Department of Architectural Sciences

Environmental Attitudes and Energy Consumption among Tenants in a High-Rise Multi-Unit Residential Building in Toronto, Canada

By

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Abstract

The influence that environmental knowledge and belief have on people's behaviour is one of the important issues in the fields of engineering, environmental study, management and other related areas. However, currently, there is not enough study on household energy use at an occupant level or on evaluation of elements that can affect household's energy use such as environmental knowledge and pro-environmental attitudes in Canadian MURBs. As such, studying household's energy use and the interrelated effects on their energy consumption is believed to be a crucial step towards reducing energy consumption.

Considering the significance of the issues stated above, the present study attempts to evaluate energy consumption and its possible correlation with environmental attitudes among the tenants of a Toronto high-rise multi-unit residential building. The research methodology is based on a quantitative survey method, and the focus of the study is on historical annual energy consumption from April 2011 to June 2013. The main tool for collecting data is a developed questionnaire, and Dunlap's NEP scale is used for measuring environmental attitudes.

With regards to data analysis, the survey data and historical energy consumption data from April 2011 to June 2013 were analysed. The statistical sample size consisted of the 50 tenants who completed the NEP survey from July 29 to August 18, 2014. The detailed statistical results show that there is a negative correlation between environmentally-conscious attitude and energy consumption of the participants which is in agreement with the study's presented hypothesis. In essence, this means that having high environmentally-conscious attitudes towards the energy consumption has a positive effect on occupant's energy consumption level.

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Table of Contents

List of Tables

List of Figures

1.0 Introduction

1.1 Background on Energy Consumption in Canada's Residential Sector

Human values can have a big impact on their beliefs. This is defined by behaviours such as a person's approaches or reactions to how their behaviours react in life's impacts (Rokeach, 1979; Schwartz, 1996 and Ardahan, 2010). Values can be imagined as important life goals or standards that define a person's principles through their life's (Rokeach, 1973). In relation to environment and its problems, values may play an important role on for solving and/or for broadening the contradiction between individual and public interests (Axelrod, 1994; Karp, 1996; Keles, 2011).

While conventional energy sources are limited, the demands for energy are increasing every day. In Canada, there have been many energy conservation efforts undertaken to tackle Canada's energy-related problems: energy security, fluctuations in fuel prices, and its threat to pollution. Residential sector in Canada accounts for more than 15% of Canada's energy consumption (NRCan, 2011) (Figure 1).

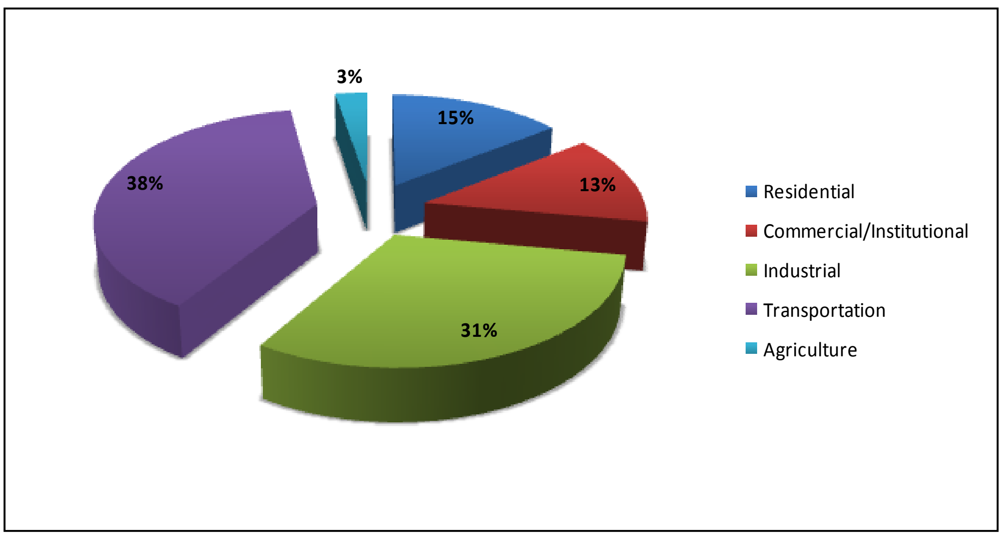

Figure 1- Energy consumption breakdown within the sectors in Canada, 2009 (NRCan, 2011)

Multi-unit residential buildings (MURBs) represent the most significant component of the Toronto residential building inventory. Over half (55%) of the dwellings in the City of Toronto consist of apartment buildings. The majority of all Toronto dwellings (39%) are either mid-rise or high-rise apartment buildings of five or more storeys. Low-rise apartments of four or fewer storeys represent 16% of the dwellings in Toronto (Policy &

Research city of Toronto, 2007 and Binkley, 2012). MURBs, as the most common form of dwelling in Toronto, are also a significant source of greenhouse gas (GHG) emissions. On an annual basis, combined electricity and natural gas consumption of Toronto high-rise MURBs are responsible for 68% of these emissions (Binkley, 2012). With increases in such emissions and energy consumption, environmental effects such as climate change and loss of biodiversity are at risk (Abrahamse et al., 2005). As a result, reducing household energy consumption would be beneficial for Canadians in order to reduce greenhouse gas emissions and their threat to the environment.

An overview of rental MURBs and their energy consumption shows that these buildings are energy inefficient due to their concrete frames, outdated building structure and features - e.g., heating and cooling equipment, appliances, etc. (City of Toronto, 2011 and Roque, 2013). In some MURBs the utility costs are included in their monthly rental payments which make improving energy efficiency a challenge. This creates an outcome of consumers not feeling responsible for the way energy is used in their units which is another dimension of high-rise MURB, since the actual consumers (tenants) do not pay their own utility bills. For example, keeping lights on when leaving their units or/and having an air conditioning system set to 'on' while the windows are open in the summer or in the winter while nobody is at home. It is said that "buildings don't use energy: people do" (Janda, 2011).

On the other hand, because of the inclusion of energy cost in the rental buildings, owners do not invest much into their rental properties in terms of energy efficiency. As a result, the majority of rental buildings are older and less energy efficient (Roque, 2013).

There has been a significant amount of studies on Canadian household energy consumption, particularly in the matter of residential building design and materials. However, energy behaviour, attitude and usage, is a relatively new topic (Yohanis, 2012).

The relations between values and attitudes which are interested about environmental issues and environmentally related behaviour are very complex (Ardahan, 2010). In order to achieve changes in people's behaviours, it is important to gain insight into their beliefs and values and how these might drive them to make decisions. Thus, opportunities for significant reductions in energy consumption could be achieved by evaluating occupant's household energy use and attitude within high-rise MURBs (focus of this study)**.**

This study is part of a larger and an on-going research project which is called “Toronto Tower Renewal” with Ryerson University. The following section explains the specified project’s concept and the discussion presented here will be limited to energy data for the residential sector with a focus on a MURB.

1.2 Toronto Tower Renewal Program

The City of Toronto's “Tower Renewal Program” is a program that was created with the aim of reducing energy consumption in MURBs. It is a municipal government initiative, where many parties - such as Canada Mortgage Housing Corporation (CMHC), Ontario Ministry of Municipal Affairs and Housing (MAH), City of Toronto, government agencies (e.g., TCHC and CMHC), University institutions (e.g., University of Toronto and Ryerson University) and NGOs (e.g., Toronto's Atmospheric Fund (TAF)) currently peruse/check various components of Toronto's high-rise buildings. Components of the analysis accomplished in this study are used to report the tenant’s household energy use in a Toronto MURB pilot site to interested stakeholders**.**

In 2004, the concepts of revitalization and retrofitting Toronto’s existing apartment buildings were presented by E.R.A. Architects (City of Toronto, 2011). The purpose of their research was to enhance energy efficiency and revitalize the community. In 2008, Toronto's City Council, and the then Mayor David Miller, also realized the significance of revitalization and making these buildings more energy efficient.

The focus of the program is on MURBs that were built between 1945 and 1984 having eight stories or more. The City decided to make this project a municipal initiative and was called the Mayor’s Tower Renewal Project (MTRP) in 2008.

Similar programs were carried out in Amsterdam and Berlin and the Revitalization of Toronto's MURBs was inspired by them. Toronto's Tower Renewal Program would be formed by applying various retrofits, programs and activities to Toronto's MURBs. Retrofits included mechanical, storm water retention, green roofs and renewable energy.

Since Toronto possesses the second highest high-rise building density in North America, the proposed project offers great opportunities to create a cleaner, healthier environment and stronger communities, bring greater cultural awareness and activities as well as to improve local economic activity (City of Toronto, 2011).

1.3 Problem Statement

Once environmental problems surfaced in the 1970s, the main problems were about environmental pollution (air, land, visual, light, noise and water pollution), and resources (especially energy). Therefore, many studies focused on the condition for environmental quality or environmental concern (Ardahan, 2010).

Nowadays, the environmental issues and challenges, particularly "energy consumption behaviour" has been the focus of attention for policy makers and scholars in the fields of sociology, environment study, management and so on (Maleki & Karimzadeh, 2011).

One of the ways to prevent harming the environment and its destruction is the change in human behaviour towards the direction of the environmentalist dimensions (Quimbita & Pavel, 2005).

The change in the people's behaviour towards the naturalist dimensions can be considered as one of the ways to avoid the damage to the environment and destruction of nature (Quimbita & Pavel, 2005). Based on the theory of Reasoned Action of Fishbin and Ajzen (1975), it is assumed that there is a systematic model between the people's approach towards a certain issue and the related behaviour towards that issue. On the other hand, scholars in the field of environmental study such as Borden and Schettino (1979), Schahn & Holzer (1990), Kaiser et al. (1999), Bayard & Jolly (2006) and Maleki & Karimzadeh (2011) believe that there is a relationship between environmental knowledge and significant environmental behaviour. In addition, Dull & Janky (2011) also found out the evidence on positive relationship between environmental attitudes and household energy consumption in advanced post-industrial societies.

In most cases the previous scholars proved that there was a statistically significant relationship between the environmental attitude and energy consumption (environmental behaviour). However, currently, there is not enough study on household energy use at an occupant level or on evaluation of elements that can affect household's energy use such as environmental knowledge and pro-environmental attitudes in Canadian MURBs (focus of this study).

Thus, the issue to be considered here is how attitude affect energy use in a high-rise MURB in Toronto. Hence, this could be possible by finding out the relationship between environmental attitude and energy consumption behaviour.

1.4 Research Objectives and Intend of Research

The premise of the research is the attitude of the occupants focusing on energy consumption. The main aim of this study is to examine, correlate the impacts of occupants' environmentally-conscious attitudes on energy consumption in a Multi-Unit Residential Building (MURB) in Toronto.

Considering the main aim of this study, the following objectives are formulated:

1) To examine the historical energy consumption[1] of household over the past within a Toronto MURB.
2) To conduct a survey to examine a different dimension of household's environmentally-conscious attitudes within a Toronto MURB.
3) To investigate the correlation between household's environmentally-conscious attitudes and their historical energy consumption during the previous years and in the current year within a Toronto MURB.

These objectives will be achieved by evaluating different occupants' attitude survey and comparing the information to their usage of energy. This will help determine their current attitudes towards energy consumption.

1.5 Research Question

The main research question is,

Is there a significant relationship between the occupants' environmental attitude and their energy consumption within a Toronto MURB?

[1] Historical data on all individual suite's energy use was collected by the property manager. This dataset begins in October 2010, is collected hourly.

The research further divided into several research questions as follows:

1) What is the nature of the historical household's energy consumption trend over the past years within a Toronto MURB?
2) How can we measure the household's environmentally-conscious attitudes within a Toronto MURB?

These questions form the basis of the entire study. In the following section a literature review concerning the aforementioned problem statement is presented.

2.0 Literature Review

2.1 Energy consumption in Canadian Multi-Unit Residential Buildings (MURBs)

Nowadays the demand for energy is increasing while limited energy resources exist. From 2003 to 2004, the world energy consumption increased by 4.3% and the trend is not going to decrease (Hodgson, 2010). Consequently, energy cost is increasing over time. This increase can be an easy solution for energy efficiency but it is not the best solution by itself. Our society trends are beginning to reflect this by making poor people's lives harder than those who are wealthy. There are many ways to save energy; people just have to get learn about energy conservation (Hodgson, 2010).

In 2001, around 31% of people in Canada lived in Multi-Unit Residential Buildings **(**MURBs), and that accounted for 24% of annual energy consumption within the residential sector (Liu, 2007). Moreover, the residential sector in Canada by itself consumed 1,439 PJ of energy in 2007 (Statistics Canada, 2010), in which space heating (63%), water heating (18%), major appliances (13%), lighting (4%), and space cooling (2%) were the main types of energy use in Canada (NRCan, 2012).

An overview of rental MURBs and their energy consumption shows that majority of rental buildings tend to be older and less energy efficient than other high-rise MURBs (Counihan & Nemtzow, 1980 and Ghajarkhosravi, 2013). In some rental MURBs the utility costs are included in their monthly rental payments this creates a tendency for tenants (actual consumers) living in rental MURBs to become less careful about the way energy consumption is used in their units. On the other hand, owners also do not spend much effort into their rental properties in terms of energy efficiency. This in effect can explain why majority of rental buildings that are older are less energy efficient (Counihan & Nemtzow, 1980). Considering all of the above, improving energy efficiency in rental MURBs becomes a challenge.

2.2 Overview of Researches on Canadian MURBs

In Canada, almost one-third of Canadians live in a MURBs dwelling, this percentage is increasing year after year (Liu, 2007). There are many issues related to MURB tenants and household energy use. First, MURBs typically house tenants are from low social-economic status (United Way Toronto, 2011). This restricts households to invest in energy efficient appliances or improvements. Secondly, tenants who have less knowledge or uninformed about residential energy consumption have shown to consume more energy than those tenants who are more informed about energy consumption (Guerin et al., 2000). Such as access to information and knowledge about the tenant's household appliances and the amount of energy these appliances consume must be available in order to reduce energy consumption. Lastly, within the monthly rental costs utilities such as electricity and gas consumption can be included as part of the total monthly payments. As a result, less care is shown by the tenants in regards to intensity consumption levels of their household energy use.

There are many factors which can affect the energy consumption of a household such as; by behaviour, age of the tenants, types of appliances, demographics of the tenants and etc. (Yohanis, 2012). These effects can lead to other elements resulting in the technical, economic, social and psycho-social origin (Cayla et al., 2011). Understanding and evaluating the tenant's present household energy use and environmentally-conscious attitudes towards energy consumption is significant in order to develop energy reduction strategies such as tenant engagement and education. Also, determining all factors contributing to one's household energy consumption, however, this is complex.

Statistics on energy consumption in Canada are collected by a number of government agencies including Statistics Canada and Natural Resources Canada's Office of Energy Efficiency. Information about residential energy use can be obtained from reports and data published by these agencies. However, before this data can be used as a point of reference, it is important to study how the data was collected so that the accuracy, completeness and relevance of the data are considered.

The three main sources for residential energy use data are: The Survey of Household Energy Use (SHEU), the Energy Use Data Handbook (EUDH) and the Comprehensive

Energy Use Database (CEUD). Figure 2 provides a simplified diagram of the flow of information indicating the location, the sources and data for each. As shown in the diagram, information collected in the Report on Energy Supply and Demand in Canada (RESD), the SHEU as well as other surveys and data sources are combined as inputs into the Residential End-Use Model. The Residential End-Use Model processes the data and organizes it into categories as reported in the EUDH and the CEUD (Binkley, 2012). These three surveys are at a national scale and focus on energy intensity of home.

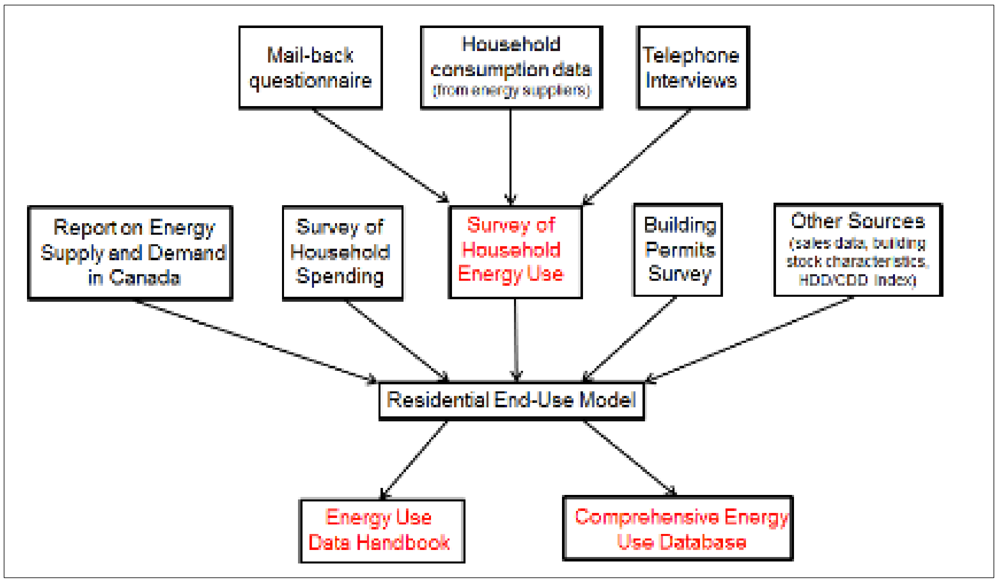

Figure 2: Flow of information for residential energy use data provided by government agencies (Binkley, 2012)

It should be noted that SHEU was a joint project between Statistics Canada and Natural Resources Canada (Natural Resources Canada, 2010). The project database collected information on household energy consumptions. SHEU uses building type for classification, including single detached, double/row houses, apartment and mobile homes. Prior to 2007, the data available for apartments only represented low-rise and mid-rise buildings up to five floors. In SHEU-2007, buildings with five floors and above were investigated regarding the abovementioned categories identifying both single detached houses and high-rise apartment only (Natural Resources Canada, 2010). In addition, numerous studies such as Aydinalp et al. (2003) and Marueljols and Young (2011) cite only SHEU versions due to the lack of data available on household energy use in Canada.

In addition, Natural Resources Canada's Office of Energy Efficiency - National Energy Use Database (NEUD) also addresses residential household energy use (Natural Resources Canada, 2011). NEUD compares Canada's energy consumption and carbon emissions, quantitatively, within the residential sector from 1990 to 2009 (Roque, 2013). Apartments surveyed in NEUD are located in various building types including residential and non-residential buildings; the buildings can be high-rise, mid-rise and low-rise. This database provides information on how different household types consume energy, while the factor of the building type is ignored.

Household energy consumption involves many factors such as occupants' behaviours, ages, type of appliances, demographics, income, gender, and more. The findings in NEUD provide an overview of the tenants' type and their household efficiency. This information can be helpful to energy conservation strategies targeting on the occupants. However, for researches on a particular building type, such as high-rise MURBs, the NEUD is not appropriate source.

The national surveys such as SHEU 2007 and NEUD lack other elements that contribute to occupant's household energy use (e.g., social aspects). Obviously, incorporating all factors of one's household energy consumption is not easy; but the national surveys do not consider social or psycho-social aspects.

It should be noted that besides the two national and comprehensive surveys conducted in Canada, SHEU-2007 and NEUD, there has been a limited amount of research done on occupant's household energy use in Canadian MURBs.

A study conducted by Canada Mortgage and Housing Corporation (CMHC) analyzed the energy intensity of 40 apartment buildings across Canada. Their study results showed that the average annual energy consumption of the 40 buildings was 279 equivalent kilowatt-hours per unit floor area (ekWh/m^2). The average annual energy consumption of residential high-rise was 317 kWh/m^2 from 1961 to 1980 and 212 kWh/m^2 after 1981 which shows that buildings which were built after 1981 consumed 33% less energy than the older buildings (Enermodal Engineering Limited, 2001 and Roque, 2013).

Another study from CMHC investigated 10 high-rise MURBs across Canada. Two buildings located in each of the following provinces: Newfoundland, Ontario, Manitoba, Quebec and British Columbia. The study found energy intensity ranged from 152 to 309 kWh/m^2, normalized to weather (Scanada Consultants Limited, 1997 and Huang, 2012).

Eighty-eight of the Ontario Housing Corporation (OHC) high-rise apartments were assessed with two-thirds of the buildings had energy intensity ranging from 150 to 250 kWh/m^2 with a mean of 232 kWh/m^2 (Canada Mortgage and Housing Corporation, 2007). An interesting finding regarding this research is how the apartment buildings located in Toronto have greater energy usage than buildings in colder locations. The study explained that the greater portion of family-type buildings might use more energy than buildings with other occupancy types.

Maruejols and Young (2010) found that whoever pays utility bills has a great impact on energy use. In their study based on SHEU 2003, MURBs in low-rise apartment buildings used 70% more electricity and 114% more overall energy when landlords paid for the utilities. MURBs in row houses and detached houses showed fewer differences but still used 40% more electricity and 37% more overall energy when landlords paid for the utilities. Levinson and Niemann (2004) had similar findings from the Residential Energy Consumption Survey and the American Housing Survey. They argued that although sub-metering can be one of the most cost-effective energy conservation measures, obstacles such as the installation fees, slow adoption of cost-effective residential energy-conservation technologies, and rental contracts with zero-marginal-cost energy use elevated the energy consumption in rental housing when landlords paid for the utilities.

Finch et al. (2010) developed a baseline of 39 mid-rise to high-rise MURBs in the Lower Mainland and Victoria BC. Energy intensity ranged from 144 to 299 kWh/m^2, with an average of 213 kWh/m^2 and a median of 217 kWh/m^2. The average heating degree-day (HDD) based on 18˚C is 2,712 for the studied period. The climate in BC is milder compared with other provinces; thus requires less energy for space heating related demands. Another possible reason is that BC uses higher percentage electricity for heating (Natural Resources Canada, 2010). In 2007, electricity was 34% of the principal energy source for heating in BC, while it was 20% in Ontario. This can contribute to a relatively low energy consumption of the buildings comparing with buildings located in other regions.

In Huang's thesis (2012), she developed a weather normalized energy benchmark for 45 gas-heated high-rise MURBs in Toronto. The normalized annual consumption for these buildings was found to range from 242 to 453 kWh/m^2.

In Roque’s thesis (2013), he developed a survey on household energy use and behaviour in a rental MURB in Toronto. The detailed analysis of his survey data resulted in the development of relationships between occupant's demographics and energy consumption. By creating an Artificial Neural Network (ANN) model, results showed that the implementation of the survey may have reduced occupant's energy consumption in the high-rise MURB. (Roque, 2013).

In Prada (2013) research, occupants self-assessed behaviour (occupants’ surveys) was compared to actual metered consumption (actual energy use) in a recently retrofit MURB in Toronto. Since simulated building performance during the design stage often differs from actual building performance, a Post-Occupancy Evaluation (POE) which is a comprehensive building performance review had been designed. Results showed that the average estimated consumption was found to be 45% more than the average meters consumption. Also, based on the survey-based estimates 46% exceeded their expectation resulting to more respective metered readings, this translated to more than 50% of the original estimations. He concluded that results like these could lead to the miss-allocation of resources during a retrofit (over-sizing of supply lines, downplaying the use of the fan-coil units, etc.). Also, it can easily mislead energy saving strategies when it comes to appliance upgrades based on usage and overall efficiency. As a result, he recommended the use of mode-based cases to limit sources of discrepancy as well as more rigorous statistical analysis.

Young (2011) also found that split incentives impact some aspects of occupant behaviour. He found that households that do not pay for their heating utilities were less sensitive to saving energy (e.g., turning off heating when no one is at home).

In summary, the research that has been conducted on Canadian MURBs mostly focuses on the energy intensity of the entire building quantitatively. Also, the large number of surveys on household energy use that have been conducted, much less is known about the human side of the energy tension**,** while residents can play an important role in energy conservation that supplements the engineering solutions.

2.3 The Relationship between Environmental Attitudes and Energy Consumption

According to the social psychology theories, the change in the behaviour will not happen by itself, unless environmental knowledge and pro-environmental attitude change (Dull & Janky, 2011). Also, Hines et al. (1986) found out that the prediction of environmental behaviour is not an easy process. This includes many different variables, apparently, that all act with correlation to each other (Maleki & Karimzadeh, 2011). Grob model in 1995 also showed that "the more people know about the environment, the more pro-environmental behaviour they will show" (Maleki & Karimzadeh, 2011). His reasons for asserting this, is the wide empirical backgrounds, based on environmental data surveys of Borden & Schettino (1979), Hines et al. (1987), Schahn & Holzer (1990) and etc. (Maleki & Karimzadeh, 2011). It is important to clarify how the environmental behaviour of people can be influenced by the environmental knowledge and belief. Therefore, consumers' attitudes are considered as important determinants of household energy usages (Dull & Janky, 2011).

As the focus of this study, literatures reviewed are concerned with the relationship between household's environmentally-conscious attitudes and their energy consumption. Literatures clearly show the importance of the human role in residential energy consumption as their results verified quite persuasively that the energy consumption of a house cannot be completely understood without referring to the people in the house (Socolow, 1978 and Ardahan, 2010). In other words, individuals are the ones who make the decisions to use the machines that consume energy.

Therefore, it is essential to explain how the environmental behaviours of people can be influenced by the environmental knowledge (Frick et al., 2004). This opens new doors in the study of the impact of the environmental knowledge on effective environmental behaviour (Maleki & Karimzadeh, 2011).

Only recently we have begun to learn about how people realize and respond to their "energy environment" and how their attitudes and motivations affect their energy consumption behaviour (Thomson & Research Ltd., 2013). Some earlier researches showed that environmental attitudes had a substantial effect on pro-environmental behaviour (Thompson & Barton, 1994; Stern et al., 1995; Poortinga et al., 2004). Those findings were according to the evidence gathered in advanced societies. It should be mentioned, however, the social context may also affect the equality among pro-environmental values, attitudes, and behaviour (Olli et al., 2001). Social context might assign not only to friends or family, but also to the whole social environment; one should not ignore the social value system of a given society (Ewert & Baker, 2001; Nordlund & Garvill, 2002).

Regarding the environmental attitudes, Dunlap and Van Liere in the mid-1970s, impressed by Pirages and Ohrlich (1970) who took Dominant Social Paradigm (DSP) center as anti–environment in USA, concluded that because of environmentalism, challenges towards the environment and in the relationship of humans with the environment has been created (Maleki & Karimzadeh, 2011). There have been some research conducted by social psychologists to reduce residential energy consumption as well as examining the factors that influence consumption (Yohanis, 2012; Brandon & Lewis, 1999; Bonino et al., 2012).

In the summer of 1976, Seligman et al. (1978) conducted two energy attitude surveys with two general purposes: 1) they wanted to see whether they could extract, from the many different attitudes that people have about energy and a few basic attitudinal dimensions that reflect people's conceptualizations of energy consumption; 2) they wanted to know whether these attitudinal dimensions relate to actual energy consumption.

The respondents of their first summer (July, 1976) questionnaire was conducted on 56 couples living in townhouses in Twin Rivers, New Jersey. A second survey was conducted on 69 couples on September 1976 in the same community to attempt to confirm the general results of the first survey. The 28 attitudinal questions were subjected in the survey and a statistical technique (factor analysis) was used to reduce the respondents' attitude scores to a relatively few attitudinal factors.

According to their results (Seligmean, Darley, & Becker, 1978), 1) homeowners' attitudes towards energy can be conceptualized into a few basic factors, and 2) these attitudinal factors can predict actual energy consumption. In other words, their study showed a strong relationship and correlation between environment attitudes and energy consumption of the homeowners.

2.4 Overview of the New Ecological Paradigm (NEP) Scale

Several ways of measuring people's environmental attitudes and basic ecological worldviews have been established since the 1970s. While only two measures are used frequently: the Ecological Attitude Scale developed by Maloney and Ward in 1973 and the New Environmental Paradigm (NEP) Scale developed by Dunlap and van Liere in 1978 (Fransson & Gärling 1999). The NEP scale became one of the most used measures of environmental concern in the world and has been used in more than 100 studies around the world (Freudenburg, 2008 and Hawcroft & Milfont, 2010, and Thompson & Versus Research Ltd., 2013). To their beliefs, despite the dominance of anti-social ecological paradigm in western societies, in recent years, some thoughts have emerged that challenge the dominant western social paradigm in relation to Human Exceptionalism (Dunlap & Van Liere, 1978 and Maleki & Karimzadeh, 2011).

The original NEP is defined by Dunlap & Van Liere in 1978 and had twelve statements that performed to demonstrate a single scale in the way in which people replied to them. This scale has been used in many countries over twenty years (Ardahan, 2010). However, it was criticized for several limitations, including a lack of internal reliability among individual responses, poor correlation between the scale and behaviour, and dated language used in the instrument's statements (Thompson & Versus Research Ltd., 2013).

This study focuses on humans, the following passage explains the reason why the New Environmental Paradigm (NEP) scale is selected to investigate household's environmentally-conscious attitude in the present study. The literature showed that, the New Environmental Paradigm (NEP) scale that Dunlap and von Liere developed was based on having the Dominant Social Paradigm at one end and on the other end, emerging environmental awareness (Thompson & Versus Research Ltd., 2013). The Dominant Social Paradigm (DSP) centres on humans seeing themselves as separated from nature more worthy than other organisms (Lundmark, 2007). With this moral predominance, humans are focused on their living conditions rather than anything or anyone else's, so that one of the key elements of the Dominant Social Paradigm is human related (Lundmark, 2007 and Thompson & Versus Research Ltd., 2013).

In addition, the revised NEP developed by Dunlap et al., in 2000 which has fifteen statements explain ecological paradigm. Dunlap et al (2000) mentioned that in the various results, demographic factors also affected NEP scores. Also, Lovelock (2010) showed in his study when analyzing underlying causes for attitudes and behaviours, demographic factors such as gender, age, income, education and employment are regarded as important (Lovelock 2010, Diamantopolous et al., 2003 and Thompson & Versus Research Ltd., 2013).

There are many researches that used NEP as their instrument of choice. Some studies that adopted the NEP scale as their method are selected in order to present the validity of the chosen method for the sake of the present study.

Cordell et al. (2004) analyzed data from the US National Survey on Recreation and the Environment (NSRE). Bjerke et al. (2006) studied NEP in outdoor recreation interests and environmental attitudes, Ardahan (2010) studied NEP in outdoor sports and environmental attitudes with respect to some demographic variables. These studies show that there is a strong relationship and correlation between environmental attitudes and outdoor sports and activities. While the aforementioned studies implemented the NEP scale, they did not focus on the relationship between the environmentally-conscious attitudes and energy consumption of the household. Due to this fact the following studies will be presented as examples where the NEP scale is used while focusing on the topic of this study.

In 2013 , Thompson and his group was commissioned by Waikato Regional Council to survey 600 residents in the Waikato region, to measure current public attitudes towards the environment to gain an understanding of people's underlying beliefs that affect how they make decisions about the environment. This survey was a repeat of previous surveys conducted in 2000 and 2004 asking the same NEP scale as in previous years, along with nine new statements drawn from similar studies in environmental sociology. In the cluster analysis, the study divided the sample into three clusters, Pro-ecological, Mid-ecological and Anti-ecological.

The results indicate that a person who achieves a pro-ecological score on the NEP scale is more likely to support actions that enhance the environment. A person who achieves an anti-ecological score is less likely to support actions that enhance the environment. These results show that while there is some variation in the data, there are some consistent demographic features that appear to influence respondents underlying ecological values.

Dull and Janky (2011) assessed the relationship of environmental attitudes and household energy use. This was due to the fact that the energy prices are not the only motivation for energy conservation. Also, according to their belief, in many cases, savings may be achieved partly by technological investments; however, they can be largely achieved by changing the behavioural patterns of residents.

In order to investigate their aim, they addressed electricity use and utilized multivariate regression technique on a sample of 503 residents of Óbuda (Budapest, Hungary) in February 2011. In order to better understand the structure of electricity use and its relationship with individuals' attitudes, they combined different types of control variables into the model systematically. For their method, a questionnaire addressed the major aspects of household energy use and included some attitude items and questions on the basic household characteristics and the respondent's socio-economic status. While in order to address environmental attitudes, they adopted the New Ecological Paradigm (NEP) scale which has been proven to be a valid measure of environmental concerns. In their study, the results showed relationship between environmental attitudes and household energy consumption in advanced post-industrial societies.

Maleki and Karimzadeh (2011) conducted a study which examined individuals attitudes towards particular issue in relation to environmental, i.e., energy, with the energy consumption behaviour. Their research method was survey and the main tool for collecting data was questionnaire. Research data were collected in summer of 2010 and the main tool for collecting data was questionnaire. Dunlap's NEP scale was used for measuring environmental attitudes of 383 people who were citizens of Urmia (West Azerbaijan, Iran) and were selected using cluster sampling method. The results showed the participants owned positive environmental attitude. Results revealed that there was a statistically significant relationship between the environmental attitude and environmental behaviour (energy consumption) of the participants. However, their findings provided further evidence that suggest in addition to environmental knowledge such as some other factors must be taken into accounting of energy consumption behaviour. In their point of view, if the purpose of a research is to understand the influencing factors on environmental behaviour, other factors besides environmental knowledge must be considered.

2.5 Overview of Weather Normalization Methods

In order to collect enough data, excellent methods should be based on easily obtained information. Given the large amount of data involved, simple tools are chosen for a cost effective assessment process. This study will focus on single measure top-down methods of energy analysis.

The residential energy use is influenced by multiple factors such as building physics, operation, tenants' characteristics, natural conditions and etc. Among these factors, climate has been identified as the main variable for energy use in cold climate region (Fels, 1986; ASHRAE 1985; Huang, 2012).

In winter, when space heating is required, the simplest method to estimate energy consumption and assume the energy required to maintain comfort is a function of a single parameter which is the outdoor dry-bulb temperature (ASHRAE, 1985). The dry-bulb temperature is the temperature of air measured by a thermometer freely exposed to the air but shielded from radiation and moisture (Nall, 2004). Nall asserted that the dry-bulb temperature is the most important climate variables for human comfort and building energy efficiency (Nall, 2004). The energy consumption normalized by weather variable is based on the assumption that when outdoor temperature drops below a certain level, a fixed amount of heating fuel is required for each additional degree of temperature drop (Chung, 2011).

The term Heating Degree Days (HDD) is used as an indicator of building heating needs. Heating and cooling degree-days are calculated as the sum of the difference between daily the reference temperature and outdoor temperature (ASHRAE, 2009). The reference temperature for a building is the temperature at which neither heating nor cooling is required. It is determined by building characteristics, tenants' behaviour and appliances (Rachlin et al., 1986). Although reference temperature differs from building to building, this temperature is commonly accepted as either 50°F or 65°F (10 ˚C or 18.3˚C) (ASHRAE, 2009). Environment Canada (2011) defines HDD as "the annual sum of degrees of the average daily temperature for all days below 18˚C.

Canada as a cold climate country has been divided into four climate zone[2] (A, B, C, and D) based on HDD (Figure 3). The zones are characterized by temperature ranging by; warmest climate (Zone A), mild climate (Zone B), cool climate (Zone C) and the coldest climate (Zone D). In these four climate zones Toronto is located in zone B (NRCan, 2011).

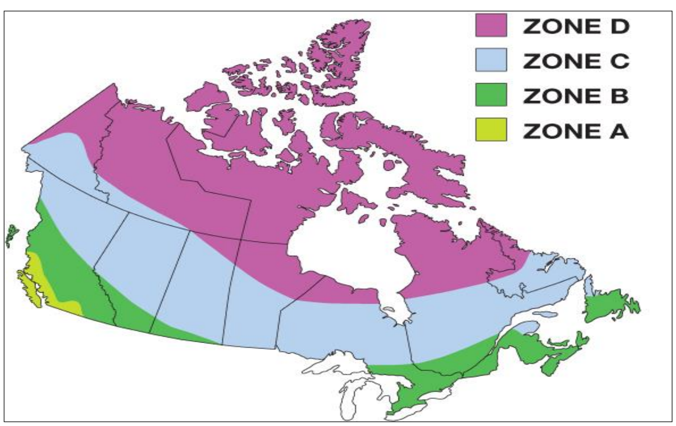

Figure 3: Different climate zones in Canada (NRCan, 2011)

According to NRCan (2012), a large portion of energy is used by space heating in cold climate provinces. Within the residential sector, 63% of the secondary energy is used for

[2] Zone A (mild zone): <= 3500 HDDs, Zone B: > 3500 to <= 5500 HDDs, Zone C:> 5500 <= 8000 HDDs, Zone D (coldest zone): > 8000 HDDs

space heating in Canada (in 2009). Due to this reason, weather normalization has been chosen for the historic energy analysis in this study using the Princeton Scorekeeping Method (PRISM) (Fels, 1986) and the ASHRAE simple ratio weather normalization (SRWN) method (ASHRAE, 1985).

Weather normalization methods are widely used in building energy consumption in cold climates. This method is based on the assumption that energy consumption for space heating follows a linear relation to the difference between the indoor and outdoor temperature, and the other end-use is constant over the year (Fels et al., 1986). Hirst & Goeltz indicated that outdoor temperature has the greatest short-term influence on fluctuations in household energy consumption while factors such as changes in fuel prices, household income, and the number of household members affect energy use only in the longer term (Hirst & Goeltz, 1986).

Some widely used energy normalization methods tools are developed using the weather normalization concept. Following section will review two widely energy normalization methods, Princeton Scorekeeping Method (PRISM) (Fels, 1986) as well as the ASHRAE simple ratio weather normalization (SRWN) method (ASHRAE, 1985).

2.5.1 Princeton Scorekeeping Method (PRISM)

PRISM was developed by the Center for Energy and Environmental Studies of Princeton University, with co-funding from participants in the Advanced PRISM Project (Fels, 1986). The most recent release was in January 1995, the PRISM® (Advanced Version 1.0), which was used in this research (Fels, 1986).

PRISM is a regression-based model (statistical procedure), in which it uses outdoor weather temperature (from the nearest weather station) and monthly energy consumption (from utility bills). These inputs are then used to estimate the normalized annual energy consumption (NAC) as a base load for heat loss and heat gain rate of the researched building. In order to make the best use of available utility data, some improvements were made to the original PRISM over time. Features such as, heating-and-cooling model, robust model, an aggregate version, and an automated data correction/ outlier detection (for reliability enhancement) were added (Fels et. al, 1995). PRISM estimates individual buildings' reference temperature according to optimized linear regression (Fels, 1986).

The researched buildings outlined in the PRISM case studies, were from three different data sets in the New York City that included; 1) 71 multi-family buildings from the Building Energy Use Tracking System (BEUTS), 2) 30 oil heated multi-family buildings from Building Monitoring Data (BMD) project and 3) other listed from Energy Conservation Cases (ECC). The results of this data found that by using the PRISM method energy conservation can be successfully monitored and reliable NAC can be estimated both for oil and gas heated large multi-family buildings (Fels & Reynolds, 1992). In addition, the PRISM method has been used for analyzing energy consumption (gas related) for space and water heating in multifamily buildings (Decicco et al., 1986).

The energy analysis of 16 buildings at Ryerson University (RU) was conducted using the PRISM method. These building represent 86% of RU's total area. The results of the PRISM analysis were then compared to the actual utility bills of the buildings. The comparison shows 2.7% and 6.4% discrepancy for hydro and steam consumption respectively, which makes PRISM results generally stable, and reliable (Fung et al., 2013).

Another study done in New Jersey investigating the effectiveness of the PRISM models for selected dataset of electric-heated houses (with and without electric cooling system) shows that PRISM can provide a reliable NAC index even for buildings using electricity as their heating source. The estimated cooling reference temperature was found to be within the range of 21 to 29 degrees Celsius. The electric cooling demand is more related to occupant's behaviour than to outside temperature. The estimated NAC of the buildings having smaller demand for cooling tends to be more reliable (Stram & Fels, 1986). Since Canada is a cold climate country, which means heating seasons are longer (more energy is required for space heating) than cooling seasons PRISM is found to be suitable for this study.

There are some advantages and disadvantages in using PRISM. The advantage of using PRISM is being able to estimate energy savings after retrofits and describe the energy consumption of the studied building over time. Feeding twelve consecutive monthly data to PRISM will result in the most reliable outcome (NAC) (Rachlin, Fels, & Socolow, 1986). Limitations of using PRISM are not being able to predict the building future energy consumption and detailed breakdown of energy uses. According to Rachlin et al (1986), in order to achieve a reliable estimate for; base load, heating loads, reference temperature, summer data and winter data a full year (12 months) of building information is required to obtain a more accurate evaluation.

2.5.2 Simple Ratio Weather Normalization (SRWN) Method

The SRWN is a simple weather normalization method that has been used by industry for decades (Huang, 2012). Similar to PRISM, the simple ratio weather normalization (SRWN) methods use the traditional degree-day procedure for estimating heating energy requirements. In heating dominated climate, this method is used to estimate the total energy consumption. The demand for cooling is ignored in SRWN.

SRWN simplifies the estimation process by assuming the reference temperature is 18.3˚C. The estimated energy consumption is calculated using Equation 1 (ASHRAE, 1985).

$$E = \frac{E_a}{HDD_a} HDD_L \quad (1)$$

Where:

E: Normalized annual energy consumption

E_a : Actual energy consumption

HDD_a: Actual HDD of the annual historic energy use

HDD_L: Long-term annual HDD

It should be noted that SRWN and PRISM only provide the overall energy consumption results; therefore, the breakdown results on end-use are not available for discussion.

2.6 Literature Gap

There has been a limited amount of research done on occupant's household energy use in Canadian MURBs. A majority of the research on Canadian MURBs focuses on the energy intensity of the entire building quantitatively. As mentioned before, the most comprehensive and cited surveys on household energy use in Canadian high-rise MURBs are SHEU-2007 and NEUD (Finch et al., 2010 & Roque, 2013). However these surveys have discrepancies in their classification of a MURB and lack of other elements that can affect a household's energy use. There is also a lack of information specifically related to high-rise MURBs at an occupant level. These surveys data's are based on general classifications of the residential sector. Factors such as; locations, year of construction, occupancy type, demographics and many more have a great influence on the energy consumption, and cannot be merged into one category.

There is surprisingly lack of information relates high-rise MURBs' occupants' environmentally-conscious attitudes to their actual energy consumption. While literature has shown that there is a strong relation and correlation between environment attitudes and energy consumption of the occupants in residential buildings. It is the intention of this study to fill in this gap. This study would be useful to understand occupant's environmentally-conscious and the impact of social, demographic, and energy behaviour measures in a Canadian high-rise MURB setting. Hence, the current research is testing the environmentally-conscious attitudes relationship concerning energy consumption in the context of a low-income Canadian MURB.

2.7 Research Model & Hypotheses

According to previous studies (Maleki & Karimzadeh, 2011 and Dull & Jacky, 2011) and the presented theoretical perspectives, we can hypothesize:

- It seems that there is a relationship between environmental-conscious attitude and energy consumption behaviour.

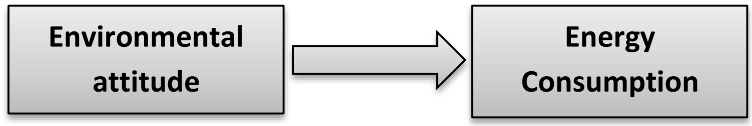

Figure 4: Research model of the current study

As the current research model above shows (Figure 4), in the present study the independent variable consisted of the environmental attitude. While, the dependent variable (continuous variable) is the annual energy consumption of the household. Therefore, a survey and statistical analysis are conducted to achieve an understanding of the households' environmental attitudes which may affect the energy consumption.

As a secondary data analysis, the relationship between the demographic characteristic of the occupants and their energy consumption is investigated.

In 2012, a study was completed which analysed the occupants' energy use in the same MURB building using the method of surveying ("Household Energy Use" survey). To verify if the feedback of previous study had provided an influence on the household's attitude and energy consumption, additional testing is done in a new survey. Additional information regarding the procedure of these tests are evaluated in the Section 5.0.

In the following section a methodology attaining the set of the aforementioned objectives of the present study is presented.

3.0 Methodology

3.1 Overview

As mentioned, this project was part of a larger and ongoing project which attempted to better understand the ways in which tenants engage with the spaces they inhabit and reduce their energy consumption patterns. Thus, in this regard, there are three main aims;

1. To reduce energy consumption by 10% at a MURB in downtown Toronto. This was through the implementation of a Tenant Engagement Program (TEP) that is intended to investigate long-term energy-conscious behaviour change amongst participating tenants.

2. To quantify the effects of combining direct feedback with social-norming data on personal energy reductions.

3. To examine and compare the impacts of environmentally-conscious attitudes on energy consumption which is the focus of this study.

As indicated, the purpose of the present study is to gain an understanding of whether there is relationship between energy-conscious attitudes and energy consumption in a Multi-Unit Residential Building (MURB) in Toronto.

A literature review was performed to establish information on the development of households' environmental attitudes studies in general and households' environmental attitudes towards energy consumption in particular. In order to obtain the set of objectives of the study, the empirical research method approach was applied. The methodology comprises the correlation between environmental attitudes and weather normalized energy consumption of the occupants in a Toronto MURB. The independent variable consists of environmental attitude. The dependent variable is the actual and weather normalized annual energy consumption of the household's occupants which might be regarded as a continuous variable. Therefore, an attitude survey (Subjective Measurement) and statistical analysis were conducted to achieve an understanding of the households' environmental attitudes which may affect on energy consumption.

Moreover, historical data (Objective Measurement) on all 136 individual suites' energy use during the previous years was collected from the property manager and were consequently analysed. It should be noted that historical energy use was from an earlier phase of the project which was monthly energy consumption before and after applying “Household Energy Use” survey in May 2012 by Miles Roque.

Furthermore, a total of 48 out of 136 households completed the survey in previous phase which will be discussed further. The flow chart of the current study is shown in Figure 5.

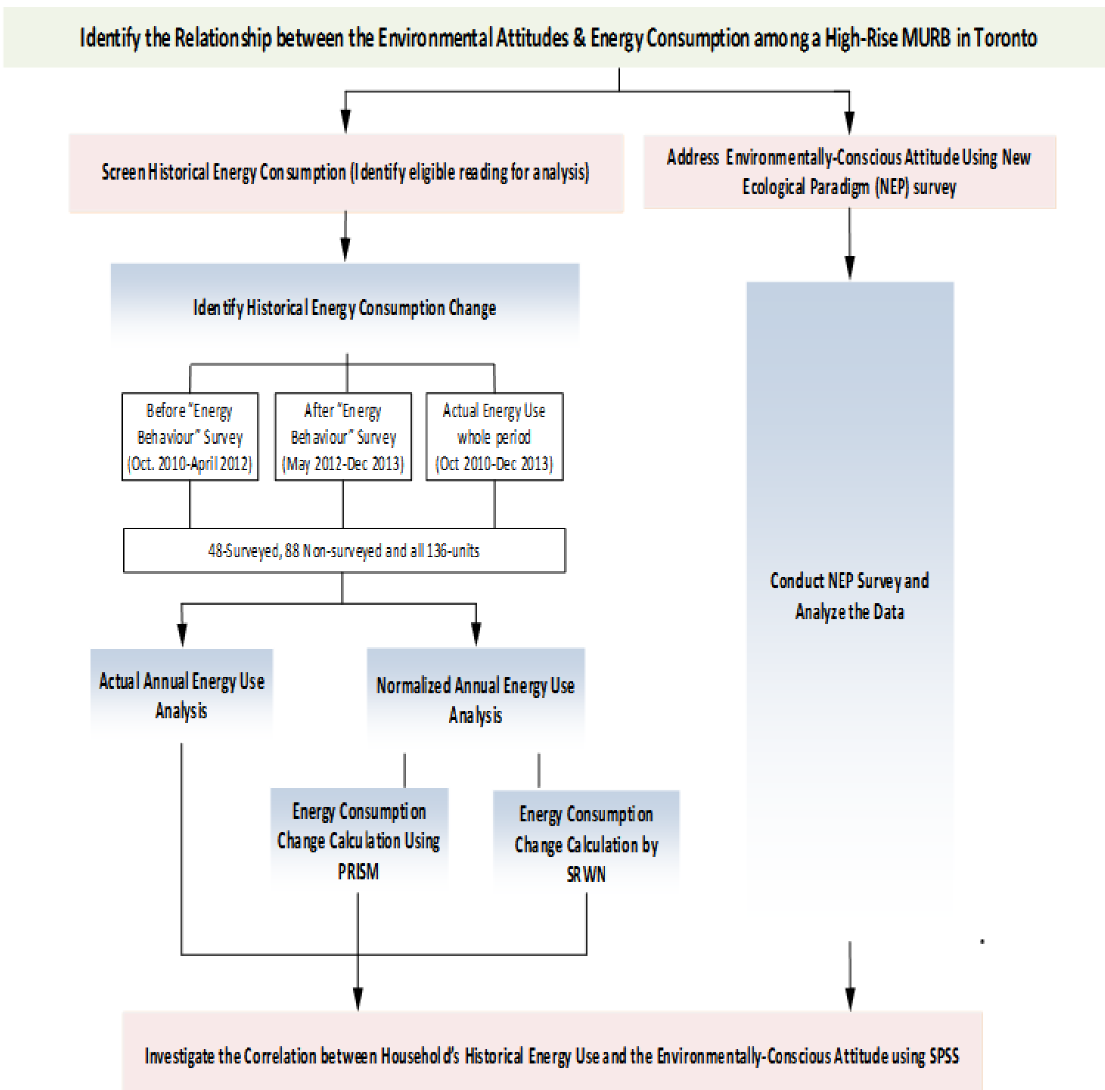

Figure 5: Overview of research methodology

This section explains the methodology implemented for the study. Evaluation of the occupant’s environmental attitude is explained first. Following this, the details of each phase of the selected methodology are elaborated.

3.2 Subjective Measurement Method

The data from this study was obtained by conducting a survey. The purpose of this survey was to examine the households' energy-conscious attitudes in the units. In order to conduct a survey of household environmental attitudes in a Toronto MURB, the following tasks were undertaken:

- Collected information on the study site, Toronto MURB.
- Proposed a survey on household attitude towards energy use.
- Developed a plan regarding survey distribution and collection.
- Ryerson University's Research Ethics Approval.
- Collected survey results and analysis.

In the subsequent sections, the different parts of the subjective measurements will be described in detail.

A. Units of study

A case study was selected, this is a high rise-MURB located in Toronto, Canada which called "Green Phoenix" This building is owned and operated by a not-for-profit organization and it shares similar characteristics to majority of Toronto's MURBs. The building consists of, sub-metered apartment units that track energy consumption data (electrical) per apartment unit from October 1, 2010 until December 31, 2013. The sub-meter takes into account the entire plug loads and fan-coil unit consumption.
It should be mention that fan-coil units within the specified building is for the delivery of heating/cooling throughout different seasons.

The main focus of this case study focuses on the annual energy consumption of the units; it does not include heating and cooling loads from the central heating and cooling plant (Roque, 2013). Table 1 displays information about the study site at a building and apartment unit level.

Table 1: Building and apartment unit characteristics of the study site

Building Characteristics	
Name of Building	Toronto MURB
Date of Construction	1976
Number of Apartment's Units	136
Room Types	2 x one-bedroom units 134 x bachelor units
Number of Storeys	11 storeys
Building Layout	Basement - Program space and mechanical rooms First Floor - Gathering room, main lobby, housing administration and washrooms Second to eleventh floor - Residential apartment units Eleventh floor - Laundry facility
Apartment Unit Characteristics	
Apartment Unit Area	Bachelor units: 21.37 m^2 One-bedroom units: 65.03 m^2
Heating and Cooling Equipment Provided	Electrical fan coil

B. Residents/Participants

The participants of the study ranged from the ages of 18 years old and over. A maximum number of 50 tenants participated in this project. The tenants (participants) are typically low-income households who are not directly responsible for the payments or fees associated with their energy consumption, these fees are included in the tenant's monthly rental fee.

C. Questionnaire

To address environmental attitude, the New Ecological Paradigm (NEP) scale which has been proved to be a valid measure of environmental concerns was adopted in July, 2014. The NEP survey consists of fifteen questionnaires documenting the tenants' opinions and perceptions concerning the energy use and the environment. These questionnaires were designed to be only a few short general questions about themselves. (Table 2 and Appendix A).

Table 2: The New Ecological Paradigm Scale under its revised version (Dunlap et al. 2000)

1. We are approaching the limit of the number of people the earth can support.
2. Humans have the right to modify the natural environment.
3. When humans interfere with nature it often produces disastrous consequences.
4. Human ingenuity will insure that we do NOT make the earth unlivable.
5. Humans are severely abusing the environment.
6. The earth has plenty of natural resources if we just learn how to develop them.
7. Plants and animals have as much right as humans to exist.
8. The balance of nature is strong enough to cope with the impacts of modern industrial nations.
9. Despite our special abilities humans are still subject to the laws of nature.
10. The so-called ’ecological crisis‘facing humankind has been greatly exaggerated.
11. The earth is like a spaceship with very limited room and resources.
12. Humans were meant to rule over the rest of nature.
13. The balance of nature is very delicate and easily upset.
14. Humans will eventually learn enough about how nature works to be able to control it.
15. If things continue on their present course, we will soon experience a major ecological catastrophe.

The NEP scale became one of the most widely used measures of environmental concern in the world and has been used in more than 100 studies around the world (Freudenburg 2008; Hawcroft & Milfont, 2010; Thomson & Versus Research Ltd., 2013). Also, NEP has already been used in some other household oriented studies (e.g. do Valle, Reis, Menezes & Rebelo, 2004; Poortinga, Steg & Vlek, 2004; Maleki & Karimzadeh, 2011; Dull & Janky, 2011).

As a protective measure, a consent form was provided with the survey. This was to ensure approval to acquire the personal information of the participants and the attendees who agree to fill out the survey. They were required to sign the consent form which was attached to the NEP questionnaire. The consent agreement, shown in Appendix B, was attached to the NEP questionnaire distributed to participants and the attendees.

D. Method of Recruitment: Survey Distribution and Collection

The survey that was conducted in the Toronto MURB building, evaluated the tenants that in total were comprised with 136 households (apartment units). Prior to survey distribution, notification flyers were posted in tenants’ mailboxes on July 25th. Surveys were distributed by three methods:

1. Paper-based surveys were distributed on July 29th, 30th and 31st from 5.30pm-8.30pm while the campaigning was held on in the main lobby of the building, by the Ryeson's research team. The attendees could fill the surveys out, either on the spot or they had the opportunity to bring them during the information sessions.
2. Tenants who had not completed NEP questionnaires had the opportunity to complete the survey during the information sessions which was held/organized on August 5th and 6th at 7.00pm.

   Assistance to complete the survey was available by ways of interacting with Ryerson's graduate students. It should be noted, the purpose of this information sessions was to raise the tenants' awareness of environmental issues by promoting energy literacy and conservation. The purpose of this was to provide awareness to the tenants about the project and to build a sense of community spirit amongst in the building.
3. Paper-based surveys were slipped under all 136-units' door on August 8th. A drop box was available in the main lobby and the drop box was removed on August 18th.

E. Compensation and Incentives

The compensation incentive ($20 cash) was offered to increase participation. This helped encourage the motivation of the sample size of those who complete the NEP survey.

3.3 Objective Measurements' Method

To develop a baseline, the historic energy consumption containing complete monthly energy consumption for the 136 units in the Toronto MURB was obtained from October 1, 2010 to December 31, 2013 (38 months). This energy consumption is the amount of electricity used by each apartment unit in a month (kWh/month/unit). Appendix C presents the energy consumption data from October 2010 to December 2013 and analysis of the energy intake.

Listed below are the energy consumption trends during different periods of time:

A) October 1, 2010- April 30, 2012[3]

[3] This set (19 -month period) was from an earlier phase of project which was complete monthly energy consumption before applying Household Energy Use`` survey in May 2012 by Miles Roque.

B) May 1, 2012- December 31, 2013[4]

C) October 1, 2010- December 31, 2013

For the sake of accuracy, the aforementioned historical energy consumption were divided into three periods (Figure 6):

1) April 1st 2011 until March 30th 2012 (12 months before the "Household Energy Use" survey).
2) July 1st 2012 until June 30th 2013 (12 months after the "Household Energy Use" survey).
3) Annual energy consumption for the whole aforementioned periods (April 1st 2011 until June 30th 2013).

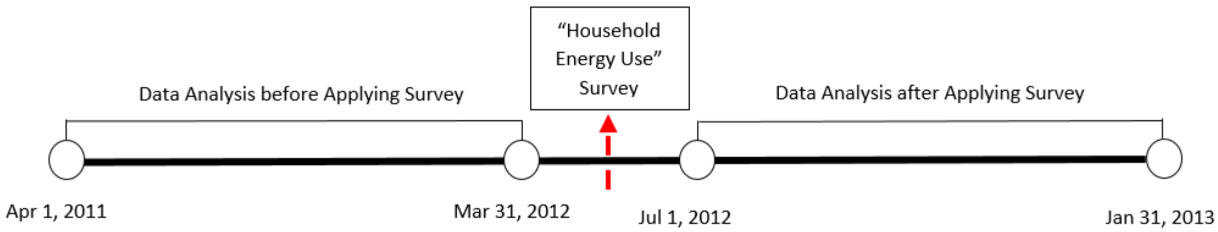

Figure 6: Illustration of the different historical energy consumption periods

Each set of the above mentioned historical energy use is divided into three categories:

A) 48-Surveyed units[5]

B) 88-non-surveyed units

C) All 136-units

In the three different sets of energy consumption trends, the weather normalization evaluated of the annual energy consumption was gathered by using PRISM and the ASHRAE Simple Ratio Weather Normalization (SRWN) method (ASHRAE, 1985) which explained in detail throughout the Section 2.5.

[4] This set (19 -month period) was complete monthly energy consumption after applying ``Household Energy Use`` survey in May 2012 by Miles Roques.

[5] A total of 48 households completed the "Household Energy Use" survey which was implemented in May 2012 by Miles Roque.

3.4 Data Analysis Method

All survey responses were entered into Microsoft Excel's spreadsheets. After that, the analysis was then performed using IBM Statistical Package for Social Science (SPSS) which has many statistical tools and one of its functions includes the analysis of the survey data. Frequency tables were created for all survey results and to assess the relationship between occupant's attitudes and energy consumption.

The NEP scale statements consist of the following scale and scores/values were given on a five-point scale for statistical analysis (Table 3).

Table 3: Five-point scale for statistical analysis

The scale consists of:	Points
Strongly agree	5
Agree	4
Neither agree nor disagree	3
Disagree	2
Strongly disagree	1

This is proposed by the Thomson (2013) research which assessed the overall levels of environmentally positive attitudes of the Waikato region (New Zealand) residents during May 2008.

The allocation of scores into the categories of Pro-Ecological, Mid-Ecological and Anti-ecological is based on a study by the New South Wales Environment Protection Authority (1997) and Thomson & Versus Research Ltd. (2013). The result is compiled as the percentage of respondents in three categories based on the 15-75 scale.

Pro-ecological – (Scores in the range of 59-75) – This is equivalent to a percentage score of 79 to 100 per cent and indicates that on average the respondent would have had to give environmentally positive "Agree" answers at least 13 times plus two "Strongly Agree" response to at least one statement. It would also be possible to give a combination of only two "Neither/Nor" answers and to answer the other four statements as "Strongly Agree".

Mid-ecological – (Scores in the range of 40-58) – This is equivalent to a percentage score of 54 to 78 per cent. At the lower end of this grouping, to be classed as mid ecological a respondent could give 13 “Neither/Nor” answers and two environmentally-positive “Agree” answer. At the upper end of this grouping, a respondent would have to give environmentally positive “Agree” answers to all fifteen statements. There are a range of combinations between these two ends.

Anti-ecological – (Scores in the range of 15-39) – This is equivalent to a percentage score of 50 per cent or less. The most environmentally positive answers someone in this group could give would be fifteen “Neither/Nor” responses.
At the lower end of this grouping someone would have to strongly disagree with all environmentally positive statements.

An important factor of this study is to find the relationship between the attitude of the occupants and the annual consumption, (during the previous years within a Toronto MURB) the correlation testing technique is applied using SPSS which is explained in Section 5.0. The variables used in this study ensured that the descriptive analysis and hypothesis testing technique are due to the categorical variables. This will provide a deeper analysis of the evaluated statics.

4.0 Data Collection and Analysis

4.1 Overview

In order to examine the historical energy consumption of households over the past years within a Toronto MURB, information regarding the energy consumption data (tenants' energy consumption) was obtained. Once this information was reviewed, a method of analysis to aid in the organization of the data was created. The data was assessed and used in two different methods:

i. Occupants' energy consumption were entered into a data pool by using Microsoft Excel and analysed.
ii. Occupants' energy consumption were entered into PRISM software, and they were weather normalized.

The content of this section is described in the information below:

In the first step, in order to have a more accurate estimation of the occupants' energy use, the monthly energy consumption (kWh/month/unit) of the occupants (136 units) over the past years (October 2010 to December 2013) were obtained and analysed.

In the next step, in order to have data sets with more accuracy, the historical energy consumption from October 1st 2010 to December 31st 2013 (38 months) explained in Section 3.3 was studied and were divided into three periods:

4) April 1st 2011 until March 30th 2012
5) July 1st 2012 until June 30th 2013
6) Annual energy consumption for the whole aforementioned periods

Lastly, each set of the above mentioned historical energy use is divided into three categories:

A) 48-Surveyed units[6]

[6] A total of 48 households completed the "Household Energy Use" survey which was implemented in May 2012 by Miles Roque.

B) 88-non-surveyed units

C) All 136-units

As discussed previously, the data from this study was obtained through the New Ecological Paradigm (NEP) scale. This scale has been proved to be a valid measure of environmental concerns, by using the responses to the questionnaires. Following the historical energy consumption analysis, the NEP scale results are presented below.

4.2 Historical Energy Consumption of the "Household Energy Use" Survey

4.2.1 Actual Energy Use Assessment

The energy consumption was the amount of electricity used by each apartment unit in a month (kWh/month/unit) which is presented in detail in Appendix C. According to the analysis results, 19 months before and after[7] applying the specified survey ("Household Energy Use" survey), energy consumption of the 48-surveyed units were 128,035 kWh (125 kWh/m^2), and 114,234 kWh (111 kWh/m^2), respectively. On the other hand, the energy consumption of the 88-non-surveyed occupants was 236,261kWh (126 kWh/m^2) and 118 kWh (118 kWh/m^2) for 19 months before and after the survey respectively. The distribution of the annual energy consumption shows that the energy behaviour had changed during this period (2010-2013) (Roques, 2012). In other words, after the implementation of the "Household Energy Use" survey in May 2012 by Miles Roque, it was concluded that the households' energy consumption had reduced (Figure 7 and 8).

[7] Before applying the "Household Energy Use" survey: October 2010- April 2012
After applying the "Household Energy Use" survey: May 2012-Dec 2013

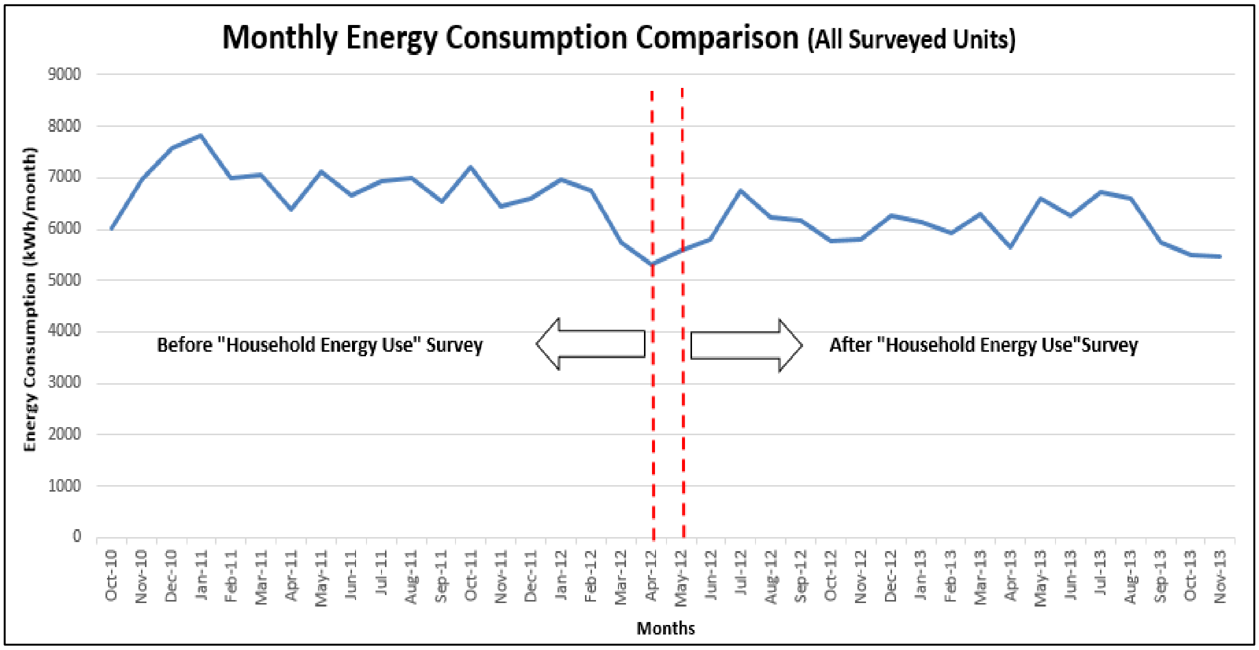

Figure 7: Monthly energy consumption comparison before and after applying survey

Figure 8 shows the total energy consumption breakdown for the last three and half years. As shown below, a majority of the time, the 48-surveyed occupants consumed less energy after applying “Household Energy Use” survey.

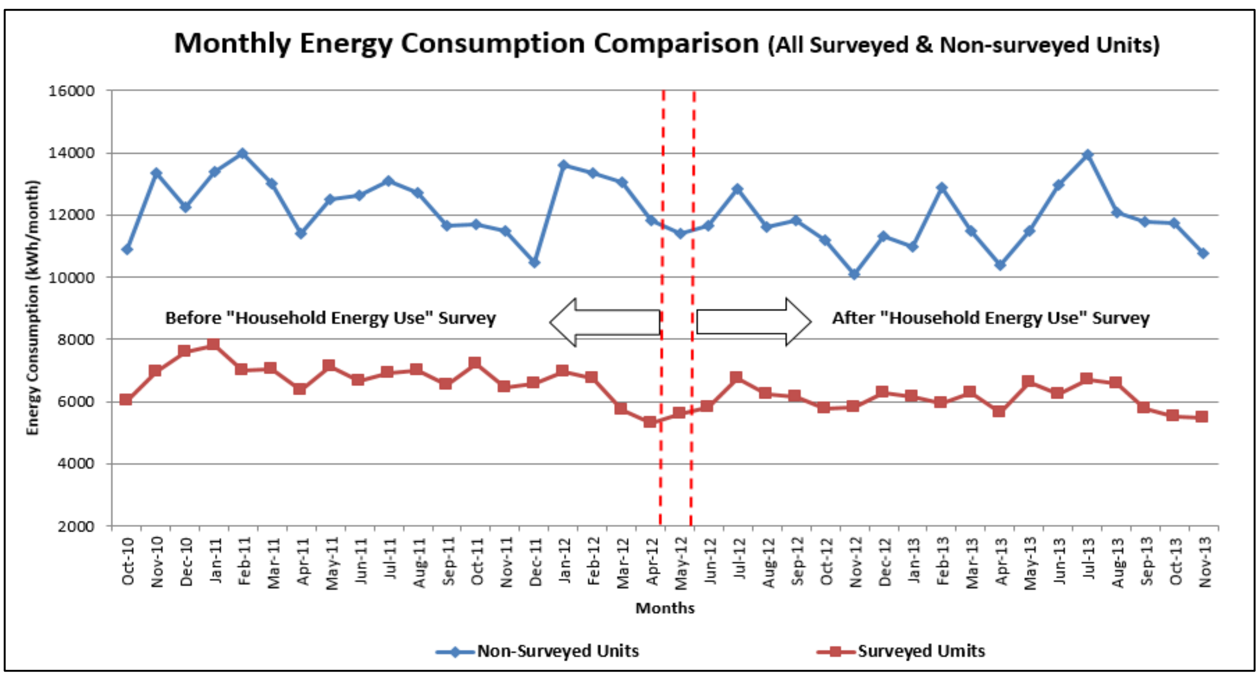

Figure 8: Monthly energy consumption comparison between 48-surveyed and 88-non-surveyed occupants

As expected, the energy consumption turned out to be the highest in the winter and summer months due to heating and cooling requirements. Energy was consumed only in the form of electrical fan-coil units and plug loads (per suite).It should be noticed that the shoulder season are indicated by the months from mid-September to mid-November and from mid-March to mid-May (which has the minimum average monthly energy consumption) (Appendix C).

In addition, as previously explained (Section 4.0), in order to have more accurate annual consumption data, the historical energy use was divided into two different groups that were analyzed consumption based on 12 months (April 1, 2011 until March 31, 2012 and July 1, 2012 until June 30, 2013). These groups contained one heating season and one cooling season (12 months).

After the Actual Energy Use (AEU) analysis, results showed that the 48-surveyed units total annual energy consumption reduced by up to 9% (6,480 kWh/yr) after applying the "Household Energy Use" surveys.

Moreover, Table 4 shows the Actual Energy Use (AEU) (kWh/unit/yr) comparison between three different periods. The total annual energy use (kWh) is divided by the total gross area of the building (2,906 m^2) to obtain the Energy Use Intensity (EUI), while the total gross area of all surveyed units and non-surveyed units was considered as 1,026 m^2 and 1,881 m^2 respectively.

Table 4: Annual Actual Energy Use (AEU) analysis

	AEU 2011-2012	AEU 2012-2013	AEU 2011-2013	Reduction
	kWh/unit/yr	kWh/unit/yr	kWh/unit/yr	%
Surveyed Units (#48)	1,673	1,538	1,605	9
Non-surveyed Units (#88)	1,677	1,580	1,629	6
All units (#136)	1,676	1,565	1,620	7

Data analysis expresses the overall energy consumption of surveyed tenants (48 units) was reduced (9%) from 1,673 kWh/unit/yr (78 kWh/m^2/yr) to 1,538 kWh/unit/yr (72 kWh/m^2/yr) after applying the "Household Energy Use" survey. The analysis of the shown AEU provides the annual Energy Use Intensity (EUI) of the selected Toronto MURB building which is 76 kWh/m^2/yr (1,620 kWh/unit/yr) within the past years (2011-2013).

In addition, the correlations between average energy consumption of the different categories (48-surveyed, 88-non-surveyed units and all 136-units), before and after applying "Household Energy Use" survey, and the outside weather temperature (Heating Degree Days) from the dataset are shown in Figures 9 and 10. The selected heating season months focus on the Heating Degree Days (HDD) above 500 based on the 18 °C balance point which is defined as a higher linear regression (R^2) (Appendix D). As expected, when the HDD values increase, the energy consumption increases as well. Therefore, when the weather tends to demonstrate that the climate becomes colder, the HDD confirms that people will use more energy.

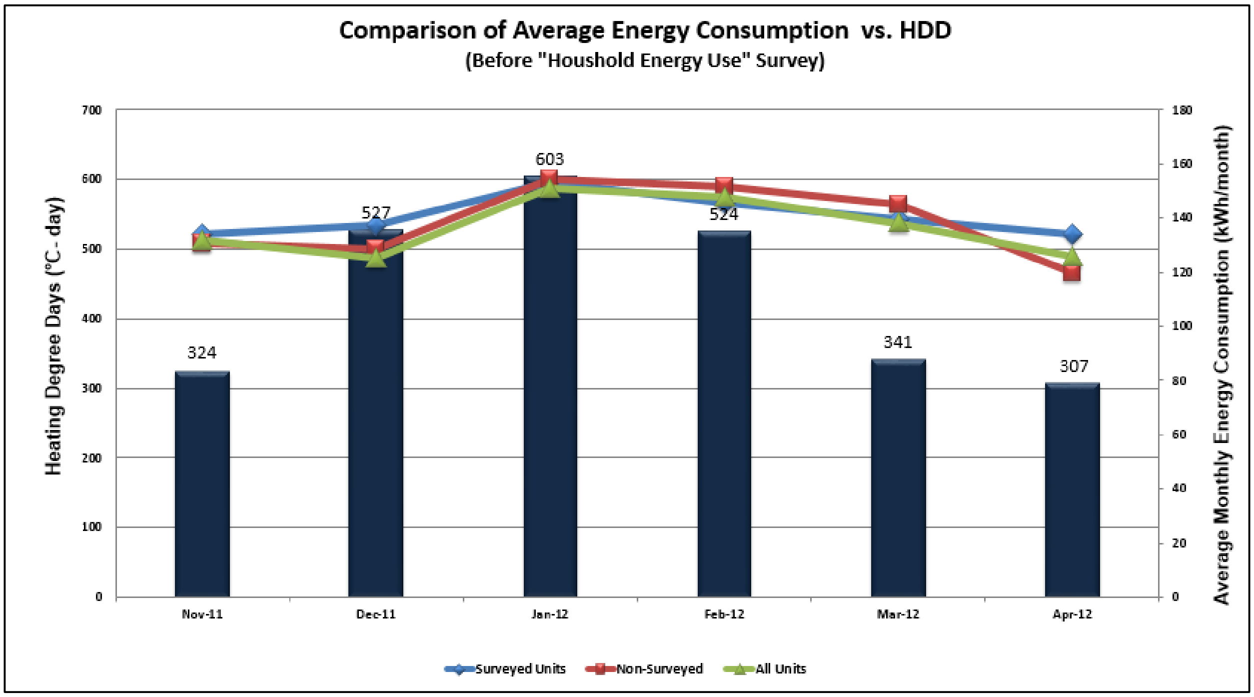

Figure 9: Average energy consumption vs. total HDD within 136 units' dataset (Before "Household Energy Use Survey)

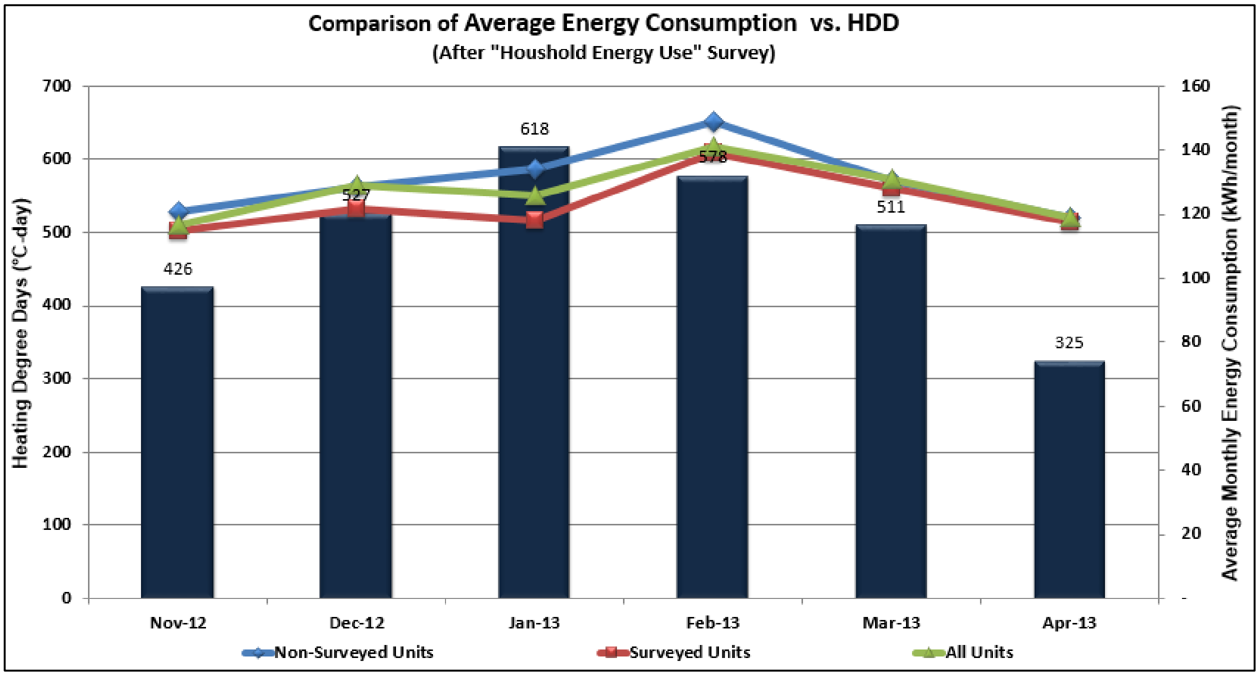

Figure 10: Average energy consumption vs. total HDD within 136 units' dataset (After "Household Energy Use Survey)

As the data analysis shows, the overall average energy consumption of surveyed tenants (48-units) was reduced from 139 kWh/month to 128 kWh/month after the application the "Household Energy Use" survey, while the average energy consumption of the non-surveyed tenants (88 units) was reduced from 140 kWh/month to 132 kWh/month. In other words, as Figure 11 shows, after implementation of the survey ("Household Energy Use" survey), respondent's household energy consumption had reduced more compared to the non-respondent's household.

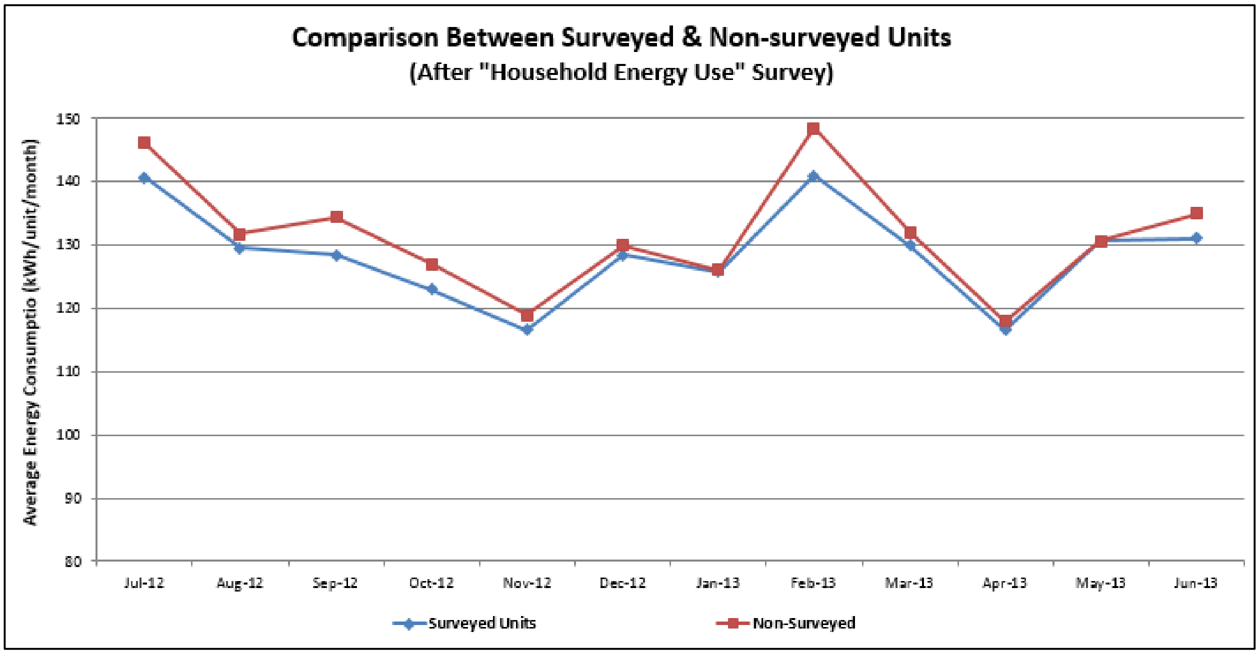

Figure 11: Comparison between 48-surveyed and 88-non-surveyed households' average energy consumption after "Household Energy Use" survey

4.2.2 Normalized Energy Assessment

As mentioned previously, the historic monthly energy consumption for 136 units were inputted into the PRISM software. Three sets of historical energy consumption data (explained in Section 4.0) were normalized with the use of 32-year weather data in Toronto to create an average year simulation.

The next step was to review the energy consumption of the 136 units from October 2010 to December 31, 2013 (38 months) using PRISM. Each set of historical energy data was divided into three categories, A) Surveyed units (48 units), B) Non-surveyed units (88 units) C) All units (136 units).

PRISM uses regression models to provide the weather-adjusted Normalized Annual Consumption (NAC) index along with the best Reference Temperature for the studied building. Daily weather temperature (mean temperature) of Toronto for thirty two years, from January 1, 1981 to December 31, 2013, was retrieved from the Environment Canada website (National Climate Data and Information Archive). The mean annual HDD and CDD based on 18˚C are 3938 and 431, respectively.

The average HDD and CDD of the 32-years, using 18°C as Reference Temperature, was calculated and shown to be as the typical Toronto long-term weather data. All the entered data had to be converted to Fahrenheit for the PRISM analysis. Moreover, and the acceptable range of input temperature is from -50°F (-45.6°C) to 120°F (48.9°C).

The normalized annual energy consumption shows that the energy behaviour had changed during this period (2011-2013). In other words, after the implementation of the "Household Energy Use" survey by Miles Roque in May 2012, households' energy consumption had reduced. Based on PRISM analysis results (Appendix E), the reduction in the respondent's energy consumption was by 7% (from 76,826 kWh/yr to 72,026 kWh/yr). In other words, the difference between surveyed and non-surveyed households in terms of energy consumption was 3%.

Table 5 illustrates the minimum, maximum and average NAC of the three different sets. The average NAC analysis shows that after carrying out the "Household Energy Use" survey, the energy consumption of the surveyed units (48 units) was decreased by 7% (from 1,601 kWh/yr to 1,501 kWh/yr). However, the energy consumption of the non-surveyed units (88 units) was decreased by 4% (from 1,695 kWh/yr to 1,629 kWh/yr). The evaluated reduction between the average consumption of the 48-surveyed and 88-non-surveyed was 3%.

Overall, the PRISM modeling results of the historical energy use showed the average annual energy use for the selected Toronto MURB (all 136 units) was 1,609 kWh/yr within the 2011-2013 period.

Table 5: Minimum, maximum and average of normalized annual energy consumption

	Normalized Annual Consumption (NAC)								
	2011-2012 (kWh/yr)			2012-2013 (kWh/yr)			2011-2013 (kWh/yr)		
	Min.	Max.	Ave.	Min.	Max.	Ave.	Min.	Max.	Ave.
Surveyed Units (#48)	556	6,087	1,601	473	3,729	1,501	823	3,688	1,513
Non-surveyed Units (#88)	554	4,994	1,695	620	4,479	1,629	590	3,615	1,662
All units (#136)	554	6,087	1,662	473	4,479	1,584	590	3,688	1,609

Table 6 lists the average energy consumption per unit (kWh/unit/yr) in the comparison before and after Miles Roque's survey ("Household Energy Use" survey). The total normalized annual energy consumption (kWh) is divided by the total gross area of the building (2,906 m^2). In this respect, same as previous section (Section 4.2.1), the total gross area of all surveyed units and non-surveyed units was considered as 1,026 m^2 and 1,881 m^2 respectively.

Table 6: Normalized annual consumption analysis using PRISM

	NAC 2011-2012	NAC 2012-2013	NAC 2011-2013	Reduction
	kWh/unit/yr	kWh/unit/yr	kWh/unit/yr	%
Surveyed Units (#48)	1,601	1,501	1,513	7
Non-surveyed Units (#88)	1,695	1,629	1,662	4
All units (#136)	1,662	1,584	1,609	5

By using PRISM, the annual EUI for the selected Toronto MURB building (136 units) was established as 78 kWh/m^2 before and 74 kWh/m^2 after applying the survey. Overall, according to the PRISM modeling results of the historical energy use, the EUI for the building (all 136 units) was 1,609 kWh/unit/yr (2011-2013).

Furthermore, as presented in Table 7 (Appendix G), a statistical test (Pearson Correlation Coefficient) was run to verify the accuracy and reliability of the normalized data using PRISM compared to the actual data. Results indicated a strong, positive correlation between NAC and AEU in different periods (before and after "Household Energy Use" survey and the whole period), which was statistically significant ($n = 50$, $p < .05$) proving the reliability of the normalized model method.

Table 7: Correlation between NAC and AEU using Pearson Correlation test in SPSS

	Normalized Annual Consumption (NAC) vs. Actual Energy Use (AEU)		
	2011-2012	2012-2013	2011-2013
Pearson Correlation (*r*)	0.88	0.91	0.95
Sig. (2-tailed) (*p<0.05*)	0.006	0.000	0.000

4.2.2.1 Alternative Normalized Annual Energy Consumption Analysis using PRISM

As an alternative data analysis method, aggregate of all units' energy consumption were weather normalized (Appendix E). The results obtained through PRISM display that the 48-surveyed units' annual energy consumption (NAC) was reduced up to 9% (7,489 kWh/yr) after applying the "Household Energy Use" surveyed. However, the 88-non-surveyed units' annual energy consumption decreased up to 6% (8,111 kWh/yr). As presented in Table 8, similar to the previous types of data analysis (Section 4.2.1. &

4.2.2), the results of the analysis showed that the 48-households' energy consumption decreased after applying the "Household Energy Use" survey in 2012.

Table 8: Normalized annual consumption analysis using PRISM (kWh/unit/yr)

	NAC 2011-2012	NAC 2012-2013	NAC 2011-2013	Reduction
	kWh/unit/yr	kWh/unit/yr	kWh/unit/yr	%
Surveyed Units (#48)	1,666	1,510	1,584	9
Non-surveyed Units (#88)	1,666	1,574	1,590	6
All units (#136)	1,685	1,565	1,577	7

4.2.2.2 Alternative Annual consumption Analysis using Simple Ratio Weather Normalization (SRWN) method

To provide another comparison of the historical energy consumption during different periods, an alternative method was considered to normalize the data. In this regard, The ASHRAE Simple Ratio Weather Normalization (SRWN) method was applied to evaluate the annual energy consumption which presented as followed.

SRWN method requires one-year energy consumption data and corresponding weather information. Since energy consumption and weather data are on an aggregated level, the readings in the year can be either monthly or multi-monthly. The flexibility of data input is an advantage of SRWN. For some buildings, there is only one reading for the full summer season. Using the total readings does not affect the calculation of NAC. The SRWN method cannot detect the outlier in the data; the data screening process is essential. The actual annual HDD, is the sum of daily HDD from the starting date to the ending date of the annual historic energy consumption. In the present study, the historic energy consumption, discussed in Section 3.3, was comprised of complete monthly energy consumption from October 1, 2010 to December 31, 2013 (38 months). However, in order to have more accurate data set which includes one heating and one cooling season (whole year), the actual HDD of the annual historical energy use which is used for the data analysis is demonstrated as follows (Table 9 and Appendix D).

Table 9: Heating Degree Days (HDD) of April 2011-March 2012 and July 2012-June 2013

	Before Survey (2011-2012)	After Survey (2012-2013)
Heating Degree Days (°C-day)	3131	3499

The annual energy consumption normalized using the SRWN method were within the range of 1,995 kWh/unit/yr and 1,641 kWh/unit/yr for 48-surveyed households before and after applying the “Household Energy Use” survey, respectively (Table 10).

Table 10: Normalized annual consumption analysis using SRWN

	NAC 2011-2012	NAC 2012-2013	NAC 2011-2013	Reduction
	kWh/unit/yr	kWh/unit/yr	kWh/unit/yr	%
Surveyed Units (#48)	1,995	1,641	1,818	22
Non-surveyed Units (#88)	2,001	1,686	1,843	19
All units (#136)	1,991	1,670	1,843	20

The EUI for the selected Toronto MURB building during 2011-2013 was obtained as 86 kWh/m^2 (1,843 kWh/unit) using the SRWN method. Since, the EUI for the building (all 136 units) was 75 kWh/m^2 (1,609 kWh/unit) calculated by PRISM for the whole period (2011-2013), the SRWN model tends to overestimate the results, as compared with PRISM. This is because by using the SRWN method only HDD is considered for the purpose of calculating the energy consumption. However, the PRISM method considers both HDD and CDD.

SRWN is a simpler method compared to PRISM in terms of weather normalization technique. SRWN is ideal for users who have limited expertise and/or time to obtain relatively accurate energy benchmarking. However, the error of the results may increase when raw data contains inappropriate estimated readings.

To examine the nature of the historical household’s energy consumption’ trend over the past years within a Toronto MURB, different methods was performed. In the three different sets of energy consumption trends, the annual energy consumption was elaborated and analysed by using PRISM and the ASHRAE Simple Ratio Weather Normalization (SRWN) method.

In accordance with all the specified data analysis, it can be concluded that the difference between surveyed and non-surveyed households was 3%. This finding was compatible with the results obtained by Roque (2012) in the earlier phase where the “Household Energy Use” survey was applied. Using Artificial Neural Network (ANN) approach, he concluded that his survey may have influenced the reduction in the respondent’s energy consumption. In the current phase of research, the historical data is tested, before and after applying the "Household Energy Use" survey, using statistical method (SPSS approach). This method will help to gain a more valid and detailed approach. The results obtained through the statistical analysis are elaborated in Section 5.

4.3 Historical Energy Consumption of the "NEP" Survey

Since the focus of this study is on the results from the NEP survey respondents, with the approval from Research Ethics and the Toronto MURB occupants, NEP survey was conducted for the duration of 20 days (July 29th to August 18th, 2014). A total of 50 households responded to the questionnaires (NEP Survey), at the current phase of research. The survey results (data) are presented in Section 4.4.

To achieve the main objectives of this study, the historical energy use of the 50-households who completed the NEP Survey is divided into three different time periods (identical to the previous section) and used in the data analysis which is presented in Table 11 and Appendix F.

Table 11: Analysis of the 50-households energy consumption during different periods

	50-housholds Annual Energy Consumption (kWh/unit)		
	2011-2012	2012-2013	2011-2013
Normalized Annual Consumption (NAC)	1,705	1,562	1,572
Actual Energy Use (AEU)	1,748	1,619	1,683

In addition to the abovementioned data analysis, with the purpose of having more accurate and deeper data analysis, energy consumption of one year prior to the NEP survey implementation (July 1st, 2013 to July 31st, 2014) was examined (Appendix F). According to the analysis results, total energy consumption of the 50-surveyed units were 94,310 kWh/yr (1,886 kWh/unit/yr) during 12 months before applying the NEP survey (July 2013-July 2014).

Furthermore, the correlations between average energy consumption of the 50 households who completed the survey before applying "NEP" survey (July 2013 to July 2014), and the outside weather temperature (Heating Degree Days) from the dataset are shown in

Figures 12. The selected heating season months focus on the Heating Degree Days (HDD) were based on the 18 °C balance point. As expected, when the HDD values increase, the energy consumption increases as well. Therefore, when the weather tends to demonstrate that the climate becomes colder, the HDD confirms that people will use more energy.

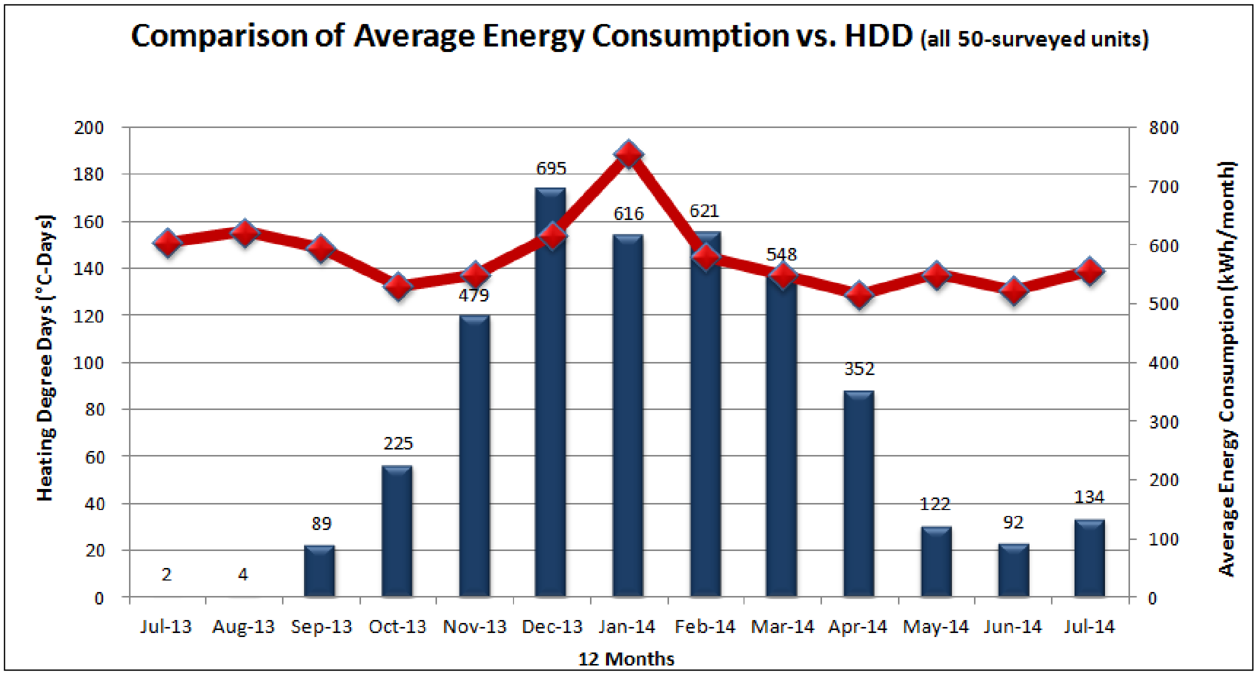

Figure 12: Average energy consumption comparison vs. HDD (50-surveyed units)

In order to gain further insight, with respect to the outdoor temperature, energy consumption of the 50 units from July 2013 to July 31, 2014 (12 months) was reviewed and normalized using PRISM. According to the Environment Canada website (National Climate Data and Information Archive), the mean annual HDD and CDD based on 18˚C are 3979 and 402, respectively.

Overall, the PRISM modeling results of the historical energy use showed the average annual energy use (Normalized Annual Consumption-NAC) for the selected Toronto MURB (all 50 units) was 100,708 kWh/yr (2,014 kWh/unit/yr) within the 2013-2014 periods.

4.4 NEP Survey Results

As presented previously, this project was part of a larger and ongoing project which attempted to better understand the ways in which tenants engaged with the spaces they inhabit and reduce their energy consumption patterns within.

There were two surveys that were performed, the earlier phase was achieved in 2012 to evaluate the energy behaviour of the occupants (using “Household Energy Use Survey) in the MURB. The current phase applied in 2014, was to determine the environmentally-conscious attitude of the occupants towards energy consumption (using the NEP Survey). Some of the participants who completed the NEP survey were the same as those who participated in the previous survey. Figure 13 illustrates the quantity of the households who responded to the previous and present survey.

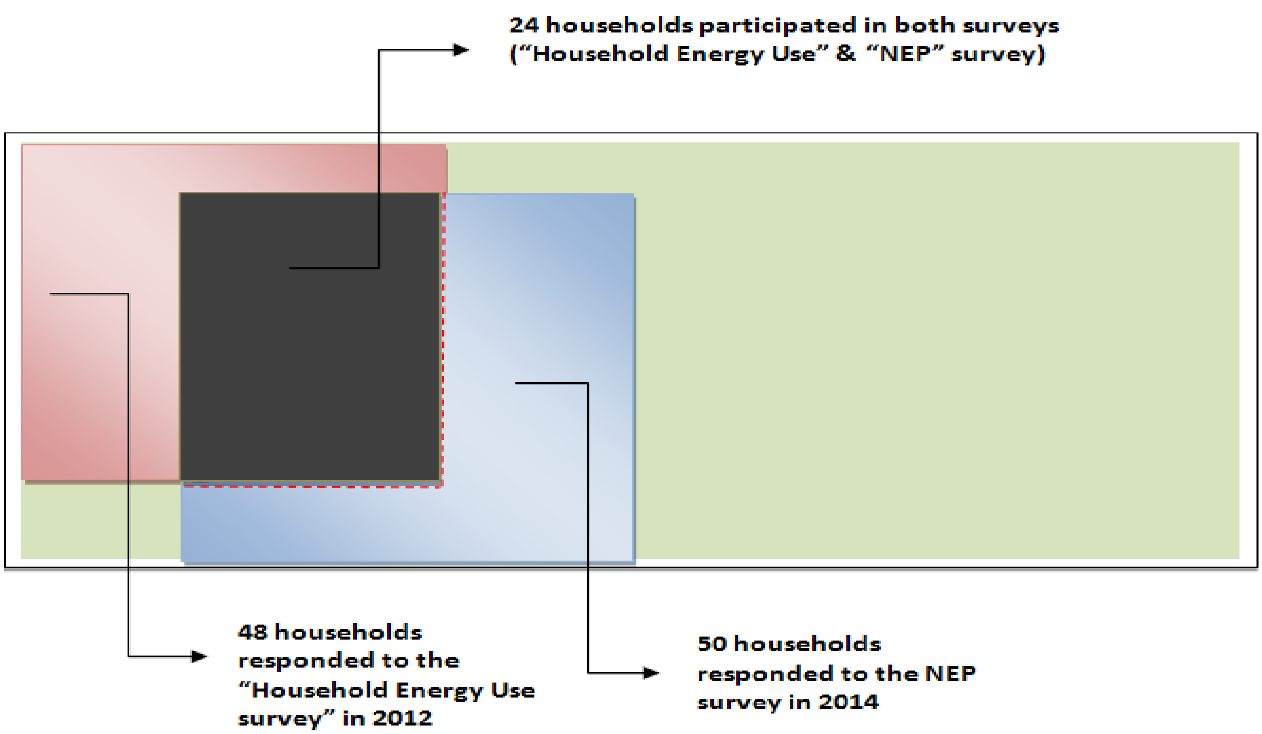

Figure 13: Selected Toronto MURB households' status

As shown in figure 13, a total of 50 households completed the NEP survey in the current phase of research (2014). Among all of the respondents, 24-housholds completed both surveys (“Household Energy Use” and NEP Survey) which were implemented in 2012 and 2014. In other words, 26-households (52%) solely participated in the current phase of research and completed the NEP survey.

After gathering the survey data, the information was then categorised into various demographics. The demographics were categorized into various groups such as gender, age, nationality and general information (Appendix A). The following demographical and general information distribution was obtained from the 50 survey responses (Table 12).

Table 12: Distribution of the NEP survey results' variables

	Variables	Frequency	Percent
1	**Male**	**36**	**72**
	Female	14	28
2	18-30 years old	6	12
	31-45 years old	9	18
	46-60 years old	**22**	**44**
	Over 60 years old	13	26
3	Canada	13	26
	Europe	2	4
	South/Central America or Caribbean	6	12
	East Asia	1	2
	West Asia	1	2
	Africa (e.g. Ethiopia)	**26**	**52**
	Other	1	2
4	0-1 Year	3	6
	2-4 Years	9	18
	5-7 Years	7	14
	More than 7 Years	**31**	**62**
5	**1 person**	**41**	**82**
	2 Persons	9	18
6	Participated	24	48
	Not-participated	**26**	**52**

*1) Gender 2) Age, 3) Nationality, 4) No. years he/she is living in the selected Toronto MURB , 5) No. of people live in his/her household 6) Household who participated in "Household Energy Use" survey in Miles' study

- Gender: majority of the participant in this survey consisted of male gender (72%).
- Age: A majority of respondents (44%) were between the ages of 46-60 years.
- Ethnic origin: 52% of the respondents grew up in Africa.
- Years of residency: 62% of the respondents resided in the selected Toronto MURB for more than 7 years.

- Number of people living in the unit: 82% of the respondents were in single occupant households.

5.0 Data Analysis and Discussion Using SPSS

5.1 Overview

The main purpose of the present study is to gain an understanding of whether there is a relationship between energy-conscious attitudes and energy consumption in the Multi-Unit Residential Building (MURB) in Toronto.

To explore the relationship between environmental attitudes and energy consumption, a series of statistical tests was carried out.

The independent variable consists of environmental attitude. The dependent variable is the actual and weather normalized annual energy consumption of the household using PRISM which is as a continuous variable. Therefore, an attitude survey (Subjective Measurement) and statistical analysis were conducted to achieve an understanding of the households' environmental attitudes which may affect energy consumption. It is crucial to note that the results of this section were discovered using SPSS version 22. It is important to emphasize that the SPSS model represents the 50 respondents living in the Toronto MURB.

In order to attain the set of objectives of the study, following hypotheses and descriptive statistics are considered:

5.2 Historical Energy Consumption Analysis

As discussed previously, to determine whether there is a significant difference between households' average energy consumption before and after applying "Household Energy Use" survey in 2012, a statistical method was applied.

So according to the previous study (Roque, 2012) and the presented data analysis (Section 4.0), we can hypothesize the following:

1) It seems there is a significant difference between the average energy consumption of the 48-surveyed households and the 88-non-surveyed households.
2) It seems there is a significant difference between households' average energy consumption before and after applying "Household Energy Use" survey in 2012 (previous phase of the research).

To test the aforementioned hypotheses, ***"Independent-samples t-test"*** was conducted.

A t-test helps in comparing two groups and determining whether they have different average values and whether a difference between two groups' averages is unlikely to have occurred because of random chance in sample selection. A difference is more likely to be meaningful and "real" if,

i. The difference between the averages (Mean Difference-M) is large,
ii. The sample size is large, and
iii. Responses are consistently close to the average values and not widely spread out (the Standard Deviation-SD is low).

In the present study, to achieve the objectives, wherever the t-test was applied the Sig. value from the Levene's Test for equality of variances and normality was checked (Appendix G). It is a test that determines if the two conditions have about the same or different amounts of variability between scores. As a result of this study, the results of the Levine's test satisfied the assumption for normality and equality of the variance. Also, some descriptive statistics about each condition of different sets was found.

- ***Testing Hypothesis # 1***

Comparison between average energy consumption of the 48-surveyed households and the 88-non-surveyed households:

Data analysis in Section 4.0 showed that 48 tenants who completed the “Household Energy Use” survey in 2012 consumed less energy than those who did not complete the specified survey. In other words, there is a difference between the energy consumption of the 48-surveyed and the 88-non-surveyed households. That difference is up to 3%.

The aim of this test is to find out whether tenants who completed the “Household Energy Use” survey in 2012 consumed less energy than those who did not complete the specified survey. As a result, the energy consumption (Normalized Annual Consumption-NAC, Actual Energy Use-AEU) of the 48-surveyed households was compared with 88-non-surveyed households during different periods (before and after the survey and throughout the whole period) in order to find the difference statistically.

Results of each of the performed t-test, as well as the means and standard deviations for each of the groups, are shown in Table 13 (Appendix G). The t-test results show that there is no significant difference in the scores of the two groups (48 surveyed participants and 88 non-surveyed participants) for each of the time periods, based on the significance value (*p*) which was greater than 0.05.

Table 13: Average energy consumption comparison between 48-surveyed and 88-non-surveyed households

		Comparison Between Average Consumption (kWh) **48-surveyed vs. 88-non-surveyed Units**	
		Actual Energy Use (AEU)	
A	**2011-2012**	M=1673, SD=857	$t(134)=-.032$, $p=.974$(2-tailed)
	2011-2012	M=1678, SD=846	$t(134)=-.032$, $p=.974$(2-tailed)
B	**2012-2013**	M=1538, SD=705	$t(134)=-.355$, $p=.724$(2-tailed)
	2012-2013	M=1580, SD=642	$t(134)=-.355$, $p=.724$(2-tailed)
		Normalized Annual Consumption (NAC)	
A	**2011-2012**	M=1601, SD=930	$t(134)=-.344$, $p=.731$(2-tailed)
	2011-2012	M=1695, SD=780	$t(134)=-.344$, $p=.731$(2-tailed)
B	**2012-2013**	M=1501, SD=727	$t(134)=-.836$, $p=.405$(2-tailed)
	2012-2013	M=1629, SD=919	$t(134)=-.836$, $p=.405$(2-tailed)

A) 48-Surveyed units vs. 88-non-surveyed-units before applying “Household Energy Use” survey (2011-2012)

B) 48-Surveyed units vs. 88-non-surveyed-units after applying “Household Energy Use” survey (2012-2013)

The average energy consumption difference of the 48-surveyed, 88-non-surveyed and all 136-housholds in different periods is shown in the Table 18. Since the results shown in Table 14, demonstrated that the mean difference does not vary significantly, comparing two different groups, shown in Table 14 (Appendix G), average energy consumption difference of those groups were 7% (94 kWh/yr (6%) mean difference 2011-2012, 128 kWh/yr (8%) mean difference 2012-2013) and 3% (5 kWh/yr (1%) mean difference 2011-2012, 42 kWh/yr (3%) mean difference 2012-2013) within the normalized and actual energy consumption, respectively. This can be due to the lack of enough sample size through the previous phase of research (N= 48-surveyed with 88-non-surveyed occupants).

Table 14: Average energy consumption comparison (48-surveyed vs. 88-non-surveyed units)

	Comparison Between Average Consumption (kWh) 48-surveyed vs. 88-Non-Surveyed Units					
	Normalized Annual Consumption (NAC)			**Actual Energy Use (AEU)**		
	2011-2012	**2012-2013**	**2011-2013**	**2011-2012**	**2012-2013**	**2011-2013**
Mean- kWh (48-Surveyed)	1,601	1,501	1,513	1,673	1,538	1,605
Mean-kWh (88-Non-surveyed)	1,695	1,629	1,662	1,678	1,580	1,629
Mean Difference	94	128	149	5	42	23
Mean-kWh (136-units)	1,662	1,584	1,609	1,676	1,565	1,620

Data analysis showed that the households' energy consumption decreased after applying "Household Energy Use" survey (Section 4.0). The next section will address whether a difference between average energy consumption of 48-surveyed before and after applying "Household Energy Use" survey is statistically significant.

- ***Testing Hypothesis # 2***

Comparison between average energy consumption of the households before and after applying "Household Energy Use" survey in 2012:

Data analysis in Section 4.0 showed that the energy consumption (energy behaviour) of the tenants of the selected Toronto MURB was changed during this period (2011-2013). In other words, after the implementation of the "Household Energy Use" survey in May 2012 by Miles Roque, households' energy consumption had reduced (up to 9% through the 48-surveyed households' actual annual consumption and 7% within the normalized annual consumption).

To test the current hypothesis (hypothesis # 2), the difference in households' energy consumption (48-surveyed and 88-non-surveyed) before and after applying "Household Energy Use" survey was compared/analysed statistically.

Results of each t-test performed, as well as the means and standard deviations for each of the groups, are shown in Table 15 (Appendix G). The t-tests results indicate that there is no significant difference between the two conditions (before and after applying the "Household Energy Use" survey), based on the significance value (*p*) which was greater than 0.05.

Table 15: Average energy consumption difference comparison before and after applying ": Household Energy Use" Survey

		Comparison Between Average Consumption (kWh) Before vs. After "Household Energy Use" Survey	
		Actual Energy Use (AEU)	
A	**2011-2012**	M=1673, SD=857	*t*(94)=.843, *p*=.401 (2-tailed)
	2012-2013	M=1538, SD=705	
B	**2011-2012**	M=1678, SD=846	*t*(174)=.862, *p*=.390(2-tailed)
	2012-2013	M=1580, SD=642	
C	**2011-2012**	M=16756, SD=847	t(270)=1.2, *p*=.230(2-tailed)
	2012-2013	M=1565, SD=663	
		Normalized Annual Consumption (NAC)	
A	**2011-2012**	M=1601, SD=930	*t*(94)=.587, *p*=.559(2-tailed)
	2012-2013	M=1501, SD=727	
B	**2011-2012**	M=1695, SD=780	*t*(174)=.311, *p*=. 756(2-tailed)
	2012-2013	M=1629, SD=919	
C	**2011-2012**	M=1662, SD= 531	*t*(270)=.520, *p*=.603(2-tailed)
	2012-2013	M=1584, SD=855	

A) 48-Surveyed units before vs. after applying "Household Energy Use" survey
B) 88-non-surveyed-units before vs. after applying "Household Energy Use" survey
C) All 136-units before vs. after applying "Household Energy Use" survey

However, as discussed in Section 4.0, a difference could be found between the two conditions' means. Descriptive statistics shown in Table 16 (Appendix G) presented that the mean energy consumption of the 48-surveyed units, 88-non-surveyed units and all 136-units decreased after implementation of the "Household Energy Use" survey. Again, in agreement with the results of the previous test, this difference is non-significant and is likely due to the sample size (N= 48-surveyed and 88-non-surveyed households).

Table 16: Average energy consumption comparison (before vs. after applying "Household Energy Use" Survey)

	Comparison Between Average Consumption (kWh) Before vs. After "Household Energy Use" survey					
	Normalized Annual Consumption (NAC)			Actual Energy Use (AEU)		
	2011-2012	2012-2013	2011-2013	2011-2012	2012-2013	2011-2013
Mean- kWh (48-Surveyed)	1,601	1,501	1,513	1,673	1,538	1,605
Mean-kWh (88-Non-surveyed)	1,695	1,629	1,528	1,678	1,580	1,629
Mean-kWh (136-units)	1,662	1,583	1,523	1,676	1,565	1,620

To sum up, the results from those two above-mentioned tests implies that, unlike the research hypotheses a significant difference between the average energy consumption of the different groups (48-surveyed and the 88-non-surveyed households) before and after applying "Household Energy Use" survey in the previous phase of study (2012) have not been seen in this study. Thus, this research hypotheses are not confirmed.

5.3 NEP Survey Findings

As mentioned earlier, with respect to the main objective, the present study aimed to test the following hypothesis (main hypothesis).

> "There is a relationship between environmentally-conscious attitudes of the 50 households who completed the NEP survey, and their energy consumption for each of the periods (before, after and throughout the whole period)."

At this stage, the relationship between the environmentally-conscious attitudes of 50-housholds who completed the NEP survey and their energy consumption for each of the three periods (before, after applying "Household Energy Use" survey and throughout whole period-2011-2013) were statistically examined. In order to test the relationship between the 15-item NEP scale scores and energy consumption (normalized and actual energy consumption) of 50-housholds for different periods, ***"Pearson Correlation test"*** was conducted.

In statistics, Pearson's correlation coefficient (r) is a measure of the linear correlation between two variables In other words; it is a measure of the strength of the association between two variables. The value of *r* is always between +1 and –1. If Pearson's r value is near 1, it means there is a strong relationship between variables. If Pearson's r value is near to 0, it means there is a weak relationship between the two variables. Different correlation coefficient value between variables are defined as follows (Taylor & Rdcs, 1990).

a) Pearson correlation coefficient (r) < 0.3: low or weak correlation
b) 0.3 ≥ Pearson correlation coefficient (r) ≤ 0.6: moderate correlation
c) Pearson correlation coefficient (r) > 0.6: strong or high correlation

- ***Testing hypothesis***

Correlation between environmentally-conscious attitudes of the households and their energy consumption:

The test results showed the correlation coefficient (r) between these two variables is significant at p<0.05. As shown in Table 17, there is a moderate negative correlation between the NEP survey scores and historical energy consumption of the 50 households who responded to the NEP Survey in 2014. As this is a negative correlation, this indicates that as occupants' attitude scores increase, their energy consumption decreases for each of the three periods. This means that as the people attitudes get more positive towards environment, their responsible energy consumption behaviour also increases. This result was confirmed using both the NAC and AEU as energy consumption variables.

Table 17: Correlation between occupants' annual energy consumption and their attitudes

	Annual Consumption (kWh) vs. Environmentally-conscious Attitude					
	Normalized Annual Consumption (NAC)			Actual Energy Use (AEU)		
	Before survey (2011-2012)	After survey (2012-2013)	whole period (2011-2013)	Before survey (2011-2012)	After survey (2012-2013)	whole period (2011-2013)
Pearson Correlation(*r*)	-0.256	-0.36*	-0.33*	-0.34*	-0.26	-0.32*
Sig. (2-tailed) (*p*)	0.073	0.011*	0.019*	0.015*	0.064	0.025*

*Correlation is significant at 0.05 level (2-tailed)

Of the results shown in Table 17 (Appendix G), it is evident that the correlation between normalized energy consumption (NAC 2012-2013) and household's attitude, after applying "Household Energy Use" survey, had the higher correlation (moderate negative correlation at r= -.358, p=0.011) compared with the actual energy consumption in different periods. This can be likely due to the fact that normalized energy consumption (NAC) is a more reliable measure of energy consumption. It should be noted that weather normalization methods is based on the assumption that energy consumption for space heating follows a linear relation to the difference of the indoor and outdoor temperature, namely HDD and the other end-use is constant over the year (Fels, 1986).

In the next phase of statistical tests, another test (Pearson Correlation test) was run to check the relationship between the reductions in annual consumption between the 2011-2012 and 2012-2013 time periods and the 50-households' environmentally-conscious attitudes who completed the NEP Survey.

Results of the test indicated that there is a correlation between occupants' environmentally-conscious attitudes and the difference in their energy consumption before and after applying the "Household Energy Use" survey, when the NAC was used as the energy consumption variable (r = 0.297; p = 0.036) (Table 18 and Appendix G). As such, it is shown that when the score of environmentally-conscious attitude of households goes up, their energy consumption difference increases (their score of their energy consumption decreases).

Table 18: Correlation between the households' energy consumption and 15-item NEP scale results

	NEP Survey Results vs. Occupants' Energy Consumption Difference (kWh)	
	Normalized Annual Consumption (NAC)	**Actual Energy Use (AEU)**
Sig.(2-Tailed)	0.036*	0.318
Pearson Correlation (r)	0.297	0.144
Number of Cases (N)	50	50

** Correlation is significant at the .05 level (2-tailed).*

However, no significant correlations could be found between occupants' attitudes and energy consumption when AEU was used as the energy consumption variable. This can be likely due to the fact that normalized energy consumption (NAC) is a more reliable measure of energy consumption because it is normalized based on the long-term annual HDD as explained previously. In present study, it could be asserted that there is a negative correlation between household's environmentally-conscious attitude level and energy consumption. So, in this regard, it can be concluded that as a result of the correlation test, our hypothesis is correct. This means that having high environmentally-conscious attitudes towards the energy consumption have positive effects on occupants' energy consumption level.

This finding is compatible to the results obtained by Maleki and Karimzade (2011) and thus in order to explain the relationship between attitude and behaviour, and their work could be of great help in this work. They conducted a study to find a possible correlation between energy consumption and environmental attitudes among the 383 citizens of Urmie, West Azarbaijan (cold climate). In their results, the correlation coefficient (R) between these two variables was 0.177 which is significant at P= 0.001. Their findings were also well-matched to the results obtained by Dunlap et al (1978), Salehi (2010).

5.3.1 Descriptive Statistics of 15-item NEP scale

- ***Descriptive Statistics # 1***

Household's 15-item NEP scale level:

The results for the 15-item NEP scale discussed previously (Section 3-4), were compiled as the percentage of respondents in three categories based on the 15-75 scale which are as followed.

1) Pro-ecological – Scores in the range of 59-75 (79%-100%)
2) Mid-ecological – Scores in the range of 40-58 (54%-78%)
3) Anti-ecological – Scores in the range of 15-39 (50% or less)

The scores are categorised into Pro-ecological, Mid-ecological and Anti-ecological categories which is based on a study by Social Scientist Community, Economy And Enlivenment Programme Resource Information Group (2013). Caronbach's alpha (α) has been used to assess the reliability and consistency of the statements that form the scale. A Cronbach's (alpha) is a coefficient of internal consistency. It is commonly used as an estimate of the reliability of a psychometric test for a sample of examinees. A Cronbanch's α of 0.7 is regarded as the lowest score for a scale to be considered reliable. The 15-item NEP scale was tested for reliability using Cronbach's α, and with all 15 of the statements that form the scale, Cronbache's α was 0.669 (Thomson, 2013).

In this part, the level of the 50-occupants' environmentally-conscious attitudes towards energy consumption were determined, by applying "Frequency test" using the SPSS software (Figure 14 Appendix G).

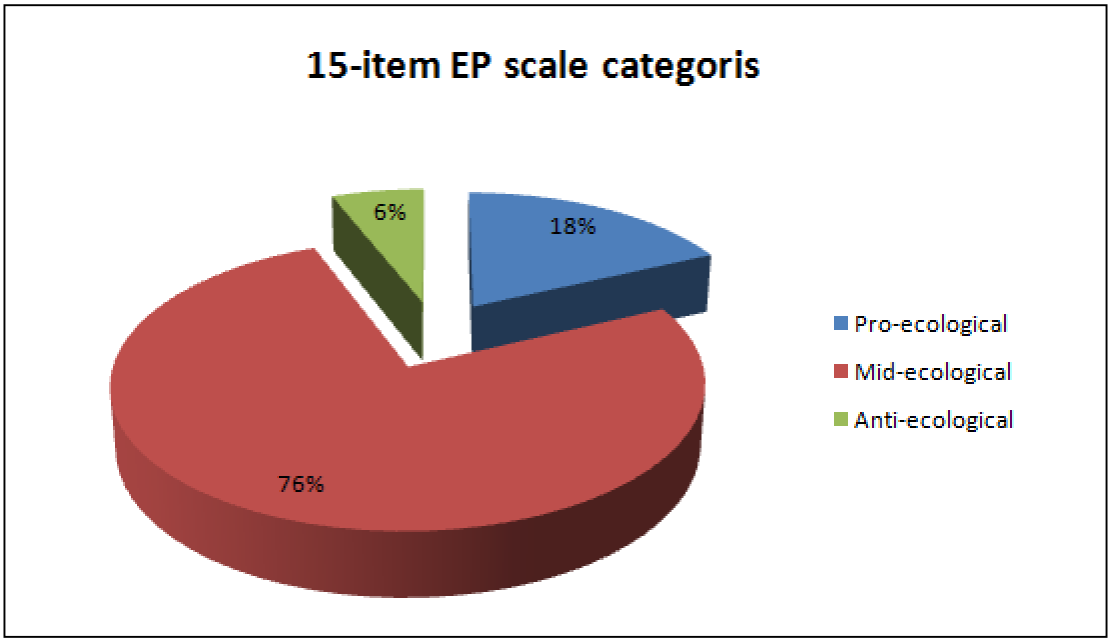

Figure 14: 15-item NEP scale Categories

From the total of 50 households being examined in this study, in terms of environmental culture of sample, results indicated that the majority of the households (76%, N=38) who completed NEP survey held Mid-ecological views; 18% of the households (N=9) achieves an Pro-ecological score which is more likely to support actions that enhance the environment. While only 6% of the participants (N=3) achieved an Anti-ecological score on the NEP which is less likely to support actions that enhance the environment.

This result could reflect household's' attitude to environmental issues and as discussed in Section 2-3, the change in the behaviour will not happen by itself, unless environmental knowledge and pro-environmental attitude change. Also, it is important to clarify how the environmental behaviour of people can be influenced by the environmental knowledge and belief. Therefore, consumers' attitudes are considered as important determinants of household energy usages (Dull & Janky, 2011).

- ***Descriptive Statistics # 2***

15-item NEP scale vs. historical energy consumption:

The impact of the households' environmentally-conscious attitude on their energy consumption was examined. The difference between category one's (occupants with Pro-ecological attitudes) levels of energy consumption, and the other two groups (category 2; occupants with Mid-ecological attitudes and category 3; occupants with Anti-ecological attitudes) were examined using a ***"One-way ANOVA"*** test. One-way analysis of variance (ANOVA) test is used to determine whether there are any significant differences between the means of three or more independent groups.

For this test, the dependent variable was the occupants' energy consumption at different periods, and the independent variable was the three different categories of 15-item NEP scale. As explained previously (Section 3.4), 15-item NEP scale were divided into three categories according to the percentage score (Category 1: Pro-Ecological = 79%-100%; Category 2: Mid-Ecological = 54%-78%; 3: Anti-Ecological = 50% or less).

Results showed that there was a statistically significant difference at the $p<.05$ level between different three categories in terms of energy consumption (NAC) (Table 19 and Appendix G).

Table 19: The difference between 15-item NEP scale and energy consumption (kWh)

	Normalized Annual Consumption(NAC)		Actual Energy Use (AEU)	
	NEP Different Categories	**Std. Deviation**	**NEP Different Categories**	**Std. Deviation**
2011-2012	F (2)= 3.68, p=0.033*	742	F(2)=3.1; p=0.46	605
2012-2013	F(2)= 3.001 p=0.059	788	F 2)= 3.09; p=0.055	459
2011-2013	F(2)= 3.575 p=0.036*	612	F 2)= 2.32; p=0.109	482

**Correlation is significant at 0.05 level (2-tailed)*
(F)=ratio value; (p) = Sig. value at NEP different levels;

In our sample, the average energy consumption in different NEP scale categories is varied. Distribution of energy consumption (energy behaviour) shows that those who had particularly higher environmental-conscious attitude, consumed less energy. For instance, as shown below (Table 20 and Appendix G), according to the normalized data (NAC), the average energy consumption of the occupants with Pro-ecological attitudes (1,294 kWh/yr) was less than the occupants with Mid-ecological (1,686 kWh/yr) and Anti-ecological attitudes (3,169 kWh/yr).

Table 20: Average energy consumption (kWh) comparison at different levels NEP scale

	Average Consumption Comparison (kWh) at NEP Different Levels					
	Normalized Annual Consumption (NAC)			Actual Energy Use (AEU)		
	2011-2012	2012-2013	2011-2013	2011-2012	2012-2013	2011-2013
Pro-Ecological (59-75)	1,294	1,234	1,373	1,538	1,486	1,512
Mid-Ecological (40-58)	1,686	1,564	1,555	1,695	1,576	1,635
Anti-Ecological (15-39)	3,169	2,511	2,392	3,038	2,556	2,797

Moreover, in order to analyze data more in detail, another test was applied which called Post hoc test in the analysis of Variance (ANOVA). Post hoc tests are designed for situations in which the researcher has already obtained a significant omnibus F-test with a factor that consists of three or more means and additional exploration of the differences among means is needed to provide specific information on which means are significantly different from each other. Results showed that there was a statistically significant difference at the $p<.05$ level between different three categories in terms of energy consumption (NAC) and those households who allocated in Pro-ecological category consume less energy compared to the other groups (Appendix G).

The present study findings are consistent with results obtained by Dull and Janky (2011). Their study aimed to assess the relationship of environmental attitudes and household's energy use. In order to investigate their aim, they addressed average monthly electricity use and utilized multivariate regression technique on a sample of 503 residents of Óbuda (Budapest, Hungary) in February 2011. Their findings showed relationship between environmental attitudes and households energy consumption. According to their belief, in many cases, savings may be achieved partly by technological investments; however, they can be largely achieved by changing the behavioural patterns of residents. Their data also showed that the effects of housing type and demography are much larger compared to the effects of the attitudes.

- ***Descriptive Statistics # 3***

15-item New Ecological Paradigm (NEP) scale vs. occupants' demographic:

Some studies stated that various factors such as age, gender and education affected NEP scores (Dunlap et al., 2000). When analyzing underlying causes for attitudes and behaviours, demographic factors such as gender, age, income, education and employment are regarded as important (Lovelock, 2010; Diamantopolous et al., 2003). These have also been found to be important influences on environmental perception and behaviour.

In the study conducted by Diamantopolous et al (2003), relationships between age and environmental consciousness were examined by surveying 33 studies in that area. Upon completion of their study, only 2 of the 33 presented a significant relationship where younger people are shown to exhibit higher levels of knowledge. Moreover, when testing their hypothesis which stated that there is no relationship between age environmental knowledge, they found significant and consistent results showing a negative relationship between age and attitudes (Diamantopolous et al., 2003).

Furthermore, regarding the effect of education on environmental attitudes, a large number of studies discovered that obtaining higher educational qualifications results in scoring higher on all environmental themes (Diamantopolous et al., 2003).

Moreover, in this regard, a difference between males and females has also been exhibited. Although males were found to display a higher level of environmental knowledge than females, a higher level of environmentally conscious attitudes and behaviour were generally shown by females rather than males (Diamantopolous et al., 2003). Also, they tested their findings by conducting a survey on British British customers. In that test, they discovered that females possess stronger environmental attitudes than males (Diamantopolous et al., 2003).

At this stage, in order to determine whether there are any significant differences between the 15-item NEP scale collected from 50-households and their demographics, "***One-way ANOVA***" test was applied. It should be noted that, in the present study, only information about the occupant's age, gender and nationality were collected and thus the demographical analysis were limited to these factors.

From the total of 50 households being examined in this study, 72% of the occupants were male and 28% female. In terms of nationality, the majority of the participants were from an African ethic background (52%). Considering the age range of participants, 44% were between 46-60 years old, 26% over 60 years old, 18% between 31-45 years old and 12% between 18-20 years old.

When the results for the 15-item NEP scale were analyzed demographically (age, gender and nationality), non-significant differences were observed by regions of origin, age and gender of the participants. These results were based on the significant value (*p*) which is greater than 0.05 (Gender, F= 2.314, p=0.135; Age, F= 1.143, p=0.342; Country of origin, F=1.47, p=0.209) (Table 21).

Table 21: 15-item NEP scale by households' demographic (Gender, Age, Country of origin)

		15-item New Ecological Paradigm (NEP) scale vs. occupants' demographic		
A	**Male**	N=36	M=53, SD=5.41	F (1)= 2.314, p=.135
	Female	N=14	M=50, SD=8.11	
B	**18-30 Years old**	N=6	M=50, SD=7.57	F (3)= 1.143, p=.342
	31-45 Years old	N=9	M=55, SD=6.25	
	46-60 Years old	N=22	M=51, SD=6.67	
	Over 60 Years old	N=13	M=53, SD=4.97	
C	**Canada**	N=13	M=52, SD=4.46	F (6)= 1.47, p=.209
	Europe	N=2	M=55, SD=1.42	
	South/Central America	N=6	M=55, SD=7.63	
	East Asia	N=1	M=51, SD= -	
	West Asia	N=1	M=37, SD= -	
	Africa	N=26	M=52, SD=6.64	
	Other	N=1	M=57, SD= -	

A) Gender, B) Age C) Country of origin

(N)= number of values; (M) =15-item NEP scale mean value (between 15-75); (SD) = Standard Deviation; (F) =ratio value; (p) = Sig. value at NEP different levels

As the present study's focus was only on the household's environmental consciousness and energy consumption, the investigation of the effects of demographics on household energy consumption, was outside the scope of this research. This is mainly as a result, due to the lack of a large enough sample size (N=50) in order to collect data/information regarding the occupant's demographics. Such an examination could be a topic of a potential future research that analyzes the relationship of each of these demographic categories to energy consumption.

- ***Descriptive Statistics # 4***

The aim of this section is to determine whether there is significant difference between the attitudes of 24-households who completed both surveys and the 26-housholds who completed just one of them (Section 4-4)**.** To achieve this aim, the Independent-samples t-test was conducted in SPSS.

Statistical analyses showed that there was no significant difference (t (48) =.302; p= 0.764) between these two groups of households (Table 22 and Appendix G). In other words, “Household Energy Use” survey does not affect the participation in the current survey (NEP Survey) and there is no bias from the previous experience.

Table 22: Two groups of 50-households' Environmentally-conscious attitude comparison

	Environmentally-conscious attitudes comparison between 24-housholds & 26-housholds	
24-households	M=51.88, SD=5.46	*t*(48)=-.302, *p*=.764 (2-tailed)
26-housholds	M=52.42, SD=7.16	

(M) = 15-item NEP scale mean value (between15-75); (SD) = Standard Deviation;

- ***Descriptive Statistics # 5***

A total of 50 households completed the NEP survey. Among all of the respondents, 24-housholds completed both surveys (“Household Energy Use” and NEP Survey) which were implemented in 2012 and 2014. 26-housholds solely participated in the current phase of research and completed the NEP survey.

To discover whether there is significant difference between energy consumption of the 24-households who completed both surveys (Household Energy Use and NEP Survey) and the 26-housholds who only completed the NEP Survey, the “Independent-samples t-test” was conducted in SPSS. For the current test, variables which were tested, were energy consumption variables (NAC and AEU) of the 24-housholds completed both surveys (“Household Energy Use” and NEP Survey) and the 26-housholds solely participated in the current phase of research. To achieve this objective, both variables were analyzed in different periods.

As presented below (Table 23 and Appendix G), the results show that there were no difference between energy consumption of those occupants who participated in both surveys and those who did not. This result is the same as the previous test result where it was found out that "Household Energy Use" survey does not affect the participation in the current survey (environmentally-conscious attitude - NEP Survey) and there is no bias from the previous experience. To sum up, it can be concluded that there were not much difference between the attitudes and energy consumption of 24-households who completed both surveys and the 26-housholds who completed only one of them. This can be likely due to the gap between the two phases of the study. That is, while the participants' energy behaviour was examined in May 2012, the participants' environmental consciousness was checked in July 2014.

Table 23: Two groups of 50-households' energy consumption comparison

		Comparison Between Average Consumption Before vs. After "Household Energy Use" survey	
		Actual Energy Use (AEU)	
A	2011-2012	M=1629, SD=723	t(48)=.954, p=.345 (2-tailed)
	2012-2013	M=1552, SD=601	
	2011-2013	M=1591, SD=634	t(48)=.681, p= 499 (2-tailed)
B	2011-2012	M=1875, SD=1079	
	2012-2013	M=1691, SD=834	t(48)=.855, p=.397(2-tailed)
	2011-2013	M=1783, SD=940	
		Normalized Annual Consumption (NAC)	
A	2011-2012	M=2181, SD=1076	t(48)=-.547, p=.587 (2-tailed)
	2012-2013	M=1498, SD=767	
	2011-2013	M=1488, SD=716	t(48)=.577, p= .566 (2-tailed)
B	2011-2012	M=1814, SD=1186	
	2012-2013	M=1630, SD=851	t(48)=.842, p=. .404 (2-tailed)
	2011-2013	M=1664, SD=759	

A) 26-households; B) 24-households

5.3.2 Alternative Statistical Analyses of NEP Survey

As discussed in Section 4.3, energy consumption of one year prior to the implementation of the NEP survey were investigated to support the results of this study and to gain further insight. Thus, after examining the energy consumption of the 50 households who completed the NEP survey from July 1st 2013 to July 31st, 2014 (Section 4.3), the relationship between the environmentally-conscious attitudes of the 50-housholds and their historical energy consumption (Actual Energy Use and Normalized Annual Consumption) were statistically examined for the specified period. In order to test the relationship between the 15-item NEP scale scores and their energy consumption, the ***"Pearson Correlation test"*** was conducted in the same way as specified in Section 5.3.

The test results showed the correlation coefficient (r) between these two variables is significant at p<0.05 and p<0.01 for the normalized and actual energy consumption respectively. As shown in Table 24 (Appendix H), there is a moderate negative correlation between the NEP survey scores and the energy consumption of the 50 households. The correlation coefficient (R) between these two variables was -0.391, with a significance at P= 0.005, and -0.343, with a significance at P= 0.015 for actual energy use and normalized annual consumption respectively.

Table 24: Correlation between occupants' annual energy consumption and their attitudes

	Annual Consumption (kWh) vs. Environmentally-conscious Attitude	
	Normalized Annual Consumption (NAC)	**Actual Energy Use (AEU)**
	2013-2014	**2013-2014**
Pearson Correlation(*r*)	-0.343*	-0.391**
Sig. (2-tailed) (*p*)	0.015	0.005

*Correlation is significant at 0.05 level (2-tailed)

** Correlation is significant at 0.01 level (2-tailed)

Furthermore, following the same pattern as the statistical analysis done in Descriptive Statistic # 2 (Section 5.3.1), the difference between occupants with Pro-ecological attitudes' levels of energy consumption, the occupants with Mid-ecological attitudes and Anti-ecological attitudes were examined. For the sake of the current set of analysis, the impact of the households' environmentally-conscious attitude on their energy consumption was obtained by applying a ***"One-way ANOVA***" test.

Results presented in Table 25 (Appendix H) showed that there was a statistically significant difference at the p<.05 level between the different three categories in terms of energy consumption and that those households who were allocated in the Pro-ecological category consumed less energy compared to other groups. It should be noted that this result was confirmed using both the Normalized Annual Consumption (NAC) and Actual Energy Use (AEU) as energy consumption variables.

Table 25: The difference between 15-item NEP scale and energy consumption (kWh)

	Normalized Annual Consumption(NAC)		Actual Energy Use (AEU)	
	NEP Different Categories	**Std. Deviation**	**NEP Different Categories**	**Std. Deviation**
2013-2014	F (2)= 3.68, p=0.033*	910	F(2)=4.313; p=0.019*	1023

**Correlation is significant at 0.05 level (2-tailed)*

(F)=ratio value; (p) = Sig. value at NEP different levels;

Also, similar to the previous section, in order to analyze the data more in detail, "***Post hoc"*** test in the analysis of Variance (ANOVA) was conducted. The results presented in Table 26 showed that there was a statistically significant difference at the p<.05 level between different the three categories in terms of energy consumption (NAC) and therefore those households who were allocated in the Pro-ecological category consume less energy compared to the other groups (Appendix H).

Table 26: Average energy consumption (kWh) comparison at different levels NEP scale

	Average Consumption Comparison (kWh) at NEP Different Levels	
	Normalized Annual Consumption (NAC)	Actual Energy Use (AEU)
	2013-2014	2013-2014
Pro-Ecological (59-75)	1804	1476
Mid-Ecological (40-58)	1962	1868
Anti-Ecological (15-39)	3305	3351

As pointed out previously, these results are well-matched to the results obtained by Dunlap et al. (1978), Salehi (2010) and Dull & Janky (2011).

Moreover, for the current set of analysis, "***One-Way ANOVA"*** test is also performed in order to analyse the 15-item NEP aforementioned scale' results demographically (age, gender and nationality).

Same as the previous set of statistical analysis presented in Section 5.3.1, after the results for the 15-item NEP scale were analyzed demographically, non-significant differences were observed by regions of origin, age and gender of the participants. These results were based on the significant value (*p*) which is greater than 0.05 (Gender, F= 2.314, p=0.135; Age, F= 1.143, p=0.342; Country of origin, F=1.47, p=0.209) (Appendix H).

Lastly, to achieve the objective of this section, an "***independent-samples t-test***" was conducted using SPSS to determine whether there is a significant difference between the attitudes and energy consumption of 24-households who completed both surveys and the 26-housholds who completed just one of them (Section 4-4)**.** As presented in Appendix H, the results show that there were no difference between energy consumption and attitudes of those occupants who participated in both surveys and those who did not.

This result is the same as the previous section's result (Section 5.3.1) where it was found out that "Household Energy Use" survey does not affect the participation in the current survey (NEP Survey) and there is no bias from the previous experience.

To sum up, the presented findings are consistent with results obtained in the previous section (Section 5.3.1) which potentially further support the analyzed data results of this study.

6.0 Conclusion

Nowadays, the environmental issues and challenges, particularly "energy consumption" behaviour has been the focus of attention for scholars in the fields of engineering, environment study, management and related areas. The change in people's behaviour towards energy consumption/naturalist dimensions can be considered as one of the ways to avoid the damage to the environment and destruction of nature.

To attain behavioural changes, at first, it requires a change in individual's attitude towards that issue. For this reason, achieving an understanding of human attitudes (e.g. environmental attitudes) and exploring individual cognition is essential (Maleki & Karimzadeh, 2011). It should be mentioned that the issue of energy is a priority and of high importance in this research because the statistical sample for this study are residents of the cold region of Canada where due to the climate and ecological conditions there is inevitably a high level of energy consumption. Therefore, knowing about household's energy consumption pattern and factors affecting it, have important and central roles in the energy use area.

This research attempted to gain an understanding of whether there is a relationship between occupant's household energy-conscious attitudes and energy consumption of 50 households in a high-rise MURB in Toronto. The main tool for measuring the occupants' household environmental consciousness was Dunlape's NEP scale which has been proved to be a valid measure of environmental concerns. Paper-based surveys also incorporated some general information of demographics (gender, age and country of origin).

Occupants' energy consumption was collected by ways of sub-meters which captured the electrical draw of each unit from April, 2011 to June, 2013. At first, in order to have a more accurate estimation, households' historical energy consumption (kWh/month/unit) were analyzed during different periods of time (before, after applying "Household Energy Use" survey and throughout the whole period) by PRISM. Results indicated that total energy consumption in the studied MURB is linearly related to the outdoor temperature. The normalized annual energy consumption of the 136-households was within the range of 78-79 kWh/m^2 during 2011-2012 (before applying "Household Energy Use" survey), and 74-73 kWh/m^2 during 2012-2013 (after applying "Household Energy Use" survey). All households' energy consumption were also normalized using SRWN method which showed good consistence with PRISM results.

Besides, data analysis in Section 4.0 showed that the energy consumption of the selected Toronto MURB's tenants was changed during this period (2011-2013). This finding was in accordance with the results obtained by Rouqe (2012) in the earlier phase. Using Artificial Neural Network (ANN) approach, he concluded that his survey ("Household Energy Use" survey) may have influenced the reduction in the respondent's energy consumption. However, results from the first two tests indicated that unlike the results obtained throughout the data analysis (Section 4.0) have not been seen in this study. This can be likely due to the lack of sample size (N=48) and two different approaches which were applied for data analysis throughout these two studies.

The main purpose of the modeling was to examine the existence of a significant relationship between environmental attitude and energy consumption (environmental behaviour) of the MURB occupants.

A total of 50 surveys were collected from the 136 households in the Toronto MURB. In order to analyse the data, the statistical approach (using SPSS) was applied using survey data and historical energy consumption.

In general, from the total of 50 households examined in this study, a majority of the participants in this survey consisted of the following categories: male gender (72%), age range between 46-60 (44%), African ethnic background (52%), building occupancy more than 7 years (62%), single occupant household (82%) and tenants who did not participate in the earlier phase (“Household Energy Use” survey- in 2012), (52%).

With respect to the main objective of the study, the analysis showed there was a statistically significant negative correlation between the 50-respondents’ households environmental attitudes and their energy consumption. Also, it should be noted that this result was confirmed using both the Normalized Annual Consumption (NAC) and Actual Energy Use (AEU) as energy consumption variables. This finding is compatible to the results obtained by Maleki and Karimzade (2011) and thus in order to explain the relationship between attitude and behaviour. In their results, the correlation coefficient (R) between these two variables was 0.177 which is significant at P= 0.001. Their findings were also well-matched to the results obtained by Dunlap et al (1978), Salehi (2010).

Moreover, in order to analyze the data more in detail, another test was applied. Results showed that there was a statistically significant difference at the $p<.05$ level between the different three categories in terms of energy consumption and that those households who were allocated in the Pro-ecological category consume less energy compared to the other groups. The present study findings are consistent with results obtained by Dull and Janky (2011) which showed relationship between environmental attitudes and households’ energy consumption.

This indicates that as occupants’ attitude scores increased, their energy consumption decreased for each of the three periods. In turn, this result suggests that as the people’s attitudes get more positive towards the environment, their responsible energy consumption behaviour also increases.

7.0 Recommendation for future work

The following are recommendations for future research on occupant's household energy use in another Toronto MURBs.

1- When analyzing the underlying causes for attitudes and behaviours, demographic factors such as gender, age, income, education and employment are regarded as important (Lovelock, 2010; Diamantopolous et al., 2003). The occupants’ information collected throughout the present study, only obtained the occupant's general factors such as age, gender and country of origin. To improve and strengthen the validity of the results, the result for 15-item NEP scale needs to analyse demographically and in more detail. As a result, a survey of household's environmental attitude incorporates other elements such as occupants' education, income and employment is needed.

2- To evaluate any potential bias between the variables and to improve the validity of the results, the average energy consumption of the 50-surveyed households and the 86-non-surveyed households could also be analysed. Correspondingly, to find out whether there is any significant difference between their average energy consumption, a statistical method should be applied.
3- To determine the most significant factor that influences energy consumption of a MURB in Canada, results of the previous phase of the study (Household Energy Use Survey) should be compared to the current phase of study (NEP Survey).
4- Some other factors must be taken into account when analyzing energy consumption behaviour. Therefore, if the purpose of a research is understand of the affecting factors on environmental behaviour, other factors besides environmental attitude (e.g. environmental knowledge/ literacy) must also be considered.
5- Because of limited access to personal information, the survey collected information by ways of mail-in and interviews. Other survey methodologies such as telephone interviews and on-line could increase the survey response rate (sample size) to have a greater representation of the pilot site.
6- Since this research focused on a single MURB located in Toronto, the results found in this study are not generalizable for other Toronto MURBs. The NEP survey can be applied to another high-rise MURB resulting in the development of a larger datasets on occupant's household environmental attitudes view.

Appendices

Appendix A: NEP Survey

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Research Study: Tenant Engagement and Energy Conservation, Toronto

General Information

Please complete all questions below. **CHECK OFF** ☑ the appropriate option.

1. What is your unit number? ________________
2. Are you male or female?
   - ❑ Male
   - ❑ Female
3. What is your age?
   - ❑ 18-30 years old
   - ❑ 31-45 years old
   - ❑ 46-60 years old
   - ❑ Over 60 years old

4. What part of the world did you grow up in?

- ❑ Canada
- ❑ USA
- ❑ Europe
- ❑ South or Central America or Caribbean
- ❑ South Asia (e.g. India, Pakistan, Sri Lanka)
- ❑ East Asia (e.g. China, Japan, Korea)
- ❑ Southeast Asia (e.g. Vietnam, Philippines, Malaysia)
- ❑ West Asia & Middle East (e.g. Lebanon, Iran)
- ❑ Africa (e.g. Ethiopia)
- ❑ Austrailia, New Zealand or the South Pacific
- ❑ Other, please specify.________________
- ❑ Prefer not to answer.

5. How many years have you been living in the Toronto MURB?

- ❑ 0 to 1 year
- ❑ 2 to 4 years
- ❑ 5 to 7 years
- ❑ More than 7 years

6. How many people live in your household?

- ❑ 1 person
- ❑ 2 persons

Environmental Attitude

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Research Study: Tenant Engagement and Energy Conservation, Toronto

To the best of your understanding, please answer whether you agree or disagree with the following statements by checking the box on the following scale (Source: Dunlap et al., 2000):

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
1. We are approaching the limit of the number of people the earth can support.					
2. Humans have the right to modify the natural environment.					
3. When humans interfere with nature it often produces disastrous consequences.					
4. Human ingenuity will insure that we do NOT make the earth unlivable.					
5. Humans are severely abusing the environment.					
6. The earth has plenty of natural resources if we just learn how to develop them.					
7. Plants and animals have as much right as humans to exist.					
8. The balance of nature is strong enough to cope with the impacts of modern industrial nations.					
9. Despite our special abilities humans are still subject to the laws of nature.					
10. The so-called ’ecological crisis‘facing humankind has been greatly exaggerated.					
11. The earth is like a spaceship with very limited room and resources.					
12. Humans were meant to rule over the rest of nature.					
13. The balance of nature is very delicate and easily upset.					
14. Humans will eventually learn enough about how nature works to be able to control it.					
15. If things continue on their present course, we will soon experience a major ecological catastrophe.					

Thank you for taking the time to complete this survey.

Appendix B: Consent Agreement Form

RYERSON UNIVERSITY
CONSENT AGREEMENT
Research Study: Tenant Engagement and Energy Conservation, Toronto

You are being asked to participate in a research study. Before you give your consent to participate, it is important that you read the following information and ask as many questions as necessary to be sure you understand what you will be asked to do and the degree of your involvement.

1. Investigators:

- Prof. Alan Fung, Associate Professor, Department of Mechanical and Industrial Engineering.
- Prof. Vera Straka, Associate Professor, Department of Architectural Science.
- Dr. Sara Alsaadani, Post-Doctoral Fellow, Department of Architectural Science.
- Kevin Trinh, Graduate student supervised by Prof. Vera Straka and Prof. Alan Fung.
- Samira Zare Mohazabieh, Graduate student supervised by Prof. Vera Straka and Prof. Alan Fung.

2. Purpose of the Study:

The purpose of this study is to promote energy literacy and conservation, and to gain an understanding of whether there is a relationship between energy-conscious attitudes and energy consumption.

3. Description of the study:

Participation in the study entails completing the attached survey. This survey consists of a fifteen questions documenting your opinions and perceptions about energy use and the environment, as well as a few short questions about yourself. Completion of this survey should take no more than 10 minutes.

4. Risks or discomfort:

There is very little risk involved in participating in this study.

You may be concerned that someone else may find out your responses to the questions. Please note that we will not publish information in any reports that will identify you by unit number or by any other kind of personal information. When we publish reports from this research project, we will be using only general information, not individual information and your confidentiality will be protected.

Please note that there is no right or wrong answer to the questions, we are seeking your individual opinions to each of the statements in the questionnaire.

5. Benefits of the study:

The following are potential benefits of the research:

- To engage and educate tenants about environmental issues.
- To promote a community and teamwork spirit.
- To gain access to valuable information about energy-conscious attitudes, and whether they have an impact on energy consumption.

While this project promises benefit for social good, individual benefit to any of the tenants cannot be guaranteed.

6. Confidentiality:

All data collected will be handled confidentially. We will not be collecting any names. Unit numbers will be collected to enable us to link energy consumption data, data from the thermal comfort survey and data from the attitude survey, and to enable us to provide you with feedback about your individual energy consumption. We will not publish unit numbers or specific information about individuals in any publication or report. Page **2** of **4**

7. Voluntary nature of participation:
Participation in the study is completely voluntary, will not be coerced by any undue influence from any party and will not influence your present or future relations with Ryerson University or the Property Manager.
If you decide to participate, you are free to withdraw your consent and to stop your participation by 30 September 2014. If you choose to withdraw your participation, any data gathered to that point, provided by you, would be destroyed.
8. Compensation:
You will be compensated with $20 for your time and participation.
9. Questions about the study:
If you have questions about the research, you may contact Prof. Vera Straka by email: vstraka@ryerson.ca or by phone at 416-979-5000 extension 6495.
If you have any questions regarding your rights as a participant in this study, you may contact the Ryerson University Research Ethics Board for information: Research Ethics Board, c/o Office of the Vice President, Research and Innovation, Ryerson University, 350 Victoria Street, Toronto, ON M5B 2K3, 416-979-5042.
10. Agreement:
By signing the following agreement and returning it to us, you are indicating that:
1. You have read the information in this agreement
2. You have had a chance to ask any questions you have about the study
3. You understand that you can change your mind and withdraw your consent to participate.
4. You are providing your consent to take part and have your information used in our study.

I, ________________________________ consent to participate in the study conducted by the investigators from Ryerson University.

Signed: ____________________________

Date: ______________________________

Appendix C: Historical Energy Consumption Data (38 months)

There are two components of Appendix C. The first component presents the energy consumption data of surveyed and non-surveyed occupants from October 2010 to December 2013. The second component analyzes the energy consumption.

Energy Consumption of Surveyed Occupants

Unit #	Oct-10	Nov-10	Dec-10	Jan-11	Feb-11	Mar-11	Apr-11	May-11	Jun-11	Jul-11	Aug-11	Sep-11	Oct-11	Nov-11	Dec-11	Jan-12	Feb-12	Mar-12	Apr-12	May-12	Jun-12	Jul-12	Aug-12	Sep-12	Oct-12	Nov-12	Dec-12	Jan-13	####	Mar-13	Apr-13	May-13	Jun-13	Jul-13	Aug-13	Sep-13	Oct-13	Nov-13	Dec-13
1	100	160	101	128	110	117	106	131	171	103	91	123	125	108	102	114	178	110	96	124	152	128	110	160	107	101	94	125	105	119	107	262	213	95	108	104	103	108	108.1
2	208	182	197	195	193	199	188	189	217	229	223	185	185	178	186	195	265	177	174	87	195	211	206	181	170	140	191	191	159	187	165	229	186	238	239	183	191	181	274.6
3	153	137	159	162	139	161	147	140	162	123	127	100	103	185	98	125	150	127	137	100	113	133	108	126	145	135	152	137	162	176	152	139	152	147	140	121	157	168	201.0
4	121	112	220	129	114	126	132	132	105	137	126	104	109	97	101	94	112	94	94	95	99	103	102	126	114	110	112	122	101	105	96	110	102	117	115	97	122	114	113.6
5	80	71	75	92	81	90	82	73	93	114	93	86	73	284	89	83	93	85	79	77	58	45	105	89	81	89	85	75	86	102	90	88	74	90	110	81	81	64	87.6
6	129	138	150	131	98	97	91	96	141	118	132	110	142	131	120	151	110	84	96	94	94	166	154	128	123	104	127	95	126	107	87	49	101	114	120	112	115	120	123.4
7	98	98	99	102	90	91	83	85	97	86	84	80	89	83	100	96	83	84	83	84	81	101	90	81	103	103	106	84	86	89	89	83	83	96	82	90	86	89	88.3
8	108	112	120	116	115	107	117	119	174	153	151	127	116	113	115	118	146	101	106	108	117	202	206	166	153	166	191	116	153	164	159	153	133	177	155	98	169	179	204.1
9	207	219	219	209	194	214	235	288	312	229	187	206	196	163	172	173	300	174	167	69	196	165	170	221	171	206	318	223	284	294	209	316	277	166	246	164	158	114	149.3
10	125	110	214	90	82	82	83	127	80	183	199	172	117	112	138	114	99	89	83	138	143	181	192	146	101	106	135	160	67	73	76	140	115	150	128	90	97	109	146.1
11	78	68	178	242	228	47	30	65	136	110	87	122	142	147	186	179	185	142	111	89	91	148	161	149	131	116	111	88	102	118	131	140	155	190	217	118	142	155	147.5
12	153	146	151	167	137	139	140	144	76	142	128	93	181	67	106	91	66	80	72	73	75	104	106	86	72	73	70	134	73	76	65	67	75	115	101	76	57	71	84.2
13	84	82	72	71	83	126	125	137	96	180	177	127	121	138	144	137	115	142	139	134	125	163	137	108	103	89	97	143	116	101	87	84	106	163	120	124	118	102	60.6
14	201	256	347	334	238	214	118	196	169	257	274	277	249	249	170	166	91	169	151	103	170	215	217	163	176	148	160	204	135	146	55	65	70	79	64	159	90	90	83.5
15	37	236	134	40	37	43	44	42	31	51	55	52	154	53	52	54	32	52	46	51	52	60	57	53	61	55	33	37	27	32	41	43	45	50	36	48	33	28	28.8
16	75	70	166	77	66	74	78	79	91	80	85	78	179	80	71	84	68	77	70	75	72	74	68	75	81	78	76	75	57	62	62	62	58	68	67	70	73	70	68.7
17	115	191	154	73	26	33	132	117	125	161	114	93	181	39	136	69	85	102	112	94	93	170	134	97	95	95	108	106	109	128	101	109	84	118	108	117	76	89	119.9
18	54	66	66	80	66	69	57	49	80	71	81	64	159	69	149	42	72	68	49	57	63	83	80	64	53	55	77	47	126	131	114	213	186	219	203	64	73	66	87.9
19	124	130	130	98	127	102	47	67	141	131	138	105	117	109	113	111	105	98	109	97	101	143	104	87	103	109	126	79	125	127	118	121	108	137	118	15	114	123	118.2
20	142	132	227	153	133	130	124	121	108	158	206	131	138	118	127	104	103	85	84	86	86	106	95	88	95	109	86	101	79	126	93	59	108	80	88	76	61	58	75.3
21	76	181	196	124	85	124	188	225	78	83	91	105	125	77	97	101	94	92	78	76	92	69	73	93	79	73	81	156	138	87	103	173	123	81	104	84	69	87	96.0
22	92	95	199	95	85	92	87	76	102	83	77	68	76	87	184	82	75	77	81	81	73	81	89	89	113	110	105	71	82	92	88	75	69	72	86	77	85	92	110.5
23	73	89	296	128	171	147	69	86	102	80	86	75	97	69	170	73	91	73	69	70	70	88	86	75	75	95	104	69	222	121	96	110	95	101	88	70	94	88	290.2
24	329	235	257	1107	1004	1000	548	747	281	255	267	625	332	343	730	977	680	179	195	113	389	237	352	628	264	159	158	284	233	331	277	918	673	322	634	496	192	193	200.0
25	48	144	55	62	57	59	50	58	75	82	114	109	86	63	176	83	70	77	68	83	82	124	100	89	83	80	80	63	84	86	74	55	51	95	84	64	66	60	75.3
26	126	150	186	336	236	190	157	194	202	157	122	169	127	113	125	168	336	135	95	88	106	146	131	131	114	128	110	173	175	134	136	174	137	70	106	108	142	118	229.9
27	207	189	177	208	198	216	206	217	182	206	201	103	134	189	249	248	136	263	213	88	181	165	148	129	197	181	187	199	167	173	190	145	159	160	155	238	203	183	191.0
28	3	42	83	75	80	84	73	63	141	90	88	52	160	106	95	121	104	109	84	105	112	101	110	104	118	128	134	80	113	118	116	133	129	126	37	103	107	84	176.3
29	331	215	210	330	186	236	246	277	304	353	347	282	281	258	253	274	527	293	253	172	310	345	342	350	304	299	325	305	250	263	234	324	406	688	540	261	311	328	312.0
30	114	177	128	162	143	128	138	172	177	170	181	149	152	115	152	132	167	197	125	65	134	154	72	117	165	203	223	159	161	233	204	146	109	133	186	174	187	171	164.3
31	108	88	114	103	97	109	95	108	67	139	131	119	93	94	91	97	31	95	80	108	99	145	120	65	53	47	51	117	58	64	60	57	50	97	85	92	79	113	192.2
32	73	187	206	109	119	166	80	96	175	108	93	81	174	190	99	109	190	93	85	82	156	237	175	113	133	143	145	80	85	152	162	149	137	159	158	100	184	145	148.4
33	181	182	204	218	202	211	194	158	235	93	92	121	194	183	217	210	76	148	145	119	113	87	78	98	172	176	204	24	141	86	84	74	72	101	110	170	77	59	80.0
34	158	169	184	197	154	174	183	166	154	57	83	73	67	160	66	73	88	71	71	69	77	104	72	74	69	173	190	135	145	169	148	60	65	113	107	75	99	75	109.9
35	82	187	71	88	86	77	70	70	97	96	102	79	83	80	80	93	81	83	69	74	72	77	69	63	81	79	92	83	70	97	100	86	74	75	76	74	73	64	69.4
36	132	123	170	147	132	128	141	128	178	129	153	173	160	138	166	145	141	100	114	71	149	168	153	175	126	179	226	134	183	168	153	146	163	178	154	109	120	154	130.2
37	121	114	126	122	119	170	182	183	121	113	135	111	134	151	73	178	45	100	87	102	83	117	131	91	84	75	102	117	65	53	47	63	72	108	61	131	59	57	77.8
38	160	154	146	159	139	160	173	225	110	281	297	231	273	58	43	44	97	82	75	91	87	123	43	63	110	112	93	235	106	114	96	98	122	149	102	69	104	124	127.2
39	46	160	142	51	48	50	51	55	61	82	90	57	76	77	70	56	43	66	55	66	59	57	30	37	51	48	57	55	85	87	70	68	61	49	45	47	43	44	56.8
40	68	90	79	114	96	96	86	107	144	127	131	87	86	146	57	115	90	121	133	144	148	183	167	152	152	134	61	161	171	153	102	124	102	100	96	124	124	135	153.8
41	125	123	116	118	104	121	121	121	128	154	153	128	136	120	29	118	119	121	120	100	130	160	161	132	121	111	126	138	114	120	116	116	114	143	146	110	114	119	124.9
42	184	186	176	129	191	30	122	162	107	176	187	165	218	106	85	102	115	89	105	120	121	135	140	130	97	114	104	162	82	88	79	82	110	165	127	93	102	103	103.7
43	162	189	189	194	177	196	181	162	156	160	164	131	141	136	139	128	181	135	118	83	82	139	147	139	150	136	150	129	134	140	139	130	143	208	152	127	168	165	183.2
44	97	90	114	130	132	138	129	127	126	116	137	102	207	101	122	128	98	117	120	119	108	144	153	133	133	136	109	115	114	113	131	112	93	136	106	118	99	111	125.1
45	141	174	190	202	163	136	169	182	180	206	199	189	165	169	46	162	176	181	184	161	169	194	162	146	149	164	183	192	172	190	192	143	194	157	152	188	142	140	150.5
46	71	170	59	78	79	80	81	81	67	95	84	66	168	169	74	73	79	61	70	80	72	98	97	82	83	74	75	84	43	44	45	59	56	71	71	52	67	68	73.6
47	78	168	178	242	228	47	29	65	107	110	87	122	143	147	186	179	105	142	111	89	91	148	161	149	114	93	104	88	100	89	82	91	112	149	131	118	103	96	111.4
48	123	126	206	203	153	230	190	244	140	174	184	128	179	160	197	231	71	189	166	124	155	171	109	86	87	92	128	172	96	86	67	82	82	63	75	211	95	91	87.7
	5896.5	6912.1	7634.5	7916.6	7019.8	6853.8	6198.1	6951.1	6601.4	6786.5	6833.4	6333.3	7139	6322.4	6542.2	6798.6	6564	5624.3	5224.4	4576.6	5691.2	6691.8	6272.8	6127.9	5711.96	5728.58	6159.22	6121.1	5870.8	6113.812	5487.63	6521.9	6204.643	6681.2	6537.878	5685.8	5428.57	5365.254	6322.0913

Energy Consumption of Non-Surveyed Occupants

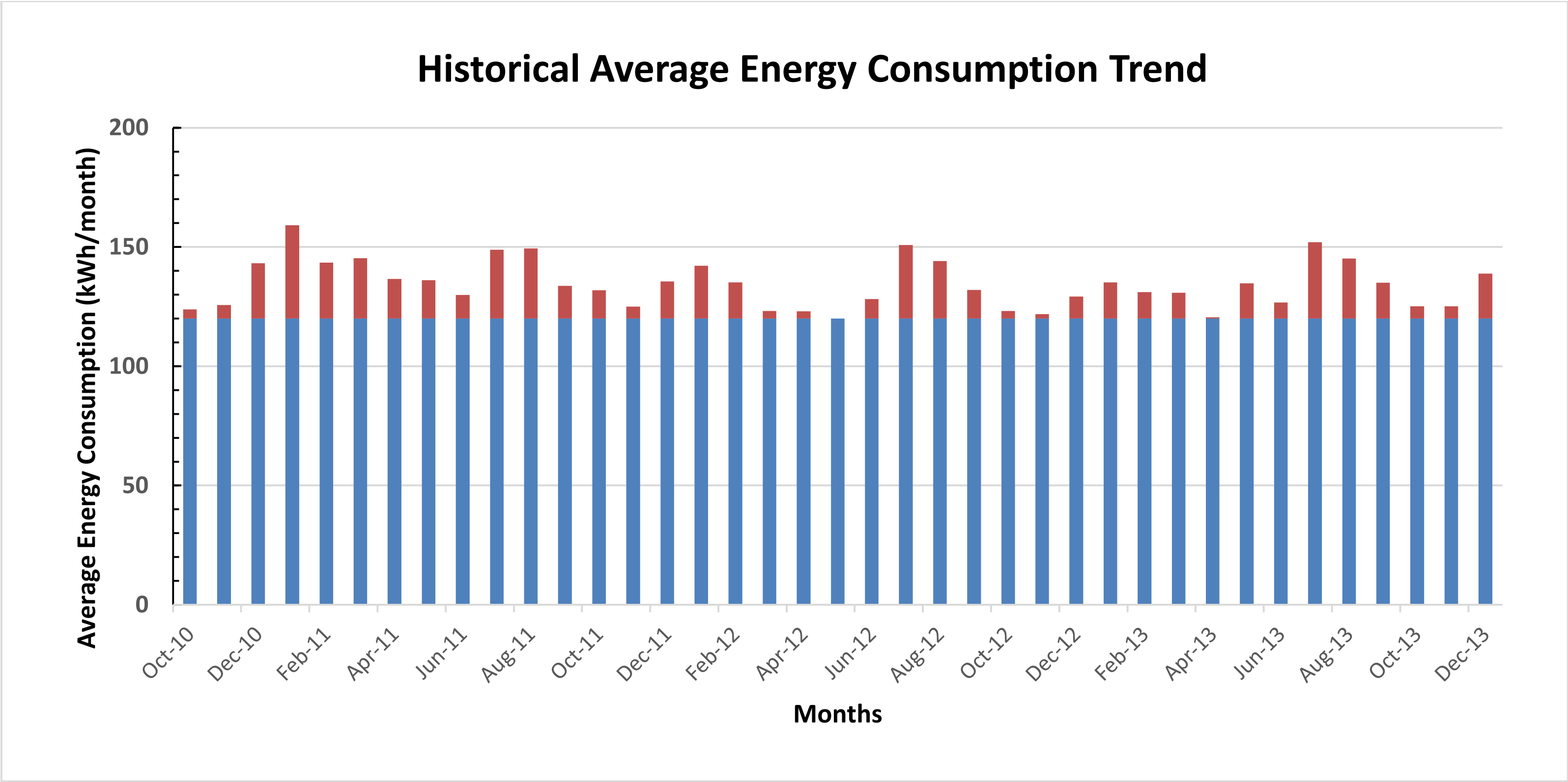
Unit #	Oct-10	Nov-10	Dec-10	Jan-11	Feb-11	Mar-11	Apr-11	May-11	Jun-11	Jul-11	Aug-11	Sep-11	Oct-11	Nov-11	Dec-11	Jan-12	Feb-12	Mar-12	Apr-12	May-12	Jun-12	Jan-00	Aug-12	Sep-12	Oct-12	Nov-12	Dec-12	Jan-13	Feb-13	Mar-13	Apr-13	May-13	Jun-13	Jul-13	Aug-13	Sep-13	Oct-13	Nov-13	Dec-13
1	67.3	173.1	72.2	77.7	78.0	85.9	83.6	189.3	76.4	78.1	75.0	76.9	85.9	86.7	86.5	86.4	92.5	94.1	105.4	81.6	76.2	72.4	71.4	68.3	88.4	179.8	105.5	107.1	90.4	99.0	78.9	80.9	176.6	86.7	81.8	79.3	84.3	83.3	106.8
2	97.3	106.9	104.4	111.8	93.1	117.8	94.7	289.8	89.2	121.2	123.8	63.0	40.5	67.4	96.1	97.0	77.5	84.4	31.0	71.9	75.0	109.9	97.6	78.7	70.8	173.0	85.7	56.8	64.8	84.3	173.0	76.3	76.6	98.6	82.4	68.1	37.5	74.2	0.0
3	51.6	160.5	117.2	91.2	179.6	54.3	49.8	85.2	35.6	31.2	30.4	26.2	76.3	92.5	73.6	67.0	248.6	255.3	68.1	67.3	108.2	71.8	127.7	102.0	157.0	161.8	172.2	128.7	135.4	167.4	157.6	141.9	121.8	93.1	92.6	86.6	72.6	152.9	67.8
4	75.9	180.7	157.2	98.4	93.0	78.5	103.9	92.8	118.2	123.6	132.0	124.6	100.8	94.8	90.4	118.7	283.0	286.8	74.3	90.5	100.2	88.2	135.1	101.2	104.4	91.7	105.2	112.0	110.9	89.9	94.2	101.4	189.2	83.8	74.8	87.3	84.2	90.4	102.3
5	276.1	257.5	256.5	285.8	259.3	271.0	262.4	263.5	248.1	148.9	250.6	239.8	272.9	234.7	149.7	242.7	239.5	262.3	244.9	62.5	256.5	72.2	55.6	248.0	244.7	245.0	281.7	196.8	77.4	280.4	235.5	294.9	266.8	268.2	268.5	264.6	259.7	282.3	258.9
6	94.4	288.6	124.2	70.7	177.0	71.3	47.0	30.8	93.4	145.7	139.8	107.2	82.4	82.4	75.5	82.9	85.4	98.3	103.1	93.8	112.7	39.0	134.3	125.5	159.6	153.9	65.6	73.8	62.6	72.7	88.0	69.5	69.8	75.5	63.7	64.8	102.5	79.6	157.2
7	166.6	280.7	103.8	78.7	80.5	81.3	87.4	101.2	87.7	87.6	88.3	89.1	108.6	91.2	81.1	82.5	85.0	87.4	32.4	86.8	82.7	56.3	79.8	73.2	89.4	192.5	84.9	88.7	77.2	83.8	90.2	81.0	89.8	107.5	114.0	99.0	45.1	79.4	24.1
8	58.7	60.0	93.6	53.1	147.5	60.0	61.3	167.0	175.5	84.8	83.0	69.1	71.8	62.5	62.3	39.4	42.8	65.0	92.4	65.0	75.6	55.1	81.6	74.1	78.0	148.7	47.1	164.1	51.8	100.9	60.8	80.3	103.7	123.4	119.6	91.9	80.2	77.6	122.7
9	42.1	142.6	116.2	55.2	155.2	54.8	47.2	240.6	48.3	88.8	85.9	55.1	50.7	58.2	59.0	29.5	155.6	177.6	190.1	102.0	93.6	54.3	92.1	106.5	91.3	99.2	132.3	115.2	131.5	114.5	200.0	114.0	108.6	121.6	132.0	120.5	179.0	96.7	194.9
10	82.0	102.7	132.5	57.5	73.1	54.9	85.6	255.1	73.0	109.9	136.6	110.1	118.5	89.6	79.6	60.5	158.9	158.4	73.2	135.8	63.6	68.9	113.0	114.8	82.2	85.4	127.9	137.3	116.6	117.9	41.2	95.8	95.6	136.9	121.1	124.7	122.6	102.5	122.8
11	57.0	252.4	116.0	76.4	89.0	81.0	68.4	71.7	86.1	51.2	75.6	70.7	75.6	72.9	82.1	88.0	186.4	187.4	67.5	84.1	89.2	56.9	112.5	84.8	93.7	83.9	101.1	96.8	83.5	79.9	79.8	69.8	167.5	93.2	76.8	66.0	79.8	75.1	41.7
12	92.3	93.2	72.0	50.8	46.9	82.7	82.9	89.6	83.9	100.8	108.6	94.7	80.4	77.3	92.8	101.0	100.1	103.7	81.7	72.0	67.2	150.9	77.7	74.2	74.9	129.8	113.1	86.8	101.7	109.6	43.5	83.6	91.2	102.2	105.6	101.8	104.2	77.9	107.0
13	45.3	43.5	74.8	56.2	30.6	39.7	43.4	46.8	48.8	66.9	75.0	49.5	50.1	44.6	44.0	42.6	57.4	46.3	44.5	43.5	44.3	140.8	63.8	47.1	53.0	44.8	48.1	51.6	48.1	51.7	38.8	50.1	51.5	67.8	56.7	47.1	47.8	49.1	59.5
14	132.1	132.9	39.9	179.4	145.9	185.4	169.1	151.5	52.3	75.5	86.7	53.0	73.3	63.9	76.3	69.0	68.2	76.5	74.9	76.2	51.6	135.6	40.9	74.0	80.5	81.2	81.7	96.6	76.4	95.5	55.3	43.1	82.2	101.0	92.0	81.7	91.1	31.6	78.5
15	71.5	73.4	91.4	84.5	78.5	84.4	79.2	68.5	71.2	86.5	75.7	67.0	69.4	74.7	84.6	85.9	80.3	74.9	68.2	166.4	77.4	82.8	79.3	69.4	70.8	67.5	77.3	83.5	76.6	82.5	66.4	69.6	79.5	89.9	78.0	69.1	67.9	70.2	79.7
16	138.3	140.1	132.4	115.3	77.4	77.6	75.4	106.8	114.7	149.1	148.8	115.2	82.1	92.5	86.5	75.2	76.5	76.4	64.8	90.8	130.9	168.3	142.4	104.0	107.6	99.9	56.5	94.4	84.6	47.5	75.7	57.2	65.6	88.6	65.0	61.0	60.5	60.9	93.7
17	98.8	111.3	115.2	95.7	106.4	126.0	79.0	86.9	109.9	108.9	121.3	128.4	84.2	89.3	81.4	87.5	84.0	69.0	103.3	183.4	85.1	91.5	112.0	85.3	77.1	80.5	61.7	74.7	69.2	110.9	71.8	92.1	107.2	120.8	104.3	96.2	107.1	82.0	75.3
18	109.7	104.7	100.5	89.6	82.5	81.1	75.8	73.3	76.3	100.0	90.7	76.5	79.3	72.9	70.4	68.5	73.9	77.1	30.7	100.1	84.3	90.4	110.3	102.0	85.0	71.7	73.5	56.3	30.6	34.9	84.0	41.7	41.7	45.5	41.0	37.2	37.3	37.4	29.8
19	75.6	171.2	102.5	45.4	130.7	82.3	74.6	85.7	82.4	82.2	89.0	74.0	94.8	90.7	97.8	100.9	93.5	87.2	80.0	125.8	89.1	65.4	98.1	96.5	95.8	94.8	94.4	92.9	76.7	79.5	96.6	96.1	82.3	82.2	81.3	78.6	91.3	88.6	90.6
21	267.1	331.7	286.7	378.7	373.2	331.7	290.6	357.8	319.2	393.1	332.5	281.9	272.1	235.3	231.8	221.8	177.7	192.9	307.7	226.1	316.9	492.8	283.2	301.6	312.1	397.9	316.7	189.3	102.1	244.9	175.5	296.4	237.5	236.9	248.7	265.3	249.3	221.3	400.0
22	82.5	381.5	158.1	56.6	74.0	82.3	66.1	88.3	90.0	112.4	119.5	80.4	74.4	72.9	82.7	78.0	69.5	80.2	125.5	137.9	92.1	65.8	178.4	154.5	87.8	198.8	101.6	97.0	108.4	109.5	74.6	101.6	89.2	92.9	85.5	98.3	106.9	102.5	106.8
23	55.3	263.2	78.8	59.6	49.0	76.8	69.9	67.0	69.3	83.1	81.2	67.1	66.1	70.5	57.5	60.6	76.6	145.4	81.0	163.6	65.3	51.9	80.5	61.3	172.7	172.2	85.7	108.3	156.4	75.1	46.3	100.1	123.7	152.6	148.9	120.3	95.8	221.9	90.1
24	97.2	89.2	142.4	90.1	62.0	94.3	80.8	91.7	280.7	106.8	99.9	94.5	86.2	79.2	82.4	81.7	107.7	87.0	63.7	89.9	94.3	99.7	88.9	91.1	162.3	152.7	57.9	58.4	45.1	54.6	99.5	69.6	101.6	118.8	120.3	100.9	65.6	48.8	71.4
25	238.8	319.5	457.1	294.8	262.2	341.1	267.9	304.4	484.0	499.2	454.4	376.0	415.1	391.8	168.4	371.9	349.3	416.9	176.7	308.3	830.5	329.6	138.1	664.4	148.2	298.9	326.7	249.5	183.7	232.4	364.5	410.0	323.8	788.8	344.7	303.6	281.2	221.3	147.3
26	207.6	301.9	66.1	589.0	470.3	456.9	406.9	306.8	191.4	197.9	184.8	213.7	312.9	266.1	89.2	324.0	295.8	310.2	352.2	185.4	179.6	200.1	137.2	157.2	204.0	240.8	346.5	271.3	143.4	409.5	221.9	305.6	382.2	138.5	226.9	164.6	287.5	337.0	539.4
27	98.5	98.5	82.3	103.3	91.9	96.4	119.7	85.9	81.3	98.9	100.7	77.9	111.5	88.4	82.2	92.3	93.0	79.8	252.4	87.0	80.3	108.7	71.2	70.6	63.1	163.9	61.7	160.8	156.6	82.5	80.1	171.1	141.1	75.5	76.6	132.6	98.2	78.2	122.1
28	316.3	305.7	357.5	380.5	272.0	304.4	322.7	365.4	333.3	337.3	335.3	334.6	351.1	381.1	497.7	613.7	491.5	328.9	235.4	346.8	344.1	232.4	116.2	330.2	129.5	331.7	361.1	147.1	127.8	357.2	327.8	335.9	292.3	325.1	148.9	288.3	271.7	312.3	297.1
29	108.8	113.3	79.3	402.4	275.0	123.8	78.0	52.0	57.8	76.3	75.2	41.7	52.7	46.8	42.9	52.0	45.0	49.8	64.8	49.0	33.9	290.7	79.3	59.3	165.2	161.2	74.6	70.1	167.5	75.0	44.4	69.9	164.9	75.8	57.5	73.1	55.4	62.3	82.3
30	106.7	97.1	97.9	103.1	96.1	115.6	125.8	101.5	132.7	122.3	98.0	85.0	79.1	69.3	70.6	71.3	68.9	80.0	90.8	80.2	85.5	95.8	109.7	95.9	96.1	189.2	107.6	104.1	94.7	106.1	74.7	101.7	100.6	108.1	93.3	106.0	99.5	100.3	69.8
31	244.2	294.7	360.4	347.8	359.2	437.4	361.9	375.1	284.7	298.7	416.5	428.6	447.9	323.8	89.9	211.1	176.5	180.1	363.4	180.7	208.9	399.6	195.4	272.7	169.0	167.8	161.3	146.7	179.1	198.0	206.8	250.2	221.2	350.6	218.5	251.7	250.1	183.9	303.4
32	69.5	24.2	79.8	25.5	224.8	108.9	29.2	65.9	69.9	85.5	76.4	69.8	26.8	24.5	25.2	24.3	23.3	25.4	102.2	176.3	74.1	122.7	84.4	78.1	97.7	100.1	56.7	42.9	125.8	28.7	43.9	149.7	101.2	109.6	80.6	79.2	90.2	55.2	26.3
33	102.1	90.4	94.8	110.6	92.5	103.0	82.9	94.7	89.5	103.7	106.2	75.7	81.4	85.2	104.5	85.1	94.6	100.2	83.2	94.3	97.3	98.8	92.8	84.8	90.7	92.7	112.8	96.7	89.4	103.1	62.2	80.5	174.5	87.1	106.9	102.2	90.7	84.8	103.6
34	75.8	56.4	84.4	100.8	69.8	81.3	57.0	156.4	76.1	81.7	86.7	61.3	61.3	44.9	50.9	38.9	44.7	45.9	95.5	49.3	66.4	61.0	79.3	65.9	81.6	182.6	58.5	67.3	99.7	104.5	51.5	105.6	67.7	70.6	115.0	95.6	100.9	102.7	69.1
35	74.2	78.9	60.4	120.0	85.0	81.7	87.3	87.2	168.7	70.1	61.2	66.0	94.3	83.8	111.5	84.1	73.9	64.0	62.8	176.3	62.4	96.9	64.0	90.6	96.2	106.2	107.9	90.8	72.5	74.0	64.8	84.4	174.3	56.7	55.3	53.7	50.2	61.3	73.8
36	102.2	102.4	81.6	101.2	96.1	122.4	114.2	85.8	98.6	118.8	119.8	99.0	75.5	65.6	81.9	85.2	81.4	74.6	125.5	83.6	63.1	95.6	77.1	58.0	76.8	87.1	66.7	90.9	77.2	97.4	94.5	116.5	186.9	144.2	161.4	131.1	118.9	111.8	99.5
37	111.3	99.4	130.4	108.4	99.4	107.7	102.0	103.5	115.5	134.2	136.5	122.2	134.9	121.8	129.7	123.9	131.4	128.6	118.2	136.0	139.3	102.0	133.5	118.4	125.8	113.8	116.1	113.2	97.9	111.9	117.0	205.2	95.7	230.0	165.9	135.4	126.4	114.0	122.9
38	110.0	112.8	135.2	182.0	161.1	175.1	109.1	102.6	107.7	120.1	137.2	96.0	110.2	97.2	46.9	194.7	179.9	135.8	117.0	100.8	114.9	158.3	116.6	100.7	116.9	121.2	130.9	70.9	139.4	225.4	140.9	161.4	125.4	123.3	111.5	112.9	128.9	211.8	267.7
39	85.9	100.2	92.1	135.5	108.4	117.4	120.2	127.9	148.3	203.6	186.0	152.8	141.2	141.7	162.4	158.8	130.2	102.1	115.6	83.4	96.8	130.0	75.6	108.3	101.6	100.5	127.5	127.6	109.1	115.5	42.7	131.1	117.9	140.6	118.6	114.8	109.9	105.4	148.2
40	80.3	97.2	158.2	101.6	100.6	85.0	93.3	99.1	105.9	127.2	140.6	85.1	106.8	61.9	103.9	102.2	183.4	142.8	203.5	151.5	138.6	82.1	168.0	146.1	137.7	138.5	141.4	210.2	190.4	219.5	139.0	181.6	150.4	133.6	157.6	152.8	201.4	215.5	239.4
41	115.6	124.0	187.1	135.3	139.4	109.3	116.2	134.1	128.7	174.0	169.6	140.7	136.2	151.5	46.0	146.6	135.0	146.0	196.1	140.7	148.4	132.4	214.2	186.8	59.8	173.9	186.1	179.4	149.8	157.4	137.4	170.3	176.6	213.5	141.9	219.7	209.7	174.8	192.6
42	122.1	112.1	121.0	145.7	127.0	139.4	155.8	149.9	135.6	156.3	159.9	129.6	154.5	145.3	167.6	160.0	152.4	145.6	205.5	107.3	108.0	126.5	117.6	109.6	126.5	117.4	128.7	138.9	137.1	195.5	128.7	200.2	192.0	218.7	271.9	307.9	216.2	204.8	216.6
43	93.3	94.9	130.6	95.8	83.2	79.3	82.7	89.9	117.1	115.9	126.3	85.2	93.1	85.9	80.1	63.1	70.6	88.7	383.3	97.5	103.4	91.4	185.7	163.7	194.0	165.2	175.6	165.5	103.9	218.7	86.8	139.3	250.5	336.7	162.7	378.7	370.2	162.7	388.9
44	112.1	69.8	51.1	123.9	75.0	78.3	88.9	60.8	94.1	93.5	165.8	110.5	78.9	78.2	76.1	75.6	152.2	149.0	195.3	59.3	80.6	79.3	129.6	133.0	114.7	84.4	125.3	128.0	143.3	149.7	42.3	135.6	140.6	198.2	111.0	180.7	176.7	127.0	201.9
45	154.7	147.5	96.9	174.7	149.3	151.1	119.7	134.9	130.5	155.5	170.4	145.5	124.8	136.0	76.8	182.5	147.6	176.4	86.6	155.6	65.6	161.6	100.1	90.0	166.0	270.2	68.4	64.6	56.7	59.2	188.1	78.2	160.8	52.3	41.7	60.1	46.3	79.1	76.7
46	85.1	111.3	77.3	119.3	135.4	105.2	94.0	87.5	72.9	106.3	123.1	100.4	83.7	118.0	124.7	129.6	115.8	100.9	127.5	104.6	74.5	114.7	70.4	78.6	86.8	95.6	94.3	106.3	107.5	125.4	108.7	63.0	136.0	42.2	84.4	85.5	89.9	97.2	124.2
47	261.2	268.8	237.8	305.6	278.9	372.7	334.0	356.9	324.5	360.2	329.8	315.9	301.4	260.5	286.1	278.1	255.6	179.3	105.2	249.8	264.0	328.6	138.5	261.3	244.1	82.9	85.5	91.6	94.3	98.3	255.8	77.5	75.9	95.7	94.0	98.2	101.9	101.3	127.8
48	96.3	179.5	184.6	96.1	170.6	180.1	95.4	75.0	165.7	190.5	183.4	168.7	192.0	183.3	177.4	178.5	153.7	165.5	144.8	128.7	145.3	174.7	197.4	139.5	153.5	156.7	153.9	147.0	136.9	180.2	127.6	134.7	151.4	190.8	81.8	142.0	111.5	163.7	155.1
49	158.6	167.8	200.7	156.6	148.8	154.5	128.7	125.5	123.4	185.7	209.8	171.3	191.4	194.4	170.1	170.2	147.2	138.7	171.2	141.1	151.0	176.3	196.3	159.5	164.4	149.5	178.7	167.5	163.4	182.6	148.9	266.6	171.3	182.0	158.8	149.1	158.2	189.8	178.3
50	98.7	142.2	159.5	153.4	140.4	145.7	58.5	115.9	121.0	142.3	127.2	120.5	80.7	135.0	101.8	85.1	375.7	376.8	81.4	81.6	152.2	150.0	158.7	148.9	120.9	119.8	97.9	85.3	159.6	58.3	69.7	69.4	173.6	81.8	92.2	94.8	99.3	65.0	99.0
51	274.6	280.2	120.9	303.4	284.7	301.9	258.8	301.2	276.0	265.1	234.8	275.7	76.5	118.3	135.1	112.1	118.3	151.1	138.6	70.3	79.5	294.2	129.7	120.2	97.1	115.3	156.6	148.0	141.5	58.4	68.7	138.7	180.0	165.5	165.9	156.7	144.7	121.6	140.9
52	101.7	87.1	147.9	102.6	105.0	104.0	65.3	43.7	40.4	42.3	47.5	126.0	152.8	109.4	110.1	121.5	131.1	129.1	73.2	150.1	289.1	97.7	34.8	223.1	82.2	85.4	127.9	137.3	116.6	117.9	179.9	95.8	95.6	136.9	121.1	124.7	122.6	102.5	122.8
53	111.6	131.3	203.5	129.3	138.2	157.7	151.9	153.0	150.7	180.4	101.1	171.0	148.6	120.6	133.2	141.1	141.4	154.6	127.8	142.6	145.2	118.6	192.0	116.2	121.0	115.1	117.3	155.1	61.5	137.9	156.2	121.6	122.4	192.1	152.2	130.6	125.6	102.7	144.8
54	116.8	103.3	153.5	135.1	137.1	145.6	140.1	142.5	147.7	189.1	215.3	127.0	129.0	107.5	96.9	74.4	82.3	113.7	105.5	211.1	133.8	85.8	163.4	137.7	128.9	134.5	170.6	156.9	196.5	201.7	117.3	238.3	213.4	159.3	116.0	102.3	87.6	203.3	117.1
55	188.3	196.1	220.6	192.7	132.8	178.5	162.8	173.1	220.4	190.6	131.3	215.1	263.4	256.0	274.9	327.9	279.1	211.5	280.8	197.4	160.3	210.8	184.5	263.2	257.9	270.9	286.3	113.8	94.2	335.1	396.6	290.9	314.6	361.4	333.4	295.6	281.1	317.4	288.2
56	134.8	130.3	149.1	163.7	169.9	184.6	126.7	154.1	140.6	140.2	155.3	161.5	141.2	127.3	152.3	146.8	146.4	141.0	359.0	131.7	141.6	150.4	180.7	173.0	159.3	138.1	237.1	139.1	117.0	271.7	121.4	333.9	353.8	802.3	306.8	543.9	581.0	250.6	353.6
57	100.1	138.9	196.9	162.6	129.2	111.1	1127.6	93.7	99.8	123.5	121.5	104.9	83.6	87.3	100.8	87.8	125.2	132.2	128.3	174.0	212.8	177.2	219.4	207.6	181.8	149.0	124.0	132.5	147.0	130.9	156.4	176.4	181.5	167.6	198.6	146.7	141.5	136.1	155.7
58	81.0	87.8	133.4	82.4	90.5	112.1	81.7	66.5	266.6	88.1	120.3	103.8	105.9	110.2	114.4	171.3	127.3	113.0	118.8	105.6	124.9	85.0	122.0	98.4	151.2	125.3	135.6	56.6	127.8	112.2	132.0	147.3	129.2	49.9	156.1	145.7	144.3	150.8	123.9
59	248.8	209.4	325.6	230.8	212.6	230.4	207.6	226.1	422.5	376.6	468.7	418.4	292.3	205.5	209.3	210.3	194.9	203.5	82.5	231.4	305.7	220.5	122.9	269.1	212.7	204.8	172.6	165.3	125.4	32.8	194.7	61.5	255.9	90.5	104.3	78.5	57.6	40.2	117.9
60	85.6	137.4	134.9	282.7	520.4	322.8	151.2	124.0	146.4	134.6	117.1	117.8	72.9	66.3	62.4	161.2	251.3	274.9	88.0	75.8	98.0	216.2	138.7	132.9	141.5	86.7	79.2	63.8	139.5	28.9	62.5	47.8	175.6	138.5	125.6	105.3	99.0	29.5	92.2
61	80.9	74.8	127.6	109.8	104.2	80.5	76.5	77.1	79.4	96.7	97.3	85.3	84.7	80.4	83.1	185.1	80.7	88.4	117.3	113.1	117.4	88.2	119.5	111.7	118.4	119.5	133.0	136.5	128.8	136.8	94.0	133.3	138.8	166.7	166.3	120.8	123.9	134.6	119.8
62	90.3	71.9	65.4	101.0	95.4	80.8	73.6	173.3	74.8	101.8	91.6	71.1	93.9	117.8	113.8	150.4	156.7	170.9	74.0	168.0	145.3	97.8	156.5	137.7	116.8	115.2	111.3	120.9	99.8	98.2	169.2	98.5	32.8	81.6	55.8	59.6	69.4	97.0	76.5
63	108.1	132.6	112.9	59.4	154.8	143.9	115.9	115.1	116.0	127.6	84.0	63.2	67.5	82.4	94.7	122.7	184.3	161.2	85.4	160.1	74.9	150.6	97.1	87.9	97.8	94.3	69.0	115.9	107.1	118.9	60.0	74.7	106.2	149.8	138.8	107.7	89.5	89.6	127.6
64	98.7	110.9	46.8	129.3	97.1	111.5	113.0	149.6	141.5	114.3	135.1	139.8	137.0	155.5	114.6	120.9	120.7	127.8	107.8	113.1	114.4	140.0	124.5	101.2	112.1	82.2	93.8	118.5	107.9	117.9	102.5	102.5	124.1	145.0	133.3	118.6	111.6	103.0	139.9
65	80.1	38.4	122.7	34.9	28.6	31.9	30.1	64.4	163.3	186.8	109.0	172.7	155.1	150.7	150.8	147.8	117.5	138.0	123.3	103.7	290.9	134.7	134.2	177.5	126.6	42.9	32.8	34.9	189.0	104.4	35.2	100.6	98.9	116.3	89.2	101.2	109.9	95.0	123.6

66	74.7	83.4	117.6	89.9	285.4	94.1	111.8	119.0	110.5	108.4	108.8	94.3	96.5
67	158.3	143.1	83.0	183.3	152.8	181.1	174.8	216.9	196.3	186.0	130.2	236.3	249.1
68	115.5	118.1	111.5	134.4	109.0	111.1	122.1	114.1	179.6	89.7	78.1	72.7	81.5
69	121.3	120.9	179.9	127.6	223.4	134.3	129.0	139.1	172.8	193.4	170.8	176.1	150.5
70	154.1	137.2	77.7	46.7	132.6	152.7	149.4	148.8	151.2	177.4	101.7	163.8	159.0
71	143.5	144.7	142.4	149.3	123.2	137.6	124.6	128.2	124.9	135.8	133.8	139.3	140.3
72	173.3	164.0	144.4	193.5	172.5	177.5	167.6	158.5	150.0	148.9	148.8	139.4	140.3
73	86.0	84.3	86.6	115.4	91.5	76.7	29.4	65.5	168.8	73.9	78.9	85.8	92.4
74	181.8	142.1	143.3	148.6	148.0	154.9	124.1	137.6	155.6	179.4	115.4	174.5	120.7
75	31.0	137.8	149.2	114.6	91.9	116.3	93.7	131.4	101.4	120.9	144.3	141.0	87.7
76	120.1	117.4	177.3	155.4	150.7	132.9	120.1	60.6	157.5	188.9	148.0	158.0	148.0
77	109.1	271.3	120.3	90.9	128.4	131.4	91.2	89.0	93.3	99.6	121.4	89.8	87.2
78	121.6	135.3	140.3	160.1	102.7	142.8	200.8	184.0	201.4	243.4	186.4	125.4	141.5
79	113.3	121.0	89.2	146.1	134.1	141.7	127.8	124.2	92.1	98.1	94.0	94.7	110.1
80	202.6	176.8	124.5	91.0	130.7	154.6	143.1	133.5	128.6	148.4	176.1	155.8	147.4
81	91.6	82.8	138.3	102.2	109.0	138.2	106.0	121.7	118.9	149.3	156.0	138.0	132.0
82	153.3	144.5	140.0	159.4	188.4	223.6	237.0	196.8	175.0	156.3	174.5	167.6	148.4
83	135.8	289.0	77.2	296.1	280.2	284.5	276.3	265.8	209.2	81.5	76.7	66.3	120.5
84	258.5	354.0	155.1	339.2	669.1	507.9	370.4	273.6	128.3	141.5	145.4	192.5	343.0
85	199.8	185.7	56.3	147.7	77.4	59.2	91.3	124.1	171.6	189.5	158.7	86.4	87.1
86	75.8	84.7	109.0	94.0	82.8	87.3	96.2	130.9	300.5	141.0	130.2	125.5	112.7
87	238.8	319.5	129.6	194.8	262.2	341.1	267.9	304.4	284	499.2	450.4	376	415.1
88	68.4	90.2	78.7	114.2	96.3	96.3	86.1	107	161	127	131.3	87	85.5
89	78.3	67.8	178.3	241.8	227.5	47.2	29.6	64.5	87.7	110.2	87.4	122	142.1

66	90.8	98.7	97.4	92.2	100.9	106.0	99.6	100.4	79.1	122.1	113.4	106.4	104.0
67	193.7	125.9	228.8	206.8	199.5	209.7	88.3	176.0	158.7	58.7	174.7	68.4	159.3
68	95.1	81.3	84.4	86.3	119.1	109.8	80.7	43.5	152.1	76.3	153.5	144.5	131.8
69	174.1	148.1	160.3	138.3	153.4	135.5	163.1	189.9	129.3	162.8	150.1	138.9	116.0
70	149.5	159.1	156.8	142.9	167.5	97.3	157.1	66.7	139.8	90.5	78.3	190.5	84.4
71	126.7	159.5	172.8	145.5	148.3	132.0	137.0	135.3	131.0	141.6	125.4	126.0	127.9
72	129.7	126.4	166.2	245.7	232.4	209.2	121.6	121.8	67.0	135.9	137.3	56.6	173.2
73	82.5	55.3	158.1	243.7	232.9	99.2	58.3	82.8	98.9	107.3	84.2	98.6	310.0
74	154.4	44.3	170.1	148.3	151.0	133.1	97.4	231.8	153.2	225.5	190.7	75.5	168.1
75	52.1	104.1	126.4	195.9	184.6	136.6	89.8	105.8	177.1	154.1	124.9	92.5	147.4
76	144.0	139.0	172.9	151.5	142.5	79.9	79.8	149.6	127.0	165.6	169.2	154.8	127.4
77	127.5	147.9	130.2	137.8	144.8	96.5	120.1	147.7	66.5	40.0	81.5	140.4	137.2
78	133.4	126.4	125.9	135.7	139.6	116.0	160.4	112.0	152.1	111.1	91.2	78.5	76.1
79	105.6	99.7	301.7	103.4	111.5	140.0	109.3	71.3	138.4	121.6	125.3	129.9	124.7
80	154.7	169.3	151.7	110.2	107.9	77.0	81.0	84.8	102.0	120.1	85.6	192.6	183.4
81	123.4	127.7	225.0	122.5	137.9	156.2	133.7	126.3	70.1	140.2	128.8	133.7	121.0
82	102.2	106.7	134.7	160.4	125.7	169.6	240.6	134.4	139.6	153.4	141.8	132.0	266.6
83	258.9	106.3	714.4	237.2	232.2	157.1	109.3	174.2	273.1	81.2	102.0	157.3	251.1
84	421.6	116.3	385.0	349.6	183.3	68.6	164.3	125.3	248.4	144.7	160.1	67.9	197.6
85	95.0	114.2	299.4	284.7	289.4	153.4	94.3	106.2	160.2	144.1	83.5	167.0	225.0
86	87.0	102.4	291.4	172.8	181.5	150.0	182.9	116.9	191.8	106.9	96.5	100.3	117.6
87	391.8	168.4	371.9	349.3	216.9	364.5	308.3	830.5	457.1	338.1	664.4	248.20	298.94
88	145.8	57.2	115.3	124.1	120.9	132.7	144.1	147.6	182.7	166.5	152.3	151.75	133.56
89	146.5	186	178.5	118.4	141.8	111.2	89.4	90.7	148.3	161	149.3	130.74	116.11

66	104.6	110.2	113.1	110.6	96.1	106.2	107.3	130.4	122.4	116.9	116.3	104.3	113.8
67	177.4	168.2	191.1	222.4	198.1	218.8	210.0	234.0	246.6	183.4	218.3	210.2	222.0
68	130.4	148.0	95.0	31.1	99.4	140.4	118.2	195.6	174.1	148.6	126.5	125.1	120.1
69	139.4	142.0	128.7	167.3	145.9	166.6	371.0	683.2	617.5	325.5	158.4	159.6	162.4
70	67.0	77.2	86.8	95.1	148.9	138.3	191.1	76.4	51.8	71.6	88.5	85.0	63.1
71	152.3	138.5	127.5	151.6	144.3	148.7	139.6	148.6	158.1	134.1	134.9	144.7	142.3
72	237.8	98.3	96.4	190.5	164.8	152.3	142.2	142.0	136.2	159.8	149.8	181.7	225.9
73	88.0	98.9	59.9	85.3	31.3	83.7	90.1	97.8	105.6	96.9	156.6	89.3	95.2
74	156.3	134.6	140.1	138.8	162.4	104.0	112.6	160.0	148.7	114.9	166.0	112.9	186.8
75	92.9	95.7	76.8	96.9	90.1	128.5	94.8	116.1	157.4	176.1	136.2	94.6	108.3
76	58.5	80.2	75.7	85.0	147.8	76.1	87.1	108.9	103.4	87.3	80.2	81.3	78.8
77	129.8	131.6	120.9	140.5	128.4	124.5	119.1	185.4	154.2	128.9	117.3	107.2	112.2
78	83.1	178.1	170.0	94.2	27.5	99.4	93.3	128.9	55.6	114.6	108.1	97.5	171.5
79	117.4	150.7	118.9	119.2	99.0	105.9	123.4	118.1	124.5	120.9	132.3	108.7	119.1
80	101.5	185.5	96.4	95.1	72.1	108.8	114.5	140.4	106.9	84.4	93.7	104.9	76.7
81	129.5	141.6	131.8	133.9	109.7	142.4	149.3	139.7	158.7	147.3	153.1	124.8	147.1
82	108.8	87.3	75.6	77.5	121.2	105.5	176.7	127.9	131.5	156.1	149.8	72.5	203.5
83	289.1	288.3	53.5	425.5	224.1	48.6	154.6	50.8	45.4	48.6	169.9	129.9	159.2
84	192.1	189.1	174.9	72.8	163.7	53.6	177.5	136.4	148.7	121.1	171.5	88.8	67.9
85	72.5	132.4	77.0	76.3	90.0	95.8	102.4	139.0	128.3	48.6	132.7	81.2	107.1
86	130.0	141.3	134.8	173.1	90.5	170.5	157.5	174.3	149.4	125.0	146.3	156.8	152.6
87	326.68	349.53	283.72	232.38	221.33	410.02	323.84	788.81	244.72	303.56	281.16	176.72	147.27
88	60.78	143.76	171.38	153.02	101.97	124.30	102.42	100.28	95.79	90.42	123.83	135.47	153.76
89	110.81	136.28	102.13	117.83	130.53	139.59	154.75	190.40	216.81	184.53	142.31	155.07	147.53

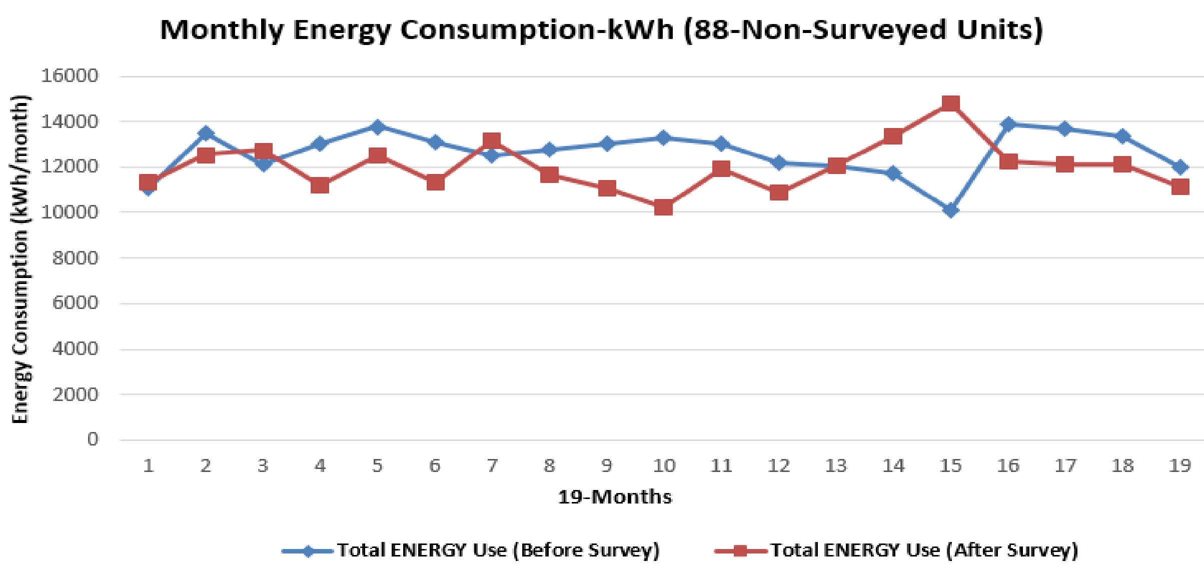
Also, breakdown of the average energy consumption for the last three and half years is presented.

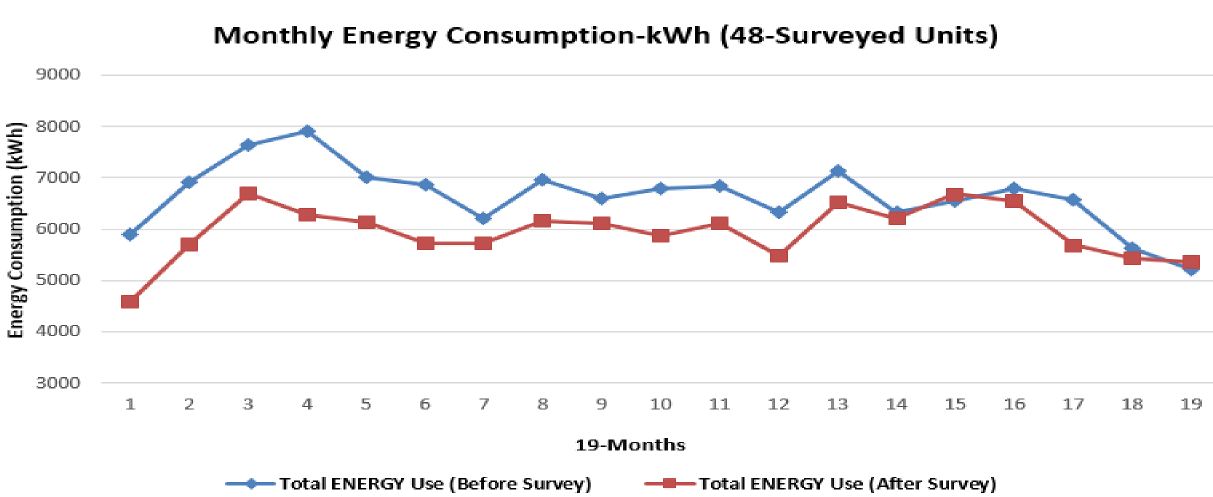


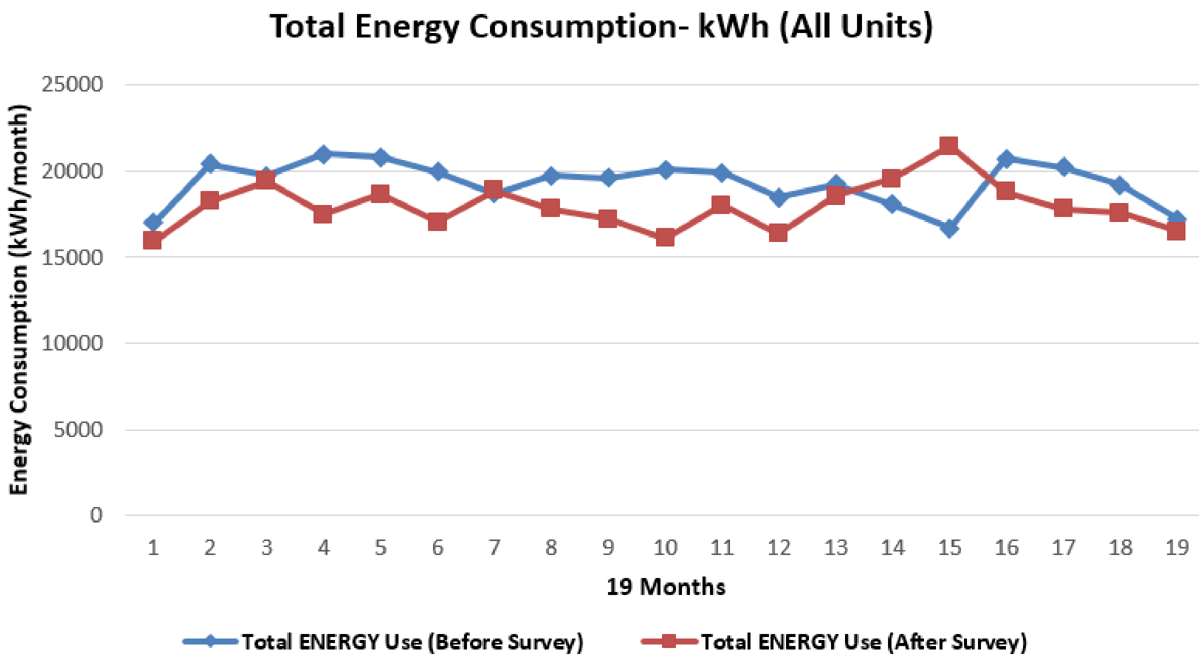
Analysis of Energy Consumption Data

The figures below show that a majority of the time, not only 48-surveyed occupants but also non-surveyed occupants consume less energy than the non-surveyed occupants.

	AEU 2010-2012 (kWh/19 months)	AEU 2012-2013 (kWh/19 months)	AEU 2010-2013 (kWh/38 months)
Surveyed Units (#48)	128,035	114,234	242,269
Non-surveyed Units (#88)	236,261	222,,361	458,622
All units (#136)	364,296	336,595	700,891







	AEU 2010-2012 (kWh/yr)	AEU 2012-2013 (kWh/yr)	AEU 2010-2013 (kWh/yr)	% Reduction
Surveyed Units (#48)	81,035	72,300	76,667	10%
Non-surveyed Units (#88)	149,532	140,735	145,134	6%
All units (#136)	230,567	213,035	221,381	8%

Appendix D: Historical Energy consumption Detail (24 months)

In order to have more accurate annual data, historical energy use was divided into two different groups of 12 months (April 1, 2011 until March 31, 2012 and July 1, 2012 until June 30, 2013) which contain of one heating and one cooling season each set.

Also, average energy consumption vs. Heating Degree Days (HDD) and Cooling Degree Days (CDD) of the surveyed and non-surveyed units is analysed below. Scattered-plot of annual energy consumption demonstrates as Heating Degree Days (HDD) and Cooling Degree Days (CDD) increase, energy consumption increase as well. Therefore, the conclusion can be made that, as weather tends to get colder, people use more energy. The correlation between average energy Consumption and HDD/CDD from the data set are shown in followed.

88- Non-Surveyed Units’ Energy Consumption-kWh/per Unit (Befor and after Applying Survey)

Non-Surveyed Units	Apr-11	May-11	Jun-11	Jul-11	Aug-11	Sep-11	Oct-11	Nov-11	Dec-11	Jan-12	Feb-12	Mar-12	SUM	Jul-12	Aug-12	Sep-12	Oct-12	Nov-12	Dec-12	Jan-13	Feb-13	Mar-13	Apr-13	May-13	Jun-13	SUM
708	83.6	189.3	76.4	78.1	75.0	76.9	85.9	86.7	86.5	86.4	92.5	94.1	1,111.4	72.4	71.4	68.3	88.4	90.4	105.5	107.1	179.8	99.0	78.9	80.9	176.6	1,218.7
707	94.7	289.8	89.2	121.2	123.8	63.0	40.5	67.4	96.1	97.0	77.5	84.4	1,244.6	109.9	97.6	78.7	70.8	64.8	85.7	56.8	173.0	84.3	173.0	76.3	76.6	1,147.5
709	49.8	85.2	35.6	31.2	30.4	26.2	76.3	92.5	73.6	67.0	248.6	255.3	1,071.7	71.8	127.7	102.0	157.0	135.4	172.2	128.7	161.8	167.4	157.6	141.9	121.8	1,645.2
712	103.9	92.8	118.2	123.6	132.0	124.6	100.8	94.8	90.4	118.7	283.0	286.8	1,669.6	88.2	135.1	101.2	104.4	110.9	105.2	112.0	91.7	89.9	94.2	101.4	189.2	1,323.4
711	262.4	263.5	248.1	148.9	250.6	239.8	272.9	234.7	149.7	242.7	239.5	262.3	2,815.1	72.2	55.6	248.0	244.7	77.4	281.7	196.8	245.0	280.4	235.5	294.9	266.8	2,499.1
614	47.0	30.8	93.4	145.7	139.8	107.2	82.4	82.4	75.5	82.9	85.4	98.3	1,070.8	39.0	134.3	125.5	159.6	62.6	65.6	73.8	153.9	72.7	88.0	69.5	69.8	1,114.3
902	87.4	101.2	87.7	87.6	88.3	89.1	108.6	91.2	81.1	82.5	85.0	87.4	1,077.1	56.3	79.8	73.2	89.4	77.2	84.9	88.7	192.5	83.8	90.2	81.0	89.8	1,086.8
903	61.3	167.0	175.5	84.8	83.0	69.1	71.8	62.5	62.3	39.4	42.8	65.0	984.5	55.1	81.6	74.1	78.0	51.8	47.1	164.1	148.7	100.9	60.8	80.3	103.7	1,046.2
910	47.2	240.6	48.3	88.8	85.9	55.1	50.7	58.2	59.0	29.5	155.6	177.6	1,096.5	54.3	92.1	106.5	91.3	131.5	132.3	115.2	99.2	114.5	200.0	114.0	108.6	1,359.5
413	85.6	255.1	73.0	109.9	136.6	110.1	118.5	89.6	79.6	60.5	158.9	158.4	1,435.8	68.9	113.0	114.8	82.2	116.6	127.9	137.3	85.4	117.9	41.2	95.8	95.6	1,196.6
410	68.4	71.7	86.1	51.2	75.6	70.7	75.6	72.9	82.1	88.0	186.4	187.4	1,116.1	56.9	112.5	84.8	93.7	83.5	101.1	96.8	83.9	79.9	79.8	69.8	167.5	1,110.2
407	82.9	89.6	83.9	100.8	108.6	94.7	80.4	77.3	92.8	101.0	100.1	103.7	1,115.8	150.9	77.7	74.2	74.9	101.7	113.1	86.8	129.8	109.6	43.5	83.6	91.2	1,136.8
811	43.4	46.8	48.8	66.9	75.0	49.5	50.1	44.6	44.0	42.6	57.4	46.3	615.4	140.8	63.8	47.1	53.0	48.1	48.1	51.6	44.8	51.7	38.8	50.1	51.5	689.3
810	169.1	151.5	52.3	75.5	86.7	53.0	73.3	63.9	76.3	69.0	68.2	76.5	1,015.3	135.6	40.9	74.0	80.5	76.4	81.7	96.6	81.2	95.5	55.3	43.1	82.2	942.9
801	79.2	68.5	71.2	86.5	75.7	67.0	69.4	74.7	84.6	85.9	80.3	74.9	917.9	82.8	79.3	69.4	70.8	76.6	77.3	83.5	67.5	82.5	66.4	69.6	79.5	905.2
612	75.4	106.8	114.7	149.1	148.8	115.2	82.1	92.5	86.5	75.2	76.5	76.4	1,199.2	168.3	142.4	104.0	107.6	84.6	56.5	94.4	99.9	47.5	75.7	57.2	65.6	1,103.7
611	79.0	86.9	109.9	108.9	121.3	128.4	84.2	89.3	81.4	87.5	84.0	69.0	1,129.8	91.5	112.0	85.3	77.1	69.2	61.7	74.7	80.5	110.9	71.8	92.1	107.2	1,034.0
503	75.8	73.3	76.3	100.0	90.7	76.5	79.3	72.9	70.4	68.5	73.9	77.1	934.7	90.4	110.3	102.0	85.0	30.6	73.5	56.3	71.7	34.9	84.0	41.7	41.7	822.1
507	74.6	85.7	82.4	82.2	89.0	74.0	94.8	90.7	97.8	100.9	93.5	87.2	1,052.8	65.4	98.1	96.5	95.8	76.7	94.4	92.9	94.8	79.5	96.6	96.1	82.3	1,069.1
1011	290.6	357.8	319.2	393.1	332.5	281.9	272.1	235.3	231.8	221.8	177.7	192.9	3,306.7	492.8	283.2	301.6	312.1	102.1	316.7	189.3	397.9	244.9	175.5	296.4	237.5	3,350.0
1008	66.1	88.3	90.0	112.4	119.5	80.4	74.4	72.9	82.7	78.0	69.5	80.2	1,014.4	65.8	178.4	154.5	87.8	108.4	101.6	97.0	198.8	109.5	74.6	101.6	89.2	1,367.2
1005	69.9	67.0	69.3	83.1	81.2	67.1	66.1	70.5	57.5	60.6	76.6	145.4	914.3	51.9	80.5	61.3	172.7	156.4	85.7	108.3	172.2	75.1	46.3	100.1	123.7	1,234.1
1104	80.8	91.7	280.7	106.8	99.9	94.5	86.2	79.2	82.4	81.7	107.7	87.0	1,278.6	99.7	88.9	91.1	162.3	45.1	57.9	58.4	152.7	54.6	99.5	69.6	101.6	1,081.3
1108	267.9	304.4	484.0	899.2	654.4	376.0	415.1	391.8	368.4	371.9	349.3	416.9	5,299.3	957.1	838.1	664.4	248.2	383.7	326.7	349.5	298.9	232.4	221.3	410.0	323.8	5,254.2
1110	406.9	306.8	191.4	197.9	184.8	213.7	312.9	266.1	89.2	324.0	295.8	310.2	3,099.7	200.1	137.2	157.2	204.0	143.4	346.5	271.3	240.8	409.5	221.9	305.6	382.2	3,019.7
1014	119.7	85.9	81.3	98.9	100.7	77.9	111.5	88.4	82.2	92.3	93.0	79.8	1,111.6	108.7	71.2	70.6	63.1	156.6	61.7	160.8	163.9	82.5	80.1	171.1	141.1	1,331.3
1001	322.7	365.4	333.3	337.3	335.3	334.6	351.1	381.1	497.7	613.7	491.5	328.9	4,692.6	232.4	116.2	330.2	129.5	127.8	361.1	147.1	331.7	357.2	327.8	335.9	292.3	3,089.2
304	78.0	52.0	57.8	76.3	75.2	41.7	52.7	46.8	42.9	52.0	45.0	49.8	670.2	290.7	79.3	59.3	165.2	167.5	74.6	70.1	161.2	75.0	44.4	69.9	164.9	1,422.3
302	125.8	101.5	132.7	122.3	98.0	85.0	79.1	69.3	70.6	71.3	68.9	80.0	1,104.5	95.8	109.7	95.9	96.1	94.7	107.6	104.1	189.2	106.1	74.7	101.7	100.6	1,276.1
306	361.9	375.1	284.7	298.7	416.5	428.6	447.9	323.8	89.9	211.1	176.5	180.1	3,594.8	399.6	195.4	272.7	169.0	179.1	161.3	146.7	167.8	198.0	206.8	250.2	221.2	2,567.8
308	29.2	65.9	69.9	85.5	76.4	69.8	26.8	24.5	25.2	24.3	23.3	25.4	546.2	122.7	84.4	78.1	97.7	125.8	56.7	42.9	100.1	28.7	43.9	149.7	101.2	1,031.9
313	82.9	94.7	89.5	103.7	106.2	75.7	81.4	85.2	104.5	85.1	94.6	100.2	1,103.7	98.8	92.8	84.8	90.7	89.4	112.8	96.7	92.7	103.1	62.2	80.5	174.5	1,179.0
309	57.0	156.4	76.1	81.7	86.7	61.3	61.3	44.9	50.9	38.9	44.7	45.9	805.8	61.0	79.3	65.9	81.6	99.7	58.5	67.3	182.6	104.5	51.5	105.6	67.7	1,025.2
212	87.3	87.2	168.7	70.1	61.2	66.0	94.3	83.8	111.5	84.1	73.9	64.0	1,052.1	96.9	64.0	90.6	96.2	72.5	107.9	90.8	106.2	74.0	64.8	84.4	174.3	1,122.7
207	114.2	85.8	98.6	118.8	119.8	99.0	75.5	65.6	81.9	85.2	81.4	74.6	1,100.4	95.6	77.1	58.0	76.8	77.2	66.7	90.9	87.1	97.4	94.5	116.5	186.9	1,124.7
703	102.0	103.5	115.5	134.2	136.5	122.2	134.9	121.8	129.7	123.9	131.4	128.6	1,484.2	102.0	133.5	118.4	125.8	97.9	116.1	113.2	113.8	111.9	117.0	205.2	95.7	1,450.4
301	109.1	102.6	107.7	120.1	137.2	96.0	110.2	97.2	46.9	194.7	179.9	135.8	1,437.4	158.3	116.6	100.7	116.9	139.4	130.9	70.9	121.2	225.4	140.9	161.4	125.4	1,607.7
310	120.2	127.9	148.3	203.6	186.0	152.8	141.2	141.7	162.4	158.8	130.2	102.1	1,775.2	130.0	75.6	108.3	101.6	109.1	127.5	127.6	100.5	115.5	42.7	131.1	117.9	1,287.3
311	93.3	99.1	105.9	127.2	140.6	85.1	106.8	61.9	103.9	102.2	183.4	142.8	1,352.2	82.1	168.0	146.1	137.7	190.4	141.4	210.2	138.5	219.5	139.0	181.6	150.4	1,904.9
307	116.2	134.1	128.7	174.0	169.6	140.7	136.2	151.5	46.0	146.6	135.0	146.0	1,624.6	132.4	214.2	186.8	59.8	149.8	186.1	179.4	173.9	157.4	137.4	170.3	176.6	1,924.1
704	155.8	149.9	135.6	156.3	159.9	129.6	154.5	145.3	167.6	160.0	152.4	145.6	1,812.5	126.5	117.6	109.6	126.5	137.1	128.7	138.9	117.4	195.5	128.7	200.2	192.0	1,718.7
706	82.7	89.9	117.1	115.9	126.3	85.2	93.1	85.9	80.1	63.1	70.6	88.7	1,098.6	91.4	185.7	163.7	194.0	103.9	175.6	165.5	165.2	218.7	86.8	139.3	250.5	1,940.4
705	88.9	60.8	94.1	93.5	165.8	110.5	78.9	78.2	76.1	75.6	152.2	149.0	1,223.6	79.3	129.6	133.0	114.7	143.3	125.3	128.0	84.4	149.7	42.3	135.6	140.6	1,405.8
710	119.7	134.9	130.5	155.5	170.4	145.5	124.8	136.0	76.8	182.5	147.6	176.4	1,700.6	161.6	100.1	90.0	166.0	56.7	68.4	64.6	270.2	59.2	188.1	78.2	160.8	1,463.9
613	94.0	87.5	72.9	106.3	123.1	100.4	83.7	118.0	124.7	129.6	115.8	100.9	1,256.9	114.7	70.4	78.6	86.8	107.5	94.3	106.3	95.6	125.4	108.7	63.0	136.0	1,187.4
908	334.0	356.9	324.5	360.2	329.8	315.9	301.4	260.5	286.1	278.1	255.6	179.3	3,582.3	328.6	138.5	261.3	244.1	94.3	85.5	91.6	82.9	98.3	255.8	77.5	75.9	1,834.1
907	95.4	75.0	165.7	190.5	183.4	168.7	192.0	183.3	177.4	178.5	153.7	165.5	1,929.1	174.7	197.4	139.5	153.5	136.9	153.9	147.0	156.7	180.2	127.6	134.7	151.4	1,853.4
909	128.7	125.5	123.4	185.7	209.8	171.3	191.4	194.4	170.1	170.2	147.2	138.7	1,956.4	176.3	196.3	159.5	164.4	163.4	178.7	167.5	149.5	182.6	148.9	266.6	171.3	2,124.9
911	58.5	115.9	121.0	142.3	127.2	120.5	80.7	135.0	101.8	85.1	375.7	376.8	1,840.5	150.0	158.7	148.9	120.9	159.6	97.9	85.3	119.8	58.3	69.7	69.4	173.6	1,412.0
913	258.8	301.2	276.0	265.1	234.8	275.7	76.5	118.3	135.1	112.1	118.3	151.1	2,323.0	294.2	129.7	120.2	97.1	141.5	156.6	148.0	115.3	58.4	68.7	138.7	180.0	1,648.4
412	65.3	43.7	40.4	42.3	47.5	126.0	152.8	109.4	110.1	121.5	131.1	129.1	1,119.2	97.7	34.8	223.1	82.2	116.6	127.9	137.3	85.4	117.9	179.9	95.8	95.6	1,394.2
402	151.9	153.0	150.7	180.4	101.1	171.0	148.6	120.6	133.2	141.1	141.4	154.6	1,747.6	118.6	192.0	116.2	121.0	61.5	117.3	155.1	115.1	137.9	156.2	121.6	122.4	1,535.1
406	140.1	142.5	147.7	189.1	215.3	127.0	129.0	107.5	96.9	74.4	82.3	113.7	1,565.5	85.8	163.4	137.7	128.9	196.5	170.6	156.9	134.5	201.7	117.3	238.3	213.4	1,944.9
403	162.8	173.1	220.4	190.6	131.3	215.1	263.4	256.0	274.9	327.9	279.1	211.5	2,706.1	210.8	184.5	263.2	257.9	94.2	286.3	113.8	270.9	335.1	396.6	290.9	314.6	3,018.8
812	126.7	154.1	140.6	140.2	155.3	161.5	141.2	127.3	152.3	146.8	146.4	141.0	1,733.4	150.4	180.7	173.0	159.3	117.0	237.1	139.1	138.1	271.7	121.4	333.9	353.8	2,375.5
807	127.6	93.7	99.8	123.5	121.5	104.9	83.6	87.3	100.8	87.8	125.2	132.2	1,287.9	177.2	219.4	207.6	181.8	147.0	124.0	132.5	149.0	130.9	156.4	176.4	181.5	1,983.7
805	81.7	66.5	266.6	88.1	120.3	103.8	105.9	110.2	114.4	171.3	127.3	113.0	1,469.1	85.0	122.0	98.4	151.2	127.8	135.6	56.6	125.3	112.2	132.0	147.3	129.2	1,422.6
610	207.6	226.1	422.5	376.6	468.7	418.4	292.3	205.5	209.3	210.3	194.9	203.5	3,435.7	220.5	122.9	269.1	212.7	125.4	172.6	165.3	204.8	32.8	194.7	61.5	255.9	2,038.3
609	151.2	124.0	146.4	134.6	117.1	117.8	72.9	66.3	62.4	161.2	251.3	274.9	1,680.1	216.2	138.7	132.9	141.5	139.5	79.2	63.8	86.7	28.9	62.5	47.8	175.6	1,313.4
605	76.5	77.1	79.4	96.7	97.3	85.3	84.7	80.4	83.1	185.1	80.7	88.4	1,114.7	88.2	119.5	111.7	118.4	128.8	133.0	136.5	119.5	136.8	94.0	133.3	138.8	1,458.3

62	603	73.6	173.3	74.8	101.8	91.6	71.1	93.9	117.8	113.8	150.4	156.7	170.9	1,389.7	97.8	156.5	137.7	116.8	99.8	111.3	120.9	115.2	98.2	169.2	98.5	32.8	1,354.6
63	602	115.9	115.1	116.0	127.6	84.0	63.2	67.5	82.4	94.7	122.7	184.3	161.2	1,334.6	150.6	97.1	87.9	97.8	107.1	69.0	115.9	94.3	118.9	60.0	74.7	106.2	1,179.5
64	501	113.0	149.6	141.5	114.3	135.1	139.8	137.0	155.5	114.6	120.9	120.7	127.8	1,569.8	140.0	124.5	101.2	112.1	107.9	93.8	118.5	82.2	117.9	102.5	102.5	124.1	1,327.3
65	506	30.1	64.4	163.3	186.8	109.0	172.7	155.1	150.7	150.8	147.8	117.5	138.0	1,586.2	134.7	134.2	177.5	126.6	189.0	32.8	34.9	42.9	104.4	35.2	100.6	98.9	1,211.8
66	508	111.8	119.0	110.5	108.4	108.8	94.3	96.5	90.8	98.7	97.4	92.2	100.9	1,229.3	79.1	122.1	113.4	106.4	113.1	104.6	110.2	104.0	110.6	96.1	106.2	107.3	1,273.1
67	511	174.8	216.9	196.3	186.0	130.2	236.3	249.1	193.7	125.9	228.8	206.8	199.5	2,344.3	158.7	58.7	174.7	68.4	191.1	177.4	168.2	159.3	222.4	198.1	218.8	210.0	2,005.9
68	505	122.1	114.1	179.6	89.7	78.1	72.7	81.5	95.1	81.3	84.4	86.3	119.1	1,204.0	152.1	76.3	153.5	144.5	95.0	130.4	148.0	131.8	31.1	99.4	140.4	118.2	1,420.6
69	411	129.0	139.1	172.8	193.4	170.8	176.1	150.5	174.1	148.1	160.3	138.3	153.4	1,905.9	129.3	162.8	150.1	138.9	128.7	139.4	142.0	116.0	167.3	145.9	166.6	371.0	1,958.0
70	211	149.4	148.8	151.2	177.4	101.7	163.8	159.0	149.5	159.1	156.8	142.9	167.5	1,827.1	139.8	90.5	78.3	190.5	86.8	67.0	77.2	84.4	95.1	148.9	138.3	191.1	1,387.9
71	214	124.6	128.2	124.9	135.8	133.8	139.3	140.3	126.7	159.5	172.8	145.5	148.3	1,679.7	131.0	141.6	125.4	126.0	127.5	152.3	138.5	127.9	151.6	144.3	148.7	139.6	1,654.3
72	206	167.6	158.5	150.0	148.9	148.8	139.4	140.3	129.7	126.4	166.2	245.7	232.4	1,953.9	67.0	135.9	137.3	56.6	96.4	237.8	98.3	173.2	190.5	164.8	152.3	142.2	1,652.3
73	209	29.4	65.5	168.8	73.9	78.9	85.8	92.4	82.5	55.3	158.1	243.7	232.9	1,367.2	98.9	107.3	84.2	98.6	59.9	88.0	98.9	310.0	85.3	31.3	83.7	90.1	1,236.2
74	202	124.1	137.6	155.6	179.4	115.4	174.5	120.7	154.4	44.3	170.1	148.3	151.0	1,675.4	153.2	225.5	190.7	75.5	140.1	156.3	134.6	168.1	138.8	162.4	104.0	112.6	1,761.7
75	1010	93.7	131.4	101.4	120.9	144.3	141.0	87.7	52.1	104.1	126.4	195.9	184.6	1,483.5	177.1	154.1	124.9	92.5	76.8	92.9	95.7	147.4	96.9	90.1	128.5	94.8	1,371.7
76	1009	120.1	60.6	157.5	188.9	148.0	158.0	148.0	144.0	139.0	172.9	151.5	142.5	1,731.0	127.0	165.6	169.2	154.8	75.7	58.5	80.2	127.4	85.0	147.8	76.1	87.1	1,354.6
77	1006	91.2	89.0	93.3	99.6	121.4	89.8	87.2	127.5	147.9	130.2	137.8	144.8	1,359.7	66.5	40.0	81.5	140.4	120.9	129.8	131.6	137.2	140.5	128.4	124.5	119.1	1,360.4
78	1004	200.8	184.0	201.4	243.4	186.4	125.4	141.5	133.4	126.4	125.9	135.7	139.6	1,943.9	152.1	111.1	91.2	78.5	170.0	83.1	178.1	76.1	94.2	27.5	99.4	93.3	1,254.5
79	1002	127.8	124.2	92.1	98.1	94.0	94.7	110.1	105.6	99.7	301.7	103.4	111.5	1,462.9	138.4	121.6	125.3	129.9	118.9	117.4	150.7	124.7	119.2	99.0	105.9	123.4	1,474.5
80	1003	143.1	133.5	128.6	148.4	176.1	155.8	147.4	154.7	169.3	151.7	110.2	107.9	1,726.7	102.0	120.1	85.6	192.6	96.4	101.5	185.5	183.4	95.1	72.1	108.8	114.5	1,457.6
81	1107	106.0	121.7	118.9	149.3	156.0	138.0	132.0	123.4	127.7	225.0	122.5	137.9	1,658.4	70.1	140.2	128.8	133.7	131.8	129.5	141.6	121.0	133.9	109.7	142.4	149.3	1,532.1
82	1109	237.0	196.8	175.0	156.3	174.5	167.6	148.4	102.2	106.7	134.7	160.4	125.7	1,885.3	139.6	153.4	141.8	132.0	75.6	108.8	87.3	266.6	77.5	121.2	105.5	176.7	1,586.1
83	1111	276.3	265.8	209.2	81.5	76.7	66.3	120.5	258.9	106.3	714.4	237.2	232.2	2,645.3	273.1	81.2	102.0	157.3	53.5	289.1	288.3	251.1	425.5	224.1	48.6	154.6	2,348.4
84	1103	370.4	273.6	128.3	141.5	145.4	192.5	343.0	421.6	116.3	385.0	349.6	183.3	3,050.5	248.4	144.7	160.1	67.9	174.9	192.1	189.1	197.6	72.8	163.7	53.6	177.5	1,842.3
85	1013	91.3	124.1	171.6	189.5	158.7	86.4	87.1	95.0	114.2	299.4	284.7	289.4	1,991.4	160.2	144.1	83.5	167.0	77.0	72.5	132.4	225.0	76.3	90.0	95.8	102.4	1,426.1
86	303	96.2	130.9	300.5	141.0	130.2	125.5	112.7	87.0	102.4	291.4	172.8	181.5	1,872.1	191.8	106.9	96.5	100.3	134.8	130.0	141.3	117.6	173.1	90.5	170.5	157.5	1,610.8
87	1113	370.4	273.6	128.3	141.5	145.4	192.5	343.0	421.6	416.3	385.0	349.6	183.3	3,350.5	155.1	144.7	160.1	167.9	74.9	192.1	189.1	197.6	72.8	88.8	53.6	77.5	1,574.1
88	1114	86.1	107.0	161.0	127.0	131.3	87.0	85.5	145.8	57.2	115.3	124.1	120.9	1,348.2	182.7	166.5	152.3	151.8	171.4	60.8	143.8	133.6	153.0	102.0	124.3	102.4	1,644.4
89	1112	29.6	64.5	87.7	110.2	87.4	122.0	142.1	146.5	186.0	178.5	118.4	141.8	1,414.7	148.3	161.0	149.3	130.7	102.1	110.8	136.3	116.1	117.8	130.5	139.6	154.8	1,597.4
90	**SUM**	**11,386**	**12,511**	**12,640**	**13,080**	**12,703**	**11,666**	**11,707**	**11,490**	**10,453**	**13,584**	**13,350**	**13,048**	147,617	**12,857**	**11,599**	**11,827**	**11,177**	**10,077**	**11,298**	**10,983**	**12,895**	**11,483**	**10,378**	**11,501**	**12,957**	139,034

48-Surveyed Units' Energy Consumption-kWh/per Unit (Befor and after Applying Survey)

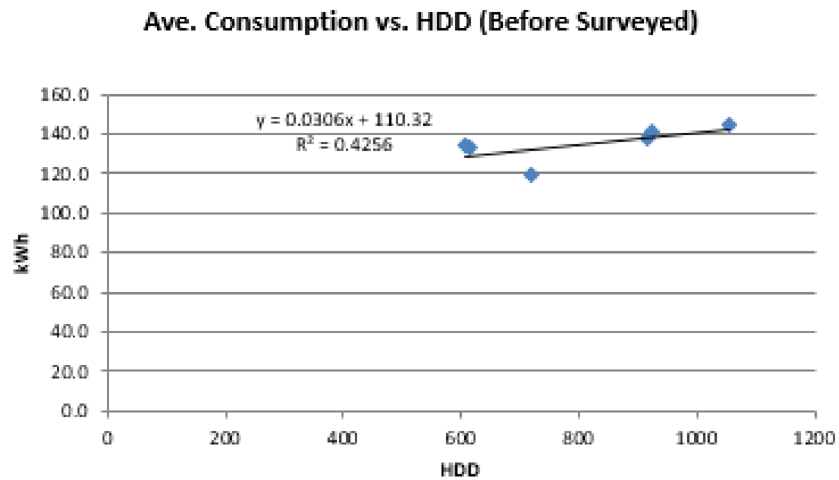
Surveyed Unit No.	Apr-11	May-11	Jun-11	Jul-11	Aug-11	Sep-11	Oct-11	Nov-11	Dec-11	Jan-12	Feb-12	Mar-12	SUM	Jul-12	Aug-12	Sep-12	Oct-12	Nov-12	Dec-12	Jan-13	Feb-13	Mar-13	Apr-13	May-13	Jun-13	SUM
401	106.0	131.3	171.0	103.3	91.2	123.2	125.0	108.1	101.5	113.7	178.4	109.5	1462.2	127.7	110.1	159.9	106.5	101.0	93.6	124.9	104.8	119.3	106.6	262.5	213.4	1630.3
208	188.3	188.8	216.8	229.0	222.6	184.9	184.9	178.3	186.1	195.1	265.0	177.1	2416.9	211.1	205.6	181.0	169.8	139.6	190.6	190.5	159.4	186.6	165.2	228.8	186.5	2214.7
404	147.2	139.7	162.0	122.7	126.6	100.4	103.0	184.8	98.0	125.3	150.0	127.2	1586.9	132.5	108.1	125.9	144.6	135.1	152.3	136.7	162.4	175.6	152.5	139.5	151.8	1716.9
804	131.9	132.4	105.4	137.0	126.0	103.6	108.8	97.3	101.1	93.9	111.8	94.0	1343.2	102.8	101.5	125.9	113.6	110.1	112.3	121.5	101.1	104.9	95.9	109.5	101.8	1301.1
312	82.1	73.4	93.2	113.8	93.0	85.7	73.4	283.7	89.2	82.6	92.9	85.0	1248.0	44.5	105.4	89.3	80.8	88.7	84.7	75.1	85.8	101.6	90.1	88.2	73.6	1008.0
809	90.8	95.9	141.3	118.3	131.5	109.5	141.5	130.7	120.1	151.3	110.3	83.5	1424.8	166.0	154.4	128.3	123.1	104.2	127.0	95.1	126.3	107.0	87.0	49.0	100.9	1368.4
502	83.3	84.9	97.4	86.0	84.4	80.1	89.1	82.7	100.0	96.1	82.8	83.7	1050.5	100.7	89.6	81.4	102.7	103.3	106.2	83.9	86.2	88.5	88.8	82.5	82.6	1096.5
606	116.7	119.3	174.3	153.1	151.4	126.8	116.1	113.4	115.0	117.5	145.7	100.6	1549.9	201.5	206.0	166.1	152.9	166.3	190.8	115.9	153.0	163.8	159.2	153.0	133.0	1961.5
803	234.9	287.6	311.7	228.6	187.2	206.0	195.5	163.0	171.7	173.1	300.2	173.5	2633.0	164.6	169.9	220.5	170.7	206.3	317.6	223.1	283.8	294.1	208.7	316.3	276.5	2852.1
702	83.4	126.7	80.3	182.7	198.5	171.8	116.9	111.5	138.1	113.8	98.9	88.5	1511.1	180.6	192.3	146.1	101.2	106.3	134.6	160.1	66.9	72.5	75.8	140.0	115.4	1491.8
1012	29.6	64.5	87.7	110.2	87.4	122	142.1	146.5	186	178.5	118.4	141.8	1414.7	148.3	161	149.3	130.74	116.11	110.81	136.28	102.13	117.83	130.53	139.59	154.75	1597.4
204	140.2	143.5	76.1	142.2	127.7	93.0	181.1	66.5	106.4	91.1	66.4	79.5	1313.7	103.9	106.0	86.4	72.0	73.2	70.4	133.9	73.4	75.7	64.9	67.0	75.1	1001.9
210	124.8	136.7	96.4	179.5	177.4	127.4	120.8	137.6	143.7	137.3	114.6	142.3	1638.4	163.0	136.6	108.4	102.8	88.7	97.3	143.3	116.4	101.1	86.7	84.2	106.3	1334.8
904	117.5	196.4	168.6	257.4	273.9	277.0	248.6	248.7	169.9	166.4	91.3	168.7	2384.4	215.2	217.4	162.8	176.0	148.2	159.7	204.2	134.7	145.9	55.2	64.6	70.1	1753.9
1007	44.3	42.0	30.7	50.5	54.5	51.5	153.6	53.1	51.6	54.0	32.3	52.3	670.5	60.1	57.3	53.2	60.8	55.0	33.0	37.1	27.4	32.4	40.9	42.8	45.3	545.2
414	78.3	79.2	75.4	80.1	85	78.2	78.7	79.5	70.9	84.3	70.4	77.4	937.4	74.1	67.5	75.1	81.43	78.25	76.46	90.76	56.95	62.26	62.11	61.54	58.18	844.6
504	132.2	117.4	124.6	160.9	113.7	93.1	181.3	38.9	136.0	68.6	84.6	101.8	1353.0	169.5	133.6	97.2	95.4	95.1	108.3	106.3	109.3	128.0	100.6	109.1	83.9	1336.1
409	57.1	49.0	80.3	71.2	80.5	63.8	158.9	69.4	148.8	41.5	71.9	67.8	960.2	82.9	80.2	64.2	52.8	55.4	77.1	46.5	126.2	130.5	113.8	212.9	186.3	1228.8
813	47.1	66.9	140.9	131.3	137.9	105.0	117.0	108.5	112.5	110.8	105.1	98.4	1281.4	143.4	104.1	86.6	102.5	108.5	125.8	79.4	124.8	127.2	118.4	120.6	108.3	1349.7
513	124.2	121.0	108.4	157.7	206.2	130.6	137.5	117.8	127.4	104.2	103.1	84.5	1522.5	105.6	95.1	87.6	95.2	109.1	85.6	101.4	79.1	125.9	92.7	59.3	107.5	1144.1
714	187.9	225.2	78.1	82.6	90.6	105.4	124.7	76.5	96.9	101.4	94.0	91.8	1355.1	69.1	73.1	93.0	78.9	73.2	80.7	155.5	138.0	87.4	103.5	173.0	123.0	1248.3
305	87.2	76.2	102.1	83.2	77.3	68.4	76.4	87.2	184.1	82.1	75.4	77.3	1076.9	81.3	89.1	88.9	113.4	109.7	104.5	70.6	82.5	91.6	88.0	74.9	68.7	1063.3
906	68.9	86.0	101.9	80.0	85.5	74.6	97.4	68.8	169.8	72.5	91.2	72.5	1069.0	88.0	86.2	75.3	74.8	94.9	104.0	68.6	222.3	121.2	95.7	109.9	95.0	1235.9
512	547.5	747.4	280.9	255.2	267.1	624.5	331.8	342.6	729.8	977.0	679.6	179.0	5962.4	237.0	351.9	628.0	263.5	158.7	157.9	283.8	232.7	331.1	276.8	917.9	672.8	4512.1
514	49.8	57.7	74.9	81.5	114.1	108.6	86.0	63.4	175.7	82.8	70.1	77.0	1041.7	123.6	99.8	89.1	83.0	79.6	80.2	63.3	84.0	85.8	74.0	54.8	51.3	968.4
601	156.8	194.1	201.6	156.8	122.1	168.6	126.9	112.7	124.5	168.1	335.5	135.2	2002.9	145.7	130.9	130.5	114.3	128.5	110.0	173.4	174.8	133.6	135.8	173.9	136.8	1688.3
510	206.3	216.7	181.6	206.3	200.7	102.6	133.5	189.2	249.0	248.1	136.0	262.9	2332.9	164.7	148.3	128.9	196.9	180.7	186.7	198.9	166.8	173.2	189.7	145.3	159.4	2039.4
213	72.6	63.0	140.9	89.8	87.9	52.1	160.0	106.4	94.6	120.9	104.3	108.6	1201.1	100.8	110.2	103.8	117.9	127.5	134.0	79.8	113.4	117.9	116.0	133.3	129.1	1383.7
713	246.4	277.4	303.8	352.5	347.1	282.3	281.4	258.2	253.3	274.1	526.7	293.3	3696.5	344.6	342.2	349.8	304.1	298.6	325.4	304.9	249.7	263.4	233.7	324.1	406.5	3746.9
314	138.0	172.1	177.5	169.9	180.9	148.7	151.6	115.0	152.2	132.4	166.9	197.3	1902.5	154.4	72.3	117.4	164.7	203.4	222.7	159.0	161.2	233.1	204.5	146.1	108.7	1947.4
1102	94.7	107.5	66.7	138.8	131.0	119.3	93.3	93.5	91.4	96.9	31.4	95.3	1159.9	144.5	119.6	65.2	52.5	46.9	51.1	117.4	58.0	63.9	59.9	56.8	49.6	885.3
701	79.9	95.8	175.4	107.7	93.2	81.1	174.2	189.6	98.7	109.2	189.6	93.0	1487.4	236.7	175.1	113.4	132.5	143.0	144.6	79.9	84.9	152.1	162.3	148.9	137.5	1710.8
1106	194.2	158.0	235.5	92.7	92.1	121.3	194.1	183.1	217.2	209.9	75.6	147.8	1921.5	86.6	78.4	97.8	171.8	176.0	204.0	24.4	140.9	85.7	83.7	73.9	71.6	1294.9
604	183.0	165.7	153.6	56.9	83.2	73.4	67.1	160.2	66.2	73.2	88.5	70.6	1241.6	104.2	72.4	73.9	68.5	172.6	190.2	135.1	144.7	169.2	148.5	60.3	64.6	1404.3
608	70.4	69.7	97.2	95.5	102.4	78.7	82.6	79.8	79.5	93.4	80.6	83.3	1013.0	77.1	68.6	63.0	81.0	78.6	92.3	83.2	70.2	97.5	99.9	85.7	74.4	971.4
509	141.4	127.8	177.9	129.3	152.8	172.8	159.7	137.6	165.7	144.9	141.4	99.6	1750.9	168.2	152.7	175.4	126.4	179.4	225.7	133.6	182.6	168.3	152.8	145.6	162.8	1973.5
802	182.4	183.4	121.0	112.7	134.7	110.9	134.3	151.4	73.3	177.6	45.0	100.0	1526.7	116.5	131.0	91.1	84.3	75.1	102.4	116.9	65.4	53.4	47.4	62.7	72.3	1018.4
912	172.8	224.9	109.8	281.1	296.9	231.1	272.7	58.0	43.1	43.7	96.7	81.9	1912.7	123.2	42.6	63.0	110.0	112.1	93.2	234.8	106.1	113.6	95.6	98.0	122.2	1314.4
901	50.8	54.9	61.1	81.6	90.0	57.2	75.7	76.5	69.9	56.0	42.6	66.0	782.4	56.5	30.3	36.7	51.2	48.4	56.6	54.8	85.4	87.4	70.2	68.0	61.0	706.6
814	86.1	107	161	127	131.3	87	85.5	145.8	157.2	115.3	124.1	120.9	1448.2	182.7	166.5	152.3	151.75	133.56	60.78	143.76	171.38	153.02	101.97	124.30	102.42	1644.4
405	120.5	121.0	127.7	153.5	152.7	128.4	136.0	119.9	28.9	118.0	119.3	120.5	1446.4	159.8	160.9	131.6	121.3	110.8	126.5	138.2	114.1	120.5	116.4	115.6	113.8	1529.5
905	122.2	162.3	107.1	175.9	186.8	165.3	218.2	105.5	84.8	102.0	114.6	89.2	1633.9	135.1	140.0	129.8	97.4	113.8	103.7	162.3	82.3	88.2	79.5	82.0	109.8	1324.0
408	180.8	162.3	155.9	160.1	164.2	131.4	141.0	136.3	138.6	127.5	181.5	134.5	1814.1	138.8	146.7	139.0	149.5	135.8	150.2	129.4	133.7	140.3	138.5	129.8	143.0	1674.6
607	128.6	127.3	126.3	115.5	137.4	101.7	206.5	101.3	121.8	128.0	97.7	117.3	1509.4	143.6	153.2	132.9	133.4	136.5	108.6	114.8	114.3	113.2	131.0	111.9	93.1	1486.5
808	169.4	182.1	179.5	206.0	198.6	188.7	165.1	169.0	45.5	162.3	176.1	181.0	2023.4	193.9	162.1	146.1	149.2	163.7	182.9	191.8	172.4	190.1	191.9	143.2	194.4	2081.8
806	80.7	81.0	66.7	94.6	84.4	65.6	167.7	168.9	73.9	73.1	79.2	60.5	1096.3	97.8	97.3	81.8	83.1	73.9	75.1	83.8	42.8	43.8	45.4	58.6	55.5	838.9
201	213.7	218.0	219.5	255.2	247.8	316.1	304.6	269.7	126.2	343.3	320.0	258.3	3092.4	208.9	106.1	183.9	163.7	156.2	214.4	56.4	155.5	270.8	235.2	174.9	154.4	2080.4
914	189.6	243.5	139.6	174.1	184.4	128.0	178.7	159.5	196.6	230.6	71.3	189.1	2084.9	171.1	108.7	85.7	87.4	91.9	127.7	172.2	96.4	86.0	66.8	81.7	81.7	1257.1
SUM	6382.5	7104.6	6666.8	6931.5	6993.8	6527.4	7200.5	6445.6	6582.4	6963.4	6748.9	5740.8	80288.2	6752.4	6217.9	6162.5	5762.0	5791.7	6270.1	6136.5	5926.0	6296.1	5640.7	6606.0	6246.6	73808.4

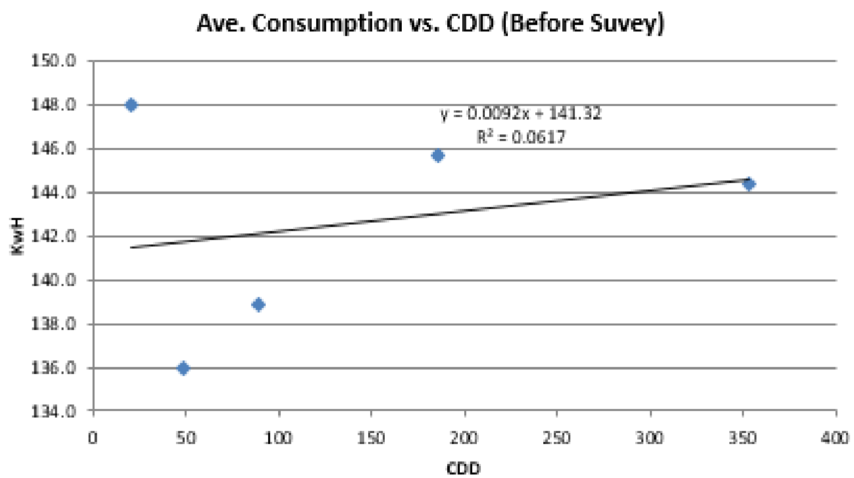
Heating Degree Days (HDD) and Cooling Degree Days (CDD)

Month	HDD	CDD	Month	HDD	CDD
Apr-11	617	0	Jul-12	0	297
May-11	239	20	Aug-12	1	199
Jun-11	0	89	Sep-12	107	62
Jul-11	0	353	Oct-12	451	0
Aug-11	0	186	Nov-12	799	0
Sep-11	40	49	Dec-12	980	0
Oct-11	437	0	Jan-13	1145	0
Nov-11	616	0	Feb-13	1073	0
Dec-11	981	0	Mar-13	951	0
Jan-12	1118	0	Apr-13	617	0
Feb-12	975	0	May-13	152	36
Mar-12	645	0	Jun-13	54	99
HDD/CDD/F	**5668**	**697**	HDD/CDD/F	**6330**	**693**
HDD/CDD/C	**3131**	**369**	HDD/CDD/C	**3499**	**367**

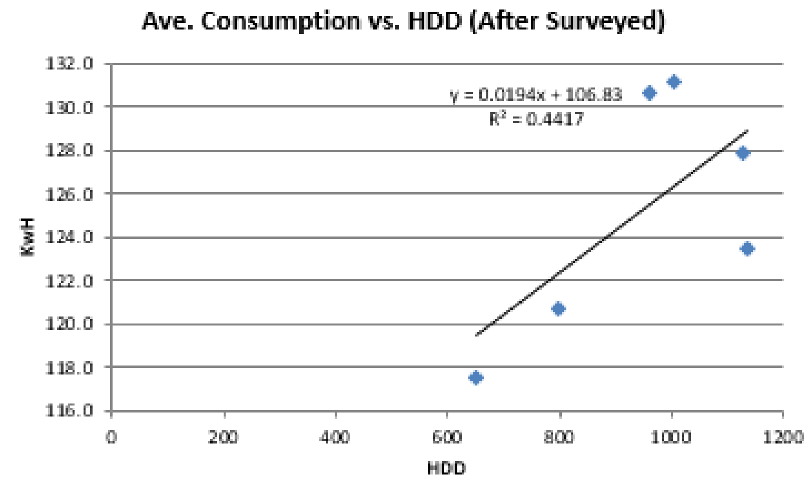
Source: http://www.weatherdatadepot.com/

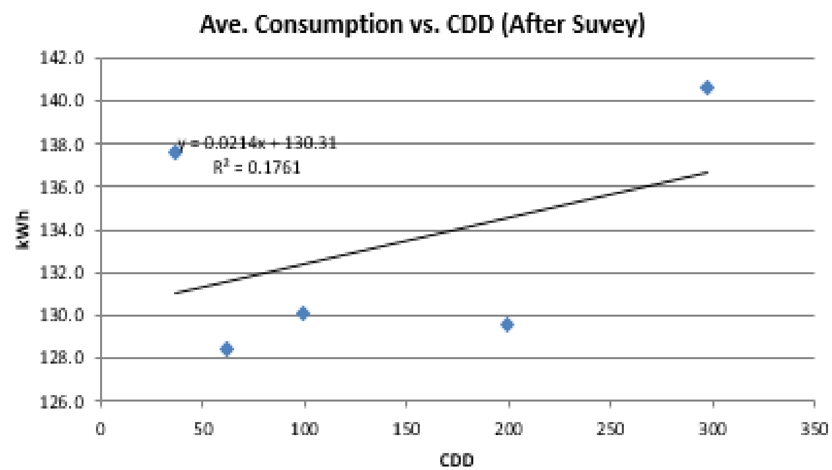
48-Surveyed Units





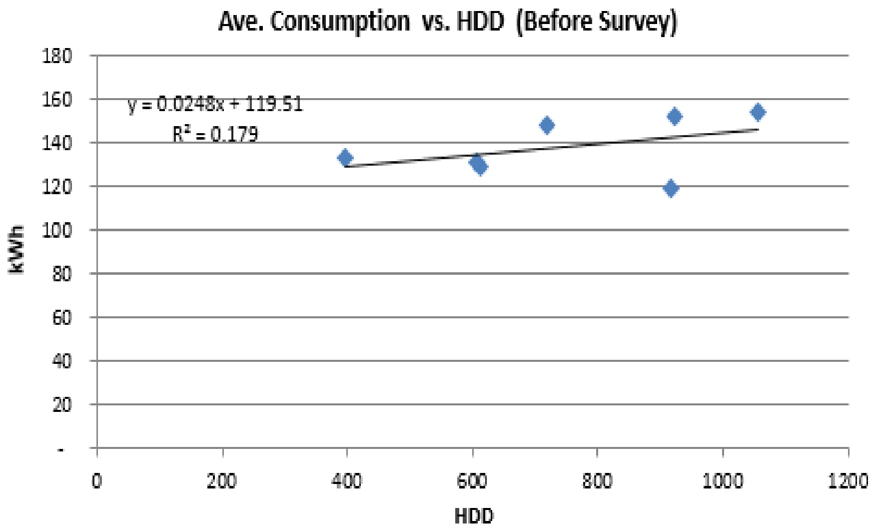
48-Surveyed Units

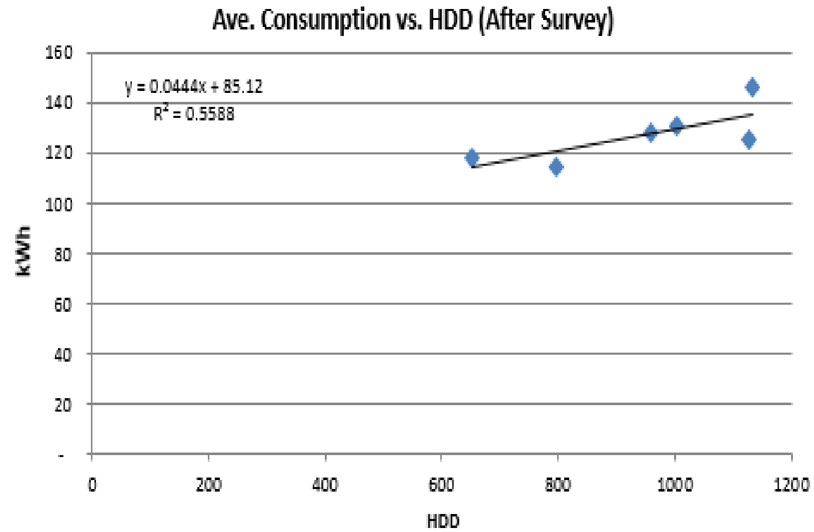


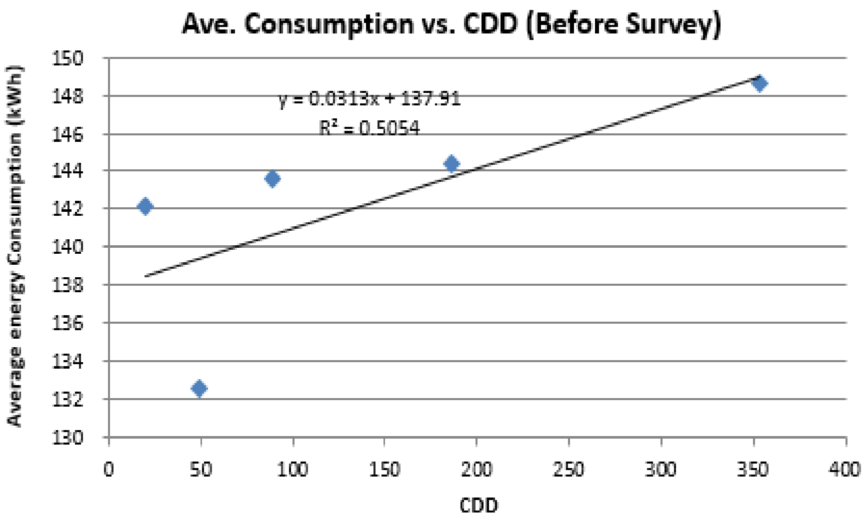


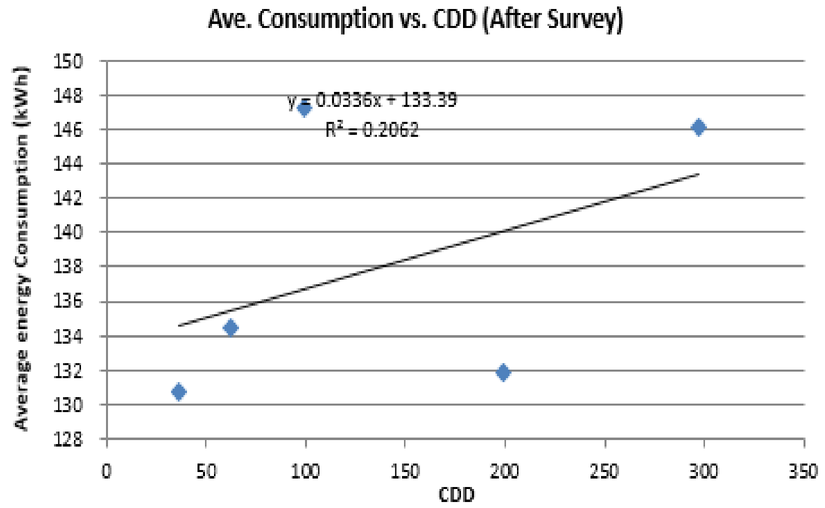
88-Non-Surveyed Units

48-Non-Surveyed Units


Ave. Consumption vs. HDD (Before Survey)
y = 0.0248x + 119.51
R² = 0.179
kWh
HDD
180
160
140
120
100
80
60
40
20
-
0
200
400
600
800
1000
1200


Ave. Consumption vs. HDD (After Survey)
y = 0.0444x + 85.12
R² = 0.5588
kWh
HDD
160
140
120
100
80
60
40
20
-
0
200
400
600
800
1000
1200


Ave. Consumption vs. CDD (Before Survey)
y = 0.0313x + 137.91
R² = 0.5054
Average energy Consumption (kWh)
CDD
150
148
146
144
142
140
138
136
134
132
130
0
50
100
150
200
250
300
350
400


Ave. Consumption vs. CDD (After Survey)
y = 0.0336x + 133.39
R² = 0.2062
Average energy Consumption (kWh)
CDD
150
148
146
144
142
140
138
136
134
132
130
128
0
50
100
150
200
250
300
350

Appendix E: Weather Normalized Energy Consumption

The Normalized Annual Energy Consumption (NAC) of the three different sets are shown below.

Normalized Annual Energy Consumption of the three different sets by PRISM

	NAC 2011-2012 (kWh/yr)	NAC 2012-2013 (kWh/yr)	NAC 2011-2013 (kWh/yr)	% Reduction
Surveyed Units (#48)	76,826	72,026	72,603	7%
Non-surveyed Units (#88)	149,196	143,359	146,278	4%
All units (#136)	226,022	215,385	218,881	5%

First Alternative Normalized Annual Energy Consumption Analysis using PRISM

Analysis of the normalized energy consumption using PRISM

	NAC 2011-2012 (kWh/yr)	NAC 2012-2013 (kWh/yr)	NAC 2011-2013 (kWh/yr)	% Reduction
All Surveyed Units (#48)	79,953	72,464	76,028	9%
All Non-surveyed Units (#88)	146,596	138,485	139,882	6%
All units (#136)	229,196	212,669	214,475	7%

Second Alternative Normalized Annual Energy Consumption Analysis using SRWN

Analysis of the normalized energy consumption using SRWN

	NAC 2011-2012 (kWh/yr)	NAC 2012-2013 (kWh/yr)	NAC 2011-2013 (kWh/yr)
All Surveyed Units (#48)	95,751	78,766	87,258
All Non-surveyed Units (#88)	176,046	148,371	162,208
All units (#136)	271,797	227,137	249,467

Appendix F: 50-surveyed units (NAC and AEU)

Following table is the breakdown of the normalized annual consumption (NAC) and actual annual energy consumption (AEU) of 50- households who completed NEP survey.

Unit No.	NAC 2011-2012 (kWh)	NAC 2012-2013 (kWh)	NAC 2011-2013 (kWh)	NAC Diffrence	AEU 2011-2012 (kWh/yr)	AEU 2012-2013 (kWh/yr)	AEU 2011-2013 (kWh/yr)	AEU Diffrence	Attitude Survey (2014)	Gender	Age	Nationality	# years	# People
208	2284	1809.79	2059.08	473.82	2417	2215	2316	202	55	1	4	1	4	1
404	1456	1764.7	1595.5	-308.66	1587	1717	1652	-130	56	1	1	3	3	1
809	1986	1382.18	1383.26	603.85	1425	1368	1397	57	55	1	4	9	4	1
606	1405	1973.76	1646.36	-569.08	1550	1962	1756	-412	57	1	2	9	3	1
1012	1243	750.09	969.1	492.52	1415	1597	1506	-182	54	2	3	1	4	1
504	1101	1307.85	1224.93	-206.58	1353	1336	1345	17	57	2	3	9	4	1
714	1076	1338.78	1420.7	-262.34	1355	1248	1302	107	54	1	4	3	4	1
305	945	1107.65	996.47	-162.7	1077	1063	1070	14	51	1	3	9	4	1
906	1911	1549.64	1378.33	360.97	1069	1236	1152	-167	51	1	4	6	4	1
512	6151	4359.38	3925.97	1791.75	5962	4512	5237	1450	37	1	3	8	1	1
601	153	1690.02	1735.64	-1537.31	2003	1688	1846	315	59	1	4	1	4	1
713	3413	3701.83	3442.1	-289.31	3696	3747	3722	-50	47	1	4	1	4	1
314	1949	1997.49	1932.74	-48.38	1902	1947	1925	-45	49	1	3	9	2	1
701	1219	860.61	1444.56	358.87	1487	1711	1599	-223	60	2	3	4	4	2
1106	1870	1552.02	1646.99	318.18	1921	1295	1608	627	43	2	3	9	4	1
608	994	995.79	979.89	-1.75	1013	971	992	42	50	1	3	9	4	1
405	1508	1481.01	1453.96	27.29	1446	1529	1488	-83	46	2	4	1	4	1
607	1420	1474.84	1406.23	-54.58	1509	1487	1498	23	47	1	3	4	4	1
201	3488	2517.17	2911.1	970.99	3092	2080	2586	1012	48	1	3	1	3	2
210	1687	1234.27	1412.04	453.03	1638	1335	1487	304	57	1	2	9	2	2
905	1455	1230.84	1309.21	224.32	1634	1324	1479	310	56	2	2	9	3	1
802	1699	968.47	1225.03	730.53	1527	1018	1273	508	52	1	1	9	2	1
914	2327	1144.56	1668.29	1182.87	2085	1257	1671	828	49	1	1	9	2	1
414	804	932.87	758.06	-128.87	845	937.4	891	-93	55	1	4	1	4	1
708	1042	1033.38	1009.43	8.15	1111	1219	1165	-107	52	1	3	9	4	1
902	973	1051.89	989.79	-79.14	1077	1087	1082	-10	52	1	2	9	3	1
407	1118	1160.38	1100.03	-42.51	1116	1137	1126	-21	47	1	3	4	4	1
1011	3271	3085.99	3062.12	185.38	3307	3350	3328	-43	53	1	3	1	4	1
1104	792	932.29	902.38	-140	1279	1081	1180	197	60	1	2	9	4	1
1110	3345	3307.28	3292.12	37.49	3100	3020	3060	80	52	2	3	1	3	1
1014	990	1073.46	843.69	-83.32	1112	1331	1221	-220	52	1	3	4	4	1
207	1036	1037.88	994.05	-1.72	1100	1125	1113	-24	50	1	3	9	1	2
207	1036	1037.88	994.05	-1.72	1100	1125	1113	-24	50	1	3	9	1	2
706	2276	1062.62	1708.74	1212.92	1099	1940	1519	-842	60	1	2	1	4	1
406	2129	1447.5	1819.49	681.85	1566	1945	1755	-379	36	2	1	9	2	1
506	1227	1727.64	1429.87	-500.21	1586	1212	1399	374	36	2	3	9	2	1
511	2255	2722.73	2360.12	-468.07	2344	2006	2175	338	48	1	4	1	4	1
1111	2307	3122.57	2587.23	-815.32	2645	2348	2497	297	60	1	2	9	2	1
1103	3978	2127.16	2518.59	1850.59	3051	1842	2446	1208	49	1	4	1	4	1
1013	1022	1368.04	1163.76	-345.57	1991	1426	1709	565	51	2	1	1	4	1
613	1072	1298.33	1166.4	-226.68	1257	1187	1222	69	42	2	2	9	4	1
214	1665	1742.07	1649.69	-76.8	1680	1654	1667	25	48	1	2	9	4	1
612	995	1154.21	1043.1	-159.63	1199	1104	1151	96	57	1	1	11	3	2
807	1938	1315.16	1545.94	622.69	1984	1288	1636	696	59	1	4	9	2	1
910	1315	686.19	1029.08	628.63	1359	1097	1228	263	60	2	3	9	2	2
1005	1261	989.67	1100.65	271.52	914	1234	1074	-320	55	2	4	9	4	1
303	1630	1228.55	1430.04	401.44	1872	1611	1741	261	52	2	3	9	4	2
308	846	501.83	643.89	343.93	546	1032	789	-486	62	1	4	4	4	2
402	1376	1803.71	1535.75	-428.18	1535	1748	1641	-213	56	1	3	9	4	1
413	804	932.87	763.36	-128.87	1436	1197	1317	239	64	1	3	4	4	1

Following table is the breakdown of the normalized annual consumption (NAC) and actual annual energy consumption (AEU) of 50- households who completed NEP survey during one year before implementation of the NEP Survey (July 2013 to July 2014).

	2014-AEU	2014-NAC	Attitude Survey (2014)	Gender	Age	Nationality	# years	# People
201	2744	2680	48	1	3	1	3	2
207	1458	1349	50	1	3	9	1	2
207	1458	1349	50	1	3	9	1	2
208	2984	3547	55	1	4	1	4	1
210	1185	935	57	1	2	9	2	2
214	1844	1633	48	1	2	9	4	1
303	1774	1806	52	2	3	9	4	2
305	1112	1210	51	1	3	9	4	1
308	1190	681	62	1	4	4	4	2
314	1936	2022	49	1	3	9	2	1
402	1836	1934	56	1	3	9	4	1
404	2069	2200	56	1	1	3	3	1
405	1506	1718	46	2	4	1	4	1
406	1552	1378	36	2	1	9	2	1
407	1361	1820	47	1	3	4	4	1
413	2910	4347	64	1	3	4	4	1
414	882	830	55	1	4	1	4	1
504	1461	1567	57	2	3	9	4	1
506	1396	1444	36	2	3	9	2	1
511	2543	3490	48	1	4	1	4	1
512	3381	2665	37	1	3	8	1	1
601	4102	4728	59	1	4	1	4	1
606	2192	2265	57	1	2	9	3	1
607	1505	1424	47	1	3	4	4	1
608	977	827	50	1	3	9	4	1
612	1328	1091	57	1	1	11	3	2
613	1313	1410	42	2	2	9	4	1
701	2159	1840	60	2	3	4	4	2
706	4508	4614	60	1	2	1	4	1
708	1266	1218	52	1	3	9	4	1
713	4741	3949	47	1	4	1	4	1
714	1143	1778	54	1	4	3	4	1
802	1080	924	52	1	1	9	2	1
807	2044	2118	59	1	4	9	2	1
809	1450	1453	55	1	4	9	4	1
902	714	407	52	1	2	9	3	1
905	1431	1253	56	2	2	9	3	1
906	1633	5953	51	1	4	6	4	1
910	2042	2251	60	2	3	9	2	2
914	1051	1074	49	1	1	9	2	1
1005	1256	1088	55	2	4	9	4	1
1011	4037	4311	53	1	3	1	4	1
1012	1800	1823	54	2	3	1	4	1
1013	1210	1461	51	2	1	1	4	1
1014	1483	1874	52	1	3	4	4	1
1103	828	1178	49	1	4	1	4	1
1104	1168	842	60	1	2	9	4	1
1106	1089	886	43	2	3	9	4	1
1110	3800	5200	52	2	3	1	3	1
1111	2378	866	60	1	2	9	2	1
	94310	100708						

Appendix G: Statistical Tests' Detail

Alternative Test

Correlation between Normalized Annual Consumption (NAC) and Actual Energy Use (AEU) of the households who are living in the selected Toronto MURB was found out by applying a Pearson Correlation Coefficient Test.

Correlations

		NAC 2011-2012 (kWh)	AEU 2011-2012 (kWh/yr)
NAC 2011-2012 (kWh)	Pearson Correlation	1	.881**
	Sig. (2-tailed)		.006
	N	50	50
AEU 2011-2012 (kWh/yr)	Pearson Correlation	.881**	1
	Sig. (2-tailed)	.006	
	N	50	50

**. Correlation is significant at the 0.01 level (2-tailed).

Correlations

		NAC 2012-2013 (kWh)	AEU 2012-2013 (kWh/yr)
NAC 2012-2013 (kWh)	Pearson Correlation	1	.911**
	Sig. (2-tailed)		.000
	N	50	50
AEU 2012-2013 (kWh/yr)	Pearson Correlation	.911**	1
	Sig. (2-tailed)	.000	
	N	50	50

**. Correlation is significant at the 0.01 level (2-tailed).

Correlations

		NAC 2011-2013 (kWh)	AEU 2011-2013 (kWh/yr)
NAC 2011-2013 (kWh)	Pearson Correlation	1	.948**
	Sig. (2-tailed)		.000
	N	50	50
AEU 2011-2013 (kWh/yr)	Pearson Correlation	.948**	1
	Sig. (2-tailed)	.000	
	N	50	50

Hypothesis #1

T-Test

Group Statistics

	Surveyed_vs_Nonsurveyed	N	Mean	Std. Deviation	Std. Error Mean
Surveyed_vs_Nonsurveyed_AEU_Before_Survey	Surveyed	48	1672.58	857.014	123.699
	Nonsurveyed	88	1677.52	845.896	90.173
Surveyed_vs_Nonsurveyed_AEU_After_Survey	Surveyed	48	1537.60	704.761	101.724
	Nonsurveyed	88	1579.89	642.009	68.438
Surveyed_vs_Nonsurveyed_NAC_Before_Survey	Surveyed	48	1600.56	929.913	134.221
	Nonsurveyed	88	1695.43	1779.697	189.716
Surveyed_vs_Nonsurveyed_NAC_After_Survey	Surveyed	48	1500.60	726.628	104.880
	Nonsurveyed	88	1629.07	918.891	97.954
Surveyed_vs_Nonsurveyed_NAC_all_Period	Surveyed	48	1512.52	654.210	94.427
	Nonsurveyed	88	1528.06	763.331	81.371
Surveyed_vs_Nonsurveyed_AEU_all_Period	Surveyed	48	1605.19	764.418	110.334
	Nonsurveyed	88	1628.64	711.344	75.829

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Surveyed_vs_Nonsurveyed_AEU_Before_Survey	Equal variances assumed	.168	.682	-.032	134	.974	-4.939	152.486	-306.530	296.652
	Equal variances not assumed			-.032	95.634	.974	-4.939	153.077	-308.810	298.931
Surveyed_vs_Nonsurveyed_AEU_After_Survey	Equal variances assumed	.255	.614	-.355	134	.724	-42.282	119.269	-278.176	193.612
	Equal variances not assumed			-.345	89.295	.731	-42.282	122.603	-285.881	201.316
Surveyed_vs_Nonsurveyed_NAC_Before_Survey	Equal variances assumed	.530	.468	-.344	134	.731	-94.869	275.636	-640.029	450.291
	Equal variances not assumed			-.408	133.827	.684	-94.869	232.396	-554.513	364.774
Surveyed_vs_Nonsurveyed_NAC_After_Survey	Equal variances assumed	2.330	.129	-.836	134	.405	-128.464	153.665	-432.387	175.459
	Equal variances not assumed			-.895	116.762	.373	-128.464	143.509	-412.682	155.754
Surveyed_vs_Nonsurveyed_NAC_all_Period	Equal variances assumed	1.008	.317	-.119	134	.905	-15.536	130.436	-273.515	242.444
	Equal variances not assumed			-.125	109.963	.901	-15.536	124.651	-262.565	231.493
Surveyed_vs_Nonsurveyed_AEU_all_Period	Equal variances assumed	.000	.985	-.179	134	.858	-23.449	131.059	-282.661	235.763
	Equal variances not assumed			-.175	90.927	.861	-23.449	133.880	-289.387	242.489

Hypothesis # 2

T-Test

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[DataSet2] F:\Statistic Tests\Hypothesis#1 Before-Afetr Survey comparison.sav
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Group Statistics

	Before_After_Survey	N	Mean	Std. Deviation	Std. Error Mean
Surveyed_AEU_Before_After	Before Survey-AEU	48	1672.58	857.014	123.699
	After Survey-AEU	48	1537.60	704.761	101.724
Surveyed_NAC_Before_After	Before Survey-AEU	48	1600.54	929.933	134.224
	After Survey-AEU	48	1500.54	726.627	104.880

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Surveyed_AEU_Before_After	Equal variances assumed	.332	.566	.843	94	.401	134.979	160.154	-183.010	452.968
	Equal variances not assumed			.843	90.620	.402	134.979	160.154	-183.164	453.123
Surveyed_NAC_Before_After	Equal variances assumed	.687	.409	.587	94	.559	100.000	170.341	-238.215	438.215
	Equal variances not assumed			.587	88.807	.559	100.000	170.341	-238.473	438.473

T-Test

Group Statistics

	Nonsurveyed_Before_After	N	Mean	Std. Deviation	Std. Error Mean
Non_Surveyed_NAC_Before_After	Before Survey	88	1695.43	1779.697	189.716
	After Survey	88	1629.07	918.891	97.954
AEU_Nonsurveyed_Before_After	Before Survey	88	1677.52	845.896	90.173
	After Survey	88	1579.89	642.009	68.438

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Non_Surveyed_NAC_Before_After	Equal variances assumed	.409	.523	.311	174	.756	66.364	213.512	-355.043	487.770
	Equal variances not assumed			.311	130.308	.756	66.364	213.512	-356.035	488.762
AEU_Nonsurveyed_Before_After	Equal variances assumed	3.807	.053	.862	174	.390	97.636	113.203	-125.792	321.064
	Equal variances not assumed			.862	162.258	.390	97.636	113.203	-125.905	321.178

Main Hypothesis

Correlations

		NAC 2011-2012 (kWh)	Attitude Survey (2014)
NAC 2011-2012 (kWh)	Pearson Correlation	1	-.256
	Sig. (2-tailed)		.073
	N	50	50
Attitude Survey (2014)	Pearson Correlation	-.256	1
	Sig. (2-tailed)	.073	
	N	50	50

Correlations

		Attitude Survey (2014)	NAC 2012-2013 (kWh)
Attitude Survey (2014)	Pearson Correlation	1	-.358*
	Sig. (2-tailed)		.011
	N	50	50
NAC 2012-2013 (kWh)	Pearson Correlation	-.358*	1
	Sig. (2-tailed)	.011	
	N	50	50

*. Correlation is significant at the 0.05 level (2-tailed).

Correlations

		Attitude Survey (2014)	NAC 2011-2013 (kWh)
Attitude Survey (2014)	Pearson Correlation	1	-.332*
	Sig. (2-tailed)		.019
	N	50	50
NAC 2011-2013 (kWh)	Pearson Correlation	-.332*	1
	Sig. (2-tailed)	.019	
	N	50	50

*. Correlation is significant at the 0.05 level (2-tailed).

Correlations

		Attitude Survey (2014)	AEU 2011-2012 (kWh/yr)
Attitude Survey (2014)	Pearson Correlation	1	-.343*
	Sig. (2-tailed)		.015
	N	50	50
AEU 2011-2012 (kWh/yr)	Pearson Correlation	-.343*	1
	Sig. (2-tailed)	.015	
	N	50	50

*. Correlation is significant at the 0.05 level (2-tailed).

Correlations

		Attitude Survey (2014)	AEU 2012-2013 (kWh/yr)
Attitude Survey (2014)	Pearson Correlation	1	-.264
	Sig. (2-tailed)		.064
	N	50	50
AEU 2012-2013 (kWh/yr)	Pearson Correlation	-.264	1
	Sig. (2-tailed)	.064	
	N	50	50

Correlations

		Attitude Survey (2014)	AEU 2011-2013 (kWh/yr)
Attitude Survey (2014)	Pearson Correlation	1	-.316*
	Sig. (2-tailed)		.025
	N	50	50
AEU 2011-2013 (kWh/yr)	Pearson Correlation	-.316*	1
	Sig. (2-tailed)	.025	
	N	50	50

*. Correlation is significant at the 0.05 level (2-tailed).

Correlations

Correlations

		Attitude Survey (2014)	AEU Difference
Attitude Survey (2014)	Pearson Correlation	1	-.144
	Sig. (2-tailed)		.318
	N	50	50
AEU Difference	Pearson Correlation	-.144	1
	Sig. (2-tailed)	.318	
	N	50	50

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  /PRINT=TWOTAIL NOSIG
  /MISSING=PAIRWISE.
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Correlations

Correlations

		Attitude Survey (2014)	NAC Difference
Attitude Survey (2014)	Pearson Correlation	1	-.297*
	Sig. (2-tailed)		.036
	N	50	50
NAC Difference	Pearson Correlation	-.297*	1
	Sig. (2-tailed)	.036	
	N	50	50

*. Correlation is significant at the 0.05 level (2-tailed).

- ***Descriptive Statistics # 1***

NEP Categories

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Anti-Ecological	3	6.0	6.0	6.0
	Mid-Ecological	38	76.0	76.0	82.0
	Pro-Ecological	9	18.0	18.0	100.0
	Total	50	100.0	100.0	

- ***Descriptive Statistics # 2***

Oneway

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Descriptives

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
AEU 2011-2012 (kWh/yr)	Pro Ecological	9	1537.57	605.156	201.719	1072.40	2002.73	546	2645
	Mid Ecological	38	1695.38	723.425	117.355	1457.59	1933.16	845	3696
	Anti Ecological	3	3038.04	2532.603	1462.199	-3253.30	9329.37	1566	5962
	Total	50	1747.53	910.460	128.758	1488.78	2006.28	546	5962
AEU 2012-2013 (kWh/yr)	Pro Ecological	9	1486.93	459.089	153.030	1134.05	1839.82	1032	2348
	Mid Ecological	38	1575.68	630.952	102.354	1368.29	1783.07	937	3747
	Anti Ecological	3	2556.26	1733.021	1000.560	-1748.80	6861.32	1212	4512
	Total	50	1618.54	718.362	101.592	1414.38	1822.70	937	4512
AEU 2011-2013 (kWh/yr)	Pro Ecological	9	1512.25	481.660	160.553	1142.01	1882.49	789	2497
	Mid Ecological	38	1635.53	655.864	106.395	1419.95	1851.11	891	3722
	Anti Ecological	3	2797.15	2120.688	1224.380	-2470.93	8065.23	1399	5237
	Total	50	1683.04	793.319	112.192	1457.58	1908.49	789	5237

ANOVA

				Sum of Squares	df	Mean Square	F	Sig.
AEU 2011-2012 (kWh/yr)	Between Groups	(Combined)		5496329.579	2	2748164.789	3.678	.033
		Linear Term	Unweighted	5065662.029	1	5065662.029	6.779	.012
			Weighted	2942489.905	1	2942489.905	3.938	.053
			Deviation	2553839.674	1	2553839.674	3.418	.071
	Within Groups			35121564.50	47	747267.330		
	Total			40617894.08	49			
AEU 2012-2013 (kWh/yr)	Between Groups	(Combined)		2863630.707	2	1431815.354	3.001	.059
		Linear Term	Unweighted	2572764.761	1	2572764.761	5.393	.025
			Weighted	1416735.905	1	1416735.905	2.970	.091
			Deviation	1446894.802	1	1446894.802	3.033	.088
	Within Groups			22422533.49	47	477075.181		
	Total			25286164.19	49			
AEU 2011-2013 (kWh/yr)	Between Groups	(Combined)		4072000.609	2	2036000.304	3.575	.036
		Linear Term	Unweighted	3714652.179	1	3714652.179	6.523	.014
			Weighted	2110679.988	1	2110679.988	3.706	.060
			Deviation	1961320.621	1	1961320.621	3.444	.070
	Within Groups			26766424.98	47	569498.404		
	Total			30838425.59	49			

Oneway

Descriptives

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean Lower Bound	95% Confidence Interval for Mean Upper Bound	Minimum	Maximum
NAC 2011-2012 (kWh)	Pro Ecological	9	1294.41	742.117	247.372	723.97	1864.85	153	2307
	Mid Ecological	38	2081.20	2566.309	416.310	1237.67	2924.72	804	16665
	Anti Ecological	3	3169.30	2621.418	1513.476	-3342.66	9681.27	1227	6151
	Total	50	2004.86	2350.255	332.376	1336.93	2672.80	153	16665
NAC 2012-2013 (kWh)	Pro Ecological	9	1233.80	788.028	262.676	628.06	1839.53	502	3123
	Mid Ecological	38	1564.16	692.954	112.412	1336.40	1791.93	750	3702
	Anti Ecological	3	2511.51	1606.424	927.469	-1479.07	6502.08	1448	4359
	Total	50	1561.54	802.677	113.516	1333.42	1789.66	502	4359
NAC 2011-2013 (kWh)	Pro Ecological	9	1373.42	612.029	204.010	902.98	1843.87	644	2587
	Mid Ecological	38	1554.55	687.371	111.506	1328.61	1780.48	758	3442
	Anti Ecological	3	2391.78	1342.856	775.298	-944.06	5727.62	1430	3926
	Total	50	1572.18	734.950	103.938	1363.31	1781.05	644	3926

ANOVA

				Sum of Squares	df	Mean Square	F	Sig.
NAC 2011-2012 (kWh)	Between Groups	(Combined)		8831873.568	2	4415936.784	.793	.459
		Linear Term	Unweighted	7909246.901	1	7909246.901	1.420	.239
			Weighted	8666710.011	1	8666710.011	1.556	.218
			Deviation	165163.557	1	165163.557	.030	.864
	Within Groups			261829451.1	47	5570839.385		
	Total			270661324.7	49			
NAC 2012-2013 (kWh)	Between Groups	(Combined)		3674319.320	2	1837159.660	3.095	.055
		Linear Term	Unweighted	3673227.788	1	3673227.788	6.189	.016
			Weighted	2981844.597	1	2981844.597	5.024	.030
			Deviation	692474.723	1	692474.723	1.167	.286
	Within Groups			27895936.18	47	593530.557		
	Total			31570255.50	49			
NAC 2011-2013 (kWh)	Between Groups	(Combined)		2382566.357	2	1191283.179	2.325	.109
		Linear Term	Unweighted	2333342.809	1	2333342.809	4.553	.038
			Weighted	1599460.892	1	1599460.892	3.121	.084
			Deviation	783105.465	1	783105.465	1.528	.223
	Within Groups			24084862.83	47	512443.890		
	Total			26467429.18	49			

Descriptive Statistics # 2

Post hoc Test

Multiple Comparisons

Dunnett t (<control)[a]

Dependent Variable	(I) NEP Categories	(J) NEP Categories	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Upper Bound
NAC 2011-2012 (kWh)	Mid Ecological	Anti-Ecological	-1482.84123*	576.19133	.011	-403.5942
	Pro Ecological	Anti-Ecological	-1874.89222*	640.52481	.004	-675.1440
NAC 2012-2013 (kWh)	Mid Ecological	Anti-Ecological	-947.34325*	462.02029	.035	-81.9466
	Pro Ecological	Anti-Ecological	-1277.71111*	513.60623	.013	-315.6904
NAC 2011-2013 (kWh)	Mid Ecological	Anti-Ecological	-837.23061*	429.30175	.043	-33.1181
	Pro Ecological	Anti-Ecological	-1018.35222*	477.23458	.029	-124.4582
AEU 2011-2012 (kWh/yr)	Mid Ecological	Anti-Ecological	-1342.65825*	518.41493	.010	-371.6305
	Pro Ecological	Anti-Ecological	-1500.46838*	576.29750	.010	-421.0225
AEU 2012-2013 (kWh/yr)	Mid Ecological	Anti-Ecological	-980.57868*	414.22176	.017	-204.7121
	Pro Ecological	Anti-Ecological	-1069.32269*	460.47086	.019	-206.8282
AEU 2011-2013 (kWh/yr)	Mid Ecological	Anti-Ecological	-1161.61846*	452.57000	.011	-313.9229
	Pro Ecological	Anti-Ecological	-1284.89553*	503.10079	.011	-342.5522

*. The mean difference is significant at the 0.05 level.

a. Dunnett t-tests treat one group as a control, and compare all other groups against it.

Homogeneity Test

Test of Homogeneity of Variances

	Levene Statistic	df1	df2	Sig.
NAC 2011-2012 (kWh)	9.162	2	47	.000
NAC 2012-2013 (kWh)	3.167	2	47	.051
NAC 2011-2013 (kWh)	1.980	2	47	.049
2011-2012 (kWh/yr)	12.952	2	47	.000
2012-2013 (kWh/yr)	5.989	2	47	.005
2011-2013 (kWh/yr)	10.053	2	47	.000

Descriptive Statistics # 3

Oneway

Descriptives

Attitude Survey (2014)

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Male	36	53.00	5.414	.902	51.17	54.83	37	64
Female	14	50.00	8.115	2.169	45.31	54.69	36	60
Total	50	52.16	6.345	.897	50.36	53.96	36	64

Test of Homogeneity of Variances

Attitude Survey (2014)

Levene Statistic	df1	df2	Sig.
4.771	1	48	.034

ANOVA

Attitude Survey (2014)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	90.720	1	90.720	2.314	.135
Within Groups	1882.000	48	39.208		
Total	1972.720	49			

Oneway

Descriptives

Attitude Survey (2014)

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
18-30 Years Old	6	50.17	7.574	3.092	42.22	58.12	36	57
31-45 Years Old	9	54.67	6.225	2.075	49.88	59.45	42	60
46-60 Years Old	22	50.91	6.697	1.428	47.94	53.88	36	64
Over 60 Years Old	13	53.46	4.977	1.380	50.45	56.47	46	62
Total	50	52.16	6.345	.897	50.36	53.96	36	64

Test of Homogeneity of Variances

Attitude Survey (2014)

Levene Statistic	df1	df2	Sig.
.135	3	46	.939

ANOVA

Attitude Survey (2014)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	136.838	3	45.613	1.143	.342
Within Groups	1835.882	46	39.910		
Total	1972.720	49			

Oneway

Descriptives

Attitude Survey (2014)

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean Lower Bound	95% Confidence Interval for Mean Upper Bound	Minimum	Maximum
Canada	13	52.08	4.462	1.238	49.38	54.77	46	60
Europe	2	55.00	1.414	1.000	42.29	67.71	54	56
South or Central America/Caribbean	6	55.33	7.633	3.116	47.32	63.34	47	64
East Asia	1	51.00	.	.	.	.	51	51
West Asia	1	37.00	.	.	.	.	37	37
Africa	26	51.69	6.644	1.303	49.01	54.38	36	60
Other	1	57.00	.	.	.	.	57	57
Total	50	52.16	6.345	.897	50.36	53.96	36	64

Test of Homogeneity of Variances

Attitude Survey (2014)

Levene Statistic	df1	df2	Sig.
1.745[a]	3	43	.172

a. Groups with only one case are ignored in computing the test of homogeneity of variance for Attitude Survey (2014).

ANOVA

Attitude Survey (2014)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	336.925	6	56.154	1.476	.209
Within Groups	1635.795	43	38.042		
Total	1972.720	49			

Descriptive Statistics # 4

T-Test

Group Statistics

	Included_Miles_Survey	N	Mean	Std. Deviation	Std. Error Mean
Attitude Survey (2014)	Included "Energy Behaviour" Survey	24	51.88	5.464	1.115
	Not Included "Energy Behaviour" Survey	26	52.42	7.162	1.405

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference Lower	95% Confidence Interval of the Difference Upper
Attitude Survey (2014)	Equal variances assumed	.703	.406	-.302	48	.764	-.548	1.813	-4.193	3.097
	Equal variances not assumed			-.306	46.410	.761	-.548	1.794	-4.157	3.061

Descriptive Statistics # 5

T-Test

[DataSet1] F:\Statistic Tests\Samira-Sep 12.sav

Group Statistics

	Included_Miles_Survey	N	Mean	Std. Deviation	Std. Error Mean
NAC 2011-2012 (kWh)	Included "Energy Behaviour" Survey	24	1814.38	1186.059	242.103
	Not Included "Energy Behaviour" Survey	26	2180.70	3076.567	603.365
NAC 2012-2013 (kWh)	Included "Energy Behaviour" Survey	24	1630.23	851.128	173.736
	Not Included "Energy Behaviour" Survey	26	1498.13	766.572	150.337
NAC 2011-2013 (kWh)	Included "Energy Behaviour" Survey	24	1663.56	758.790	154.887
	Not Included "Energy Behaviour" Survey	26	1487.82	716.643	140.545
AEU 2011-2012 (kWh/yr)	Included "Energy Behaviour" Survey	24	1875.44	1079.527	220.357
	Not Included "Energy Behaviour" Survey	26	1629.47	722.749	141.743
AEU 2012-2013 (kWh/yr)	Included "Energy Behaviour" Survey	24	1690.92	834.058	170.251
	Not Included "Energy Behaviour" Survey	26	1551.73	601.477	117.959
AEU 2011-2013 (kWh/yr)	Included "Energy Behaviour" Survey	24	1783.18	940.040	191.885
	Not Included "Energy Behaviour" Survey	26	1590.60	634.068	124.351

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
NAC 2011-2012 (kWh)	Equal variances assumed	1.439	.236	-.547	48	.587	-366.321	670.097	-1713.640	980.999
	Equal variances not assumed			-.563	32.775	.577	-366.321	650.125	-1689.356	956.714
NAC 2012-2013 (kWh)	Equal variances assumed	.024	.877	.577	48	.566	132.108	228.775	-327.875	592.090
	Equal variances not assumed			.575	46.404	.568	132.108	229.751	-330.248	594.463
NAC 2011-2013 (kWh)	Equal variances assumed	.132	.718	.842	48	.404	175.743	208.662	-243.799	595.285
	Equal variances not assumed			.840	47.095	.405	175.743	209.148	-244.988	596.473
AEU 2011-2012 (kWh/yr)	Equal variances assumed	.354	.554	.954	48	.345	245.969	257.962	-272.699	764.637
	Equal variances not assumed			.939	39.715	.354	245.969	262.008	-283.688	775.626
AEU 2012-2013 (kWh/yr)	Equal variances assumed	.247	.621	.681	48	.499	139.190	204.469	-271.922	550.302
	Equal variances not assumed			.672	41.569	.505	139.190	207.123	-278.929	557.310
AEU 2011-2013 (kWh/yr)	Equal variances assumed	.391	.535	.855	48	.397	192.580	225.182	-260.180	645.339
	Equal variances not assumed			.842	39.901	.405	192.580	228.655	-269.585	654.744

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
NAC 2011-2012 (kWh)	Between Groups	7962859.779	2	3981429.889	4.313	.019
	Within Groups	43386266.885	47	923112.061		
	Total	51349126.663	49			
NAC 2012-2013 (kWh)	Between Groups	3674319.320	2	1837159.660	3.095	.055
	Within Groups	27895936.183	47	593530.557		
	Total	31570255.502	49			
NAC 2011-2013 (kWh)	Between Groups	2382566.357	2	1191283.179	2.325	.109
	Within Groups	24084862.826	47	512443.890		
	Total	26467429.183	49			
AEU 2011-2012 (kWh/yr)	Between Groups	5496329.579	2	2748164.789	3.678	.033
	Within Groups	35121564.502	47	747267.330		
	Total	40617894.081	49			
AEU 2012-2013 (kWh/yr)	Between Groups	2863630.707	2	1431815.354	3.001	.059
	Within Groups	22422533.487	47	477075.181		
	Total	25286164.195	49			
AEU 2011-2013 (kWh/yr)	Between Groups	4072000.609	2	2036000.304	3.575	.036
	Within Groups	26766424.980	47	569498.404		
	Total	30838425.589	49			

Appendix H: Statistic analysis of 2013-2014 Data

Correlations

Correlations

		Attitude Survey (2014)	NAC_50_Units
Attitude Survey (2014)	Pearson Correlation	1	-.343*
	Sig. (2-tailed)		.015
	N	50	50
NAC_50_Units	Pearson Correlation	-.343*	1
	Sig. (2-tailed)	.015	
	N	50	50

*. Correlation is significant at the 0.05 level (2-tailed).

Correlations

Correlations

		Attitude Survey (2014)	AEU_50_Units
Attitude Survey (2014)	Pearson Correlation	1	-.391**
	Sig. (2-tailed)		.005
	N	50	50
AEU_50_Units	Pearson Correlation	-.391**	1
	Sig. (2-tailed)	.005	
	N	50	50

**. Correlation is significant at the 0.01 level (2-tailed).

Descriptive # 2

Oneway

Descriptives

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
AEU_50_Units	Pro-ecological	9	1475.78	742.197	247.399	905.27	2046.28	334	2489
	Mid-ecological	38	1867.87	825.904	133.979	1596.40	2139.34	985	4159
	Anti-ecological	3	3350.67	2621.004	1513.237	-3160.27	9861.60	1409	6332
	Total	50	1886.26	1023.672	144.769	1595.34	2177.18	334	6332
NAC_50_Units	Pro-ecological	9	1804.22	605.186	201.729	1339.03	2269.41	813	2912
	Mid-ecological	38	1962.08	723.371	117.346	1724.31	2199.85	1111	3963
	Anti-ecological	3	3304.67	2532.569	1462.179	-2986.58	9595.92	1832	6229
	Total	50	2014.22	910.423	128.753	1755.48	2272.96	813	6229

Test of Homogeneity of Variances

	Levene Statistic	df1	df2	Sig.
AEU_50_Units	9.156	2	47	.000
NAC_50_Units	12.953	2	47	.000

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
AEU_50_Units	Between Groups	7962775.056	2	3981387.528	4.313	.019
	Within Groups	43384524.56	47	923074.991		
	Total	51347299.62	49			
NAC_50_Units	Between Groups	5495959.595	2	2747979.797	3.678	.033
	Within Groups	35118644.99	47	747205.212		
	Total	40614604.58	49			

Post Hoc Tests

Multiple Comparisons

Dunnett t (<control)[a]

Dependent Variable	(I) NEP_Category	(J) NEP_Category	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval
						Upper Bound
AEU_50_Units	Pro-ecological	Anti-ecological	-1874.889*	640.512	.004	-675.16
	Mid-ecological	Anti-ecological	-1482.798*	576.180	.011	-403.57
NAC_50_Units	Pro-ecological	Anti-ecological	-1500.444*	576.274	.010	-421.04
	Mid-ecological	Anti-ecological	-1342.588*	518.393	.010	-371.60

*. The mean difference is significant at the 0.05 level.

a. Dunnett t-tests treat one group as a control, and compare all other groups against it.

Descriptive # 3

Descriptives

Attitude Survey (2014)

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Male	36	53.00	5.414	.902	51.17	54.83	37	64
Female	14	50.00	8.115	2.169	45.31	54.69	36	60
Total	50	52.16	6.345	.897	50.36	53.96	36	64

Test of Homogeneity of Variances

Attitude Survey (2014)

Levene Statistic	df1	df2	Sig.
4.771	1	48	.034

ANOVA

Attitude Survey (2014)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	90.720	1	90.720	2.314	.135
Within Groups	1882.000	48	39.208		
Total	1972.720	49			

Descriptives

Attitude Survey (2014)

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
18-30 Years Old	6	50.17	7.574	3.092	42.22	58.12	36	57
31-45 Years Old	9	54.67	6.225	2.075	49.88	59.45	42	60
46-60 Years Old	22	50.91	6.697	1.428	47.94	53.88	36	64
Over 60 Years Old	13	53.46	4.977	1.380	50.45	56.47	46	62
Total	50	52.16	6.345	.897	50.36	53.96	36	64

ANOVA

Attitude Survey (2014)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	136.838	3	45.613	1.143	.342
Within Groups	1835.882	46	39.910		
Total	1972.720	49			

Oneway

Descriptives

Attitude Survey (2014)

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Canada	13	52.08	4.462	1.238	49.38	54.77	46	60
Europe	2	55.00	1.414	1.000	42.29	67.71	54	56
South or Central America/Caribbean	6	55.33	7.633	3.116	47.32	63.34	47	64
East Asia	1	51.00	.	.	.	.	51	51
West Asia	1	37.00	.	.	.	.	37	37
Africa	26	51.69	6.644	1.303	49.01	54.38	36	60
Other	1	57.00	.	.	.	.	57	57
Total	50	52.16	6.345	.897	50.36	53.96	36	64

ANOVA

Attitude Survey (2014)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	336.925	6	56.154	1.476	.209
Within Groups	1635.795	43	38.042		
Total	1972.720	49			

Descriptive #4

T-Test

Group Statistics

	Included_Miles_Survey	N	Mean	Std. Deviation	Std. Error Mean
Attitude Survey (2014)	Included "Energy Behaviour" Survey	24	51.88	5.464	1.115
	Not Included "Energy Behaviour" Survey	26	52.42	7.162	1.405

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Attitude Survey (2014)	Equal variances assumed	.703	.406	-.302	48	.764	-.548	1.813	-4.193	3.097
	Equal variances not assumed			-.306	46.410	.761	-.548	1.794	-4.157	3.061

Descriptive # 5

T-Test

Group Statistics

	Included_Miles_Survey	N	Mean	Std. Deviation	Std. Error Mean
AEU_50_Units	Included "Energy Behaviour" Survey	24	1900.54	1017.994	207.797
	Not Included "Energy Behaviour" Survey	26	1877.54	971.798	190.585
NAC_50_Units	Included "Energy Behaviour" Survey	24	2064.63	1310.438	267.492
	Not Included "Energy Behaviour" Survey	26	2033.88	1288.482	252.692

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
AEU_50_Units	Equal variances assumed	.066	.798	.082	48	.935	23.003	281.428	-542.845	588.852
	Equal variances not assumed			.082	47.226	.935	23.003	281.962	-544.159	590.165
NAC_50_Units	Equal variances assumed	.005	.944	.084	48	.934	30.740	367.721	-708.612	770.093
	Equal variances not assumed			.084	47.538	.934	30.740	367.975	-709.308	770.789

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