

MScSM RESEARCH DAY

April 5, 2018
9 am - 5 pm
CCT Building,
U of T Mississauga



Master of Science in Sustainability Management UofT



Institute for Management & Innovation
UNIVERSITY OF TORONTO
MISSISSAUGA

Day Program

Thursday April 5, 2018

University of Toronto Mississauga

- 8:15 AM – 9:00 AM: Arrival and registration
- 9:00 AM - 10:00 AM **Prof. Jacob Hirsh, University of Toronto**
Managing Meaning and Uncertainty
- 10:00 AM – 11:00 AM **Prof. Jamie Benidickson, University of Ottawa**
Toilet Training for the Twenty-First Century
- 11:00 am – 11:30 AM Coffee Break and Poster Viewing by MScSM Students
- 11:30 PM – 12:30 PM **Prof. Mario Macis, John Hopkins University**
Management, Supervision, and Health Care: A Field Experiment
- 12:30 PM – 1:30 PM Lunch and Poster Viewing by MScSM Students
- 1:30 PM – 2:30 PM Three Minute Research Paper presentations by MScSM Students
- 2:30 PM – 2:45 PM Coffee Break
- 2:45 PM – 3:45 PM Three Minute Research Paper Presentations by MScSM Students
- 3:45 PM – 5:00 PM Reception

Keynote Speaker:

Prof. Jacob Hirsh, University of Toronto

Jacob Hirsh is an Assistant Professor of Organizational Behaviour and Human Resource Management. His research focuses on understanding the role of personality processes in the workplace, especially as they relate to creativity, self-regulation, decision-making, and motivation. He has published on a diverse range of topics in journals including, the *Psychological Review*, *Psychological Science*, *Journal of Applied Psychology*, and *Perspectives on Psychological Science*. Jacob's research has been featured in media outlets including, *The New York Times*, *USA Today*, *The Wall Street Journal*, and *The Globe and Mail*.



Title of Presentation: Managing Meaning and Uncertainty

Abstract: Who are we? Why are we here? What should we do? These fundamental questions about the meaning and purpose of life have been explored since the beginning of human civilization. In the present talk, I propose that the subjective answers that people provide to such questions have an important impact on their attempts to pursue value in a complex and changing world. In a series of experimental studies, I demonstrate that the subjective experience of meaning in life depends upon the pursuit of long-term goals. Uncertainty about such goals is in turn related to the experience of anxiety and a felt lack of meaning and purpose. In applying these ideas to professional life, I show that the experience of meaning at work is related to the perceived relevance of a job for an employee's long-term goals. An intervention study in which employees were asked to elaborate upon the relevance of their job for their most deeply valued goals led to an increased experience of meaning at work, with concomitant improvements in job satisfaction and employee engagement. Implications are discussed for the management of meaning and uncertainty among individuals and organizations.

Keynote Speaker:

Prof. Jamie Benidickson, University of Ottawa

Jamie Benidickson teaches Canadian and international environmental law at the Faculty of Law, University of Ottawa where he is a member of the Centre for Environmental Law and Global Sustainability. His publications include *Environmental Law* (Irwin Law, 2013) and *The Culture of Flushing: A Social and Legal History of Sewage* (UBC Press, 2007).



Title of Presentation: Toilet Training for the Twenty-First Century

Abstract: This presentation examines the law, policy and science of municipal wastewater arrangements in Europe and North America as background to a review of emerging developments oriented around resource recovery from sewage flows. The latter includes initiatives to re-use wastewater to restore supplies and efforts to recover nutrients and energy from wastewater streams. These developments must once again be imagined as involving scientific and technological innovation in combination with revisions to existing regulatory frameworks.

Keynote Speaker:

Prof. Mario Macis, John Hopkins University

Mario Macis is an Associate Professor in the research track with expertise in the areas of prosocial behavior, morally controversial transactions, global health, experimental economics, development economics, and labor economics. He is also Associate Faculty at the Armstrong Institute for Patient Safety and Quality at the Johns Hopkins University School of Medicine, Faculty Research Fellow in the National Bureau of Economic Research (NBER), and Research Fellow at the Institute for the Study of Labor (IZA). Dr. Macis has been a consultant for the World Bank, the International Labor Organization, the National Marrow Donor Program, and the United Nations Development Programme.



Title of Presentation: Management, Supervision, and Health Care: A Field Experiment

Abstract: We study the adoption of organizational practices through a randomized controlled trial in 80 public primary health centers in Nigeria. Facilities that received a detailed improvement plan and nine months of implementation support showed large, significant short-term effects on the adoption of several practices under local staff control. Virtually no effects remained one year after the intervention. Facilities that received only general improvement advice but no implementation support showed no change in practices. Sustained supervision appears crucial for achieving persistent improvements in contexts with a lack of incentives for the adoption of effective managerial practices.

Comparative Analysis of Ecotourism and Sustainable Tourism

Clara Carriere

Ecotourism and *sustainable tourism* are two commonly used “buzz words” in the tourism industry. However, the literature is extremely fragmented and lacks a single, standard definition for either term. This lack of specificity of two seemingly very similar terms is problematic and creates several barriers in terms of their applications. Although the concepts have an opportunity to advise tourism management that is more cognizant of its sustainability impacts, the lack of cohesion in the literature creates impediments to the transfer of knowledge from academia to the policy-making realm. This may impede the practical and accurate application of responsible tourism management strategies evolving from ecotourism and sustainable tourism policy in tourism operations. The objective of this paper is to provide an analysis of the terms along with their background and principles in order to fill the current gap regarding the use of the terminology *ecotourism* and *sustainable tourism*. The Galapagos is highlighted as a case study due to its consistent increase in tourism activity in recent decades. The analysis finds that ecotourism focuses on the visit to natural areas and their conservation, the production of revenue, education, and local participation. As a broader paradigm, sustainable tourism focuses on controlling the scale of tourism development, along with economic, environmental and social considerations, while focusing on stakeholder needs. Results show that the Islands’ tourism activities align with the criteria outlined for ecotourism, but could benefit from a more holistic sustainable tourism approach. This paper creates a basis for communication between academics and practitioners by revealing trends in the use and application of the terms *ecotourism* and *sustainable tourism* and making recommendations on which term can be most effective in ensuring the long-term sustainability of countries’ tourism industries.

The Current State of Sustainability within the Canadian Travel and Tourism Industry

Kelsey Koebel

The travel and tourism industry’s reliance on the natural environment is indicative of the need for sustainability management. This study aims to understand how the Canadian travel and tourism industry prioritizes and practices various sustainability actions by surveying industry personnel within the airline, tour operator, and hotel sub-sectors. Participants were asked how they perceive sustainability within the Canadian context, which sustainability actions are most important to their organization, and what sustainability actions they currently undertake. The results show that the industry is aware of their sustainability impacts and the types of actions they should be taking to mitigate their impact. Respondents demonstrated more favourable action towards employment quality and environmental management activities and less action towards economic and traveler education and engagement activities. The results also illustrate a lack of consistency in the understanding and implementation of sustainability action across the country. Therefore, the findings imply an immediate need for a collaborative industry-wide initiative to improve sustainability management in the Canadian travel and tourism industry.

Shifting the Peak: Utilizing a Lighting Nudge to Change Electricity Consumption Behavior

Martin Wong

The implementation of the time of use electricity program in Ontario has failed to reduce and shift consumption behaviors. To address these problems, a behavioral lens was adopted and the theories of knowledge-action gap, the availability heuristic, and loss aversion bias were used to inform the design of an experiment. The experiment involved 24 participants that were randomly assigned to a treatment or control group. The treatment group was given a device that lit up in red, yellow, or green, relating to the pricing periods of on, mid, and off peaks respectively. The experiment yielded a 13% reduction in energy consumed and cost of energy for the one-month duration of the experiment when compared to the control group. The treatment group was also given a survey, post experiment, to further understand their experiences, behaviors, and attitudes. The participants stated that they found the device slightly to moderately useful, quoting that it was a good ‘reminder’ to act conservatively. The survey also uncovered the fact that most participants were familiar with the pricing scheme beforehand and that the main drivers for conserving were existing environmental values and cost concerns. This led to the conclusion that the lack of knowledge (environmental or pricing related) was not the barrier to conservative behavior, but the lack of cognitive availability/access to this information. Which means that the availability heuristic had a strong presence within the sample population. Therefore, future plans to reduce or shift energy consumption should focus on nudges and prompts as reminders for individuals to act in an environmentally friendly manner.

The State of Autonomous and Connected Vehicles in Canada

Kristina Mlakar

Connected and Autonomous Vehicle (CAV) technologies are developing at an exponential pace and there is a global race to see which manufacturer will be first to produce a fully autonomous vehicle and which region will be first to legalize on-road deployment. CAV technologies have gained popularity due to their promise of significantly decreasing the number of on-road collisions and fatalities, vastly reducing congestion in urban centers, solving first-mile/last-mile barriers, and providing billions of dollars in economic benefits. However, ineffective CAV deployment mechanisms could alternatively lead to adverse effects, including the perpetuation of urban sprawl, increased greenhouse gas emissions from increased single passenger travel, and eroding transit ridership. The United States and European Union have emerged as the two most progressive jurisdictions with regard to regulatory reform to accommodate CAV technology testing and developing standards for safety and cybersecurity. The United States and European Union are also global leaders in the testing of these technologies, alongside China and Singapore, both in dedicated testbeds with a myriad of real-life simulated environment, as well as on-road pilot projects. Canada has proven to be a global laggard in both regards, with only one province (Ontario) enacting legislation thus far and testbeds and pilot projects that pale in comparison to the duration and scale of those in other global regions. It would bear most merit for Canada to mimic its regulatory and testing efforts after these more progressive regions and use successes and failures experiences thus far as guidance. If Canada hopes to hold a place in the global CAV market, all regulatory and testing initiatives must be starkly accelerated.

Analyzing Policy Mechanisms Affecting Renewable Energy Systems in Ontario

Morgan Wong

The development and deployment of renewable energy is seen as a fundamental solution for meeting growing energy demand while also mitigating the effects of climate change. Due to the high expense associated with renewable energy technologies compared to traditional power generation, government support is required for widespread implementation. As Canada's most populated province in the country, Ontario has significant potential to greatly reduce greenhouse gas emissions through increasing renewable energy adoption. The objective of this paper is to determine the best support mechanism for promoting renewable energy projects in Ontario moving forward. A comparative literature review was completed for the three most common policy mechanisms, namely: feed-in tariffs, quota systems, and competitive auctions. Of the three policy mechanisms analyzed, it is recommended that Ontario implement competitive auctions if the province wishes to continue financing renewable energy adoption. The competitive auction mechanism has been shown to be the most cost-efficient among the three mechanisms and can also provide the province with a greater degree of market control. Feed-in tariffs and quota systems are not recommended due to the lack of market control and associated market risks, respectively. It is important to recognize the possibility that further RE development may eventually decrease costs to the point where policy mechanisms will no longer be needed. Ontario should be aware of how renewable energy development is progressing nationally and globally in order to best finance initiatives to reduce overall greenhouse gas emissions.

Influence & Technology: Leveraging Information & Communication Technology (ICT) to Influence Sustainable Behavior in Small & Medium Sized Enterprises (SMEs)

Joseph Palladino

In the private sector, larger firms attract significantly more attention to their sustainability programming and initiatives owing to the significance of their individual environmental footprints. This has led to sustainability implementation strategies often being designed under the assumption that small and medium-sized enterprises (SMEs) are merely 'scaled-down', versions of their larger counterparts. There is now a need for sustainability implementation strategies which are designed with small businesses in mind. At the same time, information and communication technologies (ICTs) have become a staple of the 21st century business function. These megatrends have helped define the private sector in recent years, and have left a significant gap between the resources available to large firms and those built for smaller firms – especially when considering tools for sustainability integration. This paper attempts to bridge this knowledge gap by presenting information and communication technologies (ICTs) as a tool for small and medium-sized businesses to capitalize on when seeking ways to integrate sustainability into the firm's corporate culture.

An understanding of the importance of corporate culture and the current state of sustainability management in SMEs is provided before outlining those value-adding factors of ICTs which particularly benefit smaller teams. The paper indicates that of all ICT capabilities, those most noted for their ability to influence behavioral change – and thus promote the development of more sustainable cultures within SMEs – were Web 2.0 features, building a 'community of practice', and engaging in primary task support. A 'Preferred Components' Framework is presented, with the goal of reducing those barriers facing the integration of sustainability in small and medium-sized businesses.

Low Carbon Energy Development in Thailand – Analysing Implementation Barrier

Taylor Whitfield

Southeast Asia is a rapidly developing region with an expanding middle class and increasing natural resource demands. Of these increasing demands is that of energy, something that has the potential to affect many aspects of every person's daily life. With greater stress on the energy systems of many Southeast Asian countries the need to address energy sustainability is becoming more and more important.

Through the use of Thailand as a context, this paper explores the past and present environment of sustainable, low carbon energy development in Southeast Asia by analysing the implementation barriers to a next generation energy system. Using literature that addresses a broad range of sustainable energy development issues throughout the Southeast Asian region, barriers to successful sustainable energy systems are identified and compiled in order to more clearly understand the challenges at hand for Thailand and the region more broadly. Through the undertaking of a meta-analysis, the information contained within nine relevant publications was used to draw conclusions about the most prominent and impactful barriers to a successful sustainable energy system. The results of this analysis showed that financial, functional policy, and capacity barriers were the most prevalent.

As a country that has decades of experience with relatively ambitious renewable energy policies regionally, Thailand presents a widely relevant and applicable context to analyse the specific hurdles faced, both on micro and macro levels, to the implementation of a sustainable energy system. This research looks to establish where the most focus should be directed, and present potential solutions for overcoming the established barriers.

Waste Management in Multi-Residential Buildings in Toronto: Perspectives from Property Managers

Swinzle Chauhan

Multi-residential dwellers make up nearly 50 percent of Toronto's residents, but divert only 27 percent of their waste from the landfill, compared to 65 percent in landed homes (City of Toronto, 2016).

The literature argues that there are many factors for poorer sorting in multi-residential buildings: inconvenience (Lakhan, 2016; Ando and Gosselin, 2005; DiGiacomo et al, 2017; McQuaid and Murdoch, 1996); a lack of education and outreach (Henrickson and Wittman, 2010; Colin, 2014; Towes, 2013; Yau, 2010); and a lack of financial incentives/penalties (Yau, 2010).

This study interviewed and surveyed nine property managers to understand their views on waste management. Property managers are important to improving diversion because they can influence how refuse is managed in their buildings. Results show property managers feel that laziness, inconvenience, cultural factors, and a lack of responsibility placed on residents for proper sorting are reasons for poor diversion rates. They desire better waste tracking and data to create better waste management plans. They also feel that more education and awareness might help improve diversion rates and that a larger share of the burden for sorting be placed on the resident.

It is recommended that the City of Toronto communicate more frequently with industry associations to build trust with property managers, and share their insights on what would help improve waste diversion. The City should also standardise waste hauling services to ensure industry waste management standards are homogenised. Property management companies should look to provide more innovative engagement measures to residents and consider investing in disposal areas that promote better sorting.

What are the most effective interventions at changing household food waste behaviour and why?

Anastasia Boutziouvis

To provide researchers, policy makers and others with information on how to tackle household food waste, a literature review was performed on 11 peer-reviewed studies that contained 17 interventions that sought to change household food waste behaviours. Interventions that were most effective at changing these behaviours were prompts (Hedge's g : 0.51), convenience (Hedge's g : 0.45), and a combination of social modelling and convenience (Hedge's g : 0.35). It was also found that very common intervention types, such as justification information (Hedge's g : 0.12), were ineffective at changing food waste behaviour, and it is recommended that such interventions be used with caution. This review also revealed that many interventions need to be better tailored to specific personal and social factors affecting individual food waste behaviours in a given location, which would create more successful and durable behavioural outcomes.

Transforming the 21st Century Classroom into a Sustainable Learning Ground

Nadia Alick

Environmental education in Ontario is encompassed under the policy framework, Acting Today Shaping Tomorrow. However, there currently lacks a coordinated approach to integrating environmental education within the formal education system. Addressing this void, a provincial program known as Ontario EcoSchools utilizes a voluntary certification framework to incentivize school communities to participate in environmental education. Given its increasing adoption within school districts across Ontario, my research study explores the factors that have contributed to a successful implementation of environmental education in school districts as a result of the partnership between Ontario EcoSchools and school boards. This was done through a mixed-methods approach, which included the use of both survey data and data collected from semi-structured interviews with school board representatives. My analysis revealed time constraints and lack of engagement as the most common barriers to implementation. Thus, informal supports, release time and local partnerships can help overcome these challenges. In addition, there is little data collection on the impact of the EcoSchools program within the school district. Lastly, hosting regular feedback sessions throughout the certification process emerged as a best practice as it allows for efficient allocation of resources and improved support to schools participating in the program. These findings will help inform best practices in the implementation of the Ontario EcoSchools program and improve the overall integration process for environmental education in Ontario.

The relationship between pollution and child mortality: evidence from Mexico City

Irune Echevarria

Effects of air pollution on infant mortality research in developing regions commonly arise challenges derived from a limited system for data collection or low quantity-quality of available information. In this context, researchers face a methodological challenge to avoid omitted variable bias and endogeneity. I extended of a robust framework that benefits from fixed effects and instrumental variables to estimate the impact of air pollution (PM_{10}) on infant mortality in Mexico City Metropolitan Area assessing income at a municipal level. I find that an additional 1 g/m^3 increase in 24-hour PM_{10} and annual municipality income value below the mean results in 0.36 weekly infant deaths per 100,000 births. This result is comparable to results from a previous research conducted in Mexico City and those emblematic studies in the US.

Exploring the Link Between Board Gender Diversity and Environmental and Social Ratings of Canadian Publicly-traded Firms

Madeline Collins

This study aims to test for a statistically significant relationship between board gender diversity and the environmental and social rankings of Canadian firms listed on the S&P/TSX composite index. Providing insight into this correlation can help firms move towards better Environmental, Social and Governance (ESG) practices, which are gaining more attention worldwide. The focus on the Canadian business context fills a gap in research that focuses largely on U.S or multinational firms. Similar to existing studies, a multiple linear regression is performed while controlling for variables such as firm size, board size, and board independence. The findings suggest that only one woman is required to realize higher environmental and social rankings within industry peer groups. Furthermore, the number of women had no significant impact on either environmental or social performance rankings, suggesting that there is no issue of tokenism in the study context. Applying resource theory and stakeholder theory, as is done in existing literature on this topic, the results suggest that one woman on the board is sufficient to provide diverse networks, expertise, and experiences necessary to address complex challenges firms face with respect to society and the environment. Additional research is required to verify if this is due to a direct correlation or intermediary variables such as corporate culture and values.

The Management of Microplastic in the Great Lakes: A Science and Policy Perspective

Ashley Arora

Plastic pollution is an emerging global issue. According to the United Nations Environment Programme it is considered an environmental problem with potential human impacts. Plastic is particularly an issue since it never fully degrades, only dividing into smaller pieces of plastic litter called microplastic. Microplastic can also be intentionally produced for consumer use. Categories include microfibers, fragments, microbeads, foam, film, production pellets. Although there are numerous studies of microplastics in the oceans and marine environment, little research has been done on the Great Lakes. Existing research indicates that the largest category of microplastics found in the Great Lakes include fragments (56%), followed by fibres (16%), and microbeads (14%). However, from this category, only microbeads are being addressed by both Canada and US with a nation-wide ban in effect by 2018. Sources of microplastic into the Lakes are predicted to be from washing machines (from release of fibres from the textiles), direct release from industrial process, and lack of proper filtration from wastewater treatment plants. Microplastic are known to enter the aquatic food chain, easily being consumed by fish, and other wildlife. With this, they allow for biomagnification of the toxic chemical that are adsorbed on the surface into higher trophic level. This posed a risk for human who also consume fish. Other implications of microplastics to human health are currently unknown. Additional policies are needed to address the emerging issue of microplastics in the Great Lakes. Some of the incentives to reduce the amount of microplastics that end up in the Great Lakes could involve product redesign to increase use of recyclable plastic and reduce one-time use plastic, removing plastics at source by use of filters for the effluent water of washing machines, and EPR program for consumers.

Coffee organic waste management and alternative applications: A case study of coffee production in the Galapagos Islands

Rodrigo Bustamante

Current production practices and consumption levels of coffee pose a potential threat to the sustainable development of the coffee industry itself. With vast volumes of residues generated, coffee organic by-products represent a challenge for management and appropriate disposal. A case study is performed at a coffee plantation in the Galapagos Islands where visits to the facilities as well as laboratory testing of soil samples were carried out to better understand the impacts of residues disposal; while a review of the scientific literature throws light over the potential alternatives application for coffee organic by-products. Results suggest that disposal of residues might have an influence over soil properties like pH and electrical conductivity, ultimately impacting on production yields. Furthermore, it is concluded that production of biofuels from coffee waste is a potential alternative to be applied at the coffee plantation, however technical limitations may still hinder the option feasibility. In that sense, composting techniques represent the most effective way to manage residues, while mitigating potential sustainability risks.

The Influence of Organizational Behaviour in Motivating Corporate Environmental Sustainability in Quito, Ecuador

Sandra Espinosa-Moreira

This study analyzes the influence of organizational behaviour elements (i.e. leadership, communication, culture, and motivation) in fostering corporate sustainability among micro and small companies. Ecuador has seen an upsurge of voluntary sustainability initiatives from companies as well as organizations that promote this practice. However, these initiatives are still scarce and far from becoming mainstream practice, especially among micro and small companies. This group of companies are particularly relevant as they represent around 90% of all Ecuadorian companies, adding importance to their role in achieving sustainable development. This research project addresses the scarcity of sustainability initiatives in Quito, Ecuador by performing an extensive literature review of corporate sustainability in Ecuador, corporate sustainability in SMEs, and corporate sustainability and organizational change. Then, a qualitative analysis of four companies was performed to explore differences and similarities of the organizational behaviour elements among these companies, to provide insight on sustainability drivers, and to provide future research recommendations. The results suggest that direct and constant communication may be a facilitator for sustainability initiation and implementation. Furthermore, findings may indicate that creating knowledge and awareness about sustainability and adopted initiatives before, during, and after implementation prevent resistance and promote alignment of employees to corporate sustainability.

Evaluating destination competitiveness and sustainable tourism for Nunavut and the Canadian Arctic in China

Jo-Ni Su

The objective of this paper is to help northern destination managers and policy makers develop sustainable tourism and marketing strategies for Chinese tourists based on business-related competitive factors and sustainability issues. The results of primary research show that from the perspective of Chinese tourism experts, Nunavut has competitive advantages in natural resources, cultural resources, and business travel and the Canadian North more generally in natural resources, environmental sustainability, cultural resources, business travel, and international openness. Since previous literatures show that endowed resources are the second-most important dimension of Chinese tourism destination competitiveness, this paper suggests that Canada's northern regions should design market positioning and communication strategies centering on this element and implement sustainable tourism to maintain a competitive advantage. The paper also explores the competitive disadvantages and the opportunities for sustainable tourism in Canada's northern regions.

What Are the Current E-waste Recycling Challenges, with Respect to Recycling Electronic Products, Faced by Producers and Consumers in China?

Zhu Zhu

China has experienced rapid economic growth and a significant increase in the consumption of electronic devices in recent years. Consequently, periodic replacements of obsolete electronic devices generate massive quantity of e-waste. From statistical data, in 2016 China generated approximately 4.6 million tons of e-waste (Wu, 2017). Meanwhile, the current Chinese society doesn't have an appropriate recycling network to manage e-waste, and a large portion of e-waste end up into the hands of illegal dismantling workshops instead of professional (authorized) recycling enterprises. Therefore, recycling e-waste is a stubborn issue to overcome. From a sustainability perspective, albeit e-waste has negative repercussions on the environment and human health, it simultaneously creates business opportunities in the Chinese economy because e-waste also contains valuable materials that can be recycled, such as arsenic, gold and tin. This research aims to find the challenges faced by electronic device producers and consumers regarding recycling e-waste in China by reviewing literatures. In addition, this study conducted an interview with the original author of EPR theory, Thomas Lindhqvist to obtain an expert's perspective on e-waste management. The author discusses a few current challenges including illegal collection and inefficient government legislation. He also provides potential initiatives managing e-waste sustainably in China. To conclude, this paper suggests implementing Identification Registration Systems to record e-waste quantities and Deposit-Refund Systems to solve holding issues. It also emphasizes the importance of support from public education and online recycling platforms that can potentially improve the efficacy of e-waste management in China.

Innovative financing mechanisms and models for energy efficiency retrofits in Toronto

Brendan McGovern

Since nearly two thirds of the world's carbon emissions come from urban centers, many cities are at the forefront of climate action. For example, the City of Toronto claims that "climate change is the single biggest challenge facing our planet," and has developed a set of ambitious reduction targets and supporting strategies, such as building energy efficiency retrofits. This paper will explore how innovative funding and financing tools can help accelerate investment in energy efficiency in Toronto's residential sector. Although energy efficiency is recognized as an effective emission reduction strategy, retrofit projects often go unrealized as a result of knowledge, regulatory, and financial barriers. The first section of this paper provides a background on energy efficiency strategies and further examines each barrier. While barriers do not act in isolation, the financial barrier is identified as being the most prevalent. Secondly, an overview of currently available financing tools is provided before conducting a literature review of three emerging innovative financing tools and models: crowdfunding, green bonds, and green banks. Evaluated based on effectiveness and financial efficiency, crowdfunding would not provide enough scalable potential to have significant impact. However, green bonds and green banks were identified as providing the greatest potential for accelerating energy efficiency retrofits, while still facing a number of implementation challenges. Finally, a case study of Toronto's residential sector and climate action history provides context to understand the extent of action required to help reduce greenhouse gas emissions through building retrofits.

Engagement & Commitment with Canadian Aboriginal Communities by Natural Resource Sector

Rayan Dali

The purpose of this research paper is to examine engagement and corporate commitment with Canadian Aboriginal communities in the natural resource sector. Firstly, this paper discusses the various approaches and mechanisms to engage Aboriginal communities such as consultation, environmental assessments, and impact benefit agreements; each of these approaches has opportunities and limitations. Secondly, this paper seeks to develop a best practice approach to assess companies and rank their commitment to Aboriginal engagement on a measurable scale of 0 to 4. The industry analysis examines 15 companies in the Natural Resource sector with operations in Canada. More specifically, the industry analysis consisted of reviewing websites, corporate social responsibility reports, and annual reports. The analysis tools used consisted of the Canadian Council for Aboriginal Business program and the Progressive Aboriginal Relations (PAR). The paper then examines GRI 411; which includes reporting requirements for the rights of Indigenous people as a mechanism to evaluate corporate commitment to Aboriginal communities. There are three key findings in this research paper: first, there are several challenges with the current tools for Aboriginal engagement such as lack of decision-making opportunities for Aboriginal communities during the project life cycle. Second, it has been demonstrated that corporations which seek third-party assurance, provide measurable information or adhere to best practices are committed to positive and fruitful engagement with Aboriginal communities. Third, the oil and gas sector is the sector with the highest commitment to Aboriginal engagement, with 2 out of 5 companies scoring a level 4. Followed by the Forestry sector with 1 out of the 5 companies scoring a level 4 and finally, the Mining sector does not have any companies with a high score of 4 for Aboriginal commitment.

Can the Impacts of Thawing Permafrost on the Alaska Highway Be Mitigated in the Long-Term?

Karim Kettane

With current global climate-warming trends, permafrost is degrading fast: it is changing from a continuous state to a warm and discontinuous state, with a risk of subsiding into perennially frozen ground should global warming trends accelerate. The Alaska Highway, being a vital transportation corridor between Canada and the United States, largely depends on the resilience of permafrost soils. Specifically, as a section of the highway between Burwash Landing and Beaver Creek has become highly vulnerable to permafrost thaw, the study underlines that permafrost degradations can lead to major engineering implications while, in turn, impacting gravely on the communities that rely on it.

Thereby, this report shows that the impacts of thawing permafrost on the Alaska Highway can only be mitigated over the short term. Subsequently, it demonstrates that, in the long-term, no viable solution that is currently available, will successfully mitigate the impacts of thawing permafrost on the Alaska Highway should the worst climate-forcing scenarios become reality.

In coming to this conclusion, the study sheds light on the current nature and composition of permafrost under the highway while analyzing the causes of permafrost deterioration. It also discusses several mitigation techniques designed to impede the impact of permafrost degradation on the highway. The Qinghai–Tibet Highway case study is then considered to underline the potential effects of four climate-forcing scenarios on future permafrost subsidence.

The report also discusses knowledge gaps encompassing uncertainties about future climate trends and uncertainties about the long-term viability of geotechnical solutions, while providing recommendations to reduce these knowledge gaps as much as possible.

Soil chemistry changes in relation to varying densities of vegetation on abandoned agricultural land in the highlands of San Cristobal, Galapago

Carlyle Apps

Soils are the foundation of all terrestrial ecosystems in addition to being ecosystems themselves. The interaction between soils and vegetation are complex. Soil properties can affect the types of species that are able to survive within them, but are themselves affected by the vegetation they support. In the Galapagos, a biodiversity hotspot and international conservation priority, human influences on natural ecosystems has contributed to the introduction of invasive species. Limitations on agricultural practices and tension between the citizens and governing bodies has led to abandoned agricultural lands, which are vulnerable to colonization and spread of invasive species. This study examines the relationship between vegetation density and soil properties on abandoned agricultural land in the Galapagos. Significant changes in pH, cation exchange capacity and electrical conductivity were observed among sites with varying vegetation densities. Differences in soil moisture content, organic matter content and nutrient content were also observed. All three sampling locations were within a small geographic distance suggesting that the differences in soil properties may be the result of interactions between varying vegetation types and densities with the soils in which they grow. Understanding these interactions further could help inform management decisions for the control of invasive species or restoration of abandoned farmland in both the Galapagos and worldwide.

The Influence of Climate Change on the Private Insurance Industry: An Opportunity for Innovation through Strategic Partnerships & Big-Data

Cristian Altobelli

This report undertakes a comprehensive review of the private insurance industry pertaining to how the private insurance sector can facilitate a global paradigm shift towards a low-carbon economy. This analysis utilized secondary literature to determine the issues the private insurance industry is facing stemming from the impacts of climate change, the significance of these impacts with respect to long-term profitability, the shortcomings of current efforts to address risk associated with climate change and how the sector can leverage their significant financial and corporate influence to facilitate change. One of the significant trends that emerged revolved around the private insurance industry's willingness to mobilize resources to address climate change but only to the extent that it benefited organizations from a reputational standpoint. After synthesizing current and future industry trends, it is recommended that current sustainable insurance initiatives consolidate to reduce inefficiencies stemming from fragmentation, inform the public on the direct impact climate change will have on their property from an environmental & financial standpoint and establish a climate change research fund to empower future innovators with the resources to alter how society engages with climate change. Moreover, it is recommended the private insurance industry develops a formal public-private partnership with governments built upon the sharing of big data as means to exert pressure on corporations lagging in their efforts to transition to the low-carbon economy. This partnership will shape public and private policy rewarding proactive behaviour and investment into resiliency while creating a corporate environment that disciplines laggards. The utilization of this public-private partnership would facilitate increased investment into green infrastructure projects funded by the private sector to build resiliency and integrate a rebate-based catastrophe bond program that rewards proactive municipal investments.

Indoor Radon Gas Exposure: A Comparative Analysis of Radon Control Policy from Health Canada and the US EPA

Sara Tonogai

This paper examines the current state of radon policy within Health Canada and the United States Environmental Protection Agency (US EPA). The study utilized a comparative analysis to evaluate radon policy providing protection in residential buildings, child care facilities and occupational environments. This study aimed to evaluate the differences between Health Canada and the US EPA radon policy to determine which country is exercising greater control and management of this carcinogenic contaminant. The study found that the US EPA had a more protective radon strategy. This was evidenced through a lower radon guideline and more detailed radon policies in child care facilities, among many other factors considered in the analysis. Overall, there were no legal requirements found in Canadian legislature that required testing for radon, remediation where high levels were detected, and disclosure of test results. From this analysis, several strategies were proposed to help improve Health Canada's current radon strategy, including revising building codes to include radon monitoring and testing, lowering residential radon guidelines, and launching public education campaigns. Overall, more legally enforceable guidelines should be implemented to increase the safety of homes, workplaces and child care facilities.

Rebuilding the urban forest in the context of socioeconomic and demographic issues: An analysis of the City of Mississauga's One Million Trees Program

Kristen Schaper

Over the past century, the Greater Toronto Area (GTA) has undergone unprecedented expansion outside of the City of Toronto and into neighbouring communities such as the City of Mississauga. Along with this growth comes challenges in mitigating the concurrent social, economic and environmental impacts. Rapid urbanization coupled with the onset of climate change, invasive species, and other anthropogenic effects has hit the urban forests of Southern Ontario with intensity. With these challenges in mind, good management of these urban forests will ensure the successful future growth of this urban region. Good management entails developing a systematic approach to regrowing the urban forest; one way to set priorities is to identify which communities are experiencing the greatest need of reforestation, in the context of demographic and socioeconomic factors. This study addresses the question: how do components of an ecologically valuable urban forest correspond spatially with socioeconomic status and demographic variables such as recent immigration rates? This question was addressed in the context of the City of Mississauga's One Million Trees program. This was examined to gain insight into planting locations using Satellite imagery, Geographic Information Systems (GIS) and iTree software where spatial patterns of planting locations, existing canopy cover percentages, societal data and land use allocations were observed. The results show that areas of low socioeconomic status or areas where recent immigration is highest tended to be correlated with poor quality urban forest. Areas with low forest canopy coupled with low socioeconomic and high immigration percentages were concentrated in Wards 5, 7 and 10. Five recommendations were suggested, which included furthering research, stewardship, and stakeholder involvement as well as establishing a Citizen Urban Forest Advisory Committee and the continued work towards the recommendations set out within the City of Mississauga's Urban Forest Study.

Sustainability implications of use of Blockchain in Financial Services Industry?

Chetna Chaudhary

Blockchain is a disruptive technology that is expected to change the world the way Internet changed it. Internet revolutionized availability and maintenance of information, and Blockchain is expected to do the same to transactions. The technology is expected to touch almost all sections of the economy through different use cases. It is important to understand the impact that this far-reaching technology would have on the way we transact. This paper studies the impact of Blockchain by highlighting the distinctive features of the technology – distributed, secure and immutable – that make it useful in the financial services industry. The application of blockchain in Trade Finance, Global Payments and AML & KYC will have a mix of sustainability implications. It would lead to reduction in processing time, transaction fees, illegal transactions and costs for banks. It would also lead to increase in cross-border trade. However, there will be a negative impact due to job losses in affected business lines of the financial institutions. The impact that this technology can have in underdeveloped economies is immense as it would lead to reduction in poverty and income inequality by providing access to financial inclusion. The technology faces some challenges such as governance and high energy requirements, which will have to be addressed before wide scale adoption.

Coffee Processing Wastewater: Impacts and Treatment Methods - Case Study: Hacienda el Cafetal, Procafe S.A, San Cristobal Island, Galapagos

Amy Geisberger

The most popular method of removing a coffee bean from its outer fruit is known as wet processing or beneficio and includes several steps in which large amounts of water are used. As a result, this method produces wastewater (coffee processing wastewater) that is high in nutrients, organic matter and has low pH, making it contaminated and harmful to humans, flora and fauna. For this research, a study was conducted on a coffee plantation on San Cristobal Island, Galapagos, Ecuador (Hacienda El Cafetal, Procafe S.A) to assess the physico-chemical characteristics of coffee processing wastewater (CPW) and soil receiving CPW to further understand coffee processing effluent. Water sampled in a second receiving wetland on the plantation showed high concentrations of BOD at 618.31 mg/L, conductivity of 369 microsiemens/cm, phosphate at less than the detection limit of 0.5 ppm and pH of 6.14. Soil sampled in the first receiving wetland showed a pH of 4.58, an electrical conductivity reading at 151.6 microsiemens/cm and phosphate at less than the detection limit of 0.5 ppm. These results confirm that BOD and pH of CPW are concerns for the receiving environments. To develop a recommendation for the treatment of CPW, a literature review on treatment technologies was completed and found that stand-alone treatment technologies were not sufficient in reducing CPW to optimal discharge parameters. Instead, a combination of treatments should be considered to achieve ideal pollutant removal efficiencies. A specific recommendation, based on the current needs of the Galapagos plantation and its CPW characteristics was suggested and including, pH pre-treatment using finely ground agriculture lime, followed by retention in an anaerobic basin and then batch fed into an upflow anaerobic filter before reaching the first of two wetlands already on site. Based on removal efficiencies presented in literature, this recommendation would remove approximately 99.10% of the raw effluent BOD and increase pH to neutral. As Procafe is a market leader in the Galapagos, it is imperative that they take the necessary steps to protect against further pollution to the already stressed marine ecosystems and freshwater resources of their unique Island.

Human Psychology and Climate Change

Matthew Judyn

The threat of climate change has been recognized a long time ago. As with any potential disruptor to the status quo, many vested interests had strong incentives to challenge climate science. This challenge continues until today. As a result, the disparity between the scientific consensus on climate change and the public opinion is considerable. Yet while concerned scientists and climate action advocates continue to blame and put pressure on industry interests, some have decided to look beyond the motives of these interest groups and focus on the motives of the recipients of their messaging campaigns – the public. Recent research into the human psychology reveals a clearer picture of the reasons for the discrepancy between climate science and public opinion. This research paper summarizes the various psychological mechanisms which humans employ in order to understand and respond to climate change. Additionally this research stresses the importance of considering these mechanisms in designing effective climate change awareness campaigns.

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