Reducing carbon emissions from household waste and transportation vehicles in Metro Vancouver.

For: The City of Vancouver Council Members
Vancouver, British Columbia

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Figure 1: Aerial view of Downtown Vancouver from a seaplane (left). (Sources: Erfan Ahmed)

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I. INTRODUCTION

Vancouver is situated on the unceded, traditional homelands of the Musqueam, Squamish and Tsleil-Waututh Nations - and is the largest metropolitan city in western Canada, with a growing population of 631,486 as per the 2016 census and a population of 2.4 million people in the greater Vancouver area (City of Vancouver). Rising population has proven to create challenges for the region to overcome issues pertained to urban expansion, gentrification of neighborhoods and improving the transportation network within the region. With rising population growth and urban expansion, there has also been a prevalence of increased climate change around the globe that has played a significant role in contributing problems due to household waste and carbon emissions. In order to combat the issues relating to this, it is crucial to start by implementing changes in our lifestyle. Vancouver is known to be one of the eco-friendliest cities in Canada and implementing initiatives in the daily life such as the use of transit and cycling which provides an alternative to other forms of transportation. Furthermore, reducing household waste and using reusable items can act as a viable solution to overcome this area of concern.

A. MAJOR SOURCES OF EMISSIONS IN VANCOUVER

According to the Government of British Columbia, the total greenhouse gas emissions (GHG's) in 2017 for the province turned out to be approximately 64.5 million tonnes of carbon dioxide gases which reflects a 1.2% increase in emissions since 2016 (British Columbia Greenhouse Gas Emission Inventory 2017).

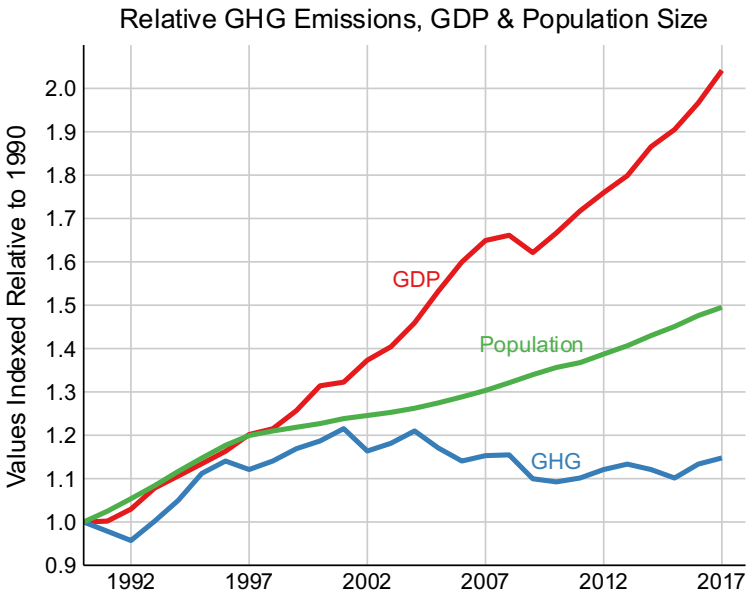

Figure 2: Relative GHG Emissions, GDP and population size. (Source: Government of British Columbia)

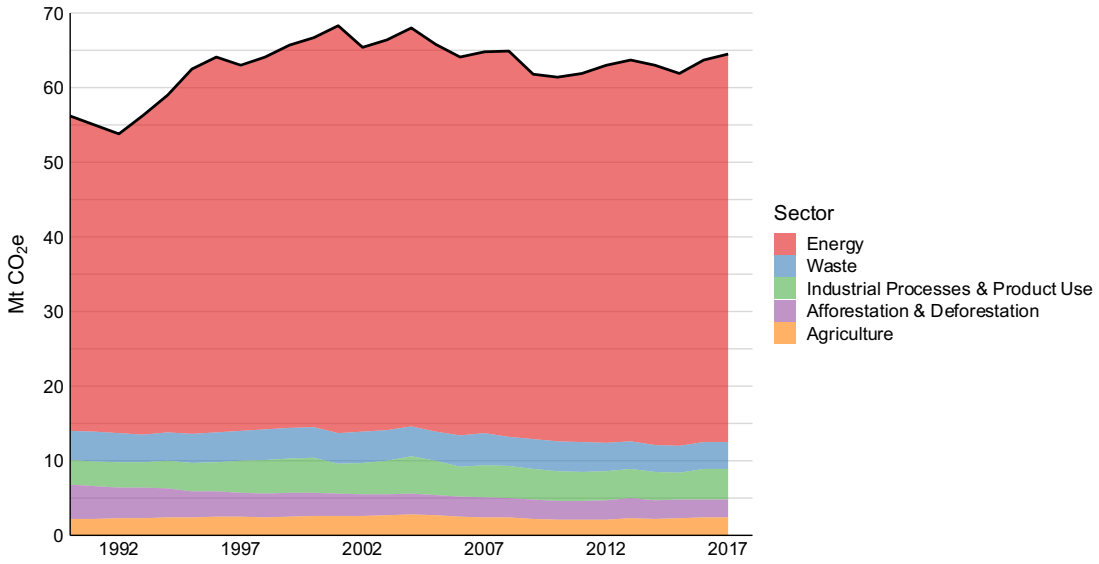

Figure 3: The largest sources of greenhouse gas emissions in British Columbia (Source: Government of British Columbia)

The above graph illustrates a steadily increase in population size and gross domestic product (GDP) since 2009, whereas greenhouse gas emissions have been increasing slowly in smaller increments during the same period of time (Government of British Columbia). Furthermore, this research has also suggested that the main sources for greenhouse gas emissions in the Greater Vancouver Area (GVA) include deforestation, agriculture, energy, industrial processing and waste. Out of the most affluent sectors in British Columbia, the two largest sources of carbon emissions have been showed to generate from energy production and waste.

i. IMPACT OF HOUSEHOLD WASTE AND CARBON EMISSION

Food waste accounts for approximately one third of all food produced for human consumption, and mass waste of food on a large-scale level has shown to decompose and release methane gas into the atmosphere (FAO 2013). Canadians have been reported to waste approximately $50 billion net worth of food every year, which accounts for 3% of Canada's 2016 GDP (Gooch et. al, 2019). Moreover, 21% to 47% of this food waste accounted for in Canada occurs on the household level. Food waste and loss also creates 3.3 gigatons of greenhouse gas emissions which contributes to our current climate issues that occur on a global scale. In addition, all of the resources that have been used to produce food are also wasted.

ii. IMPACT OF TRANSPORTATION VEHICLES AND CARBON EMISSIONS

Climate change is one of the most significant challenges that has had an impact on achieving sustainable development, and thereby threatens a vulnerable ecosystem in all realms of the globe. The prevalence of rising climate change has impacted economies and affected millions of lives,

costing people, communities around the globe. And subsequently, weather patterns have been changing significantly with sea levels rising at all-time highs, and greenhouse gas emissions that are now at their highest levels in history (UN Sustainable Development). Hence without taking an immediate action plan towards this issue, the problems associated with global warming will continue threaten the ecosystem with high temperatures and sea levels, leaving our environment as one of most vulnerable and affected the most.

B. HOW CARBON EMISSIONS AND WASTING CAN IMPACT THE COMMUNITY

It is evident that rising global climate change will continue to threaten the vulnerability of the ecosystem and natural conservation within Canada. Overall, it is expected that the average annual temperature is expected to increase which will result in further prevalence of coastal flooding within the region due to the melting of glaciers (Government of Canada). Furthermore, a subsequent increase in precipitation can result in higher likelihood of risks pertained to excessive flooding in Metro Vancouver and coastal regions within British Columbia. Heat waves are also likely to subsequently increase in severity, resulting in higher risks of forest fires – which has already been a major area of concern within the last decade. Due to this reason, many wildlife species have been forced to adapt to warmer climates and thereby be subject to stressors in the environment or be driven out from the ecosystem (Government of Canada).

C. PURPOSE OF RESEARCH

The purpose of this preliminary report is propose the City of Vancouver council members with an opportunity to invest in tax paying dollars towards two major strategic and smart solutions that will aid towards the overall reduction of carbon emissions in the region, such as providing

more transportation alternatives that allows reducing the individual carbon footprint, followed by an improved waste management program to reduce unnecessary household waste.

II. DATA COLLECTION

Residents of the city of Vancouver have been included and assessed optional surveys and questionnaires regarding the daily commute within the region, with a purpose to analyze what the average time and distance is spent per day in commuting from home to work or school, and the modes of transportation that is usually taken. The latter part of the survey analyzes the amount and types of waste that is generated in the average household, and what type of waste management strategies are currently being taken into consideration.

a. CURRENT RIDERSHIP OF TRANSPORTATION IN VANCOUVER

Vancouver is also known to have one of the most comprehensive and reliable transportation networks within the region. With a soaring rise in fuel prices, there has been a steady increase in transit ridership that has forced commuters to find other alternatives to getting to work and school without breaking the bank or spending endless amounts of time stuck in traffic. One of the major bus routes known as the '99-B line' which connects the city from east to west along the Broadway corridor, has been reported to be the busiest bus line in North America, with an annual boarding of more than 17 million people each year (TransLink, 2018). Furthermore, TransLink currently uses a diverse fleet of low and zero emission electric buses that operate within the region and creates a rapid transit system featuring high-capacity vehicles with priority over regular traffic, making it fast, frequent, and reliable (TransLink, 2018). The growing rapid transit expansion within the region has proven to create challenges pertained to an inadequate transportation infrastructure. One of these is the 99-B line along the Broadway corridor which

has proven to be a challenge to solve mass ridership that has caused a great deal of overcrowding and busses running at over-capacity, thereby forcing some riders to wait for increased amounts of time until they can successfully get on. The exponential growth of a rising population within the region has resulted in the development of the Broadway subway project that will extend the current Millennium SkyTrain line to travel westbound beneath Broadway through a lower tunnel network. However, the extension of the Millennium line has also created a challenge for transit riders using service to UBC, as the project currently does not extend the line beyond the current proposed terminus station at Arbutus street.

Figure 4: Newly red-painted high occupancy vehicle lane for the 99-B line bus to make drivers aware of the on-stopping zone along the Broadway corridor. (Source: Erfan Ahmed)

Figure 5: Proposed extension of the Millennium line for the Broadway Subject project. (Source: TransLink website)

b. CURRENT WASTE MANAGEMENT PROGRAM IN EFFECT

Currently, the city of Vancouver has been implementing a curbside recycling program that allows residents to dispose items according to one of the specific waste streams that include garbage, food scraps and yard waste. The current model has certain limitations that does not take illegal dumping or cross contamination into account such as disposing plastic into compostable bins.

c. SUMMARY OF FINDINGS FROM SURVEYS

The survey was conducted among 50 residents living in East Vancouver and included a series of quality of life-based questions that related to food waste and transportation use within the region. The results show that in terms of sources of waste on the household level, 35.5% of residents experience food that expires before the “use by” or “best before” date. Secondly, 26.9% of residents have also experienced cases of food going to waste as a result of being left too long in the fridge (of which fresh produce expires the most). In addition, the results on transportation use

in Vancouver show that a large proportion of residents (47.9%) commute to work using a motor vehicle, followed by public transportation (35.5%). The results show that even with a concrete public transportation network within the region, a majority of residents tend to still drive to work which plays a big role in the issues pertained to an individual's carbon footprint, and a rise in greenhouse gas emissions in the environment.

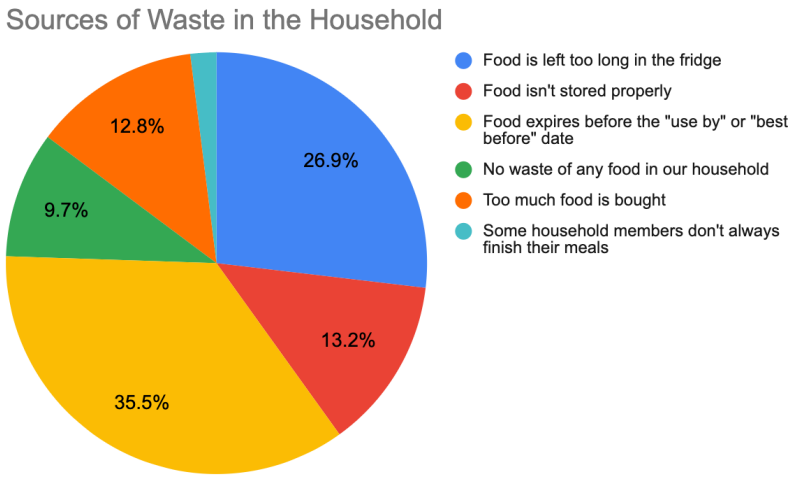

Figure 6: Survey Results of the sources of waste in the household

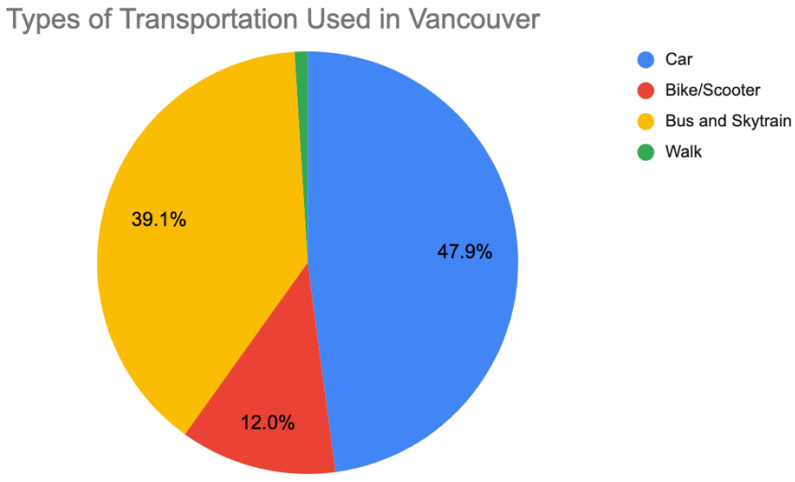

Figure 7: Survey results of the types of transportation used to get to work or school in Vancouver

III. CONCLUSION

a. EXPECTED OUTCOMES

A possible solution to this issue is to focus more on strategic actions in the daily life such as buying only what is needed, eliminating plastic bags and bringing reusable tote bags, picking ugly fruits and vegetables at smaller supermarkets, recycling efficiently and using leftover food for meals instead of making it go to waste. All of this can be achieved if the City of Vancouver counsellors introduce a smart solution to recycling that will allow residents to engage and take an active role through a rewards system that tracks household waste and promotes the reuse of items. Therefore, by reducing food waste, we can also reduce the amount of resources lost in its production, processing and distribution. According to EPA Food Recovery Hierarchy, one of the most efficient strategies to prevent excessive food waste is by implementing source reduction and donating to local charities across the city of Vancouver.

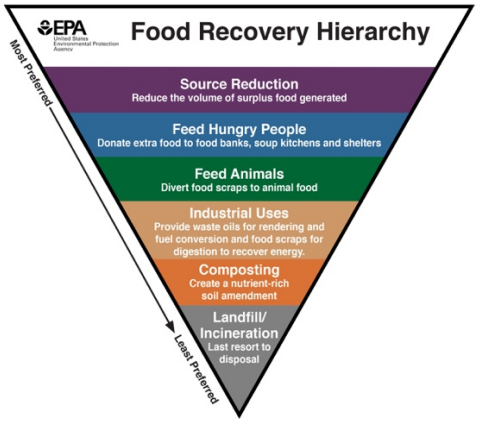

Figure 8: Food Recovery Hierarchy (Source: EPA Food Reduction Hierarchy)

Moreover, providing subsidized transportation alternatives such as the use of transit at a lower cost will allow residents to minimize the use of personal vehicles on the road, especially during peak hours on weekdays. In addition, metro Vancouver has seen a 23 per cent increase in vehicle traffic crossing on the Port Mann Bridge which has led up from 132,000 per day in 2017 to 150,100 after the removal of the tolling system (CBC News, 2019). In addition, the introduction of paid tolls on the Port Mann bridge during peak hours would encourage residents to take transit to work and school more often, and therefore aid in reducing carbon emissions.

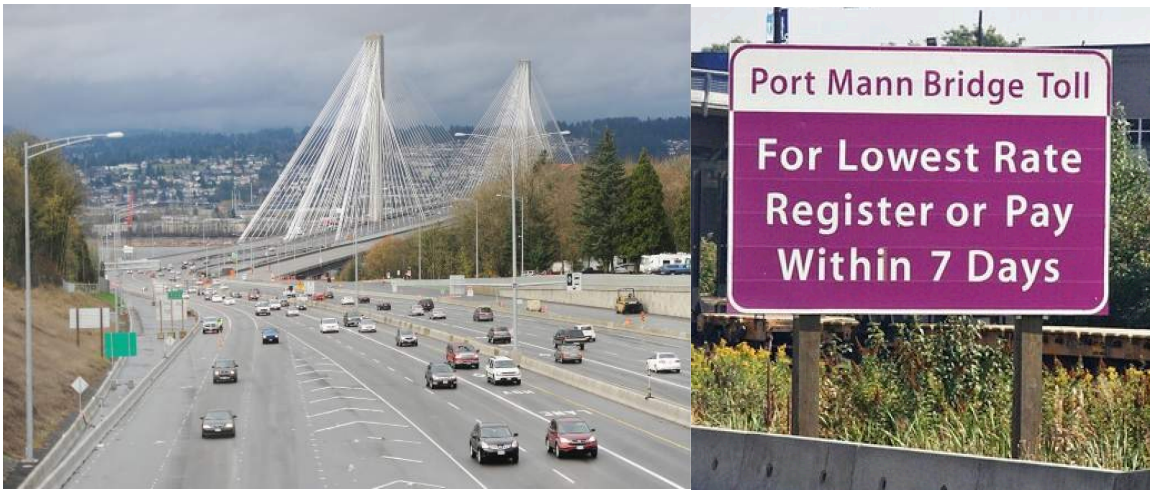

Figure 9: Traffic on the Portmann Bridge, BC Highway 1 (Source: Vancouver Sun)

b. RECOMMENDATIONS AND SOLUTIONS

It is evident that the rising problems associated with wasting and carbon emission plays a key role in the acceleration of some of the world's largest social challenges. In order to start reducing waste in our daily lives, and how everybody in society can take an active role in reducing one's carbon footprint. It is evident that Vancouver is one of the fastest growing metropolitan cities in North America, with an envision to become one of the greenest and eco-friendliest cities in the

world. And with rising growth in the region, there continues to be challenges associated with finding viable solutions towards planning sustainable housing and transportation to meet the projected higher demands within the next decade. Therefore, integrating the concept of today's urban city aims to create a sustainable model for high-density housing with easy access to reliable transportation systems. Furthermore, the need for public feedback and outreach is crucial as majority urban projects thrive better with continued support from the community collaborating together towards a better city and future for Vancouver.

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Image Source (Portmann Bridge): http://www.vancouversun.com/news/Drivers+hate+Port+Mann+toll+more+than+ever+poll/9285808/story.html