

THE APPROPRIATION OF BUILT HERITAGE AND PRO-ENVIRONMENTAL BEHAVIOURS: A CASE STUDY OF LEED-CERTIFIED LOW-INCOME MULTIFAMILY HOUSING

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Abstract

This interdisciplinary research study explores the environmental awareness, attitudes and behaviours of residents of a low-income, Leadership in Energy and Environmental Design (LEED) certified, multifamily, heritage-listed housing development in the Midwest region of the United States. Through in-depth semi-structured face-to-face interviews and review of site photographs and online and archived news articles, the causal factors for and links between environmental behaviours, LEED and built heritage were explored. The findings reveal that the LEED features the residents valued in hierarchical order were: location, the building's historic and renovated characteristics, its energy conservation system and the cleanliness and upkeep of the premises. The valued non-LEED features were security and privacy. Additionally, the findings show that residents possess a level of critical thinking and opinion pertaining to the importance of their residence as a restored building. The residents were highly aware of their own, their social group's and the management's behaviors and of the value of their property in terms of its historic significance and public image and presence in the neighborhood and among their social networks.

Keywords: Built heritage; low-income; multifamily housing; LEED; environmental behaviors; qualitative research

INTRODUCTION

For decades, affordable housing has been a vexing social problem worldwide. With the ongoing global political unrest and the continuous increase in migration and urbanization (UN-Habitat, 2015), more housing will need to be provided for vulnerable newcomers and persons with low incomes. In addition, there will be a greater need to provide equitable sustainable housing that integrates people with their indoor, built urban and natural environments. It requires creative interventions that can resolve some of the social conditions while preserving existing building heritage (Scuderi, 2015). Social-behavioural aspects can play an important role in the move to meaningful integration and for enabling diverse users to engage and learn from their immediate surroundings and actions.

Since the United States Department of Housing and Urban Development's (HUD) 2010 announcement of their plans to use the Leadership in Energy and Environmental Design (LEED) green building guidelines in their new building projects (Wendt, 2010), LEED continues to be seen nationally as the pathway for designing and constructing green affordable housing. More recently, in 2015, HUD and the United States Department of Agriculture (USDA) have announced

their continued plan for the implementation of LEED, thereby reinforcing the recognition of LEED certification as their path to green building (USGBC, 2015).

HUD explains that the cost associated with energy usage is particularly significant for low-income individuals, as they spend up to 15 percent of their income on utilities (GAO, 2008). In a written statement, the former deputy Secretary of HUD Ron Sims stated that “no one is more vulnerable to rising energy prices than low- and moderate-income families. Higher energy costs often result in cutting back on other critical needs, such as medicine and food” (Sims, 2010). Cutting back on critical needs has a major effect on quality of life which as a result can have a major effect on household environmental behaviours (Hart, 1999). Furthermore, sustainable building design is described to be best implemented when linked with social and cultural needs, while preserving the environment for future generations (Al-Jamea, 2014). This is where the notion of heritage-serving pro-environmental behaviours becomes important. Heritage adoption is a complex process that essentially requires socio-cultural engagements (Kamel-Ahmed, 2015).

The English organization Renewal.net in 2005 emphasized that “the preservation of heritage not only contributes to the state of health of the built environment but also crucially to community and cultural identity and helps to define the character of a place” (Renewal.net, 2005). The sustained re-use and renewal of existing buildings helps reduce pollution and saves having to tamper with Greenfield sites. This paper explores, through a case-study analysis, the links between LEED features, environmental behaviours and built heritage in a low-income LEED-certified residential setting.

HERITAGE AND PRO-ENVIRONMENTAL BEHAVIOURS

The significance of renovation and reuse of existing buildings have been expressed in various sections of the LEED building certification, but predominantly in the LEED for existing buildings category. Buildings with major renovations, however, have a choice of which LEED certification category to follow. For example, if a building with major renovation is planned to be used for residential purposes, the certification options would include LEED for homes, LEED for new construction or LEED for existing buildings. Each certification carries its set of rules during the certification process and after the building’s completion, with LEED for homes and LEED for existing buildings requiring a certain amount of follow-up post construction. Additionally, LEED for homes was launched after LEED for new construction and LEED for existing buildings in 2008 (USGBC, 2016). While the environmental benefits of reuse and renovation are acknowledged, the link between built heritage and human and social dimensions of sustainability, especially in connection with persons with low-income or diverse cultural backgrounds, has not been explored.

According to Rapaport (1982) there are three categories of levels of meaning of how people relate and react to their environments. The low level of meanings is the biologically based commonalities of everyday functions. The middle level of meanings are those that communicate power, wealth and status, and the high levels of meaning are those that relate to fundamental beliefs, norms, values, worldviews and so forth. Built heritage is linked to human dimensions (such as norms and values) and can produce high level of meanings to their users that in return can have a determining effect on behaviours and behavioural change.

One of the most influential and popular socio-psychological models of behaviours is the Reasoned Action Approach (RAA) by Fishbein and Ajzen (formerly known as the Theory of Planned Behaviour). In summary, RAA assumes that attitudes do not directly determine behaviours but rather are influenced by behavioural intentions. In addition, behavioural intentions are influenced by social (normative) pressures and perceived behavioural control (Fishbein & Ajzen, 2010). The major determinants of behavioural intentions are attitudes, perceived norms, and perceived behavioural control. Behaviours are also influenced by beliefs (behavioural, normative and control), which are influenced by background factors, such as demographics, knowledge, and information (See Figure 1).

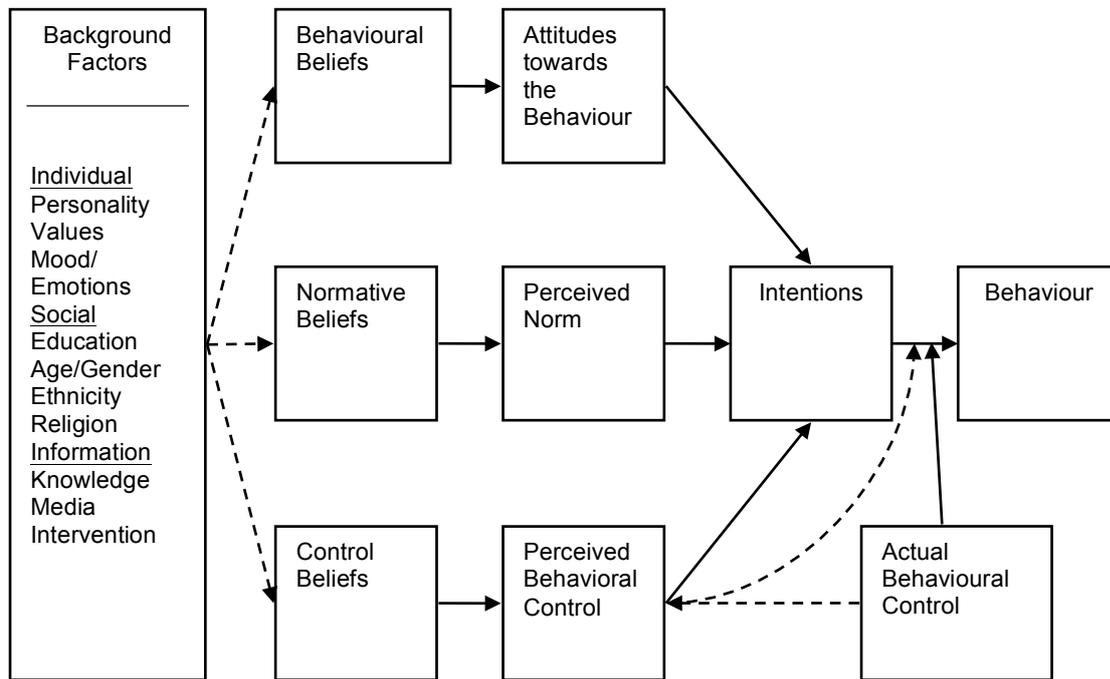


Figure 1: The Reasoned Action Approach (RAA) – (Source: Authors).

Few studies concerning LEED and green buildings have used qualitative research methods using RAA, for example, for eliciting beliefs regarding building professionals adopting the LEED green building rating systems (Kientzel and Kok, 2011) and eliciting viewpoints and behaviours surrounding household energy management (Dillahunt et al., 2009). Furthermore, previous studies have shown that the higher the social class, the greater the level of environmental concern due to having met their basic needs enabling them as a result to care for broader issues such as the environment (Fransson and Garling, 1999). However, the opposite could also be true—poor conditions lead to concerns for the environment (Corbett, 2006), and wealth leads to environmental degradation and not necessarily an increase in well-being (Csikszentmihalyi, 1999; Diener et al., 1999).

Fishbein and Ajzen's (2010) Reasoned Action Approach (RAA) has been highly influential in identifying underlying values and attitudes towards behaviours in many circumstances—for example, recycling, health, and leisure. Using the RAA constructs as guidance can provide a holistic picture and the underlying reasons of the direct and indirect adoptions of pro-environmental behaviours. In addition, it will highlight and elaborate on residents' attitudes towards the heritage of their housing development, being an existing building and a landmark. This study aims to explore the knowledge, attitudes and behaviours of residents of a low-income LEED-certified multifamily housing for better determining strategies for disseminating long-lasting pro-environmental behaviours in the future, one that is embedded with heritage ownership and appreciation.

METHODOLOGY

Due to the limited information available on low-income household environmental knowledge, attitude and behaviours, the methodological approach the study adopted was qualitative. In addition, a significant issue pertaining to low-income residents is that they are a unique population due to their special backgrounds, which include diverse education levels, experiences with domestic violence, health disability issues, and many others. Qualitative research methodology, especially face-to-face interviews, is most suitable because it does not collect data

in abstraction and, as a result, provides a “humanizing” perspective to the research (Patton, 2002). The study adopts Miles and Huberman’s (1994) approach to explore the influence of LEED features on users pertaining to environmental knowledge, attitudes and behaviours. It combines a phenomenological case study approach with the conceptual framework Reasoned Action Approach (RAA), and the categories laid out in the LEED NC2.2 handbook, the guidelines in which the building was certified under, to answer the study’s driving research questions. Phenomenology helps explore the essence of people’s lived experiences, i.e., their current, day-to-day lives (Moustakas, 1994). A case study helps to set the scope of the study and includes the real-life contexts in which they occur (Yin, 2009). Moreover, this single case is a revelatory case (Yin, 2009), as it explores and analyses a phenomenon often perceived as inaccessible, low-income residents.

A number of LEED-certified low-income multifamily housing developments were purposefully (Miles & Hubermann, 1994; Patton, 2002) invited to partake in this study. The properties were selected from the LEED-online directory of completed projects. Further information about the buildings was then researched using the world-wide web search engine. The main criterion of the selection process was that each building must have been in use for over one year. In addition, due to the study’s funding and time limitations, all residential buildings had to be located within the Midwest region. A total of twelve (12) LEED-certified multifamily housing developments were contacted, and the New Holland Apartments in Danville, Illinois, agreed to participate in this study.

The participants were residents at the New Holland for over a year and over 18 years of age. The residence’s management agreed to divulge the identity of the building and the site; the identities of the residents, however, remain confidential. Face-to-face interviews were held between the months of May and June 2011, and each interview took between 30 and 45 minutes to complete. In addition to the cash incentives of \$10, the incentives also included a chance to win a one-time \$50 cash prize awarded to one resident (excluding staff) that have participated in the study, through a draw conducted a week after all of the interviewing process was complete. The prize money was then mailed to the resident participant.

The participants included fifteen residents, the property manager, the resident maintenance personnel, the head maintenance personnel, and the executive director of Crosspoint Human Services. Interviews with residents were conducted until saturation was reached—i.e., until the researcher felt no more new information was emerging from the interviews (Glaser & Strauss, 1967). The interview questions were divided into six sections: background, knowledge and experience, attitudes toward list of behaviours, perceived normative pressures, perceived behavioural control and questions pertaining to the history and heritage of the building. In addition, the questions were then divided into two groups: questions to residents and questions to staff members.

Finally, as part of the case study methodology and for triangulation purposes, photographs of the building and site and online and archived information about the New Holland Apartments obtained from the Danville public library are included to build a holistic understanding and representation about the site, the building and its residents and the LEED features. All interviews were digitally audio-taped and subsequently transcribed verbatim. The entire process was conducted and carried out by the same researcher.

THE NEW HOLLAND APARTMENTS

The New Holland Apartments is a five-story red brick building located in the heart of Danville’s downtown area on the north side of Vermilion Street. In early 1900, the New Holland Apartments was known as the Dodge Flats and later as The Holland (See Figure 2), which was regarded as “Danville’s finest apartment building” (Commercial-News, 2006). The architecture of the building is a historic Dutch Revival style, and it was built in 1889. The original north section of the building

was designed by architect Charles M. Lewis and constructed by General Anson Phelps Dodge, a railroad and timber tycoon.



Figure 2: Postcard showing the Holland when it was opened in 1905 (Source: Danville Library).

The Holland went through several uses. The building originally accommodated 24 apartments that did not have kitchens. The residents dined in the café located on the ground floor. Dodge's only child Julia later added the south side addition in 1927. Together, the two parts of the building contained 68 apartment units, four retail stores, and a large ground floor restaurant. It was built as upscale apartments for local wealthy professionals; as a result, it was known to be a "prim and proper" place. According to news articles, the Holland was occupied originally by "physicians, lawyers and bankers" and later by "widows, spinsters, and teachers" (Commercial-News, 2006). However, as time passed, the building's residents' composition went through significant changes.

During the 1970s and 1980s, vandalism and neglect dominated the building. In late 1980 after its owner filed for bankruptcy, the building was given 26 code violations from lack of fire extinguishers to a broken elevator. The building was closed down; posted signs read "unfit for human habitation." Then the Voorhees Development Group of Des Moines, Iowa, stepped up and bought the place using federal grants and federal low-interest loans. The building's first restoration cost approximately \$3 million, which included refinishing woodwork and installing new carpeting, heating, wiring, and plumbing systems. Part of the rework included reconfiguring the building into 36 two-bedroom and 17 one-bedroom apartments. The New Holland reopened in 1990, and the structure was entered in the National Register of Historic Places.

After the New Holland apartments' first renovation in 1990, the conditions of the public grants stipulated that for the first 15 years the apartments must be rented to low- and moderate-income residents, where the eligible can also receive rent subsidies. According to the U.S. Department of Housing and Urban Development (HUD), a low-income resident is defined as an individual residing in a household with a combined income of 80 percent or less of the area median income, adjusted for household size. However, a few years later, the New Holland was again at risk of demolition due to neglect. The New Holland, after going through a long bidding process, was repurchased by Crosspoint Human Services, a local non-profit organization that also owns and manages other residential properties in the area, and went through its second major restoration work that led to its latest LEED Gold certification (See Figure 3). The executive director of Crosspoint spearheaded the latest restoration, and it was supported through numerous tax credit funds such as the Illinois Housing Development Authority: HOME funds, Enterprise

Community Investment Tax credit Equity (9%), Enterprise Community Investment Historic Tax Credit, and others.



Figure 3: Current front views of New Holland Apartments (Source: Authors).

Today the New Holland Apartments consist of 10 three-bedroom apartments, 22 two-bedroom apartments, and 14 one-bedroom apartments, a total of 46 apartments, of which 12 serve as supportive housing for formerly homeless women and children. The types of amenities provided are geothermal HVAC, electronic proximity key-cards and security cameras, two debit card (no cash) laundries, and an adjoining fenced park with children's playground equipment and grills.

The recent renovation work on the New Holland Apartments has won many awards, which include awards from the American Institute of Architects of Illinois, Crombie Taylor/Earl Reed Award, Annual Charles L. Edson Tax Credit Excellence Awards, and others (New Holland Website, 2010). At the time of this research, the residents consisted of predominantly women and children with a history of domestic abuse, elderly women and men, people with health problems, and unemployed young people. Furthermore, the majority of the women with a history of domestic abuse moved to New Holland from Danville's local women's shelter (Commercial-News, 2006).

CODING PROCEDURE AND DATA ANALYSIS

Using QSR NVivo 9 software for qualitative analysis, participants' responses to the semi-structured interviews were manually transcribed verbatim and initially analysed using Miles and Huberman's (1994) three stage coding: (1) descriptive, (2) interpretive, and (3) pattern coding. In addition, NVivo 9 was used as a data management tool for the transcribed interviews, personal memos, and photographs of the building and site.

First, the initial descriptive codes were generated under the guidance of LEED NC 2.2 categories and the Reasoned Action Approach (RAA). This strategy helped create the "start list" (Miles & Huberman, 1994) for the codes. Once the "start list" was set, the coding began. While the coding was being carried out, exploratory codes (inductive) were also identified. Exploratory codes are codes that did not fall into the scope of the LEED categories and the RAA, which are thought to affect intentions to perform environmental behaviours. Since, according to the RAA, intentions are the precursor to behaviours, exploratory codes were important as they identify deeper and unexpected causes and/or reasons for behaviours (See Figure 4). The codes were

extracted from the interviews through a system of sentences and short paragraphs, and then later questions and answers.

After establishing the initial codes and descriptions, they were then analysed by four inter-rater coders for an inter-rater reliability check. The inter-rater coders consisted of three social scientists from Purdue University's Natural Resources Social Science (NRSS) lab and an expert in qualitative research from Purdue's College of Education. Because the initial codes were open and descriptive, the meeting consisted predominantly of discussion of the appropriateness of the codes and their definitions. The outcome of the inter-rater reliability check helped to identify missing codes pertaining to the study, recheck the codes for applicability purposes and put them into an organizing format. The meeting also helped to explore ways to organize the codes into categories and sub-categories. The codes were placed into categories pertaining to LEED and constructs in Reasoned Action Approach (RAA). Finally, all other emerging codes were placed in the "exploratory factors" code. The inter-rater reliability check led to the interpretive coding stage by categorizing (and sub-categorizing) the descriptive codes by bringing together the deductive and inductive codes and enabling the search for relationships between coded elements of the data. As a result, codes evolved by becoming more detailed and more organized hierarchically (positive, negative, into groups, etc.)

The codes were then revisited to identify patterns in an attempt to make them meaningful and inferential across the dataset. Hatch (2002) explains that patterns can be characterized as the following: (1) similarity (things happen the same way); (2) difference (they happen in predictably different ways); (3) frequency (they happen often or seldom); (4) sequence (they happen in a certain order); (5) correspondence (they happen in relation to other activities or events); and (6) causation (one appears to cause another) (Hatch, 2002, p.155). Due to the overwhelming amount of information generated from the codes, a series of questioning approaches was employed as a way to further organize codes into patterns to answer the overarching research questions. In addition, these questions were generated as a guide to ensure the soundness of the codes in answering the overarching research questions. The questions were the following: What level of environmental awareness do the residents possess? What LEED and non-LEED features have had the most influence on the low-income residents' environmental behaviours? How has the building's heritage impacted the users? How can heritage be a factor for sustaining low-income residents' pro-environmental behaviours?

DESCRIPTION OF PARTICIPANTS

The total number of residents interviewed was fifteen and four staff (Table 1). The majority of the participating residents were female; 9 of the residents were single parents (women) with children; 9 of the residents were unemployed, some of the residents were retirees, and the remaining were part-time employed and students. Five of the residents interviewed had health concerns such as mental disability, epilepsy, previous surgeries, or an ailing child. In addition, the participants included a mixture of African-Americans and Caucasians. Furthermore, a majority of the residents had lived all their lives in the State of Illinois and lived in two-bedroom apartments at the New Holland despite their varying family sizes, ranging from 1 to 5 household members. Some of the participating residents moved to New Holland from the local Women's Shelter, and some from other Crosspoint managed properties; 3 of the residents previously resided at New Holland prior to its renovation; and the rest lived in rented apartments and/or single-family houses.

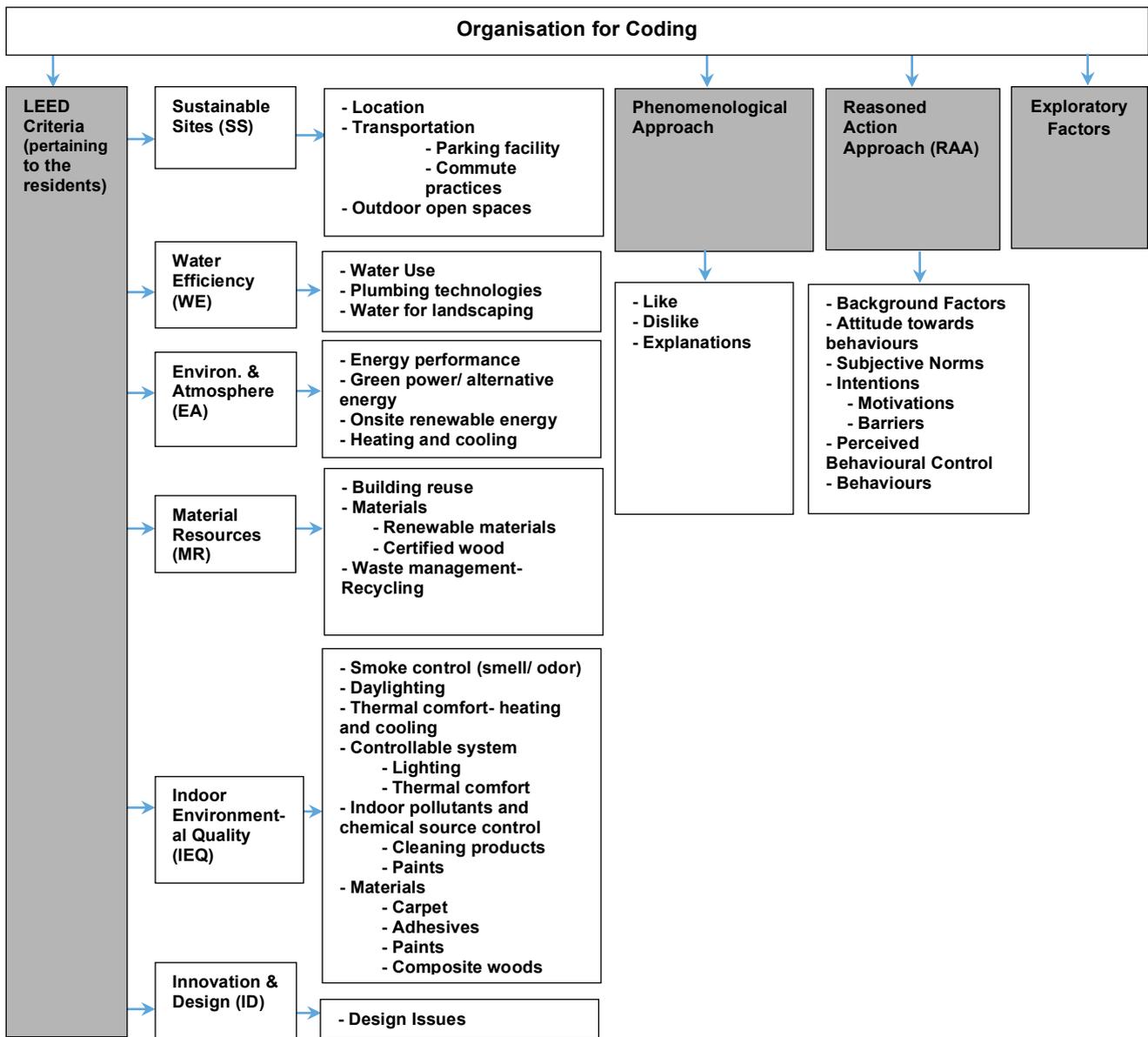


Figure 4: Organization of codes (Source: Authors).

Table 1: Summary detail of participants (Source: Authors).

| Trait | Residents (15) | Staff (4) |
|-----------------------------------|----------------|-----------|
| Gender | | |
| Male | 3 | 3 |
| Female | 12 | 1 |
| Age range (years) | 18-75 | 25-65 |
| Average age (years) | 46.5 | N/A |
| Ethnicity | | |
| Caucasian | 7 | 4 |
| Black | 8 | 0 |
| Other | 0 | 0 |
| Average time at residence (years) | 3.8 | N/A |
| Average household size (persons) | 2.1 | N/A |
| Number of household with children | 8 | 1 |
| Board members of resident counsel | 1 | 1 |
| Unit sizes- 1 bedroom | 3 | N/A |
| Unit sizes- 2 bedrooms | 11 | 1 |
| Unit sizes- 3 bedrooms | 1 | N/A |

The staff interviewed consisted of the New Holland's property manager, resident maintenance employee, head maintenance employee and executive director of Crosspoint Human Services (owner and head management). The property manager interviewed worked at New Holland since its reopening in 2005. She had 13 years of experience in residential management and in the past has managed "project based section 8 and section 202 properties, for elderly disabled handicapped housing as well as multifamily". The resident maintenance employee had been working at the property for over 2 years and resided with his wife and new-born in a two-bedroom apartment at the New Holland. Both his rent and utility bills were included as part of his job. The head maintenance employee had been working for Crosspoint for over eight years and had been a building contractor for about 20 years. Finally, the executive director had been working for Crosspoint for almost 15 years. Due to his credentials, he was invited to his current position while working at another company in Chicago. According to the interview and archived news articles, he was the main person behind and pushing for the building's purchase, renovation and LEED certification. Moreover, all staff interviewed explained that the New Holland Apartments is their first and only experience of working, managing and maintaining a LEED-certified multifamily housing development.

DISCUSSION AND RECOMMENDATION

The findings from residents' interviews show that residents' existing environmental understandings were driven by their background experiences. This was affirmed by their repetitive use of certain terms, such as *lead* (the metal) and *sufficient*. In addition, the majority of the residents understood environmentalism as keeping places clean and litter-free and behaving law-abidingly and responsibly. This also signifies the type of conditions the residents experienced, and their priorities and expectations. Furthermore, the participants kept referring to LEED as "lead" and did not identify with the LEED Gold plaque hung in the management's office for public display. The information provided on HUD's website (2012) about lead-based paint hazards in America's privately-owned and public low-income housing show that lead-based paint has been a common problem in most low-income housing, and—as a result—it is not surprising that some residents associated the term LEED with lead. Moreover, due to the residents' previous poor housing experiences and limited income, it is also not surprising that residents use of the term *sufficient* on numerous occasions in the interviews (e.g. relating to energy, lighting, and furniture and fixtures).

With a few exceptions due to health conditions, the majority of the participants were aware of the residence's geothermal renewable energy (for electricity supply and heating and cooling system) but were not familiar with details. The main reason for their awareness was their low and stable electricity bills. Residents were also aware of certain building features as not being sustainable, such as of the position of where their thermostats were situated in their apartments, light switches not being coherent, and no recycling resources on the premises at the time of the interview while head management promoted recycling at their main site. Their observations and concerns indicate that they possess a level of awareness and enough knowledge to be able to discuss green features in the building.

While the economic situations for most residents had not changed significantly since their move, residents indicated that their move to the New Holland helped improve their psyche, confidence, self-esteem and interaction with others. Numerous studies have shown that people's confidence can strongly influence behaviours (Bandura, Adams, Hardy, & Howells, 1980). As a result, increases in self-esteem and confidence brought about by the building have become an essential determinant for increasing residents' self-efficacy, "the conviction that one can successfully execute the behaviour" (Bandura, 1977), and/or perceived behavioural control, an "individual's perceived ease or difficulty of performing the particular behaviour" (Fishbein & Ajzen, 2010). However, while their move to the building helped increase their self-esteem and self-

efficacy, due to barriers such as finances, lack of knowledge, lack of environmental interventions at the New Holland, and health conditions (e.g., having to depend on others for certain tasks) residents did not display some of the pro-environmental behaviours, such as purchasing any green cleaning products and recycling off site.

The findings from this study also comply with the RAA, since residents who had negative attitudes towards walking due to health reasons and alternative transportation due to shopping habits or children, had stronger intentions to drive their cars (behaviour). In addition, residents displayed negative and neutral attitudes towards household water conservation despite their previous commitment and awareness, due to water utility fees being included in their rent and their purchase and use of bottled water. Several residents considered tap water to be unsafe and unfit for drinking.

The participating residents also indicated that their household environmental behaviours are under their volitional control (Fishbein & Ajzen, 2010) and that none of them felt forced or discomfort in performing any of the behaviours discussed. Several residents, including the resident maintenance person, mentioned that behaving as they did came to them naturally, especially conserving energy, shopping locally, using public transportation, and walking, due to their having done it for so long (habitual), easy access due to the central location of the building, and for the sake of their finances and health. Some residents also expressed the need to engage in certain behaviours as something they should be doing for self enhancement and improvement. They also emphasized that if they had more information and resources, they would engage in certain behaviours such as recycling and conserving water. As a result, their backgrounds and economic situation made them naturally engage (habitual) in certain pro-environmental behaviours, making them the most salient behaviours.

In the case of the New Holland, residents' economic situations were a major determinant for pro-environmental behaviours. For example, their limited economic resources motivated the majority of residents to conserve energy in order to lower their utility bills. As a result, while they did not display care for the natural environment in general, residents did show commitment to specific and individualistic pro-environmental behaviours. A qualitative study of 26 low-income households across 25 States by Dillahunt et al. (2009), which focused on energy use in low-income housing, showed similar findings—residents were aware of their energy bills, including those not paying their bills. For example, as one of the low-income residents from the New Holland explained, "I'm very frugal when it comes to my electricity...because nobody is going to pay my light bill but me".

Moreover, according to Rogers (2003), the characteristics that determine an innovation's rate of adoption are: relative advantage, compatibility, complexity, trialability, and observability to those people within the social system. The New Holland residents' lack of knowledge and failure to use green cleaning products stemmed from their trust and familiarity with conventional products, such as Clorox, lack of green interventions and/or knowledge of the building's use of green cleaning products, perceived lack of stores (where they frequently shop) to provide the products and the perceived extra costs associated with them. Furthermore, despite some of the residents' knowledge of the products, for example, from their workplace, they seemed to be unfamiliar with how they worked and not curious to try them out.

The overall findings show that trust plays a significant role in residents' decision making, attitudes, and behaviours. For example, trust in purchasing familiar products (such as cleaning, groceries) throughout the years; trust in moving to the building because certain sources considered it safe and reliable due to the building's location, historic significance and renovation, such as the local Women's Shelter, Crosspoint, and family and friends; and trust in staff to, for example, to fix problems (malfunctions, wear and tear) associated with their apartments.

Finally, another factor that should also be considered is that, while all the theories discussed aid in understanding behaviours, Fishbein and Ajzen's model assumes that people are

essentially rational when they engage in behaviours. While the majority of the residents interviewed appeared to be rational, we need to also take into account that residents' intense backgrounds, such as domestic violence and mental health conditions, might also have indirect effects on their engagement in certain pro-environmental behaviours, for example, new behaviours that require interaction with others. As a result, residents' behaviours might not always be displayed in a predictable manner and might be very circumstantial in some cases.

Based on the findings, the LEED features the residents valued in hierarchical order were: location, the building's characteristics (recognized as historic and/or renovated), the building's energy conservation system (recognized by some residents due to the building and/or geothermal system), and the cleanliness and upkeep of the premises. The non-LEED features were security and privacy. All participants (including staff) appeared to highly value the building's geothermal system even though they had poor knowledge of how the system works, again due to it generating low and stable electricity bills and in the case of the management a certain level of independence. The newly installed geothermal system was also considered by the maintenance staff as unique in the community and especially in low-income housing developments (See Figure 5).



Figure 5: View of the geothermal system at the New Holland (Source: Authors).

Most of the LEED features valued were implemented at the design and construction stage. The ones that pertain to the ongoing management and pro-environmental behaviours, such as recycling, the use of green cleaning products (e.g., for cleaning individual apartments), water conservation (e.g., low-flow shower heads, and using bottled water), and so forth, were lacking or not available. Moreover, although some of the residents were aware that the building was a green building, they were ill-informed about the actual benefits of the building's green features (beyond energy conservation), significance of household behaviours (singular and total), benefits of the pro-environmental behaviours they already engage in, and which other behaviours they could perform themselves and/or collectively (individual, household, and the residence as a whole). As a result, the findings show that the LEED features mentioned—geothermal system, location and building type—play an indirect role in influencing residents' everyday pro-environmental environmental behaviours.

The staff played a significant role in the upkeep and maintenance of the New Holland Apartments. Residents performed minimal actions, which included cleaning their individual

homes, behaving well at the residence and acting responsibly in public areas of the building, for example, the corridors and the playgrounds. The findings also show that the residents had formed an informal social organization consisting of those who moved from the local Women's Shelter, women with children and so forth. Therefore, understanding roles and social organization and interactions among residents and staff is perhaps the major avenue by which information about pro-environmental behaviours can be disseminated and pro-environmental behaviours encouraged. As discussed by the residents and staff, the roles and duties of the residents appeared to be passive, while the management and maintenance were active. However, the findings from the interviews show that this situation could be changed, for example, through the distribution of duties among willing residents which could help enhance self-capabilities and skills and also the maintenance or upkeep of the building, especially the building's historic features.

The building's existing informal social organization discussed earlier can be an avenue to encourage residents to engage in and commit to certain pro-environmental behaviours, especially since trustworthiness was considered by the majority of residents as the major determinant to engaging in certain behaviours. Information can be distributed and communicated among residents tailored accordingly to their social groups, for example, women with children, the elderly, residents who moved from other Crosspoint properties and women who moved from the local Women's Shelter. Due to children's significant role in the building, their engagement in activities can also aid in disseminating information about pro-environmental behaviours.

The interviews with staff also show that they lacked understanding of residents' capabilities concerning their abilities and interests in engaging in pro-environmental behaviours. The findings show that residents expressed interest in adopting pro-environmental behaviours—especially those that could help enhance their quality of life and reduce costs. It also will help residents to engage in the upkeep of the building by, for example, informing and identifying when and where changes (caused by the age of the building) occur at their apartments. Residents' increase in awareness could help alleviate pressure and distribute responsibilities among all.

The findings reveal potential opportunities for providing interventions within the building to enable residents to enhance their existing knowledge about pro-environmental behaviours and acquiring new ones. One of the avenues is providing information to new residents at the time of their move into the building about its green features (the residence and the apartments) and about ways to behave pro-environmentally. This suggestion was also discussed during the interview with Crosspoint's executive director "I know we give out tenant handbooks, but I don't know what it says and, uh, if it doesn't say those things, then it's something we should attend to."

An additional avenue is through the activities conducted in the building and newsletters organized and distributed by the property manager. The current reasons residents engage in the building activities are for their children and the free food. Children were discussed often in the interviews and are also the reason for use of certain facilities in the building, interaction among residents, concern and welfare of the residence, and some residents' concern for the environment. As a result, children can play a significant role in encouraging and informing residents, especially parents, about pro-environmental behaviours. A few of the residents mentioned in the interviews that this is already occurring in some of the households where children take their household recyclables to school for recycling and encourage parents to use electricity and water wisely:

My daughter told me when I brush my teeth, ok, I used to leave the water running, and my daughter said, "Ma, you need to turn the water off while you're brushing your teeth." I said, "Why?" because I didn't know, and she said, "Because you can save energy, you save energy, you're saving water," and I said, "ok." Now, when I brush my teeth and the water is on, I say, "Oh, I need to turn it off." Because that little bit of time she spent to tell me, well, now

I turn my water off, I take showers instead of baths, and I do that now, you know, so she's taught me a lot.

Past studies on recommendations for the reduction of household energy consumption suggested, for example, commitment, goal setting, and feedback as motivational strategies (Abrahamse et al., 2005). The findings from this study show that engagement within the building among all users, residents and staff, engagement of owner and stakeholders in providing incentives and encouragements for internal (within residence) and external (outside the residence) residents' engagement and broader engagement from the neighbourhood could increase pro-environmental behaviours at the residence.

The most influential factor mentioned in the interviews that is also part of LEED features is the location and building's characteristics. The design reflects a certain era and the values of those responsible for its design and construction, which also applies to the newly renovated features, for example, in the way the apartments have been rearranged and designed, in the way the communal spaces are set up and in the way the initial landscaping was done at the playground. When the residents were asked about their experiences moving to the building, they showed excitement and happiness when they talked about the choices the building offered, for example, in the size and layout of the apartments and the facilities. In addition, they expressed contentment with their choices due to the apartment options they were offered by the management during their move, the improved facilities provided (in comparison to their previous homes), and the amount of savings they experienced due to their low electricity bills and location.

Another factor that also influenced the residents is the building's history, which is also included in the LEED categories, however, from a different perspective. The historic nature of the building appeared to have had an influence on the way the residents felt about the building and as a result the level of attachment they had to it. The majority of the residents and staff identified with the significance of the historical nature of the New Holland in its design (old designs of spacious rooms), aesthetic standing, overall presence within the neighbourhood, and their personal or transferred memories (stories told by their families). Furthermore, several residents were proud that their residence once housed the elite of Danville and that now they get the chance to also use it. These aspects also influenced how residents perceived themselves in connection with the New Holland among themselves and others they met who did not reside at the building. For example, one low-income resident expressed "I live in a historical building, you know, so yes, so all my people and all my relatives in Tennessee, I tell them I live in a landmark."

Moreover, the level of renovation the building went through also played a role in how residents viewed their living environment and conditions. The building went through major changes—for example, changes in the majority of its windows (apart from those that were not permitted by the preservation board), plumbing system, lighting system, and installation of a geothermal system and dual water tanks. It reused the majority of its original brickwork (apart from those that could not be salvaged) and obtained extra bricks from a local site that contained identical looking bricks. Furthermore, the contaminants that were present on the site prior to its renovation due to facilities on the site, such as the gas station, had been remedied and replaced with the addition of the current parking and playground facilities (See Figure 6).



Figure 6: Views of New Holland Apartments' playground facility (Source: Authors).

Due to these changes, residents expressed satisfaction with their surroundings and acknowledged an improvement in their quality of life. Both residents and staff showed commitment to keeping the New Holland safe and trouble free. This ongoing commitment is also due to both direct and indirect impacts the building has had on residents' psyches (background factor) and performance. Moreover, some residents expressed the opinion that the New Holland requires extra care and attention due to its age and heritage significance. One of the residents mentioned "we need to take care of the building as it is a landmark".

Finally, while the residents showed a certain level of environmental engagement, depending on the behaviour, the building itself also has had a significant impact on the public and environment because of the manner in which it was renovated to preserve its historic presence, in the manner it operates and in the manner it is used. One of the users in the Danville Library said "It is good to see the New Holland building doing well and back on its feet."

CONCLUSION AND FUTURE WORK

The findings from this study extend the literature on household environmental knowledge, attitudes and behaviours of a low-income population and residents of a majorly renovated, LEED-certified, multifamily housing development. As a result, it focuses on a group that is often left out of the mainstream sustainability debate—low-income households. Given the increasing adoption of LEED-certification in the United States and worldwide, this study provides a starting point for understanding household attitudes and behaviours for future green renovation of residential buildings of heritage for motivating low-income residents to engage in pro-environmental behaviours through the consideration of social dimensions (internal characteristics, e.g., background and experiences), and specific needs in relation to green building features. The study provides focused information about a segment of the low-income population who exhibited a level of understanding, critical thinking and concern for the environment in direct relation to their needs, capabilities and awareness stemmed from their past and new experiences and knowledge of the age and heritage of their residence. The findings show that, while the majority were concerned with the direct economic value of their restored residence and personal behaviours, a few also expressed their care and concern that green buildings of heritage such as the New

Holland require a certain level of engagement and understanding from those that use them in order for them to remain green.

Strategies for the improvement of household environmental behaviours need to be employed and further research conducted for the development of effective ways for low-income residents to be more engaging in their residences. Moreover, these types of studies will encourage inclusivity in sustainable built heritage and will provide an expanded understanding of environmental behaviours that encompasses human and situational dimensions by incorporating individual and social behavioural components and built environment characteristics concerning persons with low-income and buildings of heritage.

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