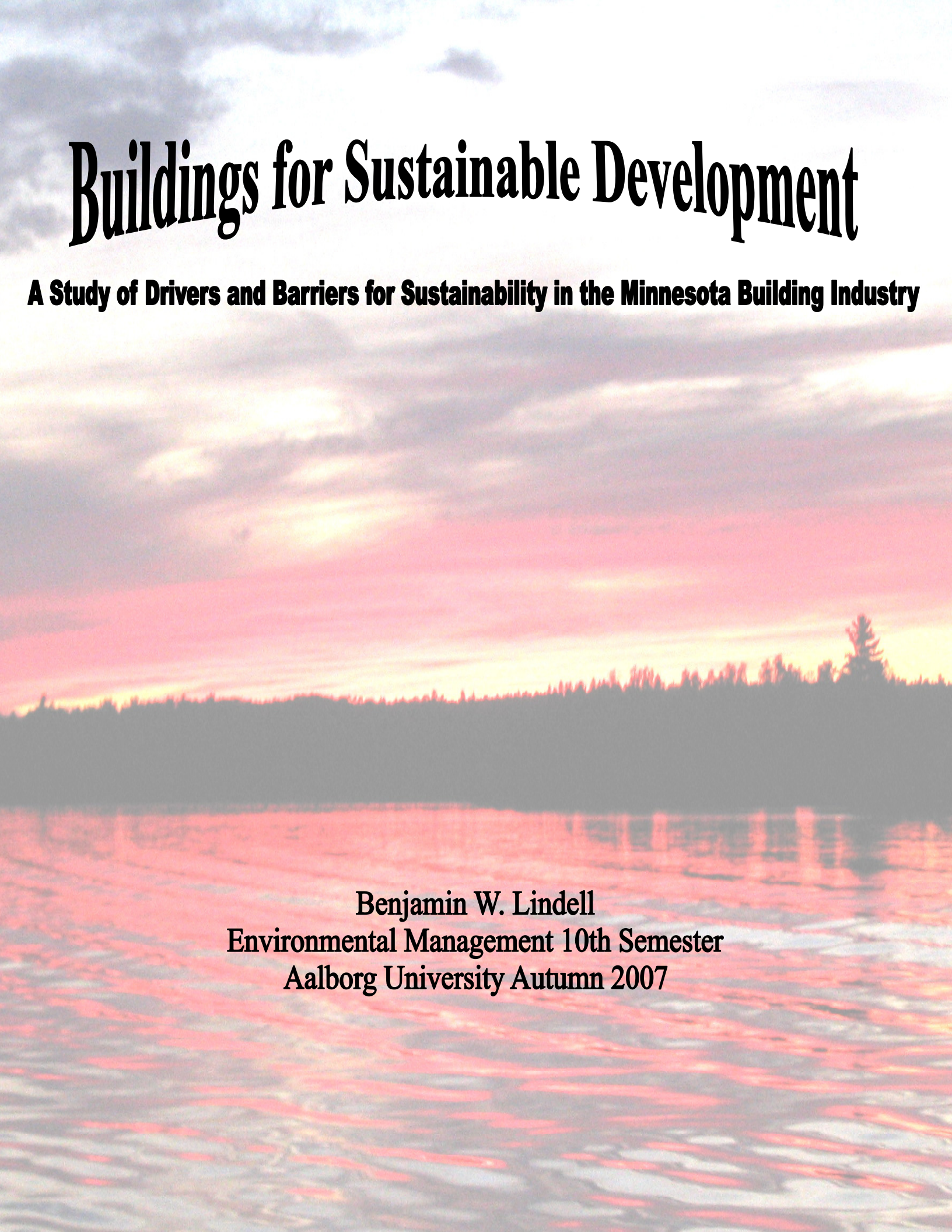

# Buildings for Sustainable Development

## A Study of Drivers and Barriers for Sustainability in the Minnesota Building Industry

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Environmental Management 10th Semester
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# Title: Buildings for Sustainable Development – A study of Drivers and Barriers for sustainability in the Minnesota Building Industry

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**Abstract:**

This project presents the analysis of how environmental issues are understood in the building industry. In particular, it concentrates on sustainable building efforts in the State of Minnesota.

The project takes its point of departure in the all-encompassing global challenge of climate change. The building industry is clearly identified as a industrial sector with vast possibilities to address its current influence on the environment in effort to mitigate Greenhouse Gases. This then leads to uncovering existing challenges towards green building, identifying regulation and entities such as institutionalization and decentralization as necessary components for successful implementation of sustainable building.

The project then takes a critical stance towards sustainable building efforts in the State of Minnesota. In particular, the approach of the Minnesota Sustainable Building Guidelines is of focus, as they appear to differentiate from the nationally recognized US Green Building Council and LEED certification. These two Green building programs are then incorporated in a program and practical analysis of sustainable building in the state of Minnesota.

The analysis identifies numerous barriers to green building in the Minnesota building industry. In addition it uncovers a number if issues that could amend green building in the state of Minnesota. In addition, the analysis identifies the need for future endeavors to place efforts towards financial and budgeting challenges and the deed of influencing the growth of green building through a sufficient emphasis of education.

# Preface

This report has been prepared during the 10th semester of the study program Environmental Management, in the Department of Development and Planning at Aalborg University, in the autumn of 2007.

In this report the literature sources are prepared in accordance to the 15th edition of the Chicago manual of style. Conveniently provided are appendices A, B, C and D. Suitably, they are referred to in the text as supporting mechanisms.

I would like to say thanks to Richard Strong, Rick Carter and Jonee. K Brigham for their willingness and providence of well-informed interviews. Also, I would like to thank Tine Herreborg Jørgensen , for her well-intended opinion and comments throughout the making of this project.

_____

Benjamin William Lindell
October 25th, 2007

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# List of Abbreviations

| | |
|---|---|
| BAT | Best Available Technology |
| B3 | Buildings Benchmark and Beyond Project |
| C | Carbon |
| C&D | Construction and Demolition |
| CO2 | Carbon Dioxide |
| COP | Conference of the Parties |
| CSBR | Center for Sustainable Building Research |
| EPA | Environmental Protection Agency |
| EPBD | Environmental Performance of Buildings Directive |
| ES | Executive Summary |
| ETC | Etcetera |
| EU | European Union |
| GHG | Greenhouse Gases |
| GJ | Gigajoule (10^9 Joules) |
| HFC | Hydrofluorocarbons |
| IIED | International Institute for Environment and Development |
| IPCC | Intergovernmental Panel on Climate Change |
| Kg | Kilogram |
| LBS | Pounds |
| LCA | Life Cycle Assessment |
| LEED | Leadership in Energy and Environmental Design |
| MBI | Market-Based Instruments |
| Mg | Milligram |
| MMT | Million Metric Ton |
| MMTCE | Million Metric Tons of Carbon Equivalent |
| MSBG | Minnesota Sustainable Building Guidelines |
| Mtoe | Million Tons of Oil Equivalent |
| ND | No Date |
| Nox | Nitrogen Oxide |
| OECD | Organization for Economic Cooperation and Development |
| OSHA | Occupational Health and Safety Administration |
| PCB | Polychlorinated Biphenyls |
| PFC | Perfluorocarbons |
| SBCI | Sustainable Building Construction Initiative |
| SME | Small and Medium sized Enterprises |
| SO2 | Sulfur Dioxide |
| Toe | Ton of Oil Equivalent |
| UN | United Nations |
| UNCED | United Nations Conference on Environment and Development |
| UNEP | United Nations Environmental Programme |
| US | United States |
| USGBC | United States Green Building Council |

# 1. Climate Change and The Building Industry

*"Climate Change represents one of the most serious and far-reaching challenges facing humankind in the twenty-first Century. The International consensus of scientific opinion […] is agreed that global temperature is increasing and the main cause is the accumulation of carbon dioxide and other greenhouse gases in the atmosphere"* (Carr et al. 2005, 13).

Today's Climate Change reflects variations within the Earth's atmosphere and other entities of the earth such as oceans and polar ice caps and essentially the factor of human influence (TNA 2006). In opposition to the above quote, some believe that the variations in global temperatures are solely subject to the dynamics of the Earth-Sun Orbital relationship, (see Hecht 2007), and not necessarily influenced by human action(s). The intuition in the quote is not addressing the natural greenhouse effect[1], however it is magnifying the *"contribution mankind is making to intensify the effect, largely through rapid increasing CO2 emissions"* (TNA 2006, 2).

The Intergovernmental Panel on Climate Change (IPCC) reported that the earth's average temperature has increased approximately 0.6 degrees Celsius in the 20th century, making the 20th century the warmest since records began (IISD 2007, 3). Thus far the effects of climate change have proven to be detrimental and consequentially irreversible, with the reality that (Roadmap nd, 9):

- The North Pole ice cap is melting: 1950-2000 the surface has diminished by 20%
- In the 20th Century, global sea levels have risen by approximately 15cm
- Worldwide snow cover is retreating and glaciers are melting
- There has been a significant increase in the frequency and severity of natural disasters

Although predictions of future climate change are debatable, the absence of proper mitigation of Greenhouse Gases (GHG's), such as $CO_2$, could result in a possible average temperature increase of 1.4 to 5.8 degrees Celsius by the year 2100 (IISD 2007). Consequences of this could possibly result in irretrievable form such as the continuous rise of sea levels and damaging natural habitats resulting in the loss of vegetation and animal species. Mankind's influence to climate change is variable, however it can be assumed that one of the greatest challenges in addressing climate change is societies' dependency on energy, and the burning of fossil fuels to produce energy, is one of the main contributors of GHG's.

[1] The Natural Greenhouse effect - A warming of the Earth's atmosphere caused by the presence in the atmosphere of certain heat-trapping gases, including water vapor, carbon dioxide and methane. These gases absorb radiation emitted by the Earth, thereby retarding the loss of energy from the system to space. The greenhouse effect has been a property of Earth's atmosphere for millions of years and is responsible for maintaining the Earth's surface at a temperature that makes it habitable for human beings (C3 2007).

## 1.1 The Building Industry to address Climate Change

In global effort to lessen climate change, the United Nations Environmental Programme (UNEP) has identified the building industry as a sector that poses considerable potential in the reduction of GHG emissions by means of mitigating energy use (UNEP 2007). In OECD[2] countries, 25-40% of energy consumption is product of the building industry, and in Europe buildings account for roughly 40-45% of energy consumption. This is equivalent to 2,500 Mtoe[3] (Million tons of oil equivalent) of energy (UNEP 2007, 11). Below in Figure 1.1 the outlook for the worlds supply and demand of energy is illustrated by fuel. Gathered from the figure, the continual dependency on coal and oil as fuels for energy is problematic when compared to cleaner technologies such as hydro and renewable energy sources that are projected to continue to provide a small percentage of energy in the future.

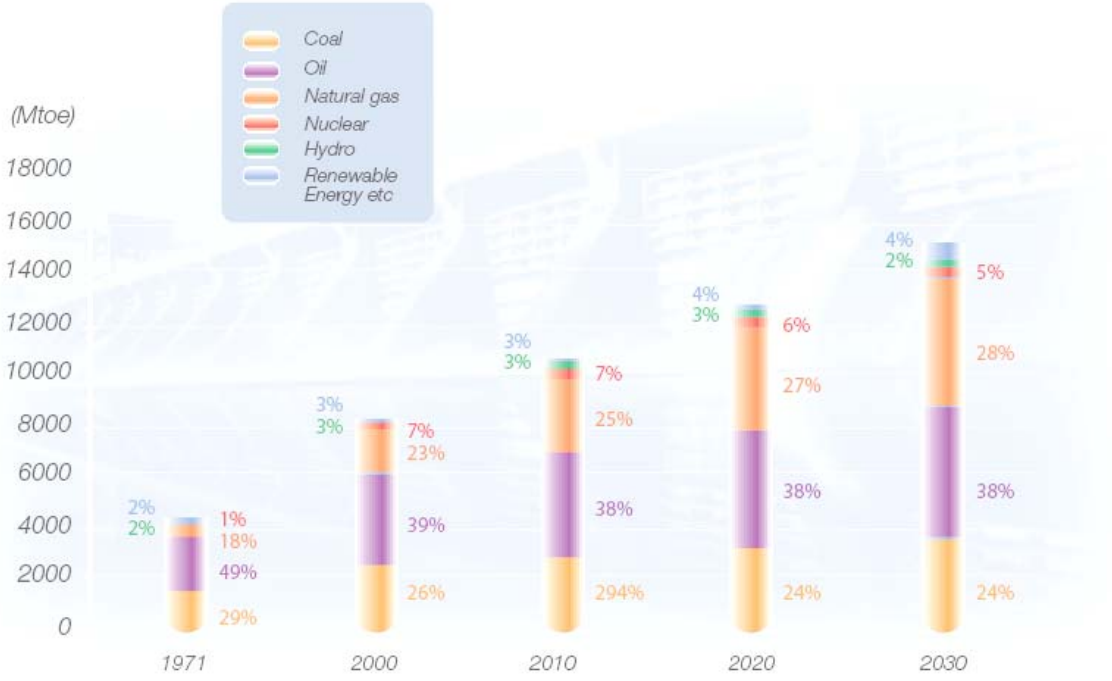


Figure 1.1 Outlook for world energy supply/demand by fuel (CICA 2002).

The Building industry can be considered one of the world's largest industrial employers with approximately 111 million employees, providing significant influence on the global economy (CICA 2002). For example, the total annual output worldwide accounts for approximately 3000

[2]OECD – Organization for Economic Cooperation and Development.

3 Because of the major role that oil plays in the world economy, to measure the energy needs of different nations, economists and politicians generally use the "ton of oil equivalent". 1TOE corresponds to 41.85 billion joules of energy, i.e. 11,626 kilowatt-hours (R&L nd).

billion[4] US dollars. The industry consists mainly of small and medium-sized enterprises (SME's). In fact, it's estimated that 97% of the firms are SME's[5], while 95% of these consist of 10 or fewer employees, creating a sense of diversity in methods and standards practiced around the world.

Depending on global regions, often influenced by local climate, resources and legislation, etc., buildings are constructed in a variety of practices. Yet arguably widespread, the energy consumption in buildings can be distinguished in five phases, which are listed below (Jones 1998).

- The Manufacturing of building materials and components
- The energy used to deliver goods to the job site
- The energy used to construct the building
- The operations of the building
- The energy used for the demolition of a building

The perspective of Jones considers the entire lifecycle of a building, from the manufacturing of materials used to construct buildings to the demolition of a structure, which resembles cradle to grave considerations. However, the greatest consumption of energy of buildings is not in the actual construction of the building, but more so during the use phase, which accounts for the energy used for heating, cooling, lighting, ventilation and so forth (UNEP 2007). Below, in figure 1.2, the three main energy consumption phases of a buildings lifecycle are presented. The following results are product of a life cycle assessment (LCA) conducted by Junnila (2004), to assess the impact of energy consumption of buildings around the world. The findings support the notion that the greatest energy consumption of buildings occurs in the use phase.

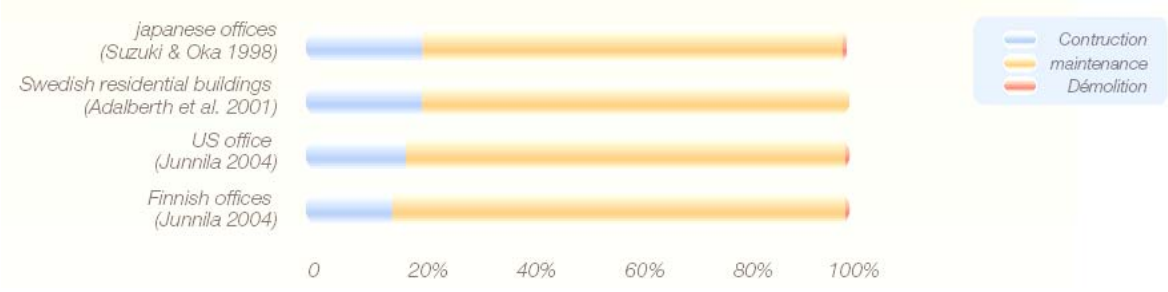


Figure 1.2 Energy Consumption of the most influential phases of a buildings life cycle (UNEP 2007).

[4] Billion- 1 billion US dollars = 1,000,000,000.
[5] SME's are Small and Medium Enterprises or firms considered to have fewer than 500 employees (CICA 2002).

Although the impact of the *use phase* in the energy consumption of buildings can be, for the most part, considered universally influential, the realization of climate, economical resources, etc. vary globally. Below in figure 1.3 the variations of energy consumption in the use phase of buildings are illustrated. The figure also provides examples of the variation in energy use from residential (houses) to Commercial (Industrial buildings).

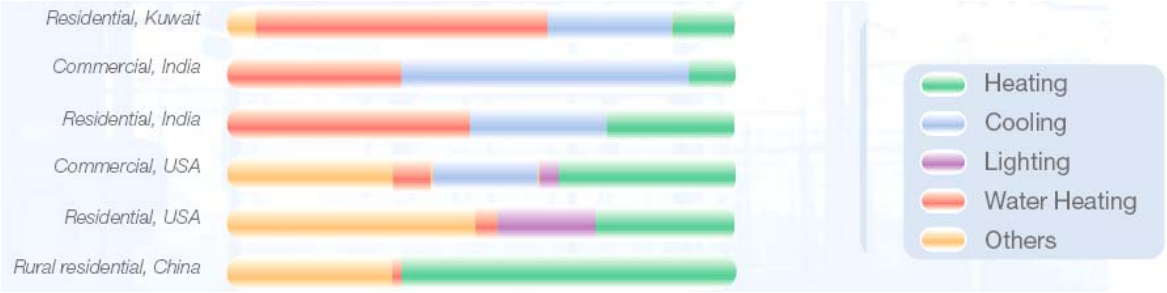


Figure 1.3 The variations of energy consumption throughout the use phase of buildings (UNEP 2007).

The illustration thus far, has been focused towards the opportunity the building industry imposes on the global effort to mitigate GHG emissions by means of reducing the energy consumption of buildings. Emphasis has been placed on the use phase in buildings as it has thus far inflicted the greatest influence on the total energy consumption of buildings. With that said, the intent has not been failure to mention other effect the building industry places on the environment, such as various materials and chemicals, which will be discussed in chapter three, section 3.3.

In this sense, when exploring possible approaches to addressing the issue of mitigating GHG emissions, it's necessary to recognize that the building industry remains to be, *"a complex industrial chain, involving a wide range of actors, an extended life cycle of products and user preferences implications, making it one of the most complex environmental policy target groups"* (UNEP 2007, 35).

Today, various mechanisms, such as *"legislative measures, economic incentives and technology transfer […]"* programs exist in the pursuit to integrate the building industry as means of reducing energy consumption (UNEP 2007, 37). However, composition of a global approach is likely unrealistic when recognizing sovereignty and national habits such as economical and social conditions which more than often reflects the precedence of Nations around the world.

In relation to the challenges of implementing realistic approaches, such as sovereignty and national habits it is of interest to mention the United States (US), a country in which it can be said has grown accustom to the scrutiny of national habits, and arguably lack thereof regulation of these

habits. In a global perspective the US, amongst others, has more or less been absent from universal efforts towards global climate change efforts, especially recalling the 1997 Kyoto Protocol[6], where debatably once again economical prosperity outweighed environmental protection.

However, the focus of this is not to reawaken the debate of past US action towards climate change, but to highlight the possibilities of future influence in the US building industry. The reality being that the US is home to *"over five million commercial structures and 76 million residential structures"*(AIAM 2004, 2). It is approximated that these buildings consume 65% of the US electricity consumption, accounting for roughly 30% of US GHG emissions.

### 1.1.2 Mandatory Vs. Voluntary regulation of the industry

With certainty of such a vast industry in the US, the Building industry practices national building codes and standards, which on a basic level, regulates the physical, thermal and electrical requirements of a building, more so to ensure the health and safety of living and working in structures (UNEP 2007). Conversely, on a national level explicit standards and regulation of the consumption of energy in buildings remains voluntary (see figure 1.4).

[6] Kyoto Protocol - The result of negotiations at the third Conference of the Parties (COP-3) in Kyoto, Japan, in December of 1997. The Kyoto Protocol sets binding greenhouse gas emissions targets for countries that sign and ratify the agreement. The gases covered under the Protocol include carbon dioxide, methane, nitrous oxide, hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulfur hexafluoride (EIA nd). The US did not ratify this agreement.

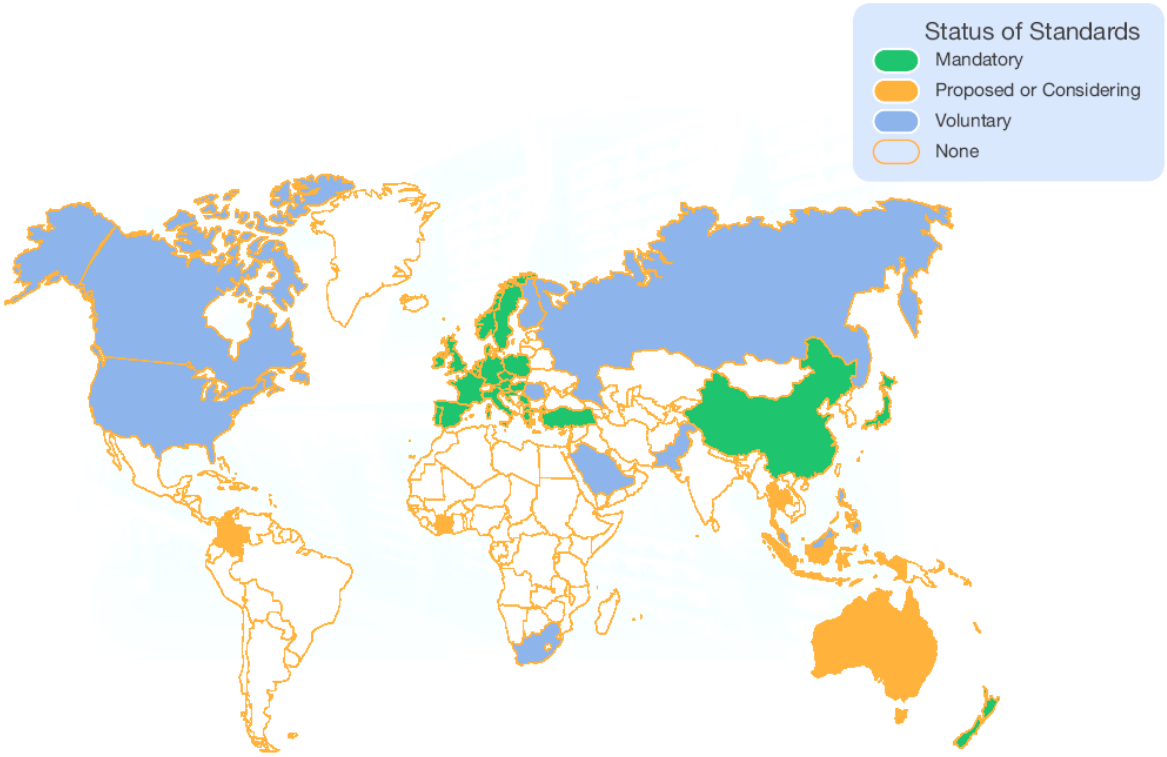


Figure 1.4 Status of energy consumption of buildings standards (UNEP 2007).

As illustrated in figure 1.4, the US remains a nation that practices voluntary standards regarding the energy consumption of buildings. However, this detail is not to overshadow recent efforts of particular states such as Minnesota, which resides in the Midwest region of the US.

## 1.2 Sustainable evidence in the State of Minnesota

In 2004, the state developed The State of Minnesota Sustainable Building Guidelines (MSBG), also known as the B3 Guidelines, which is now *"law for all building projects that are funded with state money"* (Appendix A). The B3 guidelines exist to *"reduce energy expenditures, enhance the health, well-being and productivity of the building occupants, and to improve the quality of the natural environment"* (MSBG 2006a, 1.1).

With the B3 Guidelines focusing on state funded buildings, the possibility of legitimate influence of creating more efficient buildings is present. However the reality of having a lack of national legislative influence creates a means of questioning the likelihood of adequate regulation of these efforts.

Faced with the reality of further development in the US and the current status of voluntary energy consumption standards of buildings, the extent to which GHG emissions will be mitigated by means of the building industry is questionable. Recent efforts in addressing this issue, such as the Minnesota Sustainable Building Guidelines, possibly hold the needed decentralization in order to make such efforts realistic. However the lack of national influence of this issue, in a country that arguably has a history of prioritizing economic prosperity over environmental preservation, provides room for one to question the validity in the regulation of the energy performance of buildings in the US.

## 1.3 Problem Formulation

Highlighted through the introductory chapter has been the all-encompassing global challenge of addressing climate change. Through the inevitable reality of a growing world population comes an increase in consumption of resources and land degradation that ultimately have irreversible consequences such as melting ice caps resulting in rising sea levels (Roadmap nd, 9). In effort to reduce mankind's influence on climate change, the building industry has been identified as a sector that demonstrates significant potential for GHG's mitigation.

Although identified, universal approaches towards the reduction of GHG's in the building industry are lacking. For example recalling figure 1.4, regions of the world such as Western Europe, China, New Zealand and Japan appear to lead the rest of the world through mandatory regulation in the building industry, such as benchmarking the amount of energy a building can consume. Important to notice is the lack of American efforts, a country, which presumably has the financial security and technology to take the necessary steps in order to contribute to an effort as such, however lacks national influence towards regulating the amount of energy a building can consume in it's member states. With that said, it provides incentive to question the effectiveness of state policies and programs, such as Minnesota, who have recently introduced guidelines to pilot the construction of state funded buildings towards sustainability.

The contents thus far present the point of departure for this project through the following research question:

*How are Environmental Issues understood in the Building Industry, and how can current regulatory action, both Federal and State, be amended to ensure adequate implementation of sustainable efforts in the Minnesota Building Industry?*

In the following chapter two, the research design and methodology for this project will be presented. It will provide a thematic explanation of the chapters, including a structure of the report, along with an explanation of the theories applied and the data collection methods.

# 2. Research Design and Methodology

*In the following chapter an explicit explanation of the thematic elements existing in the present report will be given. Initially a structure of the report is illustrated, followed by an explanation of each chapter. For supplementary reasoning, supporting sub-questions embedded in existing chapter are provided, which are used to support the approach to answer the research question. In addition, the methodological approach exercised in this report is provided along with the utilized data collection methods.*

## 2.1 The Report Structure

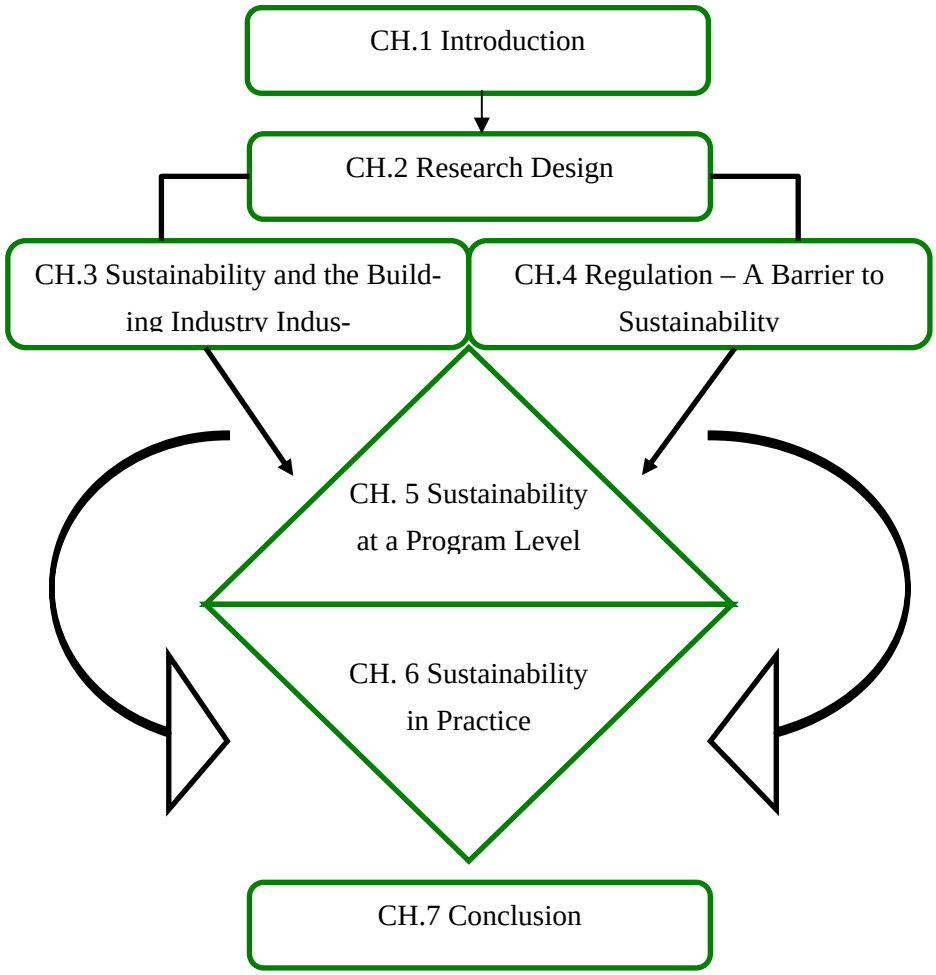


Figure 2.1 The Report Structure.

## 2.2 Thematic Explanation of Chapters

The foundation of the current report is suitably portrayed in the **introductory chapter**, **Climate Change and the Building Industry.** It is in this chapter that the reader is not so much told but reminded of the all-encompassing global threat of climate change. In effort to address this global challenge, and in reverberation of global organizations such as the UNEP, the building industry is identified as an industrial sector that poses great opportunities to mitigate GHG emissions. In a brief manner, the chapter highlights the reality that the building industry is a complex sector, with many different actors, products, and methods, and therefore remains to be one of the more complicated policy target groups, in the sense of environmental preservation.

With that said, global approaches towards universal efforts of addressing the building industry, as means of mitigating GHG's, tend to vary far and in-between. Mentioned for inspiration is the actuality that there is a list of nations implementing mandatory sanctions, targeting the amount of energy a building can consume in effort to mitigate GHG emissions.

It is first here that it becomes of interest to mention the United States, and thereof its absenteeism from this list. Whether it is a justification of sovereign rights or trend of national habits, it is received troublesome that the United States would lean towards voluntary measures in such a complex industry.

Scrutiny towards the United States is quickly overshadowed through recognition of state efforts, such as the B3 project in Minnesota. The B3 project is most notably product of the Minnesota Sustainable Building Guidelines, which are now legally required for steering green building projects funded with state money.

It is important to state that it not due to a lack of green efforts in the state of Minnesota, but more so the voluntarily lacking National influence that has created the notion to question the effectiveness of Minnesota's guidelines.

The basis on which has been presented thus far has formed the problem formulation in which the present report seeks to answer:

*How are Environmental Issues understood in the Building Industry, and how can current regulatory action, both Federal and State, be amended to ensure adequate implementation of sustainable efforts in the Minnesota Building Industry?*

The first part of the research question, *How are Environmental issues understood in the Building Industry*, is addressed throughout this project however particularity in chapters three and four which are explained below.

- In **Chapter 3**, the relationship between the concepts of **Sustainable Development and the Building Industry** is highlighted.

In the early stages of this chapter weaknesses of National sustainable development strategies are identified. Through comprehension of these obstacles, it is quickly determined that *regulation*, *institutionalization* and *decentralization* could arguably be key positions of focus in addressing sustainable development approaches.

Direction in this chapter then turns towards the manner in which the building industry addresses sustainable development on the three dimensions of sustainability. This in turn magnifies the complexity of the industry, however due to delimitation, the project opts to place emphasis towards the environmental dimension and the actual influence the industry has on the environment. As a result of identifying environmental impacts of the industry, it is deemed necessary to recognize the approaches of some prominent actors in the building industry. Comprehension of sustainable building approaches is soon achieved, as highlighting the barriers and incentives to green building justifiably forms the behavior in which they have been developed.

As a result of identifying the barriers and incentives of sustainable building, regulation is given particular attention as it is viewed responsible for steering many of the challenges of sustainable development. In chapter 4, the theoretical framework of this reports is presented in effort to understand how environmental issues are understood in the building industry and what stands in the way of sustainable efforts of the building industry.

The theoretical framework is based upon the following sub-question:

- *What function does Regulation play in efforts of Sustainable Building?*

**Chapter 4** places scrutiny on **Regulation as a barrier to Sustainability**. In the first leg of this chapter, environmental governance is introduced through the paradigm of regulation. Even though traditional command and control methods are received as the cornerstone of regulation, the incapacity of governments to effectively enforce and monitor the effectiveness, new policy instruments for environmental governance have emerged. Through this paradigm it is apparent that traditional command and control regulation is outgrown due to a shift in global concerns such as energy,

climate change, etc. It is here that a variety of policy instruments are presented, such as voluntary action, governmental expenditures and market-based instruments, illustrating possible strengths and shortcomings.

The chapter then highlights the importance of *Institutions*, as it is a mean for understanding how sustainable development is safeguarded in the building industry. In addition, through comprehension of the three pillars of institutions, value is added to the understanding of why institutions are formed and how and why they can control and constrain behavior. In the latter, *decentralization* is introduced, as it aids in the understanding of the shift from command and control regulation to more of a 'so-called' soft means of environmental governance. It also provides a method for understanding the relationship shaped between the federal and state governments and in particular their un-uniformed approaches towards sustainable building.

After chapter 4, follows the second part of the present report, which directs efforts towards sustainable building in the State of Minnesota, and consists of a policy and practical analysis. The first part of the analysis uses the following sub-questions for guidance:

- *How is sustainable building institutionalized in the State of Minnesota?*
- *What are the weaknesses in the current regulatory practices of sustainable building in the State of Minnesota?*

**Chapter 5**, **Sustainable Building on a program Level**, takes its point of departure in gaining a better understanding of how the federal government influences sustainable building onto its member states. It is here that the true colors of federal influence towards green building in the United States remain to be painted as a role-model figure, solely focusing it green efforts on federal buildings, and leaving the choice to go green up to state governments. Even with the lack of mandatory green regulation, is the growing trend of guidance by the US Green Building Council (USGBC) and the certification of LEED (Leadership, in Energy and Environmental Design). Although the USGBC and entities such as LEED are viewed as the most prominent means of institutionalization of sustainable building in the United States, there remains to be no comprehensible government-wide standard for green building in the US.

In reality of this, and in exemplar measure the policy analysis then turns to focus on the State of Minnesota. It is soon realized that the states policy towards sustainable building is safeguarded through the Center for Sustainable Building Research (CSBR) and the creation of the Minnesota Sustainable Building Guidelines (MSBG). The MSBG are the foreseeable means of Minnesota's policy instrument for ensuring proper implementation of sustainable building.

However, the current regulatory practices seem quiet lacking, as the guidelines are composed to be first party regulated and therefore legitimacy of the actual effectiveness is questionable. Although the guidelines are strategically composed to target local issues, it plants the notion to question why the state would create it's own guidelines, which are not nationally recognized, as LEED certification is. The basis of this provides logic for the practical analysis.

In **Chapter 6**, Minnesota's **Sustainable efforts in Practice** are analyzed. The chapter analysis seeks to uncover the extent to which the intentions of green building programs are integrated on a practical level. In addition the analysis searches for legitimacy in the states decision to initiate local guidelines as opposed to the nationally recognized LEED certification. The analysis of sustainable efforts in practice utilizes information gathered from interviews with informative personnel, who are active in both the MSBG and LEED. In addition the analysis is supported through an electronic questionnaire, which was distributed to approximately 225 acting organizations in respect of the two affiliations.

The findings in the analysis uncover barriers to green building in the State of Minnesota and in response provide credible possibilities for amending green efforts in the state of Minnesota. In addition strengths and shortcomings of the MSBG and LEED are exposed.

## 2.3 The Methodological Approach

There are several methods for conducting social science research, such as experiments, surveys, histories, analysis of archival information and case studies (Yin 2002). Each of the methods have embedded advantages and disadvantages which tend to be differentiated through (Yin 2002, 1):

- The type of research question
- The Control an investigator has over actual behavioral events
- The focus on contemporary as opposed to historical phenomena

In recollection of research question, the present report seeks a strategy to answer "how" and "why" questions, and therefore chooses to preference utilization of methods associated with conduction a case study, which is in this case is the state of Minnesota. Explanation for choosing this strategy of social science research is further explained by Yin (2002, 1) stating that, *"[…] when the investigator has little control over the events, and when the focus is on a contemporary phenomenon within some real-life context"*.

In the present report, sustainability is not illustrated as a new fathom, however the continual integration into sectors such as the building industry is seen as a complex task in modern day existence.

The case study is chosen in effort to understand maturation[7] of the Minnesota Building Industry or in other words, the manner in which green building is being received in Minnesota.

### 2.3.1 Designing the Case Study

In effort to answer the research question, it is necessary to create a research design, which *"is the logic that links the data to be collected to the initial question(s) of study"* (Yin 2002, 19). The research design of the present report is used for a blueprint for conducting the research while aiding in the understanding of, 1) what questions to focus on, 2) what data is relevant, 3) what information should be collected and 4) how to analyze the results (Yin 2002).

The blueprint or research design consist of five components of logic (Yin 2002, 21-28):

1. The Study Question
2. It's Propositions
3. It's Unit of Analysis
4. The logic linking the data to the propositions
5. The Criteria for Interpreting the findings

Previously explained in the introductory chapter are the basic concepts leading to the first component of the research design. The **study question** reads:

*How are Environmental Issues understood in the Building Industry, and how can current regulatory action, both Federal and State, be amended to ensure adequate implementation of sustainable efforts in the Minnesota Building Industry?*

The second component of a research design is its **propositions**, shedding light onto areas that should be observed within the scope of study. For example, propositions are first apparent in the introductory chapter, which questions the effectiveness of sustainable efforts in the building industry where mandatory sanctions are non-existent. This is then addressed in chapter 3, *sustainability and the building industry*, where challenges towards effective national sustainable policies are uncovered. In result this justifies variance, in national approaches towards green building efforts.

As the focus of this report is sustainability of the building industry, the third component of the research design is **the unit of analysis**, which is the Minnesota Sustainable Building Guidelines (MSBG). The rule of thumb for defining the unit of analysis is to *"[…] relate to the way you have defined your initial research question"* (Yin 2002, 23). In this case, the MSBG are used to gain

[7] Case study methods allow investigators to retain the holistic and meaningful characteristics of real-life events – such as individual life cycles, organizational and managerial processes, neighborhood change, international relations, and the maturation of industries (Yin 2002, 2).

further understanding of how sustainability is received in the Minnesota Building Industry, such as the strengths/weakness, to in turn gain knowledge as to what can strengthen current efforts of green building.

The forth component of the present reports research design is **the logic linking the data to its propositions**. Throughout the report various articles and publications are used to support the logic linking the data to the proposition(s). There is a significant trend in the identification of regulation as a problematic policy instrument, which support further investigation into strengths and weaknesses of current regulatory practices of green building in the state of Minnesota

The fifth and final component of this research design is **the criteria for interpreting the findings**. In effort to remain unbiased, the approach of interpreting the findings is gathered around accumulation of informative data, through various data collection methods, all of which are described in section 2.3.2.

The following section will present the data collection methods. In effort to strengthen credibility in answering the problem formulation, the present report practices data triangulation by gathering data through literature reviews, interviews, and an electronic questionnaire.

## 2.4 Data Collection Methods

The data used throughout this report has been collected through various methods such as literature in the form of articles and documentation, interviews, and an electronic questionnaire. It is of importance to note that sustainable building policy is a relatively new fathom therefore significant use of articles on the subject is used. The articles were carefully comprehended, as traditionally they should not be used as actual recording of events, therefore repetition in discourse was sought after. In addition it's important to realize that, *"[…no single source has a complete advantage over the other"* (Yin 2002, 85). According to Yin, sources are referring to the methods of data collection, and therefore it is emphasized that a quality case study will incorporate as many sources as possible, and in the instance of this report, significant efforts were put forth in collecting data through interviews and an electronic questionnaire.

### 2.4.1 Interviews

As with any Data collecting method, strengths and weaknesses exist which are strategically considered when determining which method to use. The strength of using interviews is in the ability to focus directly on the case study topic. However, even though interviews are capable of providing insightful perspectives, without properly constructed questions, they can consequently be bias (Yin 2002). As a result, the Interviews were composed with these considerations in mind. The inter-

views are used throughout the report to aid in answering the problem formulation. A description of the key personnel Interviewed for the construction of this report is provided below.

**Richard Strong** – Research Fellow, responsible for monitoring the Minnesota Sustainable Building Guidelines

**Rick Carter** – Vice President of LHB (a local architectural firm) helped develop the Minnesota Sustainable Building Guidelines

**Jonee Kulman Brigham** – Co-principal investigator for the B3 State of Minnesota Sustainable Building Guidelines

Richard Strong holds a Masters degree in Urban Planning and a Masters degree in design. He has over 30 years of experience in both private and public sector. He currently teaches sustainable design at Carleton College in Minnesota. Richard Strong is closely affiliated with the Minnesota Sustainable Building Guidelines (MSBG) as he serves as a main data collector of the current projects steered by the MSBG. In addition he assists architectural firms by providing the tools they need to comply with the MSBG. The Interview with Richard Strong was conducted in person June 19th, 2007 at the Center for Sustainable Building Research in Minneapolis, Minnesota.

Rick Carter is the Vice President of LHB, which was initially an engineering firm, but now includes architects, civil mechanical, and electrical engineers, landscape architects, interior designers and surveyors. His responsibilities include project, management, design of major projects, business development, and high performance consulting. LHB is a member of the US Green Building Council (USGBG) and also helped with the benchmarking used to steer the Minnesota Sustainable Building Guidelines. The Interview with Rick Carter was conducted by telephone on October 9th, 2007.

Jonee Kulman Brigham is a co-principal investigator for the Minnesota Sustainable Building Guidelines. She works on residential green remodeling guidelines and material lifecycle analysis. She also serves as a board member of the Mississippi Headwaters Chapter of the USGBC. In addition she has over ten years of experience as an energy and environmental analyst. The Interview with Jonee K. Brigham was conducted by telephone on October 16th, 2007.

### 2.4.2 The Electronic Questionnaire

The primary data collection method practiced in Chapter 6, Sustainable Building in Practice, is through a web-based questionnaire (please see Appendix D). The electronic questionnaire was carefully formulated to target green building actors in the state of Minnesota. Contact information was gathered from United States Green Building Council (USGBG) members that are associates of

the Mississippi Headwaters Chapter, meaning Minnesota organizations. In addition contact information was gathered from organizations participating in projects steered by the MSBG. It is important to recognize that these participants may have more experience and knowledge of green building than the average person. Again, as was the purpose of the interview, the electronic questionnaire has been used to aid in answering the problem formulation.

On October 10th, 2007, sampling of 225 questionnaires in electronic form was distributed. On October 12th a reminder e-mail was distributed requesting the contacts that have not yet completed the survey, to please do so. The questionnaire was then closed on October 16th and the results were compiled.

Out of 225 distributed questionnaires, the project received 69 replies, creating a 31% response rate, which is received respectable when considering the duration the questionnaire was open. The overall interpretations of these results are gathered in Chapter 6, and are concluded on in Chapter 7.

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# 3 Sustainable Development and the Building Industry

*This chapter introduces the concepts of sustainable development and the building industry. Initially a brief explanation of sustainable development in illustrated, and then followed by a presentation of general challenges. Secondly, addressing the economical, social and environmental pillars of sustainability provides clarification of sustainable development in realm of the building industry. In addition, this chapter takes a closer look at the environmental impacts the building industry wreaks upon the natural environment. These impacts have influenced a variety of current green building approaches throughout the world, which are then made exemplar in the latter of the chapter. The chapter places emphasis toward the identification of barriers, as it is arguably barriers that influence different approaches. By means of identifying barriers one can begin to understand what exactly challenges sustainable building efforts.*

## 3.1 Defining Sustainable Development

*"If Man does away with his traditional way of living and throws away his customs, he had better first make certain that he has something of value to replace them."*

*-Robert Ruark (1954)*

In 1992 the United Nations (UN[8]) challenged the global community to practice strategic action by creating sustainable development strategies (Pinter and Swanson 2004). The 1992 UN Conference on Environment and Development (UNCED) focused on creating agreeable future sustainable action (Agenda 21[9]), through harmonization of social, economic and environmental policies of national governments around the globe. Action being the creation of a strategy in which the above quotation would be addressed, meaning a national strategy which would address the transition from man's traditional way of living, towards a system that has the potential to continuously improve on the social, economical, and environmental pillars. This concept has been received globally as Sustainable Development.

8UN- The United Nations was established on October 24, 1945. 51 countries committed to preserving peace through international cooperation and collective security. Today, nearly every nation in the world belongs to the UN: membership totals 192 countries (UN 2007).
9 Agenda 21- is a comprehensive plan of action to be taken globally, nationally and locally by organizations of the United Nations System, Governments, and Major Groups in every area in which human impacts on the environment (UN 2004).

The concept of sustainable development is most notably product of the 1987 Brundtland commissions'[10] report of, Our Common Future. During this commission, sustainable development was foundationally defined as, *"development that meets the needs of the present without compromising the ability of future generations to meet their own needs"* (World Bank 2001, 1).

### 3.1.1 Challenges to Sustainable Development

As the concept of sustainable development is anything but new, universal effort towards national strategies tend to vary far and in-between. The reality that sustainable development competes with sovereign rights, values and norms of a global variety is apparent, and therefore global progress has been slow.

Theoretical challenges that have slowed the progress of sustainable development are possibly best magnified in the relationship between development and the environment. Some have questioned the likelihood that development can exist while preserving the environment, with the belief that development inevitably comes at the cost of *"extracting mining resources, supplying water to agricultural fields or generating power […] causing some degradation to the environment"* (Gupta and Asher 2000, 4).

However perhaps a more *pro-development* perspective, inspired by American economist Simon Kuznets, is the notion that *"pollution from industry, motor vehicles, and households increases until development generates enough wealth to promote significant pollution control"* (World Bank 2000, 8). Figure 3.1 is an illustration of the Environmental Kuznets curve.

[10] Brundtland Commission- Also known as the 1987 Brundtland Report, which stressed the need for economic growth, while emphasizing the importance of integrating environmental protection in all aspects of economic and social development (Engfeldt 2002).

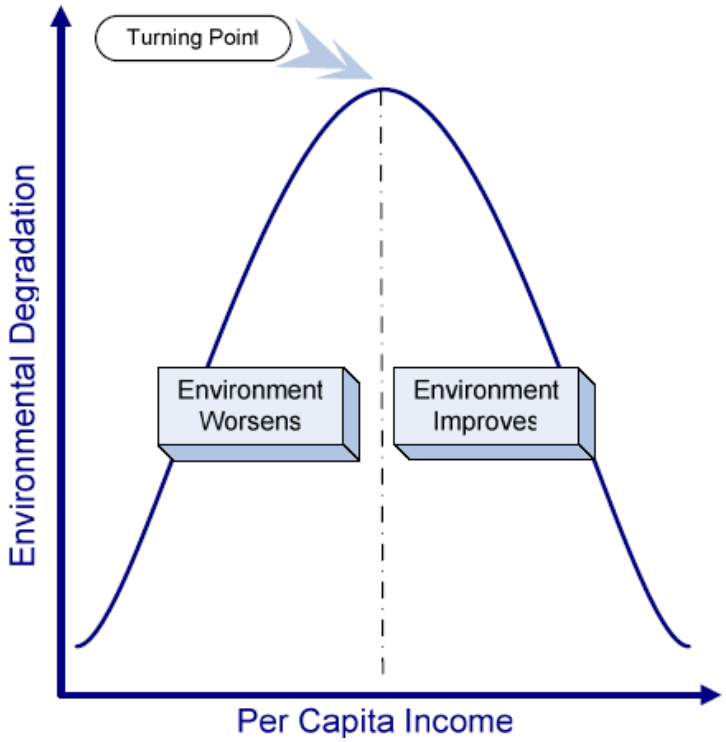


Figure 3.1 The Environmental Kuznets Curve (Christensen et al. 2006).

If the environmental Kuznets curve holds true, it would unmistakably prove sustainable development to be a true challenge in developing countries, which are desperately seeking economic growth. On the other hand, the curve provides a worthy sight of questioning the status of sustainability in the developed world, and if in fact, once economic and social prosperity is achieved, are environmental considerations prioritized? An assumption supporting the actions of developed countries would be ludicrous, as it's unquestionable that development has continued to exist with the consequences of environmental degradation (Christensen et al. 2006). On the other hand, developed societies could possibly question the height of their very own economic prosperity, as if it has yet to reach the 'top of the curve' and therefore resources lack, resulting in the absence of environmental action.

In a more practical sense in 2002 the UN, in joint effort with the Organization for Economic Co-operation and Development (OECD), funded a project to compose the Sustainable Development Strategies Resource Book. The International Institute for Environment and Development (IIED) conducted the work, reviewing existing strategies and proposed new, in effort to guide preparation of national sustainable development (Pinter and Swanson 2004).

The scope of study consisted of 19 countries[11], developed and developing, compiling key challenges along with strengths of current sustainable development policy. It was determined that many nations are aware of local issues, however having a national strategy for sustainable development, does not necessarily guarantee sufficient implementation of policy initiatives (Pinter and Swanson 2004). Although there were many new approaches to Sustainable development, it was concluded that of the 19 countries under scrutiny, *"no country acted truly strategically in their national sustainable development efforts"* (Pinter and Swanson 2004, 37).

The key weaknesses of sustainable efforts as described by Pinter and Swanson (2004, 37-38):

- **Lack of a Feedback Mechanism** (monitoring, learning, and adaptation)

Most Nations had methods to monitor aspects of economy, society, and the environment, however only a few countries developed indicators to aid in the analysis between the three.

- **Lack of Co-ordination of strategy objectives and initiatives with the national budgeting process**

Although visions and specific objectives were established, they continued to lack influence on national budget expenditures, implying that sustainable development is not fully integrated.

- **Lack of Co-ordination with sub-national and local sustainable development action**

The analysis showed that only a low number of countries were attempting to unite national sustainable development efforts with sub-national efforts. The emphasis being that in order to create strategic and effective sustainable action, the interdependency of governments must be catalyzed.

The implications of the key weaknesses of the analysis were not necessarily subjecting all 19 of the countries to all of the key weaknesses, however they were implying that all of the countries lacked strategic implementation in one or more of these areas.

Conversely, the three magnified weaknesses could be viewed foundationally necessary to the implementation of national sustainable development. Assumptions about the feedback mechanism imply the notion of **regulation** with keywords such as monitoring, learning, and adaptation. The Co-ordination of strategy objectives and initiatives with the national budgeting process exercises the importance of **institutionalization** to ensure full integration into national policy. In addition, the Co-ordination with sub-national and local sustainable development action stresses the impor-

[11] Countries of Study- Brazil, Cameroon, Canada, China, Costa Rica, Denmark, Germany, India, Madagascar, Mexico, Morocco, the Philippines, Poland, South Africa, South Korea, Sweden, Switzerland, the United Kingdom, as well as the European Union (Pinter and Swanson 2004).

tance of **decentralization**, meanwhile providing sufficient integration between interdependency of national and sub-national governance.

Although the findings of the IIED remain broad in terms of attaining 'sustainability', they provide a foundational mean to measure against the barriers and drivers to sustainable development in the building industry, which will be presented in chapter 4.

## 3.2 Sustainability and the Building Industry

Received in the business community as "the triple bottom line", sustainability has been defined as having three dimensions or pillars: an economic, a social and an environmental. The notion being that in today's building industry, companies must *"expand their responsibility to include environmental and social dimensions of sustainability"* (Remmen and Thrane 2005, 200). In the context of the building industry, the manner in which it contributes to the triple bottom line is described through each dimension. With the notion that sustainable building can be very different from country to country as resources and therefore priorities vary, focus is placed on the United States, in particular the State of Minnesota. With that there is a foreseeable assumption that the social, economical and environmental dimensions have been adequately identified in a developed country as such. However, this assumption remains skeptical, as it is the basis of the focused case study in chapters 5 and 6.

It's apparent that sustainability is *"a relationship, or balancing act, between many factors (social, environmental and economic realities and constraints) which are constantly changing"* (Vanegas et al 1995, 2). The understanding that *"sustainable Building"* is a dynamic concept rather than static requires flexibility to the combination of the three pillars or dimensions. However with that said, focus of the present report is placed upon the environmental dimension, while the social and economic dimensions are only briefly discussed.

### 3.2.1 The Social Dimension of the Building Industry

As first described in section 1.1, the building industry can be considered one of the world's largest industrial employers with roughly 111million employees. Through such a large range of affect, the building industry has evolved into a sector that emphasizes health and safety of its employees, through standards such as OSHA[12], and none-the-less, provides an industry that exist ultimately to provide welfare to humans. The social dimension of sustainable development considers societies

12 OSHA –Acronym for Occupational Health and Safety Administration. The Occupational Safety and Health Administration aims to ensure worker safety and health in the United States by working with employers and employees to create better working environments (OSHA 2004).

needs, preferences, culture, population, politics, equity, and quality of life (Vanegas et al 1995). The existence of considerations as such results from the complexity and diversity of the social dimension, which considers entities such as, but not limited to:

- The employees of the Building Industry
- The influences of products and systems delivered to the consumer or residents
- The Reality of diverse social (lower, middle, & upper) classes and the variations of age groups

More so in the developed world the social dimension of the building industry has been safeguarded through compliance of building codes and standards, providing society with a minimum foundation for safe dwellings and work place destinations. However, when considering today's developed society the concept of sustainable development in the building industry will confront societies needs and wants (preferences), as this industrial sector will challenge owners, architects, contractors, etc. to build more efficient structures, possibly requiring alternative materials and solutions. This will inevitably require a substantial effort and integration of society when considering the benefits of sustainable building practices versus traditional building practices.

### 3.2.2 The Economical Dimension of The Building Industry

Financially the building industry is an enormously important sector; as many countries around the world contribute to the 3000 billion USD Industry per year (CICA 2002). Through such a large industry, one can assume a significant amount of financial impact is placed upon a large number of suppliers and companies around the world as a result of hefty building activity.

The economical dimension places emphasis on goods and services, efficiency, resource allocation and consumption of resources. Economics in the building industry play an important role in explaining the production, distribution and consumption of goods and services. As in many industries, the building industry and the exchange of goods and services influences heavily on the environment, which serves as the primary source of raw material extraction and ultimately the depository of building wastes. Traditionally, the building industry has been driven by economical prosperity, therefore a shift towards sustainability in this sense, requires evidence that this shift in paradigms will not result in excessive costs for all parties involved.

### 3.2.3 The Environmental Dimension of The Building Industry

In the introductory chapter, the environmental dimension was emphasized through the influence the building industry places on the environment through GHG emissions. Not only does the building industry affect the environment through emissions, but also places heavy influence on quantities of

natural resources and degradation of land. In effort to minimize human influence on the global ecosystem, the approach of the building industry is to emphasize the importance of the efficiency of buildings to ultimately reduce the quantity of extracted raw material and increase the energy performance of buildings.

## 3.3 Energy, Materials and Waste of the Building Industry

According to the UNEP (2007, ES[13]), *"Worldwide 30-40% of all primary energy is used in buildings."* This indeed is a result of the large consumption of materials (not to mention the use of hazardous materials) that require an enormous amount of embedded energy, and also a result of the large amount of energy used for heating and cooling, and plug loads in buildings. The production of materials with a large amount of embedded energy has a significant trade-off, in the reality of large amounts of pollution. A large consumption of materials as such indefinitely results in producing a significant amount of waste, which deems the following sections necessary in gaining a further understanding of the influence the Building Industry places on the natural environment.

### 3.3.1 Energy Consumption in the Building Industry

Originally introduced in chapter one, section 1.1, is the conceptual life-cycle approach that is described through the perspective of Jones (1998). Jones emphasizes the realization that the building industry not only influences the environment through GHG emissions, by means of high consumptions of energy in the use phase, but also in four separate phases of a buildings life cycle (See figure 3.2). The 1$^{st}$ phase of energy consumption of a building relates to the manufacturing of the buildings materials and components. The 2$^{nd}$ and 3$^{rd}$ phase(s) correspond to the energy used to deliver the materials from the production site to the building site. In addition it considers the energy used during the actual construction of the building. The 4$^{th}$ phase considers the operations of the building, also known as the use phase. This is illustrated in figure 3.1, which is distinguished by the red dashed lines in the figure. Finally, the 5$^{th}$ phase of the energy consumption of a building considers the energy used for the demolition of a building and the recycling of particular materials.

[13] ES- Abbreviation for Executive Summary.

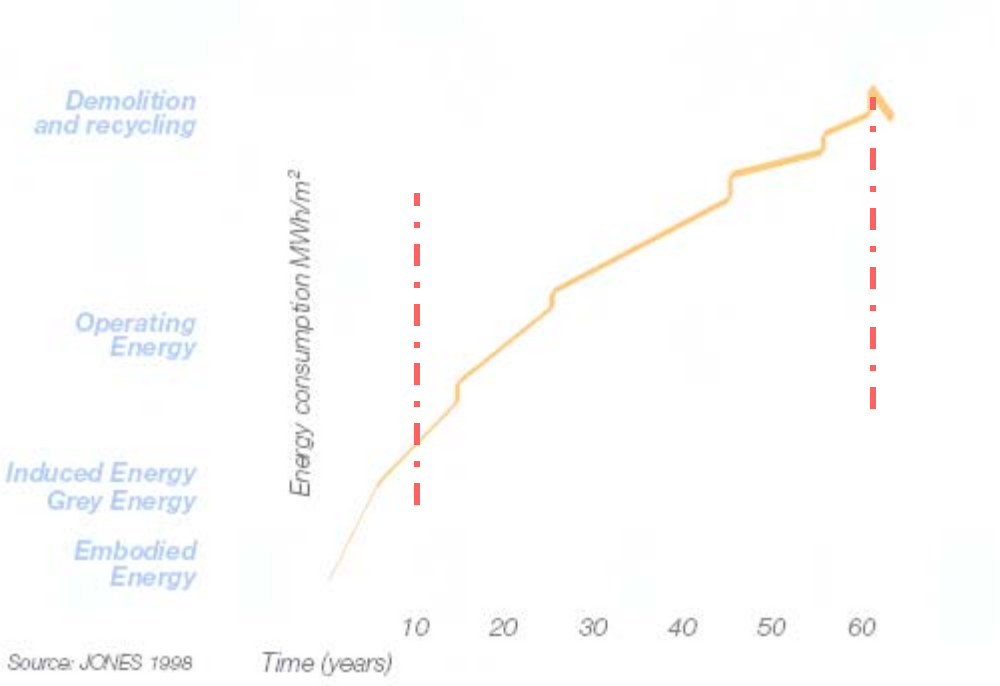


Figure 3.2 Illustrates the energy consumption throughout the life cycle of a building (Jones 1998).

As Stated in Remmen and Thrane (2005), *"Life cycle thinking and environmental initiatives involve developing products, which have improved environmental characteristics throughout the products life cycle, from cradle to grave"*. In this case the *product* being buildings, it's necessary to not only consider the use phase of a building, as illustrated in figure 3.2, and expand considerations to all phases of a buildings life cycle. In addition, it's of importance to explicitly state that the relationship between the environment and the building industry is not solely based on the consumption of energy in the use phase, but also influential realities such as the consumption of materials and also the waste accumulation adherent to the building sector.

With that said, the building industry remains to be a significant industrial sector that indefinitely consumes a vast amount of raw materials and with that delivers an influential amount of waste, although when compared to the operation/use phase appears rather small. Displayed in figure 3.3 the percentage approximations of environmental influence throughout the phases of a building lifecycle are portrayed.

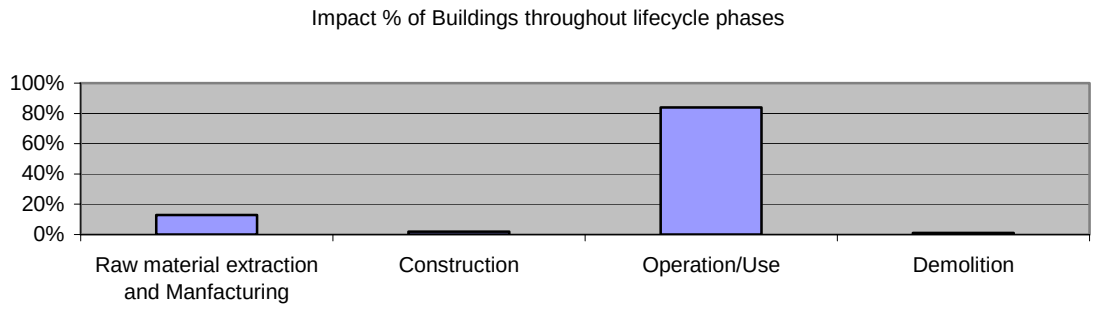


Figure 3.3 Percentage breakdown of the environmental influence throughout the lifecycle phases of a building. Inspired by (Fernandez n.d., 5).

Magnified in figure 3.3 the greatest impact on the environment occurs in the use phase of buildings which accounts for roughly 84%, followed by the extraction of raw materials and manufacturing (13%), the actual construction of a building (2%) and the demolition and waste of a building accounting for approximately 1%. It is important to realize that transportation is a big part of the building industry, for example delivering products, equipment, and even transporting waste. Therefore the assumption exists that transportation is distributed throughout the various phases.

### 3.3.2 Material Use in the Building Industry

Globally, every year approximately three billion tons of raw materials are used for the manufacturing of building products (UNEP 2007). The actual environmental impact of this consumption (has been and) continues to be debatable considering, among other things, technology used for extraction, transportation, and global resources. However it is factual that these materials are extracted, processed, and transported to the construction site and inevitably disposed as waste in the end of a buildings lifecycle.

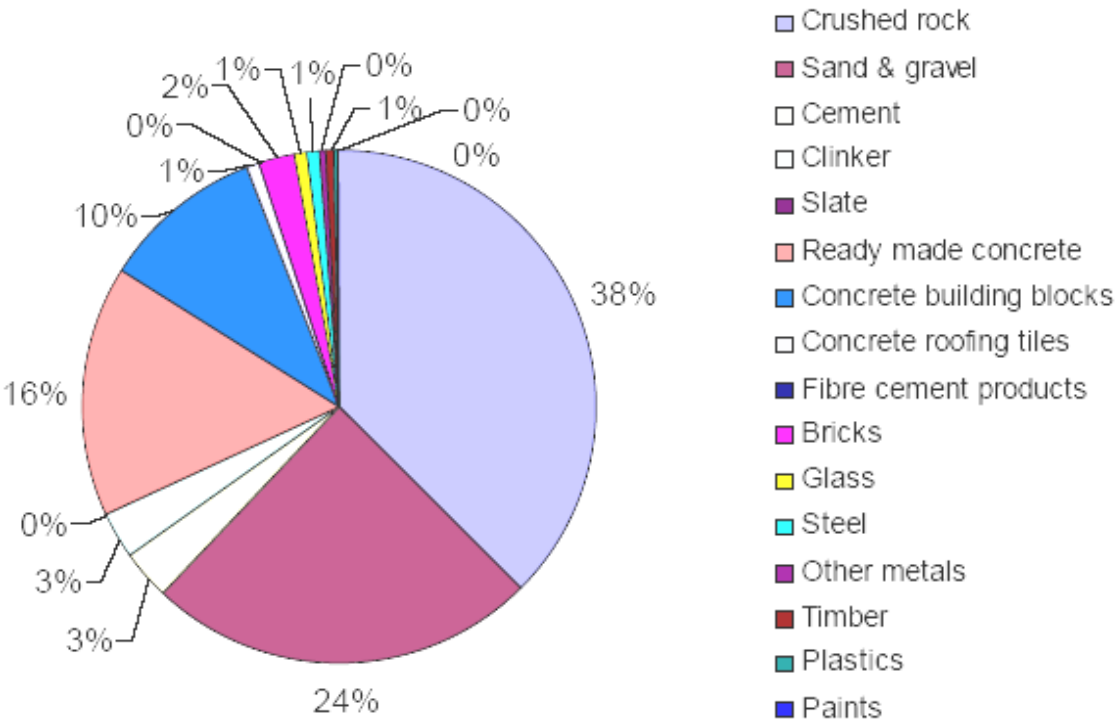


Figure 3.4 Percentage of Materials consumed in the building industry each year (Lazarus 2005).

Figure 3.4 portrays a general percentage breakdown of approximations of material use in the building industry each year (Lazarus 2005). As illustrated the highest consumption of building materials are crushed rock and sand & gravel, which are the main contents used for structural support when manufacturing materials such as concrete. Cornerstone materials of the industry such as concrete, steel and glass require manufacturing processes that are extremely energy-intensive and typically results in a significant amount of $CO_2$ Emissions (UNEP 2007).

In exemplar measures, for instance cement is the most energy intensive and polluting material utilized in the building industry (Horvath 2004). The manufacturing of cement, used for buildings and roads, accounts for approximately 5% of the global energy consumption. In accumulation this accounts for approximately 5% of the global $CO_2$ emissions and in addition other pollutants such as $SO_2$ and $NO_x$. The global average of primary energy intensity to manufacture cement is approximately 4.8 GJ/Mg, resulting in roughly 0.222Mg of C released into the atmosphere (Horvath 2004, 189).

### 3.3.3 Waste Accumulation in the Building Industry

As the Building industry is one of the largest consuming industrial sectors it contingently produces vast amounts of waste, which is also known as Construction and Demolition Debris (C&D). C&D debris is *"waste material that is produced in the process of construction, renovation, or demolition of structures"* (FA 1998). The most popular contents of C&D debris consist of concrete, asphalt, wood, metals, gypsum and roofing materials. For example, in the United States, an estimated 136 million tons of C&D debris was generated in 1996. Compilations of this approximated roughly 2.8 lbs/1.3kgs per capita each day. In the United States this is a significant issue as a large amount of C&D debris have traditionally ended up in solid waste landfills, creating a greater threat of leeching and groundwater contamination in local aquifers. According to the US EPA the number of landfills have decreased from 8,000 in 1988' to 1,654 in 2005, however the size of the landfills have "conveniently" grown, which has created a distorted picture of progress (US EPA 2007).

It is important to mention the safety issues involved with the demolition process due to the high number of hazardous materials used in the building industry. The MN EPA (1999, 1-2) has identified various materials to be safely removed before demolition of a building due to their specific properties that are hazardous to mankind and the environment. Examples of identified hazardous materials are listed below.

- **Asbestos** – found in pipe, duct and boiler insulation; ceiling tiles, textured spray, fireproofing; cement asbestos board; ceilings and walls in commercial buildings; old linoleum floors, etc.
- **Polychlorinated Biphenyls (PCB)** – found in light ballasts, small capacitors in old appliances and transformer oils, etc.
- **Mercury** – found in fluorescent lamps, mercury switches, thermostat probes, relays, thermometers, various appliances, etc.

This is a small example of the hazardous material found in the building industry, and definitely not limited to, especially when considering the variety of toxic substances used in paints, thinners, and other products, which are typically used for interior finishing practices. The use of hazardous materials plays an important role when considering the working and living environment as they influence heavily on the quality of the indoor climate.

### 3.3.4 Summary of Environmental Impact of the Building Industry

By identifying some of the means the building industry influences the natural environmental, it has in turn provided sustainable advocates, so called hotspots to focus efforts towards. For example the Building Industry uses/creates (Kibert 2002, 379-371):

- A high amount of energy use – 30% of all primary energy used in the US is product of the building industry. This includes all phases of a buildings lifecycle, but especially in the use phase of a building). Historically energy production as such has come from burning coal, oil and natural gas.
- An extreme amount of materials – Approximately 40% of all materials extracted each year in the US are utilized in the Building Industry.
- A large amount of waste – Annually, from 1996 to 2002, the US has produced an average of 145 MMT of construction and demolition waste. 92% of this is a result of demolition and 8% of this is a result from construction activities.

Although the examples above focus on the US, it is the identification of such that has sprung the concept of sustainable building. Many organizations around the globe have formed to address concepts of sustainability in the building industry, which upfront appear to focus on the reduction of resource consumption in the form of energy and materials.

## 3.4 Approaches of various Actors

As the environmental affects of the building industry have been identified by various valued organization, such as the UNEP, and in return shaped various forms of addressing the issues at hand. In effort to gain a greater understanding of what stands in the way of successful implementation of green building, it is of interest to provide examples of organizations and approaches towards these efforts.

### 3.4.1 The SBCI

In 2006, through collaboration of the building and construction sector, the UNEP created the Sustainable Buildings and Construction Initiative (SBCI). On a global perspective the SBCI can arguably be responsible for safeguarding the institutionalization of sustainable building (SBCI 2006).

The SBCI was a result of the identification, by the UNEP, of the building industry, as it *"[…] is one of the key sectors for sustainable development, both in terms of the important benefits it contributes to society and the considerable negative impacts it may cause if appropriate considerations are not given to the entire life span of buildings"* (SBCI 2006, 1).

The SBCI seeks to uncover the positives and negatives, which complement or stand in the way of sustainable building. This is done so, through collaboration with various *"[…] worldwide leading companies to promote and support sustainable solutions in the building and construction sector"* (SBCI 2006, 1). Companies as such consist of various global actors, including public organizations, representatives from the materials industry, developers and real estate personnel, architects and urban planners and other green building organizations. Below in figure 3.5 is an illustration of the SBCI organizational structure.

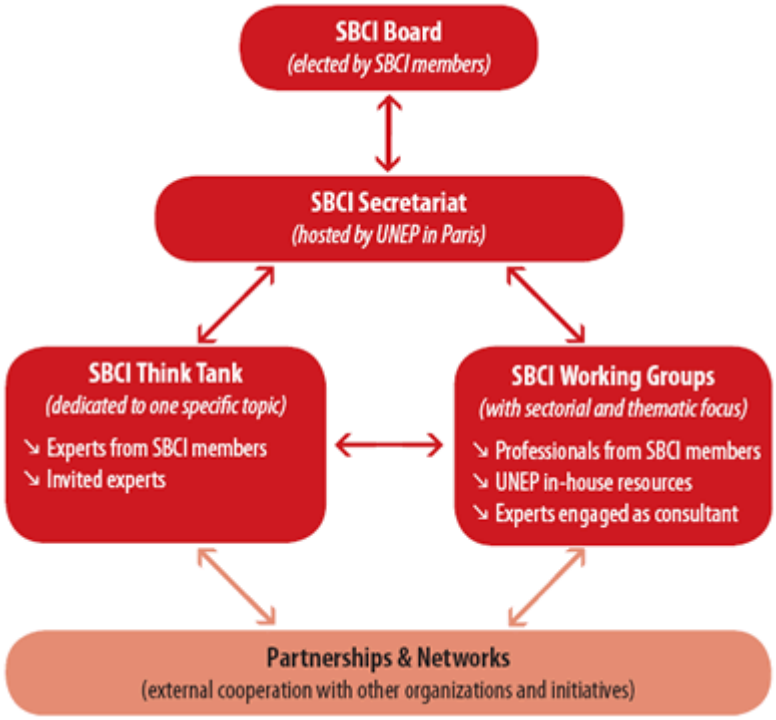


Figure 3.5 Organizational Chart of the SBCI (SBCI 2006).

In figure 3.5, the collaboration of global stances is present through the figures elements such as the *SBCI Think Tank* and *SBCI Working Groups*, which consist of SBCI members, all of which consist of actors around the world and can be viewed at (SBCI 2006). The illustration of the SBCI is to show that there is a global effort of compiling experiences within the sustainable building industry, as it exists to provide a common platform to identify opportunities and to develop mechanisms towards sustainable building.

However, as building practices and governments vary around the globe, it is difficult to declare one global model for sustainable building. With the reality that there is a variety of governmental policies, economic incentives and voluntary methods to promote sustainable development, the

SBCI serves the purpose of gathering these experiences to, in joint effort, promote sustainable building, through informative guidelines and reports (SBCI 2006).

One result of the gathered experiences can be seen in figure 3.6, which illustrates the most effective instruments to date (2007) for reducing GHG emissions and therefore aiding in sustainable building approaches.

| | Effectiveness for emission reductions | Cost effectiveness |
|---|---|---|
| Control and regulatory instruments | | |
| Appliance standards | High | High |
| Mandatory labeling & certification programs | High | High |
| Energy efficiency obligations & quotas | High | High |
| Utility demand-side management programs | High | High |
| Economic and market-based instruments | | |
| Energy performance contracting | High | Medium-high |
| Fiscal instruments and incentives | | |
| Tax exemptions and reductions | High | High |
| Support, information and voluntary action | | |
| Voluntary certification and labeling | Medium-high | High |
| Public leadership programs | Medium-high | High |

Figure 3.6 Effective Policy Instrument (WBCSD 2007, 17).

In effort to clarify how exactly these policy instruments have been implemented in approaches of sustainable building, examples will be provided in section 3.4.2.

## 3.4.2 Various Policy Instruments in Action

As a command and control mechanism, ***Appliance Standards*** can be considered one of the oldest and most commonly used instruments to enlarge energy efficiency. Today most developed countries have active appliance standards, however some seem more productive, such as the "Top Runner" program in Japan. In Japan the appliance standard makes use the acronym BAT, Best Available Technology, which requires that all new products must perform at the efficiency level of the best performing product at that time. In some cases this has resulted in efficiency improvements of over 50%. (Koeppel and Vorsatz 2007, 17).

Another emerging command and control policy instrument is that of ***Mandatory Certification and Labeling***. This forms, more or less provides information to the end user about the energy performance of products. Again, most developed countries have implemented labeling programs, due to the high prospect of transforming the market through educating the customer. Today, labeling and certification is expanding its focus from products to buildings. This is apparent in the European

Unions' (EU) Energy Performance of Buildings Directive (EPBD). This Directive mandates documentation for a buildings energy performance. (Koeppel and Vorzatz 2007, 23).

In terms of a voluntary approach, ***voluntary certification and labeling programs*** are becoming more accepted. As a basis for a voluntary action, programs must be cost-effective and tend to be subliminally influenced by fiscal incentives. In the United States one of the most recognizable voluntary labeling programs is the US Energy Star Program. The energy star program is a government program that provides education through labeling, and basically provides consumers with energy efficient solutions. The Energy Start program can save household up to 1/3 of their energy bill. (ES 2007: Koeppel and Vorzatz 2007, 40).

For further explanation of approaches please see Koeppel and Vorzatz (2007). Gathered from the Approaches listed in figure 3.6 is the reality that numerous instruments exist to support various approaches. Inevitably, these approaches tend to vary due to challenges that unfortunately are not universal, due to realities such as national sovereignty and national habits, etc. It is therefore the following section attempts to disclose some of the more apparent challenges towards sustainable building. There exist a bit of assumption in the perception that the barriers that are located in the path of sustainability subconsciously form green building approaches.

## 3.5 Barriers to Green Building

Green building approaches are in a variety of ways. An explanation for the diverse methods of addressing sustainable building can possibly be seen as a result of the challenges faced. It's likely these obstacles have shaped current approaches to what they are today. Below is a brief overview of challenges to green building.

### 3.5.1 Financial Barriers

One of the greatest barriers for energy efficiency of buildings is the assumption that green buildings cost more. Arguably, when purchasing more efficient systems, equipment, materials, etc. typically comes at a higher initial cost, generally around 2-7% (Howard 2002). This is essential true, however *"The bottom line is that the long-term savings that a green building can generate, based on energy and water efficiency, potential productivity gains, and other factors, are not factored into the budgeting equation for building and construction and renovation"* (Howard 2002, 31). This is not necessary a problem if the true potentials of green building are known, however the mechanisms necessary for gathering this evidence is lacking and therefore education is seen as a significant barrier to Green Building.

### 3.5.2 Lack of Green Education

In a 1999 study by Miriam Landman from Tufts University, found that the two greatest barriers to sustainable building were 1) a lack of interest from cliental, and 2) a lack of education and training (Landman 1999). The emphasized approach being that if education (green building) were spread to all corners of society, the lack of interest would be subliminally addressed, through a projected increase in demand for green building products and services. In addition by specifically targeting the education/training of building professionals, it would provide the market with foundational knowledge for transformation.

### 3.5.3 The Human Factor

In addition to various barriers, arguably the most obvious is the influence human behavior has towards resistance to change (UNEP 2007). The point being that energy efficiency of buildings cannot solely be solved through technological advances. It is necessary for building owners, users, and all other actors involved in the built process to be aware of the benefits of green buildings. This again, stresses the importance of education and training.

In a questioning effort of why education and training is lacking towards green building, it is sought necessary to reflect upon the importance of leadership. As stated by Howard (2002, 36), *"Policy direction is needed to further encourage or require organizations to implement green building."* In accordance to Howard's perspective, the needed direction is assumed to be from a national stand-point.

It is important to note that barriers to green building are not to be limited to the mentioned above. Although the explanation of barriers for green barriers is brief, they are received as shortcomings of falsified institutionalization, and thus far a failure of market transformation (UNEP 2007).

It is therefore intent of the present report is to understand what is lacking in the effort to transform the building industry to sustainability. The understanding that technology is, for the most part, not lacking in most developed countries, results then in the notion to question regulation and therefore lack of it. It is with that it is deemed necessary to look deeper into regulation as a policy instrument and entities such as institutionalization and decentralization to gain further understanding to what stands in the way of successful implementation of green efforts in the building industry.

## 3.5 Summary

The Illustration thus far has been the identification of the building industry as an industrial sector that poses significant means for sustainable development. Initially, a general understanding of sustainability was presented delivered in a global context by the United Nations. In exemplar

measure, the relationship between sustainability and the building industry was expressed through the three dimensions/pillars of sustainability, which set a foundation for seeking the environmental impacts of the building industry.

Although the understanding of the environmental effects the building industry imposes on the natural environment are apparent, and the impacts throughout the lifecycle of a building have been approximately been identified, there still exist a lack of knowledge as approaches are not globally equal. In a general sense of sustainable development obstacles towards sustainable efforts have been identified by the IIED and the OECD study (described in section 3.1.1) and therefore will provide an adequate foundation for analyzing sustainable efforts of the Building Industry. In the following chapter, scrutiny will be placed upon regulation, as it is deemed a reputable policy instrument for addressing the thus far, identified barriers to green building for success of sustainability in the building industry.

# 4 Regulation – A barrier to Sustainability

*The following chapter will place close scrutiny on regulation (as a policy instrument), institutions and decentralization as these three elements were identified in chapter three as significant challenges towards sustainable development. Therefore, this chapter will subliminally present challenges to Sustainable Development in realm of the building industry. This Chapter will provide the Theoretical Framework used to analyze the current sustainable building programs (Chapter five) and action (Chapter six) in the state of Minnesota. The framework will be used to aid in answering the problem formulation.*

## 4.1 Challenges towards sustainable development

Inspired from the efforts of the IIED and the OECD study (described in chapter 3), which sought to reveal barriers toward sustainable development in a general sense, it's considered fruitful to understand sustainable development in light of the building industry. The main elements of this understanding will focus on regulation as a policy instrument, institutionalization and decentralization in the building industry. These three elements have been identified as possible obstacles as they have historically challenged national sustainable strategies.

The understanding that *"we manage what we measure"* institutes a feedback mechanism or in other words a way of learning and adapting to the circumstances (Pinter and Swanson 2004, 37). In this sense regulation is used as a policy instrument for ensuring continuous learning and therefore continuous improvements towards sustainable development. The illustration in the previous chapter three, which simulated somewhat of a cradle to grave relationship the building industry has with the natural environment, may lead some to believe that the relationship has been deliberated and that the environmental effects are worthy of attention. For that reason it is viable to understand how and what stands in the way of adequate sustainable efforts. Supplementary to the understanding of environmental regulations, is the importance of institutions and also decentralization, as a sufficient combination of these may well ensure proper implementation of regulatory action in the building industry.

## 4.2 Environmental Regulation

In the 1970's, many environmental organizations and institutions were created by governments around the world to solely focus on environmental issues (Smink 2002a). Organizations and institutions derived in providing technical and scientific advice in efforts to address local issues such as air and water pollution, for example by means of the customary filter for end-of-pipe solutions. During this traditional paradigm of environmental regulation many governments basically viewed

environmental problems as an unfortunate side effect of economic growth, failing to recognize the true interdependency of the environment, economic and social systems, and treating the environment as an economic externality.

The primary objective of the term regulation refers to the manner in which government attempts to alter the behavior of businesses and society (Carter 2001). Historically this has also been referred to as command and control regulation, as explicitly stated standards existed to control a process or a product, by using the state as the legitimate enforcer.

Regulation as a policy instrument exerts significant advantages to policy makers, as it provides *"precision, predictability and effectiveness: an exact standard is set, the regulator and regulated both know what is expected of them and enforcement is ensured by a regulatory agency backed by the force of law"* (Carter 2001, 287).

Depending on the environmental policy, regulatory standards typically take one of the three forms below (Carter 2001, 286):

- **Ambient standard (Dilution)**
  - Places limits on the total concentration of pollutants emitted in a particular area.
- **Emission standard (Reduction)**
  - Limits what an individual source can emit, such as gases released from a factory.
- **Design standard (Prevention)**
  - Requires the use of a specific pollution-control technology or production process or the use of particular materials or products.

These three forms of regulatory standards display an evolutionary change in the approach towards regulation. Ambient standards more or less were associated with dilution of the 1960's, where environmental problems were understood as out of sight, out of mind. Following the paradigm shift in the 1970's & 80's, many governments became active in environmental protection through the creation of emission standards, which emphasized a reduction in polluting emissions.

However since the tactical, reactive traditional approach towards environmental regulation, which placed: *"[…] initial concerns […] among other things, with pollution (1970/80's) and depletion of natural resources (1990's)"*, the paradigm has since shifted concerns towards *"[…] energy supply, climate change, depletion of the ozone layer, etc"* (Smink 2002a, 53).

During the attempt to amend the traditional approach to cleaner production and cleaner products, the vast challenge of environmental regulation continued throughout the regulatory chain[14], particularly with enforcement. This phase in the regulatory chain proved problematic due to a lack of feedback to the policy makers, which is illustrated in figure 4.1 below.

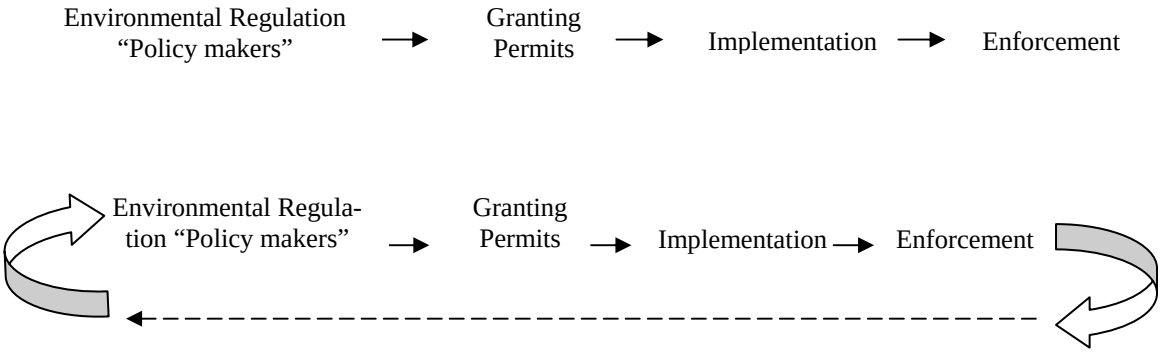


Figure 4.1 Illustrates the traditional approach to environmental regulation (top) with the new emphasis on practicing the feedback mechanism. Inspired by Smink 2002a.

The emphasis of the feedback mechanism in figure 4.1 creates a closed loop of the regulatory chain. Rather than treating each phase in the regulatory chain as individual entities, the feedback mechanism from the enforcement phase to the policy makers provides the necessary information about the difficulties of regulation. Through the exchange of information alterations can be made to policies, the implementation and the enforcement of environmental policies in effort to ensure policies are pursued and executed.

However, as command and control regulation remains to be the cornerstone of policy instruments used to support environmental protection, it does not stand-alone. As expressed by Carter (2001), there are three types of policy instrument used to ensure environmental objectives, that of Voluntary Action, Government Expenditures and Market-based Instruments (MBI's), all of which will be discussed in the following sections.

The introduction of different policy instruments comes as a result of the lacking effectiveness of traditional command and control regulation. Shortcomings of this approach are subject to the incapacity of governments to effectively monitor and enforce regulations. This indefinitely has inspired the introduction of other policy instruments, in effort to avoid failures when striving to fulfill policy objectives (Carter 2001).

[14] Regulatory Chain – Consist of four phases: 1) Environmental Regulation 2) Granting Permits 3) Implementation and 4) Enforcement (Smink 2002a, 51).

### 4.2.1 Voluntary Action

Voluntary action *"involves individuals or organizations doing things to protect the environment that are neither required by law nor encouraged by financial incentive"* (Carter 2001, 297). This particular policy instrument has the flexibility for a motivated society to change their lifestyles and contribute to sustainability. A concept such as green consumerism allows society to make decisions based upon environmental information of product or system procurement. In this sense, information as such is typically provided by environmental organizations or even possibly governmental sectors dedicated towards similar efforts.

**Potentials of environmental agreements:**

- Offer a flexible and cost-effective strategy to achieve policy objectives because they give target groups the freedom to decide how to best achieve goals and require basically no policing by government.
- Could possibly produce constructive co-operation between the state and industry as they move towards the change of environmental values and behaviors.

**Weaknesses of Voluntary action:**

- A policy instrument as such may be un-ambitious, as commitments are at the lowest level of requirement.
- Industry may set a low level of standards in order to reach targets more easily than if set by government officials.

Effectiveness of Voluntary action as a policy instrument tends to exist in a variety of spectrums. For instance Annandale et al. (2004, 3), *"claim that voluntary pollution control agreements implemented in Japan over the last 30 years have benefited local governments and companies."* Shortcomings of this claim lie in the reality that the evaluation of the voluntary agreements focused solely on the policy implementation. Therefore the true effectiveness of the agreements remains questionable, and if in fact they led to improvements of environmental outcomes.

Reasoning for a mix match of evaluation can possibly be justified, as voluntary action can be understood as a cost minimization mechanism for companies, as this tends to be the main driver of company interest in environmental performance. Historically this comes as no surprise as environmental degradation has been viewed less costly when compared to environmental protection (Annandale et al. 2004, 3).

### 4.2.2 Government Expenditures

The main purpose of a policy instruments in the form of Government expenditures is to provide subsidies where remedial action is overabundant for producers and consumers (Carter 2001). Traditional forms of this policy instrument have been the encouragement such as, to buy cleaner technologies, for example energy efficient water heaters, off-peak electricity[15], etc.

### 4.2.3 Market-based Instruments

Market-based policy instruments can be understood as a market regulation defined as, *"the ways in which market actors exert pressure on companies with regard to their environmental performance"* (Smink 2002b, 84). Actors as such are entities in the relationship between producers and consumers, or actors buying or selling products or services. Importantly understood is that there is no such presence of 'pure' market regulation, as they are subliminally influenced by voluntary action and government expenditures, for example government subsidies to promote a greener product, which could influence the purchasing trend of the consumer.

## 4.3 Institutions

Gathered from section 3.3.1 *Challenges to Sustainable Development*, inadequate Institutionalization of national strategic objectives proved problematic in the footsteps of sustainable efforts. The importance of institutionalizing sustainable efforts in the building industry is too important to ignore, therefore a further understanding of institutions is deemed necessary. This understanding will prove fruitful when comprehending the current integration of sustainability in the Building Industry.

### 4.3.1 Defining Institutions

Depending upon orientation and experiences institutions can be defined in various degrees. In the sense of the building industry, two definitions best suite integration, which are in reverberation of Scott (2001,48):

- Institutions are social structures that have attained a high degree of resilience.

[15] Off Peak Electricity – An official agreement between a homeowner and an energy provider, which allows the energy provider to meter energy usage during peak demands. For example, during daytime hours where energy usage is high. This service benefits the homeowner through a reduced cost of energy.

- Institutions are composed of cultured-cognitive, normative and regulative elements that, together with associated activities and resources, provide stability and meaning to social life.

Important to the initial understanding of institutions is that they are very complex and resistant to change. Properties as such have been the paradigm throughout generations based upon the regulative, normative and culture-cognitive entities (Scott 2001).

Institutions can be recognized as serving one of two purposes (Scott 2001, 50):

1) "*Institutions emphasize their capacity to control and constrain behavior. Institutions impose restrictions by defining legal, moral, and cultural boundaries setting off legitimate from illegitimate activities.*"

2) "*Institutions also support and empower activities and actors. Institutions provide guidelines and resources for acting.*"

Although the above defining purposes of institutions appear at opposite sides of the spectrum, it can be said that rules, norms and cultural beliefs are components of all institutional purposes, which tend to also consider behaviors and material resources (Scott 2001). These components are product of the cornerstone ingredients, also known as the three pillars to institutions, which are the Regulative, Normative and Cultural-cognitive pillars.

In figure 4.2, the three pillars are associated with distinguishing characteristics, in effort to explicitly divide. The figure, inspired by Scott (2001), can be used as a supporting guide through the following explanations of the three pillars.

### 4.3.2 The Three Pillars of Institutions

Three pillars of Institutions

| | ***Regulative*** | ***Normative*** | ***Cultural-Cognitive*** |
|---|---|---|---|
| **Basis of Compliance** | Regulative Rules | Binding Expectations | Constitutive Plan |
| **Mechanisms** | Coercive | Normative | Mimetic |
| **Indicators** | Rules, laws, sanctions | Certifications, recognition | Shared Logic of Action |
| **Basis of legitimacy** | Legally Sanctioned | Morally Governed | Comprehensible, recognizable and culturally supported |

Figure 4.2 Three Pillars of Institutions. Inspired by (Scott 2001, 52).

#### The Regulative Pillar

*"Force, fear and expedience are central ingredients of the regulative pillar"* (Scott 2001, 53). Through this aspect of institutions, legitimacy is backboned by the threat of legal sanctions. Instances of this pillar can best be exemplar through the action of environmental compliance in the form of regulation. For example, *"corporations adopt new pollution control technologies to conform to environmental regulations"* (Hoffman 1999, 353).

#### The Normative Pillar

Institutions emphasizing the normative pillar generally thrive off of indicators in the appearance of certified recognition. Institutional action tends to be based upon social obligations and somewhat of a 'rule of thumb'. For example, *"organizations will comply with them (social obligations) out of norms established by universities, professional training institutions, and trade associations"* (Hoffman 1999, 353).

#### The Cultural-cognitive Pillar

Embedded in this particular pillar of institutions are *"symbols – words, signs and gestures – as well as cultural rules and frameworks that guide the understanding of the nature of reality and the frames through which that meaning is developed"* (Hoffman 1999, 353). The understanding of this pillar is that organizations, in this sense (institutions) will concur unconsciously, for example, *"It is*

*regarded as natural that environmental activists pursue idealistic or collective interests, whereas corporations pursue economic and materialistic goals."*

When analyzing institutions its apparent to recognize that one pillar may be more dominant, however the three *"coexist and are interconnected"* (Hoffman 1999, 352). Important to note is that adequate institutions are not foundationally supported around technologies or industries, but more so upon the issues embedded.

## 4.4 Decentralization

Again, through comprehension of the IIED report, which was presented in chapter 3, decentralization is distinguished as a worthy challenge in the path of sustainability. The reality of various policy instruments brings to light the necessary recognition as to what degree an effort shall be institutionalized, and therefore considering the right mixture of decentralization from a higher state.

In the simplest context, the need for policy instruments such as voluntary action, government expenditures and market-based instruments came as a result of lacking outcomes that were historically ruled by national governments. The assumption here being that national governments set out heavy 'command and control' regulations, which in the past were received as impractical targets to successfully meet and were, more than ordinarily unrealistic to measure.

Many advocates of decentralization believe that the transformation of legislative weight can lead to higher levels of political participation, accountability and overall effectiveness of policies. On the other hand the opposition may argue that decentralization leads to *"soft budget constraints, macroeconomic instability and overall a lack of legitimacy of environmental polices"* (Falleti 2004, 5).

Being short of national influence can in fact lead some to question the supposition of legitimacy of actual implementation of policies. With that said, as traditional embodiment has failed there is little room to question the justification for decentralization of environmental governance. As stated by Lemos and Agrawal (nd) in an annual review of environment and resources, there are three distinct justifications for decentralization of environmental governance:

1. It can produce greater efficiencies because of competition among sub-national units.
2. It can bring decision-making closer to those affected by governance – thereby promoting higher participation and accountability.
3. It can help decision makers take advantage of more precise time-and place-specific knowledge regarding environmental resources.

The basic picture of justifying decentralization leads one to assume that local governments know what they need and more or less have ‘first hand’ knowledge of available resources to adequately address these needs. In addition, the likelihood of public participation creates a sense of accountability that in return should produce a fair chance of successful outcomes.

## 4.5 Summary

The context in this chapter has attempted to underline significant challenges toward sustainable efforts. In line with the findings in the previous chapter three, which highlighted regulation, institutionalization and decentralization. The theoretical context in this chapter has been presented in effort to aid in the understanding of policies in the State of Minnesota with relevance to the building industry. An initial presentation of Regulation was presented in order for one to understand the paradigm of Regulation, which can and will be compared to the current policy practices in the State of Minnesota. Secondly, the large role institutions play in the reality of providing stability and meaning to social life, provides one with a greater understanding of how decisions are embedded within society, creating a theoretical perception of how environmental considerations in the building industry may be understood and addressed. Supplementary to the understanding of institutions is the importance of decentralization as it’s a recognized advocate for public participation and generator of accountability. To an extent, this of course would support the realism of the United States having voluntary sanctions in regards to the Building Industry, as opposed to executing mandatory national sustainable Building Guidelines.

Therefore, thus far the illustration in chapter 4 shall be received as guidelines for addressing the following question:

*“How are Environmental Issues understood in the Building Industry, and how can current regulatory action, both Federal and State, be amended to ensure adequate implementation of sustainable efforts in the Minnesota Building Industry?”*

The following chapters will apply the theoretical background with focus on the Building industry as it resides in the United States, with particular scrutiny to the efforts of the State of Minnesota. In the following chapter 5, the theoretical knowledge will be applied to gain a thorough understanding of how the United States, exemplar of the State of Minnesota, approaches environmental regulation in realm of the building industry. The analysis will consider entities of regulation such as, institu-

tionalization and decentralization of sustainable efforts in the Minnesota Building Industry, as it is understood that a necessary mixture of these two will be essential for successful implementation.

# Introduction to Part – II

As previously mentioned in section 1.1.2 in the introductory chapter to Part-I of the present report, the overall underlying issues are not necessarily gathered around a negligent understanding of sustainable building. Point in hand being that even in a country such as the United States, (where it can be said that economic prosperity clearly has not been echoed by its environmental efforts) the building industry has been identified as an industrial sector posing great possibilities towards sustainable efforts.

In an American perspective, *"The federal government in the US has been a leader in the procurement of green buildings through policy, by fostering green building practices, by encouraging the market and, perhaps most important, by leading the market via procurement of green buildings. Thus, the federal government has used its tremendous purchasing power to sustain the growing green building market and to lead the way, by example, for state and local units of government, private industry, and homeowners"* (Strohmer 2006, 2).

- William H. Sanders III

US EPA Senior Executive Representative for the Federal Green Building Council

Gathered from the above quote is the message that the United States remains to be a country which vogues to exist as an inspirational figure in the sense of sustainable building to its member states. As federal regulation of sustainable buildings, for example, regulating the amount of energy a building can consume continues to be voluntary. Although it can be said that legitimacy in this approach is lacking, the advance of this particular stance (thus far) seems to lean on transforming the building industry by emphasizing the potentials through market-based instruments, which are imagined diverse from state to state.

There have been some US states that have assumed the leadership role in the area of sustainable building. As explained by Sanders (See Strohmer 2006, 3-4), there is an understanding that: *"Many ideas and advances begin in a state and after successful piloting and experience, gain acceptance and adoption in additional states and ultimately may become a part of the federal government fabric […] so, besides the federal government, we are seeing more and more regional and local efforts."*

In 2006, St. Paul/Minneapolis (ranked # 4), the capital of the state of Minnesota was recognized as one of *The Top 10 Green Cities in the U.S* (See McRandle and Smith 2006). The results were based on energy efficiency, least pollution and providing a healthy place to live.

In addition the state of Minnesota represents a worthy candidate for analysis, as it is a state that has been pursuing green efforts in the building industry, such as the composition of the Minnesota Sustainable Building Guidelines, which were earlier mentioned in section 1.2.

### Minnesota in Brief

Minnesota resides in the Midwestern Region of the United States, inhabiting approximately 5.2 millions residents (MN State 2006). The diverse 86.939 Sq. Miles (225, 171 sq. Km) of land consist of prairies and farms, to heavily wooded terrain sprinkled with a vast amount of rivers, streams and lakes, hence the states nickname, “Land of 10,000 Lakes” (MSN 2007).

Not only does the state of Minnesota provide a fishing haven for anglers, the diverse climate shelters it’s inhabitants, who are accustom to the four seasons of fall, winter, spring and summer. Minnesota’s diverse climate can best be illustrated by the variations in temperatures from the extremely cold winters to the hot summer, which have been said to vary approximately 174 degrees Fahrenheit or 96.6 degrees Celsius (Climatology 2007). The land of 10,000 Lakes, notably the nickname of Minnesota holds its headquarters in the capital city of St. Paul/Minneapolis, also known as the Twin Cities.

Figure 5.1 The Cities of St. Paul (above) and Minneapolis (below)(Pic 2007).

Since 2000, the population of Minnesota has increased by 247,609 people, which ranks 19th amongst the rest of the country (Gillaspy 2006). Side by side with the growing population, further development of public facilities and housing structures is present, as the building industry shows projections for future development of housing units to reach approximately 2,182,200 by the year 2010.

The projection of future housing growth of 15% (MN State 2003) strengthens the relevance of sustainable building practices, as this will inevitably come at an irreversible price of raw material

consumption, energy use, and some form of waste/disposal production. Projections for commercial buildings are unknown, however it is assumed that there will be a significant amount of large construction practices, mirroring the 15% growth of the future housing market.

The thematic elements leading to this stage of the project have provided an overview of such a large and influential industrial sector, which poses great possibilities in the global goal of environmental preservation. Thus far, (in chapter 1) the mitigation of GHG's in the building industry has been identified as an important means of address the all-encompassing global challenge of climate change. Further understanding of this was presented in (Chapter 3) a comprehensible manner through the building industry received the concept of sustainability. In addition, various approaches towards sustainable efforts of the building industry in a global perspective were provided. In turn, these perspective approaches uncovered some of the barriers and incentives to sustainable building, and in particular highlighted regulation as a, so to say, "make or break" policy instrument. As a result, (in chapter 4) this project placed emphasis on regulation, breaking down entities such as institutionalization and decentralization, as these two ingredients appear important for the mixture of successful implementation of sustainable action in the building industry.

### The Controversy

To now, sustainable efforts in the US building Industry are understood as, for the most part, voluntary. The Current appearance the Federal Government plays in safeguarding sustainable Building is questionable at best, when presenting itself as an actor to be "voluntarily" mirrored by member states. Point in hand being that the US Federal government seems content to "hang their hat" solely on procurement of Federal green buildings, and leaving the decision to go green up to state governments.

The reality of this seems to be quite problematic, with the assumption that if history repeats itself, economic prosperity will continue to outweigh environmental preservation, especially when recalling current barriers to green building, which were presented in section 3.5. This is essentially where Regulation is first seen as a good step in the right direction to address these barriers.

It is therefore, Part – II places emphasis towards address the second part of the problem formulation:

*How can current regulatory action, both Federal and State, be amended to ensure adequate implementation of sustainable efforts in the Minnesota Building Industry?*

In the following chapter 5 a policy analysis of the State of Minnesota will be presented. For transparent understanding, initial focus is placed on the United States as a federal government icon. By

presenting the United States and Minnesota, a clearer picture of the relationship between Federal and State approaches shall be understood. The policy analysis seeks to uncover the extent to which sustainable Building is institutionalized in Minnesota and more importantly identify weaknesses in the current regulatory practices. Important to specify is the recognition of the USGBG, as it has been identified as the foremost coalition for green building in the United States. In addition it is disclosed that the method of choice for green building, for the Federal government, is a product of the USGBG in the form of the nationally recognized LEED certification.

In the latter of Part – II, chapter 6 will place efforts towards a practical analysis of sustainable approach in the state of Minnesota. Thus far, the most prominent efforts are seen in the Minnesota Sustainable Building Guidelines (MSBG), which seem to pride itself on performance based measures. To date, these guidelines have, since 2004, been *"law for all building projects that are funded with state money"* (Strong 2007, Appendix A). However, also active in the Minnesota building industry is the existence of the nationally recognized LEED certified building, which is product of the Mississippi Headwaters Chapter of the USGBC. The existence of the two leave one to question why and when, one set of steering mechanisms would be preferred over the other, and are the two truly effective?

With that said, the analysis seeks to identify the extent to which green building intentions are integrated on the practical level in the Minnesota Building Industry. This analysis is triangulated through a web questionnaire, interviews and the literature reviews. The results of this chapter will be interpreted and finally concluded on in the closing chapter of this project.

# 5 Sustainable Building on the Program level

*This Chapter seeks to describe the extent, to which concepts of sustainable building are incorporated both on the levels of Federal and State. The analysis takes its point of departure in program documents, strategies, guidelines and interviews. It creates a less distorted picture of the relationship between Federal and State policies. The analysis uncovers the manner in which sustainable building is institutionalized in the State of Minnesota and with that identifies weaknesses in the current regulatory practices. In the latter, the analysis focuses on the Minnesota Sustainable Building Guidelines (MSBG) and Leadership in Energy and Environmental Design (LEED), as they appear to be the most prominent action of regulating sustainable building in the State of Minnesota.*

## 5.1 The Strategy for Sustainability in the United States

The overall sustainable objectives of the United States can be received through the composition of 'Direction for the Future' (US EPA 2003). See figure 5.2. In 2003 the US was represented by the EPA, which presented the American society with a strategic plan, holding the hand of the next five years in efforts to protect human health and the environment.

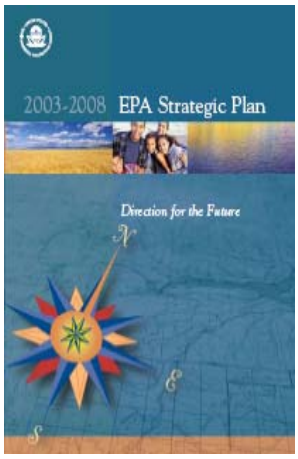


Figure 5.2 The US EPA Stra-

An emphasized approach of the strategic plan recognizes the need to anticipate future potential threats to human health and the environment, as today's environmental issues are far more complex then the past (US EPA 2003, 6). With that, the US EPA has presented five strategic goals of the 2003 strategic plan, which are listed below (US EPA 2003, 7).

**Goals of the 2003 Strategic Plan**

- Clean Air and Global Climate Change
- Clean and Safe Water
- Land Preservation and Restoration
- Healthy Communities and Ecosystems
- Compliance and Environmental Stewardship

The overall strategic plan consists of an adequate combination of the goals listed on the previous page. The five listed goals are broken down into more specific objectives in effort to provide more detailed guidance for the overall execution of the US strategic plan.

For exemplar measure, the documentation of 'Clean Air and Global Climate Change' for one National environmental goal, directs objectives such as 1) healthier outdoor air, 2) healthier indoor air, 3) protecting the ozone layer, 4) radiation, 5) reducing greenhouse gas intensity and 6) enhancing science and research. For each of the mentioned objectives exist a strategic target followed by the means for achieving these targets, which on paper, delivers recognition of global environmental concerns.

However, the present report will not go into great detail to the broadly defined goals, however the illustration is an effort to possibly create a picture of the general sustainable goals in the US. It is necessary to note that there is a significant assumption in this, or possibly shall one say anticipation that Sustainable efforts are somewhat subliminally embedded in the overall environmental strategies of the United States.

In support of the anticipation, and in relevance to the current report, it is deemed necessary to mention the stated objective 5) Reduce Greenhouse Gas Intensity (subject to the goal - Clean Air and Global Climate Change).

As Stated in the US EPA (2003, 23):

**Objective 1.5[16]: Reduce Greenhouse Gas Intensity**

*"Through EPA's voluntary climate protection programs, contribute 45 million metric tons of carbon equivalent (MMTCE) annually to the president's 18 percent greenhouse gas intensity improvement goal [17]by 2012."*

The quotation above clearly states the goal of contributing 45 MMTCE each year in the US, which is more or less the attempt to address the reduction of GHG intensity by strengthening partnerships with businesses and other sectors. This of course stems the consideration to industrial sectors such as the building industry, which was indeed identified by the UNEP as a sector that poses considerable potential reduction of GHG emissions by means of mitigating energy use (See Chapter 1 and UNEP 2007). In fact, of the 45 MMTCE, the US EPA has explicitly dedicated 27 MMTCE to the building industry in the year 2012 (UNEP 2003, 23).

[16] Objective 1.5 – For clerical reasoning, the US EPA distinguishes between objectives in this style. For unproblematic logic in this report the objective is referred to as the 5th objective of the 1st goal.
[17] In 2002, the US President Bush announced a US climate policy to reduce GHG intensity by 18% over the next decade (US EPA 2003, 23).

Thus far, this has been received as possibly the highest level of traceable influence on the building industry in regards to the legislative hierarchy. However the reality of discourse such as 'voluntary climate protection programs' and 'strengthening partnerships with businesses' again encourages the notion to question the lack of federal legislative influence. Not to mention the likelihood of questioning theories such as the Kuznets curve that was presented in chapter 3, section 3.1.1. It's assumed that most theory advocates would expect a country such as the US to hold the necessary financial resources to upfront address environmental considerations, rather than turn to industries for a *"strengthening partnership"*.

Not only does the US EPA emphasize this partnership with industries but more importantly with member states. In a sense of unity the US feels that the States and the National EPA are *"[…] equal partners in the national effort to protect human health and the environment. Progress […] depends not only on EPA's efforts, but on the efforts of all 50 states"* (US EPA 2003, 131).

The reality of this leads one to believe that there is a significant amount of emphasized decentralization of environmental governance to states. This is justifiable as the basis of the nation's environmental laws are embedded within state governments. The approach of decentralizing environmental regulation is reasoned, for the reality that environmental issues and troubles tend to vary from one region to another. As stated by Jonee K Brigham (2006, appendix C), *"[…] different regions have different issues and have different economies, for example heating requirements in Minnesota are different that they are in Arizona."*

What is of particular interest in the latter of this report is to actually uncover the effectiveness of this decentralized approach. Of course this approach is lobbied for in a number of instances, such as the lacking (in the sense of effectiveness) traditional command and control, and the likelihood that decentralized authority can lead to higher levels of participation, accountability and overall effectiveness of the green building industry (Falleti 2004). However, as it was explicit in chapter 4, the legitimacy of policy instruments that are essential for decentralized governance, such as voluntary and market-based instruments, remain questionable.

This decentralized approach has stemmed many green advocating programs, yet as stated by Brigham (2007, appendix C), *"The USGBC and the LEED system is the most common identification with green building in the country, pretty easily, […] my experience, it's the most recognized label of green building, especially nationally."*

As a white policy document steering Green building in the United States has been short of discovery, it is deemed suitable to reference the USGBC and the LEED system as the identity of green

building in the Nation. With that, the policy analysis looks upon the USGBC and LEED as a national icon for Green building.

## 5.2 Sustainable Building in the US

Even though the message is clear that the US Federal Government remains to be a role model for Green building there are separate organizations driving green building in the US. In the following sections The US Green Building Council (USGBC) will be presented as it is received as the largest actor in green building in the United States.

### 5.2.1 The U.S. Green Building Council

The USGBC is the nations foremost coalition of leaders from across the building industry working to promote buildings that are environmentally responsible, profitably and healthy places to live and work. In 1993, the USGBG was initiated through the collaboration of various actors, such as architects, engineers, manufactures, universities and public institutions (Kibert 2002). Catalyzing the actors was the notion that the direction the building industry was on needed to change, especially in order to become sustainable.

Figure 5.3 USGBC Logo (USGBC 2007)

Today, the non-profit organization consist of more than 11,000 members, which are striving to *"[…] transform the way buildings and communities are designed, built and operated, enabling an environmentally and socially responsible, healthy, and prosperous environment that improves the quality of life"* (USGBC 2007).

Similar to the approach taken by the SBCI (described in section 3.4.1) the USGBC provides a so-called *think tank* for building industry leaders to transform the market. As part of its initial goal the USGBC created what many consider to be the most nationally recognized sustainability rating system, LEED.

### 5.2.2 Leadership in Energy and Environmental Design (LEED)

In the United States LEED is acknowledged as "the" Green Building Rating System. In the building industry it's accepted as a benchmarking tool for design, construction and use of high performance buildings (Koeppel and Vorsatz 2007).

The LEED rating system was designed for a number of reasons, but primarily to safeguard a standard that constitutes a green building. This is done through a rating system used to categorize the performance of a building on four different levels, from lowest performance to highest, Certified, Silver, Gold and Platinum, all of which are 3rd-party certified. These progressive levels of certification are determined by the number of points a project receives in credit areas such as; sustainable sites, water efficiency, energy & atmosphere, materials and resources, and indoor environmental quality (Koeppel and Vorsatz 2007).

As LEED has undisputedly earned the majority consensus of what a green building constitutes in the United States, it is however imprudent to assume it is the viable answer to every region in the US. The perspective that LEED certification is arguably a money business (as opposed to a proactive think tank) and that the credibility of the point system and it truly determining what a green building is, has been questioned (see appendix A). Notions as such have stemmed the creation of local programs such as the Buildings, Benchmark and beyond program (B3) and the Minnesota Sustainable Building Guidelines (MSBG) in the State of Minnesota.

## 5.3 Sustainable Building in the State of Minnesota

In a local perspective, Sustainable Building in Minnesota can perhaps best be associated with the efforts of The Center for Sustainable Building Research (CSBR). The CSBR is located in Minneapolis, Minnesota and more specifically is an official unit within the College of Architecture and Landscape Architecture from the University of Minnesota (CSBR 2006).

In the late 1990's the CSBR, in collaboration with various organizations, were asked to compose *"[…] a manual to facilitate management, sustainability and efficiency in the construction of new buildings in the private sector"* (GUP, 2006). Today, this manual is better known as B3, which stands for Buildings, Benchmarks and Beyond. A large part of the B3 project has been directed toward benchmarking the performance of buildings for future implications, however the most notable entity of the B3 project has been the composition of the Minnesota Sustainable Building Guidelines (MSBG).

In the following section, the Minnesota Sustainable Building Guidelines are use as the main source of data, which is referenced as (MSBG, 2006).

### 5.3.1 The Minnesota Sustainable Building guidelines

The MSBG provides guidance for all new state buildings that were paid for, in full or partially, by bond money after January 15th, 2004. In alliance with the state legislature the guidelines must (MSBG 2006a, 6):


Figure 5.4 THE MSBG Logo (MSBG 2006A).

- Exceed the energy code in effect in January 2004 by at least 30%
- Achieve lowest possible lifetime cost for new buildings
- Encourage continual energy conservation improvements in new buildings
- Ensure indoor air quality
- Create and maintain a healthy environment
- Facilitate productivity improvements
- Specify ways to reduce material costs
- Consider the long-term operation cost of the building including the use of renewable energy sources and distributed electric energy generation that uses a renewable source of natural gas or a fuel that is as clean or cleaner than natural gas

The MSBG guidelines contain a foundational mixture of local and national efforts, as they are designed in similarity to the national guidelines of LEED, however prioritize regional values and requirements (MSBG 2006a). In fact the aim of the MSBG is not to follow LEED, but to recognize that there are some same or similar requirements and therefore may be helpful in accruing LEED credits.

Similar to LEED, the MSBG are broken down into the following categories: 1) Performance Management 2) Site and Water, 3) Energy and Atmosphere, 4) Indoor Environmental Quality and 5) Materials and Waste (MSBG 2006a, 8). For each category there exists an overview, goals, objective and guidelines for compliance in each of the areas of focus.

Recognized throughout the guidelines is the lack of stringency as all categories are approached through more recommended rather than required action. This is explained by Richard Strong, when asked about the differences between LEED and the MSBG. He stated, *"It really just has a different emphasis than LEED. You can either meet B3 or you don't. There isn't silver, gold or platinum"* (Strong 2007, appendix A). Strong further explained that with the MSBG, "*You can take action or you cannot take action. Like looking at life cycle costing of energy or fuels…You don't have to chose it, you just have to do the processes that allow you to look, that maybe what your choosing might not be the cheapest over the life of the building."*

In reflection of what has been illustrated thus far, it seems obvious to contemplate the instability of discourse such as, "law" for all buildings mixed with the reality of not being required to make the "greener" choice in a building project. Further understand of this was sought and therefore gained through an interview with Rick Cater (2007, appendix B), who explained that, "*the only real absolute measure goes back to the original law […] it really only had one hard requirement and that was that every building had to be designed to out perform our current energy code by 30%. So, like with LEED in order to do that you have to do energy modeling."*

Another important issue to identify in the MSBG is the existence of thresholds, such as 50% less water, 75% recycled waste, etc. As explained by Strong (2006, appendix A) to do this, *" we are not forcing you to do it, but we certainly want you to look at LCA, LCC, because they are cardinal tools that you use to make different decisions with data that you would not usually know."* Strong also believes these thresholds to be very important aspect of the Guidelines. When asked if he believed that the MSBG raised the environmental performance of the applied projects, he replied, *"I think so...Certainly the threshold things do. And then the educational things do."*

Strong's reference to education is the detail that the MSBG are prided upon being performance based outcomes meaning that the guidelines set a threshold however leaving more than one set of means of achievement. The idea being that not every method is the best method for each and every organization, and therefore creates a subliminal learning curve as the guidelines travel through a process such as energy modeling which helps an organization make a decision on future methods or systems. This is of course opposed to prescriptive measures, which has historically been a large entity in the LEED Standard.

It is important to state that the indecisive tone of Strong, when pondering the actual effectiveness of the guidelines, is not due to a lack of confidence in the guidelines but more so because the CSBR is waiting for the results of the benchmarking project which will help measure the effectiveness of the guidelines, possibly in the late autumn of 2007.

The analysis of the present report is not to dissect the specific guidelines, but more so to create a better understanding of why and how the Minnesota Sustainable Building Guidelines exist, especially in reality of the USGBG and the existing LEED credentials. In perspective of this report, these two guidelines are of focus because there are over 60 current projects under the MSBG and currently 6 LEED certified buildings in the state, with approximately 60 more expecting to achieve certification over the next few years (Benson 2007: Strong 2007, appendix A: Carter 2007, appendix B).

The Understanding thus far is that LEED certification is a voluntary Instrument that seeks to transform the building market. In contrast, the MSBG are law and the guidelines are required and therefore compliance is expected. Still, although LEED certification is voluntary and the MSBG are required, there are existing similarities of the green steering mechanisms; therefore the two are to some extent comparable when uncovering the means of compliance.

For instance, a table comparing the MSBG and LEED was constructed by the CSBR. Please see (MSBG 2006b). In the table it is gathered that for the most part, both of the guidelines mirror the same purpose however with the LEED they are not ruling, and with the MSBG they are separated between required and recommended.

What is interesting is that in both guidelines it seems all so necessary to conduct assessments such as EIA, LCA and energy modeling, however this is only *recommend* in the MSBG and evidently voluntary under LEED (Strong 2007, appendix a). Knowledgeable compliance seems difficult to accept with data requiring categories such as site development & soil erosion, building water efficiency, energy efficiency, and material use (MSBG 2006b). Reality of this may lead one to question the direction of green building in the state of Minnesota and if in fact the current means of steering are legitimate or are in fact negligently directed.

## 5.4 Considering the Theoretical Framework

The theoretical framework that was presented in chapter 4 is used in the present report to answer the following question:

*How are Environmental Issues understood in the Building Industry, and how can current regulatory action, both Federal and State, be amended to ensure adequate implementation of sustainable efforts in the Minnesota Building Industry?*

Thus far it is clear that policing green building in the United States is mainstreamed through voluntary action. Although the US as a national icon plays an advocate role through procurement of Federal Green buildings it opts to avoid command and control regulation therefore leads to the exploitation of other policy instruments such as voluntary instruments such as LEED.

Even though LEED is the majority consensus of what a green building is in the US is, the process is particularly problematic when *" you could have one meeting, separate all the points up, submit them to LEED, get a plaque and never talk again"* (Strong 2007, appendix A). Of Course, this perspective is debatable, however does in fact lead one to question the feedback mechanism of this particular process, and if in fact these processes are ensured, pursued and executed properly.

As with the MSBG, these too are a result of the decentralized governance of the green building industry. In differentiation of LEED, the MSBG appear to favor government expenditures as a policy instrument. This is especially true as, *"the stick is the funding"*, meaning that the MSBG are law for all buildings receiving Minnesota bond money (Carter 2007, appendix B). However, the understanding that the guidelines are first party regulated and the legitimacy of this is suspicious. According to Carter (2007, appendix B), *"[…] from a practical standpoint, its not really regulated. There's not an agency that oversees the guidelines and that the guidelines are followed."* He continued to explain that in essence of failure to comply with the guidelines would result in a loss of future financial support from the state.

## 5.5 Summary

Throughout the chapter disparities of both the MSBG and LEED exists. The intent of the analysis has not been to create a debate of which steering program one should choose, but to identify that a choice does indeed exist.

So far it is understood that sustainability of the Minnesota building industry is safeguarded thorough institutions embedding programs such as the MSBG and LEED, and therefore the analysis is

not capable of determine one over the other as it is assumed others exist and have not been considered in this report.

The present report will continue to seek problematic areas, which can possibly *be amended to ensure adequate implementation of sustainable efforts in the Minnesota Building Industry*.

As a means of discovery, the following chapter takes a direct approach towards sustainable building action in the State of Minnesota by contacting current actors in the Minnesota building industry. The attempt is to directly disclose which areas of the current approach, steered by LEED and the MSBG, need attention and therefore will strengthen future efforts in the Minnesota Building Industry.

# 6 Sustainable Building in Practice

*This chapter presents the empirical analysis of the extent to which the intentions of sustainable building programs are actually integrated at the practical level in the State of Minnesota. The analysis is triangulated through an electronic questionnaire, the interviews which were presented in chapter two, and the program analysis that was presented in the previous chapter 5. The results of this chapter will be interpreted and finally concluded on in the closing chapter of the current report.*

The electronic questionnaire was sent out to affiliates of the USGBC and the CSBR. Please see appendix D. This specific target group was expected to carry a higher understanding of the possibilities of Green building as opposed to the average person.

## 6.1 The Electronic Questionnaire

The purpose of the electronic questionnaire is to gain further understanding of the effectiveness of the approach the MSBG and LEED portray. The electronic questionnaire therefore takes its point of departure through a general stance towards green building, by identifying the overall importance of green considerations in the Minnesota Building Industry. It then serves the purpose to aid in the identification of problematic realities in the current green building practices in the State of Minnesota. Therefore the analysis assists in providing possibilities of amending sustainable efforts in the building industry. The electronic questionnaire does not focus on the implementation of the two steering mechanisms, and therefore nor the outcomes of either the MSBG or LEED. The questionnaire cannot respectively say anything about the environmental influence the impacts the MSBG and LEED contain, however it does express the perspective of various actors current participating in respectively both the MSBG and LEED.

As it has been identified in chapter 5 that LEED and the MSBG share similarities in the sense of categories for compliance, one questionnaire was composed and sent to various actors in the industry of both. Please see appendix D. The questionnaire was analytically composed to address both organizations, however there were some questions that were systematically constructed to be addressed by one organization affiliate over the other. For example, the first 16 questions were relevant to any active actor in the Minnesota Building Industry, however question 17 specifically asked which of the programs their organization was best affiliated with; USGBC & LEED, B3 & the MSBG, None, or other. If the actor chose the USGBC & LEED then the subsequent questions were related specifically to LEED members, and likewise with B3 & the MSBG. Following the questions specific to the organizations' affiliate (LEED/MSBG) were again 7 more general ques-

tions seeking to shed light on the current regulatory practices of green building in the state of Minnesota.

The intention of creating one questionnaire, which targeted actors in from two separate means of approaching sustainable building was justified as both the affiliates are embedded in current institutions in the State of Minnesota, and therefore the intention has been for the method of gathering the results to remains unbiased.

In the concluding stage of the electronic questionnaire an opportunity exist for actors to express comments towards the manner in which sustainable building has influenced their organization, through an open-end question. These comments will prove to be insightful through the remainder of this chapter, and lastly in the concluding chapter of the present report.

## 6.2 Limitations of the Questionnaire

In analyzing an electronic questionnaire there are several considerations one must be aware of. For instance considerations such as targeting key personnel to answer the questionnaire on top of contacting relevant actors existed. In light of this, the questionnaire was distributed to personal e-mail addresses of both of the respected affiliates. Although the e-mail addresses were associated as representative contacts in relevance of topic of focus, it was politely asked if the person receiving the email did not feel adequate to answer the questionnaire to please forward it to a relevant co-worker. Of course this represents the possibility of uncertainties in the questionnaire, as it cannot be taken for granted that the most relevant person always answered the questionnaire.

Another consideration about the data collected from the questionnaire is the notion that, for the most part all of the organizations contacted are credible actors in the industry; and their viewpoint could have been of subliminally influence due to reputable cause. Although the questionnaire was clearly stated and is to be 100% anonymous, this has definitely been considered when analyzing the data.

In addition, it is acceptably recognized that the questionnaire in itself contains some flaws. The questionnaire sought to remain unbiased, therefore presented the possibility to answer “other” where pre-determined answers were not accurate. However, there were instances where the questionnaire did not present this option and therefore some of the answers were so to say “forced answers”. Consequently, this can sometimes result in skewed data, and therefore is another consideration when analyzing and interpreting the data.

Lastly, one must accept that the chosen discourse used throughout the questionnaire cannot be assumed understood by all participants. For example the assumption that everyone defines *green building* and *sustainable building* to hold the same meaning, or clearly understands the difference between prescriptive and performance based regulation, is evidently a shortcoming to the validity of the questionnaire. It is now understood that this could have been avoided by explicitly defining the concepts and terms in the initial stage of the questionnaire.
It is through considerations as such that one shall not interpret the electronic questionnaire as 100% factual. However the questionnaire does indeed serve the purpose of creating a good indication of what is lacking in the state of Minnesota's approach to green building.

## 6.3 The Analysis

The purpose of the questionnaire has been to gather experiences and knowledge of current actors in the Minnesota building industry to identify areas that could be amended to further strengthen the approaches taken towards green building efforts in the State. In total there were 225 distributed questionnaires, all of which targeted organizations actively affiliated with the MSBG, some with LEED, and some were allied with both. There were a total of 61 completed questionnaires and 8 partially completed, resulting in approximately a 31% response rate.

Initial questions were focused towards identifying the variety of actors involved in the Minnesota building industry. In addition, it sought to gain an understanding of the resilience of the industry by posing a question of how long the organization has been active in the industry.

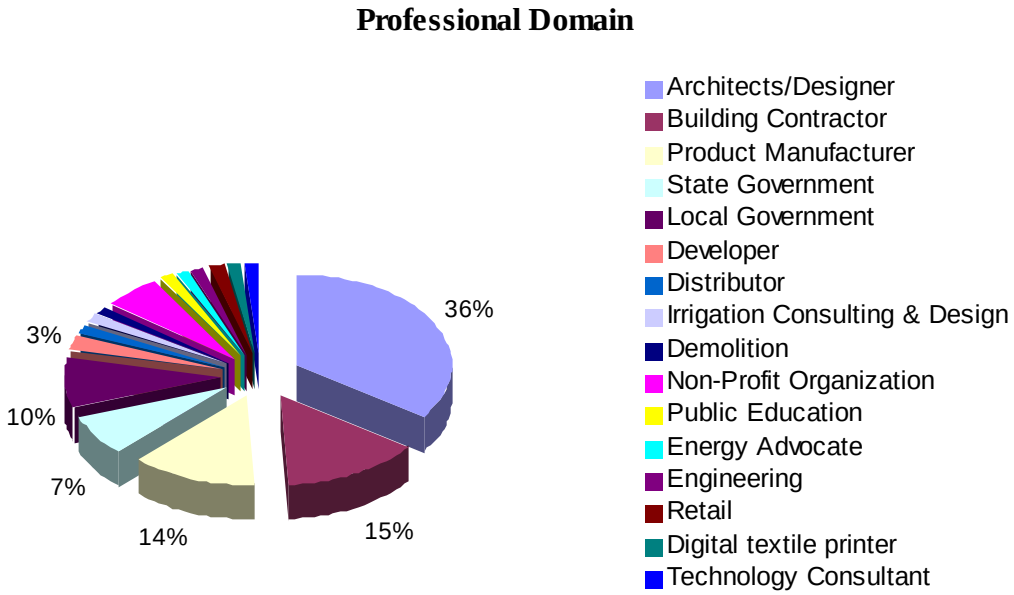


Figure 6.1 The Actors in the Minnesota Building Industry.

Illustrated in Figure 6.1 is the variety of actors in the Minnesota building Industry. There is clearly a strong presence of participation from architectural and designer organizations' (36%), followed by Building Contractors (15%), and Product Manufacturers (14%).

The majority of the organizations that participated in the survey have been active in the building industry for more than 20 years (65%), which is seen in figure 6.2 below. Again, the purpose of determining the amount of years the organizations have been active in the field can aid in the understanding of how flexible the industry is, especially in light of market transformation, which can be considered a common goal of both LEED and the MSBG.

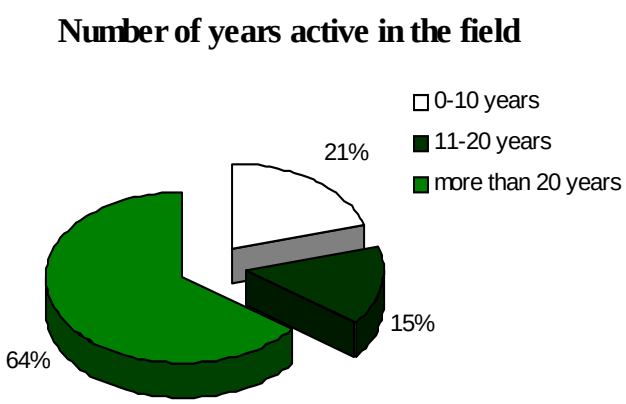


Figure 6.2 Years of experience of Actors in the Industry.

In light of having organizations with more than 10 years experience, which are now actively participating in green building in the State of Minnesota is received as an indicator that the industry is adaptable.

The next couple of questions sought to gain an overall consensus of the concept of green building and if in fact it was a legitimate means of addressing climate change. Secondly, it was important to determine if in fact companies believed it was important for them to participate in addressing climate change and therefore to incorporate green building in their organizations' efforts.

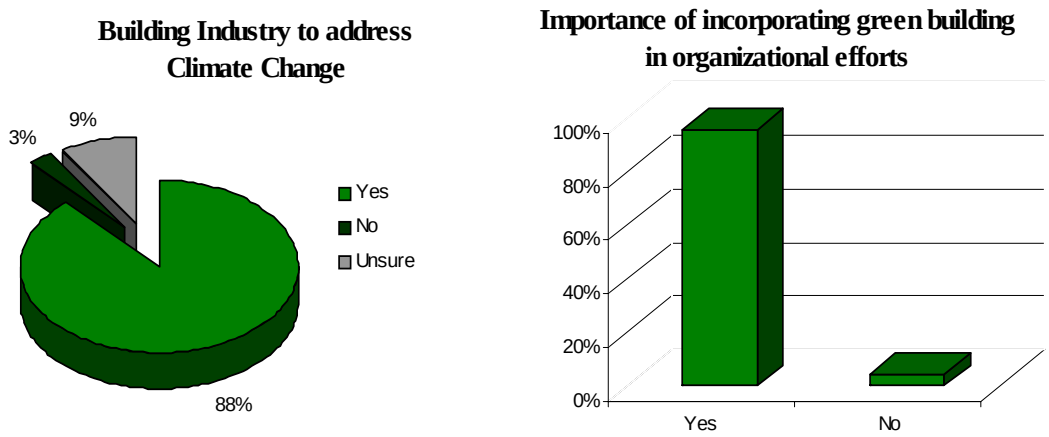


Figure 6.3 The Building Industry to address Climate Change and the importance of integrating green building in organizational efforts.

In figure 6.3 it can be seen that a significant percentage (88%) of the organizations surveyed feel that the building industry can play an important role in addressing climate change, which is shown on the left side of figure 6.3. However, the question asking if it has been important for their organization to incorporate green building into their efforts, which 95.5% answered yes, cannot be assumed that it is a direct means to address climate change. The point being that it is likely organizations has different goals and objectives and of course a different motive to achieving these.

It is almost without certain, (figure 6.3) that one reason an organization would decide to incorporate green building into their organizational efforts would be to increase sales. This was apparent as 78% of the organizations surveyed agreed that going green had had a positive influence on sales, while the rest said no (4%) or they were unsure (18%).

Rick Carter, who is the Vice President of LHB, has also identified the relationship between green building and product sales. Carter stated, *"We have had a couple of projects where clients wanted to be LEED certified because of the National attention that would help them sell"* (Carter 2007, appendix B).

In addition the questionnaire identified other motives that justified organizations' becoming involved in the green building movement.

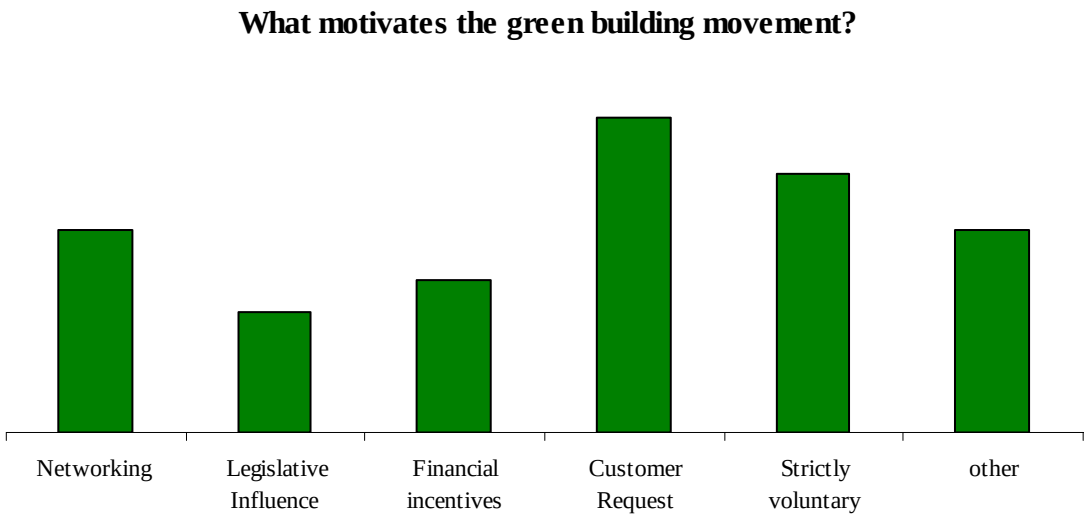


Figure 6.4 Shows means of Motivation for involvement in Green Building.

Shown in figure 6.4, the most popular response for integrating with green building was as a result of customer request, followed closely by strictly voluntary and networking. Of particular interest

were the responses gathered from the option "other". Please see appendix D. There was a strong resemblance in the amount of organizations who justified their involvement with the green building movement to be "strictly voluntary" and the amount of open end comments with discourse such as, *"It is our responsibility"*, *"Personal values of company founders"* and *"our social concern."* Responses as such can possibly support the notion that concepts of green building are respected within the industry and with that have embedded a sense of accountability.

In relevance to the notion of organizations becoming involved in the green movement to increase sales, it was necessary to identify the consensus towards green building products and services and if in fact they should be promoted in the industry. The response was close to unanimous as seen in figure 6.5.

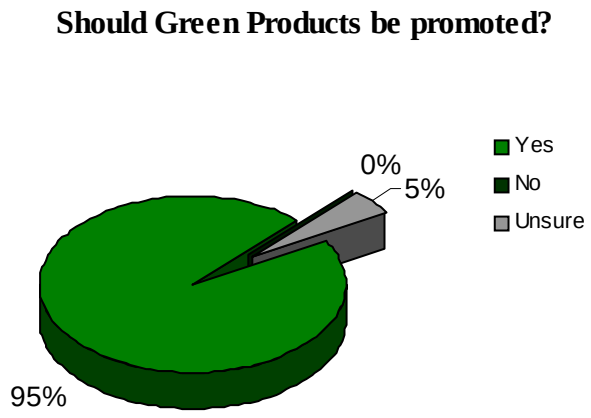


Figure 6.5 The emphasis to promote Green products and services.

As seen in figure 6.5, 95% of the survey participants believe that products and services, which earn the brand "green", should indeed be somewhat compensated for. In this sense the compensation could be seen through recognition in the building industry.

However, as it is clear that actors in the industry feel that green products and services should be promoted throughout the industry, there appears to be lack of agreement between the USGBC and LEED as it is specifically stated by the USGBG (2007), that the *"[…] USGBC does not certify, promote, or endorse products and services of individual companies […] products and services do not earn project points."*

In support of this certainty, Jonee K. Brigham who is the co-principal investigator of the B3 MSBG, explains that, *"[…] information is useful, but […] I don't think real sustainability happens at the product level. I think it happens systematically, including products"* (Brigham 2007, appendix C).

The questionnaire then turned its focus towards matters of regulation in the sense of the Minnesota green building industry. The initial intentions in this stage of the questionnaire were to gather the consensus towards the current building standard and if in fact they're looked at as being appropri-

ate. There was a bit of assumption in this question as it was unspecified whether to focus on green building standards or building standards in general such as building codes which traditionally aim to ensuring the health and safety of building inhabitants.

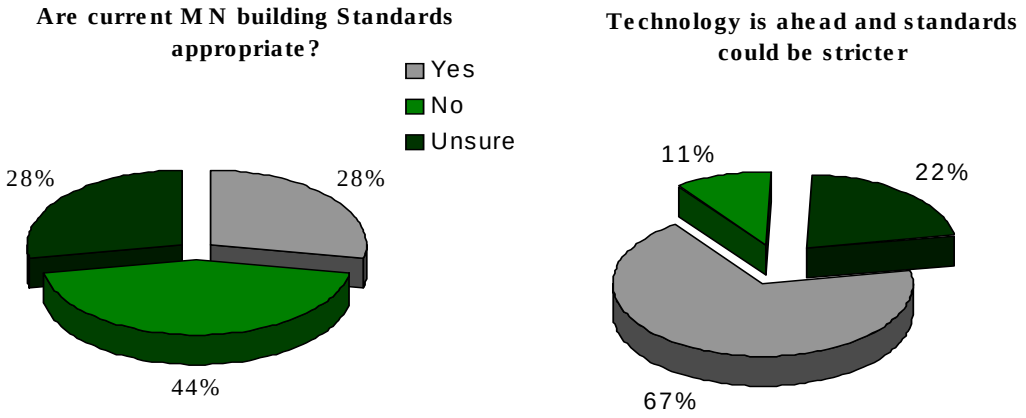


Figure 6.6 The acceptance of current building standards and the belief that technology is ahead and standards could be stricter

Gathered from figure 6.6 is the realization that well under half of the organizations currently participating in projects steered by LEED or the MSBG feel that the current building standards are appropriate (28%). Reasoning for this could possibly be received as a lacking balance between current technology and current standards, meaning that existing technology is more than capable of supporting heavier legislative standards.

As technology is apparently not at the top of the list of hindrance of green building efforts, it was of interest to uncover barriers towards green building efforts, which can be seen in figure 6.7. The question was formulated to determine if national barriers were comparable to barriers in the state of Minnesota.

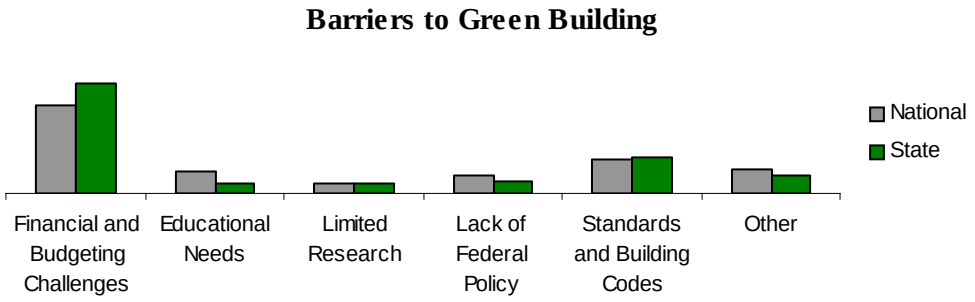


Figure 6.7 National and State barrier to Green Building.

In accordance with figure 6.7, it can be said that a general agreement exist as to what challenges the green building industry at both a national and state level. 45% of the participating organizations felt that the greatest barrier to green building in a national perspective was a result of financial and budgeting challenges, as did 56% believe it was also the greatest barrier in the state of Minnesota.

This was explicitly justified as one of the participating organizations stated, *"The reward structure of consumerism and consumption is embraced due to a growth fueled economy, rather than a conservative based economy"* (Please see appendix D). This was not the only received criticism the current financial and budgeting scheme in the US received as another participant expressed, *"The economics are backwards. Dirty, wasteful products/methods are rewarded by the market for being cheap, excess is free in the US, responsibility costs money."*

In effort to address the barriers illustrated in figure 6.7, however not limited to, it was deemed adequate to gather the perspectives of the participating actors in the sense of what exactly they felt would benefit their organizations' green efforts. In addition they were asked what policy instruments they believed would amend green efforts in the state of Minnesota. The results are portrayed in figures 6.8 & 6.9. In figure 6.8 it can be seen that there is a fairly evenly distributed request for monetary support, methods for determining and understanding the cost of green building, and therefore a greater understanding of lifecycle costing programs. This can possibly be understood as a greater need for education in the sense of green building, where arguably all of the beneficial resources appearing in figure 6.8 could be achieved through education. This was the overall consensus received in the questionnaire as participants requested, *"Environmentally friendly training on the benefits of going green"*, and *"Comprehension of productivity gains"* (appendix D).

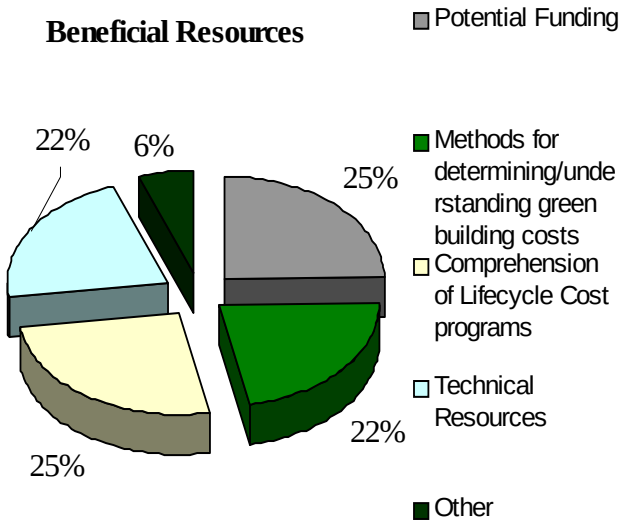


Figure 6.8 The Most Beneficial Resources.

Rick Carter, who explained his perspective on how green building is received in the state of Minnesota, further elaborates the importance of education and need for incentives. Carter (2007, appendix B) explained, *"[…] if the building industry included designers, architects, engineers, contractors, buildings, code officials, building owners, manufacturers of products, I think there is kind of a disparity across the board. Some of the contractors are extremely knowledgeable and some*

*aren't, and I would say the same is probably true for all the other categories. I think we just probably need, and this is both state and federal, I think we need some more incentives."*

Incentives are displayed in figure 6.9, which presents policy instruments to strengthen green building efforts in the state of Minnesota. From figure 6.9 one can see that the participating organizations are not set solely on one means of motivation. This could possibly mean that the industry is adaptable and willing to change, as the current understanding is that market-based instruments and government expenditures stir green building in the state of Minnesota. Of particular interest is the similar percentage a policy instruments in the form of standards enforced by law received. This can possibly support the connotation that technology is present and that the industry is capable of legislative compliance.

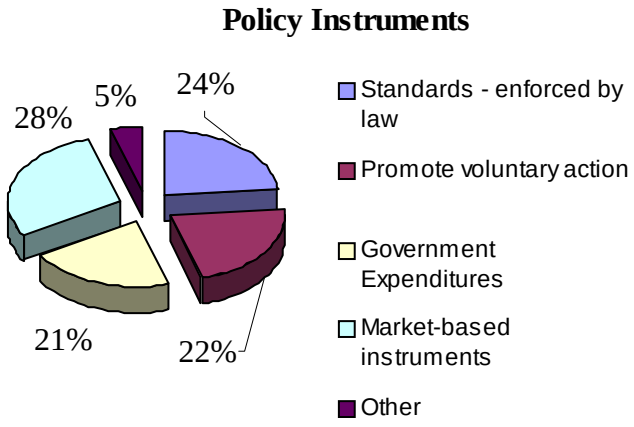


Figure 6.9 Amending Policy Instruments.

## 6.4 Summary

The purpose of the practical analysis has been to identify the extent to which the intentions of sustainable building programs are actually integrated at the practical level. More specifically, it served the purpose of identifying barriers to green building in both a national perspective and that of the state of Minnesota. The intention of identifying the barriers served two purposes. Firstly, it was to recognize problematic areas in the current green building practices, and secondly it was to identify possibilities in effort to strengthen sustainable efforts in the Minnesota Building Industry.

It is important to clarify that all of the organizations that participated in this questionnaire were to some extent affiliated with LEED or the MSBG. Therefore the received perception of green building displayed throughout this analysis, shall not be assumed the face of all actors in the US building industry, or that of the State of Minnesota.

# 7 Conclusion

In the introductory chapter of this report the Building Industry was initially introduced as a means of addressing climate change. In particular this industry has been identified as posing vast opportunities for reducing Greenhouse Gases. This is rightfully so, as the building industry is a large consumer of energy, in various forms, which is mentioned throughout this report.

Even though there appears to be a global consensus recognizing the role the building industry can play in mitigating greenhouse gases, there exists a lack of conformity when it comes to actually implementing a legitimate approach. Obvious reasoning for diverse approaches were considered, such as sovereign rights, national habit, economic resources, ect… however when looking further into national efforts of the United States and consequently the lack of firm influence the government placed upon the building industry, it was received troublesome; therefore stimulated the notion to question, what has been referred to throughout this project as the problem formulation:

*How are Environmental Issues understood in the Building Industry, and how can current regulatory action, both Federal and State, be amended to ensure adequate Implementation of Sustainable efforts in the Minnesota Building Industry?*

The problem formulation consists of two questions in itself:

1. How are Environmental Issues understood in the Building Industry?

2. How can current regulatory action, both Federal and State, be amended to ensure adequate implementation of sustainable efforts in the Minnesota Building Industry?

Solely for clarity, the first part of the problem formulation will be answered in section 7.1, while the second part of the problem formulation will be answered in section 7.2.

## 7.1 Concluding on Part -I of the Problem Formulation

As the building industry was recognized as a probable industrial sector to address climate change, the means of achieving this approach was seen through apparitions of sustainable development. The manner in which the building industry understands environmental issues was achieved by first looking at the three dimensions of sustainability and in particular the environmental dimension.

Here it was identified that the building industry indisputably influence heavily on the environment through emissions, but also influences heavily on natural resources and land degradation, through vast consumption amounts of energy, materials and land use. It is well understood that the Building industry consumes 30-40% of the world's primary energy, which is clearly more than a reasonable amount and therefore has inspired change in the industry. With that said, it is understood that there is no other industrial sector that impedes the natural environment in the sense of energy use and greenhouse gas emissions. However, even though the intense manner in which the building industry affects the natural environment is understood, there still exist significant barriers to successfully approaching this issue. In recognition of this, the latter part of the problem formulation exists.

## 7.2 Concluding on Part-II of the Problem Formulation

Again, the second part of the problem formulation was; *"How can current regulatory action, both Federal and State, be amended to ensure adequate implementation of sustainable efforts in the Minnesota Building Industry?"*

To answer this question it was initially necessary to identify the regulatory practices of the green building industry in the United States and that of the state of Minnesota. In the Introduction to part-II clarity was received as green building in the United States is seen as a voluntary issue. And with that, National influence is non-existent, other than the role-model position the federal government plays through procurement of green buildings.

In absence of National Governmental influence, recognition to the United States Green Building Council (USGBG) and their Leadership in Energy and Environmental Design (LEED) exists, as it is discovered to be the acknowledgeable face of green building in the United States. However, with the lack of National policy for green building many member states have created separate institutions for safeguarding green approaches, as exist the Center for sustainable Building Research (CSBR) and the Minnesota Sustainable Building Guidelines (MSBG).

As both of the two steering mechanisms, LEED and the MSBG, are active in the Minnesota building industry, their member organizations were seen as informative actors to aid in answering the second part of the problem formulation.

Through interpretation of the finding presented in chapters 5 and 6, various conclusions can be made as to what can amend green building efforts in the state of Minnesota, though the most prominent vision should focus on endeavors to:

- 1) Address financial and budgeting challenges, and
- 2) Educate all actors in the building industry

### Financial and budgeting challenges

There was an abundance of request for financial incentives from the organizations that participated in the questionnaire. There is a need for both federal and state governments to jointly create a "meaningful conservative tax rebate" and possibly impose penalties for disproportionate consumption levels. Joint effort between state representatives and the national government is stressed. (Appendix D).

In addition, budgeting in the US needs to be re-considered as non-renewable resources such as gas, coal and oil are subsidized, where as "things that are green" are not. This is seen as a disincentive and therefore needs to be address in order for green building efforts to grow in the United States. (Carter 2007, appendix B).

### Education

It is apparent that education throughout the green building market in the United States, and that of the state of Minnesota is lacking. There was an overall agreement that the actual cost of building green is overshadowed by initial costs. This is evidently due to a lack of knowledge of tools such as Lifecycle analysis and Lifecycle costing which can be useful to determine projections for the operational cost of a building throughout its entire lifecycle.

Received is the understand that through green building education, the true benefits of going green will be uncovered and there will be a significant increase of public acceptance. In addition, by further educating the market, it will embed the necessary knowledge to comply to performance based regulation which in turn supports the likelihood of innovation and therefore will support market transformation.

# References


Benson, L. 2007. LEED Buildings Catch on in Minnesota. Minnesota Public Radio. http://minnesota.publicradio.org/display/web/2007/06/04/leedbuilding (Accessed October 20th, 2007).

AIAM. 2004. American Institute of Architects Minnesota. Climate Change Position Statement. AIA Minnesota Board of Directors. http://www.aia-mn.org/committees/pdf/cote/Climate_Position_AIAmn.pdf (Accessed 10.04.07).

Annandale, David, Angus Morrison-Saunders, George Bouma. 2004. The Impact of Voluntary Environmental Protection Instruments on Company Environmental Performance. Business Strategy and the Environment. 1-12. Wiley InterScience.

Carr, Bob, John Holdren, Martin Khor Kok-Peng, Nathalie Kosciusko-Morizet, Claude Martin, Tony McMichael, Jonathon Porritt, Adair Turner, Ernst Ulrich von Weizsacker, Ni Weidou, Timothy Wirth, Cathy Zoi. 2005. *Meeting the Climate Challenge*: Recommendations of the International Climate Change Taskforce. London. The Institute for Public Policy Research.

Carter, N. 2001. The Politics of the Environment. Ideas, Activism, Policy. Chapter 11. 286-314. Cambridge University Press.

Christensen, David, Christophe Khalife, Sylvain Latouch, Benjamin Lindell, Jacob Rasmussen. 2006. Aiding Industry: Green Challenges for 3rd world Industrial Development. 7th Semester Project. Aalborg University.

CICA. 2002. Industry as a Partner for Sustainable Development. Confederation of International Contractors' Associations. United Kingdom. Confederation of International Contractors' Association and United Nations Environmental Programme.

Climatology. 2007. Minnesota and United States Climate Extremes. Climate Extremes for Minnesota. http://climate.umn.edu/doc/historical/extremes.htm (Accessed September 13th, 2007).

CSBR. 2006. Center for Sustainable Building Research. College of Design. University of Minnesota. http://www.csbr.umn.edu/ (Accessed October 18th, 2007).

C3. 2007. Climate Change Central. The Natural Greenhouse Effect. http://www.climatechangecentral.com/default.asp?V_DOC_ID=849 (Accessed 15.05.07).

ES. 2007. Energy Star. US Environmental Protection Agency. US Department of Energy. http://www.energystar.gov/index.cfm?c=home.index (Accessed October 20th, 2007).

Engfeldt, L.G. 2002. The Road from Stockholm to Johannesburg. *United Nations chronicle online Edition.* http://www.un.org/Pubs/chronicle/2002/issue3/0302p14_essay.html. (Accessed March 29, 2007).

EIA. Nd. Kyoto Protocol. Energy Information Administration. Official Energy Statistics from the US Government. http://www.eia.doe.gov/glossary/glossary_k.htm (Accessed 16.05.07).

Falleti, T. 2004. A sequential Theory of Decentralization and its effects on the Intergovernmental Balance of Power: Latin America cases in Comparative Perspective. http://kellogg.nd.edu/publications/workingpapers/WPS/314.pdf (Accessed September 4th, 2007).

Fernandez, J. n.d. The Ecology of Construction Materials. Emergent Materials Workshop. MIT. http://ocw.mit.edu/NR/rdonlyres/Architecture/4-493Spring-2005/5DC5266E-3BBA-4C9C-8884-2ED1DBB65DA1/0/4493lec1.pdf . (Accessed August 10th, 2007).

Franklin Associates (FA). 1998. Characterization of Building Related Construction and Demolition Debris in the United States. The US Environmental Protection Agency. Tech Law. Prairie Village, Kansas: FA.

Geology. 2007. Minnesota Geology – Map of Minnesota. http://geology.com/states/minnesota.shtml (Accessed September 13th, 2007).

GUP. 2006. Center for Sustainable Building Research, University of Minnesota. Good University Practice. http://www.guni-rmies.net/observatory/bp.php?id=66 (Accessed October 18th, 2007).

Gupta, A. and M.G. Asher. 2000. *Environment and the Developing world: Principles, Policies and Management*. New York: John Wiley & Sons, Inc.

Gillaspy, T. 2006. Rate of Population Growth in MN rebounds. Minnesota Department of Administration. http://www.admin.state.mn.us/documents/newscenter_20061222_populationgrowth.pdf (Accessed September 13t, 2007).

Hecht, L. 2007. What Really Causes Climate Change. Executive Intelligence Review. Volume 34. Number 9. March 2, 2007. http://www.larouchepub.com/eiw/public/2007/2007_1-9/2007-9/pdf/06_709_sci.pdf (Accessed 14.05.07).

Hoffman, A. 1999. Institutional Evolution and Change: Environmentalism and the U.S. Chemical Industry. Academy of Management Journal. Boston University. Vol. 42. No. 4: 351-371. http://www.bu.edu/cees/research/workingp/pdfs/9904.pdf Accessed August 30th, 2007.

Horvath, A. 2004. Construction Materials and the Environment. Annual Reviews. http://www. arjournals.annualreviews.org (Accessed 30.07.2007).

Howard, J. 2002. The Federal Commitment to Green Building: Experiences and Expectations. The Office of the Federal Environmental Executive (OFEE). http://www.ofee.gov/sb/fgb_report.pdf (Accessed October 3rd, 2007).

IISD. 2007. Climate Change and Foreign Policy: An Exploration of options for Greater Integration. International Institute for Sustainable Development. http://www.iisd.org/pdf/2007/climate_foreign_policy.pdf (Accessed July 5th, 2007).

Junnila, S. 2004. An Environmental Impact of an Office Building throughout its Life Cycle. Espoo, Helsinki University of Technology Construction. Economics and Management. Doctoral Dissertation. http://lib.tkk.fi/Diss/2004/isbn9512272857/isbn9512272857.pdf (Accessed April 20th, 2007).

Jones, D. 1998. Architecture and the Environment. Bioclimatic Building Design. Laurence King Publishing. London.

Kibert, C. 2002. Policy Instruments for a Sustainable Built Environment. http://www.law.fsu.edu/journals/landuse/vol17_2/kibert.pdf (Accessed September 21st, 2007).

Koeppel, S and D., Vorsatz. 2007. Assessment of Policy Instruments for reducing Greenhouse Gas emissions from Buildings. United Nations Environmental programme Sustainable Building and Construction Initiative- SBCI. http://www.unepsbci.org/Ressources/ReportsStudies/ (Accessed October 15th, 2007).

Landman, M. 1999. Summary of Thesis Findings and Recommendations. Breaking through the Barriers to Sustainable Building – Insights from Building Professionals on Government Initiatives to Pro-

mote Environmentally sound practices. http://egret.net/tufts/summaryoffindings.htm (accessed September 21st, 2007).

Lazarus, N. 2005. Potential for reducing the Environmental Impact of Construction Materials. Bio Regional Development Group. January 2005. http://www.bioregional.com/programme_projects/opl_prog/zsquared/BioRegional%20-%20Jan%202005%20%20Potential%20for%20reducing%20the%20impact%20of%20construction%20materials.pdf (Accessed August 10th, 2007).

Lemos, Maria Carmen Lemos, Arun Agrawal. 2006. Environmental Governance. In Annual Review of Environment and Resources. Vol. 31. 297-325. http://arjournals.annualreviews.org/doi/abs/10.1146/annurev.energy.31.042605.135621 (Accessed August 28th, 2007).

McRandle, P., and S. Smith. 2006. The Top 10 Green Cities in the U.S.: 2006. The Green Guide. http://www.thegreenguide.com/doc/113/top10cities (Accessed September 21st, 2007).

MNCC. 2006. Minnesota's Actions that help Mitigate Climate Change. Minnesota Climate Change Advisory Group. http://www.mnclimatechange.us/ewebeditpro/items/O3F12448.pdf (Accessed October 3rd, 2007).

MN EPA. 1999. Guidance on Environmental Concerns Associated with Building Demolition. Minnesota Environmental Protection Agency. http://www.pca.state.mn.us/waste/pubs/w7-01.pdf (Accessed September 25th, 2007).

MN State. 2003. Minnesota State Demographic Center. Minnesota Population Estimates: and characteristics of the current population. http://www.demography.state.mn.us/estimates.html (Accessed September 13th, 2007).

MN State. 2006. Minnesota State Demographic Center. Minnesota Population Estimates: and characteristics of the current population. http://www.demography.state.mn.us/estimates.html (Accessed September 13th, 2007).

MSBG. 2006a. The State of Minnesota Sustainable Building Guidelines: Buildings, Benchmarks & Beyond. www.msbg.umn.edu (Accessed March 17th, 2007).

MSBG. 2006b. B3-MSBG and LEED Comparison Table. The state of Minnesota Sustainable Building Guidelines: Buildings, Benchmarks & Beyond. http://www.msbg.umn.edu/support.html (Accessed October 21st, 2007).

MSN. 2007. Minnesota. MSN Encarta. http://encarta.msn.com/encyclopedia_761572444/Minnesota.html (Accessed September 13th, 2007).

OEE. 2005a. About the R-2000 Standard. Office of Energy Efficiency. Natural Resources Canada. http://www.oee.nrcan.gc.ca/residential/personal/new-homes/r-2000/standard/standard.cfm?attr=4 (Accessed October 14th, 2007).

OEE. 2005b. The indoor air quality pick-list. Office of Energy Efficiency. Natural Resources Canada. http://www.oee.nrcan.gc.ca/residential/personal/new-homes/r-2000/standard/indoor-air-quality.cfm?attr=4 (Accessed October 14th, 2007).

OSHA. 2004. OSHA Facts. U.S. Department of Labor. Occupational Safety and Health Administration. http://www.osha.gov/as/opa/oshafacts.html (Accessed July 5th, 2007).

Pic. 2007. Pictures of St. Paul and Minneapolis. Retrieved from: http://content.answers.com/main/content/wp/en/8/81/Saint_paul_mn.jpg and http://images.google.com/imgres?imgurl=http://www.destination360.com/cruise-

destinations/images/minneapolis-skyline-mississip-pi.jpg&imgrefurl=http://www.ljfind.com/search/craigslist%2520mn%2520minneapolis/&h=332&w=415&sz=23&hl=en&start=1&um=1&tbnid=43hCDFtmF1DuQM:&tbnh=100&tbnw=125&prev=/images%3Fq%3DMinneapolis,%2BMinnesota%26svnum%3D10%26um%3D1%26hl%3Den%26sa%3DG (Accessed September 13th, 2007).

Pinter, L. and D. Swanson. 2004. National Strategies for Sustainable Development: Challenges Approaches and Innovations in Strategic and Co-ordinated Action. Winnipeg, Manitoba. Institute for Sustainable Development. http://www.iisd.org/pdf/2004/measure_nat_strategies_sd.pdf (Accessed September 19th, 2007).

Roadmap. Nd. Climate Change. http://www.roadmap2010.eu/wisd/pdfs/3-17.pdf (Accessed 14.05.07).

Remmen, A., and M. Thrane. 2005. Life Cycle Thinking. In Tools for a Sustainable Development (Preliminary Edition), ed. L. Kornov, H. Lund and A. Remmen, 199-208. Aalborg: Aalborg University.

R&L. nd. La Cite des Science et de l'Industrie. Resource and Lexicon. Ton of Oil Equivalent (TOE). http://www.cite-sciences.fr/lexique/definition1.php?num_page=7&iddef=372&radiob=&recho=&resultat=&habillage=glp&lang=an&id_expo=13&id_habillage=24 (Accessed April 15th, 2007).

Ruark, R. 1954. Something of Value. Famous Quotes. http://pages.prodigy.com/RETURN/value.htm (Accessed October 24th, 2007).

SBCI 2006. Sustainable Buildings and Construction Initiative. UNEP. http://www.unepsbci.org/About/background/ (Accessed October 2nd, 2007).

Scott, R. 2001. Institutions and Organizations. Second Edition. Edited by L.L. Cummings and Peter J. Frost. Published in the Organizational Sciences. Sage Publications: Thousand Oaks, London, and New Delhi.

Smink, C.K. 2002a. Public Environmental Regulation. In Modernization of Environmental Regulation. Masters Thesis. Department of Development. 47-82. Aalborg: Aalborg University.

Smink, C.K. 2002b. Market Regulations. In Modernization of Environmental Regulation. Master Thesis. Department of Development. 83-104. Aalborg: Aalborg University.

Strohmer, S. 2006. Interview with William H. Sanders III. Green Building Focus. Bridges Vol. II. http://www.ostina.org/index2.php?option=com_content&do_pdf=1&id=1463 (Accessed September 17th, 2007).

TNA. 2006. The National Academies. Understanding and Responding to Climate Change: Highlights of National Academies Reports. National Academy of Science. http://dels.nas.edu/basc/Climate-HIGH.pdf (Accessed May 14th 2007).

UN. 2004. Agenda 21. UN Department of Economic and Social Affairs. Division for Sustainable Development. http://www.un.org/esa/sustdev/documents/agenda21/index.htm (Accessed April 4th, 2007).

UN. 2007. How the UN works. Welcome to the United Nations. The United Nations. http://www.un.org/Overview/uninbrief/chapter1_intro.html (Accessed April 4th, 2007.07).

UNEP. 2007. Buildings and Climate Change: Status, Challenges, and opportunities. United Nations Environmental Programme Sustainable Building and Construction Initiative-SBCI. http://www.unep.fr/pc/sbc/documents/Buildings_and_climate_change.pdf (Accessed April 23rd, 2007).

US EPA. 2003. EPA Strategic Plan: Direction for the Future. 2003-2008. http://www.epa.gov/ocfo/plan/2003sp.pdf (Accessed October 18th, 2007).

US EPA. 2007. Municipal Solid Waste. US Environmental Protection Agency. http://www.epa.gov/epaoswer/non-hw/muncpl/facts.htm (Accessed September 25th, 2007).

USGBC. 2007a. About the USGBG. United States Green Building Council. http://www.usgbc.org/DisplayPage.aspx?CategoryID=1 (Accessed May 15th, 2007).

USGBC. 2007b. Leadership in Energy and Environmental Design. United States Green Building Council. http://www.usgbc.org/DisplayPage.aspx?CategoryID=19 (Accessed October 18th, 2007).

Vanegas, Jorge A., Jennifer R. DuBose, Annie R. Pearee. 1995. Sustainable Technologies for the Building Construction Industry. Proceedings of the Symposium on Design for the Global Environment, Atlanta, GA. November. http://maven.gtri.gatech.edu/sfi/resources/pdf/CP/CP001.PDF (Accessed July 5th, 2007).

WBCSD. 2007. Energy Efficiency in Buildings: Business realities and opportunities. World Business Council for Sustainable Development. http://www.wbcsd.org/DocRoot/LgTO9cOXAeq991jXcwx0/EEBSummaryReportFINAL.pdf (Accessed October 20th, 2007).

World Bank. 2000. *Greening Industry: New Roles for communities, Markets, and Governments*. Oxford University Press, Inc.

World Bank. 2001. What is Sustainable Development. The World Bank Group. http://www.worldbank.org/depweb/english/sd.html (Accessed April 10th, 2007).

Yin, R. 2002. Case Study Research. Design and Methods. 3rd edition. Thousand Oaks: Thousand Oaks Sage Publications.

# List of Appendices

# Appendix A – Interview with Richard Strong

BWL: Benjamin William Lindell

RS: Richard Strong

The Interview was conducted in Person June 19th, 2007.

RS: So how this evolved as a rating system, was in Hennepin co, in 1995, even before LEED, Hennepin Co wanted to know how sustainable buildings were for them, ….So we applied to the state and received about 50,000 dollars in funding to come up with a rating system on buildings. Now rating systems were not exactly new, there was? In England, there was PBACK in Vancouver, rating systems that had evolved two or three of them at the time. Now this was Pre-LEED, we didn't even know about LEED when we were developing this. So we developed this system, and made it a bit more local to MN. (…) The UofM developed it for Hennepin CO so it had a lot of educational overtones, it kind of taught you why you would want sustainable buildings. At that time there was a lot of Grey areas when people talked about Green buildings and architecture. So it was more important to tell people why it's important to do Green buildings, so it really had a large educational component to it. LEED came on about a year and a half later. They had a point system, they were. They required that you register and pay money so it was more like a business. This was not a business. You know you could do one point, 2 points, 5 points, 10 points, they were points but they were not levels of achievement. Anybody could do anything for certain points. They didn't correspond to anything. We did the points so companies could compare, but we soon realized that the points and the environmental impacts did not correlate. One point for a parking lot, or 1 point for ten percent better energy, the environmental impacts are not the same there, yet there are rated the same. So we thought it was foolish to even have points. So when we re-developed, we decided to look at outcomes and it was strictly outcomes, and there was a baseline that you had to meet. In order to be a sustainable building you at least had to get to this point. You could go further, but it was kind of a baseline. So it because kind of a code in a way. Building codes are kind of baseline. So the State of MN came back to the university and said that we want MN sustainable guidelines for all state buildings. And Right now there are 60 buildings that are to be monitored to this day. It was only for new construction. And there was no size limitation or functional limitation. So the center here put together the MSBG. And so it's required to all state buildings. Hennepin County has adopted it, Ramsey County is going to us B3 or LEED, and so people are taking it on your not taking it on. It really just has a different emphasis than LEED. You can either meet B3 or you don't. There isn't silver; platinum or Gold, …There is kind of 3 things inside. One is kind of a yes/no questions. Either you do things or you don't. You protect habitat or you don't. Etc…the second one is processes. You can take action or you cannot take action. Like looking at a life Cycle costing of energy or fuels. You don't have to chose it, you just have to do processes that allow you

to look at that maybe what your choosing might not be the cheapest over the life of the building. You can talk to the building over and talk about that choice and possible make that choice. And then there's thresholds, 30% less energy, 50% less water, 75% recycling of waste that you either meet or you don't meet. So there is again, the educational component, that comes through there again, where were not forcing you to do that, but we certainly want you to look at LCA, LCC, because they are cardinal tools that you use to make different decisions with data that you would not usually know.

BWL: **Who is responsible for conducting an assessment as such?**

RS: The architect, we give them all the tools to conduct the assessment, they conduct it and then they decide what they want to do. We just feel that life cycle assessment, Life cycle costing is so essential in environmental determination that we put it in there. Now a lot of these things are very new to architects. And I help them through this process to show them what to do and explain why they might be doing it. And allow them the option to decide what they want to do. So the system is by law required for all state buildings. I do not enforce it, I just monitor it and I find out what portions of the guidelines are working, which one aren't, rewriting, making the work…assisting with anybody that would have difficulties with the guidelines and then monitoring to make sure they are submitting there reports. So. Another different things with LEED, where you could have one meeting separate all the points up, and then submit them to LEED, get a plaque, and never talk again. You actually have to talk in various phases and coordinate throughout the process and submit documentation. And then again, we realize that certain things have to be done early in the process, in order to create sustainable buildings…so we do a lot of no-build, no expand options at the beginning, …again, we do not say that you have to reduce footprint by 30 percent, we say you have to look at these things to see if there's things you can do to not build or reduce footprint and then we show the impact of those reductions. As far as cost, operating cost, global warming potentials, solid waste reduction, things like that. Kind of an educational tool that people say hey wow, if I eliminate 1000sq feet, over the life of the building, maybe 100tons of global warming potential not realized. Now this is not 3rd party evaluated. Where LEED is…you have to send all your documentation to LEED, and they evaluate if you met the point or not. Here you have to do it. You have to evaluate if you met the point or not, so its first party. Its only on the…we say that the integrity of the profession is here. And if they want to blow it off they can blow it off. If they really want to do it, they can do it. And most cases because it's the law. There's no penile …I suppose kind of consequences. But it is a law, and most people say if it's the law, I'm going to do it to the best of my ability. So. That's the only thing it's based on. So it does not have a real threat of not doing it. Now is the information correct? We have a sign off sheet that says if you filled it out correctly and you sign off and say that you did…that's all we have is a signature. We don't go through and verify that they done it right, we go through and see if it's within the range, and they

understand it, and things like that and they've done the proper energy simulations and they've reached the target. So. Its first party verification so who knows? Its kind of on the Honor system.

BWL: **Can you briefly introduce yourself and your job function with the MSBG?**
RS: To monitor the MSBG, I'm a data collector and I assist architectural firms in helping them through it and provide the tools that they need to get through the system.

BWL: **When and why were the MSBG composed?**
RS: It was a state contract that they came to us to come up with a system cause they wanted to use it on all state buildings …and they put some thresholds on there. They put the energy thresholds on water, LCA's, and the Life cycle costing, they wanted to make sure that architects were making good decisions on materials, energy systems over the life of the building, rather than initial cost.

BWL: **what year was that?**
RS: That was in 2003, and we took a couple of years…launched as a pilot in 2005, and actually went online in 2006.

BWL: **What are the goals and Objectives of the MSBG?**
RS: The goals and objectives are probably 5. 1) To reduce energy. And there are threshold things. It's very strong on commissioning, which is indoor air quality, its very strong on water reduction, very strong on site issues. There's a huge site section in there that LEED doesn't even come close to talking about…those areas are very strong here. And those are the major goals. Not in order of emphasis. We don't say one is over the other. You cannot choose.

BWL: **What are the main environmental problems the MSBG seek to address?**
RS: Global warming, the site issues, the water issues, and the energy issues, and also on indoor air quality.

BWL: **What is the relation between the B3 program and the MSBG?**
RS: B3 program is a little bit larger then MSBG. MSBG is one portion of B3, the other portion of B3 which another firm is doing, is looking at all the energy consumption of all the state buildings…there is about 7000 state buildings, including schools. So they're trying to find out how much electricity it uses, gas, energy, coal, whatever, and then they look at them on a range, and they can address the low performing buildings.

BWL: **It's apparent that Environmental demands towards companies' affiliated with the MSBG are based on local legislation and regulation. Why are the demands not based on US or even International legislation and regulation?**

RS: Because state building codes are state. Even towns can accept building codes or not accept them. For a long time, out of state of MN didn't have building codes, but now they have to adopt something, and its more the fire codes that's driving it cause these fireman that want to fight these fire, I'm mean that's essentially why the building code was invented, to fight the fire inside…people get out of buildings fine, normally, its when you have to go into the building to fight the fire that you know the construction of the building.

BWL: **Where is the accountability if everything is voluntary?**

RS: They feel that local communities should set their own standards. Yeah it's a different system. Well. I kind of think its self-relieant…the people at the level know more then the federal government. And certainly the federal government has not been string advocate on these things.

BWL: **To what extent do the companies comply with the environmental demands of the MSBG?**

RS: Oh okay…they. I think they really want to comply and do it. There have only been a couple of setbacks. We had to send the legislation out to somebody.

BWL: **What happens if the cases where the companies do not comply?**

RS: Nothing. There is no stick here.

BWL: **If the companies do not comply then what is the reason for this?**

RS: For a Variety of reasons. They think that they don't fall into the guidelines. And there are a few, and we are going to exempt them out.

BWL: **So, basically if companies do not comply, nothing happens?**

RS: Well, we haven't gotten to that point yet. I'm not sure if nothing happens. We are going through a list of 60 and we've got 7 that don't seem to be in compliance, and I'm kind of running them down.

BWL: **Who are the regulatory actors involved with ensuring the Guidelines are adhered to?**

RS: Its come out of the department of commerce and the state architectural office, dept of administration, they are the 3 pushing these issues.

BWL: **Can you explain the chain of authority, (Actors involved), when the MSBG are applied to project?**
RS: We work for the state; they are the entity that wanted this to happen. It came out of a legislative bill. So it is a law in MN, the dept of commerce was the ones that wrote the bill and it was passed and the department of commerce gave it to the state architect office to administer and the architect office gave it to us monitor.

BWL: **Who would be an appropriate contact?**
RS: Linda Cane, she is at the state architect office.

BWL: **Currently, what is the norm in the United States for the construction of buildings regarding the energy efficiency? And in Minnesota it would be solely the MSBG?**
RS: Well, it's all simply building code. And ours is jacked up a little bit only for state buildings.

BL: **Would you say for the most part LEED is not required?**
RS: It is all voluntary. In fact, you can get LEED certification and not do anything with energy efficiency. Now LEED is coming in there and setting standards, similar thresholds to what we did.

BWL: **Does the MSBG have any affiliation with other Sustainable Building programs in the US or International?**
RS: Not really, we certainly have a lot of contact, and we are participating in other ones, like green builds in Canada, one of our member here who helped with this is also helping in Green builds in Canada, one of our members here is on the local boards of LEED, so we interact with those…When people come to us and ask what rating system they should use, we don't say B3. We say what do you want to get? What are your outcomes? What's your environmental sensitivity? If you want to get a plaque on the wall use LEED, if you want to look at outcomes use B3. What are you more comfortable with? We don't push anyone of the 3; we understand all 3 of them. Anyone of the 3 will get you a little more environmentally friendly.

BWL: **How many past and current projects have been under the MSBG?**
RS: There are 60 projects right now. And the appropriate fund for building projects are every 2 years. There will be probably be 30-40 in 2008.

BWL: **Do you physically visit these sites?**
RS: I don't go the building sites; unless I have to…I don't think I've been to one. I do go to the firms, and do training sessions with the firms and do training sessions with the project teams. Show them how to use it.

BWL: **Would you say that the MSBG influence in these projects raises the environmental performance of the project(s)? In what ways?**
RS: I think so. Certainly the threshold things do. And then the educational aspect comes into play.

BWL: **Do they actually influence the composition of the guidelines?**
RS: I don't think so. They asked for guidelines of thresholds.

BWL: **In cases where state money is not involved, in your opinion, are contractors and large building organizations promoting buildings to go beyond the standard building codes in MN and actually 'raise the bar" and abide by guidelines such as the MSBG?**
RS: Well, there's been some interest and again, 6 months from now it will be a little bit different. Now, St. Paul has taken up the b3 and you can follow that or LEED. LEED has such a presence in the market place, that people know about it…and think that LEED is sustainable. There is actually a slogan that they got beat up on that said…if it isn't LEED it isn't Green, and they really got whacked on that. They've taken that away. They are really pushing the fact that if you follow LEED your sustainable, and B3, what do you got? You've either met it or you don't. Actually people suggested that if there should be kind of b3, b3plus, and b3 plus-plus…so there is that the rating drives LEED and some people like that…LEED does not ever say that by doing LEED they will create a sustainable building. They only transfer the industry…Transformation of the industry. That's what they're trying to accomplish. There not actually trying to accomplish sustainable buildings…people might say maybe buildings are more sustainable because of LEED, but that's not there main focus.

BWL: **Can you give me an example…?**
RS: Well, that there are greener practices in industry and things like that. So they're about market transformation. They're not about sustainable buildings…Setting a market standards.

BWL: **Are contractors hesitant to build greener buildings? Possibly for Market concerns?**
RS: I don't know about that. They follow the guidelines because they have to…I don't know if they are hesitant about that…They want to make sure what they are doing is correct and is going to be reliable to do. Sometimes they don't like that there is LEED and B3 and they just want to learn one system.

BWL: **What are the shortcomings of following the MSBG?**
RS: Well, that it is fairly new? Barriers? Well, education is certainly a barrier. And why you would be doing it, which we are trying to get around. There is also the recognition, like I talked before; people seem to want to have that. But we've noticed that firms that are heavily in LEED, they get

to a point and they cant get over the bump. They cannot get further. They need points and they chase points and are there, and they can do that. But then it doesn't give them the satisfaction that maybe there, well, they get the points but they don't get the outcomes. Where we are trying to give the outcomes. Were saying okay… you've saved this much carbon, this much land. Things like that. With energy its easy to do the outcomes and with indoor air quality its harder to do the outcomes. So all these have a variety of outcomes…we are working on a sheet that gives you the outcomes…so you've done this…here's a standards building, your building is this much better as far as water, energy, waste, indoor air quality.

BWL: **how do you monitor the guidelines? How do you evaluate the progress of the guidelines?**
RS: I just monitor it.

BWL: **Are they effective?**
RS: I don't know…I don't know if they are effective. Well, hopefully we will be rolling up all the data soon. . I mean this is the first year…so we haven't rolled up the data. We will say…so, we have eliminated this much waste, we've eliminated… etc.

BWL: **So you haven't compiled your results?**
RS: It will be once a year.

BWL: **Sustainable development is said to have three pillars or dimensions, respectively and Economic, Social and Environmental. In what way to you feel Sustainable Development, in terms of the Minnesota Building Industry, addresses the three pillars/dimensions of sustainability?**
RS: We only look at the environmental…We do have some cost issues there, but we don't say by doing this, your going to save this much money…or …its not the emphasis behind it…socially or economically, were just looking at environmental impacts.

# Appendix B – Interview with Rick Carter

BWL: Benjamin William Lindell

RC: Rick Carter

The Interview was conducted by telephone on October 9th, 2007.

BWL: **Can you please state your name, your role and responsibilities with LHB?**

RC: My Name is Rick Carter, and my title is Senor Vice President. My primary role is that I lead our Minneapolis office. I'm the Project Manager for the B3 project, which is inclusive of the guidelines, but it also has sort of a benchmarking component, which is sort of the bigger part of our project.

BWL: **How did LHB become affiliated with the B3 project and the MSBG?**

RC: Its sort of a two-part story. Rich Strong, he may have told you this, but when he was with Hennepin County he got a grant from our office of environmental assistance, hired a couple of consultants fro HLK and brought together a lot of volunteers to create what was then called the Hennepin county sustainable design guidelines, which was probably about 1995, and I was one of the volunteer members of that group. That transformed into the Minnesota sustainable design guide (MSDG) and was sort of a starting point when we submitted the proposal in 2001, requiring the benchmarking and the guidelines and they did a request for proposal to consultants in mind in 2002, and we (LHB) responded, the Weidt group and the center for sustainable building research wit some other players, but we were the 3 main players and were selected in 2002.I may have the year wrong, but its somewhere around there.

BWL: **How would you describe the institutionalization of green building in the state of Minnesota? (In which way is it safeguarded?) What are the main actors in MN?**

RC: Its sort of a very quickly changing landscape. Hennepin County and the MSDG came to be about the same time as USGBC and LEED. SO in the early days, around here, whether you were a County or a private entity, you were likely, and in our case because we have been sort of self-professed and practicing green design as an engineering and architectural firm. When we did a project from the mid 90's on, we used the MSDG as our tool. So I can't really speak universally, I would say that we had a tool that was a little bit ahead of LEED. LEED came into pilot in 1997, and LHB did the only LEED pilot building in Minnesota at the time. So there is a lot of activity around Green design but it wasn't typical like, I would say more east coast -west coast attraction to LEED. SO, I think that it's always been there, it just is not very well documented because there was no registration and certification, it was a free tool online that anybody could use at anytime.

BWL: **Is there Certification now?**

RC: Not for that program. The way it works now. The law passed in 2001/2002 requiring that any project that got any bond proceeds from the state to build a new building, (its very specific about new buildings), is required to use these guidelines. So, there still is no certification. The guidelines were developed from the MSDG with LEED in the background and very deliberately were built by consensus by the agencies that get the money (the University of Minnesota, the department of Natural resources, etc.) so they are in turn self-policed. So whoever gets the money is accountable to use the guidelines. So what we do…is, they are required by the guidelines to submit documentation at the end of each phase. So we, by we its really rich, Rich tracks the projects and, in the 2 years, (there was no bonding bill in 2004), so from 2005 to 2007 we have established about up to 65 projects now that are actively using the B3, MSBG. We know there are many more projects that use it but they are not required to use it.

BWL: **As you've designed some major projects in the past, could you describe how often the building owners/customers are looking for a green building, in the sense of energy efficiency, indoor air quality, etc? Is it truly a growing trend?**

RC: Absolutely, yes! I would say that almost, and it hard to be sure, but I would say in almost every case, almost without exception, a client comes to us today because they are interested in Green building and energy efficiently, and mostly because every client is. If we get a request for proposal today from a public entity, it will always have green building in it, almost without exception. It's a little hard to tell how high of a priority it is for them, but it's getting more and more. The last project we just got, was a dorm building at the Morris campus which is a small town in western MN, at the University of Minnesota Morris campus, and I would say that their number one selection criteria was experience with Green Building.

BWL: **What is the regulatory process when you design a so-called "green Building"? I guess I mean, when you design a building to be LEED certified it is 3rd Party regulated, correct? And how about when you design a building under the MSBG? Who regulates this? What is the regulatory approach towards sustainable building in the state of MN?**

RC: I would say, […] from a practical standpoint, its not really regulated, there's not agency that oversees the guidelines that the guidelines are followed. The stick is the funding. If an agency thumbs there nose at this requirement and didn't follow the guidelines and didn't have there project and use them and submit the documentation and show the performance outcomes…well, then the legislature would have a very good case for not giving them money for future projects. The only really absolute measure goes back to the original law, […] it really only had one hard requirement and that was that every building had to be designed that it must out perform our current energy code by at least 30%. So, like with LEED, in order to do that you have to do energy modelling. So

every project, at least that we are aware, that's going through this process is doing energy modelling, on the schematic or design development level, and they are designing buildings that model to perform 30% better than code. So it's fairly safe to say that it's happening. The other thing that happened in Minnesota, do you know about Conservation improvement program, the CIP program? So the CIP program has resulted in our larges utility company EXCEL, which is Gas and Electrical for most of the metro area. For any building that is 50,000sq ft. or more, that's new or renovated, they fully fund a very extensive energy-modelling program, so they pay for it themselves. They pay for the consultant teams, the design teams. They pay for the contractor to do estimating, and they do that whole 9 yards…and a lot of the projects that are in our database fall into that category of 50,000sq ft or more. So they get that for free.

BWL: **Do you feel that the current approach towards regulating green buildings is adequate, or do you think that technology is ahead and that possibly regulation could be stricter?**

RC: Regulation could definitely be stricter. Its kind of a whole another discussion that I will just simply make you aware. We had a fairly significant energy policy passed at a state level last year. And part of that policy, we had a 25 % renewable energy by the year 2025 law passed …so that bears on the utility companies and not the public building owners. In addition there is a desired outcome to reduce emissions by 80% by 2050. And as a part of that the governor is required to report back to recommend to the legislature, in a way, a set of policies and regulatory changes that would get us to that goal. So he established a group called the climate change advisory group that's meeting over the course of the year and making specific recommendations, and I'm on that committee, a very large group about 50 people. […] All public buildings will have to be designed to the regiment of the 2030 challenge. […] An architect named ED Mazarin basically said that we should design buildings, by the year 2030, that are net emission free. To get there, without freaking people out completely, he said that what we should do is take the average building today, in other words, the average building that sits out there in any building place in any region. When we design a new building today, we would design it 50% better than that, in terms of emissions, which is essential energy efficiency, and he actually has yearly increments that step from 50% to 100% between now and 2030. So basically that would mean that probably we would design building today that are maybe at or above 30%better than code, but we have a fairly decent energy code in Minnesota. More importantly it would just continue to ramp up over the next twenty years. […] So that's one of 10…there are others…[…] It's a pretty good time right now. We have a democratic house and senate and a republican governor who is, astoundingly enough to me, completely committed to reducing greenhouse gas emissions and improving energy efficiency. So I think there will be a law passed in the state and the legislature in the spring that will have a lot more aggressive approach to energy. […] So I think the time is right. I think a lot of people, including the governor himself, may not realize we have these B3 guidelines right now. Another thing… it's important to

know about the benchmarking. 2/3 of our project is benchmarking. The law required was to identify every public building in the state,( all schools, city, county and state buildings) collect the energy data from them, the actual performance and basically do reverse energy modelling to benchmark them. To basically benchmark them against the way they should perform. For example, against a building code as opposed to some national database, and then feed that info back to the people who own those buildings so that there investments are targeted correctly towards the building that could give them the most bang for the buck. With the theory being that a lot of money spent renovating buildings in Minnesota. All the money in that goes towards improvements that would add energy efficiency, through window replacement, furnace, etc. You would get 2-3 times more Return on Investment if you were investing in buildings that need that improvement as oppose to just doing it across the board.

BWL: **How close are you to collecting all the data?**
I think we are about ½ way through the initial data collection, 1/3 of the way through the evaluation of the data we've collected.

BWL: **My understanding is that your organization has been affiliated with projects steered by LEED and by the MSBG. Could you explain the strengths and shortcomings of the two programs? (Which is most beneficial for your organization?)**
RC: The city of Minneapolis and St. Paul went through the process of trying to decide whether to use LEED or B3 for there own buildings or other buildings developed in their cities. And in both cases, both cities decided on there own buildings first, and then could contemplate on a later date required others building in there cities. If you want a set of guidelines and you want to hold yourself to a standard that has a national recognition, 3rd party verification, there is only one and that is LEED. If you want one, that in my opinion, would drive you towards higher performance and have more regionally applicable criteria and have a higher standard across the board, I would say it's the state guidelines because that's the way we designed it. The City of Minneapolis decided to go with LEED so they passed a resolution requiring them to always use LEED to design any building. […] The city of St. Paul passed a resolution saying that every building they do […] either has to use the B3 guidelines and submit to CSCR at every stage, just like a state project would, or at the discretion of the project manager of the city, they can get the building LEED silver certified. So the original question was how would I compare or contrast? Well, I talk about this with people all the time, and because there are so many other choices you have green communities […] we have Minnesota Green Star, […] 2030 challenge, etc. so basically I would say to any organization or any building owner, pick a set of guidelines because that's a good tool to get everyone communicating and establish goals. And try and pick the one that works the best for you...we have had a couple projects where the clients wanted to be LEED certified because of the National attention that would help them sell stuff. And that makes a lot of sense. But getting LEED certified

doesn't make your building any better. It might get you more bang for the buck for having done what you did. I think that the 2 biggest things are things that LEED is gravitating towards, in addition to being regionally specific which is probably something that will happened with LEED. The goal all along in every step of the way with B3 was to try and move away from prescriptive, they want performance goals. I think LEED is doing that. And the other is to be a little bit more mindful of the process and put emphasis on the process. I tell people all the time that the absolute spend enough time programming and come up with creative ways of building less space in the first place. And that's a requirement in b3 and it's not even in the LEED system in any way, shape or form. There is no credit in LEED […].

BWL: **What do you think are the largest barriers to Green Building in the State of Minnesota/USA?**

RC: You know its just kind of a catch 22, and you want people to do something as simple as energy modelling so that you can see the bundle costs and savings of doing more of an energy efficient building, and measure the simple payback and return on investment. But to get there, somebody has to come up with 10-20-30,000 dollars in the design phase that wasn't in the Performa when the project was created. And there's no source for it, so you shortchanged the whole life of the building because of the way the money got allocated on performance. I think that is a big part of it. We don't have a lot of incentives, and in fact we had a lot of dis-incentives. […] There are some regulatory dis-incentives. We just talked about it in a meeting this morning, those waterless urinals. Somebody snuck something in a bill this spring that made them illegal in the state of Minnesota.

BWL: **Do you see the standard building codes as a barrier to green building in MN?**

RC: You know, the standard building code is pretty flexible, it allows for a lot of innovation. It getting to the building inspectors and educating them, talking to them. I always tell people, by just going in and talking with the plan reviewers and building officials in the design phase, just like you would about any other code issue, hopefully to say instead of submitting a set of plans with your fingers crossed or hoping they don't notice things or will approve things when your building. If you go to them and say hey were trying to do something different and he's why and we need your help, because it's not exclusive in the code […] usually when you approach a building official that way they're on board. Some of it is just communication. We do have another issue in Minnesota that will hopefully be resolved by the advisory committee. Our state building code adopts the international code and some national energy codes, but the counties are not required to adopt the state code, so we have 40 out of 87 counties that haven't adopted the MN state building code, and so essential don't have a building code. So, the plan is to change that, and that will have a big effect. Its not a high population part of the state, but it does have buildings.

BWL: **How are Environmental Issues understood in the Building Industry, and how can current regulatory action, both Federal and State, be amended to ensure adequate implementation of sustainable efforts in the Minnesota Building Industry?**

RC: I would say it varies. I think if the building industry includes designers, architects, engineers, contractors builders, code officials, building owners, manufacturers of products, there's kind of a disparity across the board. Some of the Contractors are extremely knowledgeable and some aren't. And I would say the same is probably true for all the other categories. I think we just probably need, and this is both state and federal, I think we need some more incentives. I mean…you know the story. Things that are not Green are subsidized everyday, like Gas, Coal, Oil and the things that are really green, like extraordinary water conserving measures, renewable energies are not really subsidized, therefore there are disincentives to use them, and we need to change that. We need to have some incentives for performance-based outcomes. And some of it is just getting the word out. In Minnesota now were starting this new program called Minnesota Green Star, which is for the builders and the goal is to keep the cost of the program down on a per unit basis, below 2000 dollars federal tax credit will come along as doing a very energy efficient home. A lot of builders don't know about that, or haven't been through the paperwork, or might not be structured from a tax perspective to take advantage of it. So some cases we have incentives but there not well known or understood. I think just connecting the dots. And you know. Its just catching on so fast that I think a lot of this stuff will naturally happen, but it would sure be a heck of a lot easier if there were Federal incentives to doing some more high end up front costs.

BWL: **Do you think that if the Federal Government created some more incentives for Green Building, states would pursue green efforts in the building industry?**

RC: I think it should be at state and local levels, but I think there are some incentives that make more sense on a national level and some that make more sense on a state level. So I say it's a combination. And its not all about incentives, some of it is about eliminating the disincentives, making sure we don't have laws against things that are green. The other thing we could do is literally regulate where we increase the codes and energy codes and make those expectations. The fact is that the economics, once people get going on this stuff makes so much sense, so I think all you need to do is prime the pump and it will take care of it self and it might be easier than regulating it.

BWL: **What about the manner in which the EU delivers a directive to its member states?**

RC: That would make full sense, however were not operating that way. I mean you look at GHG emissions our Federal Government has their head in the sand and every state is out there trying to figure it out for themselves. We are so far away from that, I mean its just almost inconceivable to me. I wish that were the case.

BWL: **Would you say that the state of Minnesota is going above and beyond the leadership of the federal government in the sense of Green Building?**

RC: I would say absolutely. There are some pockets of success in the Federal government, I think its all based on operating costs. The way we building buildings in the federal government is actually done pretty well. But to internationally, the way we handle the Kyoto protocol, from a policy standpoint is embarrassing. Were in this phase right now with our governor, it might be worth looking into…there the national governors association. And our governor Tim Pawlenty is the chair of this associate. And every year the chair is asked to develop sort of there primary objective of the year that they can get all the governors to agree on. He's actually taken, I don't know if he's hinged it on energy efficiency or GHG emissions or both. It's a challenge because every state has such a unique, you we have states like MN where almost all of our electricity is generated by burning coal, yet we have no coal in MN. So we import all this coal from other parts of the country. And we have some parts of the country where they have massive exports of coal, we have nuclear plants, nuclear storage so to get all the governors' to agree on something across the board that moves us quiet a bit further toward GHG emissions, that's a huge challenge! And that's kind of part of the problem because the national government hasn't done anything, and part of the reason the states are doing it one at a time. So there are probably 10 or so states that have completed the process we are going through. Actually created very, very specific targets and very specific methodologies to reduce GHG's and I think MN is in a position that are probably ahead of them because of some of our past practiced and kind of a meeting of the minds legislatively on that issue. So someday, maybe with the right leadership at a national level will change that.

# Appendix C – Interview with Jonee Brigham

BWL: Benjamin William Lindell

JKB: Jonee Kulman Brigham

The Interview was conducted by telephone on October 16th, 2007.

BWL: **Can you please state your name, your role and responsibilities with the Center for Sustainable Building Research (CSBR)? (Do you have any good documents/literature explaining the purpose of the CSBR?)**

JKB: My name is Jonee Kulman Brigham. My role is a research coordinator. […], in terms of the B3 MSBG program I'm the co-principal investigator. I've been involved in it since its conception. That's why I came to the center. […] What I do in the project, other than that administrative stuff, is manage the content, where as Richard, who you talked to, deals with the design assistance and outreach and kind of the external communication to the users of the program. I work on contact stuff with the client, who is the state. Right now I'm working on developing reporting mechanisms, ex. Client communication, etc.

BWL: **How would you describe the institutionalization of green building in the state of Minnesota? (In which way is it safeguarded?) What are the main actors in MN?**

JKB: first off, I would say that we traditionally have been more of the leading edge of energy code, now that's not a specialty area of mine, […] I would say the primary means of institutionalizing Green building programs in the state are through the B3 MSBG program. Now this is for new construction.

BWL: **I'm curious what the states role in all of this is? I feel the states involvement is lacking, no?**

JKB: Do you know the text for MSBG? If you want the exact text, its on our website under FAQ. It gives the text of the legislation. It's about a paragraph or two. Well, I think that's a critical role that was played, passed and not terribly specific, but reasonably specific. It says all new buildings must achieve energy savings for buildings receiving bond money. I feel legislation itself, is really a critical role, it sets the stage.

BWL**: Could you please state what you think to be the 3 greatest barriers to sustainable building? Can you explain these? (Finances, education, lack of leadership).**

JKB: Inertia in the design and construction Industry. Well, designing and construction a building is extremely complex, and to change that process in fundamental ways is hard. […] changing has potential implications on design firm profitability, perceived risk, and I guess it's a complex system that's challenging to change. That's one barrier, the inertia due to cost of changing a complex system and the perceived risk. Another Barrier is old paradigms. For example, people can do LEED or any Green effort really, it doesn't really matter what program it is. Try to use old paradigms and you end up tweaking parts and making incremental improvements that really don't get at the level of progress we need to have or a new way of design, Green as a new feature as opposed to Green as a new way of thinking, and more integrated design. The third barrier is a lack of a good feedback loop. How do our design and components perform and what are the consequences? There's really two parts. Does this work? How well does this work? How much value does it add and what are the consequences?

BWL**: What do you think is an appropriate approach to these barriers?**

JKB: For the paradigm, I think one strategy is to have thorough celebrity architects demonstrating the new paradigm. So that, those that serve in models, I think that can inspire both working professionals. Another strategy to paradigm shift is not exactly to wait it out, but I think the influence of students, as they rise into management positions, I think there will be kind of a natural evolution of the paradigm. I don't know if we just want to wait it out, but I think time will help. I see one of the main things to change the paradigms is solving the third barrier, the feedback loop. I think the feedback loop changes the paradigm. I think people understanding the consequences of action, or receive the connection between design actions and consequences will help shift the paradigms. More accurate economic models, in other words giving, or assigning to monetary cost and benefits based on environmental and human impacts. People say that the market will solve it but that's only if the market accurately values the things we value in society. I think the market is a tool, what is a translation of reality into dollars.

BWL: **Is it a safe assumption that The USGBC and LEED certification can be considered the face of the nation in the sense of green building? And likewise is it safe to use the CSBR and MSBG as the face of green building in Minnesota? I mean, I understand that there are many other programs, its just I am speaking from personal experience.**

JKB: I would say that USGBC and the LEED system is the most common identification with Green building in the country, pretty easily. At least my experience, it's the most recognized label of green building, especially nationally. The face of green home programs is regionalized in regional programs. Commercial institution, I would say national mostly LEED is identified. Residentially, I would say its more regionalized. In Minnesota […], I think Green star is going to be the primary identity.

BWL: **Which one has the most legitimacy in it? Which program in MN has the most respect right now?**

JKB: From a state mandated endorsed. Yes B3 is it! If you have a residential project that received bond money, it's B3. The states government face of Green is B3 and the MSBG. Well, including the state and private sector, its really not competing for their attention, as is LEED. So its really not oriented to the Private Sector. So Green Building in Minnesota, as a whole, you really right now, needs to split it to public funded and private. And with public funded its B3 and MSBG and with Private its LEED. It's worth noting that the green star and local chapter of USGBC, agreed to co-promote, or to focus there efforts to focus their efforts to the greening of the residential sector rather than on comparing guidelines.

BWL**: How are Environmental Issues understood in the Building Industry, and how can current regulatory action, both Federal and State, be amended to ensure adequate implementation of sustainable efforts in the Minnesota Building Industry?**

JKB: To me environmental issues are a subset of sustainability. Social justice, equity are embodied, human impacts of the way we build is very little recognized except by people identified by green leaders, very infant in its awareness. And the Economic side of sustainability is primarily under in the building industry as kind of a simplistic tradeoff of 1$^{st}$ cost and payback. In terms of Environmental, I think the categories of B3 or LEED kind of represent the understanding of the aggressive issues of green. Energy Efficiency, resource efficiency or material use, waste. All of those things, also water, storm water run-off. There are people that are highly informed, very sophisticated in understanding environmental issues and sustainability. And then there are people who just think it's a fad and want to wait and see. I would say that the understanding is somewhere in-between all of these. Im not sure federal and state action can ensure it, but I think they can support it. One thing is to keep pushing the bottom bar, politically. Get a handle on accurate

feedback loops so, you know I have a friend who says, you have to deal with accounting before you can deal with accountability. If we can get accurate feedback loops, that's the accounting side. You know. How many units of real value are we dealing with. Then we can start to set targets and thresholds. Even if we could have required labeling of buildings like we do with cars. We don't have to drive a 30 MPG vehicle, but your car has to be labeled so you know how many miles per gallon it gets, and buildings not so. So mandating the transparency of performance you can say?

BWL: **Do you think this should be at a state level or federal level?**
JKB: I think it could be done on either, but ideally on a federal level. But I think its harder to do thresholds on a national level, because different regions have different issues, and have different economies. Heating in MN is different in AZ, for example. But the units are the same, and that could be mandated federally. The other thing they could do is incentives or disincentives tax credit, tax rate, fees, economic incentives or disincentives. Inventory all the mechanisms we have to tweak how decisions are made.

**What is your opinion on EPD? (Environmental Product Declaration). I read specifically that the USGBC does not promote products, and I find that hard to believe that product manufactures wouldn't be looking for an advantage if they decided to go green?**
**JKB:** I think information is useful, but just like LEED isn't really an active portrayal of defining green, I think recycled content and even embodied energy…I don't think real sustainability happens at the product level. I think it happens systemically, including products. A recycled material used appropriately might be green and the same used inappropriately might not be green. That isn't to say they should be labeled. I think labeling it is good, but laying any valuation over it is risky. But the accounting side of it, and the full feedback loop is an excellent idea.

# Appendix D – The Electronic Questionnaire with Results

*The Questionnaire was distributed to 225 contacts in the Minnesota Building Industry. Accumulation of 61 completed surveys and 8 partially completed, resulted in approximately a 31% response rate. The following results are utilized in the practical analysis of chapter 6.*

## *What is your organizations' Professional Domain?*

| | Respondents | Percent |
|---|---|---|
| Architect/Designer | 24 | 34,8% |
| Building Contractor | 10 | 14,5% |
| Product Manufacturer | 9 | 13,0% |
| State Government | 5 | 7,2% |
| Local Government | 6 | 8,7% |
| Other (please specify) | 15 | 21,7% |
| Total | 69 | 100,0% |

| **What is your organizations' Professional Domain? - Other (please specify)** |
|---|
| Irrigation Consulting and design |
| Developer |
| Demolition |
| non-profit |
| Public Education Higher Education |
| Distributor |
| Energy advocate |
| Non-profit arts organization |
| Engineering |
| Retail |
| Digital textile printer |
| Developer |

| |
|---|
| Non Profit |
| Nonprofit Organization |
| Technology consultant |

### *How many years has your organization been active in your field?*

| | Respondents | Percent |
|---|---|---|
| 0-10 years | 14 | 20,6% |
| 11-20 years | 10 | 14,7% |
| More than 20 years | 44 | 64,7% |
| Total | 68 | 100,0% |

### *Do you believe that the Building Industry can play an important role in addressing climate change?*

| | Respondents | Percent |
|---|---|---|
| Yes | 60 | 88,2% |
| No | 2 | 2,9% |
| Unsure | 6 | 8,8% |
| Total | 68 | 100,0% |

### *Do you feel it is/has been important for your organization to incorporate green building into your efforts?*

| | Respondents | Percent |
|---|---|---|
| Yes | 64 | 95,5% |
| No | 3 | 4,5% |
| Unsure | 0 | 0,0% |
| Total | 67 | 100,0% |

### *Do you believe that green building has a positive influence on sales?*

| | Respondents | Percent |
|---|---|---|
| Yes | 52 | 77,6% |
| No | 3 | 4,5% |
| Unsure | 12 | 17,9% |
| Total | 67 | 100,0% |

## *What has been the most prominent motive for your organization to become involved in the green building movement? (Please choose all that apply)*

| | Respondents | Percent |
|---|---|---|
| Networking | 25 | 38,5% |
| Legislative influence | 15 | 23,1% |
| Financial incentives | 19 | 29,2% |
| Customer requests | 39 | 60,0% |
| Strictly voluntary | 32 | 49,2% |
| Other (please specify) | 25 | 38,5% |
| Total | 65 | 100,0% |

| **What has been the most prominent motive for your organization to become involved in the green building movement? (Please choose all that apply) - Other (please specify)** |
|---|
| Its our responsibility |
| Politically important to key officials in city |
| Company commitment to sustainability |
| Education |
| Been practicing adaptive reuse of buildings for 20 years. |
| Personal commitment of employees |
| Always done green building |
| Personal values of company founders |
| It gives a "star" quality and advantage to those who start while it's new and forthcoming |
| Personal convictions |
| We believe we must, and it can reinvigorate our professional interests. |
| Personal conviction |
| Moral stewardship |
| Moral responsibility |

| |
|---|
| Environmental reasons |
| Ethics |
| Business Opportunity |
| better built |
| Competition |
| We see it as a way to address climate change and a chance to engage others outside of the environmental arena |
| Desire to link sustainable families and communities with a sustainable environment |
| to set an example to general public |
| Our social concern |
| Believing it is the right thing to do |

## *Do you feel that "Green" products and service providers should be promoted in the industry?*

| | Respondents | Percent |
|---|---|---|
| Yes | 62 | 95,4% |
| No | 0 | 0,0% |
| Unsure | 3 | 4,6% |
| Total | 65 | 100,0% |

## *Do you feel that the current building standards in the state of Minnesota are appropriate?*

| | Respondents | Percent |
|---|---|---|
| Yes | 18 | 27,7% |
| No | 29 | 44,6% |
| Unsure | 18 | 27,7% |
| Total | 65 | 100,0% |

## *Do you feel that technology is ahead and green-building standards could become even stricter?*

| | Respondents | Percent |
|---|---|---|
| Yes | 44 | 67,7% |
| No | 7 | 10,8% |
| Unsure | 14 | 21,5% |
| Total | 65 | 100,0% |

## *What policy instrument(s) would amend green building efforts in the state of Minnesota? (Please choose all that apply)*

| | Respondents | Percent |
|---|---|---|
| Ambient, emission and design standards-enforced by law | 44 | 68,8% |
| Promote Voluntary action | 41 | 64,1% |
| Governmental Expenditures | 39 | 60,9% |
| Market-based instruments | 54 | 84,4% |
| Other (please specify) | 9 | 14,1% |
| Total | 64 | 100,0% |

| **What policy instrument(s) would amend green building efforts in the state of Minnesota? (Please choose all that apply) - Other (please specify)** |
|---|
| Modify irrelevant building codes that prevent "green" products from being used in buildings. |
| Government incentives and policies on house size and energy use (Look at Sweden, Germany) |
| AWARENESS!!! |
| Creating meaningful conservation tax rebates and penalizing excessive consumption with tax penalties. Reorganize tax system to better place value on labor contributing to conservation rather than consumption |
| private companies getting involved with government decision makers |
| It must be a combination of public and private efforts |
| Statewide adoption of LEED |
| MN adopt LEED instead of B3 |

## *What would be necessary to integrate mandatory standards for green building in the state of Minnesota? (Please choose all that apply)*

| | Respondents | Percent |
|---|---|---|
| Tax credit incentives | 52 | 81,2% |
| Integration to local building codes | 54 | 84,4% |
| More education and training | 49 | 76,6% |
| Nothing, there will never be mandatory green building standards | 1 | 1,6% |
| other (please specify) | 10 | 15,6% |
| Total | 64 | 100,0% |

| **What would be necessary to integrate mandatory standards for green building in the state of Minnesota? (Please choose all that apply) - other (please specify)** |
|---|
| Energy savings |
| Other financial incentives |
| Market Participation |
| Penalties for houses that are too large or use too much energy; existing houses need to be updated when sold to certain energy codes |
| Workforce demand |
| Tax credits would help acceptance of legal requirements |
| Integration into national codes and standards (i.e. ASHREA) |
| Simplify govt process |
| Our energy code is already one of the best in the country; the current CCS process is addressing the issue of building code enforcement throughout the state. Could start as voluntary with tax incentives and be mandated in 5 years. |
| Continued bad weather |

## *Do you feel that the future of sustainable/green building will be safeguarded through mandatory regulation?*

| | Respondents | Percent |
|---|---|---|
| Yes | 29 | 45,3% |
| No | 21 | 32,8% |
| Unsure | 14 | 21,9% |
| Total | 64 | 100,0% |

## *What is the greatest barrier to further green building in the United States? (Please choose one)*

| | Respondents | Percent |
|---|---|---|
| Financial and Budgeting challenges | 29 | 45,3% |
| Educational Needs | 7 | 10,9% |
| Limited Research | 3 | 4,7% |
| Lack of Federal Policy | 6 | 9,4% |
| Standards and Building Codes | 11 | 17,2% |
| Other (please specify) | 8 | 12,5% |
| Total | 64 | 100,0% |

| **What is the greatest barrier to further green building in the United States? (please choose one) - Other (please specify)** |
|---|
| Cheap energy |
| Availability & Cost |
| Apathy, Resistance to change, misunderstandings of the cost (feeling that it is too expensive to be environmentally conscious |
| Lack of real/proven tangible advantages |
| The reward structure of consumerism and consumption is embraced due to a growth fueled economy rather than a conservation based economy. Our taxes/government treat labor for consumerism the same as labor for conservation the same. |
| corporate greed and change of generational mindset |
| The economics are backwards. Dirty, wasteful products/methods are rewarded by the market for being cheap. Excess is free in the US. Responsibility costs money. |

## *What is the greatest barrier to further greening of the building industry in the state of Minnesota? (Please choose one)*

| | Respondents | Percent |
|---|---|---|
| Financial and Budgeting challenges | 36 | 56,2% |
| Educational needs | 3 | 4,7% |
| Limited Research | 3 | 4,7% |
| Lack of State Policy | 4 | 6,2% |
| Standards and Building codes | 12 | 18,8% |
| Other (please specify) | 6 | 9,4% |
| Total | 64 | 100,0% |

| **What is the greatest barrier to further greening of the building industry in the state of Minnesota? (Please choose one) - Other (please specify)** |
|---|
| Cheap energy |
| Poor market conditions makes innovative techniques more difficult to implement |
| Doing things as have 'always been done' |
| The economics are backwards. Wasteful products/methods are rewarded in our economy. Excess is free in the US. Responsibility costs money. |

## *Would you say that green building in the state of Minnesota is:*

| | Respondents | Percent |
|---|---|---|
| Legally Sanctioned | 5 | 7,8% |
| Morally Governed | 23 | 35,9% |
| Comprehensible, recognizable and culturally supported | 25 | 39,1% |
| Other (please specify) | 11 | 17,2% |
| Total | 64 | 100,0% |

| **Would you say that green building in the state of Minnesota is: - Other (please specify)** |
|---|
| A combination of the above choices |
| Currently movement is disbursed; too many groups getting somewhat involved, need one central clearing house. |
| Unsure |
| Fashionable |

| |
|---|
| Just beginning to be understood |
| Immature |
| Accepted by the mainstream when it is done with other peoples money. |
| Financially governed |
| Beginning |
| State building codes mandate energy conservation |

## *What would be the most beneficial resource(s) for your organizations' green efforts? (Please choose all that apply)*

| | Respondents | Percent |
|---|---|---|
| Potential funding | 40 | 62,5% |
| Methods for determining and understand the cost of green building | 36 | 56,2% |
| Comprehension of Lifecycle cost programs | 42 | 65,6% |
| Technical Resources | 35 | 54,7% |
| Other (please specify) | 9 | 14,1% |
| Total | 64 | 100,0% |

| **What would be the most beneficial resource(s) for your organizations' green efforts? (Please choose all that apply) - Other (please specify)** |
|---|
| Experienced A/E Firms |
| Comprehension of productivity gains |
| Public acceptance |
| Integrated design practices |
| Different governmental/tax structure |
| Environmentally friendly training on the benefits of going green |
| Financial incentives |
| For capitalism to start rewarding long-term responsibility. |
| Green Building Education |

| |
|---|
| Education |

## *Which of the following programs is your organization best affiliated with?*

| | Respondents | Percent |
|---|---|---|
| The USGBC Mississippi Headwaters Chapter | 44 | 68,8% |
| B3 Buildings, Benchmark and Beyond | 10 | 15,6% |
| None | 4 | 6,2% |
| Other (please specify) | 6 | 9,4% |
| Total | 64 | 100,0% |

| **Which of the following programs is your organization best affiliated with? - Other (please specify)** |
|---|
| Both USGBC & B3 |
| ASHRAE Standard 90.1 |
| Both B3 and LEED/USGBC |
| USGBC |
| We work with a variety of partners and programs, both list above as well as the state run Center for Climate Strategies (CCS) process which includes green building, as well as the new GreenStar program. |
| USGBC |

## *Have you been active in a LEED certified Project?*

| | Respondents | Percent |
|---|---|---|
| Yes | 33 | 75,0% |
| No | 9 | 20,5% |
| Unsure | 2 | 4,5% |
| Total | 44 | 100,0% |

## *Within the last 24 months, what percentage of your organizations projects have been active with LEED certified buildings?*

| | Respondents | Percent |
|---|---|---|
| 76-100% | 7 | 21,9% |
| 51-75% | 1 | 3,1% |
| 26-50% | 6 | 18,8% |
| 0-25% | 18 | 56,2% |
| Total | 32 | 100,0% |

## *What is the most important aspect of a LEED certified building? (Please choose all that apply)*

| | Respondents | Percent |
|---|---|---|
| Reducing operational Cost | 24 | 72,7% |
| Creating a healthier working environment | 28 | 84,8% |
| Conserving Natural Resources | 29 | 87,9% |
| Other (please specify) | 6 | 18,2% |
| Total | 33 | 100,0% |

| **What is the most important aspect of a LEED certified building? (Please choose all that apply) - Other (please specify)** |
|---|
| A benchmark to measure performance |
| Promotes the understanding of these issues to the whole building project team |
| Limiting CO2 emissions |
| Feeling good |
| Everything |
| Customers vision of the company |
| Stewardship |

## *Has your organization participated in project steered by the Minnesota Sustainable Building Guidelines (MSBG)?*

| | Respondents | Percent |
|---|---|---|
| Yes | 8 | 80,0% |
| No | 0 | 0,0% |
| Unsure | 2 | 20,0% |
| Total | 10 | 100,0% |

## *Has the environmental performance of your/the-affiliated projects been improved as a result of the MSBG?*

| | Respondents | Percent |
|---|---|---|
| Yes | 5 | 62,5% |
| No | 1 | 12,5% |
| Unsure | 2 | 25,0% |
| Total | 8 | 100,0% |

## *Do you feel that the Minnesota Sustainable Building Guidelines are clear, simple and easy to monitor?*

| | Respondents | Percent |
|---|---|---|
| Yes | 3 | 37,5% |
| No | 3 | 37,5% |
| Undecided | 2 | 25,0% |
| Total | 8 | 100,0% |

## *In your project experience, the Minnesota Sustainable Building Guidelines were most successful to (please choose all that apply):*

| | Respondents | Percent |
|---|---|---|
| Reduce Energy Expenditures | 4 | 50,0% |
| Enhance the health and well being of building occupants | 3 | 37,5% |
| Improve the quality of the natural environment | 4 | 50,0% |
| Other (please specify) | 1 | 12,5% |
| Total | 8 | 100,0% |

| In your project experience, the Minnesota Sustainable Building Guidelines were most successful to (please choose all that apply): - Other (please specify) |
|---|
| ? |

## *In the past 24 months, what percentage of the projects you were affiliated with conducted an environmental Impact Assessment?*

| | Respondents | Percent |
|---|---|---|
| 76-100% | 10 | 15,6% |
| 51-75% | 0 | 0,0% |
| 26-50% | 4 | 6,2% |
| 0-25% | 50 | 78,1% |
| Total | 64 | 100,0% |

## *In the past 24 months, what percentage of the projects you were affiliated with conducted a Life-cycle Analysis?*

| | Respondents | Percent |
|---|---|---|
| 76-100% | 8 | 12,5% |
| 51-75% | 3 | 4,7% |
| 26-50% | 4 | 6,2% |
| 0-25% | 49 | 76,6% |
| Total | 64 | 100,0% |

## *In the past 24 months, what percentage of the projects you were affiliated with had a regulatory actor/agency actively monitoring your "green" efforts?*

| | Respondents | Percent |
|---|---|---|
| 76-100% | 5 | 7,9% |
| 51-75% | 2 | 3,2% |
| 26-50% | 8 | 12,7% |
| 0-25% | 48 | 76,2% |
| Total | 63 | 100,0% |

## *Which certification/guideline would your organization most benefit from? (Please choose one)*

| | Respondents | Percent |
|---|---|---|
| The USGBC Mississippi Headwaters Chapter (LEED) | 44 | 69,8% |
| B3 Building, Benchmark and Beyond (MSBG) | 7 | 11,1% |
| None | 1 | 1,6% |
| Other (please specify) | 11 | 17,5% |
| Total | 63 | 100,0% |

| **Which certification/guideline would your organization most benefit from? (Please choose one) - Other (please specify)** |
|---|
| We can benefit form most any green guidelines; they are very similar and the intent to provide for healthier buildings is at the core. |
| We are looking into the Greenstar program |
| USGBC does not "certify" products; perhaps I'm reading the question incorrectly. |
| None, we chose LEED to see if it could be done in a rural community and for educational purposes. We will try other programs as well (B3 and maybe MN GreenStar) |
| Not sure |
| Internal green checklist |
| ASHRAE Standard 90.1 |
| None of the above as our organization only incurs cost due to the requirements listed due to additional training while fees stay constant |
| Mn greenstar program |
| Only a portion of the work we do is around green building and development. We partner with outside organizations when working on this subject. All standards listed above, as well as GreenStar and MN Green Communities are referenced. |
| USGBC |

## *Would you agree that there is a strong emerging preference for "Performance" (specified final goal) rather than "Prescriptive" (specified material, process, etc.) regulation in the building industry?*

| | Respondents | Percent |
|---|---|---|
| Yes | 46 | 73,0% |
| No | 9 | 14,3% |
| Unsure | 8 | 12,7% |
| Total | 63 | 100,0% |

## *Which Regulatory approach is most likely to promote innovation?*

| | Respondents | Percent |
|---|---|---|
| Prescriptive | 2 | 3,3% |
| Performance | 52 | 85,2% |
| Unsure | 7 | 11,5% |
| Total | 61 | 100,0% |

## *Who should determine the minimum standard of performance and sustainability in defining a green building?*

| | Respondents | Percent |
|---|---|---|
| The Federal Government | 12 | 19,7% |
| State Governments | 14 | 23,0% |
| Trade Associations | 3 | 4,9% |
| 3rd party Programs | 27 | 44,3% |
| Other | 5 | 8,2% |
| Total | 61 | 100,0% |

| **Who should determine the minimum standard of performance and sustainability in defining a green building? - Other** |
|---|
| Combination of trade associations with agreement by state |
| Cooperation between all of the above |
| ASHRAE |
| Client |

| |
|---|
| 3rd Party created and operated, with Federal Government adoption and requirements |

| **If you have any further Comments on how Sustainable/Green Building has influenced your organization, you are welcome to write them here.** |
|---|
| MN should leave behind the B3 and adopt LEED as the state standard. It makes no sense to have our own. It dilutes the efforts and B3 adds now value. It is overly complex for what it tries to accomplish and the efforts would be better to put into helping develop LEED |
| We have developed a corporate sustainability committee with the goal of measuring and improving our sustainability efforts; and to communicate and solicit participation from all employees with this effort. |
| As a manufacturer, many questions are not possible to answer correctly regarding percentages. We do not have access to the information you are asking. |
| Several of your questions with "forced" answers will have bad data....as a manufacturer we're not always aware of the types of projects our products are going into, so I can't give accurate answers. |
| My company is focused on green building as a market for our furniture. We have struggled to gain market acceptance of green materials being used for furniture, but are starting to see the education of clients support our market. |
| We have always tried to provide our clients with high performance projects and made them as environmentally friendly as we could, given their locations and circumstances. |
| We have become reinvigorated. |
| The State's B3 program is admirable, however projects are not funded adequately by phase for the amount of additional work required early in the process, making it difficult to truly follow the intended B3 process. In addition, the State Legislature is not yet funding projects adequately to address the initial costs of some systems that life cycle cost analysis identify as the best course (e.g. ground source heat pumps in lieu of fuel fired or electric equipment). Funding of initial design studies/options, and added initial systems costs, seem to be the biggest barrier to truly addressing the major issues related to energy and global warming. |
| Government can create more demand for labor-intensive conservation efforts by reducing taxes on these technologies and increasing taxes on technologies, which deplete our raw materials. The unintended effect of our current system is that utilizing fewer resources only shifts the allocation |

| |
|---|
| of those resources to others who find more supply and less demand. If we reduce demand through conservation we must offset the resulting lower priced resources with higher taxes on exports. Our consumer-based system will not support this until a crisis moment occurs. |
| While it is tempting to promote State and/or Federal regulation in order to enforce green-building standards, I believe that the private sector can and should implement performance-based criteria more effectively and quickly. The pace at which we are seeing clients request/require sustainable and high-performance building methods, materials and technologies is astounding, and that market force is driving us toward a greater understanding of the very complex variables and trade-offs that exist. |
| No current guideline is sufficient for producing greener buildings. Each has flaws (B3 & LEED). We find that we have to utilize multiple tools to analyze performance and costs of a design from the beginning. The task is to find the sweet spot between what clients can afford and the greenest performing architecture we can make. This is all quite bewildering and difficult, but it is the direction we need AND desire to go. |
| Our organization is a regional leader with a very high number of LEED projects and projects which conduct energy audits. Your survey "over asked" on the percentages. I seriously doubt that there are any firms that do more than 25% LEED, Audits, or projects like that. Your percentages should be more like 0, 1-10, 11-20, over 20. |
| Advances in technology could advance the green movement faster, but businesses are slow to change since they need to see financial proof that it makes sense before joining the movement. |
| As a Design Build Develop organization, sustainable design has reinvigorated our fully integrated design process and reinforced this model as the "Best Practice" model for providing good design to our clients. |
| B3 is not an organization - it is a design guideline supported by the State of MN - similar to the way in which LEED is supported by the USGBC - but without the teeth, the verification, or any real clout. |
| We as a country need to concentrate on the future for our children. If we don't protect the environment now, then we are ruining it for our children. |
| Green building will become the standard fro the better contractors. The construction industry is beginning to under go a radical change. Education and tax incentives are the best way to promote green building |
| The issue has changed dramatically over the past two years. There is much more discussion as it |

| |
|---|
| relates to climate change, which is essential. There is still a lot of hesitation from people who are unconvinced of the financial investment, and the performance that results. Lack of research? Or lack of high quality education? |
| We are a very new company-very new product. Just introduced to the market this past January 07'. New innovative and eco-friendly retaining wall units and wall coverings. We hope to be involved in many green/LEED cert. projects in the future. "Going green" has become a movement and a craze-fantastic thing. Much needed in today's wasteful world. Thank you - good luck with your paper. |
| I have two projects in design development phase and both are following B3 standards. Although the engineers propose as much as a 40% improvement above and beyond B3 we won't know until the buildings are up and operating for at least one year it they meet the projections - in 2010 - 2011. |