A TALE OF THREE CITIES: MARKET TRANSFORMATION TO LEED BUILDINGS IN PORTLAND, SEATTLE AND VANCOUVER

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Abstract

This study examines why Portland and Seattle have more LEED (Leadership in Energy and Environmental Design) buildings than Vancouver and recommends policies to bring the city on par with its Cascadian competitors. Through examining LEED buildings, building permits, and conducting stakeholder interviews, this study shows that Portland and Seattle have more LEED buildings because of higher private sector uptake, which in turn is due to the extensive market transformation programs initiated by both municipalities. After exploring various options for increasing private sector LEED uptake, this study recommends that the City of Vancouver: (1) increase its staff capacity and expertise by creating a green building team; (2) offer financial incentives to developers, such as accelerated permitting, to build LEED buildings; (3) promote the informational materials of other green building stakeholders; and, (4) look to partner with the provincial government, local utilities, and academia to deliver tax incentives, technical assistance, and outreach.

Executive Summary

Canadians spend 90 percent of their time in buildings. These buildings account for one third of our country's energy use, half of our extracted natural resources, one quarter of landfill waste, and thirty-five percent of our greenhouse gases. The indoor environmental quality of our buildings affects our health, our productivity and our general sense of well-being. High performance or "green" buildings are designed to increase quality of life by maximizing occupant health while also minimizing environmental impacts. Even though green buildings offer these tremendous benefits, they are still not common practice in the marketplace. Using the LEED (Leadership in Energy and Environmental Design) standard as the metric, this study compares Portland, Seattle and Vancouver in order to make policy recommendations on how the City of Vancouver can best increase the number of green buildings, with the ultimate goal of transforming the local market so that "green buildings are demanded and supplied, and so that the marketplace innovates continuously toward increasingly improved performance" (Sheltair, 2003, p.4).

LEED is the predominant and most accepted standard in North America for evaluating and comparing different green non-residential buildings, which are often called "ICI" (industrial, commercial, and institutional) buildings. Dividing the total number of LEED buildings registered from 2000 to 2005 by the total number of ICI building permits issued in those same years shows that the 54 LEED buildings in Vancouver represents a market penetration of 15 percent. Portland and Seattle have higher LEED penetration rates of 20 and 23 percent. More importantly, the majority of the LEED buildings in Portland and Seattle are privately owned, whereas in Vancouver green building projects have been primarily led by the public sector.

This study examined six possible reasons, or independent variables, to explain this high private sector uptake of LEED buildings: (1) level of consumer/client awareness, (2) availability of green building skills and training programs, (3) government incentives, (4) municipal procurement policies, (5) civic capacity to facilitate green innovations, and (6) local regulations and the baseline building code.

The results show that Vancouver has fewer private sector LEED buildings because:

a) there has been less public investment in marketing and communicating green buildings costs and benefits to developers and landlords,

b) there has been significantly less technical design support for green building professionals,

c) there has been much less institutionalized support within the municipalities for guiding green building projects through the plan review, permitting and inspection processes, and most importantly,

d) there have been significantly fewer financial incentives offered to developers to build LEED buildings.

Recognizing that the building development industry is composed of multiple actors in multiple stages, a variety of market transformation tools are needed to stimulate LEED construction, including: information-based tools, the reduction of barriers and conflicts, incentives, and directive-based tools. In order for any of these tools to be effective, the specific policy options within each should: (1) increase green building demand, (2) facilitate the supply and delivery of green buildings, (3) encourage the use of an integrated design process, and (4) leverage currently successful green building programs, while still being within the constraints of (5) resource costs, (6) industry acceptance, and (7) political feasibility. Based on these criteria, it is recommended that City of Vancouver should:

1. Offer indirect financial incentives, such as accelerated permitting, to encourage private sector uptake of green buildings.
2. Adopt the proposed Green Building Strategy, and in doing so create an interdepartmental green building team with the resources and mandate to administer the incentive program, facilitate green projects through regulatory processes, and to offer first-tier technical assistance.
3. Promote and market currently available informational materials and resources at the permit counter, during the design review process, and on the City's website.

In addition to the above policy actions, the City of Vancouver can offer a more complete market transformation package if it partners with other key actors to address areas that are beyond its jurisdiction. Specifically, the City of Vancouver should:

4. Lobby the Provincial Government to offer tax incentives for the energy efficiency components of LEED certification.
5. Create partnerships with the universities (through their Centre for Interactive Research on Sustainability), BC Hydro, and other local green building stakeholders to offer more in depth, project-based technical assistance. This would include programs that facilitate access to such tools as design assistance, daylight analysis, and energy modelling.
6. Look to partner with the Government of BC, the utilities, and other key stakeholders to create and deliver a coordinated and targeted communications strategy, focusing on the benefits and business case of building green.

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Glossary

BETC	Oregon's Business Energy Tax Credit
CaGBC	Canada Green Building Council
CBIP	Commercial Building Incentive Program
GBS	City of Vancouver's proposed Green Building Strategy
GIF	Portland's Green Investment Fund
GVRD	Greater Vancouver Regional District
ICI	Industrial, Commercial, and Institutional – ICI and Residential are the two segments of the building industry.
IDP	Integrated design process
LEED	Leadership in Energy and Environmental Design
NEEA	Northwest Energy Efficiency Alliance
NRCan	Natural Resources Canada
SEFC	South East False Creek
SDT	Sustainable Development Team – This is the name of the interdepartmental green building team proposed in the City of Vancouver's Green Building Strategy
USGBC	US Green Building Council

1 Policy Problem, Background and Methodology

The purpose of this study is to recommend specific policy options to the City of Vancouver in order to increase the number of green building being demanded and supplied in the marketplace. The study begins by defining the term "green building" and then highlights the public policy issues surrounding their construction and the resulting benefits, such as reduced energy consumption, waste, water use, emissions, and increased occupant health. The methodology follows by defining the dependent variable as the number of LEED registered buildings, and then by describing six key independent variables that may have impacted LEED uptake in each of the cities. This section finishes by describing and selecting Portland and Seattle as the two cases for comparison with the City of Vancouver. Understanding why Vancouver may have less LEED buildings than the others is the primary objective of this study.

Section three presents the core of the research. It gives a general description of the green building landscape in each of the three cities and then offers a detailed comparison of the number of green buildings in each case. This comparison then continues by evaluating the various factors, or independent variables, that may have caused the differences in green building uptake in each case.

Section four follows with a discussion of uncertainty and risk in the building development industry and how this applies to market transformation theory. It is through this analysis that a market transformation policy framework is created and populated with the findings from research. This analysis reveals that there are specific gaps in Vancouver's green building landscape, which then form the policy options available to the City of Vancouver for increasing private sector green building uptake.

Section five presents the analysis of these policy options. Criteria are developed to evaluate these options. Recognising the complex nature of the industry and that the City of Vancouver cannot successfully act alone, two sets of recommendations are made. The first are actions that the City can undertake on its own, and the second are specific partnership opportunities that the City should pursue in order to have a complete and whole policy framework for green building market transformation.

1.1 Green Buildings

With growing concerns over energy security, materials scarcity, and global warming, governments are looking for ways to decrease the intensity of resource consumption and reduce the amount of waste that is produced. In the GVRD, building construction and operation results in:

- 3.6 million tonnes of GHG emissions emitted by buildings in 2000
- 309 million cubic metres of water consumed by residential and commercial buildings.
- 51 million gigajoules of electricity consumed by residential and commercial buildings.
- 1.7 million tonnes of construction waste generated (Light House, 2006).

"Green buildings" reduce these harmful side-effects of urbanization by increasing occupant health while reducing energy, water, waste, wastewater and material use at each stage of a building's lifecycle (Light House, 2006). By calculating the savings achieved from these reductions, a recent study by the Sheltair Group demonstrated that there is a net benefit to both the private and the public sectors to build green buildings:

> "...for the 'most likely' scenario of a 5% discount rate, 1.5% energy inflation, and 2% water inflation, the NPV [net present value] of implementing the GB [green building] scenario at a 20% penetration rate is about $2,600 million to the private sector and $2,700 million to the region as a whole. Even for the "most pessimistic" scenario considered of an 8% discount rate, 0% energy inflation, and 0% water inflation, the NPV of implementing the GB building scenario at a 20% penetration rate is about $900 million to the private sector and $1,000 million to the region as a whole." (Sheltair, 2004, p.44).

In addition to these resource savings, green buildings also increase occupant health and worker productivity by increasing the amount of daylight and the quality of the indoor environment (GVRD, 2005). These indirect economic benefits are much larger and far more valuable than the resource savings examined in the Sheltair study (Royal Institution of Chartered Surveyors, 2005). A recent study entitled "Green Value" by the Royal Institution of Chartered Surveyors (RICS) evaluated multiple green building cases and found that increasing the quality of the indoor environment decreased patient in-hospital recovery times, decreased employee

absenteeism and turnover, and even increased retail sales (Royal Institution of Chartered Surveyors, 2005). Despite these large benefits, green buildings are still not the standard practice in the marketplace (Light House, 2006).

Many studies have examined the incremental costs of going green. While some green technologies and products will inevitably cost more on a component by component basis, it is still commonplace for green building projects to come in with little or no cost increments (Kats, Langdon, Light House, VanCity). This is due to other efficiencies gained through integrated design.

There is an emerging consensus in the building industry that "light green" buildings, like LEED Certified and LEED Silver, have no cost increment, while "deep green" buildings, like LEED Gold and LEED Platinum, may have higher upfront capital costs ranging from two to seven percent (Langdon, 2004). However, the resource savings alone are enough to justify this cost increment, but when the potential occupant benefits are considered, building green can present a healthy return on investment.

1.1.1 LEED Registered Buildings – the Dependent Variable

While desirable, it is difficult to determine whether or not a building is truly "green". For example, if one building had more insulation than required by the building code, whereas another one reduced wastewater and water use, it is difficult to say if either building is truly green, let alone decide which one is *more* green. A few independent rating and building certification systems have emerged in order to address this issue. These rating systems are used as a measurement tool so that green buildings can be compared against each other and are distinguishable in the marketplace.

The two predominant green building rating systems for new construction in BC are Built Green and LEED (Leadership in Energy and Environmental Design). Built Green is primarily focused on low-rise residential buildings, particularly single-detached homes. Since Built Green is only one year old in BC, it has been excluded from this analysis.

Only LEED buildings are the focus of this study. Since LEED is geared towards larger, non-residential buildings, which includes offices, schools, hospitals and community centres, then this study has excluded the low-rise residential sector from the scope of analysis. Non-residential buildings make up the Industrial, Commercial, and Institutional, or "ICI" sector.

In 1999, the U.S. Green Building Council (USGBC) created a rating system to define and categorize green buildings, called Leadership in Energy and Environmental Design, or "LEED". Canadian projects were able to register with USGBC until 2003, at which point a group of BC industry stakeholders adapted the US LEED system to BC-specific regulations and conditions, creating the LEED-BC standard. This was a first for Canada and soon after the Canadian Green Building Council (CaGBC) was created, who then adapted the LEED-BC to a national standard.

LEED is a point-based voluntary system that is divided into 6 categories for a possible total of 69 points. The categories are:

- Sustainable sites (14 pts);
- Water efficiency (5 pts);
- Energy and atmosphere (17 pts);
- Materials and resources (13 pts);
- Indoor air quality (15 pts); and,
- Innovation and design process (5 pts),

Each category has certain prerequisites that must be achieved, and then developers and designers are able to choose which other points they want to pursue, depending on actual site conditions. Different levels of certification can be achieved based on the number of total points:

- 26 points = Certification
- 33 points = Silver
- 39 points = Gold
- 52 points = Platinum

Industry professionals enjoy this flexibility over prescriptive approaches often found in building codes (City of Seattle, 2005). This flexibility also encourages innovation because developers and designers can try new and innovative approaches to achieving the various LEED points. The number of LEED registered buildings is the key metric used in this study and is described further in the next section.

LEED has become the accepted industry standard for green buildings in North America. Many building professionals and practitioners measure the growth of the green building industry by the number of LEED accredited professional and the number of LEED registered building projects. In a recent study by the City of Seattle, industry stakeholders indicated that LEED

metrics should be included in any measurement of local sustainable building activity (City of Seattle, 2005). Therefore this study uses the total number of LEED registered buildings as the dependent variable.

1.2 Why Some Cities Have More LEED Buildings – Independent Variables

Understanding why Vancouver has less LEED buildings than the others is the primary objective of this study. To do so, the study uses a framework of six factors that are hypothesized to increase LEED uptake. A combination of secondary sources and elite interviews are used to see if any other variables were missing and to help determine which ones were most significant. Some of these variables are common sense, while others come from the literature on market transformation and innovation adoption. Building to green standards (such as LEED) requires a change in building practices (Light House, 2006). This process of change is called market transformation and is discussed further in Section 4.1. The following table lists each variable and the related hypothesis of how it impacts the number of LEED registered buildings. All of these independent variables are hypothesized to have positive relationships with the dependent - if an independent variables increases, so should the number of LEED registered buildings.

Figure 1 - Independent variables – Hypotheses and Metrics

Variable	Hypothesis	Metric	Sources
Consumer awareness	As consumer awareness increases, so will demand for LEED buildings.	(1) Size and scope of communications/ marketing programs (2) Presence of green building awards programs (3) Presence of green building demonstration projects (4) The number of green building-related news articles.	(1) City documents and elite interviews, and (2) Lexis-Nexis and Canadian Newsstand databases
Training & skill availability	As the level of training and skill of the design community increases, so will the number of LEED buildings.	(1) The presence and extent of green building seminars & workshops. (2) The presence and extent of project-based technical advisory services (3) The presence of green building regulatory guidebooks.	City documents, NGO reports, and elite interviews.

Variable	Hypothesis	Metric	Sources
Government incentives	Financial incentives offered to developers and builders will increase the number of LEED buildings.	The dollar amount spent and a qualitative description of each incentive program.	City documents, NGO reports, and elite interviews.
Municipal procurement	Requiring LEED for civic buildings will increase the number of LEED buildings.	This is compared using a qualitative description of each city's green building policies.	City documents and elite interviews.
Civic capacity	A city must have the capacity to integrate LEED practices and related technologies with the current codes and regulatory practices. Inadequate civic capacity will limit the growth of green buildings.	A municipality is considered to have sufficient capacity if it has an interdepartmental team with a mandate to handle green building issues and has developed local LEED guidelines.	City documents and elite interviews.
Baseline codes	As the baseline building code becomes more stringent, the number of LEED buildings will increase because it will be easier to achieve LEED points.	The cases are evaluated by comparing the number of LEED points a project can receive simply by building to the baseline code.	City documents and elite interviews.

The following subsections elaborate on the previous table by describing each variable, how it is measured, and its relationship to the dependent variable.

1.2.1 Consumer Awareness

A common issue cited by many service providers (architects, engineers, and contractors) is that their clients simply are not asking for green buildings (Light House, 2006). This creates a situation where developers are not willing to try LEED because they are uncertain about the level of demand. Market demand for LEED is a function of consumer preferences, which is in turn a function of increased awareness. As consumers become more aware of green building benefits, demand for LEED buildings will increase.

This study evaluates the level of consumer awareness in each case by comparing the amount of LEED-related marketing, communications, and public outreach and by looking at the

amount of news media attention on green buildings. Various types of campaigns and tools can be used to increase consumer awareness, specifically:

1. *Marketing & outreach campaigns* – marketing is often used to induce demand and so it is important to compare the extent and focus of any LEED-related marketing and communications.
2. *Awards programs* – awards programs are important because they are highly publicized events that serve the multiple purposes of raising general awareness, providing free media to winning firms, while also harnessing the competitive nature of business.
3. *Demonstration projects* – these types of projects serve the dual function of "learning by doing" and they create a template for how green building practices can be applied. They are effective at encouraging market transformation because they show leadership, are heavily marketed and are used as case studies that help increase know-how and technical capabilities. They are also effective tools for demonstrating the costs and benefits of going green. This variable is evaluated as a simple "yes, they have demonstration projects", or "no, they have yet to build that expertise".

The second key measurement of consumer awareness is the number of LEED-related new articles in the local mainstream newspapers.

With all of these specific metrics, the hypothetical relationship is that as the amount and effectiveness of LEED marketing campaigns increase, so will consumer awareness, which in turn will lead to increased demand for LEED buildings.

1.2.2 Training & Skill Availability

Building to the LEED standard often requires new skills, concepts and processes - particularly for the architects and engineers who have to alter their design considerations and their traditional way of doing things. It is only with these new skills and processes that green buildings can be designed with zero or minimal incremental costs (Light House, 2006).

To build a green building, a design professional must take into account the unique features of the building site, while also optimizing explicit environmental, social and economic project goals. Since every site is unique, so is each green building. This adds uncertainty to each

project. A skilful and knowledgeable designer can reduce this uncertainty, whereas without a skilled design team a developer will be reluctant to try anything new.

The hypothesis is that as the experience and the skill of the design community increases, so will the number of green buildings. The level of training in each case is evaluated by comparing the amount and the type of resources invested in informal training programs. Informal training programs are defined as those that do not count as credit towards a degree or diploma. Formal programs were left outside the scope because they are focused on training new entrants to the industry instead of changing the current practices of those already operating in the industry.

There are two types of informal training programs: (1) professional development events like seminars and workshops, and (2) project-based technical services that are offered to the industry to gain "hands-on" green building expertise. A qualitative description of the number, depth and scope of these programs is used as the basis for comparison. The hypothesis is that as the level of training increases, the uncertainty around designing and building green will be reduced, and so the number of green buildings will increase as a result.

1.2.3 Government Incentives

There are financial risks and sometimes higher up-front costs that are incurred when building green. Studies have shown that is possible to build green without any additional cost, but this depends on the specifics of each project and the experience of the design team (Royal Institution of Chartered Surveyors, 2005).

Since many buyers are not yet aware of green building benefits, there is also a risk that any green-related costs will not translate into added value. Financial incentives are often used to reduce this risk and offset some of the incremental costs. They ease a developer's entry into green building processes and give developers valuable learning-by-doing experience. This helps them learn the tools to maximize green value while minimizing the risks and costs in their future green projects. For this analysis, both the incentive amounts and their specific focus and type are compared. Both dollar amounts and qualitative descriptions are used.

1.2.4 Municipal Procurement

Leadership is extremely important in any process of change. In order for a municipality to show strong leadership with regards to LEED, it must have publicly endorsed LEED buildings and then have followed through by committing to LEED for all of its future municipal projects.

These green procurement policies set the bar for the industry and send a signal to the private sector that current practices are changing. They also give the municipal government the necessary political legitimacy to enact green building policies for the private sector. Finally, requiring LEED for all civic buildings will obviously increase the number of LEED buildings. This civic leadership is evaluated through a qualitative description of the respective green building procurement policies and the level of LEED sought in each case.

1.2.5 Civic Capacity

In addition to demonstrating leadership, it is also crucial for municipalities to have the capacity to cope with new and innovative green features in both municipal and private sector projects. For example, the innovative technologies in green buildings often challenge local building bylaws and codes and/or building inspectors are reluctant to give permits to new concepts and technologies. If the city doesn't have the institutional capacity to handle these innovations then this will limit the number of LEED buildings being built. Developers do not want their projects delayed while city officials "figure things out".

Civic capacity is demonstrated by the existence of an interdepartmental team with the mandate of supporting and facilitating green building projects. Staff must have expertise and be able to "speak the language" of green buildings.

1.2.6 Regulations & Baseline Codes

The local regulations, building codes and bylaws set the minimum standards for all new buildings. If that standard is more stringent in one city compared to the others (i.e. more "green), then this will make LEED certification easier to achieve. Therefore, the more stringent the baseline, the more LEED buildings will be built.

The three cities are compared in two ways: (1) the energy efficiency requirements in each case and (2) the number of LEED points that can be achieved simply by building the baseline code. The data is taken from research already completed on demonstration projects within the cities.

1.3 Analytical Model

In order to answer the research question of "why does the City of Vancouver have too few LEED buildings", the study must first show that Vancouver does indeed have too few. This is accomplished through a case study comparison of the cities of Portland, Seattle, and Vancouver. A few possible cases were considered in the selection process, but Seattle and Portland were finally chosen for comparison because of they are recognized as North American leaders in the field of green buildings. Additionally, their similar case characteristics (population, climate, perceived as being environmental leaders) allow for easy comparison. The following two subsections explain these characteristics further.

1.3.1 Portland & Seattle - Leaders in LEED Buildings

Both the City of Portland and the City of Seattle are leaders in the field of green building. By September of 2005, Seattle ranked first and Portland second in the number of LEED Certified and Registered projects, as seen in Table 1.

Table 1 - Total LEED registered and certified projects by city, 2000 - 2005

Rank	City	LEED Projects
1	Seattle	58
2	Portland	56
3	Chicago	44
4	Los Angeles	36
5	Grand Rapids	32
6	San Francisco/ Washington, D.C.	27
7	Pittsburgh	24
8	Houston/ Atlanta	23

Source: Adapted from the City of Seattle's 5 Year Sustainable Building Report

Further highlighting their leadership is their respective municipal green building policies. In 2000, Seattle became the first city in the US to formally adopt a sustainable building policy

(City of Seattle, 2005). Portland soon followed. The specifics of these policies are described in greater detail in Section 3 which gives an overview of each city's green building initiatives.

1.3.2 Case Characteristics

Portland and Seattle also have similar case characteristics to Vancouver, which makes it easier for direct comparison. Table 2 highlights these similarities:

Table 2 - Comparison of regional case characteristics

Characteristic	Portland	Seattle	Vancouver
Population	529,121[1]	563,374[1]	545,671[2]
Number of Households	237,307	258,499[1]	236,095[2]

Sources – [1] US Census 2000, [2] Statistics Canadian Census 2001

Additionally, since Portland, Seattle and Vancouver enjoy similar climatic conditions and similar geographic regions, then building techniques, construction considerations and even costs tend to also be relatively similar.

1.3.3 Data Sources

The list of LEED registered buildings in Portland and Seattle was provided by the U.S. Green Building Council (USGBC). The list was then sorted by date and owner type. There are six owner types: (1) local government, (2) state government, (3) federal government, (4) private, (5) not-for-profit, and (6) other. The "other" category is mostly dominated by post-secondary academic institutions.

For the Vancouver case, two data sets were combined into one. The GVRD's Build Smart program had monitored LEED projects from 2000 to 2003. During this time, projects were being registered under the USGBC and then LEED-BC. When the Canadian Green Building Council (CaGBC) was formed in 2003, projects began registering with them in 2004. These two data sets were combined to arrive at a total population of LEED registered buildings in the City of Vancouver from 2000 to 2005. The owners were then classified into the same typology as the US cities and the number of LEED registered buildings in each case was compared.

In order to control for differences in the growth and sizes of each city's respective building industry, the number of LEED buildings was divided by the total number of building

permits issued in those years to arrive at a percentage of market penetration, which allows for a direct comparison of the three cities. Building permit data was supplied by the City of Vancouver and by Construction Monitor for Portland and Seattle.

Finally, telephone interviews with developers and city staff were conducted in order to evaluate the significance and effectiveness of the various independent variables. Interviewees were asked why they chose to build to the LEED standard and were also asked to discuss how the various elements of the cities' programs (i.e. Independent variables) have impacted LEED growth in their projects and in their city. Please refer to Appendix B for further details on the stakeholder interviews.

1.3.4 Data Limitations

There are a few limitations in using LEED registered buildings for this analysis. The first is method used to differentiate between public and private LEED registered buildings. The initial data list indicates the type of owner for each LEED registered project. There are six owner types: local government, state/provincial government, federal government, private, not-for-profit and other. As part of the analysis, I aggregated these categories into "public" and "private", where the private sector LEED buildings includes "private" and "not-for-profit" and public sector includes the remainder. The "other" category was included in public investment because the majority of projects in this category were from post-secondary institutions. While these institutions may or may not be publicly-funded, the point is to build the private investment category in such a way that it reflected private commercial demand for LEED buildings, thereby excluding post-secondary institutions.

The second limitation in using LEED registered buildings for this analysis is that the scope of analysis is limited to the non-residential building sector, which is commonly referred to as the industrial, commercial, and institutional, or "ICI" sector. LEED is primarily focused on these types of buildings and is not well suited for low-rise residential. This is actually beneficial to the analysis because the residential sector is very fragmented and is regulated by a different section of the building code, and so the same recommendations may not apply. A separate analysis with different data is required for the low-rise residential sector.

The third and final limitation is that actual green building penetration will be undervalued by only counting LEED buildings. While the number of LEED buildings is the only data available, there are other green buildings that are not LEED rated. While many developers may follow the LEED system for designing their buildings, they may not actually pay the extra money

to get the building certified. To minimize the impact of this limitation, the dependent variable is the total number of registered projects, instead of the number certified projects.

The certification process begins by registering the building with either the Canadian or US Green Building Council. This signals that a project is intending to follow the LEED documentation process and places the project on the list of LEED Registered Projects. Once the building and associated documentation is complete, the building then becomes certified. There are also registration and certification fees that must be paid. Depending on the size of building, registration costs can range from $1,000 to $4,200 and certification can range from $2,500 to $21,000. Not all LEED registered buildings end up being certified.

Even with these costs, LEED acceptance in the marketplace has been rapidly increasing. The following table shows the brisk increase in LEED uptake in the US from 2002 to 2005.

Table 3 - Increasing LEED penetration and market acceptance in the US

LEED Metrics	**2002**	**2003**	**2004**	**2005**
Building Registrations	624	1,095	1,792	2,080
Workshop Attendees	7,905	14,606	22,495	25,615
Accredited Professionals	2,443	5,978	19,200	20,250

Source: Adapted from the Royal Institution of Chartered Surveyors' "Green Value: Green Buildings, Growing Assets" report.

As LEED has been gaining popularity across North America, many municipalities and states have adopted it, either through policy or legislation, as the standard for their own civic buildings. The following is a partial list of municipalities that have mandated LEED as their standard:

Table 4 - Municipalities with green building procurement policies

Municipalities with Green Building Procurement Policies (2004)		
Arlington, MA	Eugene, OR	Portland OR
Atlanta GA.	Frisco, TX	San Diego, CA
Austin TX	Houston, TX	San Francisco,
Berkeley, CA	Kansas City, MO	San Jose CA
Boulder, CO.	Los Angeles CA	Santa Monica, CA
Bowie, MD	New York, NY	Scottsdale, AZ
Calgary, AB	Omaha, NE	Seattle WA
Chula Vista, CA	Phoenix, AZ.	Toronto, ON
Dallas, TX	Pleasanton, CA	Vancouver, BC

Source: Light House Economic Report on Vancouver's Green Building Industry

In summary, this study uses the number of LEED registered buildings in Portland, Seattle and Vancouver to determine that Vancouver has too few green buildings. The study then looks at the six independent variables in each case in order to determine why Vancouver has too few. Portland and Seattle were chosen as the comparison cases because they are considered to be leaders in the field of green buildings.

Finally, while LEED registered buildings is the predominant and only relevant standard by which to measure and count green buildings, the use of this metric restricts the analysis to the non-residential sector and will most likely undervalue the real green building penetration in each of the three cities.

2 Case City Background

This section provides background information for Portland, Seattle and Vancouver. It describes the green building policies, programs and initiatives in each of the cities, highlighting the specific tools used to encourage green building.

2.1 Portland, Oregon

In 1999, Portland entered into a planning process to evaluate the possibility of establishing a green building program and what that would look like. The process began with 13 public meetings involving developers, architects and representatives of several City bureaus, and resulted in the adoption of the Green Building Initiative Action Plan (City of Portland, 2003).

This initiative was moved into the newly created Office of Sustainable Development (OSD) and given official status as a City program. The new green building program, called "G/Rated", had two fundamental objectives. The first was to expand market demand by educating both industry professionals and the public about the benefits of green buildings. The second objective was to "make green building practices easier to implement by reducing regulatory and financial barriers and developing technical services and resources for building industry professionals" (City of Portland, 2003).

In order to accomplish these two objectives, G/Rated focused on four strategic areas:

1. Organization and policy development;
2. Demonstration projects;
3. Technical assistance and outreach; and,
4. Incentives.

In the first strategic area, the City adopted a policy to require LEED Certification for all new buildings that were City-owned and/or city-funded building projects.

A handful of demonstration projects were then built as part of the second strategic focus area, which was used to develop in-house capacity and to evaluate and communicate the costs and

benefits of going green. This led to the creation of "LEED Portland" and its related guidebooks, which is a local adaptation of the LEED system.

The third strategic area of technical assistance and outreach came in multiple forms:

- Green building design and construction guidelines for multiple project types;
- On-going technical information to designers, developers, builders, businesses and homeowners;
- Training and workshops targeted at specific industry sectors and focused on design and construction best practices;
- Case studies and technical briefs on local green building projects and emerging technologies;
- A green building kiosk that included fact sheets, technical briefs, resource guides and a computer terminal linked to the G/Rated website, and;
- "ReThink: Innovation in Ecological Design and Construction", the region's first comprehensive green building certificate program for practitioners and homeowners. This annual course targets local design and construction professionals as well as homeowners (City of Portland, 2003).

In addition to these programs offered by the City, the Northwest Energy Efficiency Alliance also offers a multitude of training and skill development programs. The Northwest Energy Efficiency Alliance (NEEA) is a not-for-profit that is supported by the Bonneville Power Administration, electric utilities, public benefits administrators, state governments, public interest groups and energy efficiency industry representatives (NEEA website, March 2006). The NEEA is funded by all of the utilities and has the mandate to increase energy efficiency in buildings. They run various initiatives throughout Washington, Oregon, Montana and Idaho, but of particular importance is their "BetterBricks" program. BetterBricks is an extensive network of information and technical services which are focused on increasing energy efficiency in commercial buildings.

The BetterBricks program was also support by extensive information and communication campaigns. In 2004, they spent $4,928,224 on their market support services for the entire region. They placed 39 articles in newspapers and trade press, developed 8 new ads, and increased website unique visitors, returning visitors, page views and email signups (Northwest Energy Efficiency Alliance, 2004).

The second component of the BetterBricks initiative is their technical advisory and training services, which includes daylighting and lighting design labs, advisory services and extensive training programs. The daylighting labs are available to architects and other building professionals to help them optimize daylighting through the use of window glazing and electric lighting and controls. These services are provided at little or no cost (NEEA website, March 2006). These daylighting labs can help designers achieve up to 7 LEED points in the categories of "Daylight and Views", "Controllability of Systems" and "Optimize Energy Performance" (Loveland, 2004).

The Better Bricks Advisors Program also provides support for the formation of integrated design teams. This is especially important because integrated design is a crucial aspect to building green. The importance of integrated design is discussed later in Section 5.1.3.

In 2004, BetterBricks advisors were involved in 32 building projects throughout the Pacific Northwest and provided support to 11 projects for eco-charettes (Northwest Energy Efficiency Alliance, 2004). Specific areas of project advice included systems optimization, considerations and support for an integrated design process, and encouragement for the inclusion of a building commissioning plan (Jennings, 2006).

Finally, the BetterBricks Training program includes numerous workshops, seminars and brown bag lunches that are held throughout the region. These seminars give architecture and engineering firms the opportunity to learn about high performance building practices. In 2004 the program met its stated goal for the region - 70 Brown Bag presentations, 15 workshops and 10 Roundtable events.

Moving back to the City's G-Rated program, the fourth and final strategy was to offer financial incentives. The goal was to "expand access to green building-based financial incentives for developers and builders to stimulate innovation and investment in green building practices" (City of Portland, 2003). The Green Investment Fund (GIF) was created as a result and in the first two years it distributed grants to 69 projects in four tracks: affordable housing, residential, commercial LEED, and emerging technologies. The GIF supported 12 LEED projects with $20,000 per project during these first two years (City of Portland, 2003).

The City of Portland also worked in partnership with the Oregon Office of Energy to create the LEED-based Business Energy Tax Credit (BETC). The BETC provides an income tax credit based on a building's square footage and LEED rating. This is important because energy efficiency incentives are traditionally based on achieving a certain percent above a specific

baseline, i.e. the building code. This usually requires significant energy modeling and is difficult for developers to include in their financial calculations. By basing the credit on both the square footage and the LEED rating, it became much easier for developers to incorporate the credit into their financial models (Bennett, 2006). The amount of the tax credit is 35 percent of eligible project costs. As an example, a 100,000 sq ft LEED Silver new construction project would have $400,000 in eligible costs and would qualify for a tax credit of $140,000.

In 2005 the City Council reviewed and updated their entire G-Rated program. These updates were designed to fill the gaps that the first Policy didn't address (City of Portland, 2003). The key elements of the update were: (1) raising the bar from LEED Certified to LEED Gold for City-owned facilities (and to Silver for other publicly-funded projects), (2) a renewal of the Green Investment Fund, and (3) the directive to begin exploring an accelerated and facilitated permitting process for green building projects.

Under the facilitated permitting program, all qualified public and private sector LEED Silver-registered projects enjoy special technical assistance which enables them to "move through the review process more quickly and with additional staff support" (City of Portland, 2005). The City saw this as being important because market transformation was moving at a slow pace, as demonstrated by the following quote:

> "Many developers remain unfamiliar with nascent green building technologies and practices, others do not understand the value of it, and some are wary of integrating new strategies that may challenge zoning or building codes. This program should encourage more developers to pursue LEED certification" (City of Portland, 2005).

As mentioned, the Green Investment Fund (GIF) was also renewed. The GIF is a $2.5 million, 5-year grants program that is designed to spur innovation in green building technologies and practices. The key criterion for receiving a grant is that the project must have some cutting-edge innovation, thus helping the industry to be leaders in the field.

The final aspect of the Portland case is the State's Energy Code. Oregon's energy code is similar to Seattle's in many respects. First, compliance can be demonstrated by a prescriptive path, a simple trade-off path, or a whole building approach - with the level of complexity increasing with each path. Overall, Oregon's energy code demands that buildings meet or exceed ASHRAE 90.1-1999.

In summary, Portland launched their G-Rate program which institutionalized an interdepartmental green building team, offered technical assistance to design teams, financial

incentives to developers and delivered outreach and awareness initiatives to building owners and tenants. The NEEA was also a significant contributor to green building outreach programs and technical training.

2.2 Seattle, Washington

The City of Seattle has been actively promoting green buildings since February of 2000 when they adopted a Sustainable Building Policy that established LEED Silver as the standard for all public buildings greater than 5,000 square feet. This policy was the first of its kind in the U.S. and it was coupled with "the biggest capital improvement program since the Seattle fire of 1888" (City of Seattle, 2005).

In order to effectively implement the policy, the City also created the "Green Building Team" – an interdepartmental team that focused on increasing the performance of public buildings. The City has the vision to be one of the largest owners of LEED buildings, with 38 project planned up to 2013 (City of Seattle, 2005).

In the first few years the City completed a handful of demonstration projects in order to study the process and the benefits and costs going green. From this, the City then created online LEED supplements to guide developers and builders through the relevant local regulations that applied to each LEED point. This LEED adaptation guide enabled local building professionals to better understand how LEED credits and local policies related to each other, thus reducing the uncertainty around potential regulatory conflicts.

In 2001, Seattle also launched a LEED incentive program that was modelled after Portland's G-Rated Program (City of Seattle, 2005). It was created in partnership with the two local utilities - Seattle City Light and Seattle Public Utilities. They offered cash incentives to projects that committed to the LEED standard and that promised to hold at least one LEED workshop or charrette, which is the basis of the integrated design process. The funds were intended to offset any incremental costs of the integrated design process and could not be used for any hard construction costs (City of Seattle, 2005). Funding levels per project were $15,000 for LEED Certified buildings and $20,000 for LEED Silver or above. The program began with an annual funding level of $80,000 and has since been increased to $100,000. Since its inception, the City has had 18 projects on the books, for a total incentive amount of about $350,000 (City of Seattle, 2005).

Approved projects also receive technical assistance from the City's Green Building Team, NEEA's Lighting Design Lab (previously discussed), and Resource Venture. Resource Venture is a not-for-profit that provides assistance with "identifying and implementing practices and strategies in the following areas: natural stormwater management, erosion and sedimentation control, water conservation, construction waste management, designing for occupant recycling, green building materials and achieving LEED certification" (Resource Venture, 2006). Resource Venture began in 1990 and is run through the Greater Seattle Chamber of Commerce, in partnership with Seattle Public Utilities. Their Sustainable Building Assistance Program has an annual budget of approximately $70,000 (Glazer, 2006).

In addition to this municipal incentive program, the local utilities also offer energy efficiency incentives. Seattle City Light (the local utility), through their Energy Smart Incentive initiative, offers two programs: (1) Energy Analysis Assistance and (2) Energy Conservation Measures Beyond Code (Seattle City Light, 2002).

The Energy Analysis Assistance program is available to projects that can show potential for significant energy savings and that require detailed engineering analysis to realize those savings. For new construction, Seattle City Light offers an incentive for 100 percent of the cost of analysis. Thusfar, total funding to Seattle LEED projects has been approximately $100,000 (City of Seattle, 2005).

The largest incentive program offered by Seattle City Light is their Conservation Measures Beyond Code, which funds energy measures that increase building efficiency beyond the energy code. Similarly to Canada's CBIP, this program has given over $2 million in funding to Seattle LEED projects (City of Seattle, 2005).

In addition to the various incentive programs, Seattle also launched a marketing and communications campaign to promote green buildings and their benefits. In 2003 the City partnered with King County, the US Green Building Council, and NEEA's Better Bricks program to launch an extensive communications campaign that targeted the private sector. Together they raised over $300,000 to develop a communications package that can now be used by all Green Building Council chapters to promote LEED buildings (City of Seattle, 2005).

This communications strategy began with a series of stakeholder interviews within the financial and commercial real estate sectors, which indicated that they wanted support in creating a market preference for green buildings (City of Seattle, 2005). The target audience included developers, building owners and commercial tenants and the message was that green buildings

"have higher net operating income, which increases building value; provide a marketing advantage that helps lease space in a competitive market; improve corporate image in the community; and offer lower operating costs" (City of Seattle, 2005).

Similar to Portland, all of the Seattle's green building programs are complemented by those of the NEEA's BetterBricks program. Again, this includes the daylighting and lighting design labs, energy analysis assistance and project-based technical advice.

Finally, and again similarly to Portland, Seattle has both a building code and an energy code. Seattle's Energy Code creates a certain baseline for energy efficiency and building commissioning standards. Building to this code ensures that one of the three LEED Energy & Atmosphere prerequisites is met. The Washington State Energy Code with Seattle amendments provides "a higher baseline than the LEED baseline for energy efficiency" (City of Seattle, 2001). The demonstration projects evaluated by the City show that by building to the basic codes, a project can achieve 15-17 LEED points (City of Seattle, 2005).

In summary, in 2000 Seattle enacted a LEED Silver municipal building policy and supported it by institutionalizing an interdepartmental green building team. They also offered direct financial incentives to developers and launched a green building communications campaign to help create a market preference for LEED. In conjunction with these City initiatives, the local utility is also actively engaged in offering energy efficiency incentives and project-based advisory services to support the building design community.

2.3 Vancouver, BC

In the last few years, the City of Vancouver has seen an explosion of building activity in general. The City has been undergoing large infrastructure improvements for the upcoming 2010 Olympics and the South East False Creek (SEFC) area is being redeveloped for the Olympic Athletes Village. SEFC was planned to be "a model sustainable community" and as such, it has been the focus of much of the City's green building agenda (City of Vancouver, 2006).

In July of 2004, City Council mandated LEED Gold for all civic buildings and LEED Silver for SEFC. Vancouver demonstrated its leadership as one of the first municipalities in North America to commit itself to LEED Gold, instead of Silver for its civic buildings. Additionally, Council specifically asked for the creation of a city-wide strategy to be developed with LEED Silver being the design objective for all commercial, industrial, and multi-unit residential building developments (City of Vancouver, 2006).

Later in 2004, the City also approved revisions to the Energy Utilisation Bylaw in order to improve the energy performance of new and large commercial and high-rise residential buildings by approximately 13 percent. By updating references to the 2001 version of ASHRAE 90.1 (City of Vancouver, 2006), the city created a baseline that is more stringent than both Seattle's energy requirements and Oregon's energy code.

Then in November of 2005, the City approved the first stage of a Green Building Strategy (GBS) that called for the development of specific zoning guidelines to enhance the environmental and human health performance of all Part 3 buildings (non-residential buildings). That strategy has been developed and its adoption will be considered in early 2007.

The proposed Green Building Strategy (GBS) focuses on the areas of storm water management, landscape practices, urban agriculture, energy and water conservation, indoor environmental quality, thermal comfort, waste minimization and transportation. In its analysis, the City determined that by simply building to code, a project could receive approximately 17 LEED points. The GBS increases that baseline so that projects will be able to achieve 26 to 33 points simply by building to code. This would enable all buildings to easily achieve LEED Certification, if not LEED Silver. s

More importantly, the GBS calls for the creation of an interdepartmental "Sustainable Development Team" to support all "City departments' environmental planning and building regulatory initiatives through an integrated design model in policy development, neighbourhood/ community design, building review, and education to ensure and support the growth of sustainable initiatives throughout the city of Vancouver" (City of Vancouver, 2006, p18).

With the exception of the proposed GBS, Vancouver has had no other green building programs. Fortunately, other organizations have filled this void, specifically: the Greater Vancouver Regional District, BC Hydro and Natural Resources Canada, and Light House Sustainable Building Centre.

The Greater Vancouver Regional District (GVRD) promotes green buildings through its Build Smart program. The GVRD is a quasi-government body that is a partnership of 21 municipalities and one electoral area that make up the metropolitan area of Greater Vancouver. The GVRD's role in the Lower Mainland is to:

- deliver essential utility services like drinking water, sewage treatment, recycling and garbage disposal that are most economical and effective to provide on a regional basis, and

- to protect and enhance the quality of life in the region by managing and planning growth and development, as well as protecting air quality and green spaces. (GVRD, 2006)

The Build Smart program has four concurrent and interrelated program elements to change industry practices:

1. Creating a common framework for green building using LEED,
2. Targeted professional education and information exchange in partnership with industry organizations,
3. Establishing long-term, external partnerships for program development and delivery, research and policy support,
4. Green building policy endorsement at the regional government level (GVRD, 2006).

The program offers tools and resources to design professionals in order to increase the acceptance of sustainable building practices within the GVRD. It includes an information resource (design best practices, construction best practices, funding, case studies, a research library, etc), a green building product directory, and industry training workshops.

Two key workshops delivered by Build Smart are "LEED for Contractors" and "Building Blocks for Building Green". In 2004, Build Smart held a total of 51 presentations, workshops, courses and tradeshows. Unfortunately, the program only gave technical advice to a handful of projects (Goodland, 2006).

Most of Build Smart's programs are focused on training and skill development, but has also included a small investment in branding and communications. Build Smart placed ads in magazines and helped to produce "Green Space" - a yearly insert in Business in Vancouver Magazine that promotes green buildings. In 2005, the GVRD spent approximately $50,000 in green-building related communications and advertising (Goodland, 2006).

Vancouver has also enjoyed the benefits of numerous case studies and demonstration projects. The Build Smart website highlights many of these LEED cases studies. Additionally, the Provincial government's Green Buildings BC website lists 18 case studies - 6 of which are in Vancouver. Unfortunately, the GVRD's Build Smart Program has recently been reduced in both budget and mandate and its future roll in the promotion of LEED is uncertain (Goodland, 2006).

Unlike the cities of Portland and Seattle, the City of Vancouver has no incentive programs that specifically target LEED buildings. The only related incentives are offered by BC Hydro and the Federal Government (through Natural Resources Canada) and they only focus on the energy component of green buildings, similar to the incentives offered by the utilities in Portland and Seattle.

BC Hydro's High Performance Building program targets buildings that are larger than 50,000 square feet. The program offers financial incentives and tools to: "identify energy saving strategies early in the design process, evaluate alternative design options, offset the incremental costs of the energy-efficient measures, and to market the project's high-performance design features and benefits." (BC Hydro, 2006, para 2)

The other major incentive comes from Natural Resource Canada's (NRCan) Office of Efficiency through its Commercial Buildings Incentive Program (CBIP). CBIP provides financial assistance to offset the cost of designing buildings to be 25 percent more efficient that the Model National Energy Code for Buildings. The level of funding is tied to the amount of energy savings achieved, up to a maximum of $60,000. Since the program's inception in 1998, there have been 83 projects in BC that have been approved for a total of $3.9 million in funding. Furthermore, since 2003, over 70 percent of the BC-based CBIP projects have been located in the GVRD, and so it is estimated that approximately $2.7 million in CBIP incentives has gone to projects in the GVRD (Clark, 2006).

At the national level, it seems that approximately 75 percent of CBIP funded projects achieve LEED certification (Clark, 2006). LEED energy credits are often the most expensive to achieve (Light House, 2006). Projects that are funded by CBIP can easily achieve the energy-related LEED points because they are equivalent. When the CaGBC adapted the LEED system for Canada, the energy requirements became 25 percent better than the Model National Energy Code for Buildings – which is the same as CBIP.

LEED Canada allows builders to achieve the Energy & Atmosphere prerequisite point by either following the ASHRAE 1999 standard or through the CBIP standard and Vancouver's recently updated Energy Utilization By-law (based on 2001 ASHRAE standard) is actually more stringent than MNECB/CBIP (Hepting, 2004). Since the Vancouver baseline is actually more stringent than the national incentive amount, then it is unlikely that the incentive has played a significant role in increasing energy efficiency in buildings, let alone increasing LEED uptake.

In summary, Vancouver has shown strong leadership through its LEED Gold procurement policy and the local green building industry has enjoyed some support from BC Hydro and Natural Resources Canada with regards to energy efficiency, but compared to Portland and Seattle, there has been little in the way of marketing, technical support or LEED-specific financial incentives. The next section details this comparison and highlights where Vancouver has some gaps.

3 Comparative Analysis of LEED Registered Buildings

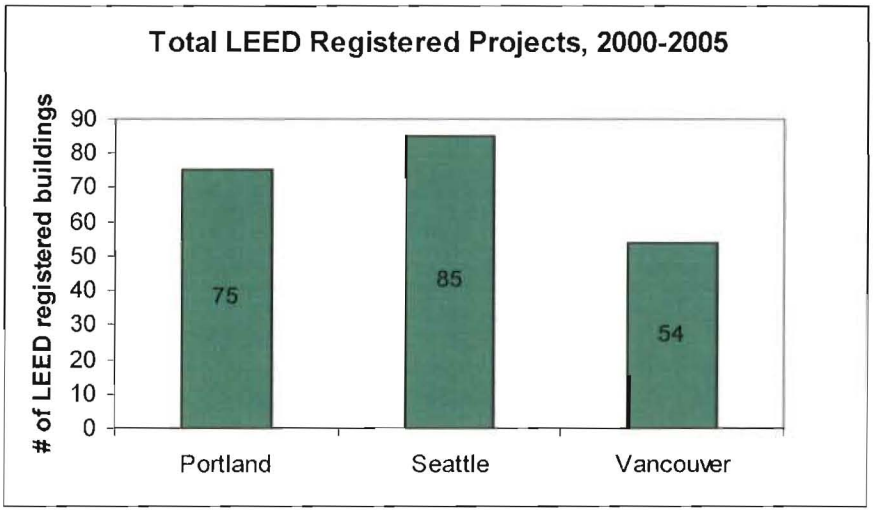
In order to answer the research question "why do Portland and Seattle have more LEED buildings than Vancouver?" section 3.1 looks at the number of LEED buildings registered each year for both public and private sector buildings. The results show that both Portland and Seattle do indeed have more LEED registered buildings and have a higher LEED penetration rate than Vancouver. The results also show that this mainly because of more private sector LEED uptake in both Portland and Seattle.

Section 3.2 then follows by comparing independent variables for each city in order to determine why Vancouver has lagged behind the other two. The conclusions show that Vancouver has had less overall investment in marketing and communications, suffers from a lack of city capacity for handling green building projects, has significantly less technical support available to building design teams, and has distinctly fewer and smaller financial incentives for developers and contractors to build LEED buildings.

3.1 LEED Building in Vancouver, Seattle and Portland

The first comparison looks at the total number of LEED registered buildings in each case for the period of 2000 to 2005. Figure 2 shows the results and clearly demonstrates that Vancouver has fewer LEED registered buildings than both Portland and Seattle.

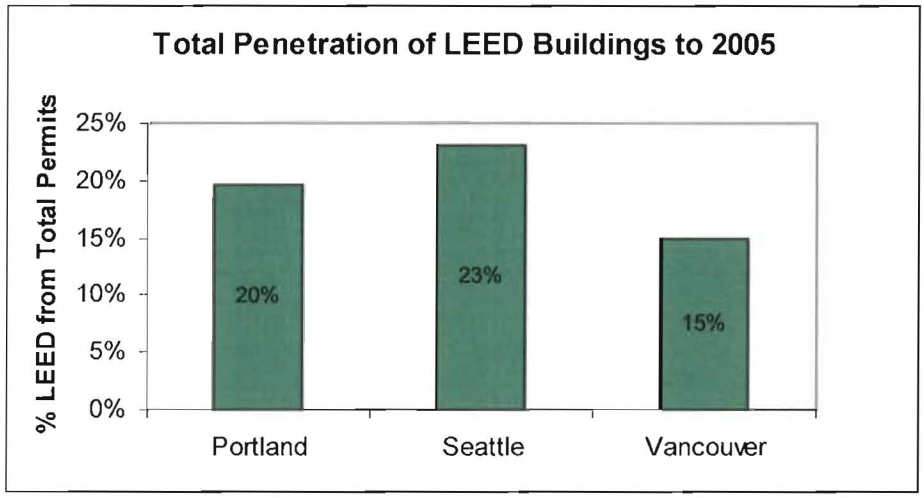
Figure 2- Total LEED registered buildings in each case, to 2005



Source – CaGBC, GVRD, USGBC

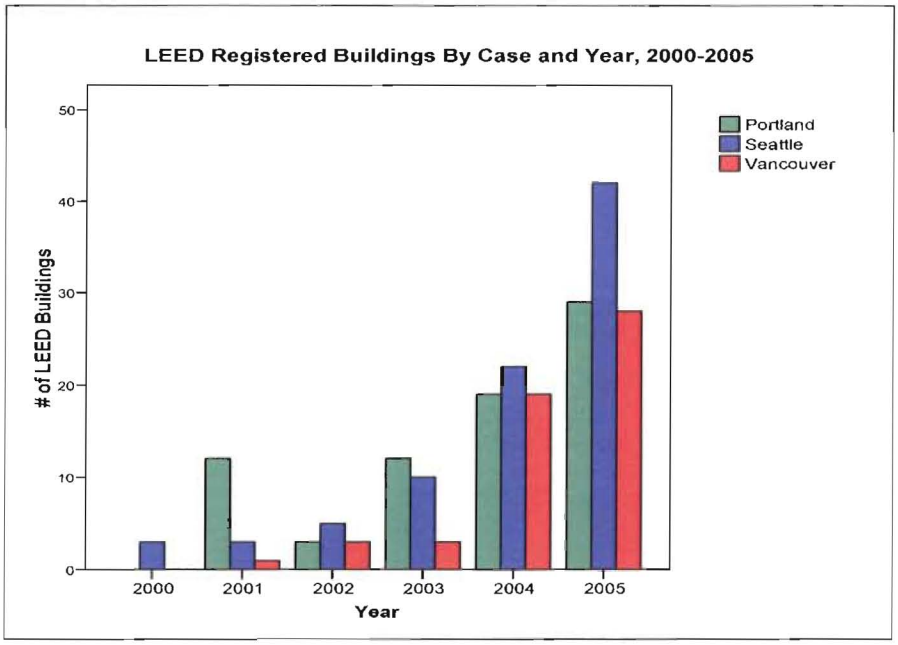
Seattle has the most LEED registered buildings at 85, Portland with 75, and Vancouver with 54. In trying to determine why this might be, the first issue that must be addressed is the difference in the relative size of each of the city's building industries. Perhaps Portland and Seattle's higher number of total LEED registered buildings is due to stronger growth in their non-residential building sectors. This is addressed by looking at the percentage of LEED penetration instead of the absolute totals. Dividing by the number of ICI building permits issued between 2000 and 2005, Figure 3 shows the LEED penetration in each city. Again, Seattle comes out ahead with 23 percent, Portland with 20 percent and Vancouver lags with only 15 percent market penetration.

Figure 3 - LEED as a percentage of total building permits from 2000-2005



Sources: City of Vancouver, Construction Monitor, CaGBC, USGBC, GVRD

Figure 4 - LEED registered buildings by case and year, 2000-20005



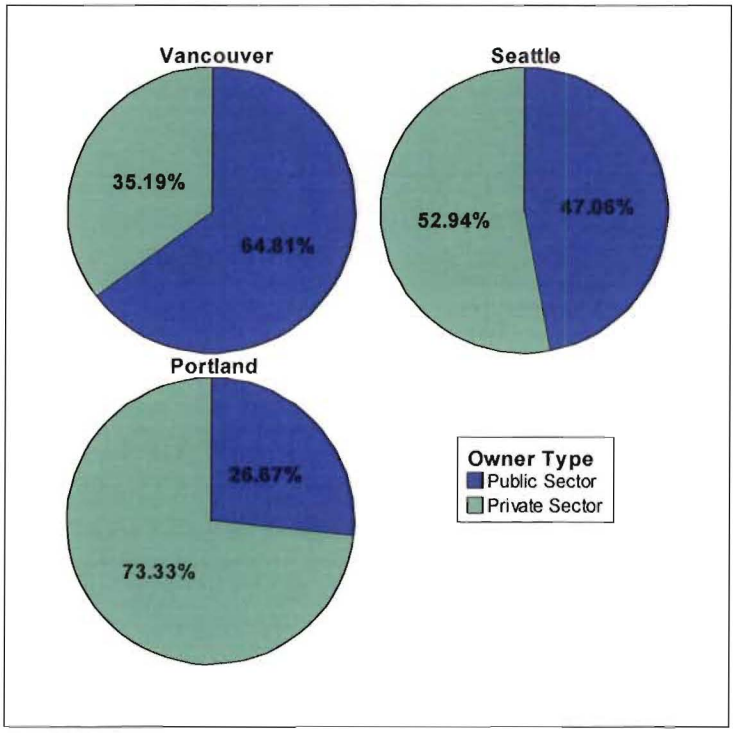
Source: City of Vancouver, CaGBC, GVRD, USGBC,

Figure 4 shows that the number of LEED registered buildings in each case has been continually increasing from 2000 to 2005. It shows that Vancouver had a relatively slow start and that LEED activity has only significantly increased in 2004 and 2005. It is also interesting to note

that Portland had a large spike of LEED activity in 2001. Figure 4 also shows that Seattle's leadership in the total number of LEED buildings is primarily due to a larger surge in 2005.

From the data presented in Figure 4 it may appear that Vancouver is not fairing too badly and that perhaps it is simply the result of a slow start has resulted in fewer LEED buildings. After all, prior to mid-2003, projects in Vancouver would have had to register with the US Green Building Council and so there was probably less awareness of the LEED program. However Figure 5 shows that the issue goes deeper than this.

Figure 5 - Percentage of LEED registered projects by city and owner type.



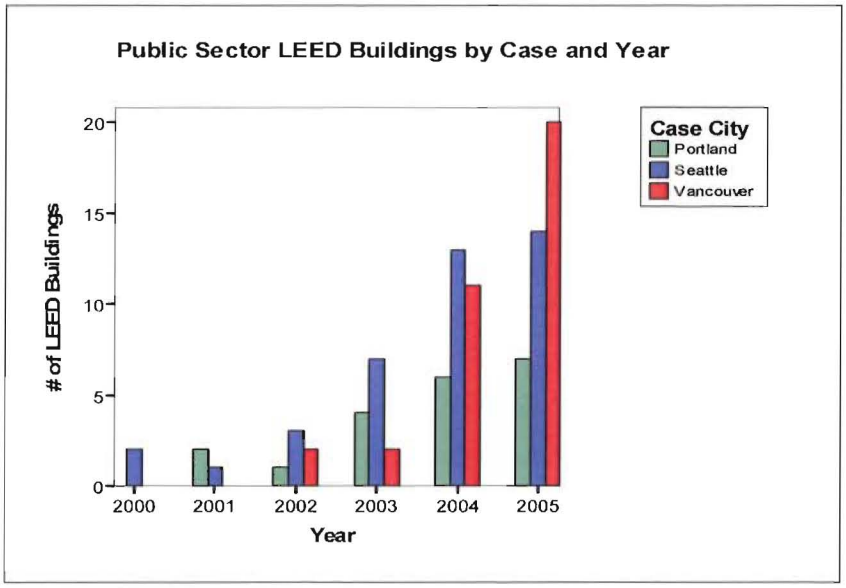
Source: CaGBC, GVRD, USGBC

Figure 5 shows the division between public and private sector LEED registered buildings and that Vancouver's demand for LEED has been primarily led by the public sector, whereas Seattle has had an equal mix of both, and in Portland, the private sector has accounted for most of their LEED buildings. In Portland, 73 percent of LEED buildings have been registered by the private sector, whereas only 27 percent has come from government spending. Seattle, at 53 percent, has also seen more private sector involvement than Vancouver even though Seattle is undergoing the "largest [public] capital improvement expenditures since 1888" (City of Seattle, 2005, 18). Figure 5 shows that it has been primarily the public sector that has been driving LEED

activity in Vancouver; with the private sector only accounting for 35 percent of LEED registered buildings.

Figure 6 presents the public sector data over time, showing new public sector LEED registered buildings each year. All three cases show upward growth in public investment, with Portland having the slowest, Seattle with the most consistent, and Vancouver starting very slowly for the first three years and then exploding in 2004 and 2005. This late explosion likely accounts for the strong total growth seen in Figure 4.

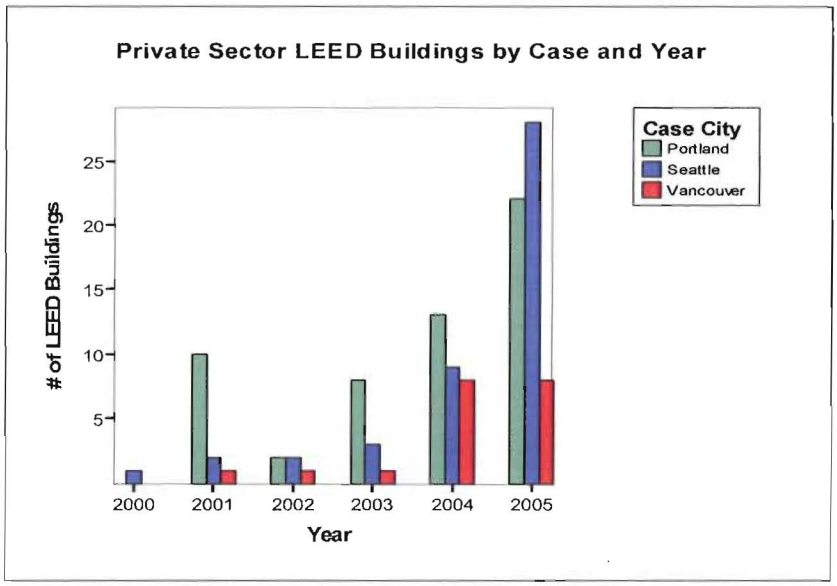
Figure 6 - Public sector LEED registered buildings by case and year, 2000-2005



Source: CaGBC, GVRD, USGBC

The story is quite the opposite when looking at private sector LEED buildings, as seen in Figure 7. All three cities have enjoyed a general increase in private investment, but Portland has seen the most consistent and largest increase, with Seattle only overtaking it in 2005. Additionally, it appears that Portland's surprising spike in 2001, seen in Figure 4 on page 27, is due to private investment. Without this spike, Portland and Seattle would have the same amount of total private sector involvement.

Figure 7- Private sector LEED registered buildings by case and year, 2000-2005



Source: Compiled from the CaGBC, the GVRD, and the USGBC

Overall, Vancouver has seen little private sector uptake with only slight increases in 2004 and 2005. It is apparent that Vancouver's LEED registered buildings has been led primarily by the public sector and that **Portland's and Seattle's success in having more LEED registered buildings is due to the relatively larger amounts of private sector LEED uptake**. Thus the general conclusion as to why Portland and Seattle have more LEED buildings than Vancouver is that they have had more private sector investment in LEED. As such, the analysis in the next section looks at why the private sector in Portland and Seattle are building more LEED buildings than in Vancouver.

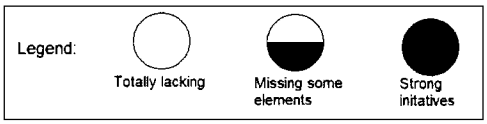
3.2 Why Portland and Seattle Have More Private Sector LEED Buildings

This section compares the independent variables in order to evaluate which ones may have impacted the number of private sector LEED buildings in each case. The six independent variables are: (1) increased consumer awareness, (2) the availability of training and skills in the design community, (3) financial incentives, (4) strong municipal leadership through procurement, (5) adequate municipal capacity to handle LEED buildings, and (6) stringent building codes that encourage green practices and LEED points. Table 5 presents the summary results of the comparison and shows that Vancouver is missing some key elements in their landscape,

specifically: (1) inadequate capacity to cope with LEED buildings and (2) a total lack of any LEED-based financial incentives.

Table 5 - Case comparison summary

Variable	Portland	Seattle	Vancouver
Consumer awareness	●	●	◒
Training & skill availability	●	●	◒
Incentives	●	●	○
Municipal procurement	●	●	●
Civic capacity	●	●	○
Baseline codes	●	●	●



The two areas where Vancouver is very similar to both Seattle and Portland are in their strong procurement policies and in the baseline standard of their respective building codes. With regards to training and skill availability and the level of consumer awareness, Vancouver receives a mixed review. It is missing some elements, such as project-based technical support services and investment in marketing and communications, but does have some of the other elements, like a large number of green building workshops and demonstration projects. The subsequent sections explain each of the comparisons in more detail.

3.2.1 Consumer Awareness

As the awareness of green building benefits increase, so will the demand for them. The level of green building awareness is difficult to measure and so a comparison of the outreach initiatives each case is used, as shown in Table 6.

Table 6 - Summary of marketing and outreach programs

Metric	Portland	Seattle	Vancouver	Vancouver Results
Marketing & Communication Initiatives	BetterBricks G/Rated Earth Advantage	BetterBricks Build Green, Everyone Profits City of Seattle GB Program	Build Smart	<
Awards Programs	BEST BetterBricks Commercial Development Award AIA Awards	BEST BetterBricks Commercial Development Award AIA Awards	Georgie Awards Earth Go Green	=
Demonstration Projects	10 projects, 0 case studies	16 projects, 3 case studies	10 projects, 2 case studies	=

All three cases have a similar number of green building demonstration projects and so here the difference between them does not seem significant. Even if it was, the number of demonstration projects in Vancouver will soon be outpacing the others simply because of Olympics-related construction, so it will soon be a moot point.

The cases are also similar in their awards programs. The only minor difference being that Vancouver's green building awards are a subset in a series of larger awards, whereas in the other two cases, green buildings and sustainability are the focus of the entire award programs.

It seems that the only real significant difference between these cases is the amount of investment in targeted marketing and communications campaigns. In Vancouver, the GVRD's Build Smart program has invested only a small amount in advertising and branding, whereas Seattle and Portland have more organizations promoting green buildings and have seen more money invested in marketing and communications. For example, Seattle partnered with various other organizations to deliver the "Build Green, Everyone Profits" campaign. They have invested over $500,000 (City of Seattle, 2005), whereas Build Smart has only invested approximately $50,000 (Goodland, 2006).

While a communications strategy may have initially been successful for Portland and Seattle, it is doubtful that such a strategy would now have any significant effect in the Vancouver

case. This is because general awareness of green buildings has been rapidly increasing over the last five years. This rising consumer awareness is demonstrated by examining how often the term "green building" appears in the major newspapers of each city. The totals are shown in Table 7.

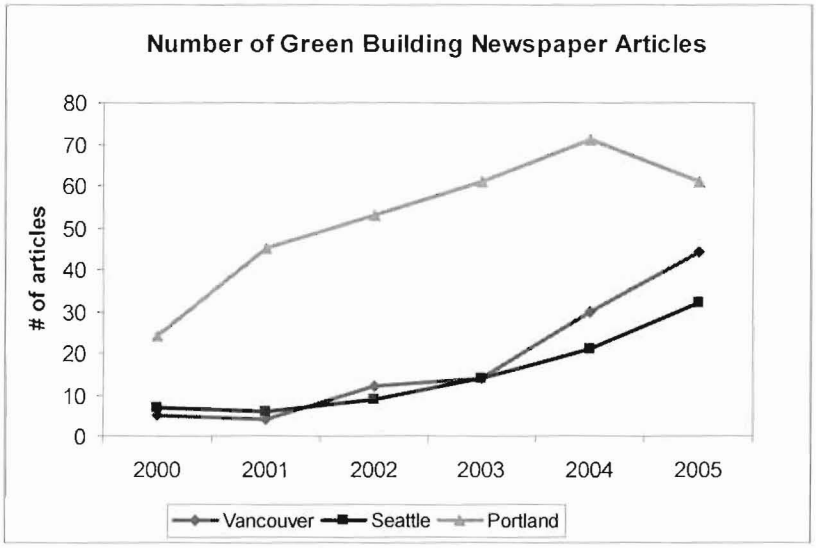
Table 7 - Green buildings in the news, 2000-2005

Newspaper	Total # of "Green Building" Articles
The Oregonian	315
Seattle Times	89
Vancouver Sun	109

Source: Lexis-Nexis & Canadian Newsstand databases, November 2006

It is interesting to note that Vancouver has more articles than Seattle, but that Portland has received significantly more green building news coverage than the other two. The trend lines of news coverage are even more revealing, as seen in Figure 8.

Figure 8 - Green buildings in the news by year, 2000 -- 2005



Source: Lexis-Nexis and Canadian Newsstand

This shows a trend similar to the number of LEED registered buildings in each case, especially the larger increases from 2003-2005. It is difficult to determine causality because this

increase in news coverage could be the result of the increasing LEED buildings or vice versa. The important thing to note is that consumers are becoming increasingly aware of green buildings and their benefits and so any communications campaigns would not be as effective now as they would have been earlier.

Overall, Vancouver receives half marks for the level of consumer awareness. On the one hand, there has been relatively little investment in the marketing and promotion of LEED buildings, but on the other hand, the overall level of green building awareness is strong and increasing.

Figure 9 - Comparing consumer awareness

Variable	Portland	Seattle	Vancouver
Consumer awareness			

3.2.2 Training & Skill Availability

In all three cases there are many organizations that offer a variety of building-related training and skill development services. Many of these organizations are professional associations that offer green building seminars and workshops. The following table lists most of them:

Table 8 - Key training and skills development organization

Portland	Seattle	Vancouver
U.S. Green Building Council (USGBC)	U.S. Green Building Council (USGBC)	Canada Green Building Council (CaGBC)
Cascadia Region Green Building Council	Cascadia Region Green Building Council	Cascadia Region Green Building Council
American Institute of Architects (AIA)	American Institute of Architects (AIA)	Architectural Institute of British Columbia (AIA BC)
Urban Land Institute Oregon Chapter	Urban Land Institute Seattle Chapter	Urban Development Institute
Oregon Building Industry Association	Building Industry Association of Washington	Association of Professional Engineers and Geoscientists of B.C.
Associated General Contractors of America	Associated General Contractors of America	Independent Contractors and Businesses Association (ICBA)

Portland	Seattle	Vancouver
National Association of Industrial and Office Properties (NAIOP)	National Association of Industrial and Office Properties (NAIOP)	National Association of Industrial and Office Properties (NAIOP)

The three cases have their respective national Green Building Councils and they also share the Cascadia Green Building Council - all of whom run LEED workshops and training seminars. The remaining organizations also offer seminars and workshops, but these trend to not focus solely on LEED.

The key differences are in the initiatives that are solely focused on green building training and skills development. Table 9 highlights these programs for each case.

Table 9 - Summary of training and skill development programs

Skill Development Programs	**Portland**	**Seattle**	**Vancouver**	**Vancouver Results**
Training (seminars & workshops)	G/Rated Betterbricks Workshops (95 in WA, OR, ID, MT - 2004) Cascadia GBC Earth Advantage	Green Building Program BetterBricks Workshops (95 in WA, OR, ID, MT - 2004) Cascadia GBC Resource Venture	Build Smart Workshops (51 in GVRD - 2004) Cascadia GBC Light House Sustainable Building Centre	=
Project-based advisory services	G/Rated Commercial and Residential Services Betterbricks Advisors *(43 projects for the NW region)* Daylighting Lab Earth Advanatge (fee based)	Daylighting lab *(1,010 attendees)* BetterBricks Advisors *(43 projects for the NW region)* Resource Venture Energy Ideas Clearinghouse	No programs	<
Policy Adaptation Guides	Portland LEED	LEED Supplements	LEED-BC Adaptation Guide	=

Vancouver is similar in the first and third categories, but not the second. In the first instance, the GVRD's Build Smart program has delivered an impressive number of green building seminars and workshops. This is similar to Seattle's and Portland's programs and therefore could not have accounted for any major difference in the number of LEED buildings. Unfortunately, the Build Smart program is currently suffering from a lack of mandate for moving forward and this will leave a large gap in the training and skill development landscape.

The key difference is Vancouver's lack of project-based technical advisory services. Both Seattle and Portland have an impressive technical support network for designers and builders. For example, an architect, engineer or builder can call, fax, email, or drop-by the Energy Ideas Clearinghouse (run through Washington State University) and receive free advice on how to include energy efficient designs and systems into their specific projects. This service is offered free of charge to local residents and is funded by the Northwest Energy Efficiency Alliance. Portland and Seattle's green building teams also offer technical advice to green building projects and then are further support by the lighting design and daylighting labs. Additionally, Portland and Seattle offer these support services as part of their incentive programs, which are discussed further in the next section.

This gap could be a significant factor that has resulted in Vancouver having fewer private sector LEED buildings. Having these technical support services increases a designer's green expertise, thus reducing the potential for design problems that result in increased construction costs. Such problems include: increased overall design time, inexperience with new products and technologies resulting in integration issues, and not meeting initial green objectives due to technical problems. Having these support services reduces the uncertainty around the qualifications and abilities of the design team, and thus reassures risk-adverse developers and investors.

Overall, Vancouver receives half-marks in the comparison with Portland and Seattle. While Vancouver has had a large number of LEED-related seminars and workshops, it has relatively little in the way of hands-on, project-based technical support services.

Figure 10 - Comparing training & skill availability

Variable	Portland	Seattle	Vancouver
Training & skill availability			

3.2.3 Government Incentives

In all three cases the utilities have offered significant financial incentives for increasing energy efficiency in buildings, but the similarity ends there. In addition to the incentives offered by the utilities, the cities of Portland and Seattle offer specific incentives to developers to build to the LEED standard. The following table summarizes the incentive programs and highlights the differences between the two cases:

Table 10 - Comparison of incentive programs

Incentive Focus	Portland	Seattle	Vancouver	Vancouver Results
Energy Efficiency	G/Rated Green Investment Fund State of Oregon Sustainable Building Tax Credit	City Light Energy Conservation Measures Beyond Code City Light Energy Analysis Assistance	NRCAN's Commercial Buildings Incentive Program (CBIP)* BC Hydro's High Performance Building Program	<
Integrated Design/ and or LEED Standard	Facilitated permitting G/Rated Green Investment Fund State of Oregon Sustainable Building Tax Credit	City of Seattle LEED Incentive Program	No incentives	<

**CBIP program has been cancelled by the current Federal Government, 2006.*

The key difference here is Vancouver's distinct lack of LEED incentive programs. Both Seattle and Portland offer direct cash to developers that build to the LEED standard. In Seattle the program has been running since 2001 and provides up-front, soft cost assistance to projects that commit to LEED and hold at least one LEED workshop or charrette (City of Seattle, 2005).

Portland has two major LEED incentive programs - the Green Investment Fund and the Business Energy Tax Credit (BETC). The GIF funded 12 LEED projects in the first two years (City of Portland, 2003), and the tax credit is a state-level initiative that can be accessed by any project that achieves a minimum of LEED Silver. Portland's new incentive program - facilitated

permitting - was just introduced in late 2005 and so did not impact the total number of LEED buildings during the study period.

It is interesting to note that both of Portland's LEED incentive programs began in 2001 and are probably the reason for the spike in private sector uptake in 2001, as seen in Figure 5 on page 20 (Bennett, 2006). Unfortunately the relative impact of each incentive cannot be determined because they were implemented at the same time.

While Portland and Seattle have LEED-specific programs, the City of Vancouver offers no such incentives. The few incentive programs offered in Vancouver are focused solely on energy efficiency, not LEED or integrated design. For example, BC Hydro's High Performance Building program provides financial incentives and tools to: "identify energy saving strategies early in the design process, evaluate alternative design options, offset the incremental costs of the energy-efficient measures, and market the project's high-performance design features and benefits" (BC Hydro, 2006).

The other energy efficiency incentive is the Commercial Building Incentive Program (CBIP) that is offered by Natural Resources Canada. The CBIP program provides financial assistance to offset the cost of designing buildings to be 25 percent more efficient that the Model National Energy Code for Buildings. Approximately 75 percent of CBIP projects also achieve LEED certification (Clark, 2006). Energy LEED credits are often the most expensive to achieve, but CBIP projects can easily achieve them – thus the high CBIP to LEED ratio. However, when the City of Vancouver amended it Energy Utilization By-Law in 2004, it raised the baseline so that minimum code became more stringent than the CBIP requirements. Therefore, for projects before 2004, CBIP may have played a role in helping them achieve energy-related LEED points, but it is unlikely that CBIP was a significant factor after 2004. Also, the level of energy efficiency required by CBIP is actually less than that required by the energy codes in both Seattle and Portland (Hepting, 2004). Therefore, the incentives offered in Portland and Seattle have buildings achieve levels of energy efficiency significantly higher than CBIP, thus making LEED energy points even easier to reach.

In addition to both a higher overall energy efficiency baseline and the incentives offered by the utilities, the State of Oregon also offers a tax incentive for increased levels energy efficiency. The incentive amount is calculated on a square foot basis, and depends on the level of LEED that the building achieves. This is important because the tax incentive encourages developers and building owners to aim for and achieve LEED Certification. Also, by estimating the energy savings by level of LEED, according to the square footage (instead of a percentage

above code), it makes it easier for developers to include the incentive amount in their initial budget calculations, thus increasing program uptake (Bennett, 2006).

Overall, Vancouver offers no LEED incentives that are comparable to Portland's or Seattle's and their energy-efficiency incentives are not as rigorous as those in Seattle and Portland, as shown in the following figure:

Figure 11 - Comparing incentives

Variable	Portland	Seattle	Vancouver
Incentives			

3.2.4 Municipal Procurement

Three of the five interviews conducted for this study underlined the importance of the City's leadership in helping to transform the market. All three cases have demonstrated this leadership through similar procurement policies, as shown in Table 11.

Table 11 - Comparing civic leadership through procurement policies

	Portland	Seattle	Vancouver	Vancouver Results
Procurement Policies	Green Building Policy (LEED Gold for new facilities, Silver for existing buildings and tenant improvements). LEED Silver for large publicly funded projects.	Sustainable Building Policy (LEED Silver for new facilities)	Green Building Policy (LEED Gold for new facilities)	=

The only key difference here is that Vancouver enacted their policy a few years later than the other two cities. Seattle and Portland implemented their LEED Silver and LEED Certification policies in 2000 and 2001 (with Portland updating to LEED Gold in 2005), whereas Vancouver only enacted their LEED Gold policy in 2004. This difference in timing likely had an impact on the total number of green buildings, with the City only contributing significantly in the last few

years, thus explaining the spike in public sector LEED registered buildings in 2004 and 2005, as seen in Figure 7 on page 31. Vancouver receives full marks for its LEED procurement policy.

Figure 12 - Comparing procurement policies

Variable	Portland	Seattle	Vancouver
Civic leadership	●	●	●

3.2.5 Civic Capacity

Figure 13 shows that there is a significant difference in Vancouver's capacity to cope with green buildings. Remembering that adequate capacity is the presence of an interdepartmental green building team that has a mandate to support green building projects, then Vancouver does not have adequate capacity.

Figure 13 - Municipal capacity to handle green building innovation

	Portland	Seattle	Vancouver	Vancouver Results
Green Building Department or Interdepartmental Team	Office of Sustainable Development G-Rated Team	Green Building Team	No program	<

Both Seattle and Portland formalized their green building teams at the same time that they developed their procurement policies. These extra years of experience have increased the cities' green building expertise, tacit-knowledge therefore their capacity to promote green buildings to the private sector. This is an important step in facilitating green building practices through the regulatory processes, and it is a crucial step for implementing future incentive programs. Without adequate staff expertise and time to steer an innovative LEED project through the permit process and plan review stages, the project could easily get stalled. This added time costs money and so developers are less likely to try LEED, or any innovation for that matter, if they are uncertain about regulatory delays.

Figure 14 - Comparing civic capacity

Variable	Portland	Seattle	Vancouver
Civic capacity	●	●	○

3.2.6 Regulations & Baseline Codes

Seattle, Portland and Vancouver are governed by building codes that are created by the provincial or state governments, and then implemented at the municipal level. The building codes are mainly a tool for fire and safety standards. While a complete comparison of the similarities and differences of the respective building codes is beyond the scope of this paper, certain case studies have already been completed that have reviewed the number of LEED points that are achievable simply by building to the baseline codes.

Two of the cities are fairly similar in their baselines, and there is no data for the third. In Seattle and Vancouver, by simply building to code, a project can achieve 15-18 LEED points (City of Vancouver, 2006, City of Seattle, 2005). While there is a slight difference in the distribution of the specific points, the total number of achievable is relatively the same. Data was missing from the City of Portland, but given that the stringency of their energy code is actually less than Seattle's and Vancouver's, then it is unlikely that the other aspects of their building code are anymore stringent than the other two cases, at least to an extent that would impact the number of baseline LEED points achieved.

In addition to the baseline code, it is also important to look at the specific energy efficiency requirements in each case to see if the LEED energy points are relatively easier to achieve. Table 12 summarizes each case:

Table 12 - Comparison of energy codes and by-laws

	Portland	Seattle	Vancouver	Vancouver Results
Energy Codes/ Bylaws	State of Oregon Energy Code (equivalent to ASHRAE 901.1-1999)	City of Seattle Energy Code (equivalent to ASHRAE 901.1-2001)	Energy Utilization Bylaw (equivalent to ASHRAE 901.1-2001)	=

All three cases have similar energy efficiency requirements except that the City of Vancouver only updated their Energy Utilization Bylaw to the 2001 standard in 2004. Prior to this, only buildings with CBIP funding would have achieved this level of energy efficiency. Regardless, it seems that the baseline codes between Seattle and Vancouver are the same, and that the energy efficiency requirements are similar in all three cases.

Figure 15 - Comparing baseline standards

Variable	Portland	Seattle	Vancouver
Baseline codes	●	●	●

3.3 Summary of Findings

This section began by demonstrating that Portland and Seattle's higher private sector LEED growth wasn't simply due to growth in their overall ICI sectors and so other factors had to be the cause. The results show that Vancouver' procurement policy and baseline building codes are similar to both Portland and Seattle and so cannot be the cause. As outlined in

Table 13, the four areas where Vancouver is different from the other two cities are: (1) less investment in marketing LEED, (2) significantly less technical support for building professionals that are trying new green designs and technologies, (3) little city staff capacity and expertise for dealing with the increased regulatory demands of LEED buildings, and (4) there have been no incentives offered to developers to build to LEED standards.

Table 13 - Vancouver's results

Factors	Vancouver Results	Explanation of Results
Government incentives		The City of Vancouver does not offer *any* LEED incentives (there are only efficiency incentives through BC Hydro, which is essentially the same as those offered by the utilities in both Seattle & Portland)
Civic capacity		Vancouver lacks the capacity to handle the added uncertainty and special regulatory considerations needed for green buildings.
Training & skills availability		Vancouver has some training programs and industry expertise, but lacks project-based technical and advisory services for industry professionals.
Consumer awareness		Vancouver has not invested in marketing campaigns that are targeted to building decision-makers. On the other hand, the overall level of awareness is strong.
Municipal procurement		Vancouver, Portland, and Seattle are all similar.
Baseline codes		Vancouver, Portland, and Seattle are all similar.

Portland and Seattle committed to green buildings a few years before Vancouver did, dedicating and institutionalizing staff resources to the promotion and adoption of LEED buildings in 2000. Their initiatives included marketing, technical assistance, regulatory guidelines, and financial incentives. They have also leveraged partnerships with utilities, universities, state governments, and industry associations to also fund and deliver extensive programs in these four areas. Vancouver kept up with its own LEED Gold policy for civic buildings, but has lacked in targeted communications, project-based technical assistance, and financial incentives to the private sector. This has resulted in Vancouver having less private sector LEED uptake.

The rest of this study focuses on formulating and evaluating policy options for Vancouver to increase local private sector uptake of LEED buildings. The next section uses market transformation theory combined with an analysis of how the building development industry handles risk and with the lessons from Portland and Seattle in order to create a complete market transformation policy framework. This framework contains specific policy alternatives that are then analyzed and evaluated and final recommendations are made for Vancouver to increase private-sector LEED uptake.

4 Options for Increasing LEED Uptake in Vancouver

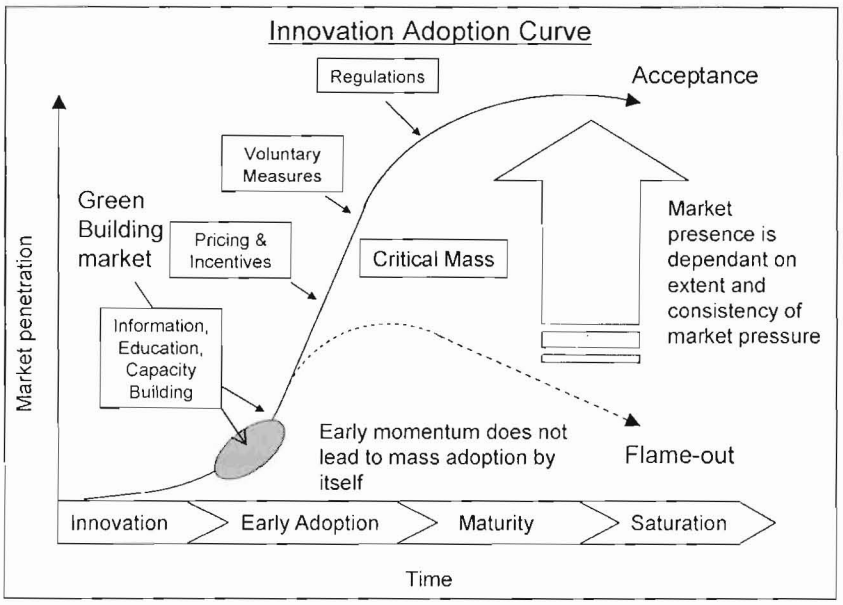
In order to craft policies that will increase private sector uptake of LEED buildings, it is crucial to first understand how change happens in the building industry. The next section describes the theory behind market change and how it applies to the specific actors within the non-residential building industry. I argue that the risks and uncertainty around green building practices must be reduced in order for the industry to adopt them. Using this discussion, I present a framework of the four types of policy tools available: (1) information-based, (2) reduction of policy distortions and conflicts, (3) incentive-based, and (4) directive-based tools. I show that the right combination of these tools is needed for market transformation efforts to be successful.

4.1 Market Transformation & the Building Development Industry

Market transformation theory looks at how innovations are diffused throughout the marketplace. This is crucial for understanding how the private sector may (or may not) adopt green building practices. Green buildings have many different types of innovations. They have innovative new products and technologies, new service delivery models, new designs, new performance criteria, and new processes for overall design and delivery. For now, consider the delivery of a green building as an innovation in itself, regardless of specific innovative components. Market transformation theory and previous work examining change in the building development industry show that specific conditions are necessary for the market to adopt green buildings practices. The market can be considered transformed when "green buildings are demanded and supplied, and so that the marketplace innovates continuously toward increasingly improved performance." (Sheltair, 2003, p.4) This will then allow for the adoption of new green building products, techniques, and practices in a sustained manner (Sheltair, 2003).

The process of market transformation is one of innovation adoption (NEEA, 2001). An innovation becomes standard practice when the majority have adopted it. As seen in Figure 16, critical mass is achieved when the early adopters influence the early majority to adopt the new idea or innovation (City of Seattle, 2005).

Figure 16 - Innovation adoption curve



Source: Adaptation from City of Seattle's 5 Year Green Building Report (2005) & a presentation to BC's Committee to Discuss Existing Commercial Buildings (2005).

Most importantly, early momentum does not always lead to mass adoption. The adoption of any innovation is dependant upon the extent and consistency of market pressures. Policy measures are often needed to ensure diffusion to the majority. The policy measures listed above are taken from BC's Energy Efficiency for Buildings Plan. Different policy interventions are needed depending on the specific market failures and frictions in each case, and an effective market transformation strategy must consider the nature of the innovation, the characteristics of the market, and how market actors cope with change (NEEA, 2001).

A report by the Northwest Energy Efficiency Alliance looked at market transformation initiatives to increase energy efficiency in new commercial office buildings. Even though energy efficiency is only one of many green building performance characteristics, the strategies and lessons put forth also apply to green buildings. In order for green building practices to become the norm, three things must occur:

1. Green buildings must have value in the market place (i.e. they must provide benefits and be relevant to market interests),
2. The demand for green buildings must be institutionalized by specific market actors, and

3. The supply of green buildings must be incorporated into the standard routines of the industry (NEEA, 2001).

This raises important questions that good policy must address. Who values green buildings? Who is demanding them? How can the process of building green buildings become standard practice in the industry? Without these factors in place it is doubtful that green buildings will ever become more than a market niche. To address these issues, one must first understand who the market actors are. Figure 17 shows the various market actors that come together to create a new building in the non-residential sector.

Figure 17 - Market actors in the building development industry

Market Actors in the Building Development Industry
Providers of Capital *Those that invest in buildings.* Financial Institutions, Institutions/Pension Funds, Real Estate Investment Trusts (REITS), Individual Investors, Public Owner-Occupants, Private Owner-Occupants.
Developers *Those that orchestrate the development of buildings in response to investment requirements, user requirements, and local and national requirements.* Build-to-sell, Build-to-hold, Build-to-suit
Design & Delivery *Those service providers (design professionals, contractors) that deliver buildings in response to developer requirements.* Design-bid-build, Design-build, Design-asst/cnstr. mgr, Hybrids
Community/Political/Regulatory *Local & national requirements (codes, land use, design review) that shape buildings and development.* Pro-development, Progressive, Restrictive
Real Estate Service Providers *The real estate professionals (property managers, general managers, investment managers, facility managers, brokers) that represent the interests of various market place groups.* Marketing/Sales, Leasing, Investing, Management/ Operations
Users of Buildings *The organizations and firms that occupy and work in buildings.* Lease, Owner/Occupied

Source: Adapted from Northwest Energy Efficiency Alliances' report entitled "New Commercial Office Buildings: Developing Strategic Market Transformation Initiatives for Energy Efficiency", 2001.

For the providers of capital "buildings represent tangible assets that provide predictable income streams to investors looking for a relatively conservative investment" (NEEA, 2001). However, building development is an inherently risky endeavor. Most of the uncertainty in commercial real estate development is due to fluctuations in both macro and local business cycles (NEEA, 2001).

> "Those in the real estate industry make money by correctly judging the market, its needs, and requirements and delivering buildings that produce reliable income streams to investors to justify their capital investment in the development. The nature of buildings as investments fundamentally defines and structures the development process. Building developers strive to minimize the risk associated with the buildings they produce" (NEEA, 2001. p12).

As highlighted by the previous quote, green building market transformation and innovation adoption is especially challenging because most of the industry tends to be risk adverse. "The models used by the building industry to control risk work against trying new ideas" (Kunkle & Lutzenhiser, 2001). Developers try to control risk and uncertainty by using models that have worked in the past. Lenders and developers tend look at past achievements and often see anything new or novel as adding uncertainty, rather than value, to a proposed development (NEEA 2001, Light House 2006).

Given the development industry's reluctance to change and its tendency to control for risk and uncertainty, a successful market transformation must reduce the uncertainty and risks associated with building green buildings. Returning to the three necessary conditions for successful market transformation, one can identify the specific areas of uncertainty that need to be reduced or eliminated.

First, as previously mentioned, green buildings must have value in the market place. With green buildings being a new phenomenon, there is uncertainty about how much value consumers place on green buildings. Much of this uncertainty is due to the lack of historical data to compare green buildings with conventional ones. In an effort to demonstrate value, there have been many surveys and case studies that show that the market does indeed value green buildings. These studies have shown that "green" is valued most by long-term owners of buildings (because of the operational resource savings), by tenants in the knowledge economy (because of the increased quality of the work environment), and by organizations that have environmental and social ethics as part of their core values and visions (Light House 2007, NEEA 2001, RICS 2005).

While these studies show a preference for green buildings, many developers are left wondering," how much of a premium are consumers willing to pay?" Without the data to show

increased value, it is difficult for developers to estimate a return on investment, thus adding uncertainty to the investors' point of view.

The second condition for successful market transformation is that the demand for green buildings must be institutionalized by specific market actors. This has already begun in the public sector where governments have committed their buildings to LEED standards. Other green building rating systems have also appeared on the landscape. This has increased the choices for building owners and tenants, and they have begun to show a market preference for green buildings. Some of the world's largest companies have committed to building green, including: Wal-Mart, IBM, Toyota, GM, Bank of America, Genzyme, and Goldman Sachs, to name a few (Light House, 2007).

The uncertainty here lies in the "build-to-sell" development segment. The other segments are build-to-hold and build-to-suit. In these cases, the developer will hold ownership of the building or else is constructing the building for a specific tenant. In these cases, the owners will enjoy the lower operational costs and resource savings for the life of the building. In the build-to-sell segment of the market, the developer does not partake in the operational green building benefits and so has no incentive to invest in long-term savings. This "split incentive" issue is described by Graeme Silvera, formerly of the UBC Properties Trust, when he states that one of the reasons why the private sector is slow to go green is:

> "the disconnect between the operating and capital cost savings (including the human capital savings of less absenteeism, turnover, sick days, etc.) and the need for the market developer to gain an immediate return on their capital investment" (Light House, 2007. p.48).

Since the speculative developer doesn't enjoy the operational benefits of green buildings, he or she is not likely to invest more upfront for green features, unless there is demonstrated demand for such features, and as already discussed, that demand is also uncertain.

The final condition for successful market transformation is that "the supply of green buildings must be incorporated into the standard routines of the industry" (NEEA, 2001. p. vi). Again, developers use tried and tested models for the design and delivery of real estate development projects. Changing these models to encompass green buildings requires practice and hands-on experience in order to get over the green building learning curve.

There are three key areas of uncertainty when supplying a green building (especially for the first time):

1. Costs – One of the first questions developers will ask is "do green buildings cost more, and if so, by how much?" In order to calculate return on investment (ROI), developers and investors need to know the amount of the investment and ts market value. Given that green building market value is uncertain, ROI calculations are already difficult. Without also knowing the cost of delivery (i.e. amount of investment), ROI calculations (even good estimates) are totally impossible.
2. Knowledge and experience – The risk-adverse developer will ask "does the design team know how to build green? Do they have the experience needed to troubleshoot any problems that arise because of these new techniques and technologies?" Green design requires new expertise and new skills and the developer needs to be assured that the design team is proficient with these skills so that the project can be delivered on time and on budget.
3. Regulatory issues – The regulatory process is already regarded by many developers as being overly burdensome. With new green buildings, developers are asking how green building technologies mesh with the current building codes and bylaws. Will there be building code conflict and/or inspection issues? Will building green slow the permitting process? This is especially critical because any time delays increases the carrying costs of capital, thus reducing ROI.

Some of these uncertainties can be reduced simply by gaining experience designing and developing green buildings. There is a learning curve to building green, and as developers travel up that curve they will be able reduce the uncertainties around cost, design and regulation (Light House, 2007).

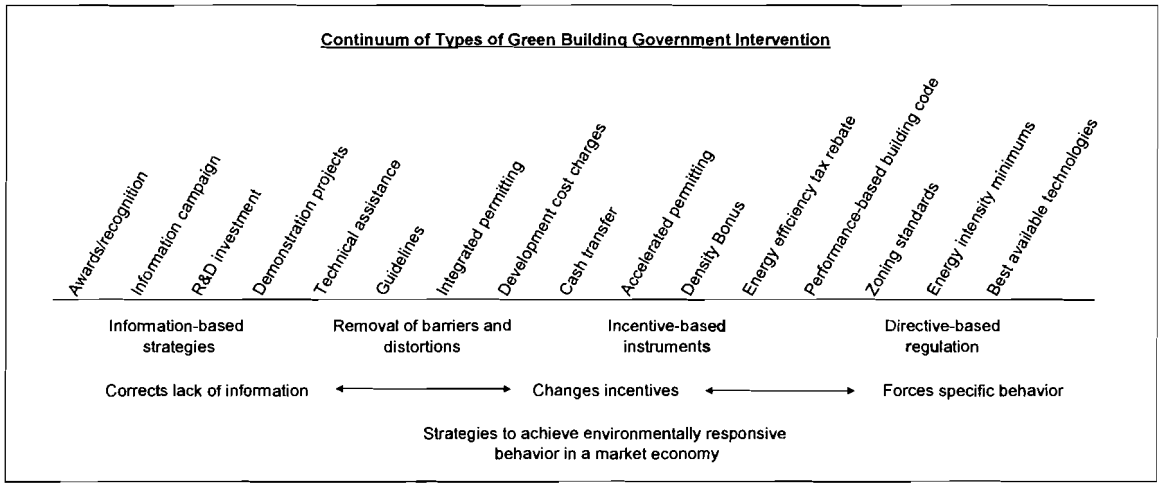
In summary, the goal of any green building policy intervention is to get the industry to continually innovate towards improved building performance. In order for green performance criteria to be permanently adopted by the private sector, they must be valued by the marketplace, specific market actors must continually demand them, and the supply of such buildings must become standardized practice. The building development industry is characterized by the need to control risk in order to ensure a healthy return on investment and therefore any market transformation initiative must focus on eliminating or reducing the market risks and uncertainties in the demand and supply of green buildings.

4.2 Policy Options - Increasing Demand & Removing Barriers to Supply

Generally, the City of Vancouver has two choices, launch a market transformation initiative or keep with the status quo. The answer of course depends in the nature of the initiative. In this section I use the lessons from Portland and Seattle and the previous discussion on risk to create a framework for a successful green building market transformation initiative. I then populate this framework with Vancouver's market transformation "gaps" that were identified in Section 3 in order to create discrete policy options. Section 5 then evaluates these policy options in order to determine the best combination that the City of Vancouver should pursue.

Any transformation initiative "cannot be simple, but ought to attack the problem on multiple levels, in concert with the efforts of multiple market and non-market allies" (NEEA, 2001. p. vi). As previously discussed, the building development industry has multiple actors in multiple stages, and any market transformation needs to be a multi-pronged effort (Gilmour 2004, Sheltair 2003, and West Coast Environmental Law 2006). Figure 18 presents a framework for the types of interventions that might be appropriate.

Figure 18 - Continuum of type of government intervention



Source: Adapted from Bill Long, OECD, presented at ECO '97 International Congress. Feb.24-26, 1997 Paris.

Generally, strategies on the left and middle are more appropriate for managing complex systems than those on the right. When examining both Portland and Seattle, it is clear that they

focused more on strategies on the left and middle for encourage private sector uptake of green buildings:

1. **Information-based tools** – These tools can both increase demand and reduce barriers to supply. Targeted marketing campaigns aimed at building owners and tenants have raised awareness of the benefits of green buildings and have in turn increased the demand for them. Demonstration projects and case studies help reduce the uncertainty around capital costs and regulatory approval. Finally, training and technical assistance reduces the uncertainty around the capabilities of the service providers (architect, engineers, and contractors) and has increased the ability of design teams to achieve specific LEED points (i.e. daylighting and lighting design labs).

2. **Removal of barriers & distortions** – green building expertise was institutionalized in both Portland and Seattle, thereby reducing technical barriers and potential regulatory conflicts. Permanent green building teams were created and given the resources to inform, educate, assist and facilitate green building projects. These programs included staff training, the development of regulatory guidelines, and extra attention was given to green projects during the plan review process.

3. **Incentive-based instruments** – Both Portland and Seattle offered financial incentives to developers that committed to LEED buildings. The incentives included cash transfers, density bonuses, fast-track permitting, and energy efficiency tax credits. These incentives serve the dual function of getting developers through the initial learning curve and buffering against the risks of increased costs and uncertain demand.

4. **Directive-based regulation** – The cities have used directive-based regulation by mandating specific LEED standards for all city-owned and/or financed buildings, but not for private sector development. Developers in Portland and Seattle do enjoy building and energy codes with performance options instead of prescriptive paths, which allowed for easier innovation.

The City of Vancouver has used only some of the tools that Seattle and Portland have. This has left "gaps" in their overall market transformation initiative. Some of these gaps are within the jurisdiction of the City and form the policy options available to them, whereas otherse

are not. Since these are still important for successful market transformation, I recommend a partnership approach. This is discussed further in Section 5.3.

Based on the comparison with Portland and Seattle, combined with the previous discussion on risk and uncertainty and market transformation, the City of Vancouver can pursue a combination of the following policy options in order to offer a whole and complete market transformation initiative:

I. Information-based tools:
    1. Status quo
    2. Launch a targeted communications campaign
    3. Leverage the communications activities of other stakeholders

II. Removal of barriers and policy conflicts:
    1. Status quo
    2. Increase technical support during plan review process
    3. Create an interdepartmental green building team

III. Incentive-based instruments:
    1. Status quo
    2. Cash payments
    3. Density bonuses
    4. Accelerated permitting

IV. Directive-based regulation:
    1. Status quo
    2. Adopt the proposed Green Building Strategy

In summary, the building development industry is a complex system with multiple stages with multiple actors, and therefore for any market transformation initiative to be effective it must be multi-pronged and target specific actors in the industry. Programs must aim to either increase the value of green buildings, thereby increasing and institutionalizing demand, or to reduce the barriers to supplying green building, thereby standardizing and institutionalizing supply. In the

context of the building industry, increasing and institutionalizing the demand and supply of green buildings is about controlling and reducing uncertainty and any associated risks.

A well crafted, risk-reducing, multi-pronged market transformation initiative utilizes all four types of policy tools: information-based, reduction of barriers and distortions, incentive-based, and directive-based tools. In this context, the comparison with Portland and Seattle show that Vancouver has elements of this framework, but that there are still gaps. These gaps are targeted marketing, technical assistance, financial incentives, city capacity, and performance-based building and energy codes. The next section focuses on evaluating specific policy options for addressing these gaps.

5 Policy Analysis and Evaluation

In the previous section, eleven policy options in four categories were presented for evaluation. This section develops the criteria that are used for that evaluation, and then follows with a discussion that compares each of the options to the status quo. The results highlight Vancouver's best alternatives, which are then followed by a discussion on the key partnerships that the city needs to pursue in order to fill the remaining gaps. These partnerships, combined with the Vancouver's direct initiatives will create a whole and effective green building market transformation strategy.

5.1 Evaluation Criteria

Each policy option within the four tool categories is evaluated using four specific criteria. An ideal policy option would:

1. increase demand for green buildings
2. standardize and/or institutionalize the supply of green buildings
3. be cost-effective
4. be relatively easy to implement

Each of the criteria are defined and discussed in the following subsections.

5.1.1 Increases Demand

All of the stakeholders interviewed for this research stressed the importance of increasing market demand for green buildings. As per the previous discussion, it is crucial to understand whose demands and desires are the most important in the building chain. The first two are the end users and the providers of capital. The developer has the most decision-making authority, but still operates within what he/she believes to be demanded by the other two. For a policy option to be effective, it must make green buildings more valuable to the providers of capital, the end users or to the developer. Strategies for making green buildings appear more financially attractive could include reducing the uncertainty around consumer willingness-to-pay, increasing awareness of

green building benefits, or simply increasing or guaranteeing the return on investment. Green building programs that are aligned with current industry trends are more likely to be effective at increasing demand.

5.1.2 Standardizes the Supply of Green Buildings

A policy initiative should use or develop mechanisms that lead to standardizing and/or institutionalizing the supply of green buildings. It should reduce or eliminate the added uncertainties (regulatory, technical, financial, or informational) in the process of delivering green buildings. Policies and programs must either (1) aid actors through the initial learning curve of delivering green buildings or (2) introduce them to green building tools and techniques that they (and the marketplace) will find useful. Creating clarity around green building regulations and regulatory processes and creating expertise in green building delivery are key aspects to this criterion.

Ultimately, standardizing the supply of green buildings will require that the building development industry adopt the integrated design process (IDP) as a new model of building design and delivery. The use of the IPD is essential for industry actors to continually innovate towards improved building performance. This is because building green requires that a whole building approach be used. While individual building components may make a building "greener", a truly green building considers all of the systems within the building and their interaction. This then determines the overall performance of the building. Adding environmental performance criteria has tremendous implications for how buildings are designed and delivered.

First, the performance of every building is unique. Two buildings that are exactly the same in design and construction will perform differently because they are on different sites. One may receive more sunlight, while the other experiences more wind. Developing high performance buildings, whether LEED or not, requires that all factors that impact the building be considered and designed for. The implication of this is that every unique site offers the potential for a unique design innovation. With each new site characteristic to consider and for every additional performance criteria to be optimized, there are a myriad of designs and processes that can be applied. This adds innovation to the building process itself. The IDP is the process innovation that is at the heart of building green.

Secondly, in order to take a whole building approach and for innovation to be positive and cost-effective, specific experts need to be part of the design process right from the outset. This integrated design process is not the usual model in the building development industry.

In the traditionally linear building process, the developer and financiers make decisions about budgets, building size and type, location, revenues, target markets, and so forth. The architects then design the structural form, and the engineers fill in that form with mechanical and electrical systems. As the building progresses, the decisions of these upstream actors constrain the decisions of those downstream (NEEA, 2001). This linear process creates inefficiencies. For example, an architect may design for too much interstitial space (the space between the floors) because he or she does not really understand how much space is needed for the mechanical and electrical systems. In an integrated design process, the mechanical and electrical contractors would be at the design table from the beginning. Eliminating this excess space could allow for more space in the occupied areas, such as a recycling room or bicycle storage.

This upstream/downstream dichotomy has important implications on the cost of going green. Experience has shown that when green components and technologies are added late in the building process, this can add significant costs to the project. Green performance criteria must be identified at the beginning of the project in order to incorporate them without an incremental cost increase. Studies have shown that by using an IDP, high performance buildings can be delivered at no or little cost increment (Langdon 2004, RICS 2005). Specific to LEED, on average, Certification has be achieved at either a *lower* cost (due to other efficiencies that were achieved) or with no cost increase, with other cost increments at 0-3 percent for Silver, Gold with 4-6 percent, and 7-10 percent for Platinum (Langdon, 2004).

5.1.3 Cost

This is the most straightforward of the criteria. As a fiscally responsible government, the City of Vancouver's policy and programs must strive to create the most impact at the least cost. The status quo in each category is considered to have no incremental cost implication and so all other policies are compared to it. The costs for each policy option are not detailed, but a rough estimate is given for the amount of resources required. An initiative is considered to have a low cost if can be delivered for under $10,000, a moderate cost for initiatives below $100,000, and a high cost for anything more.

This criterion also looks at whether the policy or program leverages current programs because to do so would reduce the total resources required to deliver the programs and/or policy options. There are many established actors and activities in the local green building industry and so it is important to recognize the programs and initiatives that have been successful, and to

leverage these resources to maximize the effectiveness and efficiency of delivery and to ensure that no new programs conflict with these current successes.

5.1.4 Ease of Implementation

This criterion has two components: (1) industry acceptance and (2) political feasibility. Regarding the first, Vancouver's building development industry can be highly vocal and influential. The industry will not adopt a practice of "continually improved building performance" if it is hostile to the specific policies or tools used to do so. Generally, the building development industry prefers clarity in regulation and incentives for change. Anything else requires significant industry engagement and participation.

The political feasibility is a little more complex as it has a few dimensions to it. The first is whether or not the policy option is amenable to the current administration and their political priorities and views. The second is whether the policy option would be accepted by the voting public, based on their current priorities and political views. The third and final dimension is whether or not the City of Vancouver is the appropriate actor, either because the option is beyond its jurisdiction or because there are other stakeholders that are better suited to implement it.

The next section evaluates the proposed policy options on their ability to increase demand, facilitate supply and encourage integrated design, while still being within the constraints of resource allocation, industry acceptance and political feasibility.

5.2 Policy Analysis

This section describes and evaluates the policy options for each of the four categories within the market transformation framework. Section 5.3 then follows with a discussion on the partnerships that Vancouver should pursue in order to fill in the remaining gaps. The policy alternatives under consideration include:

I. Information-based tools:

    1. Status quo
    2. Launch a targeted communications campaign
    3. Leverage other communications activities of other stakeholders

II. Removal of policy barriers and conflicts:

    1. Status quo

2. Increased technical support during plan review process
3. Create an interdepartmental green building team

III. Incentive-based instruments:

1. Status quo
2. Cash payments
3. Density bonuses
4. Accelerated permitting

IV. Directive-based regulation:

1. Status quo
2. Adopt the proposed Green Building Strategy

5.2.1 Information-Based Tools

These initiatives use information and communication to increase the supply and demand of green buildings. The three options under consideration are: (1) the Status Quo, (2) launch a green building targeted communications campaign, and (3) leverage and promote currently available campaigns and materials from other stakeholders.

The status quo implies that the City of Vancouver would have no added expenditures on information-based tools. The City would continue its green building promotion through is "One Day" campaign. Green buildings would also continue to be promoted through the GVRD's Build Smart campaign, the Green Building Councils (CaGBC, Cascadia GBC), the BC Government and the Olympics, and NGOs like Light House Sustainable Building Centre. The increasing number of green building news articles shows that the status quo has been reasonably effective at raising general awareness.

Unfortunately, raising general public awareness does not mean that key building decision-makers become knowledgeable of green building benefits, let alone green building practices. A targeted marketing campaign to building decision-makers is likely to be more effective at this. Portland and Seattle invested in targeted marketing campaigns to building decision-makers. This was often tied with advertising their respective green building programs, but it was still a direct investment in targeted marketing campaigns. The City of Seattle actually tested the success of their marketing program and found that after the campaign, familiarity with

green building increased by 9 percent. They also found that there was an overall 11 percent increase in involvement with green buildings, and that "tenant and owners were significantly more likely to consider 'green' attributes in their next purchase or lease following the campaign" (City of Seattle, 2005).

On the other hand, while their marketing programs may have led to increased demand, those benefits may no longer available in Vancouver. Developers are likely to have already heard about LEED and green buildings and if they haven't already tried LEED, it is doubtful that a marketing campaign alone would now convince them to do so. So while this alternative may be more effective than the status quo, it is doubtful that the effect would be worth the high cost the City would have to invest. It would also be politically difficult to spend large amounts of municipal revenues on advertising and communications.

Launching a targeted communications campaign also wouldn't leverage the activities of other stakeholders. A partnership with all of the key actors would be a more cost effective way to deliver such an initiative, and it would ensure a clear and concise message across all of the parties. The cases of Portland and Seattle show that while municipal leadership is required, their communications campaigns were funded and delivered in partnership with the utilities, universities, state and regional governments, and certain associations and NGOs.

While a communications campaign may not be the best way for Vancouver to increase the number of LEED buildings, the City still needs to be able to readily provide information and resources to developers and contractors looking to learn more about building green. A 2006 Building Design & Construction survey (from a sample of 10,000 architects, contractors, engineers, building owners, and developers) showed that "75 percent of respondents indicated that they wanted more information on the relative costs and benefits of green vs. conventional buildings" (Building Design and Construction, 2006). Fortunately, Greater Vancouver has other organizations that already offer this type of information. The City could better leverage these resources by promoting these organizations and their materials through current avenues, like at the building permit counter, through the City's website, and any other points of contact with industry development decision-makers. The cost of this would be extremely low, with a small upfront cost for the initial set-up and training of city staff and so the recommendation is for Vancouver to offer green building information at the points of contact, but to leverage the materials of others in order to minimize costs.

5.2.2 Removal of Barriers and Conflicts

The removal of barriers and conflicts requires an examination of the barriers to the supply of green buildings and what Vancouver can do to lower them. The options under consideration are: (1) the Status Quo, (2) increase the technical support available during plan review process, and (3) create an integrated team to facilitate the plan review process.

Many studies and reports have stressed the importance of providing technical assistance to the building industry (Holland Barrs Planning Group, 2005, City of Seattle, 2005, City of Portland, 2003). Currently, under the Status Quo, the City of Vancouver's plan and permit review staff does include some LEED accredited architects, and many green projects also receive extra staff attention, according to a Vancouver city planner (2007).

However, a recent report to Council states that more staff capacity is needed to support the many green building initiatives such as the Olympic Village and South East False Creek and the upcoming sustainability precinct (City of Vancouver, 2006). Also, if the current trend towards green buildings continues, the status quo will likely not be sufficient for handling the increased demands of these projects. This would cause further regulatory delays which would be unacceptable to industry stakeholders. Increasing staff expertise would require hiring at least one other green building staff member (City of Vancouver, 2006). This additional staff would help reduce technical and regulatory uncertainty, but this is in no way level with the extent and type of resources available to green building projects in Seattle and Portland.

Both cities have dedicated permanent departments and resources to facilitate the design and delivery of green buildings. Their initiatives include extensive technical assistance programs which have "helped developers adopt green practices more quickly" (Holland Barrs, Planning Group, 2005). These programs are funded and delivered through partnerships with other key stakeholders, especially the utilities and other government agencies. Additionally, local academic institutions are often involved in the delivery of this technical assistance and support. For example, Seattle's Energy Ideas Clearinghouse and the daylighting and lighting design labs are funded through the Northwest Energy Efficiency Alliance and delivered through Washington State University's research centres.

The importance of having this extensive technical expertise was highlighted in the elite interviews, where one of the interviewees sighted the expertise of the design professionals as the second key reason (behind increased demand) for the increase in LEED buildings. Additionally, all of the interviewees indicated that their design teams had used many of the technical advisory

services and that they consider them important to the growth of the industry. This is further supported by an evaluation of the BetterBricks advising program that was completed in 2005. Of those surveyed, 82 percent said that green building training had affected their practice and 53 percent said that they applied the information they received to specific projects (Research Into Action, 2005). Of the projects that were sampled, there was evidence that "60 percent of the projects had been affected by the recommendations provided by the advisors" (Research Into Action, 2005). This is a testament to the effectiveness of tacit learning.

Unfortunately, the City of Vancouver does not have the infrastructure or the financial capability to offer this type of technical support by itself. Design labs are expensive to build and professional technical advice is costly. Additionally, there are local organizations that are better suited to offer this type of design support. The appropriate infrastructure (design labs, research and training centres, etc) is currently being developed by the local universities through the CIRS project (Centre of Innovative Research in Sustainability). Also, there are other organizations like Light House Sustainable Building Centre, Cascadia Green Building Council, and the GVRD's Build Smart program that are well suited to help deliver these types of technical services.

Even though the City shouldn't embark on building design labs, it is important to recognize that its role as the focal point for directing industry professionals to these types of support services. The City could leverage this to form partnerships with other stakeholders to help deliver their technical assistance programs. Through such partnerships, the City could be the first point of contact for aspiring green projects, and if extra design help is needed then the project could be forwarded to the appropriate program. Since the value of energy savings is the greatest of all the resource savings (Sheltair, 2004), then the City should look to BC Hydro and the Province to be key partners for funding. The GVRD could also play a role through its waste management programs.

With such partnerships in place, the City could institutionalize support for green buildings by dedicating staff and resources, in the form of an interdepartmental team, to help facilitate LEED and other green projects through the permit and design review processes. The evidence from Portland and Seattle shows that this can be an effective way for a City to increase its capacity to handle the technical and regulatory uncertainties around innovative LEED buildings.

A dedicated green building team can also be important for increasing private sector LEED uptake because it signals to developers that the City is able and willing to facilitate green

building projects, thereby reducing the uncertainty around potential regulatory hurdles. It announces the city is "open for green business".

Finally, the creation of an interdepartmental team is a politically easy and inexpensive thing to do. With the exception of one full-time program manager, the resources for this team can be found by adjusting current budgets and work plans (City of Vancouver, 2006).

In summary, Vancouver should use a partnership model to ensure that green building projects receive sufficient technical support, but should create its own interdepartmental team to support green projects through the regulatory approval and permitting processes. This team would also administer the incentive program that is recommended the in the next section.

5.2.3 Incentive-Based Tools

Incentive-based tools go further than providing information or removing barriers - they induce actors to actually change behaviour. Generally, incentives work best on actors that are at the margin – people that need a little nudge to try something new. Studies have shown (Mc Graw-Hill, 2005, Building Design and Construction, 2006, Light House, 2006) that developers and builders have been reluctant to build green due to the perception that it costs more, and so the building industry has continually stressed the importance of providing financial incentives to go green. This is evidenced in the Building Design & Construction survey, where for three consecutive surveys; financial incentives were ranked as the industry's second highest concern (2006). The elite interviewees for this study were also unanimous in their support for incentives as a key factor in getting developers to go green, but they were divided on which types of incentives work best. One developer stated that these types of incentives are fundamental to the market transformation process because they can offset documentation costs, but also stated that education and training incentives are also important.

There are four incentive-based policy options under consideration: (1) the status quo, (2) cash payments, (3) density bonuses, and (4) accelerated permitting. Currently, under the status quo, the few incentives offered in Vancouver come from the utilities and are focused solely on energy efficiency. They also tend to be for specific products, like energy efficient light bulbs or high efficiency boilers, with only one program giving incentives for design items such as day lighting. Unlike Portland and Seattle, Vancouver developers do not enjoy any whole building performance incentives, nor are there any that are specifically aimed at LEED certification. Given that the building industry has repeatedly asked for more incentives, the Status Quo is not

considered to be very effective at increasing demand or standardizing the supply of green buildings.

The comparison with Portland and Seattle is also informative for evaluating the different types of incentives that Vancouver could offer for LEED certification or whole building performance, including: cash payments, density bonuses, and accelerated permitting. In Seattle, the goal of their incentive program was to give developers experience using the LEED system (Athens, 2007). In Portland, the focus was more on innovation, but they still had a separate funding track that specifically supported LEED projects. Of all the policy options available, incentives are the most effective way for encouraging private sector uptake of LEED because they are action oriented. The other options focus more on removing barriers and making it easier to do LEED, whereas incentives target the decision-maker to actually commit to a decision to build to the LEED standard. Additionally, financial incentives address the "split incentive" issue between the developer and the owner where the developer who doesn't retain ownership of a building (build-to-sell) must pay for the higher capital cost of green features, but the resulting benefits (lower energy costs for example) accrue to the owners or tenants. If there is no evidence that these upfront costs will result in a higher selling price, then there is no incentive for the developer to install these more costly features.

The research indicates that indirect incentives such as accelerated permitting and density bonuses are more effective than straight cash transfers. This was highlighted by one of the interviewees and is also an emerging trend in other leading municipalities. For example, the City of Chicago recognized the slow uptake of direct financial incentives and so they changed to a fast-tracked permitting process for LEED projects (Sustainlane, 2006). Seattle also ended their cash incentive program and replaced it with a density bonus scheme for projects seeking LEED Silver or greater. Finally, Portland is adding indirect incentives to their current program:

> "Another important area of focus will be streamlining and accelerating the permitting requirements for green, high performance buildings. Market transformation is almost guaranteed if the City can create a separate fast track for green buildings coupled with zoning code incentives." (City of Portland, 2003, p.9)

As such, Portland plans to "create fast track permitting for LEED-registered projects" and to "develop and adopt zoning code incentives for green building practices (e.g. height and floor area ratio bonuses)" (City of Portland, 2003, p.9).

Indirect incentives can be less costly than direct cash transfers and more politically acceptable to voters. It is likely that Vancouver citizens will not appreciate their tax money going directly into the pockets of already wealthy development companies, whereas the practice of using indirect incentives (such as density bonuses) is already commonplace. Therefore the City of Vancouver should offer indirect financial incentives to encourage private sector LEED uptake.

Furthermore, the evidence suggests that the City should also lobby the Provincial Government to offer tax incentives for the energy efficiency components of building green. In Portland, the early jump of private sector LEED projects in 2001 was a result of both the city's incentive program and the state's energy tax credit, which came into effect that same year.

Regarding the cost of implementing an accelerated permit process, the proposed interdepartmental team may be sufficient to implement the incentive program, depending on uptake. Under current conditions of rapid economic growth and a booming construction sector, an additional staff may be required to implement such a program.

Even with this increased staffing, this is politically preferable to using the density bonus to encourage LEED uptake. A density bonus is permission to build a larger building than the zoning permits in exchange for some other criteria – i.e. LEED certification. The City of Vancouver already uses density bonuses for social housing, heritage buildings, and social and cultural amenities. These bonuses are negotiated during the rezoning phase. The City has a long track record of using increased density to achieve these social goals and there is a fear that adding LEED to the bonus program would reduce the City's ability to achieve these other goals, especially given that homelessness and social housing is a more pressing agenda item. "The more density that is available, the cheaper it gets" says a planner at the City of Vancouver. "What's more important? Green buildings or say, homelessness?" (Ramslie, 2007)

In essence, the City already has an informal accelerated permitting process. According to a City planner, permit and planning staff already facilitate and pay extra attention to key green building projects, such as South East False Creek. Unfortunately, without this being institutionalized, this only adds more uncertainty to the permit process. Specific green features become part of the negotiation process. It is also uncertain as to which projects that City might lend their support to and which may not be as important. By institutionalizing an accelerated permitting process and demanding a set standard (i.e. LEED Silver) this provides certainty to the developers and the management of their projects.

In order for the City to offer and institutionalize an accelerated permitting process, it needs to dedicate staff and resources. This increased capacity would also enable the City to offer first tier technical assistance to green projects. In no way does this compare to the type of technical support that could be offered through partnership with the CIRS project (partnerships are discussed in the next section), but it would at least give the City the capacity to provide input and advice in conjunction with the incentive program. A recent report from the Holland Barrs Group, entitled "GVRD Green Building Incentive Study" examined various green building incentive programs, and it stressed that:

> "financial incentives complement other policy options such as technical assistance in reducing non-regulatory barriers, and are often required to precede the introduction of new regulatory measures" (Holland Barrs, 2005).

In summary, the evidence shows that Vancouver can increase private sector uptake of LEED buildings by offering financial incentives. Indirect financial incentives, like density bonuses and accelerated permitting, have been shown to be more effective than direct cash transfers. In Vancouver, density bonuses are a preferred tool for addressing affordability and social housing and there is a reluctance to use this type of incentive for green buildings, therefore an accelerated permitting process is likely to be more suitable. This type of incentive program could easily be delivered, with only nominal costs, if an interdepartmental green building team is already in place, as per the recommendations from the previous section.

5.2.4 Directive-Based Tools

Vancouver has the option to maintain the status quo or to adopt the currently proposed Green Building Strategy, which is a directive-based policy tool. In the status quo, Vancouver has recently adopted a new objective-based building bylaw to better incorporate innovation and alternative solutions. In late 2006, BC released a new objective-based version of the building code, and Vancouver has followed suit with its own update of the Vancouver Building Bylaw (VBBL), using the new 2006 BC Building Code as the base document. (City of Vancouver, 2007). The code is intended to:

> "...help users better understand the reasons why a particular requirement must be met. This is done by linking technical requirements to at least one objective and functional statement. Further, the new format is intended to assist with alternative solutions" (BC Government, Building Policy Branch, 2007).

This objective-based code should reduce some of the barriers and uncertainty about trying innovative and unique green building solutions, assuming that Vancouver trains city staff to effectively handle these "alternative solutions".

The second policy option is for Vancouver to adopt the currently proposed Green Building Strategy (GBS). There are two key elements to the strategy:

1. Greening the building stock through changes in existing by-laws and regulations.
2. The creation of an interdepartmental Sustainable Development Team that will "support all City departments' environmental planning and building regulatory initiatives" (City of Vancouver, 2006, p18).

For the first goal, the GBS aims to green the building stock through regulatory changes in the priority areas of: storm water management, landscape and open space design, water efficiency, energy efficiency, healthy indoor environments, waste minimization, and sustainable transportation. A summary of the specific strategies and the related tools used in each area can be found in Appendix C. The GBS is designed to "ensure that all mid- and high-density residential, mixed use, commercial and industrial development in Vancouver will reach at least the equivalent of LEED Certified" (City of Vancouver, 2006, p. 19). LEED Certification is awarded for projects that achieve 26-32 points and then Silver begins at 33. Table 14 shows the increase in the number of LEED points that a project can achieve by simply building to the baseline code once the GBS is implemented.

Table 14 - Vancouver LEED baseline before and after the Green Building Strategy

LEED Credits	Baseline LEED Points Before GBS	Baseline LEED Points After GBS
Sustainable Sites (14pts)	6	8
Water Efficiency (5pts)	0	2
Energy & Atmosphere (17pts)	0	3
Materials & Resources (13pts)	0	2-4
Indoor Environmental Quality (15pts)	4	3-7
Innovation & Design (5pts)	4	8
Total Points	**17**	**26-33**

Source: Condensed from a City of Vancouver Policy Report – November 3, 2005

The GBS will definitely increase the number of green buildings in Vancouver, but it is unclear what the costs will be to adhere to these new regulations. Many aspects of the GBS state that more research is still needed. A detailed costing of the each regulatory measure is beyond the scope of this study, but fortunately a comparable cost/benefit analysis has already been completed.

In 2004 the Sheltair Group conducted a study entitled "Strategic Assessment of Resource and Economic Impacts of Green Buildings in Greater Vancouver". The report developed a baseline of the building stock by examining the resource use and environmental impacts of current buildings and then compared them to a "green building scenario" of LEED Silver buildings (and R-2000 for the residential building stock). The report looked at energy use, water use, air contaminates, wastewater and solid waster reduction. Using growth models it then projected how much the building stock will increase to the year 2025 and then valued these resource savings at different amounts, depending on how much of the building stock was green (they used penetration rates of 20, 40, 60 and 80 percent). They found that:

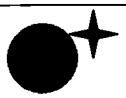
> "even for the 'most pessimistic' scenario considered of an 8 percent discount rate, 0 percent energy inflation, and 0 percent water inflation, the NPV of implementing the GB building scenario at a 20 percent penetration rate is about $900 million to the private sector and $1,000 million to the region as a whole." (Sheltair, 2004)

These results clearly show that the benefits of greening the baseline to LEED Silver far outweigh the costs. The report states:

> "There is a strong business case for implementing a GB scenario for most new and retrofit commercial buildings. LEED silver would be a realistic target for most commercial and institutional buildings" (Sheltair, 2004).

Figure 19 shows how Vancouver' baseline will compare to Portland and Seattle's once the GBS is adopted.

Figure 19 - Vancouver's baseline after the adopting the GBS

With GBS	**Vancouver**	**Portland**	**Seattle**
Baseline codes			

✦ = *with the GBS, Vancouver's baseline is now significantly "greener" than the other two.*

In addition to the proposed regulatory changes, the GBS' second thrust is the creation of the interdepartmental Sustainable Development Team. As previously discussed, the Sustainable Development Team (SDT) is needed to increase Vancouver's capacity to handle the heightened technical and regulatory uncertainty around green buildings. With the South East False Creek development and the related Olympic construction, the City needs this extra support (City of Vancouver, 2006).

In addition to supporting these specific development projects, the SDT will also be a necessary piece for the transformation of the private sector. Interviews with developers have indicated that civic capacity and leadership is an important part of green building market transformation. Both the Seattle and Portland cases show that the creation of an interdepartmental team is an important milestone in this process.

In the case of Seattle, their interdepartmental Green Building Team was created in 1999 to develop and implement the City's Sustainable Building Policy (City of Seattle website, 2006). The Team's initial focus was to support the City through its massive capital improvement program. After developing and expanding on this capacity, the City was able to use this new expertise to support the private sector through incentives, education and training programs, and through communications and outreach (Bennett, 2006).

In Portland, the G-Rated program had the two goals of (1) expanding market demand, and (2) making green building practices easier to implement. This was accomplished through four strategic areas, the first of which was organization and policy development. The objective was to "establish an organizational structure for providing comprehensive green building-related technical assistance and training services, research, and policy development" (City of Portland, 2003). Much of the early G-Rated work plan is similar to that of Vancouver's proposed Green Building Strategy and its Sustainable Development Team. Again referring back to the analysis in Section 3.5.6 of this paper, Vancouver's lack of interdepartmental team is why it only received a half score for its civic capacity.

Figure 20 - Vancouver civic capacity prior to the GBS

No GBS	**Vancouver**	**Portland**	**Seattle**
Civic capacity			

Similarly to the design of green buildings, the SDT will be an "integrated design model in policy development, neighbourhood/community design, building review, and education" (Vancouver, 2006, p. 18). With the adoption of the GBS and the creation of the SDT, Vancouver would then be very similar to Portland and Seattle in terms of capacity.

Figure 21 - Vancouver civic capacity after the GBS

With GBS	Vancouver	Portland	Seattle
Civic leadership & capacity			

The evidence on the importance of municipal capacity, combined with the supporting evidence on the costs and benefits of the proposed regulatory changes, lead to the recommendation the City of Vancouver adopt the proposed Green Building Strategy.

5.2.5 Summary

The previous analysis focused on Vancouver's best options for a green building market transformation initiative. The resulting conclusions are that Vancouver should (1) adopt the proposed Green Building Strategy, particularly the creation of an interdepartmental team, (2) create an accelerated permitting program as an incentive to encourage the private sector uptake of green buildings, and (3) use its position as a point of contact with the building industry to promote the educational and informational materials from current stakeholders and expert actors. The following table summarizes these recommendations according the framework for market transformation:

Table 15 - Recommendations for action

Market Transformation Policy Tools	Recommendations
Information-based	Promote green building information materials at City points of contact (permit counter, design review, etc)
Removal of barriers & conflicts	Create interdepartmental team and offer first-tier design assistance
Incentive-based	Create an accelerated permitting process

Market Transformation Policy Tools	Recommendations
Directive-based	Adopt the proposed Green Building Strategy

This package of policy initiatives is only one part of a complete market transformation initiative because there are still other gaps in the landscape that should be filled. The next section shows that these gaps are best filled by other actors, but that Vancouver can and should be involved with them through partnerships and strategic alliances.

5.3 Partnerships

When compared to Portland and Seattle, it becomes clear that Vancouver's market transformation framework is missing some key elements. There are thee key gaps that the City of Vancouver cannot fill either due to lack of jurisdiction or because there were public good aspects to the initiative. For example, a marketing campaign will benefit other cities in the region, even if it was initiated by the City of Vancouver. This study recommends a partnership model to address these types of gaps. The first gap is targeted marketing, the second is extensive technical design assistance, and the third is large incentives such as tax breaks.

The importance of targeted marketing was underscored throughout the literature. The Northwest Energy Efficiency Alliance (NEEA) recommends "targeted marketing efforts intended to communicate specific messages to specific groups with the intent of supporting efforts to institutionalize supply and demand of energy efficient buildings" (NEEA, 2001, p. 31). This was also repeated for the implementation of incentive programs:

> "A green building program may target more than one audience with a range of tools and incentives, making it essential that the programs be communicated and understood as a whole... the need for effective marketing cannot be underemphasized, as it can make the difference between very high and very low take-up" (Holland Barrs, 2005. p. 73).

The research also shows that both Portland and Seattle have invested in targeted marketing campaigns, much more so than Vancouver. Subsequent program evaluations have reported on their success in changing building practices and helping to increase energy efficiency (NEEA 2004, City of Seattle 2003, Rob Bennet 2006). Both cities leveraged partnerships to help fund these expensive campaigns, namely the utilities, higher levels of government, and non-

governmental organizations. The City of Vancouver should look to these stakeholders for help in delivering a targeted communications program to building decision-makers. The two key stakeholders of particular importance are the Provincial Government and BC Hydro.

As previously discussed, energy savings are the most valuable of the resource savings that are offered by green buildings (Sheltair, 2004). This creates a strong business case for the involvement of the utilities in the promotion of energy-efficient green building practices. In both Portland and Seattle, the utilities were deeply involved in all aspects of green building market transformation – marketing, technical assistance, incentives, and energy codes. Any overarching awareness campaign should include the utilities.

More importantly, in its recent throne speech and new Energy Plan, the Provincial Government announced its commitment to addressing climate change, clean energy, and energy efficiency. Directly relating to buildings, the Province plans to:

- meet 50 percent of incremental energy demand through conservation,
- increase consumer awareness through outreach programs and in-home smart-metering,
- offer incentives for energy audits and retrofits,
- create a unified Green Building Code by 2008, (Province of BC, 2007)

Many of the provincial initiatives are complementary to Vancouver's and indicate that the province is willing to take a leadership role in market transformation. The City of Vancouver should take advantage of this policy window by looking to the Province for leadership in outreach and communications and financial incentives.

While Vancouver should offer accelerated permitting as an incentive to build green, there is also evidence that tax incentives work well in combination. The State of Oregon's Office of Energy offers the LEED-based Business Energy Tax Credit (BETC). This provides an income tax credit based on a building's square footage and LEED rating. By basing the credit on square footage and a specific LEED rating, it is much easier for developers to include the incentive amount in their analytical models, thus increasing incentive uptake (Bennett, 2006). A similar income tax rebate is offered by the State of New York. These types of tax incentives have been tremendously successful at encouraging private sector green building uptake (Bennet, 2006). The City of Vancouver should lobby the Provincial Government to offer tax incentives for developers to go green. This incentive should be designed in tandem with the City's so that they don't

overlap and so they target the appropriate actors and specific resource concerns. For example, the Province could offer incentives for energy efficiency, which often has the highest first cost of the six LEED categories, and the City of Vancouver could offer incentives for an integrated design process.

Finally, green building practitioners in both Portland and Seattle enjoy a wide array of technical assistance on their projects. In addition to the programs offered by the cities themselves, the NEEA offers support through its Better Bricks program, which includes lighting design labs, daylighting labs, and energy efficiency support. These programs are offered in partnership with local Universities. In Vancouver, the Centre for Interactive Research in Sustainability (CIRS) is currently under construction. CIRS is a leading-edge green building research facility that is a joint venture between the local post-secondary institutions. Through CIRS, and in partnership with the municipalities, academia, the utilities and the Provincial Government, there is a great opportunity to offer extensive technical support to local green building practitioners. Already there are plans to house a daylighting lab and a virtual landscape design lab. Municipal and provincial incentive programs should leverage these tools to best support the building design industry and thereby reduce the uncertainty around the technical aspects of building green.

In summary, there are a few key areas where the City of Vancouver can facilitate market transformation through partnerships. The City should look to the provincial government to lead communications campaigns and for the creation of a tax incentive for energy efficiency. Additionally, the City should engage the utilities and the CIRS project to offer project-based technical assistance to local green building practitioners. The following table summarizes these recommendations according the framework for market transformation and the next section follows with a summary of all the recommendations that have emerged from this policy analysis.

Table 16 - Recommendations for partnerships

Market Transformation Policy Tools	Recommendations
Information-based	Partner with all green building stakeholders to create and deliver a targeted communications campaign.
Removal of barriers & conflicts	Partner with the post-secondary schools and the utilities to deliver in-depth project-based technical assistance.
Incentive-based	Lobby Government of BC to offer tax incentives for energy efficiency in buildings.

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6 Recommendations

There are multiple tools that must be used to transform Vancouver's building industry so that green buildings are demanded and supplied, and that the marketplace innovates continuously toward increasingly improved building performance. Direct actions that the City of Vancouver should take are:

1. Create an accelerated permitting process to encourage private sector uptake of green buildings.
2. Adopt the Green Building Strategy, and in doing so create an interdepartmental team to deliver the incentive program and to offer first-tier assistance to green building projects.
3. Leverage current resources by promoting the information and marketing materials of local green building stakeholders at the permit counter, during the design review process, and on the City's website.

In addition to these direct actions, the City should look to other key market actors in order to create a whole and complete market transformation framework. Specifically, the City of Vancouver should:

1. Partner with all stakeholders to create targeted communications campaigns.
2. Create partnerships with the CIRS program, BC Hydro, and other local green building stakeholders to offer more in-depth, project-based technical assistance.
3. Lobby the Government of BC to offer tax incentives for the energy components of LEED certification.

Successful implementation of these six recommendations would fill all of the gaps in the green building market transformation framework. The following table summarizes these recommendations within that framework.

Table 17 - Summary of all recommendations

Market Transformation Policy Tools	Recommendations	City of Vancouver Role
Information-based tools	Promote green building information materials at City points of contact (permit counter, design review, etc)	Direct action
	Create targeted communications campaign	Partnership model
Removal of barriers & conflicts	Create interdepartmental team and offer first-tier design assistance	Direct action
	In-depth project-based technical assistance	Partnership model
Incentive-based tools	Create an accelerated permitting process	Direct action
	Create energy efficiency tax incentives	Partnership model
Directive-based tools	Adopt the proposed Green Building Strategy	Direct action

Appendices

Appendix A – LEED Scorecard

LEED™ Scorecard

Instructions

The scorecard below should be used throughout the design and development of your building project to track your anticipated LEED™ score. The spreadsheet automatically dates each printout to give you a snapshot of your LEED™ score as your project progresses. The active spreadsheet sums the credit points for each category and provides a total score for the project. Do not input values in the category subtotal or in the project total fields as this will be done automatically.

The prerequisites are required and must be achieved. Thus, a "Y" appears adjacent in the first box and the other two are shaded. Beside each credit are three boxes to indicate the likelihood of achieving each credit. To score the project appropriately, input the number of points for that credit into the first column labeled "Y" if this credit will be pursued. Input the number of points in the second column labeled "?" if it is unsure if this credit will be pursued. Finally, input the number of points in the third column labeled "N" if this credit will not be pursued or is not applicable to the project. The possible points available for each credit are shown inthe far right column in each category. Remember that Energy & Atmosphere Credit 1.1 through 1.5 are each worth two points.

The total number of points listed in the first box of the Total Project Score indicates the current anticipated score of the project. The ranges for each LEED certification category are listed below this row. A minimum of 26 points and achievement of all prerequisites is required to certify a project.

In the Innovation & Design Process category you are encouraged to propose up to four innovations for your project. You should rename the credit titles for Credits 1.1 to 1.4 to reflect the strategies your project will propose.

0	0	0	**Total Project Score**	Possible Points **69**

Certified 26 to 32 points Silver 33 to 38 points Gold 39 to 51 points Platinum 52 or more points

0	0	0	**Sustainable Sites**	Possible Points 14
Y	?	N		
Y			**Erosion & Sedimentation Control**	0
			Site Selection	1
			Urban Redevelopment	1
			Brownfield Redevelopment	1
			Alternative Transportation, Public Transportation Access	1
			Alternative Transportation, Bicycle Storage & Changing Rooms	1
			Alternative Transportation, Alternative Fuel Refueling Stations	1
			Alternative Transportation, Parking Capacity	1
			Reduced Site Disturbance, Protect or Restore Open Space	1
			Reduced Site Disturbance, Development Footprint	1
			Stormwater Management, Rate and Quantity	1
			Stormwater Management, Treatment	1
			Landscape & Exterior Design to Reduce Heat Islands, Non-Roof	1
			Landscape & Exterior Design to Reduce Heat Islands, Roof	1
			Light Pollution Reduction	1

0	0	0	**Materials & Resources**	Possible Points 13
Y	?	N		
Y			**Storage & Collection of Recyclables**	0
			Building Reuse, Maintain 75% of Existing Shell	1
			Building Reuse, Maintain 100% of Existing Shell	1
			Building Reuse, Maintain 100% Shell & 50% Non-Shell	1
			Construction Waste Management, Divert 50%	1
			Construction Waste Management, Divert 75%	1
			Resource Reuse, Specify 5%	1
			Resource Reuse, Specify 10%	1
			Recycled Content, Specify 25%	1
			Recycled Content, Specify 50%	1
			Local/Regional Materials, 20% Manufactured Locally	1
			Local/Regional Materials, of 20% Above, 50% Harvested Locally	1
			Rapidly Renewable Materials	1
			Certified Wood	1

LEED™ Scorecard

0	0	0	**Water Efficiency**	Possible Points 5
Y	?	N		
			Water Efficient Landscaping, Reduce by 50%	1
			Water Efficient Landscaping, No Potable Use or No Irrigation	1
			Innovative Wastewater Technologies	1
			Water Use Reduction, 20% Reduction	1
			Water Use Reduction, 30% Reduction	1

0	0	0	**Energy & Atmosphere**	Possible Points 17
Y	?	N		
Y			**Fundamental Building Systems Commissioning**	0
Y			**Minimum Energy Performance**	0
Y			**CFC Reduction in HVAC&R Equipment**	0
			Optimize Energy Performance, 20% New / 10% Existing	2
			Optimize Energy Performance, 30% New / 20% Existing	2
			Optimize Energy Performance, 40% New / 30% Existing	2
			Optimize Energy Performance, 50% New / 40% Existing	2
			Optimize Energy Performance, 60% New / 50% Existing	2
			Renewable Energy, 5%	1
			Renewable Energy, 10%	1
			Renewable Energy, 20%	1
			Additional Commissioning	1
			Ozone Depletion	1
			Measurement & Verification	1
			Green Power	1

0	0	0	**Indoor Environmental Quality**	Possible Points 15
Y	?	N		
Y			**Minimum IAQ Performance**	0
Y			**Environmental Tobacco Smoke (ETS) Control**	0
			Carbon Dioxide (CO_2) Monitoring	1
			Increase Ventilation Effectiveness	1
			Construction IAQ Management Plan, During Construction	1
			Construction IAQ Management Plan, Before Occupancy	1
			Low-Emitting Materials, Adhesives & Sealants	1
			Low-Emitting Materials, Paints	1
			Low-Emitting Materials, Carpet	1
			Low-Emitting Materials, Composite Wood	1
			Indoor Chemical & Pollutant Source Control	1
			Controllability of Systems, Perimeter	1
			Controllability of Systems, Non-Perimeter	1
			Thermal Comfort, Comply with ASHRAE 55-1992	1
			Thermal Comfort, Permanent Monitoring System	1
			Daylight & Views, Daylight 75% of Spaces	1
			Daylight & Views, Views for 90% of Spaces	1

0	0	0	**Innovation & Design Process**	Possible Points 5
Y	?	N		
			Innovation in Design: Specific Title	1
			Innovation in Design: Specific Title	1
			Innovation in Design: Specific Title	1
			Innovation in Design: Specific Title	1
			LEED™ Accredited Professional	1

Appendix B - Summary of Developer Interviews

The interview questions are italicized and the interviewee responses follow in point form.

1. *In your portfolio, has the pe centage of projects that employ LEED been increasing, decreasing, or stable?*

    - Unanimously increasing
    - 1 interviewee cited new LEED standard (Core & Shell) that is more usable and has enabled their company to build all projects to LEED silver

2. *For the last five years, what are the most significant factors that have led to the increase in LEED buildings projects in Seattle?*

    - All interviewees cited market demand as the main reason. Specific comments include:
        - City of Seattle has done an excellent job in making developers more aware. Cascadia Chapter of USGBC has too. (1)
        - Seattle has a history of building high performance buildings.
        - Current green benefits are a little elusive, but in 5-10 years people will look back and recognize that building green was the right thing.
        - In 2000, green building was not even on the radar, and has come a long way. Developer decisions to build green were primarily ecological and branding
    - In addition to market demand, the City of Seattle was mentioned for its leadership role with their procurement policies and for raising industry awareness. (2)
    - Increased education and knowledge in the design community was the reason mentioned. (1)

3. *How would you describe your involvement in networking activities with your colleagues in the development industry? Specifically, has networking or partnerships increased your learning and participation in the green building sector? How?*

    - All interviewees agreed that networking was important for learning. Specifically:
        - While not driving the trend, organizations like the NAIOP have played a leadership role with networking and case studies
        - Learning-by-doing is still the best way, but networking is important. There's the USGBC and the ULI and the number of these networking events has been an increasing.
        - Networking is important, but primarily for leadership in branding.
        - One of the most important organizations that involves developers and public officials is www.i-sustain.com, which has spawned ½ dozen trips around the world. These trips are twice a year and we go to see other sustainable practices around the world.

4. *The City of Seattle's "Build Green, Everyone Profits" campaign and the NEEA's "BetterBricks" campaign are two examples of green building outreach programs in Seattle. Have either of these programs impacted your decision to build to LEED? Do you attribute any growth in your green building portfolio to brand awareness and campaigns such as these?*

    - All interviewees agreed that these campaigns played a strong role at increasing demand:
        - Programs were well publicized
        - These programs helped those that were already using it for branding
        - Programs have increased market demand through education
        - City of Seattle has shown leadership with these campaigns
        - Campaigns have not affected the decision to build LEED, but they have definitely increased awareness.
        - These campaigns have had great PR benefits. We got lots of phone inquires because of our participation in the campaign.

5. *The Seattle building industry seems to have a wide array of green building technical services: the Daylighting Lab and the Lighting Design Lab, Resource Venture, Seattle's Green Building Team, Seattle City Light's Facility Assessment, etc. Have you used these services in your projects? How as the availability of these services had an impact on your green building portfolio?*

    - Interviewees all had used these services in their projects and agree that these were important services.
        - Mainly used by architects
        - Important, but not key in the decision to build green
        - Great resource, good for sharing ideas

6. *Seattle and Seattle City Light have specific financial incentives for LEED design charettes and for building commissioning assistance. Have you used these services in your projects and how has the availability of these incentives impacted your green building portfolio?*

    - There was a consensus that incentives are important, but there was mixed feelings about different types of incentives and relative level of importance:
        - Incentives are fundamental:
            1. offset documentation costs
            2. education and training incentives
            3. but most importantly - zoning and density incentives
        - Have used City's incentives, but they were not key in decision
        - Prefer incentives over mandated command/control mechanisms
        - Incentives are not a critical factor, but they are important

7. *The Seattle Energy and Ventilation Codes prescribe a base level of energy efficiency and commissioning. Have these codes made building to LEED easier or more difficult? What impact have these codes had on your green building portfolio?*

   - Yes, the codes have impacted the growth of green buildings in the industry by creating an automatic baseline.
   - Codes can be important in the sense that they provide and automatic baseline.
   - Energy codes were a knee-jerk reaction to the crisis in the energy industry – Enron, regulation, supply issues.
   - The energy code has made it easier to build to LEED, but begrudgingly so, and codes are not the preferred tool to increase green buildings.
   - Energy codes are a double-edged sword. One the one side, the code has reduced the cost premium of achieving LEED standard, but on the other side, codes have been a complete failure. Codes only regulate energy within the building envelope and fail to consider the larger sustainability issues associated with land development patterns and the energy used in the development of rural areas.
   - Codes can be near-sighted in that it only focuses on energy efficiency. For example, in the recent changes, they [the government] wanted to increase efficiency in the code, but this would made it impossible to use so much glass and windows. First of all, the market would not have accepted this, and secondly, this would have greatly reduced the amount of daylight into buildings.

Appendix C – Summary of Proposed Green Building Strategy

Summary of City of Vancouver's Proposed Green Building Strategy - January 11, 2007

Applicable to buildings over 3 storeys or greater than 600m2

	Strategies	Tools	Enforcement	Further Investigation
#1 - Stormwater Management		-	-	-
a.	Mandatory stormwater management plans	Vancouver Building Bylaw	Building permit review	
b.	More stringent dischare limits for stormwater quality	Sewer & Watercourse Bylaw	Building permit review	Analysis of infiltration costs & benefits,
c.	Require parking lot stormwater treament facilites to meet the 75mg/L requirements in the Sewer & Watercourse Bylaw	Sewer & Watercourse Bylaw	Building permit review	Additional staffing requirements
d.	Allow (voluntary) rainwater harvesting	Vancouver Building Bylaw	Plan review (design drawings) & inspection stages	None
#2 - Landscape & Open Space Design				
a.	Green roofs - create techical guidelines & mandate 50 percent coverage	Zoning Guidelines	Require for all rezoning & discretionary development applications	Investigate requirements for green roofs to be extened to ALL new deveopments
b.	Create specifications for native & drought resistent plant species	Zoning Guidelines	Require for all rezoning & conditional development applications	None
c.	Urban Agriculture - create guidelines for: - mandatory number of plots & sizes w/ sun & wheelchair access - mandatory tools & compost space - mandatory access to water - edible landscaping	Zoning Guidelines	Require for all rezoning & discretionary development applications	Impact on building costs
#3 - Water efficiency				
a.	Specific 20 percent more efficient fixtures = "low-flow"	Vancouver Building Bylaw	Building Inspection	None
b.	Require "Energy Star" or equivilant for all relevant appliances	Vancouver Building Bylaw	Building Inspection	Impact on permit review process
#4 - Energy efficiency				
a.	Mandatory 10 percent below ASHRAE 90.1 for building energy consumption	Vancouver Building Bylaw	Building Inspection	
b.	Require "energy compliance plan" from the design team	Plan review process	Development permit review	Enforcement costs, Cost of 3rd party audit system,
c.	Require full energy utilization calculations	Plan review process	Building permit review	Cost of implimenting building energy targets.
d.	3rd party energy auditing (at random)	?	?	
	Strategies	Tools	Enforcement	Further Investigation

Healthy indoor environments

a.	Adopt ASHRAE 62.1 - 2004	Vancouver Building Bylaw	Letters of Assurance, Plan review & Building Inspection	Cost impact on CoV staff & building community
b.	Mandatory ventilation "flush out" prior to occupancy	Vancouver Building Bylaw	Prior to occupancy permit	
c.	Mandatory testing of indoor air quality	Vancouver Building Bylaw	Prior to occupancy permit	Determine technical parameters and standards (i.e. pass/fail)
d.	Create technical guidelines for mandatory passive design standards: - passive solar - minimum daylighting - natural ventilation	Zoning & Development Guidelines, Checklists for Building Permit & Inspection Stages	Require for all rezoning & development applications	Best practices from other jurisdictions
e.	Durability - require compliance with CSA S478 "Guidelines on Durability in Buildings"	Vancouver Building Bylaw	Required for building permit review	Cost impact, Documentation burden on design team, Impact on building permit process.

Waste Minimization

a.	Mandatory Construction Waste Management Plan	Solid Waste Bylaw	Required for building permit review, Spot checks	Added staff resources
b.	Allow for three stream recycling - added bin space - mandatory compactors for 90+ units - guidelines for all new developments - mandatory waste management plans (operations) from developers & signed by a waste service providers	Zoning Guidelines	Development permit review, Building permit review	None

Sustainable Transportation

a.	Allow displacement of required parking standards as required			
b.	Mandatory percent of electrical outlets for plug-in hybrids			
c.	Improve standards for better "end of use" facilities (i.e. shower, change rooms, etc.)	Vancouver Building Bylaw, Parking Bylaw, Transportation Demand Management Plans (TDMP)	Evidence of compliance required as part of rezoning, development permit, and building permit application. Field enforcement to be analyzed	Investigate using more parking maximums, the unbundling of parking and unit ownership, using micro-cars for meeting requirements, and design requirements to enable future conversion of parking to other uses.
d.	Allow for automated/mechanical parking systems			
e.	Allow for tandom parking in some applications			
f.	Develop landscaping requirements for temporary & ancilliary parking			
g.	Expand the application, monitoring, and compliance with TDMPs			

Bibliography

Works Cited

BC Hydro. *High Performance Building Program for Large Commercial Buildings.* Accessed March 2006. http://www.bchydro.com/business/identify/identify24037.html

Building Design and Construction. *Green Buildings and the Bottom Line: Fourth in a Series of Annual Reports on the Green Building Movement.* Supplement. November 2006

City of Portland. *ReThinking Development: Portland's Strategic Investment in Green Building.* City of Portland Office of Sustainable Development. March 2003.

City of Portland. *City Of Portland Green Building Policy Update FAQ.* City of Portland Office of Sustainable Development. n.d.

City of Seattle. *CIP Supplements to the LEED Green Building Rating System.* City of Seattle, 700 Fifth Ave, Seattle, WA. 2001. http://www.cityofseattle.net/sustainablebuilding/Leeds/docs/LEEDSupplements.PDF. Accessed March 15, 2006.

City of Seattle. *Sustainable Building Program 5 Year Report.* Deptartment of Planning & Development, 700 Fifth Ave, Suite 1900, Seattle, WA. 2005. http://www.seattle.gov/dpd/static/5-year_report_LatestReleased_DPDP_009930.pdf. Accessed March 12, 2006.

City of Seattle, King County, NEEA, & the USGBC. *Green Building Pre & Post Campaign Testing 2005.* http://www.buildgreennw.com/resource/Campaign_Testing_Report_2005.pdf. Accessed March 12, 2006.

City of Vancouver. *One Day Vancouver.* Website: www.onedayvancouver.ca. Accessed March 22, 2006.

City of Vancouver. *Vancouver Green Building Strategy – Report Draft.* November 16, 2006.

Coriolis Consulting Group. *Do DCC Development Cost Charges Encourage Smart Growth and High Performance Building Design?* West Coast Environmental Law. 2003

Ecotope. *Baseline Characteristics of the Non-Residential Sector: Idaho, Montana, Oregon and Washington.* Northwest Energy Efficiency Alliance, 529 SW Third Avenue, Suite 600 Portland, Oregon. December 2001

GVRD. *Summary of studies relating to the benefits of Indoor Environmental Quality.* BuildSmart, Greater Vancouver Regional District. www.gvrd.bc.ca/buildsmart

GVRD. *Build Smart.* Accessed March 2006. www.gvrd.bc.ca/buildsmart

Hepting, Curt. *Canada's CBIP Versus The United States' Leed: Building Energy Performance Path Requirements.* Presented at the Bi-Annual Conference for the Canadian Chapter of

the International Building Performance Simulation Association. Vancouver, Ca ada. June 2004n

Holland Barrs Planning Group. *GVRD Green Building Incentive Study – Draft.* Greater Vancouver Regional District, Business Service Group. January 2005.

Hughes Condon Marler: Architects (HCMA). *Local Government Green Building Programs* Regional District of Nanaimo, 205 Accessed March 2006 at www.gvrd.bc.ca/BuildSmart/pdfs/nanaimoregdistlocalgovtgreenprogrep.pdf.

Kunkle, Rick & Lutzenhiser, Loren. *New Commercial Office Buildings: Developing Strategic Market Transformation Initiatives for Energy Efficiency.* Washington State University. Report #01-087. September 2001.

Light House Sustainable Building Centre. *2006 Report on Vancouver's Green Building Industry.* January, 2007.

Loveland, Joel. *Lessons Learned 2003.* Seattle Daylighting Lab Presentation. 2004. Accessed March 14th, 2006. http://www.daylightinglab.com/daylighting/Lessons per cent20Learned per cent202003_2.pdf.

MacDonald, Rodney. *The Economics Of Green Building In Canada:Highlighting Seven Keys To Cost Effective Green Building.* Thesis submittal, Royal Roads University. April 2005.

Northwest Energy Efficiency Alliance (NEEA). *Market Activities Report, 2004.* Northwest Energy Efficiency Alliance, 529 SW Third Avenue, Suite 600 Portland, Oregon.. 2004 http://www.nwalliance.org/resources/documents/AllianceMAR.pdf. Accessed March 12, 2006.

Negrin, David. *To LEED or not to LEED*? A Practical Look at Sustainability Measurement Tools" Concord Pacific Group Inc. Urban Development Institute Breakfast Seminar. June 7, 2005

Optimal Energy, Inc. *Documentation of the Northwest Energy Efficiency Alliance Efforts to Support Energy Codes and Participate in the Federal Standards Setting Process.* Optimal Energy, Inc. 14 School Street, Bristol, Vermont 05443 2003. http://www.optenergy.com/pdf/OEICodesDocumentation.pdf. Accessed March 14, 2006.

Quantec. *Energy Code Support – Market Research Report.* Northwest Energy Efficiency Alliance, 529 SW Third Avenue, Suite 600 Portland, Oregon.. August 26, 2005.

Quantum Consulting Inc. *Commissioning in Public Buildings: Market Progress Evaluation Report.* Northwest Energy Efficiency Alliance, 529 SW Third Avenue, Suite 600

Pembina Institute. *CANMET Energy Technology Sector – Buildings Group.* January 2004

Research Into Action, Inc. *Architecture + Energy Program, Final Report.* Northwest Energy Efficiency Alliance, 529 SW Third Avenue, Suite 600 Portland, Oregon. June 2001

Research Into Action, Inc. *Commercial Sector Initiative: BetterBricks Training and Advising Services - Market Progress Evaluation Report.* Northwest Energy Efficiency Alliance, 529 SW Third Avenue, Suite 600 Portland, Oregon. May 24, 2005

Resource Venture. *Sustainable Building - How to Get Started.* Accessed February 2006. http://www.resourceventure.org/rv/issues/building/get-started/index.php

Roodman & Lenssen. *Worldwatch Paper #124: A Building Revolution: How Ecology and Health Concerns Are Transforming Construction.* Worldwatch Institute, 1776 Massachusetts Ave., N.W. Washington, D.C. USA. March 1995.

Royal Institution of Chartered Surveyors. *Green Value: Green Buildings, Growing Assets.* The Royal Institution of Chartered Surveyors, 12 Great George Street, Parliament Square, London, UK. 2005.

Seattle City Light. *Energy Smart Services Program Manual.* Sept. 2002. http://www.ci.seattle.wa.us/light/conserve/business/programmanual/section_3.pdf. Accessed March 15, 2006.

Sheltair Group Resource Consultants. *Strategic Assessment of Resource and Economic Impacts of Green Buildings in Greater Vancouver.* Presented to The Greater Vancouver Regional District, Policy and Planning Department. September, 2004.

Sustainlane. Accessed March 2006. http://www.sustainlane.com/

Urban Consortium Energy Task Force of Public Technology, Inc. *Sustainable Demand Project.* City of Seattle & Seattle City Light. December, 2000.

West Cost Environment Law. *Cutting Green Tape: An Action Plan For Removing Regulatory Barriers To Green Innovations.* April 2002.

Interviews & Inquiries

Developers & Designers

Gregory, Bert. CEO, Mithun. Seattle WA

Howe, Douglas. CEO, Touchstone Corporation. Seattle, WA.

Mueller, Jim. CEO, J.C. Mueller LLC. Seattle, WA

Public Officials

Athens, Lucia. Green Building Program Coordinator, City of Seattle Department of Planning & Development. Seattle, WA. March 2007

Bennet, Rob. Green Building Planner, Office of Sustainability, City of Vancouver, BC. November, 2006.

Clark, Jim. Manager, Commercial Building Incentive Program. Email correspondence. Office of Energy Efficiency. Ottawa, On. February, 2006.

Goodland, Helen. Executive Director, Sustainable Building Centre and Former Director of the GVRD's Build Smart Program. Vancouver, BC.

Jennings, John. Project Manager, Northwest Energy Efficiency Alliance. Telephone conversation. March, 2006.

Meeks, Chris. Program Manager. Seattle's Daylighting Lab. Seattle, WA. March 2006.

Mehdi, Jamal. Development Services, Department of Planning, City of Vancouver. Vancouver BC. March 2006.

Ramslie, David. Green Building Planner, City of Vancouver, BC. March 2007

Non-Governmental Organizations

Goodland, Helen. Executive Director, Light House Sustainable Building Centre. Ongoing.

Wooliams, Jessica. BC Chapter Director, Cascadia Green Building Council. LEED AP. Vancouver, BC

Zycherman, Dara. LEED Program Coordinator, U.S. Green Building Council. March, 2006.

Other

Lombard, Mark. Results from World Café comprising of 33 industry stakeholders. Light House Sustainable Building Centre. Vancouver, BC. February 2006.

McFeely, Janika. CIRS Research Assistant, UBC School of Architecture. Vancouver, BC. March, 2006.