Household Energy Billing Through an Equity and Fairness Lens: A Winnipeg Perspective

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EXECUTIVE SUMMARY

The projected annual energy rate increase in Manitoba has exceeded the consumer price inflation and this threatens low-income households into energy poverty, a situation where a household makes sacrifices on other essential needs to meet their energy expenditure. This research analyzes the barriers to efficient energy consumption for low-income households amid energy efficiency programmes by Manitoba Hydro. Energy bills are linked to housing and rent costs and are an influencing factor in determining the affordability or otherwise of owner-occupied and rental housing. Three methods were used in undertaking this research: a spatial data analysis of energy poverty and its contributing factors across Winnipeg, a rental scan of rental listings in Winnipeg, and semi-structured interviews with staff from neighbourhood associations in Winnipeg and staff from Manitoba Hydro.

The research showed that the high-risk areas of energy poverty in Winnipeg were the older neighbourhoods which also had a high proportion of renter households in the city. While low-income renters are more susceptible to inefficient energy consumption and energy poverty, the existing energy efficiency initiatives are friendlier to homeowners and landlords and less so to renters. Programme awareness remains a barrier to the existing energy efficiency programmes. Data from the interviews revealed that the current nature of affordable energy initiatives does not yield universal benefits to neighbourhoods in Winnipeg. The results also showed that the potential of land use policies and tools to increase energy efficiency has not been utilized in Winnipeg. The research presents recommendations including policies, communication approaches and programme restructuring to increase energy efficiency at the neighbourhood scale and among renter households. Identifying the distinct neighbourhood groups and addressing the specific neighbourhood challenges to energy efficiency will promote equitable and efficient energy consumption in Winnipeg.

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Chapter One: Introduction

1.1 Background

The province of Manitoba has one of the lowest electricity rates in Canada and in North America (Green et al, 2013, p.3). The province has utilized its vast hydroelectric potential and has installed electricity generating stations on several rivers that traverse its boundaries, allowing it to produce and supply electricity at relatively cheaper rates than other provinces (Fernandez, 2019, p.3). Despite the lower electricity rates, a significant proportion of households in the province experience energy poverty, a situation where households have to make sacrifices on other goods in order to meet their energy needs.

A Bill Affordability Working Group (WG) initiated by Manitoba Hydro at the direction of the Public Utilities Board (PUB) came up with a Manitoba definition of energy poverty. According to the Working Group, "Energy poverty refers to circumstances in which a household is or would be, required to make sacrifices or trade-offs that would be considered unacceptable by most Manitobans in order to procure sufficient energy from Manitoba Hydro" (Prairie Research Associates, 2017, p.72). The problems of energy poverty and inefficient energy consumption are rife in Winnipeg and require attention and solutions for short and long terms. Planning for energy efficiency and efficient energy consumption would advance the city's efforts towards becoming a green and environmentally friendly city.

1.2 Problem Statement

Ideally, a household's expenditure on energy should not be at the expense of sacrificing other essential goods and services necessary for survival. A household should spend no more than 6% of their pre-tax income on energy-related expenditure (Prairie Research Associates, 2017, p.9). Beyond this expenditure threshold, the household is regarded as energy poor.

Energy bills are fundamentally linked to housing and rent affordability. A household experiences affordable housing if its expenditure on housing is below 30% of before-tax income (Canada Mortgage and Housing Corporation, 2019).

High energy bills have the ability to increase the housing cost for renters and homeowners beyond the acceptable 30% income threshold for housing affordability. Therefore, successfully negotiating the energy billing curve will create a positive effect on housing affordability.

In Manitoba, 14.3% of households exceeded the 6% energy expenditure threshold in 2016 (Prairie Research Associates, 2017, p.73). Households in energy poverty in Winnipeg calculated at 6% of income on energy expenditure was 13.5% of total households in 2016 (Canadian Urban Sustainability Practitioners, n.d). With projected annual energy rate increases exceeding the consumer price inflation (Simpson, 2017), there is a real threat of more low-income households increasing their energy expenditure at the expense of other essential basic goods and services. If the trend of rate increase proposals by Manitoba Hydro in the past five years is anything to go by, then there is every possibility that more households will spend upwards of 6% of their income on energy-related expenditure, thereby becoming energy poor.

The purpose of this project is to analyze the uptake of Manitoba Hydro's energy efficiency programmes and the issues that continue to impact high energy consumption in Winnipeg, especially among low-income households. The interviews, spatial data analysis and rental scan revealed that the current nature of affordable energy initiatives does not yield universal benefits to neighbourhoods in Winnipeg.

The social consequences of energy poverty are dire not only for households who suffer them but also to the province in general. The consequences include; increase in household poverty, increase in the proportion of households who depend on social assistance, increase in homelessness as well as reduced productivity due to ill health (Lee et al., 2011; Consumers' Association of Canada, Manitoba Inc, 2017). Adequate and sufficient household energy access is a requirement in the improvement in general and respiratory health among asthmatic children (Thomson and Petticrew, 2005). Energy poverty makes it difficult and, in some cases, impossible for households to access adequate electricity and heat especially in winter.

1.3 Research questions

The questions that this research seeks to answer are:

1. How have energy initiatives been implemented and applied to utility costs for low income households in Winnipeg?

2. Do the energy initiatives provide equal opportunities and benefits to renters and homeowners especially in low-income neighbourhoods?
3. Are there existing and potential conflicts between encouraging reduced energy consumption and equity for low-income households and in what ways can these conflicts be mitigated?

1.4 Contributions of the research

The research developed a deeper understanding of Manitoba Hydro's initiatives for energy efficiency and the effects these initiatives have on renters and homeowners. This knowledge then formed the basis of exploring ways to maximize outcomes and benefits of present and future energy initiatives for both renters and homeowners.

The ability to achieve fairness and equity in utility billing requires an understanding of the underlying principles and barriers that have created inequality. The research provided the platform to explore the barriers that have impeded efficient energy consumption for low-income households in Winnipeg. The findings aided the development of recommendations to reduce the increase in energy poverty while building resilience against energy poverty.

1.5 Document outline

This document is categorized into eight chapters. Chapter two contains the research methods employed in this project as well as the limitations that were encountered. Chapter three discusses relevant literature about opportunities and challenges to achieving high energy efficiency and addressing energy poverty. Chapter four presents the context of the project, an inventory of energy efficiency programmes in Manitoba and the legal framework within which the energy efficiency programmes operate. Chapter five reports on the findings from the rental scan conducted in selected Winnipeg neighbourhoods, spatial analysis conducted with data from statistics Canada and City of Winnipeg, semi-structured interviews including relevant quotes from key informant interviews.

Chapter six presents the analysis from the findings and makes comparisons to secondary data and the literature review. Chapter seven discusses some recommendations arrived at from the findings and analysis and compares them to best practices elsewhere. Chapter eight contains the concluding remarks for the project.

Chapter Two: Research Methodology

The acquisition and analysis of data for this project were done using varied methods. While some of the methods were used in gathering primary data, the other methods were used in gathering secondary data and were analyzed using software applications and other research skills. The methodology discusses the procedure for the research.

2.1 Sources of Data

Interviews

My intention for this project was to gather primary data from organizations who have experiences with energy poverty in Winnipeg and Manitoba. Since energy poverty is an issue discussed at various levels of the province (Provincial, City and neighbourhood levels), I decided to speak to people who work at each level. I sampled staff from neighbourhood organizations in Winnipeg, staff from Manitoba Hydro and planners from the Province of Manitoba and the City of Winnipeg for face-to-face interviews using a semi-structured interview questionnaire. The sampled neighbourhoods all had neighbourhood organizations that assisted with energy efficiency advocacy. Using a semi-structured interview questionnaire enabled me to probe for further expansion of the responses of the interview participants as discussed by Grey (2009). Based on their experiences with energy poverty, four staff from neighbourhood associations, two staff from Manitoba Hydro and two planners were sent recruitment emails to be part of the research. The four staff from the neighbourhood associations accepted the invitation to participate and agreed to be interviewed and audio recorded. Only one staff from Manitoba Hydro responded to the recruitment email and agreed to be interviewed. The planners from the Province and the City who were contacted did not respond to the recruitment emails and as such did not participate in the project. The interviews lasted on average 30 minutes and were conducted at locations chosen by the respondents.

The interview data was later transcribed with the help of VLC media player which provided the flexibility of rewinding, forwarding and slowing down the audio in play. The coding process was next after the transcriptions were complete. The codes were generated based on the responses

from the interviews. In all, 23 codes were generated, and five themes were formed from the 23 codes.

Rental scan

Rental listings for the West Broadway, Wolesely, St. Vital and St. Boniface neighbourhoods were collected from kijiji.ca (a rental listing website) and inputted into an excel sheet. The data was taken between December 2019 and January 2020. The data included the size of the unit in square feet, the utilities included in the rent, the price, renovations, as well as the duration of the lease. The data was computed for proportion of each rental type and averages of rent per square feet based on the utilities included in the rent. Listings that excluded the total floor space and the price were removed from the spreadsheet. At the end, the data comprised of 30 listings from West Broadway, 37 listings from Wolseley, 45 listings from St. Vital and 60 listings from St. Boniface neighbourhoods. The purpose of this data gathering was twofold. First, the data was to allow a comparison of rents based on rent composition (whether energy bills are included), location and unit size. Secondly, it was to allow an analysis of who bears the responsibility of ensuring that the dwelling is and remain energy efficient, or who ensures that there is efficient energy consumption in a rental unit (Landlord-Tenant energy responsibility conundrum).

GIS Analysis

Spatial data on energy poverty in Winnipeg was accessed from Statistics Canada's census data and data from www.energypoverty.ca, a website launched and managed by CUSP (Canadian Urban Sustainability Practitioners). These data were inputted into ArcMap to give a pictorial view of how each neighbourhood in Winnipeg fares in terms of energy poverty. 6% of after-tax income spent on energy-related expenditure was used as the basis for determining the energy poverty of each neighbourhood and census division. Data on buildings built before 1960 was sourced from the City of Winnipeg's open data portal and imported into ArcMap for analysis. Other data features such as low-income, buildings requiring major repairs and renter proportions were equally taken from the census data mapped using ArcMap.

2.2 Limitations

Not all participants contacted for interviews responded to the emails sent. Of the eight emails sent to potential participants, three did not respond even after follow-up emails. With the rental

scan, some of the advertised listings excluded the floor space and that made it difficult to include in calculating the average rent per square feet. In the end, such listings had to be removed from the scan. The time span for the rental scan was short as the data was taken over a one-month span. Also, the time of year when the data was taken (winter) usually do not have much listings as compared to the summer and fall months when rental listings are at their peak.

Chapter Three: Literature Review

Energy poverty and energy efficiency have been discussed in the academic literature for several years. These literatures argue the technicalities of energy efficiency and the dimensions of energy poverty across several jurisdictions. The ideas and experiences from these scholarly sources are discussed in this section.

3.1 Energy as a Basic Human Right

The United Nations (UN) categorize human rights as "an indivisible whole" (Therien and Joly, 2014, p.378) which is an all-inclusive machine that creates a harmonious system for its components resulting in comprehensive benefit for countries and regions. This perspective of human rights depicts universal accessibility in all forms. The UN further recognize human rights as an essential component of security and development in regional territories and the global political space (p.380).

Energy has been analyzed from an economic perspective within international energy policy even though it plays a vital role in the fight against poverty and enhances the achievement of other human rights including education, health and water (Tully, 2006 a., p.547). The access to energy as a public amenity enables other basic human needs to be met as it has a high connection with several other development indicators such as economic, social and cultural rights (Tully, 2006 a.; Tully, 2006 c.). Before the United Nations upgraded its vision from the Millennium Development Goals (MDGs) to the Sustainable Development Goals (SDGs), they acknowledged that "…without greater access to reliable and affordable energy services, none of the UN Millennium Development Goals…can be achieved" (UN Millennium Declaration 2000, Cited in Ngai, 2011, p.610). This statement exemplifies the strong dependence of development on energy and the recognition it has gathered from the global front.

Ngai (2011) discusses the right to energy as having three basic components; accessibility, affordability and information (p.615). In other parts of the world (developing regions) the absence of the three components can be seen in varying proportions. In the context of Canada where the supply of electricity covers almost one hundred percent of the population, the problems are usually demand-side challenges in the form of financial inaccessibility which make low-income and vulnerable groups susceptible to service disconnections (Ngai, 2011, p.580;

Tully, 2006 b, p.33). For a right to be accessible doesn't mean it has to be free, instead, its price tag should not be the basis for discrimination or barrier to its use (ibid). Yet in the case of energy, one of the major obstacles has been the price factor. This calls for state responsibility to create an environment that enables accessibility by all and in all forms.

3.2 Energy Efficiency and Social Policy

Energy continues to dominate discussions between groups who would like to see more profit-oriented policies in the sector as against groups whose argument is deep-rooted in the wellbeing of all energy consumers (Nelson and Reid, 2014, p.106). Government intervention is necessary if low-income households are to achieve reduced energy demand and attain high energy efficiency levels (Karunathilake et al., 2018, p.2012). According to Karunathilake et al., financial and regulatory tools are used by governments to regulate energy consumption usually through the provision of subsidies and raising taxes on less efficient technologies. While Karunathilake et al., did not specify the category of subsidies governments should focus on, Pineau (2008, p.380) suggests that general subsidies should not be an option for governments in promoting energy access and efficient consumption. He argues that general subsidies, unlike targeted subsidies, are bad for energy investments, environmental sustainability and limit the efforts of efficient energy consumption by making energy further cheaper for the affluent, thereby inducing increased consumption levels.

According to Allcott et al., (2015), "a poorly-targeted subsidy generates lower welfare gains than a well-targeted subsidy" (p.88). As such, there should be enough evidence that people who are adversely affected by forces in the energy sector are the target beneficiaries of an energy subsidy before such a policy is commissioned. Their recommendation is for policymakers to use "tagging" as a restrictive tool to channel subsidies to where they are needed. The concept of tagging involves setting qualifications that applicable persons must meet to be eligible for energy subsidies (p.190). The qualifications can be set as a criterion that is specific to the jurisdiction of the energy efficiency initiative. Iweka et al (2019) criticize that the use of economic incentives alone for attracting participation in energy efficiency programmes is only positive to induce behavioural change within the period programme participants to receive those benefits (p.7). According to the authors, economic incentives alone do not help solve long term issues that require continuous change and commitment from participants or the general population. The

authors project that community-based interventions, owing to their grassroots participation approach resonate well with participants in terms of behavioural change, energy consumption and in the achievement of intervention goals both in the short term and in the long term (p.5)

While most literature focus on household income and expenditure in defining energy poverty, Marchand et al. (2019), goes a step further to evaluate the relationship between energy poverty and multi-dimensional measures of deprivation. The authors argue that the current focus on household income as the basis for energy poverty determination does not allow all energy-poor homes to be identified and this has resulted in a response rate below the actual situation of energy-poor and energy inefficient homes. Expanding the defining parameters of energy poverty to include the structural and ecological characteristics of homes would result in a holistic understanding of factors that influence residential energy poverty (p.216) and expand the response to the energy efficiency initiatives.

3.2.1 Energy poverty effects on low income households

The second leading economic cause of homelessness in Canada according to Stewart and Fry (2006, p.11) is the inability of households to pay energy bills and this is only behind the inability to pay rent in factors responsible for evictions. Attempts to reduce energy consumption or produce heat in the event of energy disconnection often lead to the reliance of low-income households on supplementary heating including ovens which pose a high safety hazard to users (ibid.).

With the price of energy increasing, more households are forced into making difficult decisions including committing more income to their energy expenditure at the expense of other basic needs such as food, medicine, as well as reducing their heating to temperatures below healthy standards, even though adequate home heating is a health requirement in Canada (Stewart and Fry, 2006, p.6: Bhattacharya, 2003, p.1153). The price of household energy has an inseparable relationship with housing affordability and in the context of Canada contributes to determining whether a household is in core housing need (Tardy and Lee, 2019, p.47). The description from Tardy and Lee indicates energy costs as a strong determinant in the quality of life of households especially among low-income earners who form the bottom income quintile.

Dampness, mould and stuffy odour are characteristics that are linked to energy-poor homes due to the inability of these households to heat homes properly and maintain proper ventilation

(Sharpe et al., 2015, p.119). According to Sharpe et al., mould contamination has a dual effect on homes. First, it results in adverse health complications including upper respiratory tract infections for residents in such conditions. Second, it affects the value of properties and may increase the cost of future repairs.

Due to the necessary demand for household energy in low temperate climatic countries including Canada, households can establish clear distinctions between their energy cost challenges and housing cost challenges (Finnigan and Meagher, 2019). The challenges a household encounters with energy costs can easily escalate the possibility of eviction in a rental home as energy costs tend to be more persistent (p.111). Finnigan and Meagher further discusses that even when eviction is averted, a household could accumulate huge debts and eventual service disconnections due to the cost of energy.

3.3 Equality and Equity in Energy Supply, Demand and Consumption

In Canada, the predefined threshold of household income which should be spent on energy is six percent or ten percent depending on the type of study or analysis (Green et al., 2016, p.11). Household expenditure above this threshold is considered energy poverty. Mirnezami (2014, p.37) identifies that the price of energy and the income level of consumers are key among the determinants of energy consumption (especially electricity) in Canada. These two factors have a higher influence in the equality and equity of household energy consumption than all other factors combined.

Mirnezami (2014, p. 43) establish that where energy prices are low, energy consumption tend to be high. This is evident in the average consumption pattern between Manitoba and Ontario where the former had relatively lower electricity prices than the latter in 2013 (Green et al, 2016, p.3). It is therefore not surprising that the average consumption in Manitoba was 4.5% higher than that of Ontario in 2015 (Statistics Canada, 2015). This situation generates more questions on finding the balance between affordable energy prices, efficient energy consumption and the impacts of increased energy consumption on the global climate.

Even though heating cost accounts for a larger share of the household energy expenditure, factoring all other energy requirements of a household into energy efficiency considerations accelerate the achievement of energy efficiency targets (Kaiser and Pulsipher 2006, p.352). Subsequent studies that analyzed the considerations on energy efficiency discussions (Chen et

al., 2017; Finnigan and Meagher 2019), still built their arguments on energy poverty exclusively on energy required for heating and cooling without including the other energy requirement of households as suggested by Kaiser and Pulsipher (2006).

3.4 Energy Efficiency in Rental and Social Housing

While private rental housing is the fastest growing provider of rental units, it is among the least in terms of household energy efficiency (Hope and Booth, 2014, p.377). This occurrence according to Hope and Booth is partly due to two major factors. First is the upfront cost that landlords incur in energy efficiency upgrades. Second is the fact that tenants remain the primary beneficiaries of energy efficiency upgrades which reflects in increased comfort and reduced energy bill payments for the tenants who are responsible for their energy bills. Wrigley and Crawford, (2017, p.376) attribute the high inefficiency in rental housing to the absence of energy efficiency standards for rental properties in most Australian cities.

In cases where tenant protection laws and standards exist, they are usually characterized by weak implementation and enforcement thereby unable to assist low-income household in making improvements that would enhance their safety and living conditions (Krieger and Higgins, 2002, p.765). The "split incentive", a situation where tenant and landlord interests are at opposing sides is another factor that affects energy efficiency in both tenant-metered (tenants paying for energy) and master-metered (landlord paying for energy) rental buildings (Schwartz et al., 2018, p.8). Tenant-metered rentals gives no financial incentives to landlords to retrofit their properties and master-metered rentals gives no incentive to tenants to consume energy efficiently.

Coyne et al (2018), argue that while energy efficiency improvement in social housing targets a reduction in consumption, it could also trigger a 'high temperature take-back' where households who previously cut back on their energy consumption for space heating, increase their indoor temperature for an optimal experience (p.2094). On one hand there is the improvement of the health and wellbeing of residents who benefit from such retrofits and on the other hand, there is a near insignificant change in energy consumption after the upgrade because of the temperature take-back effect. The household consumption and practices can increase after an energy retrofit, resulting in a 'parallel' relationship between residential energy retrofit and energy consumption (Gram-Hanssen, 2014, p.394). This results in the "rebound effect" which derails the potential of recouping significant financial gains from the renovations.

Hope and Booth (2014) describe the private rental market as highly fragmented which usually has no mandatory governing body to be negotiated with in terms of implementing energy efficiency policies and projects (p. 376), unless through building codes which may or may not result in the required changes especially for older buildings. Hernandez and Bird (2010, p.9), highlight the lack of coordination between housing and energy policies as one of the contributing factors for the increase in affordable housing problems among low-income households. Also, the incentives for pursuing energy efficiency is further complicated by factors such as differences in housing policy and landlord type (whether the housing is provided by private landlords, government or non-profit) (p.10). Landlords have the authority of making decisions on home appliances and appliance replacements without the involvement of tenants in such decisions (De T'Serclaes and Jollands, 2007, p.123). In tenancy agreements which excludes energy bills from rents, tenants pay their energy bills while landlords solely determine the standard of appliances to install in the units. Given that high energy efficiency appliances are expensive, there is a tendency of landlords choosing less energy efficient appliances in that they save money on the purchase cost and do not have to worry about the bills the appliance would accrue from its use (ibid).

Lind (2012) analyzing the pricing principles of energy and its influence on energy efficiency investment in rental housing concludes that policy makers must find the balance between renter satisfaction and landlord motivation using the pricing system as several complexities between renters and landlords must be considered (p.530). According to Lind, in lease agreements where landlords are responsible for paying energy bills, increase in energy prices becomes a motivation for the landlords to upgrade household energy appliances. Conversely, when energy bills are paid by renters, increase in energy bills increases the financial burden of the renters (ibid).

3.5 Factors that influence homeowner decisions in energy retrofit investment.

Homeowners, landlords and developers are motivated by different factors when considering the adoption of energy efficiency improvements and so specific policies targeting these groups instead of general policies are necessary in realizing an increase in the adoption of energy efficiency improvements (Noonan et al., 2015, p.111).

Noonan et al. (2015) further argue that while social factors including level of education of homeowners and the neighbourhood characteristics have a positive influence on the acceptance

of energy efficiency technologies by households, the architectural designs and physical composition of buildings have less influence on the uptake of energy efficiency improvements (p.111). In agreement to the negative relationship between architectural designs and energy efficiency investment, Sunikka-Blank and Galvin (2016) established that there is a conflict between heritage values and energy improvement in heritage buildings. While heritage buildings have a high likelihood of consuming energy inefficiently when compared to modern buildings, they also have a stronger resilience to energy efficiency improvements (p.105). The strong resilience is due to their unique features including the architectural design, historical significance as well as unique material composition which increases the reluctance of their owners to adopt energy efficiency upgrades for fear of altering these unique features.

Homeowner decision making drivers of energy efficiency investments according to Wilson et al., (2015) are categorized into occasionally identified and commonly identified factors. The ability to save cost and improve home comfort are among the commonly identified factors while property value increase and health benefits are identified by the report as occasionally identified factors that influence homeowners' decisions (p.15). The two categories can also be looked at as short-term and long-term reasons for energy efficiency renovations. The commonly identified factors have an immediate or short-term benefits while the occasionally identified factors presents homeowners with a value addition in the longer term.

3.6 Barriers for Participating in Household Energy efficiency Programmes

For most energy efficiency programmes, one of the major challenges is homeowners and tenants signing onto the programmes. The bureaucratic processes that surround energy retrofit programmes creates lengthy entry processes for homeowners and this coupled with inadequate subsidy packages reduces homeowner motivation to engage in the programme (Fyhn et al, 2019, p.140). Similarly, Ebrahimigharehbaghi (2019) describes the process of signing up for household energy upgrades as riddled with complexities making it more cumbersome and unattractive for homeowners to pursue. The limited subsidies and loans are particularly singled out as outstanding barriers which significantly reduces efforts to increase energy efficiency (p.558). The transaction costs which comprise of the time and resource required to find information about energy efficiency initiatives are also identified by Ebrahimigharehbaghi (2019, p.548) as barriers

to the uptake of energy initiatives by households. Notably missing in these arguments is specific hindrances to tenants and landlords in pursuing energy efficiency improvements.

There were few or no requirements for energy efficiency in buildings that were built before or around the 1960s in European cities (Economidou et al., 2011, p.49). This has resulted in majority of such buildings built before and around 1960 to not have the required energy efficiency installations in them. In Canada where building codes are determined at the provincial level, there are likely differences in older buildings between provinces. According to Economidou et al., “the largest energy saving potential is associated with the older building stock” where upgrades of building structure and appliances can result in large net decreases in their energy consumption (ibid.).

Chapter Four: Context

The Energy Savings Act, established in 2012, provides the guidelines for the energy efficiency programming and implementation by Manitoba Hydro who is the main utility supplier in Manitoba. Under the Act, Manitoba Hydro is mandated to make contributions to the Affordable Energy Fund, a fund set for encouraging energy efficiency improvements, reducing greenhouse gas emissions and encouraging use of renewable energy sources (Province of Manitoba, 2012, a).

In an attempt to increase household energy efficiency and help reduce the burden of energy bill payment especially on low-income households, Manitoba Hydro in the past decade introduced several programmes. These programmes are shown in Table 1. A brief description of each programme is in Appendix B.

In Manitoba, there is no mandatory regulation that makes it compulsory for homeowners and landlords to retrofit their properties to standard energy efficiency levels. As such, homeowners and landlords use their discretion in determining when and by how much to invest in an energy upgrade and this has impacts on the uptake of the energy efficiency programmes.

To determine the eligibility of a household in affordable energy efficiency programming in Manitoba, the Low Income Cut Off (LICO) is used (Prairie Research Associates 2017, p.10). LICO is a terminology used by Statistics Canada to refer to households who devote more than a specified portion of their income to the consumption of basic necessities including food, clothing and shelter (Statistics Canada, 2018, p.183). Even though this approach presents challenges of its own, it is one of the best approaches to target low-income households for energy efficiency through the subsidized provincial initiatives aimed at increasing household energy efficiency levels. Over 142,000 households, representing 30% of Manitoba Hydro's customers, as of 2017 had incomes less than 125% of Low Income Cut Off (LICO-125) (Simpson, 2017, p.4). Low-income households are more susceptible to becoming energy poor and may require some assistance to support their efficient consumption efforts.

In 2017, the Manitoba government, under Bill 19 established the Efficiency Manitoba Act which allowed the creation of Efficiency Manitoba Inc, a new Crown corporation. This new Crown corporation is to be fully responsible for energy efficiency in the province and is taking over the

energy efficiency programmes and strategies that are currently performed by Manitoba Hydro. The transition period from Manitoba Hydro to Efficiency Manitoba coincided with the time of this capstone project. Efficiency Manitoba is mandated to increase the energy efficiency efforts of the province by achieving electricity energy savings of 1.5% and natural gas savings of 0.75% annually (Province of Manitoba, 2017).

Table 1: Energy efficiency programmes by Manitoba Hydro

Programme	**Still running**	**Program launch date**	**Eligibility**
Incentive based programmes			
Affordable Energy Programme *Neighbourhood Energy Efficiency Project	Yes	December 2007	Landlord, tenant, Homeowner
Neighbours helping neighbours Programme (In partnership with the Salvation Army)	Yes	2004	Low income family not receiving social assistance.
Home Insulation programme	Yes	May 2007	Homeowner
Water and Energy Saver Programme	Yes	September 2010	Landlord, tenant, homeowner
New Homes Programme	Yes	April 2016	Homeowner
Refrigerator Retirement Programme	Yes	June 2011	Landlord, tenant, homeowner
Heat Recovery Ventilator Control Programme	Yes	April 2016	Homeowner
Community energy efficiency Project	No	April 2016	Landlord, homeowner
Community geothermal Programme	Yes	June 2013	Communities, homeowners
Residential LED lighting programme	Yes	October 2014	Landlords of multi-family

			homes
Loan, financing and instalment programmes			
Power Smart Residential Loan Programme	Yes	February 2001	Property owner
Equal Payment Plan	Yes	Unknown	Landlord, tenant, homeowner
Deferred Payment Plan	No	Unknown	Landlord, tenant, homeowner
Home Energy Efficiency Loan (HEEL)	Yes	Unknown	Homeowner
Energy Finance Plan	Yes	Unknown	Property owner
Pay as you save (PAYS) Financing	Yes	November 2012	Homeowner
Residential Earth Power Loan	Yes	April 2002	Homeowner
Customer Contribution Time Payment Plan	Yes	Unknown	Homeowner
Drain water heat recovery programme (Financed through the PAYS or HEEL)	Yes	December 2014	Homeowners.
Appliances programmes			
Plug-in timers	Yes	September 2016	Homeowners
Power bars	Yes	September 2016	Homeowners
Smart thermostats	Yes	April 2016	Homeowners
*The neighbourhood energy efficiency project is a sub project under the affordable energy programme and works with community organizations to increase the energy efficiency of low-income neighbourhood residents.			

Source: Manitoba Hydro, n.d; Manitoba Hydro, 2018

While some incentive-based programmes are available to landlords, tenants and homeowners, the financing programmes are only available to homeowners and property owners.

The heating and cooling options available to Manitobans has not changes in the past decade. However, there have been changes to the number of households using these options. The chart in Figure 1 shows increases in the percentage of households using natural gas and geothermal sources while electricity proportions declined in the six-year period compared.

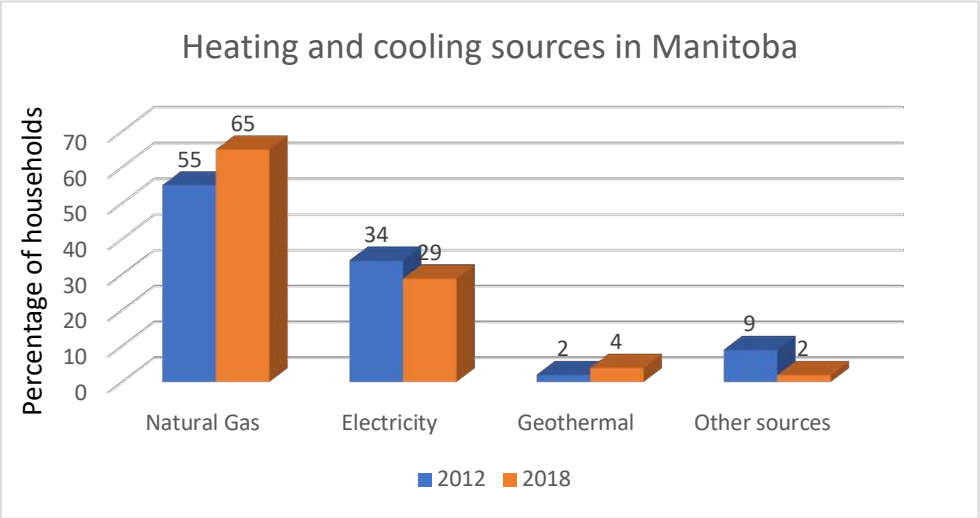


Figure 1: Sources of heating and cooling in Manitoba. Source: Province of Manitoba, 2012,b, 2018

In Manitoba, natural gas is available for heating in cities and towns. Northern, remote communities and some rural municipalities without natural gas availability use the other sources shown in Figure 1.

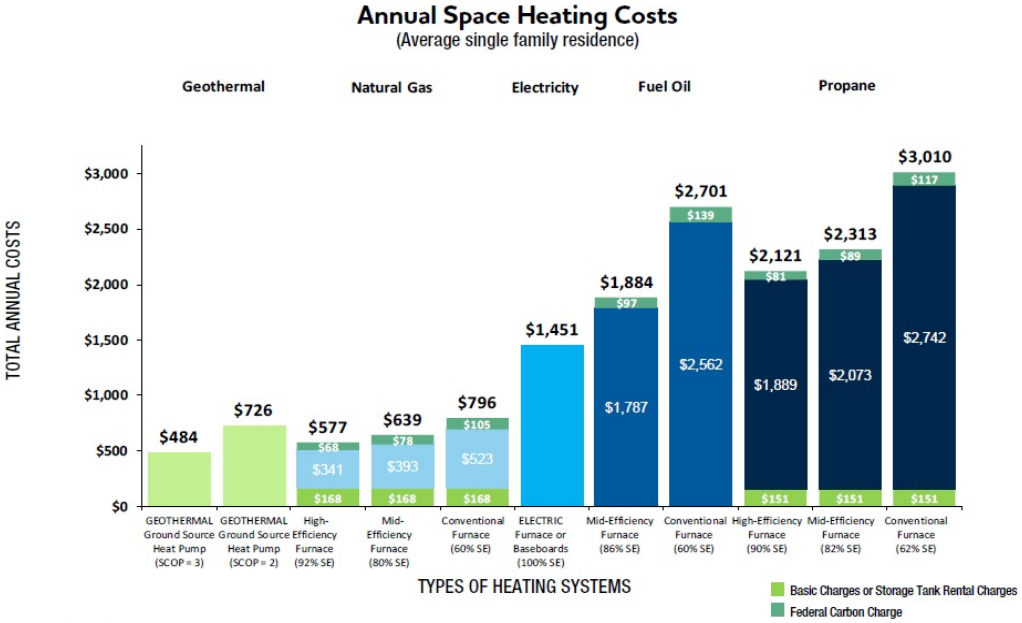


Figure 2: Space Heating costs in Manitoba. Source: Manitoba Hydro, 2020

Even though, geothermal heat source has one of the least annual space heating cost in Manitoba, it's cost of installation is higher per building or per home than all other existing heating sources. The annual cost of using the existing heating options in Manitoba is shown in Figure 2.

Chapter Five: Findings

The spatial data analysis, rental scan and interviews, were used in gathering data for the study. The findings from the data gathered are presented throughout this chapter and include figures and quotes from interviews.

5.1 Spatial data

The literature review discussed the factors that influence the energy consumption of buildings and how those factors contribute to inefficient energy consumption and energy poverty, especially among low-income households. Statistical data was taken from the City of Winnipeg and Statistics Canada and analyzed spatially to give a visual presentation of the proportions of the influencing factors of inefficient energy consumption in Winnipeg as well as the spread of energy poverty across the city.

5.1.1 Proportion of older buildings and buildings requiring major repairs in Winnipeg's neighbourhoods

This section discusses the proportion of older buildings (buildings built before 1960) in Winnipeg's neighbourhoods. As discussed by Sunikka-Blank and Galvin (2016, p.105), the age of a building may influence the efficiency of energy consumption in the building.

Data for the housing stock for neighbourhoods in Winnipeg was sourced from the City of Winnipeg's neighbourhood profiles document (City of Winnipeg, 2016). The proportion of buildings built up to 1960 was extracted for each neighbourhood and mapped in ArcMap to give a visual representation of the data as shown in Figure 4. As depicted in Figure 4, the inner-city neighbourhoods have the highest proportion of older buildings. Moving outwards of the inner-city neighbourhoods, the proportion of older buildings reduces.

The map in Figure 5 shows the concentration of buildings in need of major repairs. The highest proportion of buildings requiring major repairs is in the North Point Douglas neighbourhood at 27% of the existing housing stock. North Point Douglas represents one of the mature neighbourhoods of Winnipeg and also part of the inner-city neighbourhoods.

5.1.2 Low income and renter proportion in Winnipeg's neighbourhoods

The most vulnerable group to the effects of inefficient energy consumption and energy poverty is low-income households. The proportion of low-income households in the neighbourhoods of Winnipeg is shown in Figure 5.

Low-income proportions are high in the inner-city neighbourhoods and the proportions reduce moving outwards of the core areas of the city as shown in Figure 5. Towards the edge of the city where new neighbourhoods are located, there is a significant drop in the proportion of low-income residents.

The southern neighbourhoods surrounding the intersection of Portage Avenue and Main street had the highest proportion of renter households in the city. This is shown in Figure 6. Again, the proportion of renter households were high in the inner city and reduces towards the edge of the city.

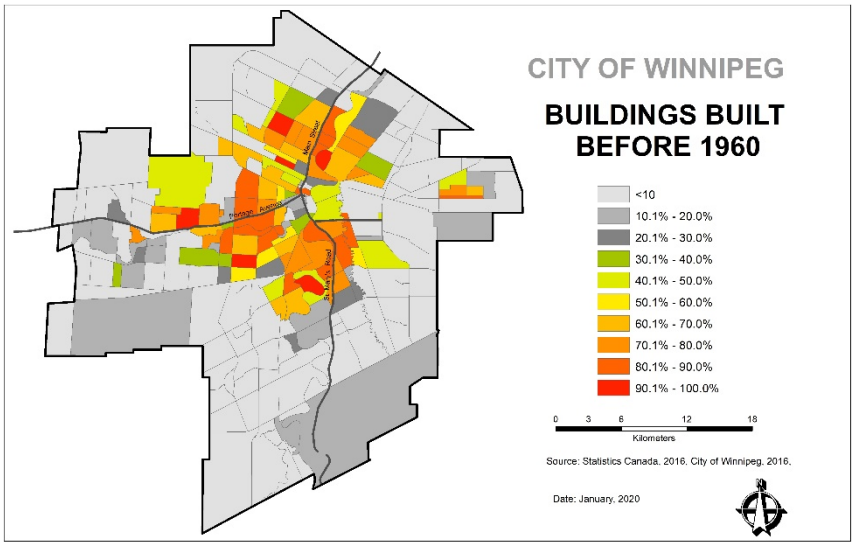


Figure 3: Buildings built before 1960

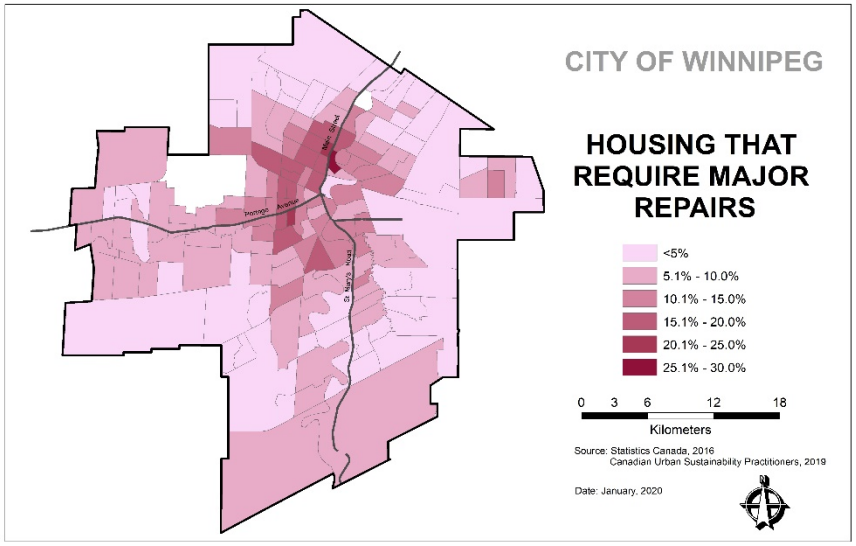


Figure 4: Housing that require major repairs

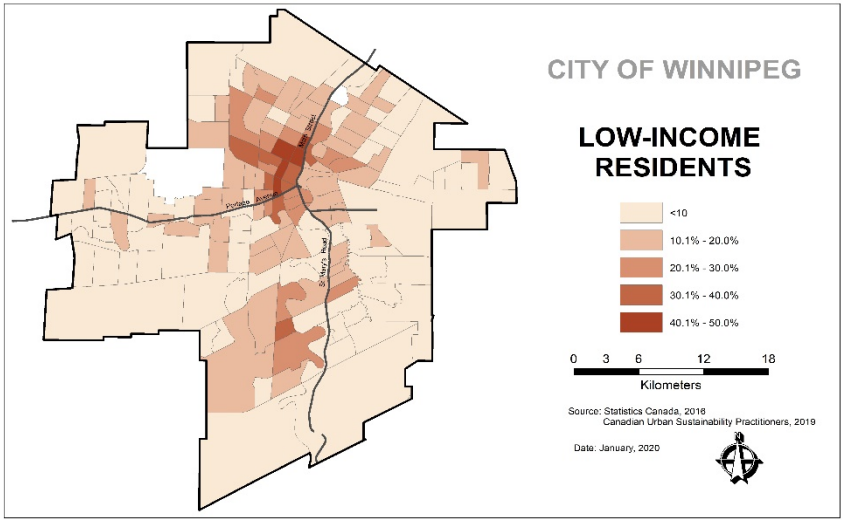


Figure 5: Proportion of low-income residents

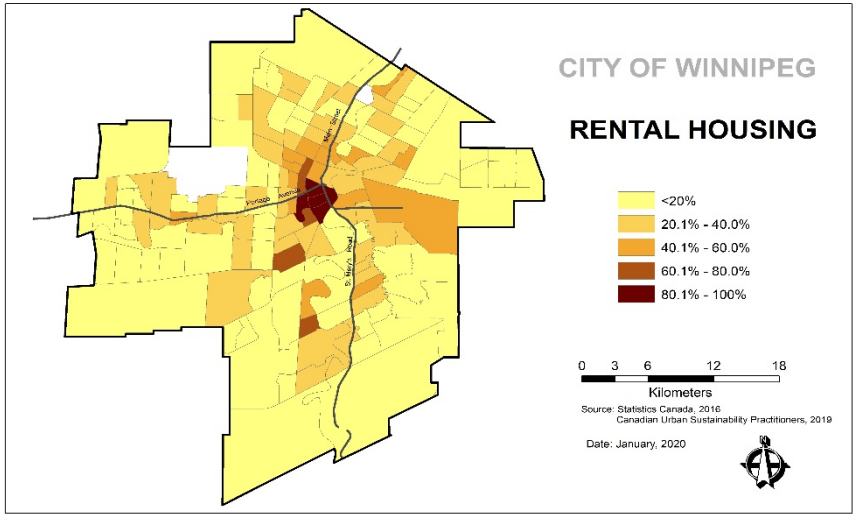


Figure 6: Rental housing proportions

Figure 3 to Figure 6 above shows how the factors influencing energy poverty and inefficient energy consumption are spread in the city and the links between these factors. There is a positive relationship between the pattern seen in Figure 4 (housing that requires major repairs) and Figure 5 (Low-income residents). The high-risk areas in Figures 3 to 5 above are within the mature community's cluster of the city. Households within these high-risk areas were more likely to experience inefficient energy consumption than households in the other neighbourhoods of the city as displayed in the figures.

5.1.3 Energy poverty and rental proportions in Winnipeg's neighbourhoods

Energy poverty data is taken from the Canadian Urban Sustainability Practitioners who calculate energy poverty using 6% of after-tax income spent on household-related energy expenses.

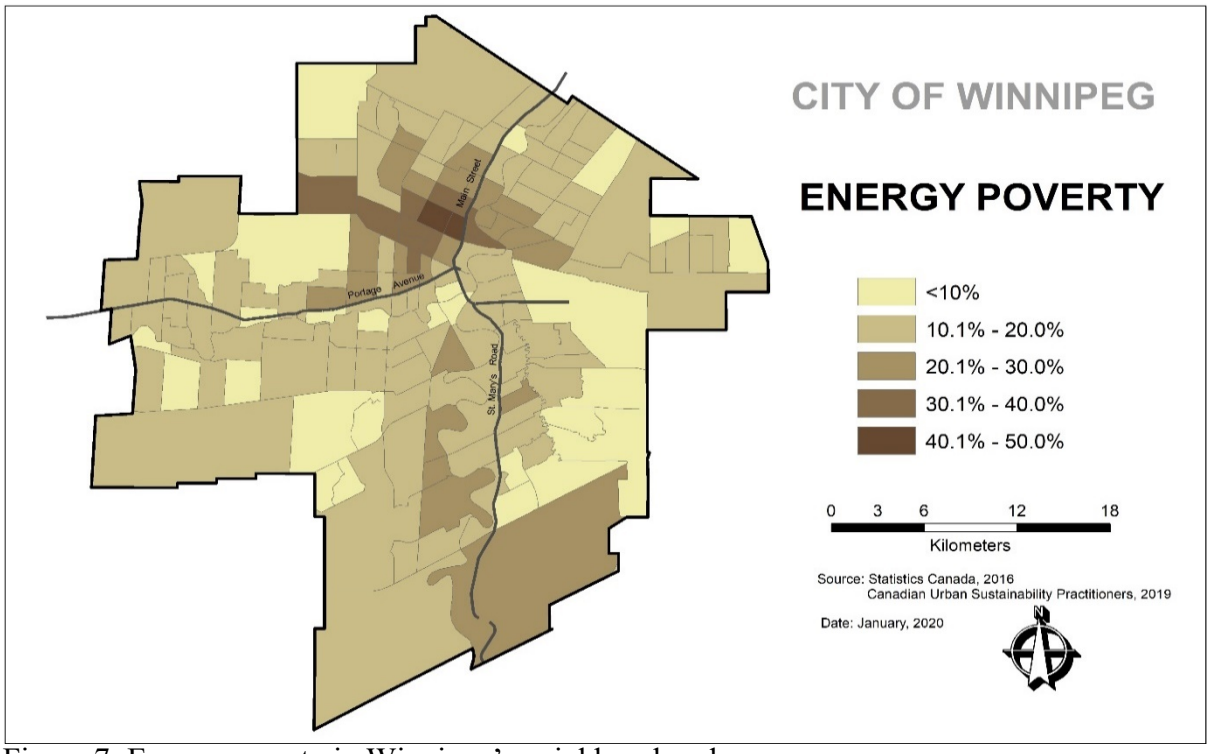


Figure 7: Energy poverty in Winnipeg's neighbourhoods

As shown in Figure 7, the high proportion of energy poverty in Winnipeg is the areas north of Portage Avenue and within the mature communities' cluster. The map also shows proportions of energy poverty distributed across the city. The highest proportion is at 46% of residents within the Dufferin, Dufferin industrial and William Whyte neighbourhoods.

5.2 Rental scan results

As mentioned earlier, the rental scan was undertaken to enable the comparison of rents based on the composition of the rent and to determine the general direction of the responsibility of keeping rental units' energy efficient. That is whether the landlord or property manager pays for the energy bills or the rents are exclusive of energy bills. The selection criteria used in selecting rental listings was that the advertisement should include the floor space information in square feet, the advertisement should specify the utilities that are included in the rent and also the advertisement should specify the rent amount and the term of the lease.

The findings from the rental scan discuss the influence of utility inclusion on rental listings and the proportion of rental listings that include some, all or no utility in their rents. A comparison of prices is also undertaken to understand how utility inclusion in rents alter the price of rental units and the availability of rental units

5.2.1 Utility inclusion in rental units

The entries made from the rental scan was categorized into units that include utilities in the rent namely heat, hydro, air conditioning, and units that did not include any utility component in the rent. Figure 8 below shows the proportions of rental units that were advertised as including no utilities, one of the utilities or several utilities as part of their rent.

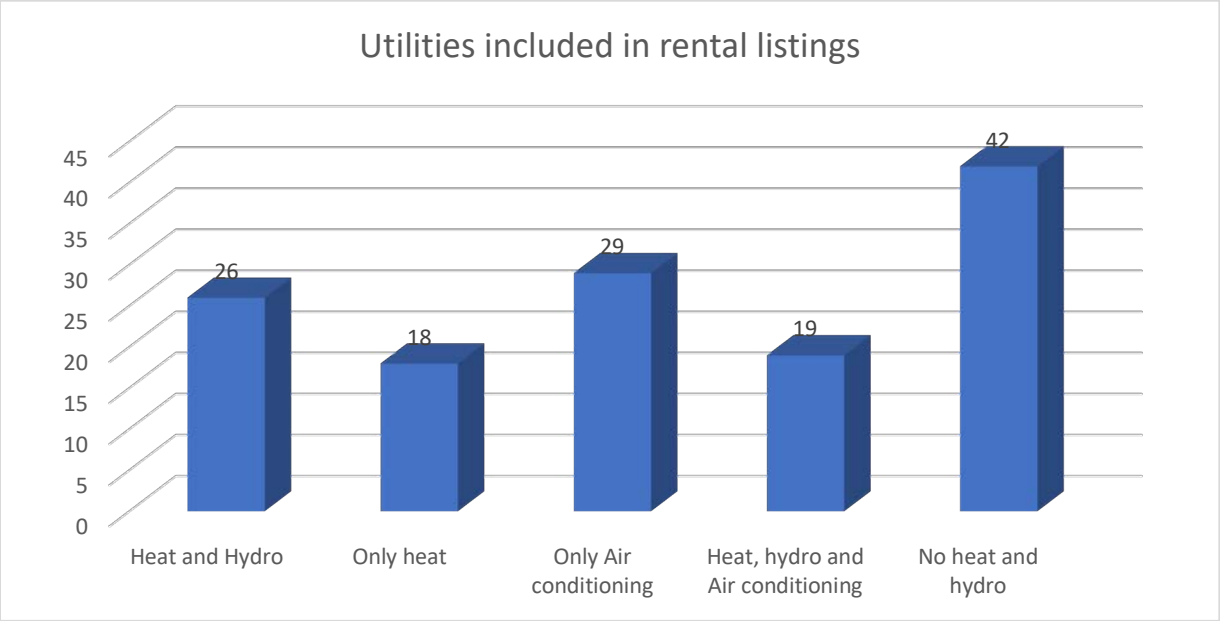


Figure 8: Rental advertisements with and without energy bills in rent in Winnipeg
Source: Data from kijiji.ca

Referring to Figure 8, more listings excluded heat and hydro cost from the rent which indicated that the responsibility of paying energy bills in rental housing within the study neighbourhoods is higher among renters. Another realization from the data is that it is not uncommon for rental listings to include one or more utilities in the rent. In such situations, renters still shared in the responsibility of energy bill payment.

5.2.2 Rent per square feet

Average rents were calculated for rental listings based on the utilities included in the rent. Rents that included heat and hydro bills had the highest rent per square feet. Rents that included only heat bills had the lowest average rents, even below the average rent of units without heat and hydro.

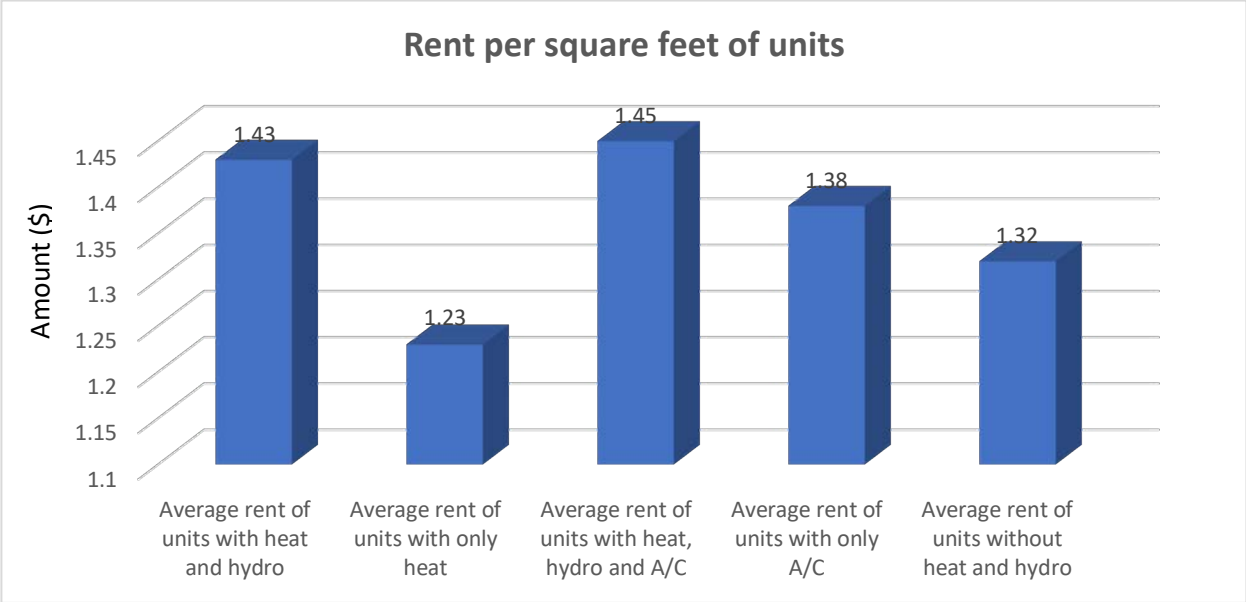


Figure 9: Rent per square feet of rental units Source: Data from kijiji.ca

Figure 9 shows the average rent for rental units without heat and hydro in all neighbourhoods to be lower than the average rent of units with heat and hydro as well as units with heat, hydro and air conditioning.

5.3 Interview results

Key informant interviews were conducted with individuals whose work is related to household energy efficiency in Winnipeg. Four of the respondents interviewed worked with neighbourhood

associations and were directly involved in energy efficiency advancement at the neighbourhood level. The fifth respondent interviewed worked with Manitoba Hydro, the primary supplier of electricity and natural gas for heating to Manitobans. The transcription and coding of the interviews resulted in the identification of five themes which will be discussed in the ensuing sections. The interviews lasted on average 30 minutes and were conducted at locations chosen by the participants. Participants were given the interview questionnaires some minutes to the interviews and responded to the questions based on their experiences with the energy efficiency programmes and energy poverty issues.

5.3.1 Energy efficiency programme awareness among low income households

Programme awareness is one of the biggest barriers to energy efficiency programmes. A survey by Manitoba Hydro in 2017 showed that inertia and difficulty understanding the information on the application materials were top reasons for energy efficiency challenges among respondents. The energy efficiency programme with the most awareness among the customer base was equal payment plan which was known by 40% of respondents (Prairie Research Associates, 2017, p,51). The success of an energy efficiency programme would be influenced by how aware those who need the programme know about it and the willingness of households to sign up for it.

The interviewees acknowledged the efforts of Manitoba Hydro in publicizing the energy efficiency programmes. Manitoba Hydro included in bill envelopes information slips about some of their efficiency programmes such as the water and energy saver programme, refrigerator retirement programme and affordable energy programme. These information slips were mentioned by the interviewees as an area Manitoba Hydro had invested more in terms of programme awareness creation. The information slips on improving energy efficiency that was put in the monthly hydro bills was mentioned by all participants as an area Manitoba Hydro had invested more in terms of awareness creation. One interviewee categorized this as a “targeted approach” to reach out to people. Other respondents also mentioned billboard and television advertisements as mediums through which they had seen energy efficiency advertisements.

Interviewees from the neighbourhood organizations pointed out that despite these advertisements and information slips about the efficiency programmes including affordable energy programme and the water and energy saver programme, there are still landlords, tenants and homeowners

who do not know about the programmes and the options that exist to help them with their hydro bills and energy consumption.

> "I feel there needs to be more in the area of creating awareness. We need to get the word out. I have run into situations where for example I discuss the affordable energy programme with our community members… and it is amazing how many people don't know about these programmes." (Interviewee 3)

This coincides with the findings of the Bill Affordability Working Group that awareness is one of the biggest challenges to Manitoba Hydro's energy efficiency programmes especially among low-income households (Prairie Research and Associates, 2017, p.50). The interviewee from Manitoba Hydro pointed to the use of social media as a tool to vary the programme communication approach.

> "We have relied a lot on billboards and printed pamphlets. In this day and age, is that really cool or do we need to be utilizing social media?' (Interviewee 1).

Again, the interviewee from Manitoba Hydro makes a point about the need to understand who the energy efficiency programmes are targeting and the best ways to reach the target population. Greater collaboration between Manitoba Hydro and municipalities, First Nations, as well as other levels of government was revealed as an option to expand the communication around the energy efficiency programmes while acknowledging the distinct characteristics of each municipality and First Nation in the province.

> "We should be aware that what works in downtown Winnipeg may not work in rural Manitoba." (Interviewee 1)

Other interviewees also pointed out that Manitoba Hydro's approach of communicating their energy efficiency programmes may have contributed to the barriers in the awareness problems of the energy efficiency programmes.

> "Manitoba Hydro put programme pamphlets into people's bills as a way of communicating their programmes, but I am thinking people are not interested in the extra little pamphlets, are not eligible for some of the programmes if they are renters or do not understand the information on them." (Interviewee 3)

Interviewees from neighbourhood associations noted their roles in the energy efficiency drive as advocates who act on behalf of low-income households and landlords of low-income tenants in securing energy efficiency programmes. They encourage neighbourhood residents to come to their offices to discuss issues they have with housing, energy and other basic necessities. This way, they are able to direct their clients to the right resources as well as the right doors to knock on to access energy efficiency upgrades to improve the housing quality while reducing the energy bills. The neighbourhood associations also represent low-income clients in discussing payment amounts with Manitoba Hydro when a client with hydro arrears is put on a payment plan. They act as a liaison between the tenant and landlord or property manager on a range of issues including rent, insulation, house conditions and energy use.

Another area of low awareness that some interviewees mentioned was about the procedures for tenants to request repairs to their homes from their landlords. This brings to question how familiar tenants are about their rights and responsibilities as well as the responsibilities of their landlords and property managers, based on which they can demand repairs. Interviewees regarded regular home maintenance as essential if landlords are to keep their properties in conditions that are conducive for living and energy efficient. Repairing homes in drafty conditions improves the ability of such homes to retain heat to the benefit of tenants. This reduces energy consumption and lessens the bills accrued from heating. Repairs that include furnace replacement results in reduced energy consumption for heating and a further reduction in hydro bills.

> "Sometimes, landlords are ignoring repairs and tenants are not aware of the procedures for requesting repairs from their landlords or property managers." (Interviewee 5)

5.3.2 Energy efficiency programme adaptation

The energy efficiency programmes are mentioned in chapter four of this document. The respondent from Manitoba Hydro revealed reasons for which some of the programmes have been discontinued including the deferred payment plan and the community energy efficiency project.

First, change in political direction. The provincial government of the day has extensive control over all Crown corporations. As such, if the government felt something was no longer a priority

or something new was a priority and so attention should be focused on that instead, then changes happen to the existing structure of programmes.

Second is when a programme or technology achieves market saturation such as the community energy efficiency project. When the target for a programme is reached and everybody is now doing what the programme intended for them to do, then it becomes necessary to withdraw the programme and shift the focus onto something else. Discontinuing the community energy efficiency project in the City of Dauphin and the town of The Pas fits this reason.

Interviewee 3 discussed that the request for confidential information such as income tax returns information as part of the application requirements for the affordable energy efficiency programmes is a reason for the gap in the uptake of the programme in their neighbourhood.

In dealing with the challenges associated with the application procedure, interviewee 3 discussed the changes Manitoba Hydro made to the existing application procedure. These changes, however, are not city-wide or province-wide but specifically to meet the needs of the particular neighbourhood. These changes are reflected in the Neighbourhood energy efficiency project which is available in only one neighbourhood in Winnipeg.

> "Manitoba Hydro vet the blocks within the neighbourhood. On the vetted blocks, it doesn't matter how much income you make, everyone is pre-approved. That is a good strategy. People just fill out an application and then have their home evaluated and you have free insulation and free energy-saving devices also. That helped with increasing the application with people wanting to participate." (Interviewee 3).

Another area that the interviewees mentioned has seen restructuring is with the equal payment plan programme for households who have energy bill arrears or are unable to manage their monthly bills. Under the equal payment plan, households who have hydro bill arrears can negotiate with Manitoba Hydro to erase the late fees associated with the arrears and subscribe to instalment payments based on their income. Interviewees from the neighbourhood associations discussed that alterations to the equal payment plan are necessary if households are to follow through with their bill arrears payments. For some neighbourhood associations, calling Manitoba

Hydro to renegotiate the equal payment plan for households with bill arrears was often necessary.

> "I run a programme where low-income households with energy bill arrears come to me and what we do is we erase all the late fees and put them on a payment plan which is more attainable for their income." (Interviewee 2)

Interviewee 2 and 3 mentioned they felt the equal payment plan initiative was more beneficial to renters who were responsible for their energy bills than homeowners or landlords. This is because, for such renters, a successful negotiation with Manitoba Hydro on a payment instalment plan gave them more control over their expenditure on outstanding bills and created a pathway to get themselves out of debt. Besides, they get advice from Manitoba Hydro on how to manage their consumption to avoid future bill arrears. Manitoba Hydro set the payment amount based on the arrears owed and the income of the household. Interviewee 2 mentioned that the payment Manitoba Hydro set was still too high and unattainable for some households in arrears considering that majority of such households are on Employment and Income Assistance (EIA) and receive monthly payments which are not enough to cover their basic needs. Priorities of low-income households and households on the EIA programme was another reason interviewee 2 assigned as a challenge for households to adhere to the equal payment plan agreement with Manitoba Hydro. Some households are constantly faced with a dilemma between meeting their everyday essential needs or paying their hydro bills. Interviewee 2 describes the situation as the equivalent of living day-by-day and not having the opportunity to think about the future.

> "One of the problems I have with Manitoba Hydro is they still set the payment quite high. For some people, that is still unattainable. I would like to see it lowered…a lot of my clients are choosing to eat rather than paying their hydro bills" (Interviewee 2)

One interviewee mentioned that energy initiatives are great but on their own, are not enough to make a significant impact on the living conditions of low-income households. As such, energy efficiency initiatives must be part of a holistic approach to addressing the challenges of low-income households.

> "The programmes we have now are great for people who can access them. But for people who are very precariously housed, energy initiatives alone are not enough. Low-income households are often living with a number of challenges including low EIA rates, cuts to rent assist and other housing benefits as well as lack of affordable and social housing." (Interviewee 5)

The section reveals that the problem of energy poverty and the inefficient energy consumption is not an issue in isolation but is interconnected with the social and community-specific issues and so require efforts from multiple fronts to create the desired results.

5.3.3 Pursuing household level energy efficiency

The challenges and motivations to pursue energy efficiency are different for homeowners, landlords, tenants and Manitoba Hydro.

Barriers for renters

Three respondents from the neighbourhood associations mentioned that energy efficiency for renters is usually at the discretion of the landlord or property manager.

> "The problem is most of my low-income clients live in a rooming house or a rental, and then it's always up to the property manager to initiate the energy efficiency process. A lot of the property managers are slumlords, so they don't care." (Interviewee 2)

Other interviewees mentioned that the lack of options for affordable housing for most low-income renters makes them succumb to staying in deplorable housing conditions just to enable them to pay their rent.

> "There are a lot of landlords who won't take advantage of the energy efficiency programmes because their properties are in such decay and unfortunately, they have got people living in them. And the tenants don't want to say anything because they would be kicked out and it is difficult to find an affordable home." (Interviewee 3)

Two interviewees mentioned mailbox break-ins as another challenge tenants and homeowners face with regards to energy efficiency. Due to these break-ins, tenants and homeowners

sometimes don't get their bills and do not know how much they owe or the level of increase in their consumption. This results in a build-up of bills into arrears.

Interviewee 4 described the location of the country of immigrants as one of the factors influencing the energy bills of low-income households and yet not obviously realized.

> "Sometimes because the household comes from a country in a temperate region, they are used to warm temperatures and want to have more heat and when the bill comes, it is usually huge and puts them in a challenging position." (Interviewee 4)

Another issue interviewees mentioned was landlords' ignorance of the challenges of their tenants who suffer insufficient heating especially if such tenants are responsible for their energy bill payments. The landlords provide space heaters to supplement the heat in the home. While this augments the heating requirements of the tenants, it feeds into increasing the monthly energy bills. Also, this practice brings only short-term relief, but longer-term solutions lie in practices including improved insulation, window and door replacements, upgrading furnaces as well as undertaking major repairs where needed.

Relationship with landlords was a challenge interviewees pointed as a barrier to tenants in achieving energy efficiency. That disconnection in the relationship creates an extra layer of difficulty for tenants to communicate energy challenges to the landlords or property managers.

> "It is hard to believe that people do not even know their landlords. They have mailing addresses so that is where their money goes or if they are on income assistance, their rent is paid for them. Therefore, some do not have a clue who their landlord or property managers are." (Interviewee 3)

All interviewees mentioned that the equal payment plan was the only initiative that renters could access without the involvement of their landlords or property managers. As long as a tenant was responsible for their energy bill payment, they could contact Manitoba Hydro directly or do so through the neighbourhood association to negotiate a payment plan.

Homeowner/Landlord Motivation

Interviewees 2 and 3 mentioned the increase in property value of buildings for homeowners and landlords as one major motivation why landlords and homeowners would want to take up energy efficiency initiatives. Another interviewee mentioned the money-saving aspect of energy efficiency upgrade as another motivation that has made some landlords and homeowners take up Manitoba Hydro's energy efficiency programmes.

Motivation for Manitoba Hydro

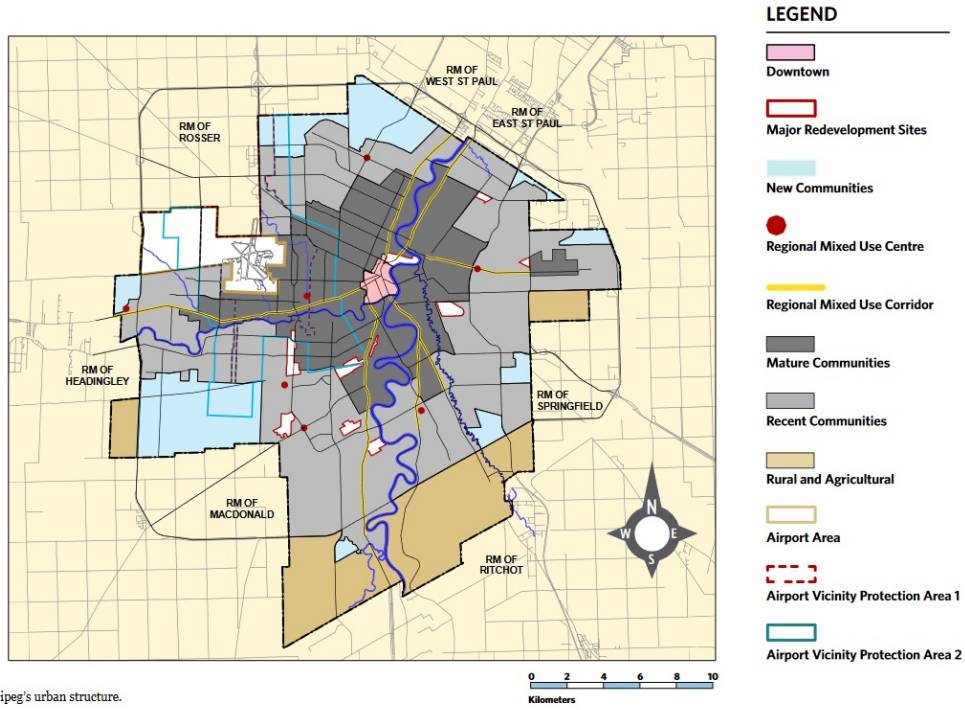
The benefits of increased energy efficiency are not only experienced at the household level but also present advantages to Manitoba Hydro. The respondent from Manitoba Hydro had two reasons why efforts were put into creating energy efficiency initiatives for the province.

> "The first reason is that our efficiency programme allows us to defer infrastructure. If we need a new power plant in 10 years, if we implement energy efficiency programmes, perhaps we can shift that to 15 years or 20 years. It also allows us to sell more power to the export market." (Interviewee 1)

This explains why the province and Manitoba Hydro continue to invest in increasing energy efficiency especially among residential energy consumers. Manitoba Hydro clarifies that if less energy is consumed on the local market, then more energy is available for export, resulting in increased foreign income generation which is used to subsidize local energy prices.

5.3.4 Challenges to achieving energy efficiency in older communities

Our Winnipeg is the City of Winnipeg's municipal development plan which provides development direction for the city over the next 25 years. Mature communities are defined in the document as early suburbs developed before the 1950s and characterised by a grid of road network with back lanes and sidewalks, low to moderate densities and a mix of land uses along commercial streets (City of Winnipeg, 2011, p.100). the mature communities represent the older communities in the city. Figure 1 shows the mature communities of Winnipeg.



Winnipeg's urban structure.

Figure 10: The urban structure, Winnipeg Source: City of Winnipeg, 2011, p.29

Respondents from two neighbourhood associations highlighted the housing stock in their neighbourhoods as one of the reasons why residents find it difficult to increase their energy efficiency. They specifically cited the technology and insulation as advantages that make houses built in recent times to be high in energy efficiency. Drafty doors and windows were other characteristics that interviewees associated with most older homes that made them energy inefficient. While drafty doors and broken windows are not necessarily characteristics associated with older homes, the interviewees felt the conditions of the buildings in their neighbourhoods were influenced by how old the current stock of residential buildings were, and in addition, the frequency of improvements the houses have received since construction.

Interviewees also described the older houses as having a comparably cheaper rent than newer buildings. This lower rent creates an immediate attractive feature to low-income renters who may only realize how high their energy bills are after they have signed a lease and moved in, giving them little or no alternatives.

> "The most common challenge our organization face is tenants living in buildings that need major repairs, resulting in high energy bills. This includes broken heating system and broken windows." (Interviewee 5)

> "The housing stock in this neighbourhood is very old. A big problem is that if they are not upgraded to today's standard for example insulation, you may not be able to afford the utility bills." (Interviewee 3)

Interviewee 5 mentioned that while some of the energy initiatives were good for tenants, more could be achieved from a policy change with the Residential Tenancies Branch and demanding accountability from landlords who have utilized the energy efficiency programme and now have reduced energy bills as a result of that. The interviewee believed that where landlords are responsible for paying energy bills, the reduced bill as a result of utilizing Manitoba Hydro's efficiency programme should reflect in their rent as well as any proposed rent increase.

> "I think that what needs to be focused on is finetuning the Residential Tenancies Branch policy and holding landlords accountable for repairs that result in reduced energy bills, rather than focusing on individual energy initiatives for tenants." (Interviewee 5)

Interviewees also stated that a lot of low-income tenants living in older buildings live in a vicious cycle of energy inefficiency and energy poverty due to the demand for energy in such buildings. The demand is not related to the floor space in the building but the draftiness of the homes.

> "Some of these homes are so drafty that you need to jack up the heat and that comes at an extra cost." (Interviewee 3)

Two interviewees mentioned that their neighbourhood associations run programmes that teach people how to cover their windows and openings under their doors. While the training is free, participants have to buy the materials. As many of these households are low-income or on Employment and Income Assistance (EIA), they have other pressing priorities and less money to spare in purchasing the items. Interviewees said even though some tenants know what they could do to lower their hydro bills, they just don't have the money to pursue it and their landlords don't seem to care enough.

Another issue discussed by interviewees was that even in instances where landlords were responsible for paying the energy bills, they still wouldn't opt for any of the energy efficiency programmes. The reasons given for this were that either the property was so drafty such that the landlord or property manager did not want 'external involvement in their property 'or the landlord's perception that renovations are costly and would take an extended time to recoup the renovation cost.

Manitoba Hydro points to tenant hesitation and permission from landlord as some key barriers to tenants in pursuing energy efficiency upgrades (Manitoba Hydro, 2017, p.36). According to Manitoba Hydro, "Tenants may be hesitant to invest in the energy-efficiency of their rented dwelling if they do not expect to stay there long term" (ibid). They also may need approval from the landlord before undertaking such an upgrade. If the approval is declined or there is an unsuccessful agreement on how the cost of the upgrade would be reimbursed, then the tenant despite their willingness to pursue the upgrade cannot proceed.

5.3.5 Focus on planning

The interviewee from Manitoba Hydro discussed how planning could enhance energy efficiency at community levels and how everyday planning tools could be a change maker in increasing energy efficiency across municipalities.

> "There are things like the building code, zoning and other planning tools out there. I think that is a very under-tapped market. We have always traditionally looked at individual buildings. It is your house or your store or office building, it's never your community…We have never really taken advantage of that." (Interviewee 1)

Interviewee 1 expressed optimism about how design principles such as building orientations could create significant changes in the energy efficiency of buildings and neighbourhoods. The interviewee from Manitoba Hydro was positive that, district heating is far efficient than targeting individual buildings, however, district heating is suitable for compact development, something that hinges on planning.

> "We must plan our communities such that it is just possible for district heating or things like that. That is not something we have ever really gotten involved in. But that again is something that would require changes potentially to the Planning Act or require changes to the zoning by-laws…That is one thing missing from Manitoba Hydro and ultimately from municipal, provincial and the federal government." (Interviewee 1)

While this option can be explored in the mature communities of Winnipeg, where buildings are in close proximity and building densities are high, the option may not be applicable in the suburban areas of the city characterised by low density developments.

One interviewee discussed that understanding what community energy planning can offer and the kinds of opportunities that exist for community energy planning can result in Manitoba Hydro and their customers reaping large benefits.

> "Buildings that share a wall, for example, represent a new opportunity for energy efficiency. Many people do share a wall in a multi-unit so there is an opportunity there to affect more than one homeowner at a time." (Interviewee 1)

The interviewee's discussion may be applicable in multi-family buildings where apartments are separated vertically or horizontally. This may however be difficult to achieve in single family neighbourhoods where buildings are detached and share no common spaces.

Interviewee 1 mentioned infill housing as a way to increase energy efficiency. There is an opportunity to utilize spaces in existing neighbourhoods to build buildings that are energy efficient by design and also uses highly efficient appliances to reduce consumption and bills.

> "You want to live in a nice older neighbourhood that is close to downtown and close to transportation routes but the buildings by their nature are not energy efficient. Putting in a new home in those areas seem perfect but it is difficult to do so and the zoning requirements are such that your house may not fit in the neighbourhood and the neighbours may hate it". (Interviewee 1)

While infill housing presents an opportunity for utilizing existing spaces in the urban fabric, it also presents challenges for utilizing tools such as altering building orientation to take advantage

of natural light to reduce energy consumption. Infill housing must adapt to the existing neighbourhood housing structure to ensure uniformity. Altering the building orientation could defeat the goal of adaptability and result in objections from neighbours.

The responses showed that while efforts have been made to increase the energy efficiency of buildings, land use planning tools and principles can be used in increasing energy efficiency for infill and new developments.

Chapter Six: Analysis

This section of the research analyzes the findings from the spatial data, rental scan and interviews. The findings from the previous section is used to answer the research questions that were outlined at the beginning of the research. The three research questions are:

1. How have energy initiatives been implemented and applied to utility costs for low income households in Winnipeg?
2. Do the energy initiatives provide equal opportunities and benefits to renters and homeowners especially in low-income neighbourhoods?
3. Are there existing and potential conflicts between encouraging reduced energy consumption and equity for low-income households and in what ways can these conflicts be mitigated?

6.1 Implementation of energy initiatives for low-income households in Winnipeg

Most of the energy initiatives that were implemented over the past decade as shown in Table 1 are still running and target energy users of all income groups. The affordable energy programme is the only programme that is tied to the income level of an applicant. Its main purpose is to minimize the financial bottlenecks and make it easy for low-income households to save energy, increase their home comfort and in extension save money (Manitoba Hydro, n.d). Considering the duration of these programmes, it gives the expectation that most low-income homes would have signed up for the programme at this point. However, there are lapses in the uptake of the programme among low-income households as per the interview results. One common reason that was revealed as contributing to this situation from the interview is communication and awareness of the programmes among the target groups. Programme awareness continues to be one of the biggest challenges of the energy efficiency programme. The medium used by Manitoba Hydro in publicizing their programmes has not worked to its fullest. This is reflected in Prairie Research Associates' (2017) report. The report indicated that 77% of Manitoba Hydro's customers knew of the equal payment plan (the most known energy efficiency programme) while 8% of the customers knew of the Neighbours helping neighbours programme (the least known

programme). Only 31% of the customer base reported as being aware of the affordable energy programme (p.50). Interview responses from both neighbourhood associations and Manitoba Hydro acknowledged the lapses in the communication of the programmes and how that has contributed to the pace of programme uptake in Winnipeg's neighbourhoods and across the province. Interview responses suggest that Manitoba Hydro has a high reliance on print materials and billboards as the medium to communicate their efficiency programmes. While these may have worked well to a degree in the past and within some neighbourhood, the interviewees believe that an alteration in communication is necessary to reach the hard-to-reach residents.

With the establishment of Efficiency Manitoba, the energy efficiency programmes, responsibilities and strategies would be transferred from Manitoba Hydro to the new corporation. The change in programme management may yet present its opportunities and challenges to the energy efficiency drive of the province as well as the influence of energy efficiency programmes on low-income households. Some interview respondents expressed concern as to how smooth or otherwise this transition would be. At this point, there is no clarity about whether new programmes would be initiated or whether all the current programmes would be continued. But there is no doubt that there is a cloud of uncertainty about the energy efficiency programmes at least in the short to medium term.

6.2 Opportunities and benefits of energy initiatives to renters and homeowners in low-income neighbourhoods

Energy efficiency benefits are numerous to residents whether renters or homeowners. The interview results reviewed the perceptions around these benefits.

The existing energy initiatives employ a flat approach for applications. That is, irrespective of the location of the resident, the application procedure and requirements are still the same. The interview results showed that viewing all neighbourhoods as the same for energy efficiency initiatives is both problematic for neighbourhood residents and less impactful for achieving the needed results. Neighbourhood specific factors influence energy consumption and the desire to apply for energy efficiency upgrades. As shown in Figure 5, some neighbourhoods have a higher need for home repairs than others. There are neighbourhoods with higher needs for major repairs than the average major repair needs in Winnipeg. The inner-city neighbourhoods in Winnipeg possess both the highest proportion of older buildings and housing in need of major repairs. As

such, the current programme structure of equal application criteria for all neighbourhood may not contribute to the expected rate of increased household energy efficiency from the current pool of energy efficiency programmes. The existing programmes are more generalized and do not necessarily consider the core issues in specific neighbourhoods. The interview responses suggest that more could be achieved if there is a redesign of the energy efficiency programmes tailored to the peculiar situation of neighbourhoods or neighbourhood clusters in Winnipeg and the province. It was realized during the interview that Manitoba Hydro has piloted a project which changed the application procedure of the affordable energy programme in a Winnipeg neighbourhood, towards increasing programme uptake.

Extrapolating this change in programme design and applying it to neighbourhoods with unique needs for major repairs would not only influence programme penetration rate, but also the overall impact that is realized from the programmes for all stakeholders involved.

There has always been a form of debate as to who the real beneficiaries of the energy efficiency initiatives are (whether renters, homeowners or landlords). From the interview, there was the identification of the equal payment plan programme as an initiative that interviewees believed were more beneficial and easily available to renters. The interview responses showed that tenants who were responsible for their bill payment, through the equal payment plan, could agree to a payment structure that worked for them and agreed to by Manitoba Hydro. Even though issues are raised about the setting of the price by Manitoba Hydro as too high and in some cases unrealistic for tenants, there is a general agreement that it presents the opportunity for continued energy service from Manitoba Hydro to the affected parties experiencing high energy arrears. While the equal payment plan programme provides a good option for renters to deal with their arrears, it does nothing or little to the root cause of the higher energy bills which result from the inefficient energy consumption. It provides a curative solution instead of a preventative solution or a permanent solution to the billing situation. Households on the equal payment plan programme who maintain the same consumption pattern could be in a vicious cycle of energy bill arrears. As such, households on the equal payment plan programme may be better off if they are also on the affordable energy programme, such that, they are also increasing the efficiency of their energy use, and decreasing their consumption to avoid a reoccurrence of the bill arrears.

The proportion of rental housing in Winnipeg is higher in the inner-city neighbourhoods and the downtown area. Figure 5 and Figure 8 shows that the areas which have a high proportion of homes in need of major repairs also have a high proportion of rental housing. This indicates that there are likely to be more rental homes in need of repairs and energy retrofits. The challenge is with access to energy retrofits by renters. The interview responses suggest that in most instances, the landlord or property manager makes the application for energy efficiency programmes and that decision is subjective to the interest and perception of the individual landlord. If a landlord pays for some or all of the utilities, they are likely to have a higher interest in keeping the energy costs low. Also, if a landlord is not responsible for the energy bill payments and believes that the appliances in their building are performing at optimal levels, then there is a high likelihood that they will not pursue an energy efficiency upgrade.

The absence of building codes or energy codes that require energy efficiency standards in rental housing means that homes with some degree of decay and inefficient heating systems can still be listed on the rental market and be rented out to unsuspecting renters. Regulations for high efficiency heating and cooling systems are more enforceable in new developments and close to nonexistent in older buildings.

While the energy initiatives are good for energy related costs of a home, some interviewees were of the view that energy initiatives on their own would not yield the needed change required for improving the living conditions of residents who suffer energy poverty. The need for a concerted effort from multiple fronts presents one of the most sustainable approaches to reducing energy poverty and increasing energy efficiency. This suggests that improvements in the rates for employment and income assistance beneficiaries, rent assist and other low-income housing programmes would provide the needed cushion to low-income households in the short term while providing them with the basis for a longer-term improved living conditions.

The role of immigration in energy consumption, efficiency and bill arrears was highlighted from the interview findings as a factor that contributed to energy poverty in neighbourhoods with large proportions of immigrants. This was particularly linked to new immigrants from temperate regions where daily temperatures throughout the year are above 0^{o}C. For such residents, high indoor temperatures similar to that of their home countries are necessary for their comfort. The

income level of these new immigrants is usually within the low-income group, so the energy bills that they receive as a result of increasing the heat becomes overwhelming.

The interview results showed that most of the energy efficiency programmes were geared towards homeowners and landlords. As mentioned by the interview respondents, most landlords are particular about their personal financial gains from energy retrofits and must convince themselves in that regard before signing up for Manitoba Hydro's energy efficiency programmes. The potential for increased property values and the ability to save money on energy bill payments especially in rental agreements where energy bills are part of rent were the factors identified as motivation for homeowners and landlords in the application for Manitoba Hydro's energy efficiency programmes. This finding is in line with the factors identified by Wilson et al., (2014) as influencing homeowner decisions in energy efficiency investments. Wilson et al., (2014) categorize the money saving that result from energy retrofit as a short-term benefits while the increase in property value as a result of energy retrofit is in the category of long-term benefits of home energy investments.

One thing is clear that in either case, whether on the part of tenants wanting to apply for energy efficiency programmes, landlords applying to improve the energy efficiency of their buildings or Manitoba Hydro looking to defer infrastructure cost, incentives for energy efficiency is key in the decision making. While for landlords and tenants, the incentive is usually linked to immediate personal gains, Manitoba Hydro's focus is to increase its export portfolio while expanding the time limit for infrastructure investment.

6.2.1 Unequal nature of energy efficiency applications between landlords and tenants

Another interesting reveal from the findings is the path taken by renters and homeowners in accessing energy efficiency programmes. A visual presentation of the route to energy efficiency for tenants is shown in Figure 9**.**

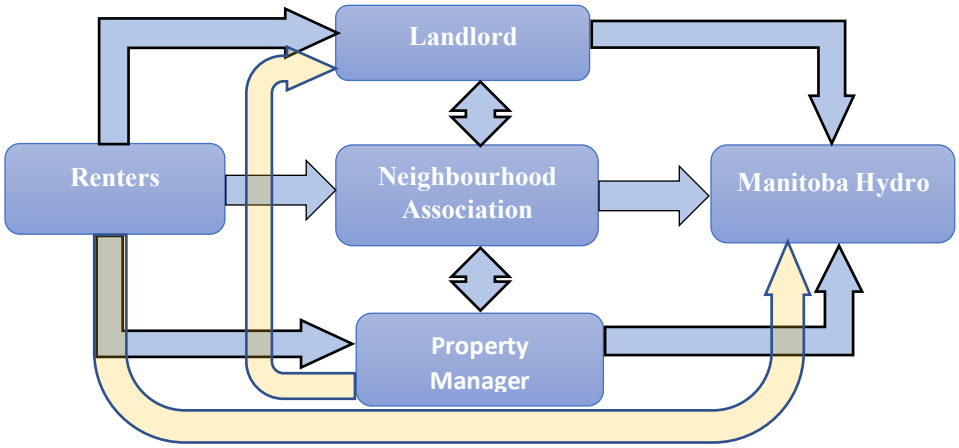


Figure 11: Barrier to renters in taking energy efficiency initiatives

In most cases, renters do not have direct access to home energy efficiency programmes. They may access such programmes through the landlord, property manager or neighbourhood association acting on behalf of the landlord or the property manager. This is a contributing factor to reduced interest of renters for energy efficiency programmes. This situation brings on board the interest of the above-mentioned groups which influences the commitment attached to energy efficiency programme applications.

6.3 Conflicts between encouraging reduced energy consumption and achieving equity for low-income households

The findings showed that the high consumption of some low-income households is not as a result of more electrical appliances in their homes but a result of outdated technology, limited air tightness and insulation challenges. By their nature, conventional furnaces are more expensive to run than high efficiency furnaces. According to Manitoba Hydro's annual space heating cost, an average single-family home would spend up to 27.5% more to heat their home using a conventional furnace (Manitoba Hydro, 2020, p.1). This additional consumption still results in the same or even less heating comfort.

As described by Tardy and Lee (2019, p.47), the cost of energy has a strong influence on the quality of life of low-income earners who form the bottom income quintile. High energy cost puts more strain on the disposable income of low-income earners. The demand for energy to heat homes that use conventional furnaces to levels optimum for health continues to be high and

results in a high energy bill. In effect, occupants of such homes consume more energy, enjoy low to moderate heat from their consumption and have high energy bills due to the above-mentioned factors, creating a cycle of energy poverty and bill arrears. The situation leads to low-income households receiving proportionally low amount of energy per dollar paid on energy bills.

Reducing energy consumption is beneficial on environmental and economic bases for both households and Manitoba Hydro as was revealed from the findings. However, for low-income households who barely have adequate heat at their current level of consumption, reducing energy consumption is not an option.

Again, for renters occupying such homes, signing up for energy efficiency programmes cannot be done without the consent of the landlord or in most cases, the landlord themselves starting the application. The greater share of the responsibility is with the landlords and as shown in the findings, some landlords still do not see a reason to sign up for the initiatives by Manitoba Hydro.

The discussion around reduced consumption is possible after the required furnace upgrades have been done, insulation and attic repairs completed, and windows and doors repaired or upgraded. While reducing energy consumption after energy retrofits is possible, there is also the possibility of a near insignificant change in energy consumption as discussed by Coyne et al., (2018, p.2094). If a household cut back on its optimum heat requirements due to the cost of running an inefficient furnace or inadequate insulation, energy retrofit could mean the household still consumes the same amount of energy but this time around have a home temperature that supports the health and wellbeing of occupants of the house. This means that there is no real change in consumption but rather an improvement in the heating experienced.

6.4 The role of planning in reducing energy poverty and increasing energy efficiency

The role of planning in increasing energy efficiency was discussed during the interview as an area of opportunity for Winnipeg and Manitoba. Planning tools such as zoning, building codes and minimum efficiency standards for existing communities has not been an integral part of the conversation around energy poverty in Winnipeg and Manitoba. The focus of energy efficiency efforts has been on improving an individual building's energy consumption. While that is a good step, a focus on the community scale is where the bigger picture can be seen.

The findings showed how environmental and design principles can add to the energy efficiency of buildings and neighbourhoods at large. The orientation of buildings to take advantage of natural light has significant contributions to reducing the energy consumption of such buildings. At a community level, trees planted to serve as windbreaks creates a difference in the energy consumption of the community by reducing wind speeds, which increases the need for heating in the winter, and reducing humidity during summer to reduce the demand for air conditioning. This aligns with the findings from Wang et al., (2015, p. 1323) who found that in light of other weather conditions, trees reduced hot thermal conditions in summer months by reducing daily temperatures by up to 2.5^{o}C and thus improving the thermal comfort of communities.

The potential of community energy planning where energy efficiency can be achieved on a large scale is not yet explored in the context of Winnipeg, partly because, the existing building codes may need to be updated to accommodate it. The other reason being that community energy planning will require an energy code which is not in existence at present.

Infill housing is another area of opportunity for efficient energy planning revealed in the findings. The compactness of older neighbourhoods and the potential to utilize empty lots or derelict buildings and putting in a new home that uses less energy is an opportunity that is available to the City of Winnipeg. Infill housing reduces the need to expand the existing electricity and natural gas infrastructure such as what is experienced in suburban developments, increases the viability of exploring district heating options, as well as helping to reduce the emission footprint of neighbourhoods.

6.5 Responsibility for energy bill payment

The rental data taken from the rent listing website in Winnipeg showed that the majority of rental units excluded heat and electricity bills from their rents. This means that the responsibility of energy bill payment lies with renters who will be the primary beneficiaries of energy retrofits and also suffer the consequences of inefficient energy appliances in the units. The absence of minimum efficiency standards for rental housing in Winnipeg, coupled with the high percentage of rental listings that exclude energy from the rent means that potential renters are at risk of renting units with inefficient energy consumption and as a result, increasing their expenditure on energy to pay the energy bills that would accrue thereafter. In agreement to this situation, Manitoba Hydro states that in rental buildings where tenants are responsible for energy bill

payments, there is little or no motivation to pursue energy efficiency by renters and tenants (Manitoba Hydro, 2017, p.36). Two reasons given by Manitoba Hydro are: First, the lack of direct financial gain to landlords reduces the landlords' interests; Second, tenants are hesitant to commit to energy efficiency improvements if they are unsure of staying for an extended period or if they cannot reach a reimbursement agreement with the landlord. The issue of split incentive is common in Winnipeg's neighbourhoods where there is rental housing.

On the other hand, rental buildings that include heat and hydro in the rent has an opportunity for energy efficiency uptake since landlords would have direct benefits from cost saving as a result of reduced energy bills which they are responsible for. The data shows 26% of rental listings in Winnipeg are in this category and present an immediate opportunity for the uptake of energy efficiency programmes.

Recognizing the dynamics between renters, landlords and homeowners and how energy efficiency initiatives apply to them, the utilization of a standardized approach where generalized strategies are used to attract interest in energy efficiency initiatives may not be beneficial. The distinct needs of the diverse groups must be factored into the initiatives, which could mean separate and targeted initiatives for renter, homeowners and landlords.

6.6 Utility influence on rent

The findings show that rents are influenced by varied factors including the neighbourhood of location, recent renovations as well as utilities included in the rent. Contrary to the notion that rental units that exclude heat and hydro bills would have a lower rent per square feet than units that are inclusive of energy bills in the rent, the data showed that the lowest average rent for all the neighbourhoods combined was rather rental units that included only heat cost in the rent. Considering that heat cost accounts for a large portion of energy bills, it was surprising to see that rental units with only heat included in the rent payment was 6.8% less than the average rent of units without heat and electricity. For being the rental type with the lowest rent per square feet, it is understandable to realize that it is the least available on the rental market representing 18% of the rental data collected. That notwithstanding, the average rent of units inclusive of both heat and hydro was 7.7% higher than units that excluded heat and hydro from the rent. This shows how energy inclusion influence rent rates.

6.7 Link between energy poverty, low-income residents and buildings requiring major repairs

The relationship between rental housing and energy poverty is shown in the mapping analysis in chapter 5. Neighbourhoods that have high proportions of rental housing also have a high proportion of energy poverty. This information agrees with the argument by Hope and Booth (2014) that rental housing is a big contributor to energy poverty and inefficient energy consumption.

There was a pattern of similarity when the map on older buildings in Winnipeg was compared with the map on housing that requires major repairs in Winnipeg. The comparison showed that neighbourhoods with a high proportion of older buildings also had a high proportion of buildings in need of major repairs. The neighbourhoods with high proportions of older buildings represent the areas with the highest potential for energy efficiency which can be in the form of building renovations and appliance upgrades. This argument aligns with the discussion by Economidou et al., (2011) about the energy efficiency potentials of older buildings.

Within Winnipeg's mature communities' cluster, there is a link between rental housing, low-income and energy poverty. Neighbourhoods with high proportions of rental also have high proportions of low-income residents. The same pattern is realized on the energy poverty map where the neighbourhoods with a higher proportion of energy-poor residents are also high in rental and low-income. Within these neighbourhoods, energy efficiency initiatives that are geared towards homeowners are likely not to produce the desired outcomes as a result of the rental proportions.

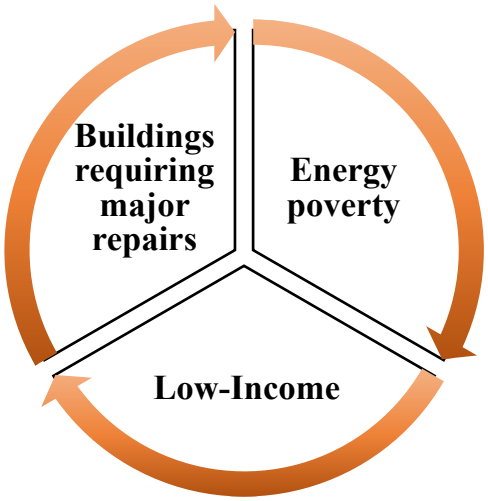


Figure 12: Relationship between repairs, energy poverty and low-income

Energy poverty is severely felt by residents who are low-income and who make sacrifices to meet their energy needs. As a result of the limitations on income, low-income residents are usually the occupants of buildings that require major repairs and have inefficient energy consumption, leading back to energy poverty as shown in Figure 12. Again, from the illustration, the relationship indicates that increasing energy efficiency by considering only one aspect of the linking factors may be less impactful. Rather, initiatives to mitigate energy poverty should be looking at the core issues of building repairs, low income and other social issues that influence the consumption behaviour of households such as social assistance and employment.

Some neighbourhoods had lower proportions of older buildings but had high proportions of buildings that require major repairs. While this in an interesting find, no immediate reason could be assigned to the reason for the changes. However, limited maintenance is one of the assumptions assigned to this change.

While most energy efficiency initiatives are homeowner friendly, there isn't any programme that specifically targets renters. As discussed previously, acknowledging the distinct needs of rental housing in energy efficiency programme may provide reasons for the creation and implementation of renter-specific energy efficiency initiatives. Looking at the renter proportions across the neighbourhoods of Winnipeg as show in the maps, there is real potential in increasing energy efficiency if renter specific programmes were available.

Chapter Seven: Recommendations

The findings and analysis from this project have unearthed some recommendations and directions for improving energy efficiency at the micro neighbourhood scale and also at the city and province scales.

- Variation in communication approaches/strategies

  The existing strategies for communicating Manitoba Hydro's energy efficiency programmes needs improving. People are not taking advantage of energy efficiency programmes because they lack information about the programmes or have not heard about them. For this situation to improve means that new ways of communicating the programmes are needed to achieve a higher penetration rate. Manitoba Hydro can expand its presence on social media platforms including twitter, Facebook and Instagram as a means of increasing interaction with customers, providing real time information on energy efficiency programmes to customers and addressing frequently asked questions. This can also be a tool to connect people to other resources on the pool of programmes that are offered for efficient energy consumption.

  For hard-to-reach communities where internet service reliability may be problematic, reliance on social media may not yield the desired outcomes. In such situations, dedicated staff could be deployed to provide the needed education on energy efficiency at the household level.

  Another concern on communication of affordable energy programmes was the difficulty to understand the information on pamphlets that are included in the bill envelopes and on the application materials. It is necessary to review the current information on materials in circulation and make the required changes to ensure they can be understood by a wide range of customers.

- Public sector policy for energy efficiency benchmark in rental homes (creating an energy standard)

  The creation of a minimum energy efficiency standard for rental homes would ensure an increase in energy efficiency in the rental housing sector. A minimum efficiency standard would mean that rental units whose efficiency is below the standard are not able to list on the

market. The split incentive problem would be avoided, and renters' energy bills would be within reasonable amounts. The absence of a standard of energy efficiency for rental homes is problematic for renters. However, the implementation of this recommendation could be faced with pushbacks from landlords.

- Amending the Residential Tenancies Act to mandate landlords to collect and disclose energy consumption data to renters. New York City is an example where the disclosure of energy use of buildings and energy star scores of appliances in buildings led to a 14 percent reduction in building energy use in a space of four years (Schwartz et al., 2018, p.22).

  There should be a requirement for landlords to gather data about the energy consumption of their buildings and disclose such data to prospective renters or in a publicly accessible data portal. The advantages of having such a system are numerous and include the following.

  - ✓ Public data about energy consumption of rental buildings will increase transparency of energy use in rental buildings for renters, landlords and Manitoba Hydro as the energy supplier. Landlords will have a reason to make their properties energy efficient.
  - ✓ Such data could be used to remedy the split incentive challenge where the interest of landlords and renters are at opposing sides. In tenant-metered lease agreements, the tenant would have pre-knowledge about the energy consumption level of rental listings and so knows what to expect as monthly energy bills. Tenants can make a comparison of the energy consumption of a rental property with the benchmark and make informed choices about renting a listed rental unit. Landlords knowing the energy consumption data of their properties is public information and that renters interest lies in energy efficient buildings presents a level of motivation for improving the energy efficiency of their properties.
  - ✓ The data would help in the identification of under performing rental buildings and target them for efficiency purposes. Knowing exactly which buildings consume energy above the benchmark would help Manitoba Hydro in specifically targeting and negotiating energy efficiency options with the owners. This would expedite collaboration between owners and Manitoba Hydro geared towards energy efficiency upgrading.

- Develop low-income energy efficiency programmes for renters and landlords.
  The existing energy efficiency programmes are generalized or targeted to low-income households. However, the application requirements are more accommodating to homeowners than they are to tenants and landlords. The data from Figure 2 shows that the proportion of tenants responsible for their energy bills are the highest among rental listings. As such, increasing energy efficiency among tenants would be enhanced with the creation of programmes that specifically targets them. The dynamics that come into play between renters and homeowners should be recognized in the creation of such programme designing such that the potential conflicts between the two would be addressed.

- Initiating community level programmes
  Designing programmes that fit specific neighbourhoods based on the neighbourhood's peculiar needs is another approach to increase energy efficiency. As mentioned earlier, there are unique challenges and barriers in individual neighbourhoods especially within the mature neighbourhood cluster in Winnipeg that limit the penetration of Manitoba Hydro's energy efficiency programmes and the achievement of energy efficiency in households. The pilot project mentioned in chapter five could be replicated and modified to address the specific challenges of neighbourhoods which have not been successfully addressed under the existing energy efficiency programmes. Iweka et al., (2019) iterated the importance of community-level interventions for energy efficiency programme uptake and sustainability.

Chapter Eight: Conclusion

This research discussed the impacts of Manitoba Hydro's energy efficiency programmes on low-income households and the barriers to achieving high energy efficiency in Manitoba. Semi-structured interviews, rental scan and spatial data analysis were used in gathering and analyzing the data.

Programme awareness continues to be one of the greatest challenges to energy efficiency programmes. The approach of communicating the programmes have resulted in a situation where not everyone knows about the programmes and the requirements for applying to them. Available literature also pointed to the issue of programme awareness in Manitoba as being caused by consumer disinterest as well as difficulty in some customers understanding the information about the energy efficiency programmes.

The findings showed that most of the energy efficiency programmes were homeowner friendly but were not necessarily available for renters due to the role landlords had to play in securing such programmes for their properties. The equal payment plan programme was the only programme that was found to be directly accessible to tenants without landlord involvement, but the amount set by Manitoba Hydro was sometimes unattainable by those who negotiate for it especially residents on employment and income assistance.

Split incentive between renters and landlords is another issue that continues to influence energy efficiency in rental buildings according to the findings. Landlords do not show enough care to upgrade their properties to energy-efficient standards if they are not directly responsible for energy bill payment while on the other hand, tenants are not bothered about consuming energy efficiently when their energy bills are already part of their rent. The rental data also showed that Within Winnipeg, majority of rental housing listings (42%) do not include heat and hydro bills as part of the rent, shifting the responsibility of consuming energy efficiently to tenants. This echoes the reason to develop separate programmes that target renters and landlords for energy efficiency.

Houses in a precarious state and in need of major repairs account for a significant proportion of inefficient consumption within neighbourhoods in Winnipeg. Such houses are in high proportions within the mature neighbourhood areas of Winnipeg. As discussed by Economidou et al., (2014), older houses in need of major repairs present a great opportunity for increasing energy efficiency through appliances upgrade, enhanced insulation as well as exterior upgrade.

The data revealed a relationship between energy poverty, low-income households and buildings in need of major repairs. The three are mostly linked together and require a holistic approach to solving them. Including social issues such as social assistance and employment in the approach to increasing energy efficiency would have far-reaching outcomes.

In promoting equitable and efficient energy consumption among all Winnipeg households, it is necessary to acknowledge the specific hindrances to the distinct groups in the city and address the specific challenges that make it difficult for neighbourhoods to increase their participation in energy efficiency programmes.

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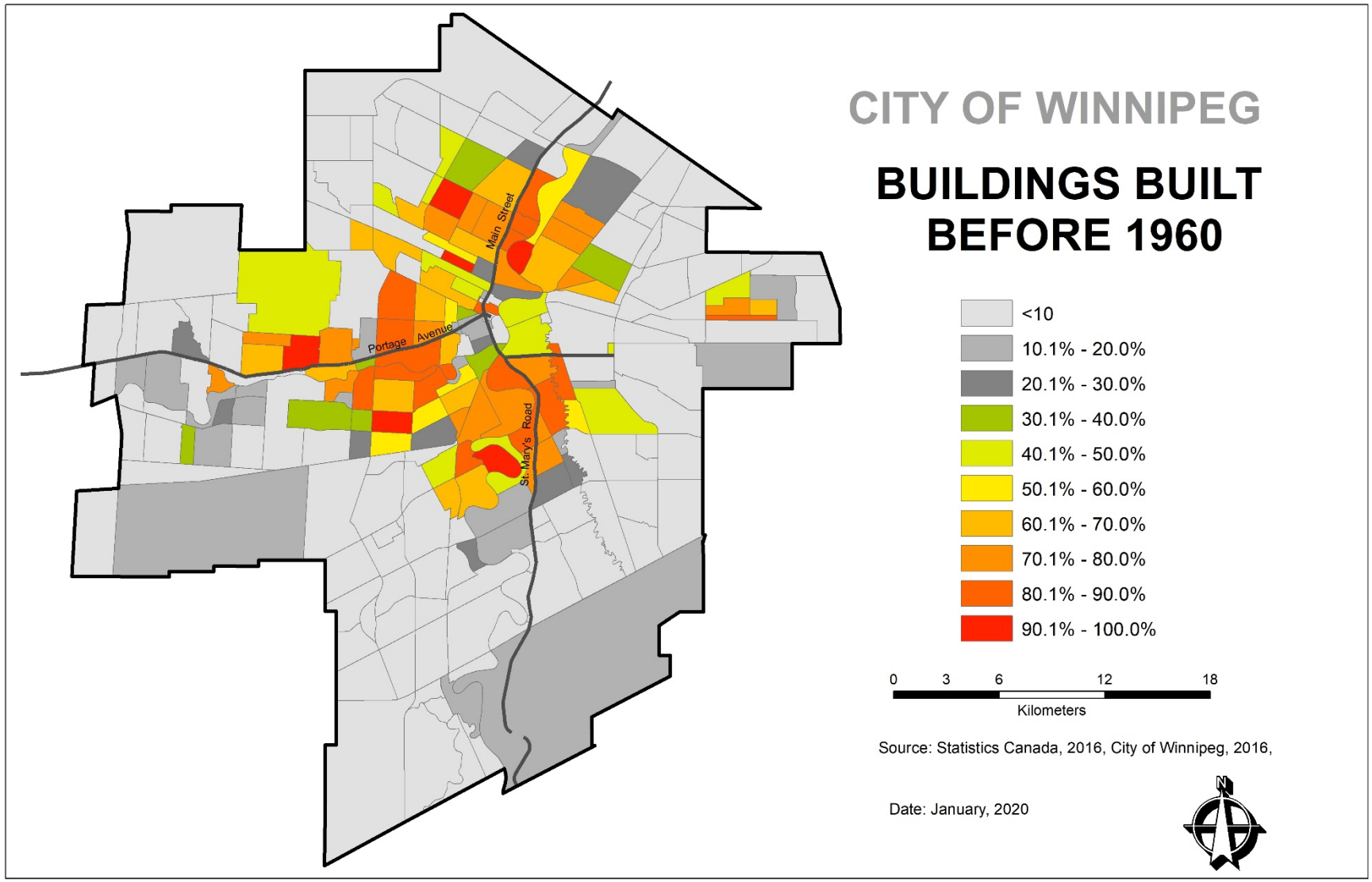
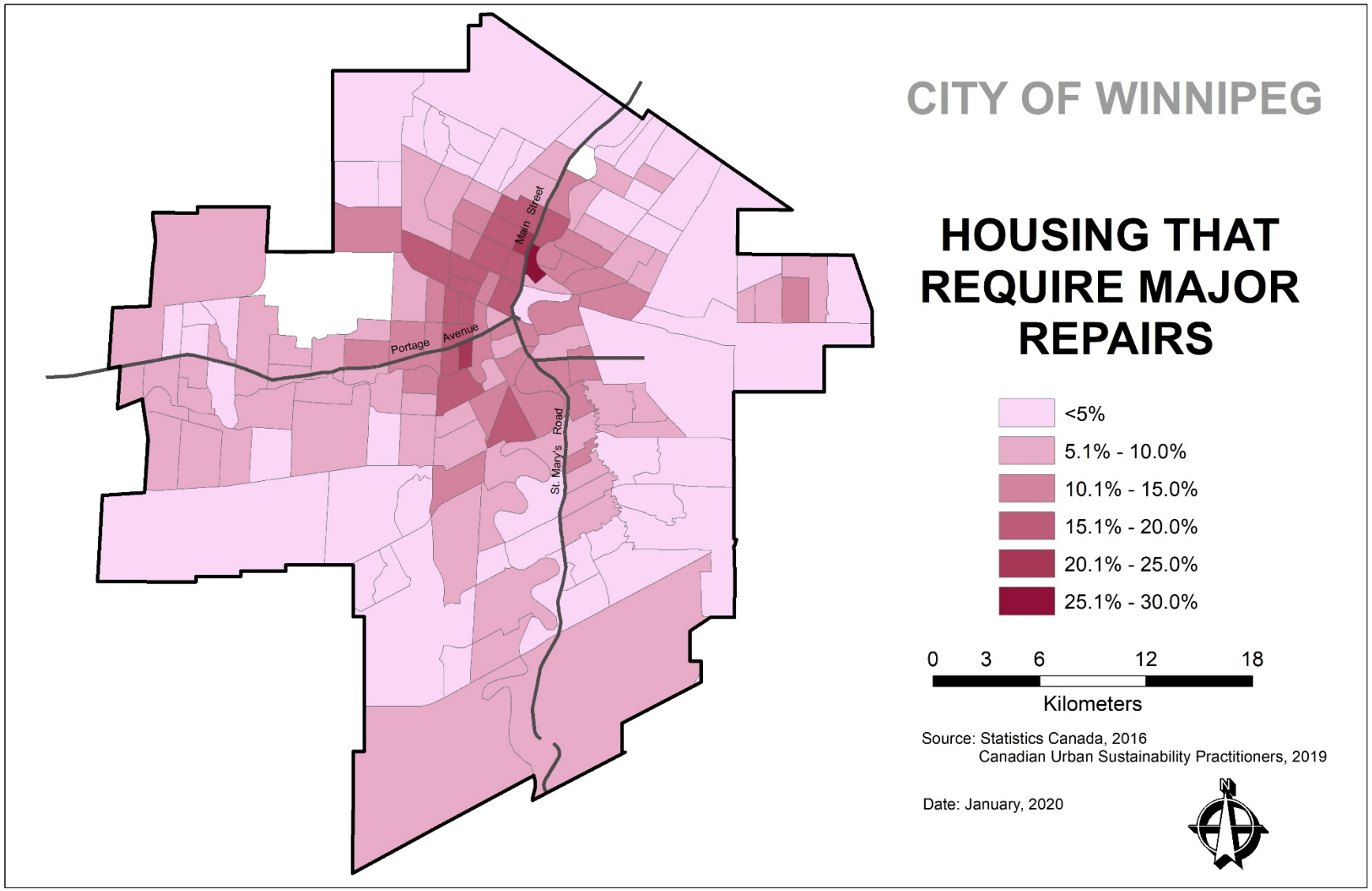
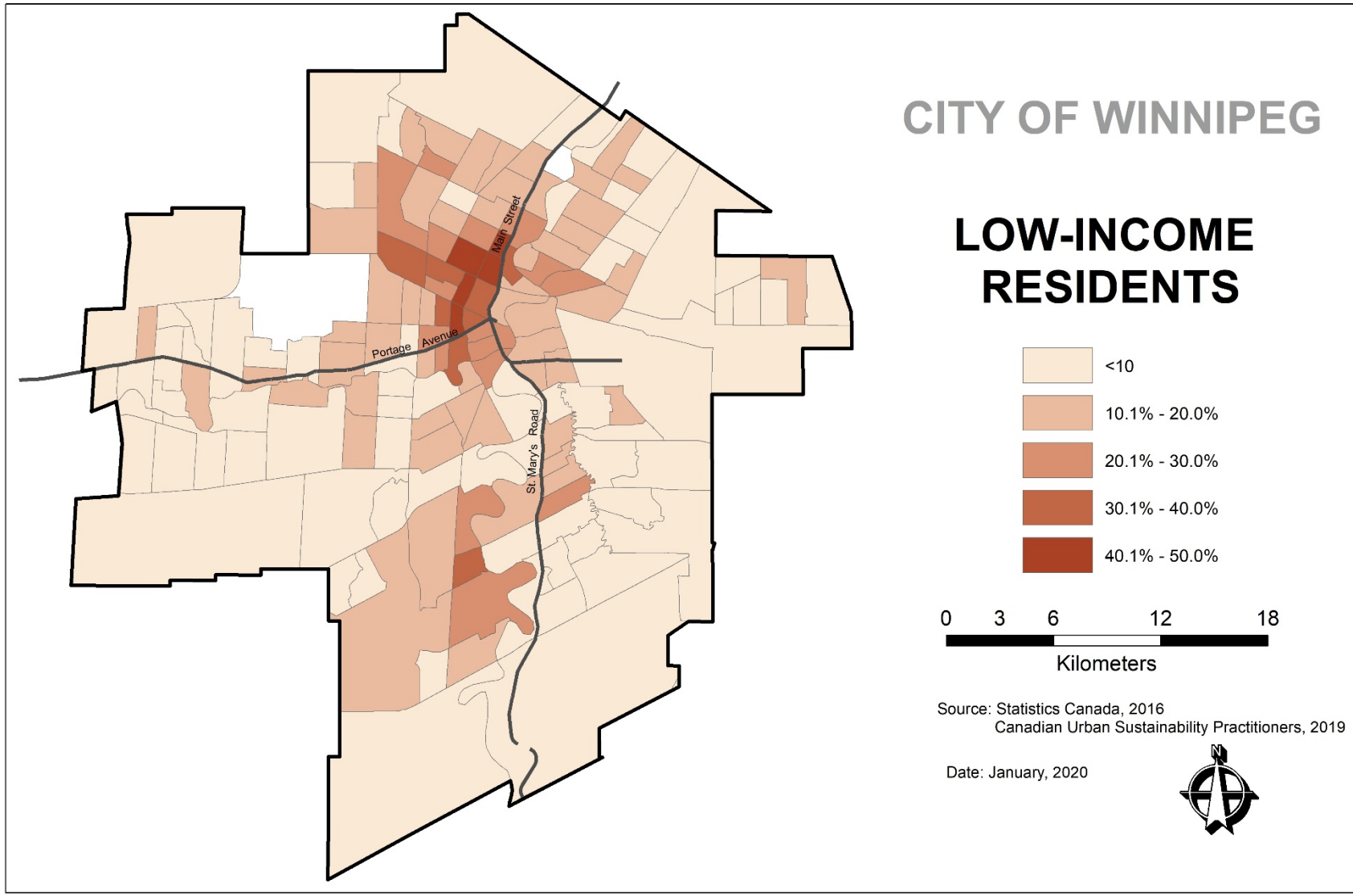
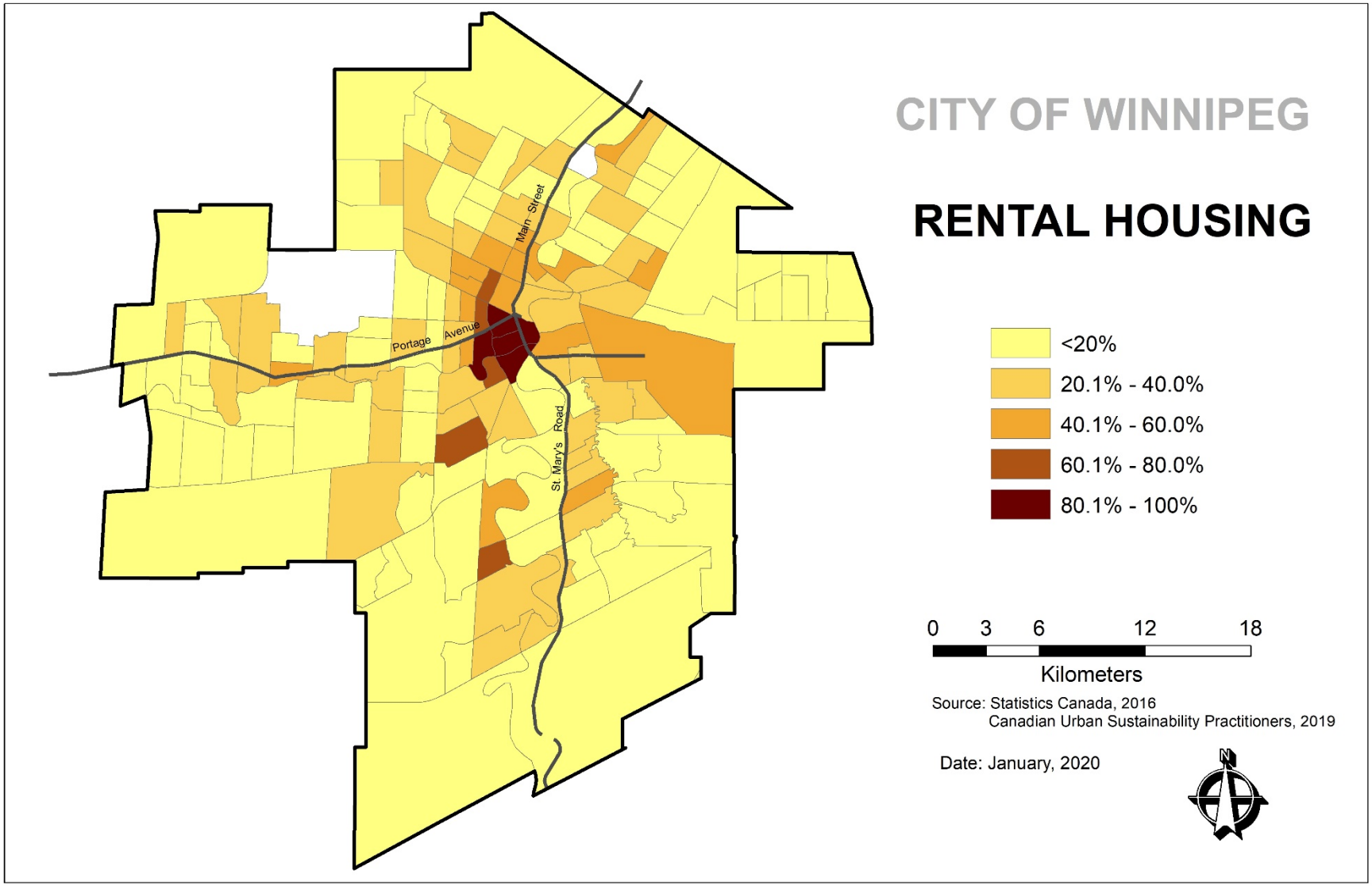
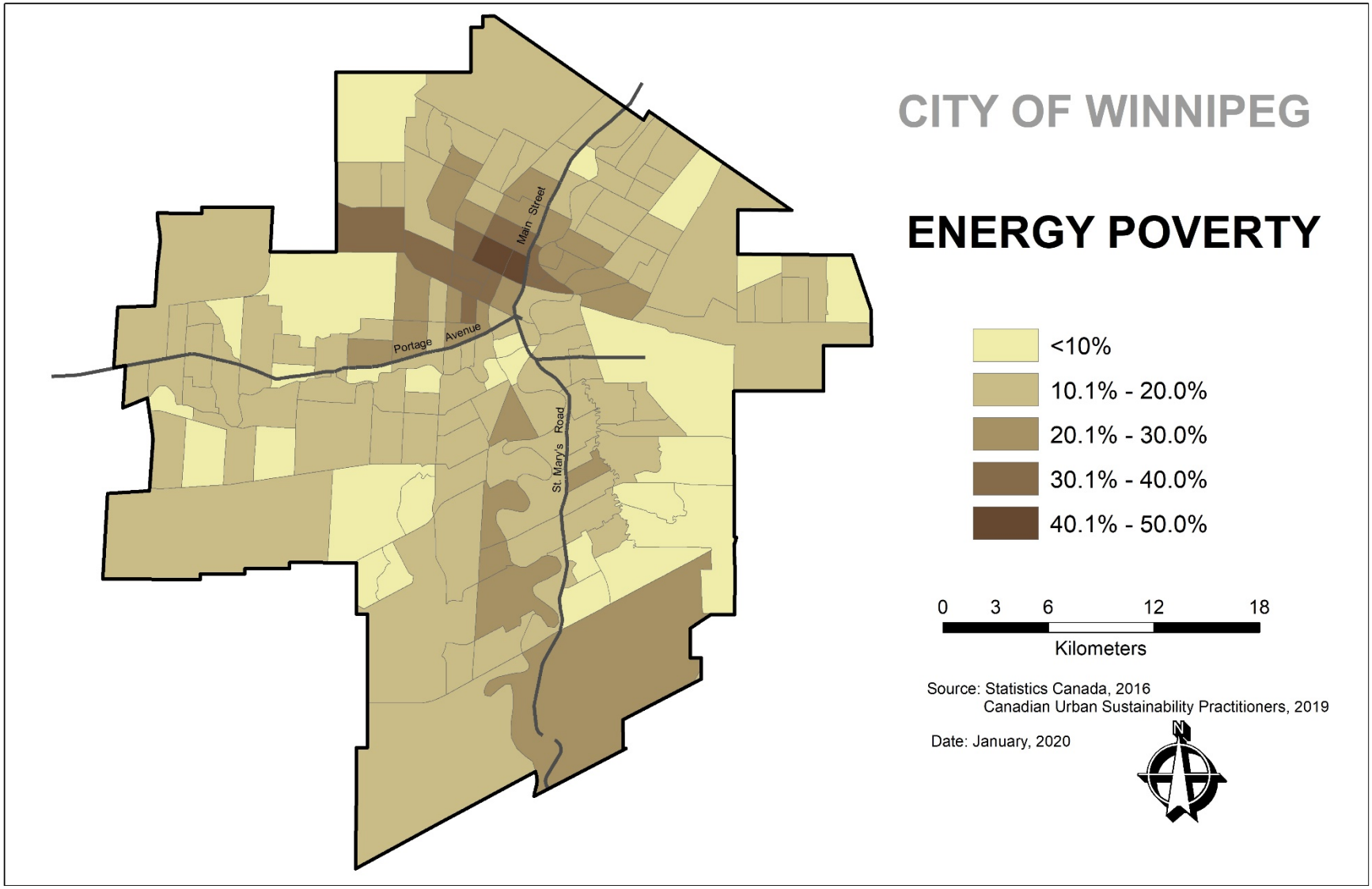
Appendix A


Main Street
Portage Avenue
St. Mary's Road
CITY OF WINNIPEG
BUILDINGS BUILT BEFORE 1960
<10
10.1% - 20.0%
20.1% - 30.0%
30.1% - 40.0%
40.1% - 50.0%
50.1% - 60.0%
60.1% - 70.0%
70.1% - 80.0%
80.1% - 90.0%
90.1% - 100.0%
0 3 6 12 18
Kilometers
Source: Statistics Canada, 2016, City of Winnipeg, 2016,
Date: January, 2020
N


CITY OF WINNIPEG
HOUSING THAT REQUIRE MAJOR REPAIRS
Main Street
Portage Avenue
St. Mary's Road
<5%
5.1% - 10.0%
10.1% - 15.0%
15.1% - 20.0%
20.1% - 25.0%
25.1% - 30.0%
0 3 6 12 18
Kilometers
Source: Statistics Canada, 2016
Canadian Urban Sustainability Practitioners, 2019
Date: January, 2020
N


CITY OF WINNIPEG
LOW-INCOME RESIDENTS
Main Street
Portage Avenue
St. Mary's Road
<10
10.1% - 20.0%
20.1% - 30.0%
30.1% - 40.0%
40.1% - 50.0%
0 3 6 12 18
Kilometers
Source: Statistics Canada, 2016
Canadian Urban Sustainability Practitioners, 2019
Date: January, 2020
N


CITY OF WINNIPEG
RENTAL HOUSING
Main Street
Portage Avenue
St. Mary's Road
<20%
20.1% - 40.0%
40.1% - 60.0%
60.1% - 80.0%
80.1% - 100%
0 3 6 12 18
Kilometers
Source: Statistics Canada, 2016
Canadian Urban Sustainability Practitioners, 2019
Date: January, 2020
N


CITY OF WINNIPEG
ENERGY POVERTY
Main Street
Portage Avenue
St. Mary's Road
<10%
10.1% - 20.0%
20.1% - 30.0%
30.1% - 40.0%
40.1% - 50.0%
0 3 6 12 18
Kilometers
Source: Statistics Canada, 2016
Canadian Urban Sustainability Practitioners, 2019
Date: January, 2020

Appendix B: Short description of energy efficiency programmes by Manitoba Hydro

Affordable Energy Programme: Designed to assist low-income homeowners and renters to pursue energy efficiency upgrades through various energy efficiency measures including improved insulation and installation of high efficiency natural gas furnaces.

Neighbours Helping Neighbours: A partnership programme between Manitoba Hydro and The Salvation Army to provide a one-time emergency funding to assist with energy bill payments for households who as a result of hardships or crisis are unable to pay their energy bills.

Home Insulation Programme: Targets owners of homes built before 1999 to upgrade their insulation to energy efficient levels including air sealing in foundations and attics.

Water and Energy Saver Programme: This programme was designed to reduce residential water heating energy consumption through water and energy saver kits and energy efficient plumbing fixtures.

New Homes Programme: A programme that provides incentives to builders and customers who optimize designs and construction to build homes which are at least 20 percent more energy efficient than conventional new homes.

Refrigerator Retirement Programme: Designed to reduce residential energy consumption through the removal of inefficient and old refrigerators and freezers in addition to old window air conditioners and dehumidifiers.

Heat Recovery Ventilator Control Programme: A programme designed to reduce heat loss, improve ventilation and air quality for households while reducing energy consumption.

Community energy efficiency project: Designed to assist communities develop a sustainable community energy plan which focuses on identifying areas of energy consumption in a community which can be improved to increase efficiency at the community level.

Community geothermal Programme: Designed to increase the adoption of geothermal heat pump systems in order to reduce the cost of space heating. A customised approach is used to provide heat pump installation for communities especially ones without a natural gas heating option.

Residential LED lighting programme: Designed to increase the adaptation of Light Emitting Diode (LED) technology by encouraging residential customers to choose the most efficient lighting for their homes through rebates. Rebates are offered through market retail and also through rebates for property managers of multi-unit residential buildings.

Power Smart Residential Loan Programme: Designed to provide on-bill financing to assist homeowners make energy efficient upgrades to their homes including insulation, ventilation equipment, doors and windows.

Equal Payment Plan: Developed to enable customers pay their electricity and or natural gas bills in equal monthly installments on a yearly basis.

Deferred Payment Plan: Developed to offer flexible payment arrangements to customers who have not been able to keep up with payment of their energy bill arrears due to financial challenges or emergencies.

Home Energy Efficiency Loan: This programme provides a convenient and affordable financing option to homeowners who want to make energy efficiency upgrades to your home. It requires no initial down payment but rather monthly payments which are added to the monthly energy bills of the homeowner.

Energy Finance Plan: This plan is available to residential, commercial, farm and seasonal customers and provides funding for upgrades to gas and electrical systems.

Pay as you save (PAYS) Financing: This programme allows customers to use the estimated annual savings from an energy efficiency upgrade to pay for the cost of the upgrade. The potential annual energy savings are averaged over 12 months and used to calculate the monthly payment which is added to the monthly energy bill.

Residential Earth Power Loan: Designed to support the adoption of geothermal heat pump technology and increase awareness of new technologies through educational materials, training workshops and technical support.

Customer Contribution Time Payment Plan: A programme that allows customers with approved credit to apply for a payment plan on a loan for service extension or conversion from overhead to underground wiring facilities.

Drain water heat recovery Systems: It is a system that captures heat lost from hot water going down the drain and uses that to pre-heat cold water entering the water heater. It is able to reduce energy consumed by water heaters by up to 25%. Customers can get a financing plan to upgrade their homes with this system.

Plug-in timers: A programme developed to provide rebates to customers on the purchase of plug-in timers. These timers are designed to help consumers reduce their energy consumption by regulating the timing for appliances including heaters, lights and pool pumps.

Power bars: Established to provide rebates to customers on purchasing power bars. Power bars help consumers reduce their energy consumption by providing automated shut off function when gadgets are left plugged in when not in use.

Smart thermostats: A programme that provides rebates to homeowners on the purchase of smart thermostats. These thermostats give customers absolute control over the house climate by enabling remote activation, voice activation or geo-fencing to modify the settings.

Appendix C: Research tools (Semi structured interview questionnaires)

Group 1: Community Advocacy organizations

1. What is the relationship between your organization and low-income households?
2. Have you encountered issues of energy poverty among individuals or groups you work with?
3. Do the groups you work with express awareness about the provincial initiatives that support low income households with energy efficiency and bill payment?
4. Do you collaborate with other departments and agencies when dealing with energy poverty issues?
5. Does your organization provide any assistance related to energy costs to individuals or groups you work with?
    a. If yes, what forms of assistance?
    b. If no, do you anticipate any such assistance for low-income households in the future?
6. What are the challenges of low-income households towards achieving high energy efficiency?
7. Are you aware of any initiative that support energy affordability or efficient energy consumption or both for low income earners?
    a. If yes, what is your understanding of such an initiative?
8. Do you think that existing energy initiatives benefit renters and home owners equally?
9. Do existing initiatives require changes to increase their impact on low income households?
    a. If yes, what are these changes?

10. Do you know of other energy initiatives from other provinces that could be implemented in Manitoba to assist low income households?

Group 2: Manitoba Hydro Staff

1. What is your understanding of energy poverty?
2. Can you describe the energy affordability and efficiency programmes of Manitoba Hydro?
3. Are the programmes currently running?
    a. If yes, what has kept it running up to this point?
    b. If no, why was it discontinued?
4. Are the benefits from the programmes the same for renters and owners?
    a. If one group (either renters or owners) benefit more from the programmes than the other, how can the benefits be maximized for all?
5. Do you collaborate with other agencies, departments and organizations in the implementation of your programmes?
6. What has been the changes in the consumption level/ bills of beneficiaries of your programmes?
7. How does Manitoba Hydro publicize energy efficiency and affordability programmes to ensure that those who need them get to know about them?
8. Do you think things could be done to improve the delivery of Manitoba Hydro's programmes?
9. Are there plans to introduce other programmes targeted at low-income households in the future?

10. Do you know of other initiatives from other provinces that could be implemented in Manitoba to assist low-income households?