidence referenced.

For example, reference to provincial cancer statistics released at the county level do not provide evidence of no negative effect on human health associated with exposures to mill effluent among residents of PLFN (Page 117).

In another example, the document relies heavily on analysis (Toxikos, 2006) of effluent from a proposed mill. In other words, the true chemical composition of the effluent is unknown and toxicological analysis was based on sample effluent taken from operating mills of similar design at dilutions equal to or less than 10% which does not account for potential diffusion problems.

In terms of routes of human exposure, the registration document omits research on the psychological impacts of the project, limiting exposures to traditional routes such as inhalation, ingestion and dermal absorption. The notion of releasing pollution (formally identified as effluent) into the local environment will invariably increase stress levels in the communities affected, regardless of efforts made to dilute the pollution in the receiving media. The result of the omission is an inability to recognize and assess health effects of stress associated with perceived contamination of the local environment and potential impacts to local livelihoods.

The registration document also omits reference to the practice of speciation as a legitimate approach to the identification of fine particulate pollution origin. Although measured concentrations of fine respirable particulate pollution are within guideline values it should also be recognized that: 1) there is no safe level of exposure to fine particulate pollution, and 2) the chemical composition of particles varies with source so that the toxicity of particulate pollution will also vary with the source. The omission of any reference to speciation limits the reliability of the conclusion of no significant impact arising from the proposed project or continuing mill operations.

4. What significant assumptions are relied upon in the materials filed by Northern Pulp, and what is your view as to the reliability of each such assumption? What is the impact of each assumption on the findings contained in the Northern Pulp materials?

There are several significant assumptions contained with the materials filed by Northern Pulp.

Assumption 1: There is no evidence of increased cancer risk associated with mill operations, either historic or proposed modifications to these operations. The materials do not provide any evidence in support of this assumption other than a provincial report of cancer prevalence for the county as a whole. The use of this report would support the assumption that there is no variation in cancer prevalence within the county.

Assumption 2: The analysis and conclusions reached as part of a toxicological analysis of potential effluent (not actual effluent) from a proposed mill in another location are applicable to the proposed project. While the science underlying the analysis is likely to be sound, the conclusions may not be as reliable as portrayed in the registration document.

Assumption 3: The identification of human exposures assumes no impact on health associated with perceived risk of pollution discharge, regardless of dilution, in areas of concern including local wetlands, groundwater recharge zones, and in active fishing grounds. The conclusion of no significant impact on health is potentially erroneous in this context.

Assumption 4: Current air emissions from the mill are well within provincial and federal air quality guidelines and thus there are no potential health effects from air pollution exposures. This assumption does not acknowledge the fact that there are no “safe” concentrations of air pollution, particularly for particulate air pollution which has been shown to have health effects even at low concentrations (Cohen et al., 2017; ECCC, 2017). Moreover, the materials assume that particulate air pollution, regardless of source, will have similar health impacts. However, without conducting speciation analysis on particles collected in receptor communities, the impact of mill emissions cannot be discounted by concluding that there are a variety of air pollution sources within the vicinity of local populations (e.g., power plant, tire plant, vehicular emissions, fugitive dusts, etc.). The conclusion of no significant impact on health may not be accurate.

Cohen et al. Estimates and 25-year trends of the global burden of disease attributable to ambient air pollution: an analysis of data from the Global Burden of Diseases Study 2015. *Lancet* 2017;389:1907-18.

<http://ec.gc.ca/indicateurs-indicators/default.asp?lang=en&n=CB7B92BA-1&pedisable=true>.
Accessed: February 22, 2019.

5. Within the portions of the materials identified in your response to question 1, are there any [findings/issues/etc] on which you are unable to express an opinion? If so, why are you unable to express an opinion? What, if anything, would enable you to express such an opinion?

There are no portions in the sections identified in my response on which I was unable to express an opinion.

Thank you for the opportunity to provide comments on the environmental assessment materials submitted by Northern Pulp.

Sincerely,



Daniel Rainham, Ph.D.
Director, Environmental Science
Senior Research Scholar, Institute of Population Health

APPENDIX D-2

DANIEL G. C. RAINHAM, PH.D.

CURRICULUM VITAE

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Daniel Rainham, Ph.D.

PERSONAL:

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International Society for Children's Health and the Environment
International Society for Environmental Epidemiology
American/Canadian Association of Geographers
Children and Nature Network
Geomatics Association of Nova Scotia

EDUCATION:

2003-2009 (Ph.D.) University of Ottawa, Ottawa, Ontario, Canada
Major: Population Health Science; Specialization: Health & Place
Supervisors: Daniel Krewski, Ph.D. and Ian McDowell, Ph.D.

1998-2000 (M.Sc.) University of Alberta, Edmonton, Alberta, Canada
Major: Atmospheric Sciences; Specialization: Medical Geography
Supervisor: Karen Tomic, Ph.D.

1994-1998 (B.E.S. hon.) University of Waterloo, Waterloo, Ontario, Canada
Major: Environment & Resource Studies; Minor: Music
Supervisor: Paul Kay, Ph.D.

OVERVIEW OF RESEARCH PROGRAM

I am an Associate Professor in Environmental Science and Senior Research Scholar with the Healthy Populations Institute at Dalhousie University. My research is focused at the nexus of population health science, environmental epidemiology and health geography. Specifically, I investigate people-environment interactions and how these interactions affect health and well being. These efforts are supported by innovations in wearable sensors and spatial analytics, and have most recently been applied to patient management strategies, physical activity interventions and empirical research on the role of nature contact in supporting healthy behaviours.

PROFESSIONAL EXPERIENCE

Position	Organization	Department	Start Date (MM/YR)	End Date (MM/YR)
<i>I. Current Appointments</i>				
Director	Dalhousie University	Environmental Science	07/2015	-
Associate Professor (Chair in Sustainability and Environmental Health)	Dalhousie University	Environmental Science	07/2014	-
Assistant Professor (Chair in Sustainability and Environmental Health)	Dalhousie University	Environmental Science	01/2009	06/2014
Assistant Professor – Jointly Appointed	Dalhousie University	College of Sustainability	09/2009	07/2015
Assistant Professor – Cross Appointed	Dalhousie University	School of Planning	09/2010	-
Assistant Professor – Cross Appointed	Dalhousie University	Earth Sciences	09/2010	-
Assistant Professor – Cross Appointed	Dalhousie University	Community Health and Epidemiology	09/2012	-
Assistant Professor – Cross Appointed	Dalhousie University	Health and Human Performance	09/2012	-
Assistant Professor – Cross Appointed	Dalhousie University	School for Resource and Environmental Studies	09/2012	-

 II. *Previous Appointments*

Research Associate	University of Ottawa	McLaughlin Centre for Population Health Risk Assessment	09/2004	12/2008
Lecturer	Dalhousie University	Health and Human Performance	09/2001	12/2002
Instructor	MacEwan University	Faculty of Arts and Science	09/1998	12/1999

AWARDS AND HONOURS

<i>Award</i>	<i>Institution</i>	<i>Amount</i>	<i>Start Date (MM/YR)</i>	<i>End Date (MM/YR)</i>
Elizabeth May Chair in Sustainability and Environmental Health	Dalhousie University	Endowment (Approx. \$2.3 million)	01/2009	-
CIHR Doctoral Research Award	University of Ottawa	\$19,900/annum	04/2004	04/2007
Doctoral Admission Scholarship	University of Ottawa	\$11,000/annum	09/2004	09/2008
Research Development Award	Environment Canada	\$14,000	09/1999	05/2000
Alberta Graduate Scholarship	University of Alberta	\$9,000	09/1999	09/2000
J. Gordin Kaplan Graduate Award	University of Alberta	\$1,000	09/1998	09/1999
Senate Scholarship	University of Waterloo	\$500	01/1996	04/1996

RESEARCH SUPPORT*Research Grants and Contracts (funded)*

Date	Agency (Role)	Title	Amount
2019-2022	Canadian Institutes of Health Research Villeneuve P, Crouse D, Dales R, Griffith L, Hystad P, Raina P, Rainham DG , Ross N.	Does residential proximity to natural environments impact the mental health and well-being of participants of the Canadian Longitudinal Study on Aging?	\$191,251
2019-2020	Canadian Institutes of Health Research Rainham DG , Crouse D, Gilliland J, Villeneuve P, van den Bosch M, Collyer C, Duinker P.	Optimizing Health and Sustainability Interventions on Schoolgrounds (OHASIS): Increasing Green Infrastructure for Healthy Cities	\$100,000
2019-2020	Nova Scotia Health Research Foundation Stone M, Joshi N, Miller L, Rainham DG , Cawley J, Rehmen L, Turner J, Kolen A, Kirk S, McIsaac J-L.	#PLEYRocks: A knowledge sharing strategy to improve children's physical literacy through quality outdoor play in Nova Scotia early years settings	\$10,000
2018-2021	Nova Scotia Health Research Foundation St. Jacques N, Terashima M, Dummer T, Rainham DG , Brown P, Purcell J.	Nova Scotia Community Cancer Matrix	\$107,661
2018	Canadian Institutes of Health Research Rainham DG , Crouse D (Co-PI), Collyer C, Gilliland J, Katapally T, Villeneuve P, van den Bosch M.	A Nature-based Solutions Research Incubator (NBSRI) for Healthy Cities	\$10,000
2018	Canadian Institutes of Health Research Katapally T, Osgood N, Rainham DG	A System Sciences Approach to Building Healthy, Equitable, and Smart Cities: a citizen science-driven population health intervention	\$10,000
2018	Canadian Institutes of Health Research Kestens Y (PI), Fuller D, Rainham DG (Co-Inv) , Widener M, Winters M.	INTervention Research Across Cities Team	\$10,000

Date	Agency (Role)	Title	Amount
2017-2018	Canadian Institutes of Health Research Rainham DG (PI) , Fuller D, Gilliland J, Kestens Y, Shooshtari M.	Location Sensor Analysis Platform (LSAP)	\$53,750
2017	Canadian Institutes of Health Research, Public Health Agency of Canada, MaRS Discovery Rainham DG (PI) , Buckeridge D, Doherty S, Stewart B.	National Dashboard of PASS Health Behaviours	\$10,000
2017-2020	Nova Scotia Health Research Foundation Terashima M, Rainham DG (Co-Inv) , Kirk S, Kephart G, Habib M.	Spatial Accessibility to Four Services and their Influence on Health Inequality	\$147,792
2016 – 2021	Canadian Institutes of Health Research Brook J, Stieb D, Awadalla P, Brauer M, Hu H, Mcgrail K, Subbarao P (PIs), Pantelimon O, Atkinson S, Azad M, Carlsten C, Chaumont D, Copes R, Davies H, Demers P, Dunn J, Evans G, Feddema J, Habib M, Hakami A, Hatzopoulou M, Henry D, Johnson M, Lou W-Y, Mclaughlin J, Rainham D (Co-Inv) , Ross N, Smargiassi A, Takaro T, van den Bosch M, Villeneuve P.	CANadian Urban Environmental (CANUE) Health Research Consortium	\$4,165,000
2016 – 2018	Saskatchewan Health Research Foundation Katapally T, Tremblay M, Larouche R, Osgood N, Longo J, Rainham DG , Leatherdale S, Ferguson L.	Smart Active Living Policy	\$118,500
2016 - 2017	Canadian Institutes of Health Research Villeneuve P (PI), Brauer M, Hakami A, Weichenthal S, Davies H, Kennedy J, Moola F, Peters C, Pinault L, Rainham D (Co-Inv) , Tjepkema M.	Mortality Impacts of the Urban Built Environment in Canada: Evaluating the Role of Environmental and Socio-Demographic Factors	\$48,823
2015 - 2020	Social Sciences and Humanities Research Council of Canada Ramos H (PI), Grant J, Haan M, Kaida L, McDonald T, Radice M, Rainham (Co-Inv) , Stoddart M, Thériault L, Wilkes R.	Perceptions of Change in Atlantic Canadian Cities	\$418,924
2014 - 2016	Dalhousie Research Development Fund (SSHRC) Rainham D (PI) , Johnson S	Evaluating the Role of Nature Contact on Cognitive, Social and Physical Outcomes in Older Adults	\$4,460

Date	Agency (Role)	Title	Amount
2014 – 2016	Heart and Stroke Foundation of Nova Scotia/CIHR (Bridge Funding) Blanchard C (PI), Warburton D, Rhodes R, King-Shier K, Grace S, Reid R, Sweet S, Giacomantonio N, McGowan E, Saunders T, Rainham D (Co-Inv) , Witcher C.	Cardiac rehabilitation sedentary behaviour correlates (CARES)	\$59,820
2013 – 2015	Canadian Institutes of Health Research Muhajarine N, Fuller D, Katapally T, Osgood N, Rainham D (Co-Inv) , Stanley K.	A Step towards Creating Active Urban Communities: Informing Policy by Identifying and Mapping Locations of Seasonal Activity Accumulation	\$388,756
2012 - 2015	Canadian Institutes of Health Research Blanchard C (PI), Fowles J, Giacomantonio N, Plotnikoff R, Rainham D (Co-Inv) , Rhodes R, Shields C, Vallis M.	Lifestyle Activity Correlates for Diabetics (LIFE)	\$384,679
2012 - 2014	Nova Scotia Health Research Foundation Dummer T (PI), Otley A, Parker L, Rainham D (Co-Inv)	Why does Nova Scotia have the highest incidence rate of inflammatory bowel disease (IBD) in the world? Exploring the role of environmental factors	\$99,750
2012 - 2015	Canadian Institutes of Health Research Castleden H (Co-PI), Martin D (Co-PI), Adams M, Campbell D, Clow B, Gibson M, Jamieson R, Rainham D (Co-Inv) , Russell R, Steenbeek A, and Collaborators.	A 'two-eyed seeing' approach to researching environmental health concerns with Pictou Landing First Nation	\$444,639
2012 - 2013	Social Sciences and Humanities Research Council of Canada Johnson S (PI), Rainham D (Co-PI) , McGonnell M.	Effects of Exposure to Nature in Children: An Interdisciplinary Exploration	\$34,110
2012 - 2013	Canadian Breast Cancer Foundation Blanchard C (Co-PI), Keats M (Co-PI), Rainham D (Co-Inv) , Younis T.	Breast Cancer Environmental Activity Correlates Trial (BREAST)	\$143,568
2011 - 2012	Health Canada Rainham D (PI)	School-based Air Quality Study	\$22,015

Date	Agency (Role)	Title	Amount
2011 - 2012	Dalhousie Research Development Fund Johnson S (PI), Rainham (Co-PI)	The Effects of Nature Exposure on Attention and Well-being in Children	\$4,490
2011 - 2012	Capital Health Research Fund Blanchard C (PI), Keats M, Rainham D (Co-Inv)	Environmental influences on physical activity behaviours in breast cancer patients: A pilot study	\$14,784
2011 - 2014	Canadian Institutes of Health Research Kirk S (Co-PI), Rainham D (Co-PI) , Rehman L, Shearer C, Blanchard C, Chircop A.	TIME (Tools, Information, Motivation, Environment) for health: A multi-level intervention to promote healthy eating in children and their families	\$598,553
2011 - 2013	Cancer Research Society Dummer T, Rainham D (Co-Inv) , Parker L.	Cancer risk and outdoor air pollution in Halifax Regional Municipality, Nova Scotia	\$117,520
2011 - 2013	Health Canada Gibson M (Co-PI), Rainham D (Co-PI) , Duck T, Pierce J, Pegg M, Satish M, Jamieson R.	Halifax Marine Emissions Study	\$265,920
2011	Nova Scotia Health Research Foundation Kirk S (PI), Shearer C, Barro K, Rainham D (Co-Inv)	Obesity and Health Inequities	\$10,000
2011 - 2012	Nova Scotia Lung Association Rainham D (PI) .	Map of Radon Potential for Health Risk Exposure Assessment	\$8,320
2011 - 2014	Canadian Foundation for Innovation Rainham D (PI) .	UrbanSense: Infrastructure for an Urban-Scale Environmental Sensor Network	\$300,809
2010 - 2011	Health Canada Rainham D (PI) , Dummer T.	Measurement and Analysis of Air Quality and Noise in Halifax Regional Municipality	\$55,609
2010 - 2011	Canadian Institutes of Health Research Rainham D (PI) , Shookner M, Blanchard C, Lyons R.	Knowledge Synthesis on Measures of Environmental Deprivation in Health Inequalities (MEDHI) Research: A Knowledge Synthesis on the Environment	\$72,864

Date	Agency (Role)	Title	Amount
2010 – 2012	Nova Scotia Health Research Foundation Rainham D (PI) , Blanchard C.	Development of a Health Geo-Informatics Service (HEALGIS)	\$48,792
2010 – 2013	Canadian Institutes of Health Research Blanchard C (PI), Lyons R, Rainham D (Co-Inv) , Murnaghan D, Rhodes R, Giacomantonio N, Young W, Reid R, Kirkland S, & Spence J.	Environmental Physical Activity Correlates after Cardiac Hospitalization (EPOCH)	\$484,988
2010 – 2013	Nova Scotia Health Research Foundation Blanchard C (PI), Rainham D (Co-Inv) , Giacomantonio N, Lyons R.	Environmental Correlates Of Cardiac Rehabilitation (ENCORE)	\$145,269
2009 – 2010	Capital Health Innovation Fund Blanchard C (PI), Rainham D (Co-Inv) , Giacomantonio N.	Community and Environmental Factors Influencing Drop-out and Adherence to Cardiac Rehabilitation	\$25,000
2009 – 2010	Heart and Stroke Foundation Canada Blanchard C (PI), Rainham D (Co-Inv) , Giacomantonio N, Cyr C, Dufour-Doiron M.	Community and Environmental Factors Influencing Drop-out and Adherence to Cardiac Rehabilitation	\$14,985
2009 – 2010	Public Health Agency of Canada Rainham D (PI) , Willison M.	Healthy Housing, Health Community Project	\$35,000
2009 – 2010	QEII Research Foundation Parker K (PI), Rainham D (Co-PI) .	Development of an Objective Evaluation Device to Measure the Impact of Learning Wheelchair Skills	\$5,000
2009	Canadian Institutes of Health Research Rainham D (Co-PI) , Blanchard C (Co-PI).	Environmental Correlates Of Cardiac Rehabilitation (ENCORE) - Pilot	\$9,853
2007 – 2012	Canadian Institutes of Health Research / Heart and Stroke Foundation Lyons R (PI), Grant J (Co-PI), Arthur M, Blanchard C, Chircop A, Dummer T, Kirk S, Parker L, Pitter R, Rehman L, Rainham D (Co-Inv) , Shields C.	Optimizing Investments in the Built Environment to Reduce Youth Obesity	\$597,437

Research Grants and Contracts in Development

Date	Agency (Role)	Title	Amount
2019-2022	Canadian Institutes of Health Research Rainham, D (PI) , James P, Villeneuve P, Crouse D, Lanphear B.	The Impact of Green Space on Mental Health of Canadian Children	\$ 330,000

Total Funding to Date (since 2009): **\$ 9,788,691**

Total Funding As Principal Investigator (*incl. Co-Pi*): **\$ 1,639,545**

PUBLICATIONS**Theses:**

1. Rainham DG. (2008) *Human healthscapes as an approach to measuring context in research on place and health*. Ph.D. Thesis, Institute of Population Health, University of Ottawa, ON. pp. 231.
2. Rainham DG. (2000) Atmospheric risk factors of human mortality. M.Sc. Thesis, Earth and Atmospheric Sciences, University of Alberta, AB. pp. 146.

Refereed Journal Articles: Citations=1842; h-index=19; i10-index=26; RG Score=31.55
(students/trainees are **underlined**)

- 51 Houser N, Cawley J, Kolen A, **Rainham DG**, Rehman L, Turner J, Kirk S, Stone M. A loose-parts randomized controlled trial to promote active outdoor play in preschool-aged children: Physical Literacy in the Early Years (PLEY) project. *Methods and Protocols* 2019; (Submitted).
- 50 Stone M, Houser N, Cawley J, Kolen A, **Rainham DG**, Rehman L, Turner J; Kirk S. Accelerometry-measured physical activity and sedentary behaviour of preschoolers in Nova Scotia, Canada. *Applied Physiology, Nutrition and Metabolism* 2019. <http://dx.doi.org/10.1139/apnm-2018-0683>.
- 49 Daley K, Jamieson R, **Rainham DG**, Truelstrup Hansen L, Harper S. Screening-level microbial risk assessment of acute gastrointestinal illness attributable to wastewater treatment systems in Nunavut, Canada. *Science of the Total Environment* 2018; 657:1253-1264.
- 48 Johnson S, Snow S, Lawrence M, **Rainham DG**. Quasi-randomized trial of contact with nature and effects on attention in children. *PLOS ONE* (*In Review*).

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- 47 Oiamo T, Davies H, **Rainham DG**, Rinner C, Drew K, Sabaliauskas K, Macfarlane R. A combined emission and receptor-based approach to modelling environmental noise in urban environments. *Environmental Pollution* 2018; <https://doi.org/10.1016/j.envpol.2018.08.016>.
- 46 Villeneuve P, Shehata M, **Rainham DG**, Ambrose S, Kumar N, Root A, DiMuzio J, Ysseldyk R, Xi M. Are greener and more walkable neighbourhoods associated with increased physical activity and better self-rated health in Ottawa, Canada? *International Journal of Environmental Research and Public Health* 2018;15(8).
- 45 Blanchard CM, Forbes C, Keats M, Younis T, **Rainham DG**. Changes in objectively measured activity behaviour among women undergoing breast cancer treatment: longitudinal cohort study. *Rehabilitation Oncology* 2018;36(4):198-205.
- 44 Crouse D, Balram A, Hystad P, Pinault L, van den Bosch M, Chen H, **Rainham DG**, Thomson E, Close C, van Donkelaar A, Martin R, Ménard R, Robichaud A, Villeneuve P. Associations between living near water and risk of mortality among urban Canadians. *Environmental Health Perspectives* 2018;126(7): <https://doi.org/10.1289/EHP3397>.
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 - 1 **Rainham DG**, Wright TSA. Feds fish for support: A ripple of cautious optimism greets new Oceans Act. *Alternatives Journal* 1997; 23:10-12.

Book Chapters:

1. **Rainham DG**, McDowell I, Krewski D. A Sense of Possibility: What does governance for health and ecological sustainability look like? Chapter 9. In: Soskolne CL, Westra L, Kotze LJ, Mackey B, Rees WE, Westra R. (Editors). *Sustaining Life on Earth: Environmental and Human Health Through Global Governance*. Lexington Books: Lanham, Maryland, USA, 2007.
2. **Rainham DG**, McDowell I., Wilson J. Does improving well-being inevitably drain natural capital? In: Leal Filho, W.(ed) *Handbook of Sustainability Research*. Peter Lang Scientific Publishing, Frankfurt, 2005.
3. Vasseur L, Schaberg PG, Hounsell J, with **Rainham DG**, and others. Ecosystem health and human health: healthy planet, health living. In: Costanza R, Jorgensen SE. (Editors). *Environmental Problems in the 21st Century: Toward a New, Integrated Hard Problem Science*. Elsevier: San Diego, USA, 2002.

Non-Refereed Contributions and Reports:

1. Pictou Landing Native Women's Group, Castelden H, Lewis D, Jamieson R, Gibson M, **Rainham DG**, Russel R, Martin D, Hart C. *Our Ancestors Are in Our Land*,

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- Water, and Air”: A Two-Eyed Seeing Approach to Researching Environmental Health Concerns with Pictou Landing First Nation. Final Report. 2016.
2. Gibson M, **Rainham DG**. Halifax Marine Emissions Study: Final Report. Contract report for Dr. Amanda Wheeler, Exposure Assessment Section, Health Canada, Ottawa, Ontario. March 2013.
 3. **Rainham DG**. Report on School-Based Air Quality Measurement: Pilot Study. Contract report for Dr. Amanda Wheeler, Exposure Assessment Section, Health Canada, Ottawa, Ontario. October 2012.
 4. **Rainham DG**, Gibson M. Halifax Marine Emissions Spatial Study. Contract report for Dr. Marika Egyed, Fuels Assessment Section, Air Health Science Division, Health Canada, Ottawa, Ontario. March 2012.
 5. **Rainham DG**, Dummer T. Measurement and Analysis of Air Quality and Noise in urban Halifax. Report fulfilled under contract with Air Health Science Division of Health Canada, Ottawa, Ontario. May 2011.
 6. Steiger H, Yue G, Willison M, **Rainham DG**. Putting Spryfield on the Map. A Partner Project of Chebucto Communities Development Association and the Health Geomatics Laboratory. Supported with funding from the Public Health Agency of Canada. March 2010.
 7. Rainham DG. Environmental Burden of Disease in Canada. Chapter 5 in Discussion Document: Environmental Burden of Disease in Canada. McLaughlin Centre for Population Health Risk Assessment & Health Canada. Ottawa, Ontario. January 2007.
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 9. Smoyer K.E, **Rainham DG**, Hewko JN. Integrated Analysis of Heat-Related Mortality in the Toronto-Windsor Corridor. Environment Canada, Atmospheric Environment Service. Toronto-Niagara Region Study on Atmospheric Change, Report and Working Paper Series. Report 99-1, Contract KM170-8-6640. 1999.

Papers/Abstracts Published in Conference Proceedings:

1. Villeneuve P, Root A, Kumar N, Ambrose S, DiMuzio J, **Rainham DG**, Ysseldyk R. Are Neighbourhood Walkability and Greenness Associated with Increased Physical Activity and Better Self-Rated Health? Findings from the Beyond Health Survey of Adults in Ottawa, Canada. *Journal of Transport and Health* 2017;5:S88.
2. Awan T, **Rainham DG**, Johnson S, McSweeney J. Children want to spend time in outdoor nature but rarely do: A study exploring how children in Nova Scotia engage with nature. 29th International Congress of Applied Psychology (ICAP 2018), Montreal, QC, June 26-30, 2018.
3. Forbes CC, Keats M, **Rainham DG**, Younis T, Blanchard CM. (2017, June). Environments associated with moderate-to-vigorous physical activity in breast cancer survivors in Nova Scotia, Canada. Annual meeting of the International Society for Behavioural Nutrition and Physical Activity, Victoria, British Columbia.
4. Daley K, Jamieson R, **Rainham DG**, Castleden H, Truelstrup Hansen L, Harper S, Furgal C, Ell E. The social context of drinking water, sanitation and public health in the Arctic territory of Nunavut, Canada. In ARTEK Event 2016 – International Conference Sanitation in Cold Climate Regions. (pp. 21-22). Arctic Technology Centre, DTU Technical University of Denmark.
5. Balish S, **Rainham DG**, Blanchard CM. Digit-ratio (2D:4D) predicts youth sport motivation through feelings of self-assurance. Proceedings of the SCAPPS (Canadian Society for Psychomotor Learning and Sport Psychology) 2016 Annual Conference. *Journal of Exercise, Movement and Sport* 2016;48(1).
6. Lewis D, Castleden H, Martin D, Jamieson R, **Rainham DG**, Gibson M, & Pictou Landing Native Women's Group. Understanding the impacts of industrial development on health within a relational worldview. Royal Geographical Society Annual International Conference 2016, London, UK.
7. **Rainham DG**. A wireless sensor network for urban environmental health monitoring: Urbansense. Proceedings of the 9th International Symposium on Digital Earth (ISDE9), Halifax, Nova Scotia. 2016. <http://iopscience.iop.org/article/10.1088/1755-1315/34/1/011006>
8. Blanchard CM, Campbell N, **Rainham DG**, Giacomantonio N. Translating physical activity recommendations into steps per day for cardiac rehabilitation patients. Proceedings of the SCAPPS (Canadian Society for Psychomotor Learning and Sport Psychology) 2015 Annual Conference. *Journal of Exercise, Movement, and Sport* 2015;47(1).

9. Forbes C, Laczy R, Keats M, **Rainham DG**, Younis T, Blanchard CM. Prevalence of objectively measured physical and sedentary behaviour in Nova Scotia breast cancer survivors undergoing adjuvant therapy. *Journal of Exercise, Movement, and Sport* 2015;47(1).
10. Balish S, Deaner R, **Rainham DG**, Blanchard CM. Does gender inequality moderate sex differences in sport across countries? *Journal of Exercise, Movement, and Sport* 2015;47(1).
11. Saunders T, Jason T, MacKay J, Giacomantonio N, **Rainham DG**, Blanchard CM. Associations of Sedentary Behavior, Light Physical Activity and Moderate to Vigorous Physical Activity with Clinical and Psychological Outcomes in Cardiac Rehabilitation Patients. *Canadian Journal of Diabetes* 2015;39(Suppl. 1):S66.
12. Poirier A, Dodds L, Johnson M, Dummer T, **Rainham DG**. Associations between exposure to air pollution and gestational hypertension in urban Halifax. *Journal of Epidemiology and Community Health* 2015;69:A2.
13. **Rainham DG**, Brown PE, Sampalli T, Fox R. Spatial variation in cumulative incidence of multiple chemical sensitivity. In: Abstracts of the 2014 Conference of the International Society of Environmental Epidemiology (ISEE). Abstract 2305. Research Triangle Park, NC: Environmental Health Perspectives; <http://dx.doi.org/10.1289/ehp.isee2014>.
14. Ferrier S, Blanchard CM, Giacomantonio N, **Rainham DG**, Murnaghan D, Rhodes R, Reid R, Warburton D, Spence J, King-Shier K, McGowan E, Lyons J, Kirkland S. Demographic and clinical correlates of sedentary behaviour in heart disease patients. Proceedings of the SCAPPS (Canadian Society for Psychomotor Learning and Sport Psychology) 2013 Annual Conference. *Journal of Exercise, Movement, and Sport* 2013;44(1).
15. Balish S, McLaren C, Rainham D, Blanchard C. Correlates of youth sport attrition: A review and future directions. North American Society for the Psychology of Sport and Physical Activity Conference, New Orleans, 2013. *Journal of Sport & Exercise Psychology* 2013; 35: S75.
16. Blanchard, C.M., **Rainham, D.**, McSweeney, J., Spence, J.C., McDonnell, L., Reid, B., Rhodes, R., McGannon, K., Edwards, N. Community socioeconomic status, urban sprawl, and the perceived environment's relationship to physical activity during home-based cardiac rehabilitation. *Journal of Cardiopulmonary Prevention and Rehabilitation* 2013;1, S5.
17. Keats M, Blanchard CM, Tyrrell A, **Rainham DG**, Younis T. Environmental influences on physical activity behaviours in breast cancer patients: a pilot study. Proceedings of the SCAPPS (Canadian Society for Psychomotor Learning and

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- Sport Psychology) 2012 Annual Conference. *Journal of Exercise, Movement, and Sport* 2012;44(1).
18. Blanchard CM, Jason T, **Rainham DG**, Giacomantonio N. The effect of one's living environment on physical activity during cardiac rehabilitation. Proceedings of the SCAPPS (Canadian Society for Psychomotor Learning and Sport Psychology) 2012 Annual Conference. *Journal of Exercise, Movement, and Sport* 2012;44(1).
 19. Blanchard CM, Shearer C, **Rainham DG**, Kirk S, Shields C, Pitter R, Dummer T, & Lyons R. Physical activity in adolescents: The role of the built environment from a GPS perspective. *Journal of Sport and Exercise Psychology* 2012;34 (Suppl.), S203.
 20. **Rainham DG**, Tomic KE, Sheridan SC, Burnett RT. Synoptic weather patterns and modification of the association between air pollution and human mortality. In: AMS, Proceedings 16th Conference on Biometeorology and AeroBiology. Vancouver, British Columbia. August 23-27, 2004. Pp. 10.
 21. Krewski D, **Rainham DG**. Ambient air pollution and population health: Overview of health effects posters presented at the 2003 AIRNET/NERAM Conference. In: Craig L, Krewski D, Shortreed J, Samet J. (Eds), *Strategies for Clean Air and Health: Proceedings of AIRNET Annual Conference/NERAM International Colloquium*. Rome, Italy. November 5-7, 2003.
 22. Rainham DG. Atmospheric Risk Factors of Human Mortality in Toronto, Ontario. In: AMS, Proceedings from the 14th Conference on Biometeorology and Aerobiology, Davis, California, August 2000.
 23. **Rainham DG**, Smoyer KE, Burnett RT. Spatial synoptic classification of air pollution and human mortality associations in Toronto, Canada: Past relationships and policy implications. *American Journal of Epidemiology* 2001; 153(11): 1015(S).

Publications in Submitted

1. Cleveland T, Dec P, **Rainham DG**. Shorter Roads go a Long Way: The relationship between density and road length per resident within and between cities. Submitted to *Land Use and Transport* (Nov 2018).

Book Reviews and Popular Writing:

1. Rainham DG. There's More to Health Than Health Care. *Health: An Ecosystem Approach*, Jean Lebel, Ottawa: International Development Research Centre, 2003. *Alternatives Journal* 2004; 30(4): 36-7 [on-line at: www.alternativesjournal.ca].

2. Rainham DG. Global climate change: is global warming a health warning? *Encompass* 1999; 4(2): [on-line at: www.encompass.org/4-2/global.htm].

PRESENTATIONS (ALONE UNLESS OTHERWISE NOTED)

Invited Presentations:

- 2018 Location, Location, Location: Adding Value to Physical Activity Research. Annual Larry Maloney Lecture. Dalhousie University. March 24, 2018
- 2017 A Public Health Perspective on Urban Trees. Atlantic Urban Forest Conference. Fredericton, New Brunswick. November 7-8, 2017.
- 2017 Impact of Contact with Nature on Attention in Children. Children's Health and the Environment Workshop & Symposium: Moving Research to Action for Healthy Kids. Ivey Spencer Leadership Centre, Western University; London, Canada, June 26-28, 2017.
- 2017 Advancing Intervention to Reduce Risk of Obesity in Children. Children's Health and the Environment Workshop & Symposium: Moving Research to Action for Healthy Kids. Ivey Spencer Leadership Centre, Western University; London, Canada, June 26-28, 2017.
- 2013 Cities as if Ecology Mattered. PK13: Dense in the City, Halifax, NS.
- 2012 Exploring Physical Activity Behaviour Using Life Patterns Data. IWK Interdisciplinary Research Conference. Halifax, NS.
- 2012 Environmental Exposure to Electromagnetic Radiation. CH&E Seminar Series. Department of Community Health and Epidemiology, Dalhousie University. Halifax, NS.
- 2012 Location Tracking and Applications in Health Research. Spatial Intelligence for Health Meeting, ESRI Canada. Halifax, NS.
- 2012 Radon Soil Gas Exposure in HRM: Linking Geology and Probability. Atlantic Respirirolgy and Critical Care Conference. Halifax, NS.
- 2012 Health Mapping. Atlantic Association on Planning Technicians Workshop. Centre of Geographic Sciences, NSCC. Lawrencetown, NS.
- 2012 Extreme Heat and Climate Change Vulnerability. Vulnerability to Global Changing Environments and Impacts on Health in Maritime Canada: Latest Research Findings and Implications for Policy. Halifax, NS.

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- 2012 Using Life Patterns Data to Explore How Built Environments Shape Human Behaviours and Health. Place and Health: Shaping the Built Environment of New Brunswick and PEI. Canadian Public Health Association. Fredericton, NB.
- 2012 Free Range Kids: Classifying Youth Physical Activity Domains in the Built Environment. Dalla Lana School of Public Health & Bridgepoint Health. Toronto, ON.
- 2011 Nurturing Nature. Physical Activity Practitioners Exchange. Halifax, NS.
- 2011 Halifax Spatial and Personal Exposure Assessment Study. Air Quality and Health Research in Atlantic Canada: New Directions and Opportunities. Dalhousie University.
- 2011 The Contexts of Rehabilitation. Rehabilitation Research, Faculty of Health Professions, Dalhousie University. Halifax, NS.
- 2011 Examining the Issue of Overweight and Obesity in Nova Scotia from a Health Geomatics Perspective. Community Health and Epidemiology Seminar Series. Faculty of Medicine, Dalhousie University.
- 2010 Children's Health in an Age of Nature. Evergreen. Toronto, ON.
- 2010 Children's Health in the Age of Nature. Great Lakes Public Health Network. McMaster University.
- 2010 How Built Environments Influence Health. Ecology Action Centre Conversation Series on Healthy Urban Development, Halifax, NS.
- 2010 Biodiversity and Children's Health. Children's Health and Environment Workshop. University of Western Ontario.
- 2009 The Value of a Sustainability Perspective in Global Health Diplomacy. 16th Annual Canadian Conference on International Health, Canadian Society for International Health. Ottawa, Ontario.
- 2009 Human Health in the Age of Nature. Invited Keynote. Crossroads in Health Conference. Dalhousie University
- 2008 Context in Research on Place and Health. Invited Lecture. Occupational and Environmental Health (CHE 6001). Community Health and Epidemiology Department, Faculty of Medicine, Dalhousie University, Halifax, NS.

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- 2008 The Place of Occupations. Invited Lecture. Occupational Therapy (Occu 2000): Occupation and Daily Life. Faculty of Health Professions, , Dalhousie University, Halifax, NS.
- 2008 A Sense of Possibility: What Does Governance for Health and Sustainability Look Like? International Health Speaker Series, International Health Office, Faculty of Medicine, Dalhousie University, Halifax, NS.
- 2007 Are Cities a Health Hazard. Café Scientifique. Canadian Institutes of Health Research. Halifax, Nova Scotia.
- 2007 When an Apple a Day Keeps Sustainability Away. 2nd Annual Atlantic Sustainable Campuses Conference. Sierra Youth Coalition. University of King's College. Halifax, Nova Scotia.
- 2006 GIS for Health and Epidemiology. GIS Day. Dalhousie University. Halifax, Nova Scotia.
- 2006 Geomatics for Population Health and the Healthscapes Study. Geomatics Atlantic 2006 Conference, Acadia University, Wolfville, Nova Scotia.
- 2006 Climate Change and Human Health. Our Forests, Our Health. Joint Meeting of: Nova Scotia Forest Technicians Association Canadian Institute of Forestry – NS Section Registered Professional Foresters Association of Nova Scotia. Truro, Nova Scotia.
- 2004 Air Quality and Human Health. International Youth Summit on Sustainable Urban Transportation, Ottawa, ON.
- 2003 Krewski D, **Rainham DG**. Overview of Health Effects Posters. AIRNET/NERAM Joint Colloquium: Strategies for Clean Air and Health. Rome, Italy. November 6, 2003.
- 2002 Human Health Response to Atmospheric Change – Review of Research Evidence Linking Climate Change, Air Pollution, and Health. Climate Change and Health Issues Research Network. The Impact of Climate Change on Air Pollution and Health. Summary Report of the First Workshop. Best Western Crystal Palace Hotel, Moncton, NB.

Scientific:

- 2019 Alwan T, Johnson S, **Rainham DG**. (2019). Children perceive time in nature as restorative despite minimal exposure to nature. Canadian Psychological Association 80th Annual National Convention, Halifax, N.S. May 31- June 2, 2019.

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- 2019 Liu Y, Goudreau S, Oiamo T, **Rainham DG**, Hatzopoulou M, Chen H, Davis H, Tremblay M, Johnson J, Bockstael A, Leroux T, Smargiassi A.(2019). Comparison of land use regression and random forests models on estimating noise levels in five Canadian cities. Canadian Society for Epidemiology and Biostatistics 2019 Biennial National Conference, Ottawa, ON. May 13-15, 2019.
- 2019 Liu Y, Goudreau S, Oiamo T, **Rainham DG**, Hatzopoulou M, Chen H, Davis H, Tremblay M, Johnson J, Smargiassi A.(2019). Estimation of double exposures to outdoor nitrogen dioxide and environmental noise in five Canadian cities. 2019 HEI Annual Conference, Seattle, Washington, May 5-7, 2019.
- 2018 Trecarten N, Rhodes R, Warburton D, Murnaghan D, King-Shier K, Spece J, Reid R, Giacomantonio N, **Rainham D**, Kirkland S, McGowan E, Blanchard CM. (2018). Examination of sedentary time in patients with coronary heart disease. Presented at the Canadian Association Cardiovascular Prevention and Rehabilitation, Toronto, Ontario.
- 2016 **Rainham DG**, Crouse DL. Nature-health interconnections: Evidence, mechanisms and current research. Canadian Association of Geographers. Halifax, Nova Scotia, May 30-June 3, 2016.
- 2016 Bennett M, **Rainham DG**, Drage J. Radon potential mapping: Sensitivity to input weighting selection. Canadian Association of Geographers. Halifax, Nova Scotia, May 30-June 3, 2016.
- 2016 Bennett M, **Rainham DG**. The relationship between greenness and physical activity in Canadian children and adults. Canadian Association of Geographers. Halifax, Nova Scotia, May 30-June 3, 2016.
- 2016 Castleden H, Francis S, Lewis D, Strickland D, Denny C, Martin D, Jamieson R, **Rainham D**, Russell R, Gibson M. (May 11-14, 2016). "Our ancestors are in our land, water, and air: A Two-Eyed Seeing approach to researching environmental health concerns with Pictou Landing First Nation. Community-Campus Partnerships for Health's 14th International Conference Journey to Justice: Creating Change Through Partnerships. New Orleans, Louisiana, USA.
- 2015 Blanchard CM, Campbell N, **Rainham DG**, Giacomantonio N. (2015). Translating physical activity recommendations into steps per day for cardiac rehabilitation patients. Canadian Society for Psychomotor Learning and Sport Psychology, Edmonton, Alberta.
- 2015 Balish S, Deaner R, **Rainham DG**, Blanchard CM. Sex differences in sport across countries: Does gender inequality and digit ratio (2D:4D) matter? Northeastern Evolutionary Psychology Society (NEEPS), 9th Annual Meeting, Suffolk University in Boston, Massachusetts.

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- 2015 Poirier A, Dodds L, Dummer T, **Rainham DG**, Maguire B, Johnson M. Maternal exposure to air pollution and adverse birth outcomes in Halifax, Nova Scotia. Canadian Society for Epidemiology and Biostatistics 2015 Conference, Toronto, Ontario, Canada.
- 2014 Daley K, Jamieson R, Rainham DG, Truelstrup Hansen L. (December). Assessing exposure pathways and human health risks related to wastewater treatment in Inuit communities. Arctic Change 2014, Ottawa, Ontario, Canada.
- 2014 Balish SM, Rainham DG, Blanchard CM. (2014, November). Community Size and Sport and Exercise Participation Across 28 Countries. Verbal presentation at SCAPPS (Société Canadienne d'Apprentissage Psychomoteur et de Psychologie Sportive) annual meetings, London, Ontario, Canada.
- 2013 Rehman L, Shearer C, **Rainham DG**, Kirk S. Recreation facility food environments: Exploring opportunities to improve family food choices. Qualitative Health Research Conference, Halifax, NS.
- 2013 **Rainham DG**, Blanchard C, Dummer T, Kirk S, Lyons R, Rehman L, Shearer C. Activity Space Measures of Access to Residential and School Neighbourhood Food Environments, Diet and BMI among Youth. International Medical Geography Symposium, Michigan State University, East Lansing, MI.
- 2013 Balish, S.M., Evans, B., Blanchard, C., & **Rainham, D.G** (June 2013). Female Participation Profiles and Reasons for Physical Activity Stratified by Gender-Inequality of Host Country. Verbal Presentation of the 2013 Annual Meeting International Society for Behavioral Nutrition and Physical Activity, Ghent, Belgium.
- 2013 **Rainham DG**, Cui Y, Nauta L, Parker L, Dummer T. Lung Cancer and Exposure to Air Pollution in Halifax, Nova Scotia. Canadian Association of Geographers Conference, St. John's, NF.
- 2013 Balish, S., McLaren, C., **Rainham, DG.**, & Blanchard, C.M. Correlates of Youth Sport Attrition: Review, Synthesis, and Future Directions. Presentation at the North American Society for the Psychology of Sport and Physical Activity, New Orleans, Louisiana, US
- 2012 Balish S, Blanchard C, **Rainham D**. The Social Ecology of Team-Sport Participation in Youth: A Multilevel, Gender-Specific Approach. Sports Canada Research Initiative Conference, Ottawa, ON.
- 2012 Jason, T., Blanchard, C.M., **Rainham, D.**, & Giacomantonio, N. (2012). The effect of one's living environment on physical activity during cardiac rehabilitation. Canadian Society for Psychomotor Learning and Sport Psychology, Halifax, NS.

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- 2012 Keats, M., Blanchard, C.M., Tyrrell, A., **Rainham, D.**, & Younis, T. (2012). Environmental influences on physical activity behaviours in breast cancer patients: A pilot study. Canadian Society for Psychomotor Learning and Sport Psychology, Halifax, NS.
- 2012 **Rainham DG**, Shearer C, Kirk S, Blanchard C, Dummer T, Shields C, Bates C, Lyons R. Navigating Nutrition in the Neighbourhood. American Associations of Geographers Annual Conference. New York, NY.
- 2012 Blanchard, C.M., Shearer, C., **Rainham, D.**, Kirk, S., Shields, C., Pitter, R., Dummer, T., & Lyons, R. (2012). Physical activity in adolescents: The role of the built environment from a GPS perspective. Presented at the North American Society for the Psychology of Sport and Physical Activity, Hawaii, USA.
- 2011 **Rainham DG**, Blanchard C, Dummer T, Kirk S, Shearer C, Bates C, and the ENACT Team. (July 2011). Spatial classification of youth activity patterns. International Medical Geography Symposium. Durham, UK.
- 2011 McSweeney J, **Rainham DG**, Bates C, Gibson M, Guernsey J. (July 2011). Using wearable global positioning technology to assess personal exposure to fine airborne particles. . International Medical Geography Symposium. Durham, UK.
- 2011 Neimanis A, Castleden H, **Rainham DG**. (May 2011). (Health) Justice for All: Creating a Tool for Environmental Justice with an Ecological Integrity Lens to Improve Well Being. Canadian Association of Geographers, Calgary, AB.
- 2010 Pitter R, Shields C, Chircop A, **Rainham DG**, Shearer C, Rehman L, Blanchard C, Flannery M. (November, 2010). I Think my Neighbourhood is Safe, So Why is Safety a Barrier to Physical Activity? North American Society for the Sociology of Sport (NASSS) 2010 Conference: Producing Knowledge, Producing Bodies: Cross-Currents in Sociologies of Sport and Physical Culture. San Diego, CA.
- 2010 Blanchard, C.M., **Rainham, D.**, McSweeney, J., Spence, J.C., McDonnell, L., Reid, B., Rhodes, R., McGannon, K., Edwards, N. (2010). Community socioeconomic status, urban sprawl, and the perceived environment's relationship to physical activity during home-based cardiac rehabilitation. Canadian Association for Cardiac Rehabilitation, Montreal, QC.
- 2010 Patricia Manuel, Andrea Chircop, **Daniel Rainham**, Jill L. Grant, Laurene Rehman, Gillian McGinnis, Meredith Flannery, Renee Lyons, Trevor Dummer, Chris Blanchard. (October 2010) You want us to do what, where? Investing in youth health through the built environment. 48th International Making Cities Livable Conference True Urbanism: Planning Healthy and Child-Friendly Communities. Charleston, SC.

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- 2010 Neimanis A, Castleden H, **Rainham DG**. (July 2010). A Systematic Review of the Literature on Environmental Justice: What about Ecological Integrity. Ecohealth 2010. London, UK.
- 2010 Shearer, C., Grant, J., Lyons, R., Arthur, M., Blanchard, C., Chircop, A., Dummer, T. Kirk, S., Manuel, P., McHugh, T., Parker, L., Pitter, R., **Rainham, D.**, Rehman, L., & Shields, C. (July 2010). Environmentally-linked disparities in youth physical activity and nutrition. 20th IUHPE World Conferences on Health Promotion. Geneva, Switzerland.
- 2010 **Rainham DG**, Blanchard C, Chircop A, Dummer T, Kirk S, Rehman L, the ENACT Team. How much and where? Using actimetry and global positioning systems (GPS) to assess the relationship between physical activity and the built environment. Paper presented at the Canadian Public Health Association Centennial Conference, June 13-16, 2010, Toronto, ON.
- 2009 **Rainham DG**, Wilson J. Socioeconomic Metabolism, Health and Ecological Thresholds. International Medical Geography Symposium. Hamilton, ON.
- 2009 Grant, J., Lyons, R., Arthur, M., Blanchard, C., Chircop, A., Dummer, T. Kirk, S., Manuel, P., McHugh, T., Parker, L., Pitter, R., **Rainham, D.**, Rehman, L., Shearer, C., & Shields, C. (2009, June). Optimizing investments in the built environment to reduce youth obesity: Methodological approaches and dilemmas. Poster session presented at the 7th International Conference on Diet and Activity Methods, Washington, DC.
- 2008 McHugh, T., Shearer, C., Grant, J., Lyons, R., Arthur, M., Blanchard, C., Chircop, A., Dummer, T., Kirk, S., Manuel, P., Parker, L., Pitter, R., **Rainham, D.**, Rehman, L., & Shields, C. Optimizing investments in the built environment to reduce youth obesity. Poster session presented at the Childhood & Adolescent Obesity 2008 Conference, Vancouver, BC.
- 2008 Is the Path to Human Well-being Inevitably Unsustainable? Public Health in Canada: Reducing Health Inequalities through Evidence and Action. Canadian Public Health Association 2008 Annual Conference. Halifax, NS.
- 2008 Gibson, M.D., Guernsey, J.R., **Rainham, D.**, Gould, R., Hore, P., Garand, L., Beauchamp, S., Waugh, D., Brook, J.R., McPherson, J., Bryden, B., Maher, R., King, G. Pilot Comparative Personal/Indoor/Outdoor/Urban/Rural Exposure Studies for Ground-Level Ozone (O₃) and Fine Respirable Particles. Canadian Public Health Association 2008 Annual Conference. Halifax, NS.
- 2007 The Spatial Existence of People and Their Health. Public Health in Canada: From Politics to People. Canadian Public Health Association 2007 Annual Conference. Ottawa, ON.

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- 2007 Governance for Population Health and Sustainability. Ecological Integrity and a Sustainable Society Conference. Dalhousie University. Halifax, NS.
- 2006 Geovisualization of Health and Social Capital Data Derived from Statistics Canada Surveys. Statistics Canada 23rd International Methodology Symposium: Methodological Issues in Measuring Population Health. Gatineau, QC.
- 2004 **Rainham DG**, Tomic KE, Sheridan SC, Burnett RT. Synoptic weather patterns and modification of the association between air pollution and human mortality. 16th Conference on Biometeorology and Aerobiology and the Fifth Symposium on the Urban Environment, American Meteorological Society, Vancouver, British Columbia
- 2004 Population Health and the Health of the Biosphere. Global Ecological Governance for Eco-Justice and Public Health. Global Ecological Integrity Group. Montreal, QC.
- 2003 Examining Sustainability and Population Health. 10th Annual Conference of the Environmental Studies Association of Canada, Halifax, NS.
- 2002 Atmospheric Risks to Public Health – What is the Evidence? Urban Heat Island Summit. The Clean Air Partnership. Toronto, ON.
- 2001 Smoyer-Tomic KE, Kuhn R, **Rainham DG**. Natural Hazards Assessment: Heat Waves. Canadian Natural Hazards Assessment Second Workshop. Mississauga, ON.
- 2001 Smoyer KE, **Rainham DG**, Pereira D. In Search of a Heat Stress Index for Southern Ontario. Association of American Geographers Annual Meeting. New York, NY.
- 2000 Smoyer KE, **Rainham DG**. When Weather Kills: The Search for a Heat Stress Index Continues. 9th International Symposium in Medical Geography. Montreal, QC.
- 2000 Contaminated Communities and Continuums of Causation: Perspectives From Environmental Epidemiology. ESAC 2000: Exploring the Shades of Environmentalism. Congress of the Social Sciences and Humanities, University of Alberta. Edmonton, AB.
- 2000 Modelling Atmospheric Risk Factors of Human Mortality. EcoSummit 2000. Westin Nova Scotia, Halifax, NS.
- 2000 Smoyer KE, **Rainham DG**, Hewko JN. Hot in the City: Heat Waves and Health in Southern Ontario. Centre for Health Promotion Studies Research Symposium Series. Edmonton, AB.

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- 2000 Nonparametric Smoothing Techniques: Applications in Environmental Epidemiology. Area-Wide Epidemiology and Biostatistics Conference, University of Alberta. Edmonton, AB.
- 1999 Smoyer KE, **Rainham DG**. Humidex and Mortality Response in Toronto, 1980-1996. Public Health Impact of Extreme Heat Workshop. Toronto Public Health. Toronto, ON.
- 1999 Healthy Cities and Shires in Rural Australia: The Cambooya Experience. Canadian Association of Geographers Conference. Lethbridge, AB.
- 1999 **Rainham DG**, Smoyer KE. Weather-Related Mortality in Southern Ontario. Western Division, Canadian Association of Geographers, Annual Meeting. Kelowna, BC.

SERVICE

Workshops:

- 2018 Spatial Analytics for Health Research using ArcGIS. Maritime SPOR (Strategy for Patient-Oriented Research) Support Unit. Dalhousie University. February 22-23.
- 2017 Spatial Analytics for Health Research using ArcGIS. Maritime SPOR (Strategy for Patient-Oriented Research) Support Unit. University of New Brunswick. November 9-10.
- 2016 Spatial Analytics for Health Research using ArcGIS. Maritime SPOR (Strategy for Patient-Oriented Research) Support Unit. Dalhousie University. June 20-21.
- 2016 Spatial Analytics for Health Research using ArcGIS. Maritime SPOR (Strategy for Patient-Oriented Research) Support Unit. Atlantic Veterinary College, University of Prince Edward Island. June 20-21.

Guest Lectures:

- 2018 Noise!. Guest Lecture to ENVS 2500, November 2, 2018.
- 2018 Environmental Determinants of Physical Activity and Obesity. Guest Lecture to KINE 4709, October 18, 2018.
- 2018 Urban Nature as Health Promotion. Guest Lecture to ENVS 1200, April 3, 2018.
- 2017 An Introduction to Systems Thinking. Guest Lecture to ENVS 3501, September 27, 2018.

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- 2017 Environmental Determinants of Physical Activity and Obesity. Guest Lecture to KINE 4709, September 18, 2017.
- 2016 How to Conduct a GIS-Based Research Project. Guest Lecture to the GIS Certificate Project Course, January 16, 2016.
- 2015 Kids Need Nature. Guest Lecture to the SHAD Valley Program, July 9, 2015
- 2015 Thinking Spatially: GIS in Epidemiology. Guest Lecture to HESA 5320: Managerial Epidemiology. February 2, 2015.
- 2013 Space, Place and Health. Guest lecture to CH&E 6042: Determinants of Health in Human Populations. March 27, 2013.
- 2013 Spatial Thinking: Applications to Resource Decisions. Guest Lecture to ENVI 5500: Socio-political Dimensions of Resource and Environmental Management. March 11, 2013.
- 2013 Environment and Health: An Introduction. Guest lecture to ENVS 1000, Introduction to Environmental Science. January 10, 2013.
- 2012 Health Geomatics. Guest lecture to ENVS 3400, Environment and Human Health. March 27, 2012.
- 2011 How Our Environment Affects our Health. Guest lecture to ENVS 1000, Introduction to Environmental Science. March 10, 2011.
- 2011 Governance for Sustainability. Guest Lecture to ENVI 5500. January 26, 2011.
- 2010 Place and Health. Guest lecture to CH&E 6042, Determinants of Health in Human Populations. March 18, 2010.
- 2010 What is Environmental Health? Guest lecture to ENVS 1000, Introduction to Environmental Science. January 21, 2010.

Grant Review:

Date	Organization/Role	Opportunity/Committee
2012 - Present	CIHR Operating Grants (PH)	Institute of Population and Public Health
2016	Health Canada - Clean Air Regulatory Agenda (CARA)	Environmental and Radiation Health Sciences Directorate

2012 - 2015	CIHR Training Grants (PROPEL)	Population Interventions for Chronic Disease Prevention
2012 - 2013	Nova Scotia Health Research Foundation Scientific Officer (Training)	Establishment Grants Health Policy, Health Services and Outcomes
2012	Health Effects Institute Proposal Review	Rosenblith New Investigator Award
2011 - Present	Heart and Stroke Foundation of Nova Scotia Proposal Review	Bright Red Awards Scientific Advisory Committee
2010	National Institutes of Health/Centers for Disease Control Proposal Review	FOA EH09-001 Climate Change: Environmental Impact on Human Health
2009	Northern Ireland Chest Heart & Stroke Proposal Review	Reference Number: 200925 Climate Change and Cardiovascular Health
2007 - Present	Canadian Public Health Association Abstract Review	Canadian Public Health Association Annual Conference / Abstract Review

Institutional Service:

Date	Committee	Location
2017 – Present	Director, ESRI Centre of Excellence	Dalhousie University
2017 - 2018	Chair, Senate Review Committee for Faculty of Arts and Social Sciences	Dalhousie Senate
2016 - Present	Selection Committee for Director of the Interdisciplinary PhD Program	Faculty of Graduate Studies
2015 - Present	Faculty Council	Faculty of Science

2015 - Present	Director, Environmental Science	Faculty of Science
2015	Faculty Search	School for Resource and Environmental Studies, Faculty of Management
2014 - 2016	Member, Executive Committee	Healthy Populations Institute
2014	Tenure and Promotion Committee	School of Planning, Faculty of Architecture and Planning
2014 -	GIS Centre Advisory Committee	Killam Library
2011 -	Scientific Advisory Committee	Heart and Stroke Foundation of Nova Scotia
2009 -	Environment Committee Representative	Science Atlantic
2009 - 2015	Undergraduate Student Research Awards Committee	Faculty of Science
2009 - 2014	Curriculum Development and Awards Committees	College of Sustainability
2007 - 2009	Executive Committee, Institute of Population Health	University of Ottawa
2007	GIS Workshop Steering Committee	Nova Scotia Health Research Foundation

Journal Review (last 5 years):

American Journal of Preventive Medicine
 BMC Public Health
 Canadian Journal of Public Health
 Diabetes Technology and Therapeutics
 Environmental Research
 Health and Place
 International Journal of Health Geographics
 Journal of Epidemiology and Community Health
 Journal of the Air and Waste Management Association
 Social Science & Medicine
 Spatial and Spatiotemporal Epidemiology

SUPERVISION OF POST-DOCTORAL FELLOWS

1. Terashima, M. (2012-14). Mapping the social-ecological determinants of youth sport participation: A community level perspective. Interdisciplinary PhD program, Faculty of Graduate Studies, Dalhousie University.
2012 – 2014: CIHR Fellowship / \$80,000

Peer-Reviewed Publications:

1. A small-area analysis of inequalities in chronic disease prevalence across urban and non-urban communities in the Province of Nova Scotia, Canada, 2007–2011. (BMJ Open)
2. Should we enhance the commonly used deprivation index for a regional context? (Can J Pub Health)

GRADUATE SUPERVISION*DOCTORAL STUDENTS*

1. Barber, B. (2017-). An Investigation of Super-Users of Emergency Health Services in Halifax. Ph.D. in Health program, Faculty of Health, Dalhousie University.
2017 – 2019: Nova Scotia Graduate Scholarship / \$15,000/annum
2. Balish, S. (2011-2016). Mapping the social-ecological determinants of youth sport participation: A community level perspective. Interdisciplinary PhD program, Faculty of Graduate Studies, Dalhousie University.
2012 – 2015: SSHRC Doctoral Research Award / \$105,000
2012 – 2014: President’s Award, Dalhousie University / \$17,226
2012 – 2103: CIHR / HSFC Fellow in Population Intervention for Chronic Disease Prevention Top-up Award / \$2000
2011 – 2012: Dalhousie FGS Award / \$6,000
2011 – 2012: Doctoral Stipend / CIHR / \$17,850
3. Daley, K. (2013-present). Human Health Risk and Wastewater Treatment in Arctic Canada. Interdisciplinary PhD program, Faculty of Graduate Studies, Dalhousie University.
2013 - 2017: Northern Municipal Wastewater Management’ Project / \$64,500
4. McSweeney, J. (2010-2016). Nurturing nature and the human psyche: Understanding the impact of indoor nature exposure on depression. Interdisciplinary PhD program, Faculty of Graduate Studies, Dalhousie University.
2013 - 2014: SSHRC Doctoral Research Award / \$35,000 (1 yr)
2011 - 2013: NSHRF Scotia Support Scholarship / \$35,000
2010 – 2013: CIHR / HSFC Fellow in Population Intervention for Chronic Disease Prevention / \$17,500

MASTER'S STUDENTS

1. O'Brien, K. (2011-2013). Radon Soil Gas Mapping in Halifax Regional Municipality. Masters in Earth Sciences, Faculty of Science, Dalhousie University.
2011-2012: Nova Scotia Lung Association: Legacy Research Grant / \$5,000
2. McCurdy, J. (2012-2014). Community Mapping of Elder Oral Histories in Pictou Landing-Boat Harbour. Masters in Resource and Environmental Management, Faculty of Management, Dalhousie University.
3. Neimanis, A. (2010-2012). Environmental Justice: Making the Case for Ecological Integrity. Masters of Environmental Studies, Faculty of Management, Dalhousie University.
2010 - 2012: SSHRC Masters Scholarship / \$35,000

UNDERGRADUATE SUPERVISION*HONOURS STUDENTS*

Year	Name (Degree)	Title
2017-18	Chantelle-Lyn Fynn	The relationship between urban tree canopy cover and socioeconomic status in urban Halifax
2015-16	Rachel Shin (Environmental Science)	Exploring the influence of nature exposure on risk-based decision-making
2014-15	Allison Welk (Environmental Science)	Association Between Access to Neighbourhood Greenness and Physical Activity in Nova Scotia Youth
2012-13	Kit Moran (Environmental Science)	An Investigation into the Ability of Urban Green Space to Provide Stress Restoration
2012-13	Caroline McNamee (Environmental Science)	Evaluation of Public Recreational Greenspace in Halifax for Physical Activity Promotion Using the Quality of Public Open Space Tool
2010-11	Emily Stewart (Environmental Science)	Spatial and Temporal Mapping of Radiofrequency Fields
2009-10	Alexandre Girard (Community Design)	Elderly Walkability in Spryfield, Nova Scotia
2008-9	Gavin King (Environmental Science)	Community Environmental Noise and the Built Environment in Two Halifax Neighbourhoods
2005-6	Rory Cantwell (Environmental Science)	The Relationship Between Ecological Footprint and Population Health in Twenty-Two Canadian Municipalities
2005-6	Erin Balsler (Environmental Science)	Assessing the Sustainability of the University of King's College

2005-6	Ashley Greenspoon (International Development)	The Tale of Two Medicines: Examining the Influence of Western Medicine on Traditional Medicine in Developing Countries
2005-6	Nicholas Ahlers (International Development)	Ecotourism in Botswana: The Okavango Polers Trust (OPT) and a Sustainable Approach to Ecosystem Health

Courses Taught

1. Environmental Science (ENVS2000): Urban Field School
Urban Field School introduces students to environmental science issues within an urban setting. By the end of the course a student will be able to: discuss how humans are components of ecosystems; differentiate urban and non-urban areas and systems; understand how plants and animals exist and interact with humans; understand human-dominated landscapes; engage in scientifically informed discussions related to urban areas and urbanization; and demonstrate proficiency in a variety of environmental science techniques including mapping, sampling, and measurement.
2. Environmental Science (ENVS2100): Environmental Informatics
Environmental Informatics is the knowledge skills and tools which enable information to be collected, managed and disseminated to support research in environmental science. Students develop skills for the analysis, evaluation and synthesis of knowledge in environmental science. Information systems, tools, and techniques are introduced and applied to current environmental challenges.
3. Environmental Science (ENVS3400): Environment and Human Health
You and everything around you is part of the environment. Every aspect of the environment, from the air you breathe to the water you drink, from the roads you travel to the waste you produce, may affect how you feel and ultimately your well being. Environmental health is a discipline that focuses on the interrelationships between people and their environment, promotes human health and well being, and fosters a safe healthful environment. In this course we will learn about the tools and perspectives needed to investigate the relationships between human health and the environment. We will also examine a variety of current issues from the global to the local and critically evaluate the systems required to support human health in the context of environmental sustainability. Weekly laboratory exercises will teach students how theories and methods from ecology, epidemiology and geomatics (GIS, GPS, and remote sensing technologies) can be employed in environment and health research.
4. Sustainability 3000 (SUST3000): Environmental Decision Making
Making decisions regarding our individual and collective choices for a sustainable future requires decisions to account for the uncertainty and complexity inherent to human development that is sensitive to ecological constraints along with competing human values. Given this context, this course sets out to explore a number of key challenges that confound decision-making generally along with a variety of decision support tools that help us integrate diverse knowledge and values for theoretically better outcomes. While many of the issues and approaches covered transcend human decision contexts,

throughout the course we will draw on resource and environment related examples and contexts and consider the implications of disconnecting development decision-making from sustainability.

5. Environmental Science (ENVS4901/2): Honours Thesis

An honours thesis comprised of an independent investigation to develop mastery of the basic skills of problem definition, proposal preparation and project implementation is the key to dealing with a wide range of "real-life" situations, both on and off the career path. The journey includes lectures and tutorials on proposal writing, research design and methodology, and an independent environmental science research project carried out under the supervision of an approved faculty member. An honours thesis gives you the opportunity to conduct an independent research project over the course of the full academic year. The experience will help you to decide if you would be interested in a career in research as well as the aptitude to be a successful researcher in environmental science.

I also contribute to the Environmental Science Field School classes (ENVS3001) teaching geographic information systems and sampling methods.

TEACHING SUBJECT MATTER

- Teaching in epidemiologic and geomatics research methods, environmental science, measurement and methods, and health geography
- Medical school teaching on population and environmental health
- Graduate and undergraduate supervision in epidemiology, environmental science and sustainability research

RESEARCH AND IDEAS IN THE MEDIA:

November 2017: What neighbourhood noise drives you nuts? CBC Maritime Noon, November 3, 2017.

November 2017: Noise and health effects. CBC Radio 1: Mainstreet. November 2017.

November 2014: [Dal study looks at physical effects of exposure to nature](#). By Ben Cousins. UNews, November 18, 2014.

May 2013: [Chronic illness high near pulp mill](#). By Daniel Campbell. The News, May 3, 2013.

July 2012: [The future of downtown: re-ripening Barrington Street](#). By Chris Benjamin. Openfile, July 6, 2012.

June 2012: [Getting kids moving](#). Maritime Noon, CBC, Halifax, Nova Scotia (.mp3).

June 2012: [A television interview about the Environment, Nutrition and Physical Activity Project and the results of the paper published in the American Journal of Preventive Medicine](#). CTV Morning Live, Halifax, Nova Scotia.

May 2012: [City kids get more exercise than rural ones](#). The Chronicle Herald, Halifax, Nova Scotia (online).

April 2012: [Obesity linked to neighbourhood features: Do you live in a fat neighborhood?](#) ABC News (online).

April 2012: [New technology maps the surprising subtleties of childhood and teen obesity](#). Scientific American (Observations Blog),

August 2011: [A television interview about the Legacy Research Grant and Kelsey O'Brien's work on radon mapping](#). CTV Morning Live. Halifax, Nova Scotia.

July 2011: [Feds to probe air pollution from ships; Study will analyze data from 55 air quality monitors in Halifax](#). The Chronicle Herald. Halifax, Nova Scotia.

August 2010: [Researcher wants to probe air quality](#). The Chronicle Herald. Halifax, Nova Scotia.

November 2009: [Sustainable Offices 101](#). Green Living Magazine.

February 2009: [Tracking our eco-footprints](#). The Coast. Halifax, Nova Scotia.

October 2008: [The Joy of Parking: Hot Meters Map and Map of Parking Ticket Intensity](#). CBC News Feature Report. Halifax, Nova Scotia.

February 2007: [A night on the town: Interactive Map of Reported Crimes](#). CBC News Feature Report. Halifax, Nova Scotia.

June 2009: Is your neighbourhood healthy? Harrowsmith Country Life (Vol. 30, pp. 108-9).

March 2006: [He knows where you've been](#). Dalhousie Alumni Magazine. Halifax, Nova Scotia.

APPENDIX E-1