Creating a Sustainable Housing Market in KW

Taylor Helferty20247112
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Advisor: Prof. Robert Gibson
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Abstract

The building industry contributes upwards of a third of the greenhouse gas emissions in Canada. Conventional housing, despite efforts to improve energy and water efficiency, still remains largely unsustainable. To create healthier cities and homes as well as provide a better environment for future generations, the building industry must build to sustainable standards. As a contribution to needed changes, this thesis proposes a set of criteria for sustainable housing and current and emerging trends, developed through review of the existing literature and interviews with professionals in the housing market.

There are also many institutional, political, economic, and social barriers preventing the widespread adoption of sustainable housing. To create a successful transition to a mainstream sustainable housing market, sustainable housing must be reframed to be more attractive to consumers and businesses, proper incentives and standards must be enacted by government, and more networks and businesses should be created to establish the groundwork for a feasible sustainable housing market. Beyond this paper, more research needs to be done to increase consumer education and build demand for sustainable housing, create effective incentives that foster innovation, and establish the groundwork for businesses and government to ensure the widespread adoption and implementation of sustainable housing practices.
1.0 Introduction

People usually make their choices based on what is available to them. Much of the environmental movement focuses on direct efforts to change the minds and habits of the general population. While this can be effective, an often better option is to change the infrastructure the world makes its choices upon; not by restricting innovation or imposing totalitarian rules, but simply by changing the basic infrastructural components that are available and that can support desirable innovations and choices. Changing agricultural systems, energy systems, transportation, urban development, etc. by creating sustainable infrastructure could facilitate big steps towards making the world sustainable.

Entire anthologies could be written about methods to create global infrastructure to support sustainable systems, so for this paper the focus will be on where we spend most of our time and make most of our choices: the house. The house and other buildings are the central areas where sustainability considerations can come together in many forms: materials, energy use, water use and waste, and space, to name a few. By creating more sustainable, self-reliant homes, adverse environmental impacts can be mitigated and positive impacts enhanced by the housing industry. The building industry (along with transportation, related to housing location, and construction) accounts for over a third of Canada’s greenhouse gas emissions (Brooks, 2012). Aside from environmental health, there are many potential economic and social benefits from sustainable housing (International Energy Agency, 2006).

Currently, there is still a fairly large divide between “conventional” and sustainable homes, despite growing recognition of the need for more efficient designs and energy systems. Many barriers contribute to the slow adoption of sustainable housing, ranging from the lack of a shared vision for sustainable housing and poor quality design to a lack of knowledge and skill in sustainable building methods and negative perceptions from the public to elements such as high density and social mix (Winston, 2010).
The purpose of this thesis is to understand the current sustainable housing market in Kitchener-Waterloo (KW) and identify the gaps, barriers, and other elements affecting sustainable housing development in the area. This is done in order to create an action plan that can redefine housing development strategies towards a sustainable future. This will only address new development, but retrofits will be touched on briefly. The core question is: how can sustainable housing practices become conventional in Kitchener-Waterloo? While the scope is limited to KW, it can certainly be extrapolated to other Ontario or Canadian cities as well.

Through research into the existing literature and interviews with professionals in the local housing market, this paper first defines what sustainable housing is. Sustainable development is a complex and very broad topic, and even more ambiguous is the single word: “sustainable.” The widely-accepted short version definition of sustainable development that was given by the United Nations (1987) in the Brundtland Report is, “...development that meets the needs of the present without compromising the ability of future generations to meet their own needs.” This involves three main pillars of sustainability, or the commonly named “triple bottom line” of environmental, economic, and social aspects (Evans & Jones, 2008). This still creates ambiguity among stakeholders, especially when it comes to housing specifically. There is a large debate in the literature as to what specifically defines sustainable housing and how to extinguish ambiguity and prioritizing between the three main pillars. Before delving into the sustainable housing market in KW, this debate will be explored to come up with a confident definition of and criteria for sustainable housing.

Along with the definition, more background information on sustainable housing will be given, largely specific to Ontario and KW, including current certifications and policies and how well they suit the criteria defined for sustainable housing. As well, existing housing design standards - both conventional and sustainable - will be explored and also compared to the definition. With the background information available, the current housing market trends, emerging sustainable best practices, and barriers to the wider adoption of sustainable housing...
in Ontario and more specifically KW will be described. From there, recommendations for how to transition the conventional housing market into a sustainable alternative, what can be done to achieve this transition, and next steps to be taken will be discussed.

Currently, both the City of Kitchener and the City of Waterloo now have vision plans to revitalize their downtown cores. This timing provides an excellent opportunity to foster sustainable change in the housing market for Kitchener-Waterloo and establish the groundwork for what the current market is moving towards, where sustainable housing currently fits, and what the gaps are. By identifying the gaps in housing where sustainable practices can and should be present, practices can be suggested to address those gaps. While there will be gaps in the broader context of sustainable development such as the suitability of current transportation and energy grid systems, the focus for this paper will be the gaps in individual buildings or the immediate, small neighbourhood scale. This will create a clear foundation to explore new standards, definitions, and policies that can be brought into the housing market in Ontario and, more particularly, KW. Even more, this research can shed insight onto potential new projects, businesses, and networks that can be created within KW to help make sustainable housing practices more conventional.

1.1. Methodology

A large part of the research for this project is literature review. Existing literature about sustainable housing was used to find information on existing housing policies in Ontario and KW, as well as case studies for sustainable housing, definitions of sustainable homes and communities, and what has been done locally and in other areas to create sustainable housing initiatives. This established a large part of the groundwork for determining what is needed to create a sustainable housing market in KW.

The second research method consisted of interviews. This was especially helpful in determining what trends and market interests exist and what developers should and want to
deliver. Interviewees included real estate agents and small business owners involved with sustainable development. One challenge here was getting enough data, as many interviewees, especially those who are in roles such as large-scale development, had less time or interest in going through the interview process. To attempt to make the interviewing process as simple and effective as possible, there were only two questions which can be simply answered and expanded upon depending on the willingness of the interviewee. As well, for more hard to reach interviewees, the questions could be answered via e-mail. The questions asked were:

i) What are the current trends and buyer expectations in the housing industry in KW and where do you see it going in the future?

ii) What is your opinion on the feasibility of sustainable housing now and in future developments? What will the future market likely be driven by (i.e. consumer demand, government requirements or incentives, industry leadership)?

With these questions, the interviewee was provided with a description of the thesis agenda, including a brief definition of sustainable housing as used in this study in case there is ambiguity in their opinion of the definition. All interviewees remain anonymous in the final product. At the end of the research period, four interviewees responded, numbered Interviewee One to Four throughout the paper. The interviewees’ backgrounds are: Interviewee One from real estate, Two and Three from small business in sustainable housing practices, and Four from consulting business involved in sustainable development.
2.0 What is Sustainable Housing?

2.1. Definition of Sustainable Housing

The term “sustainable” has lately been viewed as an over-used and ambiguous term. While many associate it with environmental concerns, it is used in a variety of other contexts due to its broad definition. This widely accepted definition is simply to meet the needs of current generations without impeding future generations from meeting their own needs. In terms of sustainable housing, sustainability is usually broadened to involve links with many forms of development, such as energy sources, transportation, and food production and sales. Therefore sustainable housing specifically must be clearly defined for the purpose of clarifying the scope of this project.

The broad concept of sustainable development involves three main elements – ecological, economic, and social – and their interactions. As sustainable housing is a part of sustainable development, it also focuses on these elements, but in a more specific manner. As well, a definition for sustainable housing is more a definition of sustainable architecture, and can include more elements that are more relevant for the small scale of a single house or building. These elements include technical, organizational, functional; technical refers largely to the skills and tools used, while organizational refers to the ability to work with stakeholders and functional is the way the building is used by the occupants. (Norton, 1999; Maliene & Malys, 2009).

Another element, albeit more a “sub-element” to social factors, is social-psychological - how the home is a place for privacy and intimacy for the occupants (Maliene & Malys, 2009). While they may not be a part of the house itself, institutional elements such as governance and education also play an important role in the home and can either help or deter its sustainable claim (Winston & Eastaway, 2008). A definition which brings that all together could be housing design that conserves energy, works with the local climate, reduces the use of new materials and resources, respects its users (in terms of the function of the building) and the site the house is built on, and takes an overall holistic approach to housing (Vale & Vale, 2000).
The literature largely agrees on these elements being the most important to the individual house's sustainability. However, even still the definition can become ambiguous, which is in itself a barrier to adopting sustainable practices (Evans & Jones, 2008). This is in large part to the varying discourses and priorities of various stakeholders over a development project (Seyfang, 2010), where different stakeholders will put different weights on economic, environmental, or social factors. The paper by Kern (2011) explains that this diversity can be as much good for sustainability as it is a barrier, where the diversity can foster innovative ideas and bring together different strategies for tackling a problem.

While the above factors are a sufficient definition for what elements are considered for a sustainable house, it is more effective to look at what is required to make those factors sustainable themselves.

Sustainability in general requires equal attention to and integration of the economic, environmental, and social determinants of wellbeing. As the United Nations’ definition suggests, this is by meeting the needs of these three pillars without compromising the future from meeting their own needs. This entails maintaining a functioning economy, giving everyone access to the basic necessities and comforts of life, and staying within the environment’s limits. For the environment, this would mean staying within waste absorption limits, allowing resources to regenerate appropriately, preserve species biodiversity, and preserve water quality and availability. Globally, this becomes very complex; however at the household scale it can become much simpler. How does the house contribute to sustainability?

For a house, the same general criteria for achieving sustainability apply as for other forms of development, yet on a smaller scale. To be classified as sustainable, a house must stay within the absorptive capacity of the local and global waste absorption limits, use renewable and replenishable resources sustainably, meet basic human needs and comfort levels, be economically viable and socially acceptable, improve socio-economic equity, and be technologically feasible (Choguill, 2007).
While there are many homes that exist under these criteria today, they are usually still at a high premium, and so improving equity factor is particularly important. It entails that sustainable housing should be affordable and able to scale across different income levels. The builders and planners should also be forward thinking and focusing on trends and changes in the market, as well as ensuring a proper consensus among all sectors, such as builders and developers (Winston & Eastaway, 2008; Zimmermann et al., 2005). On the neighbourhood scale, communities and citizens should also be empowered and engaged when it comes to the construction of the housing (Deakin & Allwinkle, 2007). This social inclusion not only allows them to make an input on community design process, but also educates them on the best practices and empowers them to bring those practices to others. As well, the community should be fairly self-reliant so as to limit the dependence on non-local resources (Winston & Eastaway, 2008). The social and economic elements of sustainable development are tightly woven, and it is through their resilience that real change can occur. When discussing the idea of sustainable economic development through a more liberal, free market, Dorn (2007) discusses the importance of institutional infrastructure ahead of physical infrastructure when it comes to development. While this argument may only relate to economic development, it is repeated that sustainability depends on the resilience of social systems, which is dependent on institutional design, property rights, communication, and trust (Crabtree, 2005). These elements of social acceptance and resilience are the more important aspects of sustainable housing, as public acceptance is necessary for the mainstream uptake of sustainable housing practices.

One limitation with these definitions is they largely focus on the built house and not the construction process. When it comes to housing, the environmental pillar does not restrict itself to the use of the finished house, but also includes the “embodied energy,” and embodied pollution and embodied ecological disturbance arising from the nature of the energy and materials inputs required during the construction and life of the house itself and the processing
and transportation of the energy and materials used (Magwood, 2012). Minimizing the embodied pressures on the planet, therefore, is also a key element to attaining sustainability.

In North America especially, the life of a building, is perceived to be short (Interviewee 3), with multiple changes in purpose and major renovations as the building ages. In order to be sustainable, a building throughout its life should require little maintenance, be easy to disassemble and reuse materials, be easy to renovate, and be overall durable and built to last for as long as possible. Adaptability and durability of a house is a key component in reducing negative environmental and economic impacts especially by designing for both anticipated and unanticipated changes to the purpose and use of the house and external factors, such as energy prices (Gibson et al., 2005).

Extrapolating to the neighbourhood and city level or beyond can arguably require the same criteria, however larger scale applications get much more complex and thus will not be discussed in this paper. On the household level, certain practices can ease demands on the larger systems on which the house would otherwise rely, such as energy or water infrastructure if the house produces its own energy and has its own water source (i.e. rainwater). While ambiguity is largely inevitable when it comes to complex issues such as sustainable development, it is not hard to design a set of criteria for the single house or even the immediate neighbourhood. In theory, the difficult task is usually not in defining what constitutes a sustainable home, but rather integrating the economic, environmental, and social aspects without prioritizing one in a way that degrades the effectiveness of the others, such as sacrificing environmental or social sustainability for economic gain.

In conclusion, to more concretely define sustainable housing it is important to go beyond setting out the overall broad elements of sustainability to specify what criteria need to be fulfilled to define a home as sustainable. Drawing from the discussion above, these are the main overall criteria that should be met:
• **Conserves energy and water.** The house should conserve energy wherever possible; especially for heating and cooling. Energy use should first be avoided where possible, and then minimized by energy efficient mechanical systems, which can be powered by renewable sources. Water should be conserved, reused, and retrieved locally wherever possible.

• **Works with local climate.** The house should be designed in a way that works with the local climate, requiring little to no energy use for heating, cooling, and ventilation.

• **Reduces embodied energy.** Reduce materials used. Materials used are recycled or reused from demolished buildings or existing structures on the site, are local, and use little energy and resources for production. Embodied energy also extends through the material’s lifespan, thus materials should be durable and have little embodied energy during disposal (Magwood, 2012).

• **Stays within waste absorption capacities.** The house is within the local and global waste absorption capacities. This includes material and construction waste as well as human waste.

• **Is economically viable and affordable.** Sustainable housing practices should be economically feasible and available to all income classes. This involves the ability to scale designs and practices across income classes.

• **Is socially acceptable.** Sustainable practices should be flexible enough to meet diverse homeowner preferences. Not everyone will want a green roof or compostable toilets; therefore all sustainable aspects of a home should have alternatives to foster diversity and homeowner control over their home.

• **Empowers and engages the community and fosters self-reliance.** The community and individual homeowners should have more input into housing developments and be educated on sustainable housing designs. An engaged community and homeowner can
foster better informed decisions and more motivation (Gibson et al., 2005). By meeting other criteria, individual homes and communities can become more self-reliant in the event of disruptions to larger systems (e.g. energy grid blackouts).

- **Enhances adaptability and durability.** Houses should be designed for change, both anticipated and unanticipated. This also means self-reliance for the homeowner and community. Relevant considerations include easy disassembly and renovation, and durability to allow the building to be adapted for different purposes and uses over time and for future generations to use the house with little maintenance and the same amount of sustainability.

2.2. *Certification and Policies*

One of the barriers to mainstream sustainable housing practices is the lack of government regulations and political will to create a norm for these practices (Seyfang, 2010; Crabtree, 2005; Winston, 2007; Winston 2010). However, many municipal and provincial level incentives and business-driven certifications exist in North America and Ontario. The best known of these certifications is the Leadership in Energy and Environmental Design (LEED) rating system for green buildings, a points-based system that rates homes on various elements of sustainability. It was adapted for Canada from the US Green Building Council and is largely overseen by the Canada Green Building Council (CaGBC), although there are other businesses that oversee LEED certification. LEED uses a tiered approach to certifying buildings where, based on the number of points scored, a building can attain one of four certification levels: certified (lowest tier), silver, gold, and platinum (highest tier). While there is a broader application of LEED for new construction and major renovations or larger buildings, the CaGBC also has LEED Canada for Homes, which focuses on the homebuilding industry specifically (Canada Green Building Council, 2009). The points for LEED Canada for Homes are scored in eight categories (Canada Green Building Council, 2009):
• innovation and design process → exemplary performance and design methods
• location and linkages → placement of the home in relation to the larger community
• sustainable sites → impact of the home on the site
• water efficiency → indoor and outdoor water efficiency
• energy and atmosphere → heating and cooling design and energy efficiency
• materials and resources → embodied energy consideration and construction waste reduction
• indoor environmental quality → reduction of pollutants indoors
• awareness and education → education of homeowner, tenant, building manager on green practices

The LEED Canada for Homes program is more extensive than the general LEED certification for buildings, which excludes the location and linkages and awareness and education categories, but adds regional priority (a focus on durable buildings and focus on geographic location).

While LEED is largely overseen by private business and the CaGBC, Natural Resources Canada (NRCan) runs its own rating guide for sustainable buildings. EnerGuide requires that an energy advisor from NRCan perform an analysis on house plans, suggesting measures to improve efficiency and then testing those measures upon completion of the house. Like LEED, EnerGuide uses a points-based rating system, although not as in-depth or categorized as LEED. The rating system for existing and new homes, defined by Natural Resources Canada (2011), consists of:

• older house not upgraded (0-50)
• upgraded older house (51-65)
• energy-efficient upgraded older house or built-to-standard new house (66-74)
• energy-efficient new house (75-79)
• highly energy-efficient new house (80-90)
• house requiring little or no purchased energy (91-100)

A rating of 0 is a house with virtually no insulation and requiring huge energy inputs, while 100 requires no purchased energy for heating and cooling. The rating number is determined, generally, using a series of tests on energy consumption by the various functions of the house (such as space and water heating) which are then put into a simple equation. Recent policy changes require all new homes to have a rating of at least 80 (Ministry of Municipal Affairs and Housing, 2010).

Along with EnerGuide, there is also the Energy Star certification, well known for its use in appliances and products that has been extended to homes to rate them on energy efficiency, including insulation levels, high-performance windows, draft proofing, and efficient space and water heating (Natural Resources Canada, 2011). NRCan also has the R-2000 home program, which certifies homes based on how a house performs through requirements such as R-2000 training for builders, energy budget, water conservation, and undergoes a series of independent inspections. It also requires builders to choose from a “pick list” of various environmental features and materials selections (Natural Resources Canada, 2010).

In Kitchener-Waterloo specifically, many sustainable building initiatives are business-driven. Local businesses such as Enermodal Engineering, Mindscape Innovations, Community Renewable Energy Waterloo (CREW), and the Residential Energy Efficiency Program (REEP) all contribute to LEED certification, incentive programs, and energy audits for houses and buildings in KW. Otherwise, KW’s municipalities adhere to Ontario policies in regards to sustainable building, except for small initiatives and partnerships. One such initiative, which reaches its end this year, is the Green Housing Incentive Program, a partnership with CREW using the Local Environmental Action Fund. The latter was a $5 million fund set aside in 2007 for those with ideas for environmental preservation programs, whereupon applicants could receive a portion of this fund for their initiatives. CREW was approved $500,000 from 2010-2012
to give incentives to builders of LEED-certified homes, in the manner of $2000-$5000 (certified to platinum, 1st home) to $1000-$3000 (certified to platinum, third or higher home). There are also the downtown revitalization projects by both Kitchener and Waterloo that promote construction and renovation of their downtown cores, which will be talked about in more detail later in the discussion of current trends.

Do these certifications align with the criteria defining sustainable housing? LEED is the more extensive of these certifications and incentives, while the others are narrower in their scope. Table 1 presents a general list of the criteria discussed in section 2.1 and compares LEED, EnerGuide, R-2000, and Energy Star. Since KW’s incentives and businesses use these rating systems and certifications, they are not in the table.

Table 1. How well do the main certifications for sustainable building compare to the definition?

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Conserves Energy/Water; use renewable energy</td>
<td>Points scored based on energy and water efficiency</td>
<td>Main focus</td>
<td>Main focus</td>
<td>Main focus</td>
</tr>
<tr>
<td>Works with Local Climate</td>
<td>Points scored based on relation to larger community; adapted to fit Canadian climate</td>
<td>Not focus, but energy conservation methods will vary by climate</td>
<td>Not focus, but energy conservation methods will vary by climate</td>
<td>Not focus, but energy conservation methods will vary by climate</td>
</tr>
<tr>
<td>Reduces “embodied energy”</td>
<td>Points for environmentally friendly materials</td>
<td>No consideration for materials</td>
<td>“Pick List” includes consideration for materials</td>
<td>No consideration for materials</td>
</tr>
<tr>
<td>Within waste absorption capacities</td>
<td>Points for relation to site and larger community; waste reduction during construction</td>
<td>Only focuses on technical efficiencies, no waste consideration</td>
<td>Only focuses on technical efficiencies, no waste consideration</td>
<td>Only focuses on technical efficiencies, no waste consideration</td>
</tr>
<tr>
<td>Economically viable/Affordable</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Socially acceptable</td>
<td>Social recognition, indoor environmental quality category for points</td>
<td>No focus on social acceptance, though label recognized by buyers</td>
<td>No focus on social acceptance, though label recognized by buyers</td>
<td>No focus on social acceptance, though label recognized by buyers</td>
</tr>
<tr>
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<td>---------------------------------------------------------------</td>
</tr>
<tr>
<td>Empowered/Engaged/Self-reliant Community</td>
<td>LEED for Homes gives points for education of community on green features</td>
<td>N/A</td>
<td>Focuses on education of builder on sustainable building methods</td>
<td>N/A</td>
</tr>
<tr>
<td>Adaptability/Durability</td>
<td>Not focused on, though effort towards this could be considered for points in innovation category</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

As Table 1 reveals, LEED has the most holistic approach, while NRCan’s programs largely focus on energy efficiency, with the exception of R-2000 certification which also takes into account the embodied energy of materials used in construction and the education of builders on sustainable best practices. A key concern is that there is very little focus on the economic, social, or adaptability elements of sustainable development for any of the certification processes. The programs concentrate mostly on the biophysical environmental aspects of sustainability. All but LEED neglect social and economic criteria entirely and LEED’s attention to these factors is limited. The result is misleading labelling. While having a home certified under any of the above will give a home more recognition in the market as being a “sustainable” home, only LEED certification with its awareness and education and indoor environmental quality categories incorporates the three basic aspects of sustainability or pays attention to the larger community.

Aside from these certifications, there exists a number of provincial incentives for builders and homeowners, such as the ecoEnergy Retrofit program which can award homeowners up to
$5000 for energy efficient retrofits and the Ontario Power Authority’s microFIT program, part of the Feed-in Tariff (FIT) program, which pays for small-scale renewable energy generation on homes that feed excess energy into the grid.

2.3. Conclusion

A definition of sustainable housing should be holistic; not only should it serve the three pillars of sustainable development – environmental, social, and economic – but it should also consider organizational, functional, technical, socio-psychological, and institutional elements. To do this, a house should conserve energy, work within its local climate, reduce the embodied energy of its materials, respect its users and the site it is on, stay within local and global absorptive capacities and manage waste accordingly, be economically viable and affordable (i.e. using economically scalable methods), empower and engage the community, be technically feasible, and be adaptable to change. While LEED certification encompasses most of these principles, it does not consider the economic or adaptability portions of this definition very strongly. Other certifications, such as EnerGuide and Energy Star, pertain to the physical house itself and do not consider affordability or scaling for different incomes. As well, NRCan’s various certifications and standards are options to going above current building codes and largely focus simply on energy saving. More criteria should be encouraged to meet all principles of the proposed definition. Furthermore, these principles should evolve from an award for doing extra work to becoming normal building codes themselves. Changing the minimum EnerGuide rating of all newly built homes to 80 is a good example of this, but still only addresses one element of sustainable housing.
3.0 Current Housing Market Trends

3.1. Conventional Housing in Ontario

Currently, conventional housing is defined by current trends in the housing market. Some of these trends are leading towards sustainability, such as higher density developments in downtown areas and more adoption of energy-efficiency standards (Interviewee One, Two, Three), which will be discussed later in this paper. However, many of the current trends in the housing market are unsustainable. In the interviews, the two biggest trends mentioned seemed to be split generally between urban and rural settings; in urban settings, there was a trend towards high rises and infill developments. Homeowners wish to be closer to employers, especially due to rising gas prices, and want less space to maintain, such as lawns and personal driveways (Roe & Saglie, 2011; Ireland, 2008). In Kitchener, many old industrial buildings are being turned into lofts and commercial spaces, such as Kaufman Lofts and Briethaupt Block. There is a large focus on downtown regeneration and development within the city core. The same is true for Waterloo, where high-rise buildings are beginning to dominate the landscape, especially around the universities. In rural areas and neighbourhoods with many single-detached homes, the interviewees who work with sustainable retrofits for homes see a continued demand for large homes. An interviewee (Two) who works in housing retrofits stated that builders advertise their homes on a cost-by-square-foot basis, making larger homes more desirable. In suburbs and residential areas between downtown urban and country-rural areas, lot sizes are starting to shrink, but the house is using as much of the zone as possible (Interviewee One). In residential communities outside of the city core, smaller lots are becoming more common for the same reason that development in the core is becoming denser: land is becoming a more costly commodity, especially in cities such as Toronto and Waterloo, which are surrounded by agricultural land that has been barred from development (Interviewee One, Three).
The best way to establish the physical qualities of conventional housing is to look at the Ontario Building Code. The Code sets the minimum standards a house must meet to be considered legal. As previously mentioned, all new homes must have an EnerGuide rating of at least 80 as per the updated Ontario Building Code. As well, minimum insulation values for walls, ceilings, roof, foundation, and windows have all increased significantly and natural gas or propane furnaces must have a minimum of 90% efficiency (Ministry of Municipal Affairs and Housing, 2010). This is a big step in making higher energy efficiency the new norm for homes. However, it does not address all elements of sustainable housing. Other than energy efficiency, the only efficiency concerns involve water, which is addressed in the required use of low-flush toilets, while grey water systems and other green technologies are simply encouraged (Ministry of Municipal Affairs and Housing, 2010). The minimum building standards still do not consider the environmental impact of materials, waste absorption, overall water efficiency, or renewable energy sources. The social and economic aspects of sustainability are not addressed at all and the standards relate only to the physical house itself, without attention to the community. A broader range of practices are encouraged outside the Building Code, mostly through third-party or extra-effort certifications such as LEED, and are not tied to any legal requirements for house construction.

Under the Ontario Building Code most of what is needed to make housing sustainable is voluntary. In this context, most large-scale developers continue with established, energy and materially inefficient practices. While there are cases of innovation, largely in single institutional or business structures, the majority of large-scale development and sprawling neighbourhoods continue to aim for the minimum standard (Winfield, 2003).

Conventional housing that meets the minimum standard dominates the mainstream housing market. While this standard now includes higher energy efficiency requirements, it still leaves out most of the criteria of sustainable housing.
3.2. Leading Global Examples of Sustainable Practices

There are many and diverse practical applications of the design principles discussed in section 2.

**Earthships**

Among the least conventional in terms of materials and design are Michael Reynolds’ “earthships” in New Mexico, USA. While these homes may not be what we’ll see in the future conventional housing market, the practices Reynolds uses are definitely worth learning from. His homes re-use old car tires packed full of dirt covered over with adobe for walls. This creates thermal mass which, through the use of south-oriented windows, is heated by the sun during the day, keeping the house at a comfortable temperature even in the cold winter months. The homes also use wind and solar power, catchment systems for water from rain and snow, and all recycled and natural materials. They also feature sewage treatment on site, and allow for food production inside and outside the home (Hodge, 2007).

The “earthships” concept has been turned into a business model called “biotecture,” which is promoted in learning centres where people can become educated on the design and construction of the homes, have their own built, or take up internship opportunities (Earthship Biotecture, 2012). While unconventional, the homes do fit the complete definition of sustainable housing and have virtually no impact on the local and surrounding environment, are affordable, and provide a comfortable and private space to live in. Reynolds had to spend a decade battling the government of New Mexico for the right to build his homes experimentally (Hodge, 2007), but the “conventional” earthship is now designed to meet building codes. While the homes can be beautiful to some, they are very different from the norm. The concepts behind them, however, could be translated into conventional standards with the right motivations.

**Passivehaus**

Probably the most influential and effective design standard is illustrated by the passive home. The first formally designed passive house was originally built in Regina, Saskatchewan, Canada
in 1978, but was all but forgotten after it was introduced except by a German physicist who developed the idea into the European Passivehaus standard (Paulsen, 2011). Now, the standard is widespread in Europe. A Passivehaus standard house, or passive house, is defined as a house using at least four times less (ideally zero) mechanical energy for heating and cooling than regular housing (International Energy Agency, 2006). The passive house is achieved in a variety of ways, but generally utilizes solar radiation, thermal mass and high insulation values, air tight vapour barriers, and highly efficient ventilation systems to achieve an indoor atmosphere that requires little to no input from a furnace or other mechanical heating or cooling system.

The passive house approach is used extensively in Germany, where it is applied in conventional housing projects from single-detached to entire department buildings, especially due to its flexibility in terms of design (from high insulation values and insulating windows to solar gain and thermal mass) (International Energy Agency, 2006). The passive house concept alone conserves energy, is adaptable to the local climate, creates comfort for the user and is very affordable to build (International Energy Agency, 2006; Paulsen, 2011), is technically feasible, can be achieved with low embodied energy materials, and works towards a self-reliant community. The passive house is a tested and successful method of conserving energy that can be built with affordable materials and is scalable in design and cost. If implemented as a standard in all newly built homes, passive homes could have drastic effects on energy efficiency and sustainability of Canadian housing.

Dewees Island Community

Featured in the International Energy Agency’s Sustainable Housing Marketing Guide (2006) is a community-scale example of sustainable housing practice on Dewees Island, South Carolina, USA. The 486 hectare Dewees Island sustainable community was built with strict restrictions on construction, energy, water use, waste, and space used. The houses themselves cannot be taller than the tree heights and use passive solar heating through orientation and design, as well
as only being allowed to disturb a maximum of 697 square metres. There was no minimum house size. No lawns were allowed, only indigenous plants were acceptable for landscaping, and the electric-car-only roads were built from local materials such as crushed limestone and oyster shells. There was stakeholder collaboration and educational seminars for builders and homeowners and scientific research about the area’s habitat. Labelling their sustainable practices as an amenity, the developer has sold lots and homes successfully and has generated profit, while also experiencing low development costs. While the homes were on the pricier end, the case shows that conventional-style sustainable communities can exist and create demand, while meeting most of the criteria from section 2.1. The only drawback was the high price of the homes.

*Waterloo Green Home*

A final and more local example is the Waterloo Region Green Home, built as part of the Advanced Houses Program by CANMET, Natural Resources Canada (Carpenter, 1996). It was built with virtually no construction waste, environmentally friendly building materials and furnishings, native species for landscaping, stormwater management, triple-glazed windows, heat recovery ventilator with a gas furnace, air conditioning by outside ground and circulated rainwater, a solar-heated hot water system, and other green features. It boasts energy savings of 75%, water savings of 75%, and raw material savings of 40% (Vamberger, n.y.). As well, it looks like every other house in the area – a typical 3-bedroom raised bungalow while achieving LEED Gold. While it certainly addresses many of the criteria for sustainable housing, it does not engage the community or influence the neighbourhood around it. Although it was reasonably affordable, it was sold at $196,000, a 15-20% premium over the other homes in the mid-range neighbourhood. The Waterloo Region Green Home shows that conventional-looking sustainable homes can be built and sold. Comparing it to the others, shown in table 2, reveals that there may be better ways to make conventional-style homes even more efficient while covering more criteria for sustainable housing.
Table 2: A comparison of the examples of sustainable design against the criteria from section 2.1.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Earthships</th>
<th>Passivehaus</th>
<th>Dewees Island</th>
<th>Waterloo Region GH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conserves Energy/Water; use renewable energy</td>
<td>Sustains itself on its own renewable energy source, while cutting down on energy needs</td>
<td>Reduces mechanical energy for heating/cooling by at least 75%, up to 100%</td>
<td>Energy consumption 75% below national average; water consumption 70% less than comparable homes</td>
<td>Energy savings of 75%</td>
</tr>
<tr>
<td>Works with local climate</td>
<td>Designed specifically for the climate it is built in</td>
<td>Designs can vary depending on climate</td>
<td>Built to work specifically with the Dewees Island climate</td>
<td>Use of passive design, but relies more on mechanical technologies</td>
</tr>
<tr>
<td>Reduces &quot;embodied energy&quot;</td>
<td>Utilizes waste materials for construction</td>
<td>N/A</td>
<td>Used local and natural materials. Some embodied energy likely in the houses themselves</td>
<td>Careful to use non-hazardous or polluting materials</td>
</tr>
<tr>
<td>Within waste absorption capacities</td>
<td>Processes all waste on-site</td>
<td>N/A</td>
<td>Strict waste policies</td>
<td>Waste savings of 40%</td>
</tr>
<tr>
<td>Economically viable/affordable</td>
<td>Can be built cheaply and is scalable</td>
<td>Designs for passive systems generally less expensive, especially 100% passive homes</td>
<td>Meant as vacation homes for higher income class; some practices could be scaled down</td>
<td>Only 15-20% more expensive than surrounding conventional homes; heavy use of new technology adds cost</td>
</tr>
<tr>
<td>Socially acceptable</td>
<td>Very unconventional design, though practices could be transferred; high level of comfort</td>
<td>Creates comfortable indoor temperatures; flexible design criteria</td>
<td>Sustainable features viewed as amenity; many homeowners made it their primary home</td>
<td>Completely fits suburban landscape; very conventional design</td>
</tr>
</tbody>
</table>
Empowered/Engaged/Self-reliant community

<table>
<thead>
<tr>
<th></th>
<th>Many resources to train/educate homeowners, builders; homeowners completely self-reliant</th>
<th>Fosters self-reliance due to little to no need for mechanical heating, cooling, and ventilation.</th>
<th>Outreach and training/education to homeowners, architects, builders</th>
<th>Used as a showcase home to showcase features; does not engage the rest of the community for the building process</th>
</tr>
</thead>
</table>

Adaptability/Durability

<table>
<thead>
<tr>
<th></th>
<th>Built to remain durable for the long-term with little maintenance</th>
<th>Requires less maintenance needed for mechanical heating/cooling</th>
<th>No mention of this criteria, though built within limits of local habitat</th>
<th>Very technology-heavy design may require more maintenance.</th>
</tr>
</thead>
</table>

3.3. Emerging Sustainable Best Practices

Despite the predominance of conventional housing strategies in the Ontario and KW housing markets, there are a number of emerging best practices to foster sustainable housing designs. Both the municipalities of Kitchener and Waterloo have begun downtown vision programs to revitalize and concentrate development on their downtown cores. The City of Kitchener has introduced many incentives to spur development within the downtown, including tax rebates, grants, and even an exemption from development charges for projects initiated within their delineated downtown area (City of Kitchener, 2006). The City of Waterloo’s vision statement is similar in that it calls for better standards, incentives, planning, and initiatives (City of Waterloo, 2011). For both cities, these encouragements are broadly based in economic stimulation, creating better social standards and amenities, and helping to protect the environment. While the environment is a part of these vision statements, it is broadly covered and mostly relies on incentives towards LEED or similar initiatives. However, the main focus of both of these plans is to intensify downtown regeneration and development, which in itself slows down the pace of urban sprawl. As for urban sprawl itself, Kitchener and Waterloo, like Toronto, have begun to
limit their sprawl into surrounding agricultural land by adopting growth management plans that emphasize densification in existing built up areas and require higher than conventional densities in new greenfield developments (City of Kitchener, 2006; City of Waterloo, 2011; Interviewee Two, Three). Kitchener has about 15 years of residential land left, while Waterloo has six (Interviewee One). Across Ontario in general, there has been more of a shift towards brownfield development over greenfield development as cities like Toronto and KW try to avoid the looming cost of servicing and repairing infrastructure in low population suburbs (Winfield, 2005).

As discussed in section 3.1, the energy standards in the Ontario Building Code have also changed dramatically over the last few years, adding higher minimum insulation values for walls, floors, ceilings, roofs, windows, and foundations (Ministry of Municipal Affairs and Housing, 2010). As well, all new homes must be built to at least an EnerGuide rating of 80 for energy efficiency. Even without the standard, it is becoming harder to sell homes that do not have Energy Star, or high energy efficiency ratings of any kind (Interviewee One, Two). This same trend of consumer awareness is seen with water efficiency, though perhaps not as much as energy. While this only affects the energy and water conservation aspect of sustainable housing, it can lead to more innovative designs and is proof that successful incentives such as EnerGuide and LEED can make their way into standard practice.

Interviewees in the housing industry, such as real estate and related small businesses, reveal that people are becoming more conscious of the need for sustainable choices around their home, although the trend is slow moving. Positive indicators include more informed people purchasing solar and geothermal systems, wanting environmentally friendly materials, and wanting high EnerGuide rating or Energy Star certified homes (Interviewee One). One thing to note is that these trends are very much focused on ratings and efficiencies, with a trend towards energy efficiency above anything else. This still leaves out most of the other criteria for sustainable housing. As well, buyer choices still largely depend on cost and while these energy efficiencies are becoming standards, many of the true sustainable homes are small-scale
“example projects,” usually too unconventional or too expensive for the mainstream market (Bula, 2010). These examples need to become more focused on becoming large-scale standard-setters.

3.4. Existing Barriers to Sustainable Housing

Despite some growing trends towards energy efficiency and more sustainable housing designs, there are still many barriers preventing the mainstream adoption of full and true sustainable housing. These barriers stem from institutional, political, social, and economic factors.

Institutional barriers stem from established rules and cultures of societal and market structures and organizations that can foster or maintain reluctance to build sustainable homes. One common problem discussed in section 2 is confusion about the meaning and implications of sustainability and sustainable development. This confusion leads, for example, to prioritizing one of more of the pillars or criteria for sustainable housing, usually favouring economic aspects (Evans & Jones, 2008). This lack of shared visions causes inertia within regulatory bodies and businesses, where there is a reluctance to adopt changes seen as radical or risky (Winfield, 2003; Winston, 2010); this also causes increased time in approvals which restricts sustainable building projects and can raise costs (International Energy Agency, 2006).

Other institutional barriers are lack of resources, education, and proper regulation (Winston, 2010; Love, 2012). There is especially a lack of general knowledge regarding the integration of sustainable housing and urban planning. For example, it is one thing to orient a single house south, but in an urban setting such as KW, the orientation and layout of the neighbourhood should be considered to orient all homes south (Interviewee Three).

Political barriers largely influence and are influenced by institutional barriers, and one of these is also the problem of inertia within political forums. While sustainable practices exist, there is a reluctance to adopt them in the mainstream due to the conflicting discourses and governance and general suspicion and ignorance from government and other larger industries.
in the housing market (Seyfang, 2010; Crabtree, 2005). This ignorance creates a political barrier between innovation and grassroots practices as well, where a policy divide between community action and innovation and a lack of resources for communities prevents the innovative potential of local grassroots ideas and movements (Seyfang, 2010; Interviewee Four).

Dale & Newman (2009), in their paper on green urban development and affordability, mention two interesting social barriers: of the degradation of the “green” label to minimally credible marketing of products on the shelf rather than meaningful change, and negative social effects from neighbourhood gentrification. When neighbourhoods become a hub for a certain kind of popular lifestyle, (Dale & Newman (2009) use the example of Kensington Market in Toronto), upscale development and chain businesses can start to move into the area, raising property values and pushing out lower income classes. In terms of sustainable development, marketing “green” development at a premium can make it seem trendy and higher class, pushing out lower income classes and discrediting the affordability of sustainable housing. This can become a risk and barrier to the affordability – and certainly the perception of sustainability as being affordable – of sustainable housing practices. This relates to their first point of sustainability becoming a product, where it becomes a trend to be purchased and marketed at large premiums. Outside of gentrification, there are also the social barriers of general fear of change and the unknown, negative perceptions of high density housing and social mixing, and society not recognizing the need for its own regeneration (International Energy Agency, 2006; Winston, 2010).

Economic barriers - alongside political barriers - are some of the toughest to get past. This is largely attributed to buyers and developers being most concerned with cost and profitability. Throughout the literature, economic priority is identified as one of the largest hindrances to sustainable practices and discouraging integrated attention to the three main pillars of sustainability. While large-scale developers may focus on the profits and timeline of their projects in relation to profits (Smith et al., 2011), typical homeowners also focus mostly on
cost. Housing sales are focused on the initial capital cost of the house over operating costs (Gray et al., 2005). Advertising ten and twenty year costs to buyers could have a positive effect on their education and behaviour. On a broader scale, a home or housing development with features that enhance livability, such as increased walkability or efficiency measures, tend to come with market premiums which can cause the public to perceive sustainable housing as more expensive and “elite” (Dale & Newman, 2009). There are even mixes of institutional or social and economic barriers to sustainable practices within the owned home itself – revealed, for example, where grants towards renovations are used for beautifying homes instead of more practical sustainable uses (Interviewee Three). For example, granite counter tops can usually take priority over a rainwater collection system or better efficiency measures.

Finally, home builders and developers have long-established practices and ways of working through all aspects of house construction. Changing these established practices is a challenging barrier due to the high cost and difficulty of retraining staff, transitioning to new practices and methods regarding site planning and construction management, changing tools and distributors for materials, and changing their market strategies and partnerships (Dimson, 1996). Therefore, many builders who have established their business would be very reluctant to change their entire industry over, due to costs, complex supply chains, time, and a need for stability (Interviewee Four; Bon & Hutchinson, 2000).

Barriers to sustainable housing practices permeate all levels of the market world and these barriers are what need attention in order to bring sustainable housing into the mainstream market. While trends towards sustainable practices exist, these barriers slow them down and create fundamentally different discourses when it comes to evenly addressing the appropriate criteria. Acknowledging these barriers is one of the most important steps when it comes to transitioning to a prominent sustainable housing market.

There is still a competition between the trends and barriers discussed. Trends are slow moving and very economic-dependent and there are still many barriers towards widespread
adoption of sustainable practices. Many homes that are meet most or all of the sustainable housing criteria, while functional, are “example” homes. We have made plenty of different examples of different technologies and practices, and as the literature (largely from European countries) shows, these examples are becoming common practice in European countries such as Germany, which boasts many passive houses. There needs to be a transition from these example homes into a fully sustainable housing market, where these barriers are overcome and trends become standards.
4.0 Transitioning the Market

4.1. Making the Transition to Sustainable Housing

Some housing professionals now see local governments moving very slowly on development and housing initiatives (Interviewee Four). Especially at a time when so many are concerned for the fate of the Canadian economy, issues such as sustainable housing practices take a backseat for fear of an adverse impact on the economy. Therefore, it is important to reframe sustainable housing to shift the publics’ focus to social and economic benefits of sustainability through environmentally beneficial practices in the housing market.

When asked whether government, industry, or consumer demand would most lead new sustainable trends in KW, professionals in the housing industry said it was largely a “chicken and egg” scenario, where they all work with each other. However, they also said the most likely player to solidify market and consumer trends into minimum standards and regulation was government. The literature largely agreed with this, calling for municipal and larger government intervention to establish more sustainable housing standards and foster innovative competition between developers (Choguill, 2007; Seyfang, 2010; Winston, 2007; Winston, 2008; Winfield, 2003; Interviewee Four). To transition successfully to sustainable housing, local governments must have strong political will and policy initiatives (Kern, 2011; Winston, 2007). This should include not only new standards that place sustainable practices as a minimum, but also grant and incentive programs that foster innovative competition between development companies and give smaller niche builders an in to the larger building market. These programs would need to go beyond the standard energy efficiency certifications and small rebate programs to incentives that would focus on all criteria for sustainability, diminish barriers such as fear of up-front costs and ignorance of life-cycle (van Hal, 2007), and give rewards to truly innovative ideas. In Kitchener, development charges are waived for new projects in the downtown core (City of Kitchener, 2006), though Interviewee Four believes this could be taken a step further such as waiving property taxes for a year if buildings meet certain standards. Currently there is a
premium on sustainable designs or designs that enhance livability; this can be used as an incentive to foster innovation for higher-income projects, but should also be moderated or removed in cases such as low-income projects and to buffer against displacement in areas that become attractive to higher income classes (Dale & Newman, 2009). One method to remove these premiums could be through cheaper, affordable sustainable housing practices such as passive house designs. Also, if sustainable housing practices were conventional and widespread, economies of scale and increased competition would likely eliminate premiums. Programs should also put more focus on house amenities on functionality over purely aesthetic elements. These initiative ideas will be discussed in more detail in section 5.

Re-framing sustainable housing so that it becomes the “conventional” for, of housing in general, as well as introducing more innovative incentives to foster sustainable practices in development, can dispel the inertia that prevents these practices from becoming mainstream. Taking the new definition further into practice, this can involve a re-labelling of sustainable housing so that it is not misconceived as putting the environment far before the comforts and finances of the homeowners and industry. Van Hal (2007) advocates a labelling system as a way of perceiving sustainable housing in “one language,” or a more manageable system. Systems such as LEED or EnerGuide are examples of labelling systems that are fairly successful in translating sustainable practices into routes to profit. However, transition of the entire housing market to a sustainable norm requires a more encompassing labelling system as part of the building code (Interviewee Two). This labelling would include the criteria defined in section 2 and certain practices that have been seen in small examples that could be more easily adopted into building codes. As well, this labelling system should involve aggregate measures of progress towards sustainability across environmental, economic, and social elements that do not conceal any aspects and are not biased towards any one of these elements (Steer & Lutz, 1993).
Throughout the literature, effective green projects are only examples of what can be done (International Energy Agency, 2006; Crabtree, 2005; Engel-Yan et al., 2005). However, as discussed earlier, there are designs that can become – and in some places around the world are becoming – more widely used. One of these designs is the passive solar house. As mentioned in section 3, these homes are becoming very common in Germany and other parts of Europe, (International Energy Agency, 2006) and the main principle can be scaled to various climates and costs (Paulsen, 2011). In using the passive house as a standard for insulation and mechanical heating and cooling avoidance, businesses in KW could come up with innovative new designs. Currently, higher insulation standards in the Ontario Building Code do help avoid high energy inputs for heating and cooling, although by introducing passive house practices such as predominantly south-facing windows and thermal mass, such as concrete floors, to trap sunlight and release heat, the need for mechanical energy could be reduced to as little as zero.

While energy efficiency standards are becoming widely adopted, there is less attention on water and waste efficiency. These too can easily become standards with the implementation of greywater and rainwater catchment systems, localized waste treatment, and better stormwater management. Like EnerGuide, a rating system can be given to water efficiency. This is currently being done in Guelph, Ontario, where the “Blue Built Home” program awards new homes for water efficiency with certification (Bronze, Silver, or Gold) and rebates of up to $2,460 (City of Guelph, 2012).

As noted in the previously discussed barriers and trends for sustainable housing, the largest gaps between conventional and sustainable homes are due to inertia within the government and building industry, lack of knowledge about the practices, and a fear of changing the norm too much (Winfield, 2003; Winston, 2010; Interviewee Two, Four). A focus on easily adopted practices such as passive housing designs and water efficiency measures, along with the already widely adopted energy efficiency measures, can create a smoother transition to having sustainable homes considered conventional.
Aside from labeling specific efficiency measures and practices, another method of marketing sustainable housing to the general public is to re-frame the definition of a sustainable house to easily show the connections between environmentally sustainable practices and the social and economic benefits. The concepts and practices behind sustainable housing would likely be attractive to government, industry, and the wider public as practical and beneficial not only to the environment, but also to their own lives and businesses.

4.2. Reframing Sustainable Housing

While the main criteria that define sustainable housing were discussed in section 2, this definition can be reframed. To successfully transition the current housing market into a more sustainable norm, the definition of what sustainable housing is should be framed in a way that will a) be accepted by the wider public; b) is clearly stated and unambiguous; c) can easily be translated into strong policies and initiatives; d) prevents prioritizing one element of sustainability (such as economic factors) over others. Generally, sustainable housing has to become more personal (Interviewee Three). The criteria from section 2 indicate that sustainable housing must conserve energy and water use and use renewable sources for energy that must be generated; it must work with the local climate, reduce the “embodied energy” of materials through the house’s life, be within local and global waste absorption capacities, be economically viable and affordable, be socially acceptable, empower and engage the community while allowing them to become more self-reliant, and be adaptable and durable. The question now becomes: how do we translate these criteria into a widely accepted definition?

First, there is the issue of framing the definition in a way that is understood and accepted by the wider general public, as opposed to just the environmentally aware and motivated individuals in the public. As Dale & Newman (2009) note in their paper about the effects of gentrification, the concept of “green” or sustainable products has a tendency to become another category for consumption rather than meaningful change or a social movement; in terms of
housing, this can lead to displacement of lower class neighbourhoods by trendy, higher class businesses and homes. While the largely accepted perception of sustainable housing is that it is environmentally friendly, there are the other elements that should be part of that perception. Similar to the prioritizing of economical concerns over social and environmental concerns, framing sustainable housing as simply an environmental endeavour prioritizes it over economical and social, which is equally a barrier to the adoption of sustainable housing as a mainstream practice. Instead, parallels should be drawn that put economical, environmental, and social sustainability within the same boundaries and criteria. As a simple visualization of this, Table 3 below labels how each of the defined criteria from section 2 can serve the three main pillars of sustainable development.

**Table 3**: Connections between the categories for a sustainable house and the three pillars of SD.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Environmental</th>
<th>Social</th>
<th>Economic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conserve energy and water; use renewable energy</td>
<td>mitigates climate change; reduces stress on aquatic systems; prevents pollution</td>
<td>better air quality; more water availability; more self-reliance for water and energy needs</td>
<td>lowers energy bills of homeowner; reduces load on grid and can provide more energy from generating households</td>
</tr>
<tr>
<td>Design works with local climate</td>
<td>conserves energy by design (passive homes)</td>
<td>more comfortable environment; reduces energy needs</td>
<td>less maintenance; cuts energy costs; enhances durability</td>
</tr>
<tr>
<td>Reduces “embodied energy”</td>
<td>less pollution from waste; mitigates climate change by reducing energy used in production</td>
<td>can result in better quality, healthier materials; less pollution and potentially toxic materials</td>
<td>reduces cost of pollution clean-up; can reduce cost of continued maintenance</td>
</tr>
<tr>
<td>Within local/global waste absorptive capacities</td>
<td>reduces pollution; reduces energy used in large-scale waste facilities</td>
<td>healthier local/global environment</td>
<td>reduces costs for waste management; reduces costs of pollution clean-up projects</td>
</tr>
<tr>
<td>Economically viable/affordable</td>
<td>Fosters widespread adoption of environmentally sustainable practices</td>
<td>Lowers costs for homeowners and stakeholders; fosters social acceptability</td>
<td>Ensures economic sustainability.</td>
</tr>
<tr>
<td>Socially acceptable</td>
<td>Fosters widespread adoption of environmentally sustainable practices</td>
<td>Scalable across various homeowner interests and uses.</td>
<td>Fosters market demand for sustainable practices.</td>
</tr>
<tr>
<td>---------------------</td>
<td>---------------------------------------------------------------------</td>
<td>----------------------------------------------------</td>
<td>-------------------------------------------------</td>
</tr>
<tr>
<td>Empowered/engaged/self-reliant community</td>
<td>Educated and engaged community can create/maintain environmentally friendly functions; creates motivation towards sustainable lifestyles</td>
<td>Engaged community has more input on development; self-reliance and empowerment creates sense of community with neighbours, builds better relationships</td>
<td>Innovative and locally relevant solutions from community; better use of financial resources; creates better trade/economic relations in community (Dorn, 2007)</td>
</tr>
<tr>
<td>Adaptability/Durability</td>
<td>Ensures long-term sustainable use or ability to recycle upon end of life; reduces waste and pollution</td>
<td>Able to adapt to changes in demand; built for long-term use by multiple generations/purposes</td>
<td>Low maintenance costs; long-term durability means less overall life-cycle costs</td>
</tr>
</tbody>
</table>

As the above table reveals, each of the criteria can be relevant and beneficial to all three pillars of sustainable development in very common ways. The most obvious connections rest on the observation that improving and preserving the environment through housing design and sustainable practice creates healthier living conditions, less personal and community reliance on large infrastructure, and lower long term costs for homeowners and industry. Community engagement and empowerment can be considered largely social elements, pertaining to equity and livability in housing design, but engagement can also apply to ecological stewardship. Economic viability, affordability, and social acceptance can similarly help establish a viable context for the full range of sustainability initiatives by permitting broader societal uptake of sustainable practices. Socially acceptable and affordable housing involves scalability of housing designs and costs so that sustainable housing is feasible across all income classes. As well, economic viability ensures that this scaling as well as the technologies and designs used do not make the housing market economically unfeasible.
The connections among, and indeed the interdependence of, the economic, social, and environmental aspects of sustainability in the terms of housing are apparent, especially in Dorn’s (2007) article about the economic side of sustainable development. In this article, Dorn argues that the main focus of economic development should be to extend the range of choice and alternatives to the public. This can be extrapolated to the previously discussed definition of sustainable housing; by providing housing that limits high maintenance costs and provides more methods of self-reliance to the community and homeowner, their choices can be maximized. This can enhance property rights, trust, and communication, which Crabtree (2005) argues is more important to sustainable development, along with institutional design, than efficiency measures. It can be argued that they can go hand-in-hand, with community and economic self-reliance as a measure of efficiency.

So how can this new framing of sustainable housing become a sufficient definition? The main goals are: maximize energy, water, and waste efficiency and minimize impact to the environment over the long-term, engage communities in a socially acceptable manner, and retain profits while remaining scalable to different income and social classes. There is also a theme of self-reliance, in that many efficiency measures can form self-reliant homeowners and communities. Therefore, sustainable housing should be framed as housing that stays within local and global environmental capacities (including water, energy, and waste), is scalable across all income and social classes while retaining profits, and creates a more self-reliant and engaged community and homeowner.

4.3. Moving from the House to the Community

Studying sustainable development at the largest scales becomes very complex, as it involves not only the building, but also the industrial manufacturing of materials, energy systems, water and waste systems, and various markets with different discourses and goals. Moreover, instead of looking at housing alone, it is beneficial also to consider the immediate community, or
neighbourhood. In rural areas, a house can more easily be designed as self-sustaining. Yet in
the interest of intensification of urban areas as opposed to sprawl, it is better to work
sustainable building designs into the surrounding community; after all, one of the criteria for
sustainable housing is to strengthen and engage communities. Many of the factors affecting the
sustainability implications of homes – such as uses of water, energy, and waste – can be made
more efficient when considering the immediate community. Methods such as green roofs,
community gardens, orientation of all homes (for passive housing designs), and water features
can improve housing sustainability from the community level (Engel-Yan et al., 2005). When
developing neighbourhoods and communities, it is important that these methods be considered
before building the homes; focusing on a house separate from the community can make it more
difficult to achieve the most efficient designs (Crabtree, 2005). As an individual working with
sustainable home retrofits comments, there is a need for communication between urban
planners and builders to better implement community designs with housing designs (Interviewee
Three).

One of the best examples of sustainable community planning is the concept of
cohousing - housing which reduces private space with shared spaces and facilities (Crabtree,
2005). Families can own their own house or live in a home with another family, yet the
surrounding landscape is very community-oriented (such as community gardens) and there is
normally a single shared community centre where everything from events, meetings, and even
lunches and dinners are held by the community. Cohousing is the ideal example of designing
the community to work as a single unit. However, this sort of lifestyle is not accepted by
everyone. Conventional standards are typically against sharing space when it comes to housing
(Interviewee Three). Crabtree (2005) noted that during the construction of a community-led
cohousing initiative, the housing provider became a barrier due to fear of “tenant control” and
losing their role of delivery to a passive recipient. Suspicions from government, real estate,
building industry, and financiers were also barriers. The idea of cooperative food provision and
more community involvement can be unattractive to the typical individual with the 9-5 job; however, many of the principles can be carried over into conventional neighbourhoods and communities. Many communities would thrive with the concepts of shared food and other systems in their community, but in urban centres with very dynamic individual lifestyles and cultures, this can be difficult. Elements of cohousing can already be seen in buildings such as condominiums, where there is generally some shared space within the building (such as a gym or lounge area). Enhancement of shared space in high-density neighbourhoods and other design practices from cohousing - such as community gardens, urban forests, and decentralized water and waste systems - could be accepted in conventional community spaces.

Another strategy could be the use of community land trusts (CLTs), where the land title is given to the trust and homeowners control improvements and title for the homes (Crabtree, 2005). Giving more power to the community in decision-making processes over their homes, with a focus on self-reliant and engaged communities, can be important for innovation and foster often-overlooked grassroots ideas from the community (Dale & Newman, 2009; Seyfang, 2010). Involving the community in housing design can help build connectivity in suburbs (Fiedler & Addie, 2008) and elevate more niche actors into positions that could influence housing policy (Seyfang, 2010).

In making the housing market more sustainable, it is important to focus on the micro-neighbourhood scale and create a better understanding of how housing can become more sustainable through its interaction with the immediate community – including its income class, zoning, and how it fits into the larger urban system (Engel-Yan et al., 2005). A study comparing sustainability of inner city neighbourhoods and newer subdivisions on the outskirts of town in Hamilton concluded that older, inner city neighbourhoods were up to twice as sustainable as newer outskirt subdivisions (McLean & Korol, 2004). In Kitchener-Waterloo, central intensification can provide the same results, as well as an opportunity for creating communities that can be empowered instead of disconnected through strategies for self-reliant, sustainable
designs. While cohousing may still be a niche concept, its designs and overall ideology can be adapted to the dense living conditions of central neighbourhoods and conventional high-rises. Involving homeowners in policy and design decisions, as well as simply viewing the sustainable designs of a home in the context of community and enhancing shared spaces and livability elements for the entire community, can greatly increase the desire for sustainable housing design throughout the conventional housing market.
5.0 What Needs to be Done

5.1. New Standards and Incentives

When it comes to leading new sustainable housing trends in the conventional market, many believe it is a chicken-and-egg scenario between government, industry, and consumer demand. However, governments – namely provincial and municipal governments – should be the ones to develop, or at least implement, effective programmes for encouraging and expanding desirable trends (Kern, 2011; Winston, 2007; Winfield, 2003; Curran, 2012).

Choguill (2007) lists criteria for sustainable housing policies. These criteria include: involvement of community with planning, construction, and maintenance; builders have access to good quality, affordable materials (embodied energy should also be considered); change building standards to reflect sustainability principles; finance housing properly to foster sustainable practices; ensure adequate and affordable land for residential construction. These kinds of criteria can be adopted and applied by municipal and provincial governments. In terms of building standards, there have already been changes to the Ontario Building Code reflecting better energy efficiency, yet this is only one criterion for sustainable housing design. The Building Code should include all sustainable design criteria (Choguill, 2007; Bula, 2010; Interviewee Three). Areas needing attention include water efficiency, waste efficiency, less intrusive designs and integration of housing with the natural environment, materials with less embodied energy, infrastructure interactions, and size of homes. As discussed earlier, there are many practices that can be used to meet these standards, including passive house design and more decentralized water and waste systems. Standards that involve the community in decision-making processes and policy making can foster further innovation for sustainable housing at the community and household level (Evans & Jones, 2008; Seyfang, 2010; Choguill, 2007).

The recommended new additions to the Ontario Building Code would make new builds more energy efficient and foster renovations of existing housing that falls below these
standards. Retrofits can be done through the use of already available services that conduct energy and other efficiency audits on existing homes, such as EnerGuide and REEP in KW. In Ontario it is becoming more difficult to sell homes with low EnerGuide ratings (Interviewee One), so having visual ratings along with standards for other efficiencies - such as water efficiency - can bring about these same consumer demands. Providing regular mandatory audits on these efficiencies, along with grants or subsidies to improve them, can apply the building code more extensively to existing buildings and retrofits. Instead of incentives to go beyond the Building Code, the Building Code should set these practices as the minimum (Curran, 2012). The best example would be taking the criteria from a certification program like LEED and making them the standard building code as opposed to the step above.

Simply changing the building code is not something that can be done without encountering resistance from industry, which has already expressed concern about the higher upfront cost of renewable energy installations (Painuly, 2001). While other designs discussed can be made with little to no extra cost to the builder, more advanced (and effective) means of sustainable housing such as the incorporation of renewable energy technologies can be much more expensive. While the life-cycle costs may be lower, these are largely ignored in favour of the immediate capital costs faced by both builders and homeowners (van Hal, 2007). To address these concerns, one initiative that is popular in many US cities is the property assessed clean energy (PACE) program (Interviewee Four). This program uses municipal bonds secured by real property for residential, commercial, or industrial districts to cover upfront costs for projects such as solar panel installation, energy efficiency measures, or even water efficiency measures. These bonds are then voluntarily paid by property owners as fixed payments along with their property tax bills (Renewable Funding, 2011). This creates a very powerful way to avoid upfront costs to sustainable house designs and renewable energy without putting financial stress on the municipality, builder, or homeowner. As well, since these practices save
homeowners money over time, the added cost of paying off the bond is barely noticed (Interviewee Four).

Along with the concept of PACE loans, properly placed subsidies on sustainable designs and incentives for the developer can be very effective. An example of this, proposed by Interviewee Four, would be waiving property taxes for a year for sustainable buildings. Such incentives that significantly reduce costs to the builder can be more effective and foster more innovative solutions to overcome barriers to sustainable housing than focusing incentives on the homeowner. While homeowners and community should be engaged in decision-making processes, some grants focused on home renovation can be used for aesthetic changes (i.e., granite counter tops) as opposed to functional, sustainable changes (Interviewee Three).

As mentioned earlier, the introduction of a robust labelling system that focuses on efficiency ratings and indicators of sustainability can greatly improve the adoption of these practices (van Hal, 2007; Interviewee Two). Well publicized labelling can foster innovation from builders as well as giving homeowners a clearly labelled comparison between inefficient and unsustainable homes and sustainable ones. Like the EnerGuide rating for energy efficiency, labels and ratings for all criteria of sustainable housing can cause less sustainable homes to become undesirable in the market to homeowners and push builders to attain higher efficiencies in order to sell.

Housing trends are being influenced by government, industry, and consumers, with the players constantly interacting and passing responsibilities between each other. However, provincial and municipal government can pave the way for more sustainable trends in the housing market through the introduction of sustainable housing initiatives and incentives and more sustainable standards in the Ontario Building Code. A proper labelling system and market incentives like PACE loans can push developers and builders into creating sustainable housing projects, while making sustainable practices more desirable to consumers. It is not in a government’s nature, however, to make major policy changes or initiatives without the proper
groundwork being completed and assurance that the changes will work; for example, the current energy efficiency changes to the Building Code were not implemented until long after EnerGuide ratings had created demand for higher energy efficiency measures. This is where it is up to industry, business, and consumers to create a proper foundation upon which government can make appropriate initiatives and policy changes. Before new standards are written into the Building Code, it must be proven that these standards will create beneficial and effective change for the government, industry, and consumers. There is a need for networks, organizations and market-based projects, and appropriate learning environments to prove effective sustainable practices, create consumer demand, and design cost effective designs and technologies to transfer sustainable housing trends into government-led initiatives and policy changes (Deakin & Allwinkle, 2007). With an effective foundation as well as these government-led initiatives and policies, the gap between conventional and sustainable homes can diminish until all conventional homes are sustainable.

5.2. Projects and Businesses
To spur government into creating effective standards and initiatives, there is potential for new businesses and new sustainable housing projects that can create the foundation for new trends and policies.

Currently, there are many businesses that assist in sustainable retrofits for homeowners and provide services such as energy efficiency audits. These businesses provide an invaluable service for the current housing stock. However, this leaves a gap for new builds, which is governed largely by competitive bidding over land, thus shorter time scales which leave smaller, sustainably-minded developers at a disadvantage for being unable to afford working in those timescales (Smith et al., 2011). To ensure new buildings are built to sustainable standards, research can be done to assist developers, planners, and housing associations and builders in building sustainable projects within their timescales and business models. This can be done as
independent projects, projects initiated or funded by the developers themselves, or even a model for a small business or consulting firm. This research can also be in the form of training programs for urban planners to better collaborate with builders so that community design can work with housing design in a more sustainable way (Smith et al., 2011; Engel-Yan et al., 2005).

Currently, there is plenty of research and examples of successful sustainable homes and communities; these only need to be converted into practical applications that are easily adopted by large-scale developers and urban planners. This does not mean small businesses building sustainable homes should be discontinued – they still fill an important niche market and can offer more unconventional designs such as net-zero homes and cohousing communities that larger scale developers may be wary to build. Third-party businesses could also help with loan programs for sustainable homes to alleviate the financial pressures of monetary incentives from government.

For homeowners, a lack of education about the benefits of, and strategies for, sustainable housing remains a barrier. The mainstream housing market is not as sustainable as it could and should be in part because many people do not know what constitutes a sustainable house, or how it can benefit them (Winston, 2010). Therefore, projects aimed at educating the general public on how sustainable housing can improve their lives could go a long way in creating consumer demand. With a focus on the social and economic benefits of having an environmentally compatible home, as well as the elements of self-reliance these practices bring, sustainable housing can be more attractive to homeowners than simply educating them to how it is beneficial to the environment. While it is important that homeowners be conscious of how their home is good for the environment as well, knowing that this also lowers their electricity and water bills, makes them more self-reliant, and teaching them how the house can work with their surrounding climate and neighbourhood can allow homeowners to make more informed decisions when buying homes. In Ontario, this has been seen with EnerGuide ratings; homeowners know that a higher rating means more efficiency and, thus, lower energy bills. If
that knowledge were extended to the benefits of all sustainable housing criteria for the environment, economy, and social well-being, then unsustainable homes could simply become obsolete in terms of consumer demand.

For lower income housing, a market could also be created to build sustainable communities and houses for lower income classes. Currently, many sustainable homes are sold with a premium that is above a cost already too expensive for low income homeowners. However, there have been initiatives and projects in North America that have created cheap, sustainable, and comfortable homes for very low prices (Hilsabeck, 2012; Michler, 2011). This in itself is a possible market for small businesses to provide intentionally low income households that still adhere to the sustainable house criteria.

Finally, there is a potential for business aimed at working with other businesses to transition their well-established practices into more sustainable methods. The core activities could include training programs for staff on sustainable housing practices and consulting between businesses and suppliers for new equipment and supplies. Having an easier, more cost-effective way to transition businesses to fully sustainable housing practices could foster more widespread adoption of sustainable housing.

The diversity of variables to cover when transitioning the conventional housing market to a more sustainable one provides many opportunities for new business models, projects and research. This paper provides a preliminary baseline at what sorts of barriers prevent the widespread adoption of sustainable housing, which successes there have been, and what potential there is for it to occur in Ontario and Kitchener-Waterloo. However, more specific research and projects would greatly benefit this transition. Research into what kinds of programs would be most economically feasible and effective at fostering sustainable innovation within housing developments is one potential area of research; another is establishing sustainable housing practices that fulfill all criteria within the Ontario Building Code. Furthermore, this paper only focuses on individual new houses in KW and Ontario, while briefly
touching on the immediate community, retrofits, and other buildings. There is still the need to extrapolate these practices to all sustainable development including urban planning and development as a whole, energy production systems, national energy grids, large water systems, transportation, and industrial production of materials. Housing is only the end product of all of these systems; while its sustainability can affect much of an individual’s lifestyle, it only goes so far in addressing the sustainability of all forms of development. This research must also focus not only on successful examples, but also on how these practices can be implemented into conventional designs and thinking. More research is necessary to successfully make sustainable housing and development more than an example, but the conventional and normal way communities and infrastructure is planned. Aside from potential for businesses and projects, this also creates potential for various networks.

5.3. Network Potential

Sustainable housing involves a wide variety of professionals and stakeholders. It is therefore essential that these actors communicate and work collaboratively to create innovative solutions to implementing a sustainable housing market. To foster an effective housing market transition towards sustainability, there is a need for networks and creative partnerships that can reach consensus regarding ecological integrity, social equity and socially inclusive decision making, and institutionalizing values (Deakin & Allwinkle, 2007). Building these networks and partnerships would involve several key components.

First of all, there is a need for collaboration between developers, city planners, land owners, home builders and small business, architects, and municipalities when it comes to implementing incentives and grants towards sustainable housing as well as changing the building code. There needs to be proper networking between these actors to reach a consensus that delivers an integrated plan for economic, environmental, and social sustainability in housing (Evans & Jones, 2008). The perception that these three aspects of sustainability are
fundamentally different and conflicting is negative should instead be seen as a positive way to breed innovation and create meaningful institutional changes (Kern, 2011). Standardized changes at the municipal level can have meaningful effects if it is reached through consensus with these actors.

There also needs to be networking between builders, developers, landowners, real estate professionals, and homeowners and communities concerning actual development projects, and means of allowing niche actors in sustainable housing not only into policy decisions (Seyfang, 2010), but also into cooperative relations with large-scale developers during or in the planning stages of projects. With sustainable housing standards in place, collaborations among these interests can be more effective, though properly fulfilling the criteria of empowering communities and allowing them to become more self-reliant would happen more at the market level. Such collaboration could also foster innovative ideas for thorough sustainable housing labelling and rating systems.

In sum, there is plenty of potential for networking among key actors in the housing market. Research into strategies to form these networks and to establish new arenas and projects that encourage collaborative efforts involving all actors could foster real movement towards a mainstream sustainable housing market.
6.0. Conclusion

Long before households had electricity, humanity had adequate shelter all over the world. These designs have evolved and today, with the help of more advanced technology and more innovative designs, there are countless global examples of homes that rely less on electricity for comfort, are self-reliant, and have little adverse impact on the surrounding or global environment.

The definition of sustainable housing has been grouped under the broad and ambiguous definition of sustainable development, which mandates meeting the needs of today without compromising the needs of future generations. When it comes to housing, this definition and the integration of environmental, economic, and social equity considerations can be better framed as a set of criteria a house must meet to be considered sustainable. These criteria are to conserve energy and water while using renewable sources, design to work with the local climate, reduce the embodied energy of materials, work within local and global waste absorptive capacities, be economically viable and affordable, be socially acceptable, empower and engage communities, make communities and homeowners more self-reliant, and make homes more adaptable to change and durable to last for the long-term with little maintenance.

Currently, conventional housing still follows many unsustainable trends. In peri-urban rural areas especially, house sizes are still very large as homes continue to be marketed on a cost per square foot basis. In urban centres, however, there is a movement towards densification and more infill developments. While the Ontario Building Code has been updated to include better energy efficiency measures and low flush toilets, it does not meet all of the criteria for making housing sustainable. There are certifications and programs that reward those who go a step above the Building Code in terms of sustainable designs, but other than LEED these also focus on only a few of the criteria. LEED itself covers many general areas of sustainable housing and does more to foster innovation, yet a building does not have to meet all of the criteria defined in this paper to be awarded LEED status.
There are many institutional, political, social, and economic barriers to the transition of sustainable housing towards widespread adoption. These include political inertia and suspicion, lack of education on sustainability principles for homeowners and builders, a focus on profits and faster timelines before sustainability, and reluctance from businesses to retrain and transfer from their well-established practices to sustainable alternatives. To overcome these barriers and transition the market, there is potential for new networks to be formed between the various stakeholders and new businesses to lay the groundwork that convinces government to initiate incentives and new standards to make sustainable housing practices the norm. There is also a need for more research and methods to allow easier transitions for businesses from their current work model to one that focuses on sustainable housing.

6.1. Implications

Transitioning the current housing market in KW to sustainable housing practices has implications for the building industry (such as builders, developers, and architects), consulting firms working with the building industry, municipal government, and homeowners.

Building Industry. There is a need for all actors to create innovative solutions using the resources and technology we have today, fostered by incentives from government and demand by consumers. The building industry requires the biggest change to make mainstream sustainable housing possible, involving training their staff in sustainable housing practices and designs and changing their established business models and technologies to support sustainable practices. Discussed further in Next Steps, this can be done with the help of government incentives and more research into efficient methods of changing existing practices.

Consulting Firms. The transition of the entire housing market to sustainable alternatives requires getting past many barriers, especially reluctant actors in the building industry and government to change well established practices. These actors can be assisted with research that works with them to overcome the barriers and assists them with easier transitions to
sustainable practices. Therefore, there are implications for consulting firms to research strategies to ensure this transition and to work with businesses towards sustainable practices that continue to generate profit and redefine the market.

*Municipal Government.* The best way to ensure sustainable housing becomes the norm is to change the standards and policies to foster innovation and make these practices required. There is also a need for more incentives that foster innovative competition within the building industry and educate homeowners. The previously discussed labeling system that rates and labels housing in light of all the criteria for sustainable housing could go a long way in informing the public and creating demand for more sustainably built homes, while fostering innovation among builders to meet the requirements for these ratings.

*Homeowners.* As shown by the EnerGuide label’s ability to inform buyers about energy efficiency and making less efficient homes less desirable, informed consumer demand can change the market. By becoming educated on all sustainable housing practices, consumers can become a force, focusing demand on sustainably built homes. Awareness of the financial and social benefits to homeowners by using sustainable designs, such as increased self-reliance, savings in energy and water, decreased house maintenance, and healthier communities and homes, can foster demand for sustainable homes and cause less sustainable homes to become less desirable. This could also create more business for the home renovation industry, as these less desirable homes can be renovated to sustainable standards.

6.2. Next Steps

This paper provides preliminary research into the barriers that prevent wide adoption of sustainable housing practices and how these barriers can be overcome to make sustainable housing practices the standard. The paper also identifies needed steps including more clearly defining sustainable housing and reframing it to increase societal uptake of the ideas presented. However, there are still many areas that require further research and other stakeholders to
include in the discussion. It would be beneficial to talk with more stakeholders affected by changes in the housing market, such as policy makers, architects, and large-scale developers. There are also proposed solutions to transition the housing market to a sustainable standard that require further research to make possible. Good research combined with political issues can help reveal better means to engage decision makers with the various environmental, social, and economic issues in sustainable housing (Lo, 2011).

There needs to be more research into effective market incentives and how they can be implemented. Incentives such as the previously discussed PACE loans should foster innovation within the building industry while respecting needs to remain economically viable and to reward progressive builders, government, and even homeowners. This can include research into an effective and comprehensive labeling system that informs buyers on the various sustainable measures and benefits of a house and fosters demand for these practices.

There is also a need for research that helps create easier and cost effective transitions for the building industry from their well-established practices a sustainable housing business model. This is a large undertaking that involves retraining staff, changing established ways of building homes and running their business, and even changing interactions with distributors. Many businesses that have been working within a set of practices for a long time would be very reluctant to change their entire business model to a new one, so making this process easier, more efficient, and more attractive would be a large step in the direction of transitioning the entire housing market.

Finally, along with creating better incentives and assisting businesses in transitioning their practices, more research needs to be focused on creating the groundwork for a successful transition as a whole. The Ontario Building Code will not change unless the demand and market is already established. This entails creating the consumer demand and establishing effective practices that ensure any government regulations and changes to housing standards will have positive implications. While the government has the ability to push progress to a mainstream
sustainable housing market, this will not happen without the demand and market already established.

Many of today’s sustainable homes and buildings are “examples” that are showcased to illustrate what is possible in the way of sustainable building designs. They are independent projects to demonstrate what technology works and what is possible. All over the world, these projects have succeeded and have proven that we do have the technology and sustainable housing can be implemented across vast scales. Sustainable homes can be affordable or high-end; they can be single units or an entire apartment building; they can be built in any climate and allow large variations in design. Therefore, the next steps should not be creating more examples, but researching how to take everything we already know and implement it into a mainstream market. The next frontier for sustainable housing is not the technology or the design, but how to create demand for these designs and establish a new housing market where there are no more gaps between conventional and sustainable homes, but where sustainable homes are conventional.
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