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# Sustainability and collegiate recreational sports facilities.

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# SUSTAINABILITY AND COLLEGIATE RECREATIONAL SPORTS FACILITIES

By

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B.S., Western Kentucky University, 1997
M.A., Western Kentucky University, 1999

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# DEDICATION

I dedicate this dissertation to my parents, Jimmy and Dorothy Stinnett, for always finding a way for me. I will forever appreciate the unconditional love and support they have given me. Their efforts in raising me will serve as motivation for the rest of my life.

I also dedicate this dissertation to my wife, Denise, and our three children: Savannah, Cade, and Caroline. My family is ultimately why I chose to begin this journey. Without their encouragement, love, patience, and sacrifice, there would not have been an end to this endeavor.

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dissertation chair. His honest feedback and meticulous editing skills helped facilitate a study that I am proud of, and he is the consummate faculty member in higher education.

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*"I can do everything through Him who gives me strength."* – Philippians 4:13

ABSTRACT

SUSTAINABILITY AND COLLEGIATE RECREATIONAL SPORTS FACILITIES

Thomas Bradley Stinnett

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Sustainability is a hot topic in higher education. Buzz words such as *green* and *renewable* have helped brand modern environmentalism. A greater emphasis on facility planning, development, and management is contributing to sustainability efforts. Collegiate recreational sports programs often include facilities that pose a challenge to the green movement, due to their size and operational requirements. To identify efforts within the collegiate recreational sports industry, this dissertation focuses on assessing the state of facility sustainability. The purpose of this study was to assess levels of personnel familiarity and institutional level of adoption related to sustainable initiatives at collegiate recreational sports facilities. Additionally, the study collected the perceptions of the benefits and challenges of implementing such initiatives. This foundational study attempted to create some benchmark data for the collegiate recreation industry within the National Intramural-Recreational Sports Association (NIRSA). The Collegiate Recreational Sports Sustainability Survey was developed to assess the variables in the study and was sent to directors of NIRSA member institutions. This hybrid study utilized both quantitative and qualitative research methods and produced primarily descriptive research. Data were analyzed by calculating descriptive and inferential statistics, as well as by employing content analysis techniques. This research produced a number of key

findings: the LEED Accredited Professional (AP) certification is virtually non-existent among collegiate recreational sports professionals; institutions that led in adoption levels per their respective category type were two-year public institutions, *large* enrollment institutions, institutions from NIRSA Region VI, and institutions that contain *large* collegiate recreational sports facilities; statistically significant differences in adoption levels existed between four-year public and four-year private institutions, between *large* and *small* enrollment institutions, and between institutions that had *large* and *small* facilities; *Environmental* and *Fiscal* were the top two perceived benefits of implementing sustainable initiatives; and *Fiscal* and *Administrative* were the highest reported perceived challenges of moving toward sustainability. Implications from this study include providing benchmark data, LEED-AP credential considerations, creating advisory committees, and modeling NIRSA Region VI institutions. This study establishes a foundation for further research on sustainability efforts in collegiate recreational sports.

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# CHAPTER I

## INTRODUCTION

In recent years, there has been an increased focus on the importance of protecting the environment. Buzz words such as *sustainable* and *renewable*, along with catch phrases *going green* and the *green movement*, have helped brand modern environmentalism. An area that is playing a major role in environmental efforts is that of facility design and operations. Today, many facilities are planned, constructed, and operated with long-term sustainability as a prominent goal of architects, contractors, and managers.

Although sustainability means different things to different people, the generally accepted definition is "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Brundtland Report, 1987, p.24). For architecture, this means design that delivers buildings and communities with lower environmental impacts while enhancing health, productivity, community, and quality of life (Carmody, 2006).

The current state of the green industry in higher education is encouraging as universities are seemingly becoming more receptive to sustainability efforts and seizing the opportunity to have an impact of the sustainability movement. Sustainable practices are not just good for the environment, but also good business practices, good for healthy living, and good for the community. Enhancing quality of life and effective community relations are typical operating principles for collegiate facility managers (Reinhart, 2010).

The green movement has emerged as a critical business model and facilities that want to be competitive and in the forefront of their industry are taking steps to join in this movement. The premise is changing as conservation trends become more popular (Wettlaufer, 2010).

Currently, sustainability and green design are rapidly being adopted as increasing numbers of higher education systems, colleges and universities, municipalities, and state governments are including environmentally friendly policies in their building codes, ordinances, and laws (Sowell, Eichel, Alevantis, & Lovegreen, 2003). Recreational sports facilities tend to be the some of the largest buildings on college campuses. Facility directors and personnel can be champions for their respective campus by managing these massive facilities with sustainability in mind.

This chapter describes the research study to follow regarding the exploration of sustainability efforts in collegiate recreational sports. Specifically noted in this chapter are the problem, purpose of the study, research questions, general methodology, significance of the study, limitations, and definitions. The chapter ends with a brief conclusion and offers a preview for the following chapter.

## Problem

Richardson and Lynes (2007) define *green buildings* as construction that is more energy and resource efficient; releases less pollution into the air, soil, and water; and is healthier for occupants than standard facilities. The U.S. Green Building Council's (USGBC) Leadership in Energy and Environmental Design (LEED) Rating System is an internationally accepted, third-party certification program for green building design, construction, and operation. LEED provides building owners and operators with a

framework for identifying and implementing practical and measurable green building design, construction, operations and maintenance solutions. According to the USGBC, LEED promotes a whole-building approach to sustainability by recognizing performance in five key areas: sustainable site development, water savings, energy efficiency, materials selection, and indoor environmental quality. To earn LEED certification, a project must satisfy all LEED prerequisites and earn a minimum 40 points on a 110-point LEED rating system scale. LEED provides four measures of performance certification: Basic, Silver, Gold, and Platinum, based on a set of prerequisites and credits in the five aforementioned categories (U.S. General Services Administration, 2008).

The USGBC maintains a directory of registered and certified LEED projects. The directory contains the following information for each registered project: identification number, name, address, LEED category, points achieved, certification level, certification date, square footage, project type, and owner organization. The directory shows how each project achieved LEED certification and is broken down into the following building categories: commercial interiors, core and shell, existing buildings, healthcare, homes, hospitality, mid-rise, neighborhood development, new construction, retail, schools, and warehouse and distribution centers. There is not a category specific to recreation or sport facilities.

Ries, Bilec, Gokhan, and Needy (2006) claimed that, on average, people spend 80-90% of their time in buildings. That claim alone should serve as motivation for facility planners and managers to strive toward designing and operating sustainable buildings. It is important for facility management professionals to be aware of the research on sustainable facility design and operation. Previous research (Kats, 2003;

Kats, 2006; Ries, Bilec, Gokhan, & Needy, 2006) highlights the benefits associated with green building design. Specifically, economic and environmental factors seem to be the most prevalent benefits. Because of these, sound fiscal practices and environmental stewardship should be primary objectives for any facility manager.

Gonzales (2009) claims that health, fitness, physical activity, recreational, and sports facilities fall behind other types of facilities with sustainability features in mind. There is no apparent reason why this industry has lagged behind others. In the day-to-day operations, there are a number of things that operators can do to promote sustainable operations. These operations can help to reduce operating costs, promote air quality, reduce pollutants, and conserve resources. Areas where sustainable practices can make a difference include but are not limited to the following: green cleaning, heating/ventilation/air conditioning maintenance, energy conservation, water conservation, green vehicles, recycling programs, food service operations, and green grounds keeping (Gonzales, 2009).

In the fall of 2010, the National Intramural-Recreational Sports Association (NIRSA) collected data from its member colleges and universities involved in capital projects from 2010 through 2015. Included in the report were the name of college/university, type of project, square footage of construction project, budget, completion date, and project description. According to the Collegiate Recreational Sports Facilities Construction Report (NIRSA, 2010), 82 colleges and universities were currently involved in 129 facility construction, expansion, and/or renovation projects. The projects underway on NIRSA-member campuses totaled $1.7 billion with the

average project expenditure being $13.2 million (Table 1). Additionally, these campuses have a combined enrollment of 1.7 million students.

Table 1

*NIRSA Collegiate Recreational Sports Facilities Construction Report*

| Type | Mean Budget | Mean Area (SF) | N |
|---|---|---|---|
| New Construction | $20,442,976 | 85,192 | 53 |
| Expansion/Renovation | $8,292,515 | 69,244 | 76 |
| **Project Average** | **$13,284,565** | **75,849** | **129** |

Note: SF=Square Feet

By their nature, recreation centers and facilities pose a challenge for the green movement. These facilities have a massive footprint, requiring tons of steel, concrete and other material that must be transported during construction. Recreation facilities have the potential to be enormous guzzlers of water and feature large volumes that come with huge air-handling requirements, encompass energy hogs, and utilize large expanses of glass that can add significantly to the building's heat load. Facilities of this nature burn tremendous amounts of energy and create mountains of trash (Cohen, 2009).

Recreational sports program personnel can be key partners in the realm of sustainability by being familiar with and committed to green and sustainable initiatives related to their facilities. To identify familiarity and adoption levels, as well as perceptions of the benefits and challenges associated with sustainability, an assessment of the state of facility sustainability was needed.

## Purpose of the Study

The purpose of this study was to assess levels of collegiate recreational sports department personnel's familiarity and institutional level of adoption related to sustainable initiatives at campus recreational sports facilities. Additionally, the study collected the perceptions of the benefits as well as the challenges of such initiatives. This was a foundational study that attempted to create benchmark data for the practitioners of campus recreational sports facilities industry within NIRSA.

This study focused on recreational sports facilities from NIRSA member institutions. No previous research had been conducted specifically on personnel familiarity and institutional level of adoption regarding facility sustainability. Although there have been numerous studies on the benefits and challenges of green designed buildings, the literature review did not yield any prior studies specifically pertaining to the benefits and challenges of sustainability and campus recreational sports facilities. The current study sought to explore the levels of familiarity of those in charge of recreational sports facilities and the apparent level of institutional adoption of facility sustainability. Additionally, this study provided information on the current state of green and sustainability efforts in the industry of collegiate recreational sports. Administrators (President, Vice-President/Student Affairs, Chief Financial Officers, etc.) can benefit from this study when determining the strategy for a new construction project or an existing facility renovation. Finally, this study can potentially lead to new areas of research of green and sustainable initiatives in campus recreation, particularly with the management and operations of facilities.

## Research Questions

This exploratory study produced descriptive data to answer the following five basic research questions:

1. What are the levels of familiarity of campus recreational sports department personnel regarding green/sustainable initiatives?
2. What are the institutional adoption levels related to green/sustainable initiatives?
3. Are there significant differences of institutional adoption levels related to green/sustainable initiatives based on categorical variables such as type of institution, enrollment, geographical region, and size of facility?
4. What are the perceived benefits of implementing green/sustainable initiatives in campus recreational sports facilities?
5. What are the perceived challenges in implementing green/sustainable initiatives in campus recreational sports facilities?

## General Methodology

The study was conducted upon approval of the Office of Compliance at Western Kentucky University and the Institutional Review Board at the University of Louisville. All protocols from both institutions were strictly followed throughout the study. In an attempt to improve the study's quality and efficiency, a pilot study was administered to test logistics and procedures. Any deficiencies revealed from the pilot study were addressed and corrected prior to the larger study. Both quantitative and qualitative methods were used to answer the research questions. Directors at NIRSA member institutions were sent a survey in an attempt to assess the levels of familiarity, institutional adoption, benefits, and challenges related to green/sustainable initiatives at

campus recreational sports facilities. As an additional measure to solicit a higher response rate, five one-year NIRSA Professional Memberships at a NIRSA member institution (valued at $126 each) were offered as an incentive to complete the survey; the respondents submitted their names (separate and apart from the submission of the survey) for a random drawing to determine the winners.

The Director of the selected facilities, typically serving in the University's Recreational Sports Department, served as the participant/contact for the researcher. The researcher informed the participants about the purpose of the study via a prepared statement distributed electronically by e-mail. In some instances, other representatives of the University may have been needed to assist in identifying the appropriate participant. Typically, these representatives were employed in the University's Department of Sustainability, Energy Management, or Department of Facilities Management.

A survey was developed to assess the levels of personnel familiarity, institutional adoption, benefits, and challenges related to green/sustainable initiatives at campus recreational sports facilities. The electronic instrument was created with the assistance of the WKU Division of Information Technology for data collection. The survey was sent electronically to the identified representative of each participating University facility via information found on the Web site. The identity of the participants and facilities surveyed was kept anonymous by using a coding system during the research. Statistical Package for the Social Sciences (SPSS) software was utilized to analyze the descriptive data to answer research questions #1-#3. Qualitative procedures were utilized to analyze the data to answer research question #4 and #5.

## Significance of the Study

This study could potentially make a significant contribution to higher education, NIRSA, and the recreational sports field in general. This study documented research in the attempt to provide discernment to professionals on the current state of green and sustainability efforts in the industry. Higher education administrators can benefit from this study when contemplating a new construction project or a facility renovation. NIRSA and the recreational sports practitioners can find value and meaning in the results because of their unique and intimate relationship with the topic. Finally, this study may lead to additional research and further investigations of green and sustainable initiatives at campus recreational sports facilities.

## Limitations

The following limitations were apparent in the study:

1. Ideally, the survey instrument would have had an established record of reliability and validity. The Collegiate Recreational Sports Sustainability Survey was created for this study due to the fact that no other tested instrument for this study existed. Although a pilot study was administered to address deficiencies in the study's design, it was still possible that respondents may have misinterpreted some of the survey questions.
2. The self-report format of the survey instrument may lead to somewhat skewed data since respondents may not return accurate responses.

## Delimitations

The extent of the study was delimited by the following:

1. The study was limited to Directors of collegiate recreational sports departments from NIRSA member institutions. Professional members of NIRSA, other than Directors, were not surveyed. Directors were chosen because of their intimate knowledge of departmental and facility operations. Subordinates of Directors were not surveyed for this reason.

## Definitions

For the purpose of this study, the following terms were defined:

1. Campus Recreational Sports: "A major sector of recreation programming designed to meet the needs of older teenagers and young adults in college settings; often used interchangeably with *recreational sports*" (Franklin & Hardin, 2004, p.20).
2. Commitment: "The state or quality of being dedicated to a cause, activity, etc." (http://oxforddictionaries.com/definition/american_english/commitment?region=us&q=commitment, ¶ 1).
3. Green Building: "The practice of creating structures and using processes that are environmentally responsible and resource-efficient throughout a building's life-cycle from siting to design, construction, operation, maintenance, renovation and deconstruction" (http://www.epa.gov/greenbuilding/pubs/about.htm, ¶ 1).
4. Knowledge: "Facts, information, and skills acquired by a person through experience or education; the theoretical or practical understanding of a subject" (http://oxforddictionaries.com/definition/american_english/knowledge?region=us&q=knowledge, ¶ 1).

5. Leadership in Energy and Environmental Design (LEED): "A rating system that provides building owners and operators with a framework for identifying and implementing practical and measurable green building design, construction, operations, and maintenance solutions. It promotes a whole-building approach to sustainability by recognizing performance in key areas such as sustainable sites, water efficiency, energy and atmosphere, materials and resources, and indoor environmental quality" (http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1988, ¶ 1).
6. LEED Accredited Professional: "A credential that provides a standard for professionals participating in the operations and maintenance of buildings that implement sustainable practices and reduce the environmental impact of a building over its functional life cycle" (http://www.usgbc.org/DisplayPage.aspx?CMSPageID=2195, ¶ 1).
7. LEED Existing Building: "A certification in the LEED rating system that addresses whole-building cleaning and maintenance issues (including chemical use), recycling programs, exterior maintenance programs, and systems upgrades; and assists building owners and operators in measuring operations, improvements and maintenance on a consistent scale, with the goal of maximizing operational efficiency while minimizing environmental impacts" (http://www.usgbc.org/DisplayPage.aspx?CMSPageID=221, ¶ 1).
8. LEED New Construction: "A certification in the LEED rating system designed to guide and distinguish high-performance commercial and institutional projects including office buildings, government buildings, recreational facilities, hotels,

and residential buildings that addresses design and construction activities" (http://www.usgbc.org/DisplayPage.aspx?CMSPageID=220, ¶ 1).

9. National Intramural-Recreational Sports Association (NIRSA): "An organization of over 3,800 members and the leading resource for professional and student development, education, and research in collegiate recreational sports with a mission to be a leader in higher education and the advocate for the advancement of recreation, sport, and wellness by providing educational and developmental opportunities, generating and sharing knowledge, and promoting networking and growth for its members" (NIRSA, 2012, p.8).
10. NIRSA Member Institution: "A membership category, consisting of 98% college and university recreational sports programs, that grants differing benefits from the association" (NIRSA, 2012, p.8).
11. Recreational Sports Facility: "A building on a college/university campus intended for the general student and campus community that contains a wide variety of exercise and wellness equipment and programs" (Dymecki, McCord, Freedman, & Vitters, 2008, p.55).
12. Sick Building Syndrome: "An environmentally related condition connected with building characteristics such as poor construction, ventilation system problems, or established toxic exposure" (Laumbach & Kipen, 2005, p.135).
13. Sustainability: "Development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Brundtland Report, 1987, p.24).

14. United States Green Building Council: “A 501 (c) (3) non-profit organization, based in Washington, D.C., committed to a prosperous and sustainable future for the United States through cost-efficient and energy-saving green buildings” (http://www.usgbc.org/, ¶ 1).

## Closing

This chapter provided an overview of the research study in terms of exploring sustainability efforts in collegiate recreational sports. This chapter reviewed the research strategy by detailing the problem, purpose of the study, research questions, general methodology, significance of the study, limitations, and definitions. The ensuing chapter offers a literature review that will analyze some of the published research on the industry regarding green initiatives and sustainability.

# CHAPTER II

# REVIEW OF LITERATURE

## Introduction

While the green building movement has gained momentum recently, the origin can be traced back to the late nineteenth century with examples such as London's Crystal Palace and Milan's Galleria Vittorio Emanuele II using methods that decreased the impact of the structure on the environment (Marble Institute of America, 2012). From the 1930's through the 1960's, new building technologies facilitated a dramatic shift in construction methods. New technologies, including air conditioning, reflective glass, and structural steel made glass-enclosed and steel buildings popular. These buildings required a massive consumption of energy and made their existence entirely dependent upon energy availability and cost (Building, Design and Construction, 2006).

Since the first Earth Day in 1970, society has been making strides in conserving energy, recycling waste, and preserving the environment for future generations. Until recently, the movement toward sustainability has been marginalized and considered out of the mainstream of political thought. However, with the political and social climate shifting toward more energy efficient strategies, sustainability has been thrust into the forefront. Higher education should be doing its part in contributing to this sustainability movement through education and research, as well as building and landscape design (Turman & Hewitt, 2008).

In 1992, the White House underwent a greening program that was designed to improve energy efficiency and environmental performance of the structure by focusing on reducing waste, lowering energy use, and making an appropriate use of renewable resources. Additionally, the program aimed at improving air quality and overall building comfort. In 1996, the results of the White House greening project showed more than $150,000 per year in energy and water costs, landscaping expenses, and expenditures associated with solid waste were saved (Marble Institute of America, 2012).

Today, architects and designers are captivated by green building and the potential for cost savings, lower energy usage, a modern look, and the symbolic relationship with green buildings and nature. Architects and designers look toward organizations dedicated to green building and sustainability for guidance on construction or renovation projects. The USGBC has become the foremost leader and educator within the world of green building and was created to promote the design and construction of buildings that are environmentally responsible, profitable, and healthy places to live and work (Marble Institute of American, 2012).

Whether the facility is a residence hall, a student union, or a recreational sports facility, it is essential that leaders in higher education understand the strategic and operational considerations in facility management and construction (McClellan & Barr, 2000). The structure of this review of literature consisted of a conceptual framework with a review of theory. Glatthorn and Joyner (2005) describe a *conceptual framework* as identifying the concepts included in a phenomenon and showing their relationships. The review of literature covered a number of factors related to sustainable facility design and management.

## Organization of the Literature Review

The literature review consists of six areas related to green design and sustainability. The first section, "Theoretical Framework," reviews theoretical literature involving sustainability and provides a foundation for the empirical research that follows. "Sick Building Syndrome" describes some of the effects of poorly designed and constructed buildings and lays the foundation for the sustainability movement. "Sustainable Planning, Design, and Construction" reviews empirical literature regarding the benefits of green-designed facilities, specifically LEED certified buildings and summarizes the impact of LEED on sustainable facility planning and management. The fourth section, "Financial Implications," considers one of the primary benefits of sustainable design and management including construction costs, energy savings, and return of investment for green buildings. "Maintenance and Operations" reviews literature regarding practitioner knowledge and training pertaining to sustainable building management. The final section, "Barriers to Green Construction," addresses lack of awareness by administrators and negative perceptions of the cost of green building construction.

## Theoretical Framework

Sustainability, seemingly at the forefront of global affairs recently, is not a new concept. The use of fire and intentional selection of specific foods may have altered the natural composition of plant and animal communities in early human history (Scholars, 2003). Other examples of sustainability issues have been documented as well (Clarke, 1977; Meadows, Meadows, Randers, & Behrens, 1972; Turner, 2008). According to the U.S. Environmental Protection Agency Web site (2012), "[In the United States, the first

establishment of a national policy for environmental sustainability came in 1969 with the passage of the National Environmental Policy Act whose purpose was to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony and fulfill the social, economic and other requirements of present and future generations. ¶ 1]"

This theoretical framework is a blend of related theories. Several theories of sustainability attempt to organize and merge social responses to issues of an environmental and cultural nature. Solow's (2003) economic model asserts that sustainability should be thought of as an investment problem, in which returns from the use of natural resources must be used to create new opportunities of equal or greater value. Rolston (1994) claims that the focus should be on the health of the living world and not on financial opportunities. Political models, inclusive of environmental justice and civic environmentalism, propose to sustain social systems and focus on environmental threats to human life (Ageyman, 2005). Jenkins (2009) also suggests that religion has entered the sustainability debate by writing that "religious thought enters public sustainability debates as societies are increasingly challenged to make decisions about what is worth sustaining and to formulate questions about what sustains them (p. 202)."

Goodland's (1995) concept of environmental sustainability summarizes the monumental challenge of not damaging the environment in a world of billions of people. Goodland challenged social and economic sustainability models by addressing the imperative need for environmental sustainability for human welfare improvement, including areas of raw material usage, water, air, and energy. Recreational sports facility

administrators are faced with a tremendous challenge and opportunity to be leaders and good stewards of environmental sustainability efforts on their respective campus. Sowell, Eichel, Alevantis, and Lovegreen (2003) state that "sustainability and green design are rapidly becoming accepted as increasing numbers of higher education systems, colleges and universities, municipalities, and state governments are including environmentally friendly policies in their building codes, ordinances, and laws (p. 121)."

Goodland divided environmental sustainability into three degrees: *weak, strong* and *absurdly strong*. The first degree, *weak*, focuses more on human capital (education, skills, and experience) than the world's natural capital. Colleges and universities rely on their human capital when planning, renovating, or managing facilities. Recreational sports facility design and management involves a plethora of activities and steps including feasibility studies, building case statements, selecting architects and consultants, performing needs assessments, and benchmarking to name a few.

The second degree, *strong*, requires maintaining separate types of capital (natural, human, and human-made) so that the different types can complement one another. An example of this regarding recreational sports facilities is the planning process of a new facility. The planning process includes each of the aforementioned types of strong sustainability capital. Natural (site selection), human (campus master planning committee), and human-made (operating systems) forms of capital are utilized in recreational sports facility planning, design, and management.

The third and final degree of sustainability, according to Goodland, is *absurdly strong* environmental sustainability. Goodland summarizes this degree of sustainability as society never depleting anything including never using nonrenewable resources.

Goodland also states “some ecologists fear we may be reduced to this type of sustainability (p-16).”

The blend of related theories reviews the status and debate about environmental sustainability and lays the foundation for the huge challenge of society not further damaging the environment. More recent literature reviews other prevalent areas of sustainability. The next section reports the negative effects that poorly designed and constructed buildings can have on occupants.

## Sick Building Syndrome

The World Health Organization (1982) defined *sick building syndrome* (SBS) as “an environmentally related condition with increased prevalence of nonspecific symptoms among the populations of certain buildings, absence of clinical signs, and poor or no objective measures of symptoms” (p. 25). Additionally, Laumbach and Kipen (2005) stated that SBS should be distinguished from building-related illness and is connected with building characteristics such as poor construction, ventilation system problems, or established toxic exposure. Many studies have reported on the effects related to SBS.

Fisk, Mirer, and Mendell’s (2009) study attempted to determine the quantitative relationship of SBS symptoms with ventilation rates. The researchers did not pose any research questions, but combined and analyzed data to develop best-fit equations and curves quantifying the change in SBS symptom prevalence in office workers with ventilation rates.

Data collection started with information provided in technical papers or reports from numerous specific research studies performed in office buildings. The researchers

used data from all studies that met their criteria, regardless of their findings. The researchers used three basic steps to analyze the data. First, the processing of data in the original papers determined normalized slopes (fractional changes in SBS symptom prevalence divided by changes in ventilation rates). Second, the use of a statistical model (linear regression) fitted equations to the resulting pairs of numbers. Third, the integration and usage of equations calculated those of relative SBS symptom prevalence vs. ventilation rate.

Results indicated that as ventilation rate dropped from 10 to 5 liters per second (l/s)-person, relative SBS symptom prevalence increased approximately 23%, and as ventilation rate increased from 10 to 25 l/s-person, relative prevalence decreased approximately 29%. The researchers suggested that variations in SBS symptom types, building features, and outdoor air quality may cause the relationship of SBS symptom prevalence with ventilation rate in specific situations to differ from the average relationship predicted in the study.

The researchers noted some practical implications from the study. The researchers state that, on average, providing more outdoor air ventilation will reduce prevalence rates of SBS symptoms. The researchers also state, however, it is important to balance the benefits and risks of increased ventilation, given the costs of energy use. A final implication of the study is that it provides initial estimates of how the incremental health benefits per unit of increased ventilation diminish at higher levels of ventilation. This study's contributions can also serve as a facilitator for additional research on the potential benefits of sustainability-designed facility, particularly in the area of indoor air quality.

Gomzi et al. (2007) pursued potential relationships between work-related symptoms attributed to SBS and certain psychological, somatic, and environmental factors. The researchers studied the concurrent role and relative contribution of somatic, psychological, and environmental factors in the prediction of SBS symptoms in female office workers. Hypotheses tested included (a) women working in air-conditioned buildings report SBS symptoms more often than do those working in naturally ventilated buildings, (b) certain aspects of psychological characteristics of workers affect SBS symptomatology in both groups of employees, and (c) SBS symptoms were reported more often by subjects having an allergy than by other subjects.

The researchers constructed a multidisciplinary, cross-sectional study consisting of 171 female office workers from Zagreb, Croatia. The subjects worked either in air-conditioned ($n$ = 93) or naturally ventilated nonindustrial office buildings ($n$ = 78). The researchers collected information concerning symptoms related to SBS and assessed quality of life by using appropriate questionnaires. The Sick Building Syndrome Questionnaire, the World Health Organization Quality-of-Life Questionnaire, the Social Readjustment Rating Scale, and the Cornell Index – Form N3 served as the instruments for data collection. Statistical analyses included descriptive statistics, $t$ tests, Pearson's chi-square, the Mann-Whitney test, and the Kolmogorov-Smirnov test for nonnormally distributed data, multiple regression, and logistic regression analyses.

Results from the study indicated a significantly higher SBS Index and more women reporting irritative SBS symptoms in the group from air-conditioned buildings than from the group in naturally ventilated buildings. Additionally, the study suggested that individuals who exhibited higher levels of neuroticism, those who estimated the

quality of their physical health to be lower, and individuals working in air-conditioned offices were more likely to report a higher incidence of SBS complaints than were individuals who exhibited lower levels of neuroticism, those who estimated their physical health to be higher, and those who worked in naturally ventilated offices.

This study's main contribution is the careful assessment it gives to occupants' personal factors, predisposition to allergies, and psychological variables, by means of objective methods and validated scales. The researchers imply the need for more detailed hypotheses regarding the causes and symptoms and a set of questions about work-related SBS, suggesting the additional need for a distinction between SBS and "sick workplace syndrome."

Hansen, Meyer, and Gyntelberg's (2008) study aimed to examine physiological stress indicators in relation to the prevalence of building-related symptoms (BRS) among teachers employed in three selected schools in Copenhagen. The researchers offered three research questions: (a) Is perceived psychosocial work environment (job strain) associated with BRS? (b) Is perceived psychosocial work environment associated with physiological strain? and (c) Is BRS associated with physiological strain?

The researchers selected three schools, approximately the same size, with respectively low, moderate, and high prevalence of BRS. BRS calculations served as mean prevalence of eight symptoms: eye irritation, nose irritation, nose congestion, irritation of throat, itching/flushing facial skin, headache, fatigue, and difficulties to concentrate. Among the 150 teachers employed at the three schools, 86 participated in the questionnaire study. The final sample used for the study included 75 teachers. Data were analyzed by the use of a Mann-Whitney *U*-test to test for differences in demographic data

between being BRS negative and BRS positive for men and women. Multiple logistic regressions estimated the influence of high job demands, low job control, or low social support in teachers being BRS positive compared to BRS negative. Additionally, multiple logistic regression estimated the odds ratio of being job strained or being BRS positive when physiological stress indicators increased one unit.

The researchers answered the three research questions. Results indicated that the researchers found a tendency among women of an association between job strain and being BRS positive. Women with job strain tended to be more BRS positive. In addition, results showed an association between job strain and physiological strain in women. The study indicated no association for men. Finally, no association existed between being BRS positive and physiological strain. The researchers indicated that the study be regarded as a preliminary study because of the small number of participants involved. No other implications arose from the study.

Kinman and Griffin's (2008) study investigated job control, intrinsic and extrinsic job satisfaction, job-related mood, and negative affectivity as predictors of self-reported symptoms associated with SBS. The study contained two research questions: (a) Do females report more symptoms when they are working under similar conditions to males? and (b) Do the psychosocial predictors of symptoms differ according to gender?

The researchers used a descriptive study design to answer the research questions. Data collection techniques included questionnaires pertaining to job control, job satisfaction, job-related mood, and negative affectivity. The target population comprised 620 office-based employees working for five organizations situated in separate buildings in the South East of England. Three hundred and forty-six returned the questionnaires.

Females comprised 55% of the sample. Methods of data analysis included inter-correlations between the study variables and hierarchical multiple regressions.

The results of the study provided insights to the research questions. First, 78% of respondents reported experiencing at least one symptom associated with SBS *always*, *regularly*, or *often*, with 24% disclosing four symptoms or more. The findings revealed that employees who experience more symptoms reported significantly less job control and job satisfaction and more work-related depression and anxiety. A positive relationship occurred between symptom-reporting and negative affectivity. Next, no gender differences were apparent in the extent of self-reported symptoms. In terms of individual symptoms, women reported experiencing headaches at work more frequently than men did. Some gender differences became nonetheless apparent, both in the pattern of symptom predictors and the proportion of variance explained. These findings suggested that gender might influence the manner in which negative perceptions of features of the psychosocial working environment manifest themselves as health symptoms.

Implications derived from the study focus on future research. The researchers suggest that future research could investigate perceived opportunities for employees to influence their physical working conditions, as this aspect of control might be particularly relevant to the reporting of SBS symptoms. Additionally, the researchers claim that the results of this study provide evidence that psychological factors, as well as features of the objective physical environment, should be considered in future investigations of building-related symptoms.

Abbaszadeh, Zagreus, Lehrer, and Huizenga (2006) looked at occupant satisfaction in green buildings in comparison to non-green buildings and asked occupants directly about satisfaction with indoor environmental quality (IEQ) in their workplace. The researchers specifically focused on improved IEQ as a stated goal of sustainable design and questioned how green buildings were performing in comparison to non-green buildings. The researchers asked the following research question: What is different in green buildings that lead to higher satisfaction with certain IEQ categories in comparison to non-green buildings?

The design included administering a survey developed by the Center for the Built Environment (CBE) at the University of California, Berkeley. The survey measured occupant satisfaction and self-reported productivity in an anonymous, Web-based questionnaire. A seven-point semantic differential scale with endpoints *very dissatisfied* and *very satisfied* served as the scale for the respondents. The researchers did not describe any specific data analysis techniques.

Results from the study found that occupants in green buildings were on average more satisfied with their air quality and thermal comfort. Results also suggested that on average the strategies commonly employed in green buildings lead to higher effectiveness in the improvement of occupant satisfaction with air quality and thermal comfort. Strategies identified included maximizing daylight, views, ambient lighting opportunity, personal control, flexibility, and equality of workspace allocation. Finally, results suggested a need for improvements in controllability of lighting and innovative strategies to accommodate sound privacy needs in open plan of cubicle office layouts in both comparison groups. The researchers did not mention any implications of the study,

but the study does speak to some of the benefits of green designed facilities. This is certainly applicable to recreational sports facilities as these facilities typically serve hundreds to thousands of occupants daily.

SBS is not a new concept and has served as one of the motivating factors toward the sustainability movement. As noted in the examples from the literature, the effects of poorly designed and constructed buildings can have negative effects on occupants. As stated before, this is especially applicable to recreational sports facilities due to the high number of occupants on a daily basis. The next section focuses on better building planning, design, and construction tactics to alleviate the potential harm of sick buildings.

## Sustainable Planning, Design, and Construction

This section discusses the documented benefits of green-designed and green-constructed buildings. Specific building characteristics and components are mentioned in the reviewed literature. Additionally, the role of LEED Certification, building performance implications, and the impact of green influences on educational facilities are noted.

### *LEED Certification*

Numerous studies have focused on the role of building ratings systems, particularly the LEED certification. The U.S. Green Building Council's (USGBC) LEED Rating System is a nationally accepted third party certification program for green building design, construction, and operation. According to the USGBC, LEED promotes a whole-building approach to sustainability by recognizing performance in five key areas: sustainable site development, water savings, energy efficiency, materials selection, and indoor environmental quality. LEED provides four measures of performance

certification: Basic, Silver, Gold, and Platinum, based on a set of prerequisites and credits in the five aforementioned categories (U.S. General Services Administration, 2008).

The USGBC maintains a directory of registered and certified LEED projects. The directory shows how each project achieved LEED certification and is broken down into the following building categories: commercial interiors, core and shell, existing buildings, healthcare, homes, hospitality, mid-rise, neighborhood development, new construction, retail, schools, and warehouse and distribution centers. Additionally, the directory contains the following information for each registered project: identification number, name, address, LEED category, points achieved, certification level, certification date, square footage, project type, and owner organization.

Diamond et al. (2006) studied was the exploration and evaluation of modeled and actual energy performance of LEED Certified buildings. In addition, the researchers aimed to provide a quantitative assessment of the buildings' actual and simulated energy performance.

A quantitative research design facilitated the research project. The study explored the modeled and actual energy performance of a sample of 21 LEED Certified buildings, including how extensively the design teams pursued LEED energy-efficient credits, the modeled design and baseline energy performance, and the actual energy use during the first few years of operation. Data collection consisted of utility billing data from 2003-2005 and compared the billed energy consumption with the modeled energy use. The researchers also calculated Energy Star ratings for the buildings and compared them to peer groups where possible. The researchers did not mention specific data analysis techniques.

The researchers summarized their results with several key conclusions. First, for the 17 buildings that had whole-building basecase and design whole-building simulations, the mean simulated energy savings was 27% (*SD* = 8%). Second, for the 18 buildings that had both simulated whole building design and actual purchased energy, the actual consumption was lower than simulated by 1% (*SD* = 46%). Third, the number of LEED energy efficiency points did not correlate with actual energy savings. Next, for the 12 buildings which the researchers had sufficient data, the "equivalent" Energy Star scores had a mean value of 71, which was slightly below the Energy Star award threshold of 75 but higher than the whole-stock average value of 50. Finally, for the subset of nine federal buildings and eight non-federal buildings, the federal buildings had higher design and basecase modeled energy consumption, smaller predicted savings, lower actual energy use than modeled, and higher Energy Star scores than the non-federal buildings.

Several implications resulted from the study. First, the researchers call for a more comprehensive collection and publication of modeled vs. actual energy consumption data. Next, the researchers claim that further research could go a long way towards addressing the problem of closing the gap between design simulation and actual performance. Finally, the researchers note that reducing energy consumption is only one element of sustainable building design and hope that future evaluations of LEED and other green buildings can incorporate additional aspects of materials and resource consumption to assess more fully their sustainable performance. Knowledgeable campus recreation staff can be essential during the assessment of building performance.

Newsham, Mancini, and Birt's (2009) study was twofold. First, the study reanalyzed data previously supplied by the New Buildings Institute (NBI) and the

USGBC. The supplied data consisted of measured energy use from 100 LEED certified commercial and institutional buildings. Second, the study examined energy use by LEED certification level (Basic, Silver, Gold, Platinum). The researchers posed two research questions: (a) Are LEED-New Construction buildings living up to expectations? and (b) Does measured energy performances of LEED buildings vary with the certification level of the building?

To answer both research questions, the researchers utilized a descriptive study design. The study looked at 121 LEED buildings that achieved certification up to and including 2006. Excluded from the study were 21 buildings with unusually high-energy activity types, leaving 100 buildings serving as the focus for the researchers. To answer the first research question, the researchers collected data via post-occupancy evaluations (POE's). The POE's extensively monitored energy flows, including lighting loads, heating/ventilation/air conditioning loads and plug loads, for a minimum of one year. Multiple *t*-tests served as the method of data analysis. To answer the second research question, the researchers reanalyzed data collected previously by the NBI and the USGBC that compared to the energy use of the general United States Commercial Building Stock. Data analysis consisted of chi-squared tests on the distribution of building activity type, climate zone, age, by certification level, and an analysis of variance (ANOVA) on the distribution of building size by certification level.

The researchers reported results in order of the original two purposes of the study. Results related to the first purpose and research question indicated that LEED buildings, on average, use statistically significantly less energy per floor area than conventional buildings. On average, LEED buildings used 18-39% less energy per floor area than their

traditional building counterparts. Despite the per floor energy savings, 28-35% of LEED buildings used more energy than their individually matched conventional buildings. Results related to the second purpose and research question showed measured energy performance of LEED buildings had little correlation with certification level of the building. In other words, LEED Gold buildings did not exhibit better energy performance than LEED Silver buildings.

Several implications resulted from the study. The researchers suggest that the energy credit scheme be refined to deliver more reliable performance at the individual building level. The researchers also recommend in the longer term, if post-occupancy evaluation becomes routine, it may be wise for green building certification to require not only sustainable design intent, but also demonstrated sustainable performance after the buildings are built and operational. Finally, the researchers highlight the importance of continuing the investigation of the post-occupancy performance of green buildings.

Retzlaff (2009) conducted a study that focused on one building assessment system, LEED. The study addressed the following five questions: (a) What is the structure of policies and incentives pertaining to the use of LEED at the local and county levels? (b) What is the role of planners and planning departments administering LEED policies and incentives? (c) Given that there is a wide range of building assessment systems to choose from, why are these particular jurisdictions using the LEED system? (d) What are the major obstacles to adopting and implementing green building policies and incentives, and LEED in particular? (e) What are the physical results of LEED policies and incentives?

Data for the research came from a list of 60 cities and counties that had enacted green building policies that used the LEED building assessment system as of October 2007. The list came from information from the United States Green Building Council Web site, research reports, and online databases. A 15-question survey, e-mailed to each of the administrators of the LEED policies, took place in October 2007 through January 2008. The receipt of 34 survey responses resulted in a response rate of 61%. The survey contained a mixture of open-ended, exploratory questions, and closed-ended questions. The design of the open-ended questions gathered data about the administrators' experiences with green building policies and the LEED building assessment system, and the closed-ended questions collected data on the details of green building policies and their outcomes. Coding and categorization into common themes served as the analysis for the survey answers, which created a database format.

The results addressed the five research questions. First, municipal policies impacting use of the LEED building assessment system could be classified into three categories: (a) policies for buildings that were funded or owned by municipalities; (b) private development requirements; and (c) incentives such as density bonuses, property tax incentives, expedited permitting, grants for green building certification fees or green elements in buildings, and waivers of permitting or inspection fees. Second, survey respondents indicated that the planning department as being the most common administrative agency, followed by the building department. The role of the planning department included working collaboratively with other departments to comply with extensive documentation and testing requirements in LEED. Third, in regards to using LEED, nearly half of the respondents (45%) indicated that it evolved from a general

sentiment of environmental consciousness. Additionally, most respondents either indicated that overall environmental protection was the main advantage of establishing a LEED policy or that community awareness and education was the main advantage. Fourth, results on obstacles to adopting and implementing LEED indicated 30% of respondents saw no obstacles to using LEED. Other respondents believed that a lack of expertise regarding the LEED system by city and county staff, as well as the increased cost of documentation, certification, construction, and complication for designers and developers, as being problematic. Additionally, cost was an issue for some survey respondents. The final research question addressed practical outcomes of LEED policies. Overall, cities and counties experienced positive reactions regarding LEED policies and incentives from elected officials, developers, and citizens. Seventy percent of the surveyed administrators reported an overall positive reaction, while none reported a negative reaction.

The author offered several implications about planning for green buildings and the inclusion of LEED in development regulations. First, the author noted the need for more information on the choices of and differences between building assessments systems, so that planners can make informed decisions about a system's potential impacts. Next, because collaboration among various fields is an essential part of using many building assessment systems, the author implied that it may be a good point of departure for initiating other sustainability tools that may not have such a clear interdisciplinary component. Finally, the author stated that the use of LEED in planning can serve as an example of a trend that can benefit cities, although LEED is not without its problems and many other building assessment systems do exist.

Turner and Frankel's (2008) study on energy performance of LEED for new construction buildings analyzed measured energy performance. The purpose of the study provided a link between intention and outcome for LEED projects. The study intended to provide the most comprehensive view of post-occupancy energy performance of LEED buildings.

At the time of the study, all 552 LEED-certified new construction facilities received an invitation to participate in the study. The only requirement for inclusion included the ability to provide at least one full year of measured post-occupancy energy usage data for the entire LEED project. Twenty-two percent, or 121 total facilities, provided the requested information and were included in the study. Data sources included measured energy usage, Energy Star ratings, and design and baseline modeling. Measured energy usage data, obtained directly from the owners, referred to purchased site energy. The Environmental Protection Agency provided information regarding Energy Star ratings. Finally, design and baseline modeling results came from the United States Green Building Council files for the final LEED project submittals.

The results of the study demonstrated on average that LEED buildings saved energy. The utilization of three specific metrics analyzed whole-building energy usage: Energy Use Intensity (EUI) comparison of LEED and national building stock, Energy Star ratings of LEED buildings, and measured results compared to initial design and baseline modeling. Each of the three views of building performance showed average LEED energy use 25%-30% better than the national average. Additionally, measured EUI's for over half of the projects deviated by more than 25% from design projections, with 30% significantly better and 25% significantly worse.

An implication of the study included the researchers calling for the need for more feedback between actual building performance results and design-phase performance predictions. The researchers also suggested the need for continued improvements to the LEED program. A high commitment level of campus recreation professionals can be a difference maker when comparing actual vs. anticipated building performance.

Gebken, Bruce, and Strong (2010) researched the impact that the LEED accredited professional (AP) designation has had on architecture/engineering (A/E) firm employees versus employees of owners, contractors, subcontractors, and other organization types. The researchers asked the following research question: Is there a statistically significant difference between the impacts the LEED-AP credential has made on the careers of professionals in A/E firms versus those working for all other organization classifications?

The researchers analyzed 9,060 responses from LEED-AP's using a one-way ANOVA to determine whether significant differences in perceived benefit existed between LEED-AP's working for A/E firms and LEED-AP's working for other organization classifications. The researchers modified a previously tested instrument. The instrument, constructed using Survey Monkey, consisted of 35 questions about the effect that the certification has had on the respondent's career as well as demographic information. The population for the study included all credentialed LEED-AP's. At the time of the study, the USGBC advertised that there were 62,000 LEED AP's. Of this, 46,332 LEED-AP's allowed their e-mail addresses to appear publicly at the USGBC's website. This represented the sample for the study. The researchers used both descriptive and inferential statistical techniques to analyze the data. ANOVA served as the primary

statistical analysis tool because of its ability to compare the means of two or more independent groups representing different levels of a single factor.

Results from the study indicated a statistically significant difference in six of the eight "impact" categories. LEED-AP's working for A/E firms did not feel as strong as LEED-AP's working for other organization types that the credential provided any more recognition, professional opportunities for contributions, and prestige among superiors and individuals within their organization. There were no significant differences between the groups, however, with regard to the credential's impact on salary and job responsibilities.

The researchers claim that the study highlights the issue that many factors, including an employer's organization type, can play a significant role in determining the perceived benefit of a professional certification. Additionally, the researchers suggest that future studies should investigate the reasons why architects and engineers are seeking additional certifications.

Lavy and Fernandez-Solis (2009) aimed to address issues related to LEED AP's practicing during the first 10 years of LEED in building industry holding perceptions that have influenced the adoption of LEED. Perception included that some LEED credit points were more difficult to obtain than others, LEED projects had higher first costs, and LEED projects had higher levels of complexity. The researchers did not ask specific research questions.

The researchers conducted a literature review to study the development of the green building industry and to determine the market of LEED-New Construction (NC) standards. A survey questionnaire served as the most appropriate method to gather

information from practitioners regarding the identified research objectives. LEED-AP's, involved in a variety of roles, comprised the target population for the study. In order to standardize the issue of geographical boundaries and ensure randomization, a cluster random sampling served as the technique. The researchers sent 8,000 invitation letters via e-mail. Out of the total invitations sent, 2,213 of the e-mail addresses were non-functional and the e-mails bounced back. Approximately 400 out of the remaining 5,787 replied, stating that they did not meet the qualifying criteria. Out of the remaining sample, 383 expressed interest in the survey; however, only 271 started the survey. Therefore, the 383 qualifying participants who expressed interest in participating in the survey represented the entire population, out of which 105 submitted their responses. Descriptive statistics determined the trends in the adoption of the credit points and determined the perceptions associated with incremental cost and level of complexity of credit points. In order to determine the relationship between the parameters of the study, the researchers used correlation analysis. The researchers used Pearson correlation values to depict the association.

The survey identified which LEED credit points LEED AP's perceived as more difficult, as contributing to higher initial costs, and as increasing project complexity. The conclusions indicated a trend toward a higher adoption rate of points perceived as having lower initial costs and a lower level of complexity. The findings were primarily due to two reasons: increased cost in managing project documentation; increased cost in project complexity.

The researchers explained that the results of the study can be used by designers, construction professionals, and facility managers who are involved in new construction

projects. The researchers also stated that the trends in credit point adoption, and the professionals' perceptions of their initial cost and level of complexity, may encourage others to consider using systems that introduce sustainability concepts into their design and construction process.

*Performance Implications*

Many studies have focused on the impact of the green design process. Research has focused on design's influence on workplace culture, barriers to green design, and the utilization of reflective journaling.

Berke and Conroy (2000) examined the influence of the sustainable development concept on plans by using a sample of city and county plans. The sample consisted of plans that explicitly incorporated the sustainable development concept and those that did not. The researchers asked two research questions: (a) Are plans that use sustainable development as an organizing concept more likely to promote sustainability principles than plans that do not? and (b) Do plans achieve balance by supporting all sustainability principles, or do plans narrowly promote some principles more than others?

An evaluation to determine how well policies supported sustainable development occurred using a sample of 30 comprehensive plans. The first phase of the study focused on identifying a study population and selecting a sample of local plans. The next phase involved development and application of a method for evaluating the extent to which plans integrated the principles of sustainable development. Groups of 20 plans were randomly selected for evaluation.

The researchers answered both research questions. For the first question, the findings indicated no significant differences in how extensively sustainability principles

were supported between the plans that stated an intention to integrate sustainable development and those that did not. For the second question, the findings showed that the plans did not provide balanced support of all six sustainability principles, as they supported principles significantly more than others.

The researchers offer some key implications that resulted from the study. First, they stress that the study represented an initial step in carrying out the task of narrowing the gap between theory and practice. In addition, the researchers suggested ways for the planning field to clarify the role of planners in creating comprehensive plans that foster community sustainability.

Brown, Cole, Robinson, and Dowlatabadi (2010) aimed to explore the relationship between green building design and workplace design practice. Additionally, the researchers examined the role of organizational culture in shaping design and operation decisions with consequence for user experience. The study centered on a Canadian company's move to a new headquarter building explicitly designed to both shift organizational culture and to meet environmental objectives.

The researchers reviewed literature, introduced key concepts to establish the foundation for the research, and provided a context for interpreting the results. Building users were surveyed in the spring of 2008 (old building) and 2009 (new building) using the Building Use Studies (BUS) occupant questionnaire. The BUS survey gave respondents an opportunity to rate and comment on building design, work requirements, comfort, health, and productivity. The survey, conducted via a Web-based version, ran for approximately one week in each building. Response rates for the survey were 37% for the old building and 48% for the new building.

Results demonstrated that, while there were potentially significant gains to be made from integrating green building with workplace design strategies from the outset, there were many other factors beyond quality of the space, which may play a role in shaping user experience. The researchers drew links between improved occupant comfort, health, and productivity in the new headquarters building, and organizational culture and contextual factors accompanying the move. The finding also raised a number of important questions and considerations for organizational and workplace research and post-occupancy evaluations of buildings.

The researchers mentioned a couple of implications. First, they state that the research brings together the two agendas of workplace design and green building design, which have, until very recently, progressed along separate paths. Additionally, the researchers suggest that the research begins to articulate some of the key issues arising from the mainstreaming and merging of green building design with workplace design practice.

Magent, Korkmaz, Klotz, and Riley's (2009) study presented a design process evaluation method for sustainable buildings. The researchers' study developed a technique to model and evaluate the design process for sustainable buildings. They did not pose any specific research questions.

The research utilized a proposition-based case study approach to develop and validate a method that design teams could use to help plan design processes for sustainable buildings. The evaluation of six propositions, based on background from theory and practice, occurred in the study on three separate case study projects. The researchers conducted a comprehensive literature and industry practices review. The

review, combined with information gathered from meetings with practicing design experts in the field of sustainable buildings provided the basis for the theoretical design model. The researchers utilized qualitative social sciences practices in the form of proposition testing on multiple case studies as a means to develop an evaluation method for the design process of sustainable buildings. The researchers felt that case studies were appropriate due to the exploratory and qualitative nature of the study and because the research focused on contemporary behavior. Yin's (1984) case study approach served as the analysis method for each of the three cases. The case study approach included data gathering, content discovery, event/proposition support analysis, event corroboration, and event replications.

The results indicated the validation of propositions one through five by the case study analyses as the total corroborated events exceeded the number of required events. The validation requirements for proposition six lacked evidence from the selected case studies. The researchers stated that conclusions drawn based on the research should consider the limited number and location of case studies as well as the absence of rival theories in the case study data collection phase.

The researchers claim the primary contribution of the research as being the development of an evaluation method for the sustainable building design process. The researchers offered three suggestions for future research. The first opportunity is to construct a broad study of the design process for sustainable buildings. Second, the researchers recommend measuring the impact of implementing the design process evaluation method approach. Finally, the researchers suggested investigating the relationship between project outcomes and the presence of team competencies.

Mills and Glass (2009) investigated the ability of construction design managers to integrate sustainability objectives into the process they manage, with particular emphasis on the importance of skills. The overarching aim was to canvass new and experienced practitioners about the existing levels of skills within the sustainable building design subject and thus to establish the apparent status of the profession. Mills and Glass did not ask any specific research questions.

The interpretative, qualitative discipline facilitated the method of research for this study. The acquisition of data occurred from an extensive literature review, semi-structured interviews with experienced design managers, and a survey of senior level design managers. In this case, the researchers used a multi-method approach consisting of an opinion questionnaire complemented by semi-structured interviews to explore and develop those opinions. Of the 22 people approached to take part in the survey, 13 responded. To supplement these responses, seven semi-structured interviews were conducted, five face-to-face and two via the telephone. This gave a total of 20 construction design managers' views. The development of a number of tentative conclusions and recommendations resulted from the analysis of data.

Findings confirmed the researchers' belief that design management is a developing profession with a lack of clarity concerning its parameters and skills. Data collected suggested the need for design management representation at a high level in the industry. Participants in the research called for better representation within contracting companies. The researchers' findings indicated the importance of communicating sustainability in a project's brief to overcome barriers to sustainable development related to stakeholders and an unwillingness of the industry to change.

The researchers proclaimed that the research outcomes contributed to the emergent dialogue on construction design management with regard to sustainable building design. The researchers also state that the findings have implications for government, contractors, and their clients in terms of skills acquisition and improvement, with ramifications for the industry's attitudes towards project management, human resource planning, institutional representation, and training.

Nielsen, Hoffman, Quitzau, and Elle (2009) argued that the promotion of sustainable design solutions is more about developing new and innovative networks and strengthening certain collaboration and management competencies. The key question posed by the researchers was this: What characterizes successful processes of implementing sustainable design solutions? The researchers attempted to answer the question by focusing on examples of successful implementation in an attempt to understand the competencies required.

The research studied Danish projects that had empowered design managers and other stakeholders to implement sustainable solutions in the design and building phase. The answer to the research question focused on case studies of new and successful projects about innovation in building design. Eight key actors, interviewed about the process leading to the first low-energy housing area in Denmark, served as the participants of the study.

The researchers posited in the findings that network changes could not rely on courage alone, but that innovators were also required to act as catalysts to reorder the processes. Additional conclusions pointed to the importance of a design manager and others to develop socio-technical networks and storylines to integrate sustainability in the

design and building processes. Finally, the researchers found that implementation of sustainable design solutions takes more than courage, as it requires key competencies in catalyzing network changes.

Nielsen et al. stated that further research is a critical need to learn more about innovation strategies in sustainable building design and to identify ways of building new innovative networks. Additionally, the researchers imply that perspectives they offer in the research could change the thinking about sustainable innovation in the built environment and the sustainable design manager as a potential network facilitator.

The purpose of Williams and Dair's (2007) study was to present 12 barriers to achieving sustainability in development schemes, drawn from qualitative research on five recently completed projects in England. The study complements previous research on barriers to the implementation of sustainability that took a theoretical approach and those that investigated current practices. The study provided material that is of interest in itself and formed the basis for very tentative analytic generalizations about the ability of the planning and development processes in England to deliver sustainable building projects.

Five case studies of residential and mixed-use schemes comprised the research design. The cases, chosen randomly, included in-depth interviews that were undertaken with stakeholders (*n=63)*, and the content of documentary sources such as planning application files, planning committee reports, and research reports relating to the cases were all analyzed.

The findings showed mixed achievement of sustainability in the case studies. In general, many of the social and economic elements of sustainability were both considered and implemented in the case studies. Many environmental sustainability objectives were

categorized as unmet. The barriers identified by the stakeholders in the schemes included a lack of consideration of sustainability measures, real and perceived costs, and inadequate expertise and powers.

Implications offered by Williams and Dair include that further research is required to test the generalizability of the barriers identified in the research and to identify strategies to overcome them. The researchers also stated that unless stakeholders understand the practical problems of implementing sustainable development policies, a sustainable building environment is unlikely to happen. Campus recreation staff can be champions of overcoming barriers to sustainable facility design and management by being aware of said barriers to help educate other administrators involved in the building project.

*Impact on Educational Facilities*

There is a growing bank of research regarding the impact of sustainable design on educational facilities. Studies focused on topics such as teaching and learning benefits, enhanced educational performance, daylighting, and indoor air quality.

The specific aim of Edwards' (2006) study was to investigate the argument that attention to environmental conditions, such as energy efficiency and sustainable architectural design, in the classroom helps support the delivery of the curriculum. Primary schools, identified to be the most common type of green school, served as the concentration of the study. The author posed three research questions: (a) Do green schools provide teaching and learning benefits beyond those of their more orthodox counterparts? (b) What is the perception of green schools by the major stakeholders? (c)

What aspects of classroom design appear most critical in enhanced educational performance?

The researcher employed methods that used both empirical and observational techniques and were based upon comparing qualitative and quantitative data from a number of paired 'green' and 'ungreen' schools. The author identified 54 green schools constructed between 1975 and 1995. The list included various types of schools and those that incorporate a range of sustainable design features. In order to select the appropriate paring of green and ungreen schools, the author sought certain similar characteristics, such as geographical proximity, similarity of size, similarity of type, and similarity in social/economic conditions. Of the 54 green schools, the lack of a suitable control school reduced the number of research parings to 42.

The findings answered the first research question by suggesting that green primary schools in Hampshire provided an environment that led to enhanced pupil performance. The findings indicated an enhanced pupil performance, specifically a 3-5% improvement in Standardized Attainment Tests (SATs), in the green designed schools when compared to the ungreen schools. In addition, the findings indicated lower levels of pupil sickness in the green schools when compared with their ungreen counterparts. Next, the findings suggested that green schools provided an environment which pupils and teachers both value, answering the second research question. The quality of the classroom environment resulting from green design approaches appeared to reduce stress in teachers and improved productivity. Finally, the findings also addressed the third research question regarding the most influential aspects of green design. Results indicated

evidence that those green schools, which gave priority to daylight and natural ventilation, generally outperformed other schools in the county.

Two primary implications arose from the study. First, the author highlighted the importance of ensuring that the energy design strategy for the school and educational need coincide in terms of the use and management of classroom space for teaching and learning. Additionally, the author suggested the limited number of green schools available for modeling makes it imperative that initiatives get under way to facilitate further studies.

Heschong Mahone Group's (1999) study looked at the effect of daylighting on human performance. The study included a focus on skylighting as a way to isolate illumination effects from other qualities associated with daylighting from windows, such as view and ventilation. The researchers did not ask specific research questions.

The researchers obtained student performance data from three elementary school districts and looked for a correlation to the amount of daylight provided by each student's classroom environment. The researchers analyzed test score results for over 21,000 students from the three districts. The researchers reviewed architectural plans, aerial photographs, and maintenance records. Data analysis consisted of the use of multivariate linear regression to control for other influences on student performance. Regressions were compared using data from two separate tests, math and reading, for each district. The mathematical models allowed the researchers to isolate the effect on one variable, while controlling for the influence of all the other. The models also tell the researchers the statistical probability that have a "true" effect and the power of each variable in predicting results.

The results of the analyses of the three districts were remarkably consistent: all showed positive daylight effects with highly significant results. The researchers made three important findings from the study. First, the researchers found a uniformly positive and statistically significant correlation between the presence of daylighting and better student test scores in all three districts. Second, the researchers found that the positive effect of daylighting was distinct from all the other attributes of windows. Finally, the researchers found that the methodology of using large, pre-existing data sets can be a successful and powerful tool for investigating the effects of the physical environment on human performance. The researchers admitted many limitations with this type of statistical study. No specific implications arose from the study.

Wargoki and Wyon (2007) conducted a study to extend the knowledge of the effects of poor air quality on performance from adults in offices to children in schools. The researchers posed one research question: Does classroom air quality affect schoolwork?

An experimental design served as the study's design structure. The study included a series of field experiments in existing classrooms occupied by children performing their normal schoolwork, which the researchers anticipated as being more natural for children than transporting them to a laboratory where they might have behaved abnormally. Data collection methods included measurements of performance by teachers, measurements of perceptions and symptoms of sick building syndrome, observational checklists, parental logbooks, and measurements of perceived air quality. Shapiro-Wilk's test was the method used to test whether residuals were normally distributed, and if necessary, those data were log-transformed.

The results showed that increasing the outdoor air supply rate in classrooms improved the performance of a wide range of tasks characteristic of schoolwork, from typical rule-based logical and mathematical tasks requiring concentration and logical thinking to language-based tasks requiring concentration and comprehension. Additionally, the results indicated that increasing the outdoor air supply rate to mechanically ventilated classrooms from about 3.0 to 8.5 l/s per person improved the speed at which 10- to 12-year-old children performed two numerical and two language-based tasks.

The researchers stated that further validation of the study results is required with other children and higher outdoor air supply rates. The researchers implied the need for further research on the topic.

The main goal of Bernardi and Kowaltowski's (2006) study was to register awareness attitudes of users as they relate to the need to adjust comfort conditions. Additionally, the researchers analyzed the user-environment relation and how the occupants assimilated the environment. The researchers did not ask any specific research questions.

The case study took place in two classrooms in public schools in the city of Campinas in Sao Paulo, Brazil. Investigated in the study were user perception and behavior in relation to environmental comfort. Through questionnaire responses, a follow-up study evaluated user perception of possible interventions and knowledge of environmental comfort concepts. The methodology adopted was based on field observations of technical aspects of the school environment and of types of user behavior that introduced changes in the classroom space.

The results of the case study showed few interventions by users in favor of their own comfort. Users did not open or close doors or windows or turn lights and ceiling fans on and off. The most observed types of behavior related to communication, with either the teacher or other students. The student questionnaire results of the four-day study indicated that the children did recognize the less than ideal comfort conditions, especially regarding thermal comfort.

The researchers implied that some programs may be devised to heighten environmental awareness. The researchers also suggested that investigations of environmental awareness must also pay attention to architectural elements, which may hinder or facilitate users' participating in the adjustment of environmental conditions.

The purpose of Jain and Pant's (2010) research was to put forth a model for implementation of an environmental management system (EMS) in institutes of higher education in India. The aim of the research was to prepare an environmental management plan (EMP) for TERI University, New Delhi, with a view to minimize the ecological footprint of the university. Additionally, the proposed EMP aimed to identify potential areas for improving the university's environmental performance and give recommendations on how to achieve the goals of on-campus environmental sustainability. The researchers did not ask any specific research questions.

The researchers carried out initial environmental review (IER) and strengths, weaknesses, opportunities, and threats (SWOT) analysis to identify the major environmental concerns in the university. The IER was a collaborative project in consultation with the architect of the building, the housekeeping in-charge, and other people involved in the task. The researchers prepared a detailed questionnaire based on

information collected regarding different aspects within each domain. The purpose of the SWOT analysis was to see how the shaping of the EMS should be in order to take into account the existing concerns related to environment.

The findings of the research identified key concerns in the university as energy consumption, waste generation, and transportation. The SWOT analysis showed that the university was doing satisfactorily in energy efficiency and water conservation while there was room for improvement in the case of waste management, transportation, and landscaping. The researchers assert two key implications from their research. First, the researchers claim that implementing an EMS at the university will help reduce the impact on environment due to various day-to-day activities. Second, the researchers declare the EMS will also lead to developing environmental consciousness in the minds of young professionals who graduate from the university as well university staff. Additionally, the researchers comment on the lack of examples of environmental consciousness in educational institutions in India and recommend the need for model systems for incorporating environmental management in the university set-up.

Karol (2006) attempted to integrate a Curtin Environment Awareness Team (CEAT) concern relating to a declining habitat for bird and animal life around a campus lake, with an undergraduate problem-based design project in the School of Architecture. After the students completed their work, CEAT reviewed the projects and selected three schemes for possible inclusion in the program of capital works for the campus. Karol did not offer any specific research questions.

Karol used a case study design for the study. CEAT members and students participated in a survey after the completion of the design project. The survey asked

CEAT members about the effectiveness of student involvement in the project and with CEAT projects in general. Additionally, the survey asked the students about the relevance of the lake project to their development as architects as well as to their understanding of the campus environment. The author did not mention data analysis techniques.

The findings indicated that CEAT members considered that student involvement enhanced the quality, scope, and likely implementation of the project. The student survey results indicated that the project raised their awareness of the complexity of addressing sustainable use of the campus and identified the potential influence of architect designed projects on the natural environment. Karol stressed that the study showed universities do provide an avenue for addressing matters related to sustainability, irrespective of administrative and governance practices.

Karol inferred from her research that there might be a greater possibility of sustainable project implementation on campus because of student involvement due to potential for positive publicity and financial sponsorship for projects. Additionally, Karol remarks that a *sustainable living* attitude can provide a basis for increasing the pressure on this particular university to create policies that enable students to see the university as a leader in sustainable practices and provide strong learning experiences through action.

Sammalisto and Arvidsoon's (2005) study explored how the industrial concept of environmental management was applied in institutions of higher education in Sweden. Specifically, the researchers' aim was to present the situation of the implementation of structured environmental management systems (EMS) in Swedish universities and to form the basis for further studies and for the identification of future action. The

researchers asked the following research question: Why and how are universities working with EMS?

The empirical study focused on Government directives that made EMS implementation compulsory for all public organizations in Sweden, annual environmental reports of Swedish universities for the years 1997-2002, their Internet home pages, and a survey. The survey took place with 17 university-based environmental co-coordinators to trace any possible changes in driving forces and hindrances they had experienced. The annual reports also provide some information about the organizational position of the environmental coordinator, which was seen as an indication of how prioritized the work with EMS at the university was.

Results demonstrated that many universities focused only on direct environmental aspects like paper use and waste handling, even though the main tasks of the university, namely education, research, and cooperation with the surrounding society, were likely to have a considerable environmental impact. The researchers also claimed that the organization of the environmental work and the placement of the environmental coordinator also vary. The findings showed two main patterns that appeared. First, the coordinator had a function in the service department or an administrative function in the president's office. Second, the goal of certification increased the likelihood of the environmental coordinator assigned to the president's office.

Several implications resulted from Sammalisto and Arvidsson's study. First, the researchers stated that the study provided a basic platform for further studies of environmental management in Swedish universities. Second, the researchers imply that the study provided a means for identifying ways of improving the process. Finally, the

researchers posited that the results can be compared to other studies regarding environmental management.

The literature in the foregoing section indicates that buildings planned, designed, and constructed with a "sustainability" mindset have a beneficial effect regarding performance. The LEED Certification process examines specifics components and building characteristics and the potential financial benefits associated with them. The next section reviews literature that focused on additional financial implications of green buildings.

## Financial Implications

There have been a number of studies documenting the financial benefits associated with green building design. Additionally, these studies include findings on energy savings associated with green buildings compared to traditionally designed buildings.

Kats (2006) documented the financial costs and benefits of green schools compared to conventional schools. The author intended to answer two fundamental questions: (a) How much more do green schools cost? and (b) Is greening schools cost effective?

Although the author did not identify a specific study design, data were drawn from 30 green schools built in 10 states during the period of 2001-2006. The schools' architects generally supplied data on costs as well as savings compared to a conventional design. Some of the costs analyzed in the report were based on actual building performance, while some new school costs were estimates based on architectural modeling and engineering estimates. To evaluate the current value of a future stream of

financial benefits and costs, the author conducted a net present value (NPV) analysis with 2006 as the base year. The study assumed a 20-year term for benefits in new buildings. Additionally, the study assumed an inflation rate of 2% per year, staying consistent with most conventional inflation projections. All green school designs met requirements on the USGBC LEED Certification program.

The study's findings answered both research questions. First, the study found that the 30 green schools cost less than 2% more than conventional schools or approximately $3 per square foot. Second, the study showed that green buildings provided financial benefits that were 20 times larger than conventional schools. The financial savings were about $70 per square foot. Ancillary findings indicated that results on energy savings were promising, as green schools used an average of 33% less energy than conventionally designed schools. The energy savings equated to an average monetary savings of $0.38 per square foot. Typical energy performance enhancements included lighting that is more efficient, greater use of daylighting and sensors, more efficient heating and cooling systems, and better-insulated walls and roofs. Results indicated an average water use reduction of 32%.

One primary implication resulted from the study. The researcher provides a clear and compelling case that greening schools today is extremely cost effective and represents a fiscally far better design choice. The researcher notes that building green schools is more fiscally prudent and lower risk than continuing to build inefficient conventional schools. This could be of particular importance to higher education buildings, including recreational sports facilities, as funding for capital construction and facility management is seemingly always a challenge to secure.

Ries, Bilec, Gokhan, and Needy (2006) investigated the relationship between green building construction and five major areas of improvement: gains in worker productivity, reductions in health and safety costs, improvements in indoor environmental quality, reduction in maintenance costs, and energy and water savings. Evaluation of the benefits of green building design and construction served as the purpose of the study.

A mixed methods approach served as the research design for the study. A case study conducted at a concrete manufacturing facility that had moved to a new facility included data collection and analysis for both the old and new facilities. The method included building performance surveys, data collection with statistical analysis, and interviews with management. The comparison of facility performance occurred with the new green building compared to the performance in the previous facility.

The results indicated that employees generally agree that the indoor environmental quality of the new facility was superior to the old and that productivity improved by the view to the outdoors, the size of the work area, the temperature, and the relative humidity. Results also indicated employee satisfaction with their work area and their building in general. Absenteeism indicators generally showed no statistically significant differences, with the exception of an increase in post-move excused absences for office workers and an increase in excused with doctor's excuse for production employees. Statistically, workers' compensation for production employees was significantly less post-move. The researchers reported an energy use decrease of about 30% per square foot in the new green building compared to the old conventional building. No implications came from the study. The researchers recommend further analysis of green building endeavors.

The U.S. General Services Administration (2008) comprehensively evaluated 12 sustainably designed buildings for measuring environmental performance, financial metrics, and occupant satisfaction. The study, performed to provide more information about the performance of sustainably designed facilities, included one research question: Does sustainable design deliver?

The study compared the energy performance, operating cost, water use, and occupant satisfaction of the 12 General Services Administration (GSA) buildings against the average performance of U.S. commercial buildings. The following sources of data, from widely accepted industry and government standards, aided the data collection process: CBECS National Survey of Commercial Buildings constructed between 1990 and 2003 (energy performance); Building Owners and Managers Association International Experience Exchange Report (operating cost); Federal Water Use Index (water use); and the Center for Built Environment Occupant Satisfaction Survey (occupant satisfaction). The research team used a consistent evaluation process for every building studied by obtaining and reviewing one year of operating data, surveying building occupants, interviewing the building manager, and conducting an expert walkthrough.

The study evaluated actual building performance and found that GSA's green buildings outperformed national averages in all measured performance areas – energy, operating costs, water use, and occupant satisfaction. Compared to national averages, green buildings had 26% less energy use, 13% lower maintenance costs, and 27% higher occupant satisfaction. Buildings designed with a strong energy focus had outstanding energy performance. Operations and maintenance costs were lowest in buildings where

sustainability played an integral role to every aspect of the building, including cleaning and recycling. The GSA affirmed that upfront investments in sustainable measures needed matching by sustainable operations and maintenance practices. The results indicated higher occupant satisfaction levels in green buildings in areas of overall building and workplace quality, indoor air quality, cleanliness, and quality of maintenance.

Three implications arose from the study. First, the GSA states that the need for upfront investments in sustainable measures to match sustainable operations and maintenance practices is crucial. Second, the GSA states that good building maintenance is a foundation stone of occupant satisfaction and that it is critical for the post-occupancy performance of a green building. Finally, the GSA claims that it can build on the strong foundation of the study on achievable performance by continuing to be an important benchmark for other public agencies and for companies and institutions as they plan and implement their building programs.

Construction costs, energy savings, and potential return of investment are three financial implications associated with sustainably designed buildings. The literature review touches on several other financial effects of sustainably designed buildings. The next section reviews literature regarding maintenance and operations. Practitioner training and knowledge are examined as well.

## Maintenance and Operations

Facilities require a tremendous amount of maintenance, both routine and preventative. Additionally, many operational policies and procedures are necessary for

building management. Green buildings add a new dimension to the management element. Literature concerning staff training and knowledge is reviewed in this section.

Elmualim, Czwakiel, Valle, Ludlow, and Shah's (2009) research established perceptions, level of commitment, and knowledge chasm in practicing sustainable facilities management (FM). The overall aim of the research was to investigate the nature of sustainable facilities management and provide a benefit to the industry and community in the form of best practice guidance. The researchers did not pose any research questions.

The researchers positioned their research within the interpretative research paradigm with the objective of contributing to the understanding of sustainability discourse as well as providing a knowledge portal for practicing FM. The research utilized critical literature reviews, thinking approaches, workshops, and questionnaires to shed light on the wider sustainability debate as well as with the FM industry. The collection of data occurred through an online survey in the form of self-administered questionnaires. The survey, accessible through the BIFM website, was available to subscribing members for a period of one month. Ninety-two respondents provided the results.

Research findings indicated that the majority of respondents considered the sustainability agenda as important to them and their organizations. Furthermore, the majority stated that sustainability was an objective within their organization's corporate plan. Additionally, many respondents stated that they reported on sustainability as part of their organization's annual reporting with energy efficiency, recycling, and waste reduction as the main concern for them.

The researchers provided two key implications as a result of the study. First, the researchers declared that skills and training provision, traditionally offered separately to designers and facilities managers, needed to be re-evaluated. Second, the researchers emphasized that sustainability education and training be developed to provide effective structures and processes to apply sustainability throughout the construction and FM industries coherently and as common practice.

Marans and Edelstein's (2010) study determined the behaviors, attitudes, and levels of understanding among faculty, staff, and students in an effort to design programs aimed at reducing energy use in University of Michigan (UM) buildings. Besides gaining insights about what occupants know, what they do with respect to energy use, and their views about the work environment, energy conservation, and sustainability, the study also intended to test measurement procedures that could apply to other UM buildings and their occupants and to buildings at other universities. The researchers did not pose specific research questions.

The researchers used a mixed-methods approach in five diverse pilot buildings including key informant interviews, focus groups, behavioral observations, and environmental measures. Insights from the key informant interviews, focus groups, and observations led to the design of two questionnaires. The questionnaires, administered via the Internet, consisted of one for faculty and staff and one for students. The researchers contacted 3,248 faculty, staff, and students in five buildings. A total of 1,473 completed a questionnaire. Staff responded at an 88.4% rate and faculty responded at a 78.5% rate. The response rate for students was 34.8%. Synthesis and analysis of data collected from

the focus groups, observations, and surveys showed differences and similarities among faculty, staff, and students and among the five buildings.

The findings from the study identified the UM staff as the most concerned about conserving energy in UM buildings while students were the least concerned. A significant portion of survey respondents were not aware of past university efforts to conserve energy. The researchers suggested that among those that were aware of past university efforts, many felt that university efforts were inadequate. The observations revealed an abundance of energy-consuming equipment in offices, and lights and computers often remained on when workspaces and conference rooms were unoccupied. The study's results also found that occupants tended to wear heavy clothing during warm weather months indicating excessively low building temperatures. Additionally, the study found that most occupants were willing to accept higher building temperatures during warm weather months and lower temperatures during cold weather months.

The findings from the study led to implications summarized into policy recommendations for a new energy conservation program that will incorporate occupant behavior into its mission. Leadership, better and clearer information, motivating more appropriate behaviors, changing existing buildings, and guidelines for new buildings compose the policy recommendation categories.

Lai and Yik (2006) investigated the knowledge and perception of serving and prospective operation and maintenance (O&M) practitioners about the key aspects of sustainable buildings. Additionally, the researchers aimed to study the contribution of the current education and training to their knowledge level. The researchers did not ask any specific research questions.

The research design included a self-administered questionnaire survey on full-time practitioners attending continuous professional development courses related to building service engineering (BSE) or facilities management (FM); full-time practitioners studying part-time on undergraduate BSE/FM courses; and full-time undergraduate BSE/FM students. One hundred sixty-eight respondents completed and returned the questionnaire on a voluntary basis. The majority of the respondents were young practicing or prospective practitioners with a degree or sub-degree qualifications.

Results demonstrated that respondents were largely unaware of the initiatives for promoting building environmental performance and sustainability. The respondents' knowledge level about sustainable buildings was generally low and bore little correlation with their work experience, attendance to continuous professional development (CPD) training, and undergraduate courses that they had taken. Good O&M for buildings was perceived by both O&M practitioners and building designers to be highly relevant to sustainable buildings.

Lai and Yik stated that further research is required to study how the education and training means should be revamped and coordinated to tailor for the O&M practitioners. Additionally, the researchers state that more stringent CPD requirements by relevant professional bodies would help motivate the practitioners to continuously acquire knowledge that is essential for making buildings sustainable.

Velazquez, Munguia, Platt, and Taddei (2006) presented a comprehensive managerial model for a sustainable university with empirical data collected from 80 higher education institutions around the world. The sustainable university model offered a clear perspective about how people responsible for sustainability initiatives achieved

their initial momentum to progress to advanced steps in the process to become a sustainable university.

The researchers conducted a survey to expand the information and to include certain themes in the model that were not available in the literature. The goal of the survey was to develop a more complete depiction of the sustainable university model through the perceptions and interpretations of people involved with the process for implementing sustainability in higher educational institutions. The survey instrument consisted of 26 questions designed in an open-answer format and targeted a select group of experts in the field.

Results indicated that only a few institutions had included sustainability in their mission statements. The researchers found 43% of the institutions had or planned to have a written commitment to support sustainability on campus. The necessity for increasing the coordination among different initiatives on campus was evident in the study. Additionally, almost all institutions were offering environmental courses and were researching sustainability issues.

The researchers state that there is a growing impetus on campus for expressing sustainability dimensions in missions, plans, and policies. The researchers also asserted that there is a long way to go before achieving sustainability and that all the energy, dedication, time, and resources invested by university members in universities around the world have yielded many fruits.

Lai's (2010) study aimed to identify the available higher education programs that focused on training of sustainable facility practitioners. Lai focused specifically on practitioners that possessed the appropriate levels of knowledge. Additionally, Lai

intended to investigate they types of education needs for the operation and maintenance (O&M) practitioners in Hong Kong. Lai did not pose any specific research questions.

The review of published information of the building-related programs offered by the local higher education institutions occurred. Strategies used to survey the perceptions and opinions of the practitioners included a questionnaire, designed, piloted, and distributed with the support given by the leading O&M society in Hong Kong. Respondents returned 145 questionnaires, with an average of 12.4 years working in the building industry and 9.0 years in the O&M field. Lai did not elaborate on specific data analysis techniques.

Lai's findings indicated that no education programs existed that tailored to producing professionals to meet the rising demand for O&M works. Practitioners indicated their strong wish to learn more, in particular, about energy and environmental management, testing, and commissioning. Practitioners also expressed an overwhelming desire for dedicated O&M programs.

Lai suggested launching a new program in a university, tailored to O&M practitioners, to match with its defined role. Additionally, Lai mentioned hurdles to launching these programs, such as availability of funding, teacher expertise, and research support for the new subject area.

In summary, this section reviewed literature concerning the maintenance and operational aspect of managing green buildings. Practitioner awareness, knowledge, and commitment of green issues, as well as organizational objectives, importance, and policies regarding green issues were noted. Although the literature indicates some openness to sustainable operations, it also indicates some barriers to moving forward with

green and sustainable initiatives. The following section reviews literature documenting some of these barriers.

## Barriers to Green Construction

The following section reviews literature regarding barriers to green construction. Literature reviewed pertains primarily to administrative perspectives and policy development.

Examining how a cohort of university presidents and vice-presidents in Canadian universities conceptualize sustainable development, sustainable universities, and the role universities play in achieving a sustainable future was the purpose of Wright's (2010) study. Also examined were key issues facing the university over the next decade and the barriers to implementing sustainability initiatives on campus.

A qualitative research approach made up the study design. The population of the study was limited to all Canadian university presidents and vice-presidents in Canadian universities where institutions are signatories to the Talloires Declaration ($N = 29$), which according to the Association of University Leaders for a Sustainable Future (2001) is "a ten-point action plan for incorporating sustainability and environmental literacy in teaching, research, operations and outreach at colleges and universities" (¶ 1). A total of 21 participants representing 17 universities agreed to interviews as part of the study. In the case of institutions where there were multiple respondents, responses were aggregated into one transcript to represent the university ($N = 17$). Interviews included both closed and open-ended questions and two checklists focused on sustainable development and sustainable universities. All interviews were digitally recorded and transcribed with the permission of the participant. Data coding and analysis took place once all of the

interviews were complete and data analysis occurred through the identification of respondent themes. Data grouping ended up theme based, and then the groups combined into themes. QDA Miner (Provalis Research) was used to generate codes and aggregate statistics.

The study findings revealed that the cohort of Canadian university presidents and vice-presidents have, at the very least, thought about sustainable development, and that most have contemplated the role the university can play in the broader sustainability movement. Additionally, the cohort's conceptualizations of sustainable development tended to focus more on the environmental aspects of sustainability rather than the social and economic aspects. Conversely, the interviews revealed that most presidents and vice-presidents were unaware of the emerging field of sustainability in higher education (SHE). The interviews also revealed that as administrators they were dedicated to their universities playing a role in creating a sustainable future.

The author stated two implications of the study results. The results provided a context to SHE initiatives and are helpful in understanding the issues facing presidents and vice-presidents when developing and promoting sustainability on campus. The study contributed to the evolving body of SHE literature by investigating the level of sustainability knowledge and understandings of the role the university can play in creating a sustainable future.

The purpose of Richardson and Lynes's (2007) study was to explore the barriers and motivations to the construction of green buildings at the University of Waterloo (UW). Additionally, the researchers intended this study to have a practical and policy

contribution at UW. The researchers completed the study by documenting and analyzing the UW building process.

The case study used a two-part qualitative research approach in order to understand both the process for constructing new buildings at UW and to analyze motivations and barriers to green building implementation. The first phase of the study involved a review of a variety of UW internal and external documents regarding campus greening initiatives, organizational structure, building policies, procedures, and committees related to the design and construction of new buildings on campus. Documents included university guidelines, policies, agendas, minutes, student projects, and news bulletins. The second phase consisted of 13 semi-structured, in-person interviews with key stakeholders intimately involved in decision-making processes relating to buildings at the UW. Informants included faculty and staff and represented a variety of positions and departments, including administration and finance, facilities, environmental studies faculty, and engineering faculty. The diversity of informants ensured an acquisition of a wide variety of perspectives. The interviews lasted between 30 and 80 minutes.

Two themes, those that related to financial aspects of decision making and those that related to organizational structure and culture at UW categorized the findings. First, the financial barriers identified in the study ranged from negative perceptions of green buildings in general, the perception that green buildings incur higher initial capital costs, and a lack of incentives to reduce long-term energy and maintenance costs at both faculty and facilities level. Second, UW organizational weaknesses found included the following: a lack of internal leadership amongst stakeholders with decision-making power; a lack of

quantifiable sustainability targets; an operational structure that does not reward building designs with lower energy costs; and a lack of communication between professional designers, facilities management, and faculty.

Several implications resulted from the findings of the case study. The implications focused on changing the culture inherent in the UW administration. The researchers recommended that UW develop strong university leadership, establish guidelines and quantitative sustainability targets; facilitate collaboration and partnerships, and foster increased communication and transparency. Additionally, the researchers suggested that this study facilitates reform to make campus operations more environmentally sustainable.

The purpose of Conroy's (2006) study was to take an initial assessment of three states (Indiana, Ohio, and Kentucky) to attempt to offer insights into how sustainability concepts and principles were being adopted in communities that were both less studied and perhaps more typical of the country as a whole. The study attempted to answer the following research question pertaining to sustainability in typical places: What is the level of pervasiveness at which sustainability concepts are being discussed and adopted in Indiana, Kentucky, and Ohio?

The study used a mailed questionnaire to survey planning directors or others responsible for planning-related practices in all of the communities in Indiana, Kentucky, and Ohio with populations of at least 2,000 and fewer than 1,000,000. To try to capture the range of sustainability-related activities and insights in the communities, survey questions were both multiple-choice and open-ended. Analysis of survey responses used response counts and rates for all closed-ended survey questions; open-ended survey-

question responses provided additional details from the respondents. Participants returned 436 surveys, which gave an overall response rate of close to 45%. The survey addressed three main topics: familiarity with the sustainability concept, activities promoting the concept, and background information on the respondent and his or her organization.

The researchers documented three key findings of the study. First, the study indicated that a general familiarity with the concept of sustainable development existed but that it had not been accepted as a new or different standard for planning practice. Second, the adoption of many activities that forward the goals of sustainable development occurred or were planned for adoption in the majority of the communities in the study. Third, the findings emphasized a continual challenge to sustainable development.

The study examined the level to which sustainability has become part of planning practice in three states: Indiana, Kentucky, and Ohio. An implication suggested by the researchers pertains to the challenge to planning. The researchers implied that if sustainable development is a new paradigm and not simply a recasting of good planning ideals, then there needs to be a better marketing of its differentiating factors, primarily its integrations of concept goals.

In summarizing barriers to green construction, the literature assesses administrative awareness levels concerning sustainable concepts. Some negative perceptions regarding costs associated with green design was highlighted as well. Continuing education and policy development were two themes generated from the literature review. The next section is a summary of the review of literature including the relevance to sustainability in recreational sports.

## Summary

The aforementioned literature review highlights the bank of empirical research on sustainable buildings, including sick building syndrome; green planning, design, and construction; financial implications of green buildings; maintenance and operations of sustainable facilities; and barriers to "going green." It is important to note, however, that none of the research dealt specifically with recreational sports facilities in higher education. Many American college campuses contain these types of facilities and a snapshot summary of the state of the industry can serve as an excellent start to facilitating more research on the topic. Therefore, the need for an exploratory study to assess levels of recreational sports department personnel's familiarity, institutional adoption, perceptions of the benefits, and challenges of green initiatives is justified. This study can potentially make a significant contribution to higher education, the National Intramural-Recreational Sports Association (NIRSA), and the recreational sports field in general by documenting research in the attempt to provide discernment to professionals on the current state of green design and sustainability efforts in the industry.

# CHAPTER III

# METHODOLOGY

The purpose of this study was to assess levels of personnel familiarity and institutional adoption related to green and sustainable initiatives at campus recreational sports facilities. Additionally, the study collected perceptions of the benefits as well as the challenges of such initiatives.

This study was important for a number of reasons. First, no previous research had been conducted specifically on personnel familiarity and institutional adoption regarding facility sustainability. In addition, there is no evidence of prior research explicitly on the perceived benefits and challenges of green and sustainable initiatives in campus recreational sports facilities. Second, this study provided information on the current state of green and sustainability efforts in the industry of collegiate recreational sports. Administrators (President, Vice-President/Student Affairs, Chief Financial Officer, etc.) can benefit from this study when determining the strategy for a new construction project or an existing facility renovation. Finally, this study can potentially lead to new areas of research of green and sustainable initiatives in campus recreation, particularly with the management and operations of facilities.

This chapter presents the methodology utilized to execute the study. Detailed descriptions of the research perspective, research design, research context, participants, instrument, pilot study, procedures, and data analysis are offered in this chapter. The

chapter ends with a brief summary of chapter information and provides a preview for the following chapter.

## Research Perspective

This study attempted to assess levels of personnel familiarity and institutional adoption related to green and sustainable initiatives at campus recreational sports facilities. Additionally, the study collected perceptions of the benefits as well as the challenges of such initiatives. Because the study was of an exploratory design in nature, there were no hypothesis statements. The study sought to address the following five research questions:

1. What are the levels of personnel familiarity of campus recreational sports department personnel regarding green/sustainable initiatives?
2. What are the institutional adoption levels related to green/sustainable initiatives?
3. Are there significant differences of institutional adoption levels related to green/sustainable initiatives based on categorical variables such as type of institution, enrollment, geographical region, and size of facility?
4. What are the perceived benefits of implementing green/sustainable initiatives in campus recreational sports facilities?
5. What are the perceived challenges in implementing green/sustainable initiatives in campus recreational sports facilities?

## Research Design

This hybrid study utilized both quantitative and qualitative research methods. The primary type of research this study employed was descriptive research. Descriptive research is used to describe the characteristics of a population by directly examining

samples of that population (Glatthorn & Joyner, 2005). Descriptive statistics are statistical procedures used to summarize, organize, and simplify data (Gravetter & Wallnau, 2007). The main purpose of descriptive statistics is to reduce the data to simpler and more understandable forms without distorting or losing much information (Agresti & Finlay, 2009). Qualitative questions were employed to allow respondents to elaborate on the perceived benefits of and challenges in implementing green design and sustainable initiatives in campus recreational sports facilities. Open-ended questions were included on the survey to allow the respondents to elaborate on specific questions and to elicit more information on the topic. The Writing Studio at Colorado State University (2012) contends that the use of open-ended questions allows for a more successful approach to securing respondents' intimate feelings on a topic. Additionally, surveys that use this method can be more easily used for additional analysis by other researchers.

## Research Context

The research activities covered a one-month period, from January 22 – February 21, 2013. This study focused on campus recreation departments at National Intramural-Recreational Sports Association (NIRSA) member institutions. NIRSA is the leading resource for professional and student development, education, and research in collegiate recreational sports. NIRSA's mission is to be a leader in higher education and the advocate for the advancement of recreation, sport, and wellness by providing educational and developmental opportunities, generating and sharing knowledge, and promoting networking and growth for its members (NIRSA, 2012).

According to the NIRSA Recreational Sports Directory (2011), NIRSA serves a network of more than 3,800 highly trained professional, student, and associate members

in the recreational sports field throughout the United States, Canada, and other countries. Of NIRSA's institutional members, 98% are from college and university recreational sports programs. NIRSA's member institutions represent nearly seven million college students, of whom an estimated five and a half million participate in recreational programs.

An informed consent document, detailing the need to conduct the research, the voluntary nature of participating, and measures to ensure confidentiality, was created and sent to all participants in the study. There were no foreseeable risks associated with participating in this study. A potential benefit of participating was the satisfaction of contributing to research aimed at assessing levels of recreational sports personnel familiarity and institutional adoption related to green/sustainable initiatives at campus recreational sports facilities, as well as collecting perceptions of the benefits and challenges of such initiatives. The names of the directors were not solicited on the survey instrument, and all surveys received were stored electronically on a secure, password-protected computer. The final report consisted of aggregated data with a personal identifier. An Executive Summary of the results was made available, on request, to the participants.

## Participants

The intent of this study was to send surveys to the entire population of recreational sports departments/directors at NIRSA member institutions. Sending surveys to the entire populations was chosen because of the relatively small population size and the ease of access to each. Five hundred seventy five directors of recreational sports programs at NIRSA member institutions were sent surveys for the study. Directors were

specifically chosen to complete the survey, for the study, because of their intimate knowledge of departmental and facility management and operations. Directors were identified for this study by using a membership database provided by the NIRSA National Center.

## Instrument

There were no existing instruments related to the specific purpose of this study to utilize, so a new one needed to be developed. The Collegiate Recreational Sports Sustainability Survey was self-developed in consultation with a variety of experts who were knowledgeable in the area of sustainability, and by relating the questions to some of the aspects of LEED criteria. DeVellis (2003) claims that this method serves multiple purposes related to maximizing the content validity of the instrument. The experts included an Associate Professor in Kinesiology, Recreation and Sport, a Plant Operations Manager in Facilities Management, a Sustainability Coordinator in the Office of Sustainability, and an Associate Professor in Social Work. The aforementioned experts were consulted due to their proficient knowledge of recreational sports facility management, sustainability, and instrument development, respectively. As recommended by Dillman (2007), the experts thoroughly reviewed the survey questions and offered feedback on each item. Survey items were included, omitted, or revised based on the constructive assessment of the experts.

The Collegiate Recreational Sports Sustainability Survey was an electronic survey that consisted of 24 questions in various formats. The majority of questions were listed in *yes/no* format. Some of the questions were open-ended to solicit more specific feedback. Additionally, a typed response to the open-ended questions was required in the

space provided. Two questions required the inclusion of the "other" option to make each item answer complete.

The Collegiate Recreational Sports Sustainability Survey questions related to specific LEED credit criteria, such as sustainable sites, water efficiency, energy and atmosphere, materials and resources, indoor environmental quality, and innovation. The survey items were strategically tied to the research questions and were related to the following areas: personnel familiarity with sustainable initiatives, institutional adoption of sustainability, benefits and challenges of becoming more sustainable. Questions 1-6 consisted of inquiries regarding categorical information. These questions proved to be most helpful in answering Research Question #3. Questions 7-18 were aimed at assessing the institutional level of adoption component. Questions 19-22 focused on assessing familiarity levels of campus recreation department personnel regarding green/sustainable initiatives. Questions 23 and 24 solicited information on the perceived benefits and challenges of implementing green and sustainable initiatives in campus recreational sports facilities. A small pilot study was conducted for a variety of reasons, namely to test logistics associated with the study. Additional information on the pilot study is in the next section.

## Pilot Study

According to the University of Illinois Center for Teaching and Learning (2006), a pilot study is designed to test logistics and gather information prior to a larger study in order to improve the latter's quality and efficiency. Additionally, a pilot study can reveal deficiencies in the design of a proposed study and these can be addressed before time and resources are expended on a larger study. Ten campus recreational sports employees, not

involved as subjects in the study, participated in a pilot study to check for the following: (a) that instructions given were clear and comprehensible, (b) that the format of the survey was understandable, and (c) to complete a check of the planned data analysis techniques.

The pilot study proved to be effective and beneficial in facilitating a more effective and efficient survey. Feedback was given from each pilot study participant and revisions were made to answer choices on two of the questions for improved clarity. Pilot participants confirmed that the instructions were clear and that the survey format was understandable. Pilot study data were successfully analyzed with the planned data analysis techniques. Descriptive statistics and inferential statistics were ascertained and content analysis proved to be effective in analyzing the qualitative component of the survey.

## Procedures

Several specific procedures were used when conducting the data collection phase of this study. An electronic survey, the Collegiate Recreational Sports Sustainability Survey, was created using the survey software Qualtrics©. Qualtrics© is an online survey research suite used for creating, distributing, and analyzing results for Web-based surveys. The link for the electronic survey was sent to all campus recreation directors at NIRSA member institutions. Directors were specifically targeted for the study because of their intimate knowledge of departmental and facility management and operations. Directors' e-mail addresses were identified for this study by using a membership database provided by the NIRSA National Center.

To facilitate a higher response rate, all participants were given the following correspondence electronically: (a) an invitation e-mail to complete the survey explaining the purpose of the study, (b) informed consent e-mail, and (c) detailed instructions on how to complete and submit the survey. A follow-up e-mail was sent to participants that had not completed the survey two weeks after the initial invitation to participate. As an additional measure to solicit a higher response rate, five one-year NIRSA Professional Memberships at a NIRSA member institution (valued at $126 each) were offered as an incentive to complete the survey; the respondents submitted their names (separate and apart from the submission of the survey) for a random drawing to determine the winner.

The University of Louisville Institutional Review Board and Western Kentucky University Office of Compliance approved and sanctioned the study. All protocols required from each institution were strictly carried out to ensure that participants were protected from potential harm and informed of their rights.

## Data Analysis

Survey data were analyzed using the computer software program, IBM SPSS Statistics 19. This data analysis and subsequent reporting tool was used in the attempt to reduce the data to simpler and more understandable forms without distorting or losing important information. SPSS offered reliable statistical analysis capabilities. Descriptive statistics, including means, medians, modes, ranges, standard deviations, and variance were calculated to summarize the data sets and answer the research questions. Inferential statistics were also used to determine if there were significant differences in terms of personnel familiarity and institutional adoption levels of green and sustainable initiatives based on a variety of categorical variables.

Content analysis served as the method for analyzing and categorizing the qualitative data. Content analysis is defined as "a research technique for making replicable and valid inferences from texts to the contexts of their use" (Krippendorf, 2004, p. 18). Using this method facilitated the identification of the important aspects of the content. Additionally, content analysis techniques allowed for the counting of instances to see frequency and the creating of codes to define categories. Ultimately, these techniques quantified the qualitative data and tables were used to illustrate. As suggested by Bogdan and Biklen (2006), themes and patterns were identified and coherent categories were developed that summarized the results and brought meaning to the study. Themes emerged from study in the form of word repetitions, specialized vocabulary, recognizing themes that were not present, and pawing. Pawing refers to marking the text and eyeballing or scanning the text to look for patterns and significances (Ryan & Bernard, 2003).

## Summary

This chapter explained the methodology used in this study that assessed levels of personnel familiarity, institutional adoption, benefits, and barriers related to green/sustainable initiatives at campus recreational sports facilities. Detailed descriptions of the research perspective, research design, research context, participants, instrument, pilot study, procedures, and data analysis were offered in this chapter. The next chapter offers the results of the study obtained through the aforementioned methods.

# CHAPTER IV

# RESULTS

The purpose of this study was to assess levels of collegiate recreational sports department personnel's familiarity and institutional adoption related to sustainable initiatives at campus recreational sports facilities. Additionally, the study collected the perceptions of the benefits as well as the challenges of such initiatives. This was a foundational study that attempted to create some benchmark data for the practitioners of campus recreational sports facilities industry within the National Intramural-Recreational Sports Association (NIRSA). This chapter is organized by displaying the results in order of the five research questions addressed in the study:

1. What are the levels of familiarity of campus recreational sports department personnel regarding green/sustainable initiatives?
2. What are the institutional adoption levels related to green/sustainable initiatives?
3. Are there significant differences of institutional adoption levels related to green/sustainable initiatives based on categorical variables such as type of institution, enrollment, geographical region, size of facility, and LEED status?
4. What are the perceived benefits of implementing green/sustainable initiatives in campus recreational sports facilities?

5. What are the perceived challenges in implementing green/sustainable initiatives in campus recreational sports facilities?

## Respondent Demographics

The Collegiate Recreational Sports Sustainability Survey was developed to provide information on the current state of sustainability efforts in the industry of collegiate recreational sports. Additionally, the survey facilitated this foundational study that attempted to create some benchmark data for practitioners within NIRSA of the campus recreational sports facilities industry. Directors of NIRSA member institutions were specifically chosen to complete the survey for the study because of their intimate knowledge of departmental and facility management and operations. Directors were identified for this study by using a membership database provided by the NIRSA National Center. The research activities covered a one-month period, from January 22 – February 21, 2013. A total of 575 directors were sent the survey and received a reminder e-mail two weeks prior to the survey expiration date. Responses were returned from 223 directors for a total response rate of 39%. The average enrollment from responding institutions was 14,933 students. Recreational sports facility size of respondents was 106,023 square feet. Full-time professional staff of the responding institutions ranges from 1-70 ($M$ = 10) staff members. Tables 2 provide a breakdown of responses by type of institution, institution enrollment, NIRSA geographical region, facility size, and LEED certification status.

Table 2

*Response Breakdown by Categorical Variables*

| Variable | *n* | % |
|---|---|---|
| Institution Type | | |
| 2-Year Public College/University | 9 | 4% |
| 4-Year Public College/University | 151 | 68% |
| 4-Year Private College/University | 59 | 26% |
| Other | 4 | 2% |
| Institution Enrollment | | |
| Small | 102 | 46% |
| Medium | 61 | 27% |
| Large | 54 | 24% |
| Unknown | 6 | 3% |
| Geographical Region | | |
| Region I | 43 | 19% |
| Region II | 48 | 21% |
| Region III | 37 | 17% |
| Region IV | 41 | 18% |
| Region V | 24 | 11% |
| Region VI | 30 | 14% |
| Facility Size | | |
| Small | 80 | 36% |
| Medium | 67 | 30% |
| Large | 44 | 30% |
| Unknown | 32 | 14% |
| LEED Status | | |
| Certified | 49 | 22% |
| Not Certified | 174 | 78% |

4-Year Public Colleges/Universities yielded the highest number of responses among the category of Institution Type. The majority of responses came from 4-Year Public and 4-Year Private institutions.

Approximate institution enrollment information was collected for the study. Enrollment categories of *small, medium, and large* were created for the data analysis purposes. Institutions with total approximate enrollments of 10,000 students or less were placed in the *small* category. The *medium* category consisted of colleges/universities with approximate enrollments ranging between 10,001 – 20,000 students. Institutions with total enrollment of 20,001 or more students were place in the *large* category. Finally, six respondents were not sure of their institutions total approximate enrollment. *Small* institutions accounted for nearly half of the overall respondents. Six respondents were not sure of their institution's approximate enrollment.

Survey data were collected from institutions in each of the six geographical regions deemed by NIRSA. Region II (Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, West Virginia) totaled the most responses of all of the regions with 48 (21%). Region I (Connecticut, Delaware, District of Colombia, Maine, Maryland, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont), had the second most responses with 43 (19%). The region with the third most responses was Region IV (Arkansas, Kansas, Louisiana, Missouri, New Mexico, Oklahoma, Texas) with 41 (18%). Region III (Illinois, Indiana, Michigan, Ohio, Wisconsin), had the fourth most responses with 37 (17%). Region VI (Alaska, Arizona, California, Hawaii, Idaho, Nevada, Oregon, Utah, and Washington) had the fifth most responses with 30 (14%). The least amount of responses came from member institutions from Region V (Colorado, Iowa, Minnesota, Montana, Nebraska, South Dakota, Wyoming) with 24 (11%).

Size, in square footage, of the survey participants' primary campus recreation facility was collected for the study. Facility size categories of *small, medium, and large* were created for the data analysis purposes. Institutions with a facility size of 75,000 square feet or less were placed in the *small* category. The *medium* category consisted of facilities ranging between 75,001 – 150,000 square feet. Institutions with a campus recreation facility of 150,001 square feet or more were place in the *large* category. Finally, 32 respondents were not sure of the size of their facility. Respondents from *small* facilities accounted for the most responses, although there was a small gap in the number of responses between all sizes of facilities.

LEED Certification and level (if applicable) information was collected as part of the survey. Table 3 reports the LEED Certification status and level of certification.

Table 3

*Response Breakdown by LEED Certification Level*

| Level | *n* | *%* |
|---|---|---|
| Not LEED Certified | 174 | 78.0% |
| LEED NC Platinum | 3 | 1.3% |
| LEED NC Gold | 9 | 4.0% |
| LEED NC Silver | 10 | 4.5% |
| LEED NC Basic | 5 | 2.2% |
| LEED EB Platinum | 1 | 0.7% |
| LEED EB Gold | 3 | 1.3% |
| LEED EB Silver | 3 | 1.3% |
| LEED EB Basic | 4 | 1.8% |
| Other | 11 | 4.9% |
| Total | 223 | 100% |

*Note*: NC = new construction, EB = existing buildings.

The large majority of respondents came from buildings that were not LEED certified. Among the LEED certified campus recreation facilities, a variety of rating levels were represented, including the most from the LEED New Construction Silver category.

## Research Question One

The first research question was "What are the levels of familiarity of campus recreational sports department personnel regarding green/sustainable initiatives?" Descriptive statistics were determined in the form of frequency distributions and percentages in order to address this question and to provide some benchmark information

relative to personnel familiarity levels regarding green/sustainable initiatives. The results of overall responses are displayed in Table 4.

Familiarity indicators included in the survey were a) personnel having LEED AP certification, b) personnel attending a sustainability-specific conference or workshop, c) personnel having taken a sustainability-specific academic course(s), and d) personnel that have pursued financial incentives regarding sustainability efforts.

Table 4

*Overall Responses Regarding Personnel Familiarity Indicators*

| Initiative | Yes (%) | No (%) | Not Sure (%) |
|---|---|---|---|
| LEED AP Certification | 2 (1%) | 128 (57%) | 93 (42%) |
| Conference/Workshop Attendance | 82 (37%) | 67 (30%) | 74 (33%) |
| Academic Courses | 21 (9%) | 115 (52%) | 87 (39%) |
| Financial Incentives | 45 (20%) | 149 (67%) | 29 (13%) |

Respondents were surveyed on whether personnel at their recreational sports facility possessed the LEED AP certification. The overwhelming majority of respondents indicated that they did not have personnel that possessed the credential or were not sure. Conference/Workshop Attendance results were more evenly distributed. Respondents were asked if their personnel had taken any academic courses, in the past five years, in the area of green design, management, or operations. As with LEED AP certification, the large majority of respondents indicated that their personnel had not taken an academic course or were not sure. When asked if any personnel in their facility had pursued financial incentives (tax benefits, grants, rebate programs, etc.) available for

sustainability initiatives, the majority of respondents reported that their personnel had not pursued financial incentives.

*Type of Institution*

As reported in Table 2, 4-Year Public Colleges/Universities accounted for the largest amount of respondents by institution type. Additional institution types represented included 4-Year Private Colleges/Universities and 2-Year Public Colleges/Universities. Four-year public institutions reported the highest percentage in the personnel familiarity indicators of LEED AP certification (1%) and financial incentives (24%). Regarding conference/workshop attendance, 2-year public institutions had the highest percentage of attendance within institution types with 44%. Other institution types showed the highest level (25%) of personnel taking green-specific academic courses.

*Institution Enrollment*

*Large* institutions reported the highest percentage in the personnel familiarity indicators of financial incentives (30%) and academic courses (15%). Regarding conference/workshop attendance, *medium* and *large* institutions had the highest percentage of attendance within institution enrollment size with 39% respectively. *Small* and *large* institutions showed the highest level (1%) of personnel being LEED AP certified.

*Geographical Region*

Region III reported the highest percentage in the personnel familiarity indicators of LEED AP certification with 3% of respondents from that region indicating that they had personnel with the certification. Regarding financial incentives, Region V had the highest percentage within the NIRSA regions with 42%. Institutions from Region VI

showed the highest level (57%) of personnel having attended a conference/workshop and taking green-specific academic courses (20%).

*Facility Size*

Institutions that had *large* facilities reported the highest percentage in the personnel familiarity indicators of conference/workshop attendance (46%), academic courses (14%), and financial incentives (36%). Institutions with *small* and *large* facilities tied with the highest percentage of staff having the LEED AP certification with 1%.

*LEED Certification Status*

Institutions that had LEED facilities reported the highest percentage in the personnel familiarity indicators of conference/workshop attendance (39%), academic courses (10%), and financial incentives (27%). Institutions with non-LEED facilities had the higher percentage of staff having the LEED AP certification with 1%

## Research Question Two

The second research question to be answered in this study was "What are the institutional adoption levels regarding green/sustainable initiatives?" Descriptive statistics were calculated in the form of frequency distributions and percentages, in order to answer this question and to provide a snapshot summary of the level of adoption to certain green/sustainable initiatives. The results of overall responses are displayed in Table 5.

Initiatives included in the survey were a) bicycle racks or storage within 200 yards of building entrance for 5% or more of all building users; b) low flush toilets/urinals; c) sensored restroom faucets; d) low flow shower heads; e) accountability of annual building energy consumption; f) dedicated area for recycling; g) occupancy

sensors for automated lighting control; h) green cleaning policy; i) staff training program regarding green cleaning for personnel responsible for housekeeping and maintenance; j) facility sustainability committee or advisory council; k) grants, rebates, or tax incentives received for sustainability-related items; and l) dedicated Office of Sustainability on campus.

Table 5

*Overall Responses Regarding Adoption of Various Sustainable Initiatives*

| Initiative | Yes (%) | No (%) | Not Sure (%) |
|---|---|---|---|
| Bicycle Racks or Storage | 147 (66%) | 71 (32%) | 5 (2%) |
| Low Flush Toilets/Urinals | 109 (49%) | 96 (43%) | 18 (8%) |
| Sensored Restroom Faucets | 97 (43%) | 124 (56%) | 2 (1%) |
| Low Flow Shower Heads | 124 (56%) | 81 (36%) | 18 (8%) |
| Accountability of Annual Building Energy Consumption | 104 (47%) | 74 (33%) | 45 (20%) |
| Dedicated Area for Recycling | 173 (78%) | 46 (21%) | 4 ( 2%) |
| Occupancy Sensors Installed | 133 (60%) | 88 (39%) | 2 (1%) |
| Green Cleaning Policy | 94 (42%) | 97 (44%) | 32 (14%) |
| Staff Training Program | 75 (34%) | 99 (44%) | 49 (22%) |
| Sustainability Committee or Advisory Council | 64 (29%) | 151 (68%) | 8 (3%) |
| Grants, Rebates, or Tax Incentives Received | 47 (21%) | 154 (69%) | 22 (10%) |
| Dedicated Office of Sustainability | 133 (60%) | 75 (33%) | 15 (7%) |

*Bicycle Racks or Storage*

Respondents were surveyed on whether their recreational sports facility offers secure bicycle racks or storage within 200 yards of a building entrance for 5% or more of all building users (measured at peak periods). Regarding adoption of this initiative, respondents reported being the second most committed to this initiative out of the 12.

*Low Flush Toilets/Urinals*

Respondents were asked if their respective facility included low flush toilets/urinals. Results show that this initiative ranked sixth out of the 12 initiatives, based on the responses.

*Sensored Restroom Faucets*

Regarding the installation of sensored (automatic off/on) restroom faucets in their facility, 43% ($n$ = 97) reported having the sensored faucets. Adoption level to this initiative ranked eighth out of 12.

*Low Flow Shower Heads*

Respondents were surveyed on whether low flow shower heads were installed in their recreational sports facility. Regarding adoption of this initiative, respondents reported being the fifth most committed to this initiative out of the 12.

*Accountability of Annual Building Energy Consumption*

When asked if they had a system in place for ongoing accountability of annual building energy consumption, results show that this initiative ranked seventh out of the 12 initiatives. This initiative yielded the second highest reporting of respondents being unsure of adoption.

*Dedicated Area for Recycling*

Regarding having at least one easily accessible dedicated area for the collection and storage of materials for recycling for the entire facility, 173 (78%) reported having an area. This ranked as the number one overall initiative committed to by respondents.

*Occupancy Sensors for Automated Lighting Control*

Respondents were surveyed on whether their facility was installed with occupancy sensors (i.e. motion detectors) for automated lighting control. Regarding adoption of this initiative, respondents reported being third most committed to this initiative out of the 12.

*Green Cleaning Policy*

When asked if they had in place a green cleaning policy for using green cleaning products and equipment, results show that this initiative ranked ninth out of the 12 initiatives. This initiative yielded the third highest reporting of respondents being unsure of adoption.

*Staff Training Program Regarding Green Cleaning*

Regarding if a staff training program existed relative to green cleaning for personnel responsible for housekeeping and maintenance, 75 (34%) reported having a program. This ranked tenth out of the 12 initiatives, although respondents were most unsure about adoption of this initiative.

*Active Sustainability Committee or Advisory Council*

Respondents were surveyed on the existence of an active facility sustainability committee or advisory council within their department. Regarding adoption of this initiative, respondents reported being second most uncommitted of the 12 initiatives.

*Grants, Rebates, or Tax Incentives Received*

When asked if their department had been awarded funding, for sustainability-related items, in the form of grants, rebates, or tax incentives within the past five years, results indicated that the adoption of this initiative ranked last of the 12 initiatives.

Nearly three-fourths of respondents reported not being the recipients of financial incentives.

*Dedicated Office of Sustainability*

Regarding the existence of a dedicated office of sustainability on their respective college/university campus, 133 (60%) reported the existence of an office. This was one of the most committed-to initiatives, ranking third out of the 12 initiatives.

*Type of Institution*

As reported in Table 2, 4-Year Public Colleges/Universities accounted for the largest amount of respondents by institution type. Additional institution types represented included 4-Year Private Colleges/Universities and 2-Year Public Colleges/Universities. A breakdown of percentages regarding adoption of various sustainable initiatives by institution type is summarized in Table 6.

Table 6

*Percentages Regarding Adoption of Sustainable Initiatives by Institution Type*

| Initiative | 4-Pub | 4-Pri | 2-Pub | Other |
|---|---|---|---|---|
| Bicycle Racks or Storage | 66% | 68% | 78% | 25% |
| Low Flush Toilets/Urinals | 52% | 37% | 67% | 50% |
| Sensored Restroom Faucets | 48% | 32% | 56% | 25% |
| Low Flow Shower Heads | 60% | 49% | 56% | 50% |
| Accountability of Annual Building Energy Consumption | 50% | 37% | 67% | 25% |
| Dedicated Area for Recycling | 81% | 73% | 67% | 50% |
| Occupancy Sensors Installed | 67% | 41% | 67% | 50% |
| Green Cleaning Policy | 46% | 37% | 33% | 75% |
| Staff Training Program | 38% | 25% | 33% | 25% |
| Sustainability Committee or Advisory Council | 31% | 27% | 11% | 25% |
| Grants, Rebates, or Tax Incentives Received | 25% | 14% | 22% | 100% |
| Dedicated Office of Sustainability | 68% | 51% | 89% | 25% |

The type of institution that reported the highest level of adoption of the most initiatives was 2-year public with six (bicycle racks or storage, low flush toilets/urinals, sensored restroom faucets, accountability of annual building energy consumption, occupancy sensored installed, and dedicated office of sustainability). The type of institution that reported the second highest adoption of the initiatives was 4-year public with five (low flow shower heads, dedicated area of recycling, occupancy sensors

installed, staff training program, and sustainability committee or advisory council). The institution type *other* had the highest adoption of initiatives in two categories: green cleaning policy and grants, rebates, or tax incentives received. Four-year private institutions did not lead any initiative category relative to adoption.

*Institution Enrollment*

Approximate institution enrollment information was collected for the study. Table 7 summarizes percentages regarding adoption of various sustainable initiatives by institutional enrollment.

Table 7

*Percentages Regarding Adoption of Sustainable Initiatives by Institution Enrollment*

| Initiative | Small | Medium | Large |
|---|---|---|---|
| Bicycle Rack or Storage | 61% | 77% | 67% |
| Low Flush Toilets/Urinals | 42% | 59% | 52% |
| Sensored Restroom Faucets | 35% | 51% | 54% |
| Low Flow Shower Heads | 52% | 59% | 61% |
| Accountability of Annual Building Energy Consumption | 42% | 53% | 52% |
| Dedicated Area for Recycling | 69% | 80% | 89% |
| Occupancy Sensors Installed | 55% | 61% | 70% |
| Green Cleaning Policy | 39% | 41% | 52% |
| Staff Training Program | 29% | 36% | 41% |
| Sustainability Committee or Advisory Council | 27% | 28% | 35% |
| Grants, Rebates, or Tax Incentives Received | 18% | 21% | 30% |
| Dedicated Office of Sustainability | 41% | 74% | 82% |

Institutions with *large* enrollments reported the highest level of adoption in the most categories of sustainable initiatives (sensored restroom faucets, low flow shower heads, dedicated area for recycling, occupancy sensors installed, green cleaning policy, staff training program, sustainability committee or advisory council, grants, rebates, or tax incentives received, and dedicated office of sustainability). Institutions with *medium* enrollments reported the second highest adoption of the initiatives with three (bicycle

racks or storage, low flow toilets/urinals, and accountability of annual building energy consumption). *Small* institutions did not lead any initiative category relative to adoption.

*Geographical Region*

Data were collected from institutions in each of the six NIRSA geographical regions. Table 8 presents a breakdown of percentages regarding adoption (yes responses) to various sustainable initiatives by NIRSA geographical region.

Table 8

*Percentages Regarding Adoption of Sustainable Initiatives by Geographical Region*

| Initiative | I | II | III | IV | V | VI |
|---|---|---|---|---|---|---|
| Bicycle Rack or Storage | 63% | 60% | 78% | 54% | 75% | 73% |
| Low Flush Toilets/Urinals | 42% | 54% | 43% | 46% | 54% | 57% |
| Sensored Restroom Faucets | 33% | 38% | 46% | 46% | 58% | 50% |
| Low Flow Shower Heads | 51% | 50% | 57% | 46% | 67% | 73% |
| Accountability of Annual Building Energy Consumption | 35% | 56% | 49% | 46% | 42% | 50% |
| Dedicated Area for Recycling | 74% | 77% | 87% | 73% | 75% | 80% |
| Occupancy Sensors Installed | 63% | 40% | 68% | 59% | 67% | 73% |
| Green Cleaning Policy | 42% | 46% | 43% | 32% | 25% | 63% |
| Staff Training Program | 30% | 33% | 38% | 32% | 17% | 50% |
| Sustainability Committee or Advisory Council | 28% | 29% | 22% | 37% | 25% | 30% |
| Grants, Rebates, or Tax Incentives Received | 12% | 13% | 27% | 10% | 54% | 30% |
| Dedicated Office of Sustainability | 65% | 63% | 62% | 39% | 54% | 77% |

NIRSA Member Institutions from Region VI reported the highest level of adoption in the most categories of sustainable initiatives with six (low flow toilets/urinals, low flow shower heads, occupancy sensors installed, green cleaning policy, staff training program, and dedicated office of sustainability). Institutions from Region III and Region V tied for the second highest adoption of the initiatives with two each. Region III led in the categories of bicycle rack or storage and dedicated area for

recycling. Region V led in the categories of sensored restroom faucets and grants, rebates, or tax incentives received. Institutions from Region II and Region IV tied for the fourth highest adoption of the initiatives with one each. Region II led in the category of accountability of annual building energy consumption, while Region IV led in the category of sustainability committee or advisory council. Institutions from Region I did not lead any initiative category relative to adoption.

*Facility Size*

Size, in square footage, of the survey participants' primary campus recreation facility was collected for the study. Table 9 summarizes response breakdowns by facility size.

Table 9

*Percentages Regarding Adoption of Sustainable Initiatives by Facility Size*

| Initiative | Small | Medium | Large |
|---|---|---|---|
| Bicycle Rack or Storage | 61% | 72% | 68% |
| Low Flush Toilets/Urinals | 43% | 52% | 64% |
| Sensored Restroom Faucets | 33% | 52% | 55% |
| Low Flow Shower Heads | 49% | 55% | 68% |
| Accountability of Annual Building Energy Consumption | 37% | 48% | 64% |
| Dedicated Recycling Area | 72% | 76% | 93% |
| Occupancy Sensors Installed | 53% | 64% | 73% |
| Green Cleaning Policy | 38% | 46% | 52% |
| Staff Training Program | 27% | 36% | 50% |
| Sustainability Committee or Advisory Council | 22% | 27% | 46% |
| Grants, Rebates, or Tax Incentives Received | 13% | 24% | 32% |
| Dedicated Office of Sustainability | 46% | 70% | 75% |

Institutions with a *large* facility reported the highest level of adoption in 11 of the 12 categories of sustainable initiatives (low flow toilets/urinals, sensored restroom faucets, low flow shower heads, accountability of annual building energy consumption, dedicated area for recycling, occupancy sensors installed, green cleaning policy, staff training program, sustainability committee or advisory council, grants, rebates, or tax incentives received, and dedicated office of sustainability). Institutions with a *medium*

facility reported the second highest adoption of the initiatives by leading in the bicycle rack or storage category. Institutions with a *small* facility did not lead any initiative category relative to adoption.

*LEED Certification Status*

Information was collected on LEED status for the campus recreation facility of each respondent. A breakdown of percentages regarding adoption of various sustainable initiatives by LEED certification status is summarized in Table 10.

Table 10

*Percentages Regarding Adoption of Sustainable Initiatives by LEED Status*

| Initiative | LEED | Non-LEED |
|---|---|---|
| Bicycle Racks or Storage | 80% | 62% |
| Low Flush Toilets/Urinals | 80% | 40% |
| Sensored Restroom Faucets | 71% | 36% |
| Low Flow Shower Heads | 76% | 50% |
| Accountability of Annual Building Energy Consumption | 61% | 43% |
| Dedicated Area for Recycling | 80% | 77% |
| Occupancy Sensors Installed | 82% | 53% |
| Green Cleaning Policy | 59% | 37% |
| Staff Training Program | 61% | 26% |
| Sustainability Committee or Advisory Council | 35% | 27% |
| Grants, Rebates, or Tax Incentives Received | 29% | 19% |
| Dedicated Office of Sustainability | 69% | 57% |

Institutions with a LEED certified facility led in every category of sustainable initiatives. The biggest difference between LEED certified and non-LEED buildings was in the low flow toilets/urinals category, while the smallest difference was in the dedicated area for recycling category.

## Research Question Three

The third research question was "Are there significant differences of institutional levels of adoption related to green/sustainable initiatives based on categorical variables such as type of institution, enrollment, geographical region, size of facility, and LEED status?" To answer this question, summative scores for adoption (ranging from 0-12) were calculated for each respondent in order to determine a cumulative rating on adoption. Descriptive statistics, in the form of frequency distribution, percentages, and means were used to provide insight to this question. Table 11 summarizes the descriptive statistics of categorical variables relative to adoption.

Table 11

*Descriptive Statistics of Categorical Variables Relative to Adoption*

| Variable | *n* | % | *M* |
|---|---|---|---|
| **Institution Type** | | | |
| 4-Year Public | 151 | 68 | *6.28* |
| 4-Year Private | 59 | 26 | *4.95* |
| 2-Year Public | 9 | 4 | *5.56* |
| Other | 4 | 2 | *2.75* |
| **Institution Size** | | | |
| Small | 102 | 46 | *5.11* |
| Medium | 61 | 27 | *6.39* |
| Large | 54 | 24 | *6.81* |
| **Geographical Region** | | | |
| Region I | 43 | 19 | *5.37* |
| Region II | 48 | 21 | *5.58* |
| Region III | 37 | 17 | *6.22* |
| Region IV | 41 | 18 | 5.17 |
| Region V | 24 | 11 | *6.17* |
| Region VI | 30 | 14 | *7.07* |
| **Facility Size** | | | |
| Small | 79 | 36 | *4.94* |
| Medium | 68 | 30 | *6.24* |
| Large | 44 | 20 | *7.36* |
| **LEED Status** | | | |
| Not Certified | 174 | 78 | *5.28* |
| Certified | 49 | 22 | *7.82* |

The categorical variables with the highest mean scores relative to the adoption summative score were 4-year public institutions, *large* enrollment institutions, institutions in NIRSA Region VI, institutions with a *large* facility, and institutions with a LEED certified building.

Inferential statistics were also employed to answer this research question by determining if there were significant differences in terms of institutional adoption levels of green/sustainable initiatives based on a variety of categorical variables. Using the calculated summative scores, a Test of Homogeneity of Variances, in the form of a Levene's Test, was administered to determine if the respective parametric test (*t*-test or ANOVA) could be performed. Parametric tests were executed to determine if there were statistically significant differences between variables. If differences existed, a post hoc test, in the form of a Scheffe Test, was run to highlight which variables yielded statistically significant differences.

*Institution Type*

To determine if differences in institutional adoption levels existed by the type of institution, a one-way ANOVA was selected as the method of analysis. The Levene Statistic for Institution Type equaled 2.34 for a significance of .075. Since the significance was above the standard .05, an ANOVA was determined to be applicable and was administered. The ANOVA determined the overall adoption levels to have statistically significant differences ($p = .004$) between types of institutions (see Table 12).

Table 12

*Analysis of Variance on Overall Adoption Levels Based on Institution Type*

| | *SS* | *df* | *MS* | *F* | *p* |
|---|---|---|---|---|---|
| Between Groups | 114.72 | 3 | 38.24 | 4.59 | .004 |
| Within Groups | 1824.14 | 219 | 8.33 | | |
| Total | 1938.86 | 222 | | | |

To ascertain where the differences existed within in the group, a post hoc test, in the form of a Scheffe Test, was run to highlight which variables yielded statistically significant differences. Table 13 displays the results of the Scheffe Test.

Table 13

*Post Hoc Test on Overall Adoption Levels Based on Institution Type*

| Type | Type | Mean Diff | *SE* | *p* |
|---|---|---|---|---|
| 2-Year Public | 4-Year Private | .61 | 1.03 | .951 |
| | 4-Year Public | -.72 | 0.99 | .912 |
| | Other | 2.81 | 1.73 | .456 |
| 4-Year Private | 2-Year Public | -.61 | 1.03 | .951 |
| | 4-Year Public | -1.33 | 0.44 | .032* |
| | Other | 2.20 | 1.49 | .538 |
| 4-Year Public | 2-Year Public | .72 | 0.99 | .912 |
| | 4-Year Private | 1.33 | 0.44 | .032* |
| | Other | 3.53 | 1.46 | .124 |
| Other | 2-Year Public | -2.81 | 1.73 | .456 |
| | 4-Year Private | -2.20 | 1.49 | .538 |
| | 4-Year Public | -3.53 | 1.46 | .124 |

*Note*: *$p < .05$

The Scheffe Test indicated a statistically significant difference ($p = .032$) among the four-year private institutions and the four-year public institutions.

*Institution Size*

A one-way ANOVA was used to analyze if differences existed in institutional adoption levels by size of institution, more specifically total enrollment. The Levene Statistics for Institutional Size was 1.15 ($p = .330$), confirming the ANOVA could be administered. The ANOVA determined the overall adoption levels to have statistically significant differences ($p = .000$) between sizes of institution (see Table 14).

Table 14

*Analysis of Variance on Overall Adoption Levels Based on Institution Size*

| | *SS* | *df* | *MS* | *F* | *p* |
|---|---|---|---|---|---|
| Between Groups | 156.07 | 3 | 52.02 | 4.59 | .000 |
| Within Groups | 1782.79 | 219 | 8.14 | | |
| Total | 1938.86 | 222 | | | |

To see where the differences existed within in the group, a post hoc test, in the form of a Scheffe Test, was run to highlight which variables produced statistically significant differences. Table 15 displays the results of the Scheffe Test.

Table 15

*Post Hoc Test on Overall Adoption Levels Based on Institution Size*

| Type | Type | Mean Diff | *SE* | *p* |
|---|---|---|---|---|
| Small | Medium | -1.28 | 0.46 | .057 |
| | Large | -1.70 | 0.48 | .007* |
| Medium | Small | 1.28 | 0.46 | .057 |
| | Large | -0.42 | 0.53 | .891 |
| Large | Small | 1.70 | 0.48 | .007* |
| | Medium | 0.42 | 0.53 | .891 |

Note: *SE* = Standard Error
*$p < .05$

The Scheffe Test indicated a statistically significant difference ($p = .007$) among the small and large institutions.

*Geographical Region*

To determine if differences in institutional adoption levels existed by NIRSA geographical region, a one-way ANOVA was selected as the method of analysis. The

Levene Statistic for Geographical Region equaled .370 for a significance of .869. Since the significance was above the standard .05, an ANOVA was determined to be applicable and was administered (see Table 16).

Table 16

*Analysis of Variance on Overall Adoption Levels Based on Geographical Region*

| | *SS* | *df* | *MS* | *F* | *p* |
|---|---|---|---|---|---|
| Between Groups | 83.87 | 5 | 16.78 | 1.96 | .085 |
| Within Groups | 1854.99 | 217 | 8.55 | | |
| Total | 1938.86 | 222 | | | |

The ANOVA determined the overall adoption levels did not have statistically significant differences ($p = .085$) between geographical regions.

*Facility Size*

A one-way ANOVA was used to analyze if differences existed in institutional adoption levels by size of facility. The Levene Statistics for Institutional Size was .972 ($p = .407$), confirming the ANOVA could be administered. The ANOVA determined the overall adoption levels to have statistically significant differences ($p = .000$) between sizes of facility (see Table 17).

Table 17

*Analysis of Variance on Overall Adoption Levels Based on Facility Size*

| | *SS* | *df* | *MS* | *F* | *p* |
|---|---|---|---|---|---|
| Between Groups | 195.04 | 3 | 65.01 | 8.17 | .000 |
| Within Groups | 1743.82 | 219 | 7.96 | | |
| Total | 1938.86 | 222 | | | |

To see where the differences existed within in the group, a post hoc test, in the form of a Scheffe Test, was run to highlight which variables had statistically significant differences. Table 18 displays the results of the Scheffe Test.

Table 18

*Post Hoc Test on Overall Adoption Levels Based on Facility Size*

| Type | Type | Mean Diff | *SE* | *p* |
|---|---|---|---|---|
| Small | Medium | -1.30 | 0.47 | .054 |
| | Large | -2.43 | 0.53 | .000* |
| Medium | Small | 1.30 | 0.47 | .054 |
| | Large | -1.13 | 0.55 | .237 |
| Large | Small | 2.43 | 0.53 | .000* |
| | Medium | 1.13 | 0.55 | .237 |

*Note: $p < .05$

The Scheffe Test indicated a statistically significant difference ($p = .000$) between the *small* and *large* facilities.

*LEED Status*

To determine if differences in institutional adoption levels existed by LEED certification status, a one-way ANOVA was selected as the method of analysis. The Levene Statistic for LEED status equaled .427 for a significance of .514. Since the significance was above the standard .05, an ANOVA was determined to be applicable and was administered. The ANOVA determined the overall adoption levels to have statistically significant differences ($p$ = .000) between LEED status (see Table 19).

Table 19

*Analysis of Variance on Overall Adoption Levels Based on LEED Status*

| | *SS* | *df* | *MS* | *F* | *p* |
|---|---|---|---|---|---|
| Between Groups | 246.76 | 1 | 246.76 | 32.23 | .000 |
| Within Groups | 1692.11 | 221 | 7.66 | | |
| Total | 1938.86 | 222 | | | |

To give an indication of separateness of LEED and Non-LEED, an independent sample *t*-test was administered. Table 20 presents the *t*-test on overall adoption per LEED status.

Table 20

*Independent Sample t-Test on Overall Adoption Based on LEED Status*

| | Mean Diff | *SE* | *p* |
|---|---|---|---|
| Equal Variances Assumed | 2.54 | 0.45 | .000 |
| Equal Variances Not Assumed | 2.54 | 0.43 | .000 |

Group means are significantly different as the *p* value is below .05. As reported in Table 10, LEED Certified buildings had a higher adoption summative score (*M = 7.82*) than Non-LEED buildings (*M = 5.28*).

## Research Question Four

The fourth research question was "What are the perceived benefits of implementing green/sustainable initiatives in campus recreational sports facilities?" Overall, respondents furnished a total of 399 responses to the open-ended question. Six distinguishable categories of perceived benefits were identified after the responses were examined. The categories included 1) Educational (responses related to educating the campus community, particularly students, staff, and facility users on sustainability initiatives), 2) Environmental (responses related to environmental impact), 3) Ethical (responses related to the stewardship and responsibility of practicing sustainability), 4) Fiscal (responses related to financial implications), 5) Operational (responses related to impact on departmental facilities, programs, and services), and 6) Other. Common themes emerged from the responses and were sorted within their respective category. Table 21 summarizes the comments regarding the perceived benefits of implementing sustainable initiatives by displaying the breakdown of categories and themes.

Table 21

*Categories and Themes of Perceived Benefits of Implementing Sustainable Initiatives*

| Category | *n* | % |
|---|---|---|
| Environmental | 115 | 28.7 |
| General | 47 | 11.8 |
| Saving Energy and Resources | 41 | 10.3 |
| Reducing Carbon Footprint | 13 | 3.2 |
| Health and Safety | 7 | 1.7 |
| Protection | 7 | 1.7 |
| Fiscal | 89 | 22.3 |
| Costs Savings | 84 | 21.1 |
| General | 3 | 0.7 |
| Increased Awarding of Grants | 2 | 0.5 |
| Operational | 64 | 15.6 |
| Marketing and Public Relations | 25 | 6.3 |
| Meeting University Goals and Objectives | 16 | 4.0 |
| Appearance of Facility | 9 | 2.3 |
| Increased Longevity of Equipment | 6 | 1.5 |
| Recruitment of Staff | 3 | 0.7 |
| Increase in Memberships | 2 | 0.5 |
| Competitive Advantage | 1 | 0.3 |
| Ethical | 63 | 15.8 |
| Increased Responsibility and Stewardship | 35 | 8.8 |
| Modeling | 15 | 3.8 |
| Ability to Demonstrate Leadership | 7 | 1.7 |
| Promotion of Topic | 6 | 1.5 |
| Educational | 45 | 11.3 |
| Students | 24 | 6.0 |
| General | 5 | 1.4 |
| Awareness | 4 | 1.0 |
| Customers | 4 | 1.0 |
| Staff | 3 | 0.7 |
| Pedagogical Use | 3 | 0.7 |
| Campus Community | 2 | 0.5 |
| Other | 23 | 5.8 |

The category that received the most comments regarding perceived benefits was *Environmental* (*n* = 115). This category was comprised of comments that were geared toward positive impact on the environment. The two most common themes within this category were *General* (*n* = 47) and *Saving Energy and Resources* (*n* = 41). The *General* category consisted of comments that had no specificity such as "environmentally friendly" and "environmental benefits." Regarding *Saving Energy and Resources*, one respondent submitted,

> Benefits of implementing sustainable initiatives include energy conservation, limited water use and sewage, reduced waste, and more recycling.

A total of 13 respondents directed comments specifically toward reducing the overall carbon footprint.

*Fiscal* (*n* = 89) received the second most comments relative to perceived benefits of implementing green and sustainable initiatives. This category consisted of comments regarding positive financial implications. One dominant theme emerged from this category, *Costs Savings*. *Cost Savings* accounted for 84 of the comments in the category and were related primarily to savings on utilities and reduced operational expenses. When posed this question, one respondent noted,

> The benefits are primarily financial, specifically the reduction of operating costs over the lifetime of the building.

Another respondent posed,

> I would anticipate direct financial savings through energy efficiency and reduced maintenance costs. The saved money can help the budget elsewhere.

Comments regarding fiscal benefits accounted for 22.3% of the overall comments on perceived benefits of implementing sustainable initiatives.

The category that received the third most comments regarding perceived benefits was *Operational* (*n* = 64). This category was made up of feedback regarding the improvement of departmental facilities, programs, and services. Themes from this category included, *Marketing and Public Relations*, *Strategic Planning*, *Facility Appearance*, *Longevity of Equipment*, *Staff Recruitment*, *Increase in Memberships*, and *Developing an Advantage over the Competition*.

*Ethical* (*n* = 63) was the category that received the fourth most comments, slightly below *Operational*. *Increased Responsibility and Stewardship* was the leading theme from this category, followed by *Role Modeling*. One respondent asserted,

> Going green allowed us to align our belief of being good stewards of our institutional resources as well as our environmental resources.

Another response read,

> Implementing sustainable initiatives will allow for us to serve as advocates and role models to the campus community.

Other themes that developed from this category were the *Ability to Demonstrate Leadership* and *Promotion of the Topic of Sustainability*.

The fifth category regarding perceived benefits of implementing sustainable initiatives was *Educational* (*n* = 45). Being able to practice sustainability in a way that would provide education for students on the topic was the leading theme in this category. One respondent submitted,

> Practicing sustainability allows us to educate our students and professional staff

members on the importance of incorporating sustainability in their lives. Other themes in this category included *Awareness, Educating Customers, Educating Staff, Using Sustainable Initiatives to Facilitate Teaching,* and *Educating the Campus Community*.

## Research Question Five

The fifth research question was "What are the perceived challenges in implementing green/sustainable initiatives in campus recreational sports facilities?" Respondents supplied an overall total of 345 comments to this open-ended question. Eight separate categories of perceived challenges were identified after the responses were analyzed. The categories were 1) *Administrative*, 2) *Attitudinal*, 3) *Commitment*, 4) *Educational*, 5) *Facility*, 6) *Fiscal*, 7) *None*, and 8) *Other*. Common themes arose from the responses and were sorted within their respective category. Table 22 summarizes the comments regarding the perceived challenges of implementing sustainable initiatives by displaying the breakdown of categories and themes.

Table 22

*Categories and Themes of Perceived Challenges of Implementing Sustainable Initiatives*

| Category | *n* | % |
|---|---|---|
| Fiscal | 136 | 39.4 |
| Cost/Expense | 72 | 20.9 |
| Lack of Funding | 40 | 11.6 |
| Existing Budget Structure | 12 | 3.5 |
| Return of Investment Concerns | 7 | 2.0 |
| Other | 5 | 1.4 |
| Administrative | 55 | 15.9 |
| Lack of Support | 20 | 5.8 |
| Not Part of College/University Planning | 10 | 2.9 |
| Undersized Staff | 9 | 2.6 |
| Current Organizational Structure | 6 | 1.7 |
| Bureaucracy | 6 | 1.7 |
| Other | 4 | 1.2 |
| Facility | 38 | 10.4 |
| Age | 25 | 7.2 |
| Miscellaneous | 9 | 2.6 |
| Size | 2 | 0.6 |
| Attitudinal | 37 | 10.7 |
| Changing Existing Culture | 24 | 6.9 |
| Securing Buy-In | 13 | 3.8 |
| Educational | 27 | 7.8 |
| Level of Knowledge | 14 | 4.0 |
| Educating/Training Staff | 13 | 3.8 |
| Commitment | 25 | 7.2 |
| Time | 12 | 3.5 |
| Other | 8 | 2.3 |
| Staff | 5 | 1.4 |
| None | 14 | 4.0 |
| Other | 13 | 3.8 |

The category that received the most comments regarding perceived challenges was *Fiscal* (*n* = 136). This category was comprised of comments that were geared toward financial challenges associated with implementing sustainable initiatives. The two most common themes within this category were *Costs* (*n* = 72) and *Lack of Funding* (*n* = 40). Regarding *Costs*, one respondent submitted,

> Being green is not cheap. Many items necessitate replacement of functioning systems with greener ones that cost more.

Four other themes, consisting of 24 additional comments rounded out the *Costs* category.

*Administrative* (*n* = 55) received the second most comments relative to perceived challenges of implementing sustainable initiatives. This category consisted of comments regarding administrative-related aspects. Many themes emerged from this category, including *Lack of Support, College/University Strategic Planning, and Undersized Staff*. When posed this question, one respondent noted,

> We currently do not have top-down support from our administration.

Another respondent asserted,

> We are stuck in the past with administrators who do not value sustainability.

Comments regarding Administrative challenges accounted for 16% of the overall comments on perceived challenges of implementing sustainable initiatives.

The category that received the third most comments regarding perceived challenges was *Facility* (*n* = 38). This category was made up of feedback regarding challenges with the respondent's existing facilities. *Age* of the facility developed as the dominant theme from this category. Other themes from this category were *Design, Size,* and *Services*.

*Attitudinal* ($n$ = 37) was the category that received the fourth most comments, slightly below Facility. *Changing Culture* and *Securing Buy-in* were the leading themes from this category.

The fifth category regarding perceived challenges of implementing sustainable initiatives was *Educational* ($n$ = 27). This category consisted primarily of two themes, *Lack of Knowledge and Educating Staff*. Comments like "lack of staff education," "lack of knowledge on campus," and "lack of knowledge from key decision makers" helped form the themes within the category.

Other categories relative to perceived challenges in implementing sustainable initiatives included *Commitment, None,* and *Other*.

## Summary

This chapter summarized the results of data collected from the Collegiate Recreational Sports Survey. The survey was developed to provide information on the current state of sustainability efforts in the industry of collegiate recreational sports. Additionally, the survey facilitated this foundational study that attempted to create some benchmark data for practitioners within NIRSA of the campus recreational sports facilities industry. The next chapter includes discussion of findings, conclusions, implications for practice, and recommendations for future research relative to sustainability and recreational sports facilities.

# CHAPTER V

# DISCUSSION

The purpose of this study was to assess levels of collegiate recreational sports department personnel's familiarity and institutional adoption related to sustainable initiatives at campus recreational sports facilities. Additionally, the study collected the perceptions of the benefits as well as the challenges of implementing such initiatives. This was a foundational study that attempted to create some benchmark data for the practitioners of the campus recreational sports facilities industry within National Intramural-Recreational Sports Association (NIRSA). Five research questions were addressed in the study:

1. What are the levels of familiarity of campus recreational sports department personnel regarding green/sustainable initiatives?
2. What are the institutional adoption levels related to green/sustainable initiatives?
3. Are there significant differences of institutional adoption levels related to green/sustainable initiatives based on categorical variables such as type of institution, enrollment, geographical region, size of facility, and LEED status?
4. What are the perceived benefits of implementing green/sustainable initiatives in campus recreational sports facilities?

5. What are the perceived challenges in implementing green/sustainable initiatives in campus recreational sports facilities?

The major sections of this chapter include relationship to prior research, a discussion of results, conclusions, implications for practice, and recommendations for future research. Additionally, to provide clarity to the reader, this chapter restates the problem, reviews the methodology, and summarizes the results.

## Problem

Richardson and Lynes (2007) define *green buildings* as construction that is more energy and resource efficient; releases less pollution into the air, soil, and water; and is healthier for occupants than standard facilities. The U.S. Green Building Council's (USGBC) Leadership in Energy and Environmental Design (LEED) Rating System is an internationally accepted, third-party certification program for green building design, construction, and operation. LEED provides building owners and operators with a framework for identifying and implementing practical and measurable green building design, construction, operations, and maintenance solutions. According to the USGBC, LEED promotes a whole-building approach to sustainability by recognizing performance in five key areas: sustainable site development, water savings, energy efficiency, materials selection, and indoor environmental quality. To earn LEED certification, a project must satisfy all LEED prerequisites and earn a minimum 40 points on a 110-point LEED rating system scale. LEED provides four measures of performance certification: Basic, Silver, Gold, and Platinum, based on a set of prerequisites and credits in the five aforementioned categories (U.S. General Services Administration, 2008).

The USGBC maintains a directory of registered and certified LEED projects. The directory contains the following information for each registered project: identification number, name, address, LEED category, points achieved, certification level, certification date, square footage, project type, and owner organization. The directory shows how each project achieved LEED certification and is broken down into the following building categories: commercial interiors, core and shell, existing buildings, healthcare, homes, hospitality, mid-rise, neighborhood development, new construction, retail, schools, and warehouse and distribution centers. There is not a category specific to recreation or sport facilities.

Ries, Bilec, Gokhan, and Needy (2006) claimed that, on average, people spend 80-90% of their time in buildings. That claim alone should serve as motivation for facility planners and managers to strive toward designing and operating sustainable buildings. It is important for facility management professionals to be aware of the research on sustainable facility design and operation. Previous research (Kats, 2003; Kats, 2006; Ries, Bilec, Gokhan, & Needy, 2006) highlights the benefits associated with green building design. Specifically, economic and environmental factors seem to be the most prevalent benefits. Because of these, sound fiscal practices and environmental stewardship should be primary objectives for any facility manager.

Gonzales (2009) claims that health, fitness, physical activity, recreational, and sports facilities fall behind other types of facilities with sustainability features in mind. There is no apparent reason why this industry has lagged behind others. In the day-to-day operations, there are a number of things that operators can do to promote sustainable operations. These operations can help to reduce operating costs, promote air quality,

reduce pollutants, and conserve resources. Areas where sustainable practices can make a difference include but are not limited to the following: green cleaning, heating/ventilation/air conditioning maintenance, energy conservation, water conservation, green vehicles, recycling programs, food service operations, and green grounds keeping (Gonzales, 2009).

In the fall of 2010, NIRSA collected data from its member colleges and universities involved in capital projects from 2010 through 2015. Included in the report were the name of college/university, type of project, square footage of construction project, budget, completion date, and project description. According to the Collegiate Recreational Sports Facilities Construction Report (NIRSA, 2010), 82 colleges and universities were involved in 129 facility construction, expansion, and/or renovation projects. The projects underway on NIRSA-member campuses totaled $1.7 billion with the average project expenditure being $13.2 million. These campuses have a combined enrollment of 1.7 million students.

By their nature, recreation centers and facilities pose a challenge for the green movement. These facilities have a massive footprint, requiring tons of steel, concrete and other material that must be transported during construction. Recreation facilities have the potential to be enormous guzzlers of water and feature large volumes that come with huge air-handling requirements, encompass energy hogs, and utilize large expanses of glass that can add significantly to the building's heat load. Facilities of this nature burn tremendous amounts of energy and create mountains of trash (Cohen, 2009). Recreational sports program personnel can be key partners in the realm of sustainability by being familiar with and committed to green and sustainable initiatives related to their facilities.

To identify familiarity and adoption levels, as well as perceptions of the benefits and challenges associated with sustainability, an assessment of the state of facility sustainability was needed.

## Review of Methodology

The study was conducted upon approval of the Office of Compliance at Western Kentucky University and the Institutional Review Board at the University of Louisville. All protocols from both institutions were strictly followed throughout the study. In an attempt to improve the study's quality and efficiency, a pilot study was administered to test logistics and procedures. Any deficiencies revealed from the pilot study were addressed and corrected prior to the larger study. Both quantitative and qualitative methods were used to answer the research questions. Directors at NIRSA member institutions were sent a survey in an attempt to assess the levels of familiarity, adoption, benefits, and challenges related to green/sustainable initiatives at campus recreational sports facilities. As an incentive, five of the institutions that completed the survey were randomly selected to receive NIRSA gift cards toward one professional membership each.

The Director of the selected facilities, typically serving in the University's Recreational Sports Department, served as the participant/contact for the researcher. The researcher informed the participants about the purpose of the study via a prepared statement distributed electronically by e-mail. In some instances, other representatives of the University may have been needed to assist the identified participant (Director). Typically, these representatives were employed in the University's Department of Sustainability, Energy Management, or Department of Facilities Management.

A survey was developed to assess the variables in the study. The electronic instrument was created with the assistance of the WKU Division of Information Technology for data collection. The survey was sent electronically to the identified representative of each participating University facility via a Web site. The identity of the participants and facilities surveyed was kept anonymous by using a coding system during the research. Statistical Package for the Social Sciences (SPSS) software was utilized to analyze the descriptive data to answer Research Questions #1 - #3. Qualitative procedures were utilized to analyze the data to answer Research Questions #4 and #5.

## Discussion of Results

### *Relationship to Prior Research*

This section will relate the findings of this study to the various sustainability topics found in the literature review. Although the focus of this study was on recreational sports facilities and the campus recreation industry, the findings can be compared with the results found in Chapter Two. The literature review for this study included the presentation of various aspects of sustainability, such as Sick Building Syndrome; Sustainable Planning, Design, and Construction; Financial Implications; Maintenance and Operations; and Barriers to Sustainability.

As indicated in Chapter Two, the World Health Organization (1982) defined Sick Building Syndrome (SBS) as "an environmentally related condition with increased prevalence of nonspecific symptoms among the populations of certain buildings, absence of clinical signs, and poor or no objective measures of symptoms" (p. 25). The research of Fisk, Mirer, and Mendell (2009); Gomzi et. Al. (2007); and Kinman and Griffin (2008) document some aspects of SBS by reflecting on the negative impact that "sick" buildings

can have on occupants. The results of the current study found that 174 of the 223 (78%) recreational sports facilities in the survey were not LEED certified, indicating that they are not as "healthy" as they potentially could be. The move away from sick buildings was important to some study participants as several comments on the benefits of implementing sustainable initiatives pertained to "healthier buildings" or a "healthier environment."

The literature review indicated that buildings planned, designed, and constructed with a "sustainability" mindset has a beneficial effect regarding performance. In the current study, institutions with a LEED certified facility reported higher levels of adoption when compared to institutions with non-LEED buildings. This is consistent with information (Turner & Frankel, 2008; United States General Services Administration, 2008; United States Green Building Council, 2011) documented in the literature review that details LEED's promotion of a whole-building approach to sustainability and the recognition of performance in key areas.

Literature associated with cost savings, potential return on investment, and other fiscal aspects of sustainable buildings were reviewed. Most notably, Kats's (2005) study showed that green buildings provided financial benefits that were 20 times larger than conventional buildings. The financial savings were about $70 per square foot. Ancillary findings indicated that results on energy savings were promising as green buildings used an average of 33% less energy than conventionally designed buildings. Results indicated an average water use reduction of 32%. Interestingly enough, the *Fiscal* category was at the top of the list in both perceived benefits and perceived challenges associated with becoming more sustainable.

Numerous studies in the literature review touched on the maintenance and operational facet in the management of facilities with sustainability in mind. Lai and Yik (2006) specifically focused on staff training, concluding that respondents in their respective survey reported low levels of training and awareness of sustainable initiatives within their building. This is consistent with the findings in the current study as 34% of respondents indicated having a staff training program in place for their facility staff. Additionally, in terms of maintenance and operations, 42% of respondents reported having a green cleaning policy, which ranked this as the third most uncommitted-to sustainable initiative of the 12 overall.

Findings from the current study show that *Fiscal* concerns were the most reported in terms of perceived challenges of implementing sustainable initiatives. Previous studies, as documented in the literature review, conducted by Kats (2005) and Richardson and Lynes (2007) may negate some of the perceived fiscal challenges by their documentation of lower construction costs of green buildings when compared to conventional buildings. The results of the current study also mirrored those in Richardson and Lynes (2007) in terms of perceptions that green buildings incur higher initial capital costs.

*Personnel Familiarity*

An ocean of information exists on sustainability and its many branches. Practitioners need to adequately navigate through the overwhelming amount of information to be effective professionals at their craft. In terms of facility sustainability, there is a hunger for knowledge and for learning more about how concepts on the topic facilitate a better understanding of the greening of facilities. As noted by Stieg (2006), knowledge is the understanding of how information can be used to come to conclusions

or take action. Knowledge includes knowing the boundaries within which factual information can be applied when problem solving. The gaining of knowledge implies the ability to secure useable, applicable information that can assist practitioners in fulfilling sustainability goals.

The first research question sought to determine familiarity levels of campus recreational sports department personnel regarding green/sustainable initiatives. Overall, respondents reported highest in the familiarity indicator of conference/workshop attendance, while reporting the lowest in the area of staff having the LEED AP certification. NIRSA offers a variety of professional development opportunities including conferences, institutes, and symposia to its members. Also, NIRSA's collaboration with organizations such as the Association for the Advancement of Sustainability in Higher Education, the Higher Education Associations Sustainability Consortium, and Second Nature may explain why respondents reported highest in this indicator. NIRSA member institutions do not place a large emphasis on the LEED AP credential at this time. The vast majority of job announcements for facility management positions in the industry do not list the certification as a requirement or preference. This can account for the low reporting of staff possessing this credential.

Four-year public institutions reported the highest percentages in the personnel familiarity indicators of LEED AP certification and financial incentives. Four-year private institutions did not lead in any of the familiarity indicator categories. Institutions with large enrollments, those with 20,001 or more students, led or tied for the lead in each of the familiarity indicators. Although these institutions reported low percentages, they did still lead in each category compared to other sized institutions. Large institutions

have more students and more alumni, which typically leads to having more financial resources. The combination of more financial resources and state funding implications usually means being able to better support staff in professional development and continuing education endeavors. When considering NIRSA geographical regions, Region VI reported the highest participation in the most categories of familiarity indicators. Regions I, II, and IV did not lead in any category relative to personnel familiarity. Large campus recreational sports facilities, those that were reported as 150,001 or more square feet, led or tied in each of the personnel familiarity indicator categories. Additionally, LEED certified buildings reported higher percentages in regard to the personnel familiarity indicators than non-LEED buildings. Staff from LEED buildings are naturally more exposed to green concepts and sustainable practices since the LEED certification demands a higher level of building and operator performance. Because of this, the reporting of higher levels of familiarity from personnel at LEED buildings was not surprising. This finding could also insinuate that having a LEED certified building can potentially aid staff of those buildings in achieving a greater understanding of sustainability.

The literature review produced little information regarding levels of campus recreation professional staff familiarity of green/sustainable initiatives. It is difficult to adequately assess overall knowledge levels based on this study, since assessments were not used. Rather, simple reporting of "exposure to information" was the intent. Further exploration on the topic is needed to complement the findings. These results do reveal that the LEED AP certification is virtually non-existent among collegiate recreational sports professional staff. This can be a point-of-emphasis moving forward for the

industry, as the LEED AP credential indicates that the professional has the knowledge and skills to facilitate the LEED certification process and will be able to offer advice on sustainable solutions (Zimmerman, 2008). Additionally, taking sustainability specific academic courses is seemingly not a priority for professional staff in campus recreation. As Dyball and Mcmillin (2009) suggest, many benefits, including providing solutions to sustainability problems, result from participating in green academic courses or programs.

*Institutional Level of Adoption*

Institutional commitment is imperative for success in the realm of sustainability. As emphasized by Tinto and Pusser (2006), institutional commitment is more than just words, more than just mission statements issued in elaborate brochures; it is the willingness of the institution to invest resources and provide the incentives and rewards needed to enhance success. Without an institutional commitment to sustainability, activities and programs may be introduced, but the chances of prospering over the long term are slim.

The second research question focused on institutional adoption levels regarding green/sustainable initiatives. Overall, respondents indicated their institutions were most committed to setting aside dedicated areas for recycling, providing bicycle racks or storage, and installing occupancy sensors, while being the least committed in terms of receiving grants, rebates, or tax incentives; having a sustainability committee or advisory council; and having a staff training program.

This study provides foundational information and an effective snapshot of institutional adoption levels regarding various sustainable initiatives. The initiative category where institutions were most committed was in the area of recycling. This was

not surprising as recycling is generally considered one of the easiest and least expensive green practices. It is interesting to note that having a sustainability committee or advisory council was one of the least committed to initiatives from institutions. Advisory groups act as sounding boards to help determine need and provide feedback that is useful during assessment, implementation, and evaluation (Mull, Bayless, & Jamieson, 2005). This could be an important piece for institutions wanting to move forward with initiatives regarding sustainability. The implications of having sustainability advisory groups will be examined further in a later section.

In terms of type of institution, two-year public colleges/universities reported the highest level of adoption to the most initiatives (bicycle racks or storage, low flush toilets/urinals, sensored restroom faucets, accountability of annual building energy consumption, occupancy sensors, and dedicated office of sustainability). Four-year private institutions did not lead any initiative category relative to adoption. Large institutions led the way on adoption to green/sustainable initiatives by institution enrollment size. Institution with large enrollments reported the highest level of adoption in the most categories of sustainable initiatives. Small institutions, those with 10,000 students or less, did not lead any initiative category. Again, large institutions tend to have more financial resources, as well as an increased ability to construct and maintain educational and recreational facilities. In this case, simply having more fiscal options may facilitate higher adoption levels. When considering NIRSA geographical region, Region VI reported the highest level of adoption in six of the 12 initiative categories. Each region had the highest level of adoption in at least one category except for Region I. Region VI consists of member institutions from the states of Alaska, Arizona, California,

Hawaii, Idaho, Nevada, Oregon, Utah, and Washington. Institutions in the region exhibiting higher adoption levels may be the result of being in states that are among the greenest in the United States. According to Greenopia's Green State Guide (2011), which measures green variables including, but not limited to, recycling rate, LEED buildings, and green businesses, seven of the top 20 greenest states came from Region VI. Institutions of higher education from this region are apparently benefiting from the documented higher levels of sustainable practices in these particular western states. Campus recreational sports facilities that were deemed large accounted for the highest level of adoption to sustainable initiatives per facility size. Large facilities led in 11 of 12 initiative categories, while small facilities did not lead in any categories. When assessing LEED certification status, LEED certified facilities led in every category of sustainable initiatives. The biggest difference between LEED certified and non-LEED buildings was in the low flow toilets/urinals category, while the smallest difference was in the category of recycling. The fact that LEED certified buildings led the way in every category was not surprising, as LEED buildings emphasize the promotion of alternative transportation, reduction of waste, and conservation of energy and water among many other things. A higher adoption level of sustainability was expected from institutions with LEED certified recreational sports buildings because of the overall promotion of sustainability associated with the LEED rating system by the United States Green Building Council.

The results illustrate somewhat of a typical institution regarding higher levels of adoption of sustainability. The results show that two-year public institutions, large enrollment institutions, member institutions from NIRSA Region VI, and institutions with large recreational sports facilities had the highest level of adoption of the

green/sustainable initiatives. As previously stated, financial resources and overall state efforts to sustainability provide some insight as to why these types of institutions lead the way. Further research is needed to determine why these types of institutions lead the way among NIRSA member institutions. Institutions with a LEED certified facility reported higher levels of adoption when compared to institutions with non-LEED buildings. This is consistent with information (Turner & Frankel, 2008; United States General Services Administration, 2008; United States Green Building Council, 2011) documented in the literature review that details LEED's promotion of a whole-building approach to sustainability and the recognition of performance in key areas.

*Differences of Institutional Adoption Levels Based on Categorical Variables*

The third research question sought to determine if significant differences of institutional adoption levels related to green/sustainable initiatives existed among certain categorical variables. The variables included type of institution, enrollment, geographical regions, size of facility, and LEED status. A summative score for adoption was calculated for each respondent in order to determine a cumulative rating on adoption. The variables with the highest mean scores relative to the adoption summative score were four-year institutions, large enrollment institutions, institutions from NIRSA Region VI, institutions with large recreational sports facilities, and institutions with LEED certified buildings. The results showed statistically significant differences in regards to adoption levels between three of the categorical variables. First, four-year public institutions were significantly more committed than and four-year private institutions. The funding mechanisms in place for these types of institutions may drive adoption levels of sustainability. Public institutions are typically funded by state governments are held

accountable by appointed boards and trustees. Private institutions do not receive funding from state government and rely heavily on tuition and private contributions. These points may be the key elements as to why significant differences of adoption levels exist. Next, large enrollment institutions were significantly more committed than small enrollment institutions. As previously noted, large enrollment institutions tend to have more financial resources, as well as an increased ability to construct and maintain educational and recreational facilities. Additionally, Marcus (2013) reports a dire concern over the financial stability of small colleges/universities. Dangerously low enrollments and shaky finances have led to uncertain futures with small institutions. Financial concerns and implications of uncertain futures may have small institutions prioritizing strategies and initiatives other than sustainability. Finally, large sized facilities were more committed than small sized facilities. This finding was somewhat surprising as recreational facilities with more square footage require larger operating systems, more equipment and supplies, and typically have many more users than small buildings. Large recreational facilities tend to be on campuses of large enrollment institutions, therefore the aforementioned funding implications of a large college/university may affect the ability to be more committed to sustainability.

*Perceived Benefits*

Seeking the perceived benefits of implementing green/sustainable initiatives at campus recreational sports facilities was the focus of the fourth research question. Using content analysis, categories and themes emerged providing insight to the research question. The categories (with most frequent theme) that developed were *Environmental* (*General*), *Fiscal* (*Cost Savings*), *Operational* (*Marketing and Public Relations*), *Ethical*

(*Increased Responsibility and Stewardship*), *Educational* (*Educating Students*), and *Other*.

Gathering qualitative data and identifying categories and themes were important aspects of this study. This information can be beneficial to administrators when contemplating the implementation of various green/sustainable initiatives. The top two perceived benefits were in the categories of *Environmental* and *Fiscal*. One respondent expressed an *Environmental* benefit of implementation of sustainable practices.

> The ability to lessen the impact we have on the environment. Hopefully the creation of a campus recreation facility that will be more efficient in all areas, especially energy consumption.

Many comments in the *Environmental* category had no specificity but referenced the environment such as "environmentally friendly" and "environmental benefits." The respondent perceptions of environmental benefits are consistent with Rolston's (1994) and Goodland's (1995) premise that the focus of sustainability should be on the overall impact of the environment. Respondent perceptions of environmental benefits may stem from an overall fear or guilt of destroying the Earth. Many individuals view the environment as the most important resource for life because of its supply of oxygen, power, and water. These general attitudes may offer insight to why the *Environmental* category received the most comments pertaining to benefits.

Respondent feedback on the *Fiscal* benefits associated with incorporating sustainability were numerous. One respondent submitted,

> Direct financial savings through reduced consumption of electricity, chilled water,

steam and water/sewer.

Another respondent remarked,

> The benefits are primarily financial, specifically the reduction of operating costs over the lifetime of the building.

Yet another respondent expressed,

> I would anticipate direct financial savings through energy efficiency and reduced maintenance costs.

The literature review for this study documented the financial benefits of green/sustainable initiatives. Most notably, Kats's (2005) study showed that green buildings provided financial benefits that were 20 times larger than conventional buildings. The financial savings were about $70 per square foot. Ancillary findings indicated that results on energy savings were promising as green buildings used an average of 33% less energy than conventionally designed buildings. Results indicated an average water use reduction of 32%. Money steers the ship in higher education. Higher education administrators and recreational sports leaders alike are charged with applying sound fiscal practices, generating revenue, and getting "more bang for the buck." Because of these reasons, the high number of comments regarding *Fiscal* benefits was not surprising. More research is needed, but perception may be reality in terms of the benefits of implementing green/sustainable initiatives in collegiate recreational sports.

*Perceived Challenges*

The fifth research question sought to determine perceived challenges in implementing green/sustainable initiatives in campus recreational sports facilities. As with research question four, content analysis was used to analyze the data and produced

categories and themes. The categories (with most frequent themes) that emerged were *Fiscal* (*Cost/Expense*), *Administrative* (*Lack of Support*), *Facility* (*Age*), *Attitudinal* (*Changing Existing Culture*), *Educational* (*Level of Knowledge*), and *Commitment* (*Time*).

This study produced information regarding the perceived challenges of implementing such initiatives. Identifying perceived challenges can aid administrators in attempting to proactively plan for obstacles that may be in the way of moving toward more sustainable operations. *Fiscal* and *Administrative* categories accounted for nearly 50% of the total comments regarding challenges. When considering *Fiscal* challenges, one respondent stated,

> The facility is relatively new (5 years old) and we did not have enough money during construction to go "green." While it was discussed, we simply did not have the funding to move forward. We still have the issue with lack of funding in order to add light sensors, etc.

Another respondent noted,

> Initial costs are often not worth the expense. For example, you may not realize a return on investment for the installation of solar panels for 10-20 years.

Previous studies (Kats, 2005; Richardson & Lynes, 2007) may negate some of the perceived fiscal challenges by their documentation of lower construction costs of green buildings when compared to conventional buildings. The results of the current study also mirrored those in Richardson and Lynes (2007) in terms of perceptions that green buildings incur higher initial capital costs. The feedback from the respondents also brings forth the notion of new facility construction vs. renovating/retrofitting. Financial

parameters factor largely in the decision-making process of building new or renovating. Dymecki, Freedman, McCord, and Vitters (2008) suggest focusing on the comparison of hard costs associated with the project because of the susceptibility to fluctuation and change with these types of costs. Hard costs are also known as construction costs and usually constitute 70% to 75% of the total project costs. Renovation may be the least expensive option for some and renovating a facility can be a very environmentally responsible decision as opposed to starting from scratch. Ultimately, when deciding whether to build new or renovate, administrators need to weigh different agendas, competing priorities, and other important factors.

This study also identified some perceived *Administrative* challenges associated with implementing green/sustainable initiatives. More specifically, the *Administrative* challenges reported related to *Lack of Administrative Support*, *Organizational Structure*, *Undersized Staffing*, and *Bureaucracy*. A variety of comments regarding *Administrative* challenges came forth in the study. A respondent offered,

> Management buy-in: becoming sustainable requires senior administration buy –in. Some senior management may be more supportive than others. They see the cost to get LEED certified as an "obstacle" rather than an "opportunity."

A lack of internal leadership amongst stakeholders with decision-making power and a lack of communications between senior administration and their staff may account for the perception of *Administrative* challenges by the respondents. Strong university leadership is required for overcoming administrative challenges. Collaboration and partnerships, as well as increased communication and transparency can help campus recreation professionals subdue some of the administrative barriers to becoming more sustainable.

When referring to *Administrative* challenges specifically pertaining to *Organizational Structure*, another respondent noted,

> Our housekeepers are part of the University's Facilities Services staff thus our department does not control the products that they use for cleaning.

It is not uncommon for housekeeping and maintenance staff of a campus recreation facility to report to another department on campus, typically the Department of Facilities Management or Physical Plant. This organizational structure can limit a campus recreation department's efforts toward sustainability. An example of this is with green cleaning products. Although a campus recreation department may want and support the use of green cleaning products, the organization that supervises facility housekeeping may choose to use other, non-green cleaning products. These types of reporting structures sometimes handcuff campus recreation department's. Similar examples can be given in the area of maintenance as well.

A number of comments such as "not enough staff," "lack of dedicated personnel," "red tape," and "bureaucracy" helped account for the respondents perceived challenges related to *Undersized Staffing and Bureaucracy.* Professionals specifically responsible for campus recreation facility management have seemingly absorbed the added responsibilities of the building becoming more sustainable. This could account for some of the comments regarding *Undersized Staffing*. In a "do more with less" mentality in higher education, campus recreation departments may not feel adequately equipped staffing wise to handle the time and effort needed in implementing sustainable initiatives.

## Conclusions

This study contributes to the constantly evolving field of sustainability. This was a foundational study that attempted to create some benchmark data for the practitioners of the campus recreational sports facilities industry within NIRSA. This was the first study to produce descriptive data related to personnel familiarity and institutional adoption levels of green/sustainable initiatives in campus recreational sports facilities at NIRSA member institutions. The findings relative to the benefits and challenges associated with becoming more sustainable can be used by administrators to proactively plan for potential implementation of initiatives.

Regarding familiarity of green/sustainable initiatives, respondents reported their personnel to be at relatively low levels in terms of possessing the LEED-AP certification, attending sustainability conferences or workshops, taking a sustainability-specific academic course, and in receiving financial incentives for sustainable initiatives. NIRSA member institutions were most committed to the sustainable initiatives of having a dedicated area for recycling, providing bicycle racks or storage, possessing occupancy sensors, and having a dedicated office of sustainability on campus. NIRSA member institutions were least committed to receiving grants, rebates, or tax incentives; having a sustainability committee or advisory council; and installing sensors in restroom faucets. Institutions that were two-year public, had large enrollments, were in NIRSA region VI, owned large recreational sports facilities, and were LEED certified reported the highest levels of adoption in their respective category. Statistically significant differences existed between four-year private and four-year public institutions; between small and large enrollment institutions; and between small and large recreational sports facilities.

*Environmental* welfare was cited as the biggest perceived benefit of implementing green/sustainable initiatives, followed by *Fiscal* advantages. In regards to perceived challenges of implementing green/sustainable initiatives, study respondents indicated *Fiscal* challenges the highest followed by *Administrative* issues.

Results from the study can be used by NIRSA to track future progress related to sustainability. Administrators can benefit from this study by assessing their respective institution's current situation where sustainability is concerned. As suggested by Henricks (2007), architects and facility planners are aware that the focus on sustainability, particularly how it relates to operational costs and environmental impact, is going to shape building design for the foreseeable future. Additional research on the topic can complement this study by producing useful data regarding levels of personnel familiarity, institutional adoption, benefits, and challenges relative to sustainability.

## Implications for Practice

This study collected data from and was geared toward NIRSA member institutions. NIRSA aims to develop strategies that will continue to support and enhance the positive effects of recreation programs and inspire communities of wellbeing in diverse settings with the intent to respond to the changing face of higher education and rising to new challenges in the recreational sports profession (NIRSA, 2013). NIRSA has incorporated sustainability in its *Strategic Positioning* statement and has recently formed a Sustainable Community of Practice. This member community is charged with working to educate its members on the meaning of sustainability, in addition to developing a framework and understanding within which the profession can grow.

Six key implications developed from the study for higher education administrators, recreational sports professionals, and NIRSA. These included (a) providing benchmark data, (b) LEED-AP credential considerations, (c) advisory committees, (d) modeling NIRSA Region VI institutions, (e) perceived environmental benefits, and (f) perceived fiscal challenges.

The first implication is that the study provides foundational, benchmark data for the industry that can be used by administrators, practitioners, and NIRSA for future efforts toward sustainability. The results of the Collegiate Recreational Sports Sustainability Survey allow for a snapshot of sustainability efforts and perceptions within the industry. Administrators in higher education, practitioners in recreational sports, and NIRSA should use this study to better understand at least a part of the current state of sustainability initiatives within the field. In order to know where you need to go and how to get there, you need to know where you are. Baseline data provide this.

The second implication from the study is that LEED-AP certified professional staff are virtually non-existent in campus recreation. The United States Green Building Council (2013) suggests that a LEED-AP credential signifies an individual as being a leader in the field and an active participant in the green building movement who contributes expertise to the design, construction, operations and maintenance of buildings that save energy; use fewer resources; reduce pollution; and contribute to healthier environments for building occupants and the community. To move forward with efforts and results, campus recreation professionals must become more familiar with initiatives in the area of sustainability. The LEED-AP credential could be an avenue to achieve increased cognition on the topic. Short of this, professionals can pursue other professional

development opportunities to expand their familiarity of sustainability. One way is to become active in NIRSA's Sustainable Community of Practice, which fosters education on the topic and aids in professional growth and development. Additional avenues for professionals to develop on the topic include consulting with other sustainability-specific associations and organizations. The Association for the Advancement of Sustainability in Higher Education, the International Society of Sustainability Professionals, Second Nature, and the United States Green Building Council provide a plethora of information and resources for professionals. Finally, professionals can self-educate themselves by reviewing scholarly articles, papers, and book reviews from journals such as the *International Journal of Sustainability in Higher Education* to acquire information specific to sustainability and sustainable development at universities.

The next important implication from the study pertains to advisory committees. Nearly three-fourths of NIRSA member institutions do not have a sustainability advisory committee in place. As suggested by the United States Department of Education (2008), an advisory committee can (a) provide guidance that helps staff solve day-to-day problems; (b) offer a forum for program stakeholders to communicate their opinions, share their expertise, and coordinate services; (c) act as a link between program operations the board through a member who serves on both groups; and (d) support and represent interests of a program with a larger agency. By not having an active sustainability advisory committee, valuable opportunities are potentially being lost that could enhance facility sustainability efforts.

Another implication from the study is that institutions from NIRSA Region VI as a whole are more committed to sustainability than any other geographical region.

Institutions from NIRSA Region VI reported the highest levels of adoption in the most categories of sustainability initiatives. Additionally, these institutions had the highest mean summative score for adoption. Recreational sports professionals may want to consider networking with colleagues from this region to gain a better understanding as to what may facilitate higher levels of adoption of sustainability. NIRSA can assist in identifying professionals from this region that may be willing to take leadership roles to promote and advocate for sustainability efforts throughout the association.

Respondents deem *Environmental Welfare* as the top perceived benefit of implementing green/sustainable initiatives. This implication is important as it can serve as a starting point for professionals to achieve a greater understanding on environmental benefits such as saving energy and resources, reducing a carbon footprint, and overall environmental health and safety that can help justify requests to implement green/sustainable initiatives.

Finally, the majority of respondents indicate fiscal demand as being the top challenge when it comes to implementing sustainable initiatives. This implication should force institutions to proactively assess a number of fiscal mechanisms. These may include evaluating expenses associated with implementing sustainable initiatives, identifying funding opportunities to combat costs, dissecting current budget structure and allow for potential reallocation to support sustainability efforts, and examine estimated return on investment metrics.

## Recommendations for Further Research

This study establishes a foundation for further research on sustainability efforts in campus recreation among NIRSA member institutions. Since fiscal demands was

reported as being the biggest hurdle in implementing sustainable initiatives, a logical next step for researchers is to assess the return on investment associated with sustainability. The ultimate goal is to determine costs of implementing sustainable initiatives and the length of payback in terms of savings to see if going green is actually fiscally worth it. Knowing return on investment statistics associated with sustainability implementation will result in more informative decision-making by administrators and professionals and may negate some of the perceptions associated with costs.

This study focused on personnel familiarity, institutional adoption, and perceived benefits and challenges associated with sustainability. Future research can focus on studies that compare the performance of green recreational sports facilities against traditional (non-green) buildings. Findings from such research efforts will furnish definitive proof on whether green recreational sports facilities perform better than traditional buildings in terms of operational costs, reduced waste, energy and water usage, occupant health and safety, and other sustainable metrics.

Finally, this study could be emulated in other areas of sport, such as collegiate athletic facilities or professional sports arenas and stadiums. In the United States alone, $3.34 billion was spent on new sports facilities during 2008 (Ammon, Southall, & Nagel, 2010). Research on personnel familiarity, institutional adoption, benefits, and challenges could assist professional sports organizations and the National Collegiate Athletic Association in their respective efforts toward facility sustainability.

If sustainability is a concept that benefits the public good, then efforts should be made by college and university leaders to support efforts in this direction. This study can

also operate as a model for any program within postsecondary education or, for that matter, any industry or organization.

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# APPENDICES

# APPENDIX A

# COLLEGIATE RECREATIONAL SPORTS SUSTAINABILITY SURVEY

**Collegiate Recreational Sports Sustainability Survey**

You are being asked to participate in a research study intended to explore sustainability and collegiate recreational sports facilities at NIRSA member institutions. NIRSA's Research and Assessment Committee has approved this project and has taken the appropriate measures to endorse this research through NIRSA. Brad Stinnett, a doctoral student at the University of Louisville and Western Kentucky University, is conducting this study. There are no foreseeable risks associated with completing this survey. A potential benefit of participating in the study could be the satisfaction of contributing to a project aimed at assessing the current state of sustainability and collegiate recreational sports facilities. Information that you provide specific to your institution will be sent directly to Brad Stinnett and will be kept confidential. Completing this survey is voluntary. If you are willing to participate, please click the right arrow below to begin. The survey will take approximately 10 minutes to complete. Thank you in advance for assisting me with my doctoral work and for helping to explore sustainability and campus recreational sports facilities. As a survey participant, you will have the opportunity to be entered into a random drawing to win one of five available gift cards toward a free year of a NIRSA professional membership.

**Q1: Which of the following best describes your institution?**

- ❍ 2-Year Private College/University (1)
- ❍ 2-Year Public College/University (2)
- ❍ 4-Year Private College/University (3)
- ❍ 4-Year Public College/University (4)
- ❍ Other (please specify) (5) _____

**Q2: What is the current approximate enrollment (undergraduate and graduate) of your institution?**

**Q3: Your institution is in which NIRSA region?**

- ❍ Region I (CT, DE, DC, ME, MD, NH, NJ, NY, PA, RI, VT) (1)
- ❍ Region II (AL, FL, GA, KY, MS, NC, SC, TN, VA, WV) (2)
- ❍ Region III (IL, IN, MI, OH, WI) (3)
- ❍ Region IV (AR, KS, LA, MO, NM, OK, TX) (4)
- ❍ Region V (CO, IA, MN, MT, NE, ND, SD, WY) (5)
- ❍ Region VI (AK, AZ, CA, HI, ID, NV, OR, UT, WA) (6)

**Q4: What is the approximate square footage of your main, indoor recreational sports facility?**

**Q5: Regarding LEED Certification, your main, indoor campus recreational sports facility is:**

- ❍ Not LEED Certified (1)
- ❍ LEED New Construction Platinum (2)
- ❍ LEED New Construction Gold (3)
- ❍ LEED New Construction Silver (4)
- ❍ LEED New Construction Basic/Certified (5)
- ❍ LEED Existing Buildings Platinum (6)
- ❍ LEED Existing Buildings Gold (7)
- ❍ LEED Existing Buildings Silver (8)
- ❍ LEED Existing Buildings Basic/Certified (9)
- ❍ Other LEED Certification (please specify) (10) _____

**Q6: How many full-time, professional staff members does your recreational sports department employ?**

**Q7: Does your recreational sports facility offer secure bicycle racks or storage within 200 yards of a building entrance for 5% or more of all building users (measured at peak periods)?**

- ❍ Yes (1)
- ❍ No (2)
- ❍ I Don't Know (3)

**Q8: Does your campus recreational sports facility have low flush toilets/urinals that increase water efficiency?**

- ❍ Yes (1)
- ❍ No (2)
- ❍ I Don't Know (3)

**Q9: Does your campus recreational sports facility have sensored (automatic on/off) restroom faucets that increase water efficiency?**

- ❍ Yes (1)
- ❍ No (2)
- ❍ I Don't Know (3)

**Q10: Does your campus recreational sports facility have low-flow showerheads that increase water efficiency?**

- ❍ Yes (1)
- ❍ No (2)
- ❍ I Don't Know (3)

**Q11: Is there a system in place to provide for the ongoing accountability (e.g., measurement and verification plan) of annual building energy consumption for your recreational sports facility?**

- ❍ Yes (1)
- ❍ No (2)
- ❍ I Don't Know (3)

**Q12: Does your recreational sports facility have at least one easily accessible dedicated area for the collection and storage of materials for recycling for the entire building? A yes response indicates that materials must include at a minimum, paper, corrugated cardboard, glass, plastics, and metals?**

- ❍ Yes (1)
- ❍ No (2)
- ❍ I Don't Know (3)

**Q13: Is your recreational sports facility installed with occupancy sensors (i.e., motion detectors) for automated lighting control?**

- ❍ Yes (1)
- ❍ No (2)
- ❍ I Don't Know (3)

**Q14: Does your recreational sports facility have in place a green cleaning policy for using green cleaning products and equipment?**

- ❍ Yes (1)
- ❍ No (2)
- ❍ I Don't Know (3)

**Q15: Does your recreational sports facility have in place a staff training program regarding green cleaning for personnel responsible for housekeeping and maintenance?**

- ❍ Yes (1)
- ❍ No (2)
- ❍ I Don't Know (3)

**Q16: Does your campus recreation facility have an active sustainability committee or advisory council?**

- ❍ Yes (1)
- ❍ No (2)
- ❍ I Don't Know (3)

**Q17: Has your campus recreation facility been awarded funding for sustainability-related items, in the form of grant money, rebates, or tax incentives within the last 5 years?**

- ❍ Yes (1)
- ❍ No (2)
- ❍ I Don't Know (3)

**Q18: Does your institution have a dedicated Office/Department of Sustainability that is available for your department to collaborate with on sustainability issues?**

- ❍ Yes (1)
- ❍ No (2)
- ❍ I Don't Know (3)

**Q19: How many certified LEED Accredited Professionals are on your full-time, professional recreational sports staff (please indicate with a number)? Leave BLANK to indicate an "I Don't Know" response and move to next question.**

**Q20: How many professional staff members of your campus recreation department/facility have attended at least one professional conference or workshop dedicated to sustainability within the last 5 years (please indicate with a number)? Leave BLANK to indicate an "I Don't Know" response.**

**Q21: How many professional staff members of your campus recreation department/facility have taken academic courses in green building design, management, or operations within the last 5 years (please indicate with a number)? Leave BLANK to indicate an "I Don't Know" response.**

**Q22: Have professional staff members of your campus recreation department/facility pursued financial incentives (tax benefits, grants, rebate programs, etc.) available regarding sustainability initiatives?**

- ❍ Yes (1)
- ❍ No (2)
- ❍ I Don't Know (3)

**Q23: What do you see as the primary benefits of your campus recreation facility being green/sustainable?**

**Q24 What do you see as the primary challenges to your campus recreation facility becoming more green/sustainable?**

Thank you for participating in the survey! As a survey participant, you have the opportunity to be entered into a random drawing to win one of five available gift cards for use toward a free year of a NIRSA professional membership. Please submit your Name and E-mail Address if you wish to be entered. Thanks again for participating in the survey and assisting me with my doctoral studies!

# APPENDIX B

## UNIVERSITY OF LOUISVILLE INSTITUTIONAL REVIEW BOARD APPROVAL


**INSTITUTIONAL REVIEW BOARDS**

University of Louisville
MedCenter One, Suite 200
501 E. Broadway
Louisville, Kentucky 40202-1798
Office: 502-852-5188
Fax: 502-852-2164

**To:** Keaster, Richard
**From:** The University of Louisville Institutional Review Board (IRB)
**Date:** Wednesday, November 14, 2012
**Subject:** Approval Letter

**Tracking #:** 12.0490
**Title:** Sustainability and Recreational Sports Facilities
**Approval Date:** 10/29/2012 12:00:00 AM
**Expiration Date:** 10/28/2013 12:00:00 AM

---

This study was reviewed on 10/29/2012 by the chair/vice chair of the Institutional Review Board and approved through the Expedited Review Procedure, according to 45 CFR 46.110(b), since this study falls under Expedited Category (7) Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

This study was also approved through 45 CFR 46.117(c), which means that an IRB may waive the requirement for the investigator to obtain a signed informed consent form for some or all subjects if it finds either:
º That the only record linking the subject and the research would be the consent document and the principal risk would be potential harm resulting from a breach of confidentiality. Each subject will be asked whether the subject wants documentation linking the subject with the research, and the subject´s wishes will govern; or
º That the research presents no more than minimal risk of harm to subjects and involves no procedures for which written consent is normally required outside of the research context.

The following items have been approved:

- Invitation E mail to participants, not dated

- Subject Informed Consent Document, dated 10/05/2012
- Brad Stinnett Protocol, not dated
- Recreational Sports Sustainability Survey Stinnett (with preamble)

This study now has final IRB approval from 10/29/2012 through 10/28/2013. You should complete and return the Progress Report/Continuation Request Form EIGHT weeks prior to this date in order to ensure that no lapse in approval occurs. The committee will be advised of this action at their next full board meeting.

Site Approval
If this study will take place at an affiliated research institution, such as Jewish Hospital/St Marys Hospital, Norton Healthcare, or University of Louisville Hospital, permission to use the site of the affiliated institution may be necessary before the research may begin. If this study will take place outside of the University of Louisville Campuses, permission from the organization should be obtained before the research may begin. Failure to obtain this permission may result in a delay in the start of your research.

Privacy & Encryption Statement
The University of Louisville´s Privacy and Encryption Policy requires such information as identifiable medical and health records: credit card, bank account and other personal financial information; social security numbers; proprietary research data; dates of birth (when combined with name, address and/or phone numbers) to be encrypted. For additional information: http://security.louisville.edu/PolStds/ISO/PS018.htm.

1099 Information (If Applicable)
As a reminder, in compliance with University policies and Internal Revenue Service code, all payments (including checks, gift cards, and gift certificates) to research subjects must be reported to the University Controller´s Office. Petty Cash payments must also be monitored by the issuing department and reported to the Controller´s Office. Before issuing compensation, each research subject must complete a W—9 form.
For additional information, please contact the Controller´s Office at 852—8237 or controll@louisville.edu.

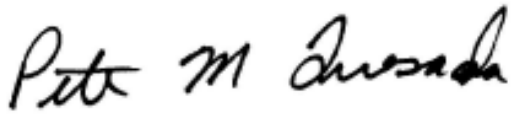
The following is a NEW link to an Instruction Sheet for BRAAN2 "How to Locate Stamped/Approved Documents in BRAAN2" if your item was submitted on or after 5/17/10:

http://louisville.edu/research/braan2/help/ApprovedDocs.pdf/view

Please begin using your approved (stamped) document(s) at this time. The previous versions are no longer valid. If you need assistance in accessing any of the study documents, please feel free to contact our office at (502) 852-5188. You may also email our service account at hsppofc@louisville.edu for assistance.

Best wishes for a successful study. If you have any questions please contact the HSPPO at (502) 852-5188 or hsppofc@louisville.edu.

Thank you.



Board Designee: Quesada, Peter

Once you begin your human subject research the following regulations apply:

1. Unanticipated problems or serious adverse events encountered in this research study must be reported to the IRB within five (5) work days.
2. Any modifications to the study protocol or informed consent form must be reviewed and approved by the IRB prior to implementation.
3. You may not use a modified informed consent form until it has been approved and validated by the IRB.
4. Please note that the IRB operates in accordance with laws and regulations of the United States and guidance provided by the Office of Human Research Protection (OHRP), the Food and Drug Administration (FDA), the Office of Civil Rights (OCR) and other Federal and State Agencies when applicable.
5. You should complete and SUBMIT the Continuation Request Form eight weeks prior to this date in order to ensure that no lapse in approval occurs.

Letter Sent By: Block, Sherry, 11/14/2012 2:10 PM

# APPENDIX C

# WESTERN KENTUCKY UNIVERSITY

# HUMAN SUBJECTS REVIEW BOARD APPROVAL

A LEADING AMERICAN UNIVERSITY WITH INTERNATIONAL REACH

OFFICE OF COMPLIANCE

| | |
|---|---|
| DATE: | December 5, 2012 |
| TO: | Brad Stinnett, M.A. |
| FROM: | Western Kentucky University (WKU) IRB |
| PROJECT TITLE: | [338681-1] Sustainability and Recreational Sports Facilities |
| REFERENCE #: | IRB 13-146 |
| SUBMISSION TYPE: | New Project |
| ACTION: | APPROVED |
| APPROVAL DATE: | December 5, 2012 |
| EXPIRATION DATE: | May 15, 2013 |
| REVIEW TYPE: | Expedited Review |

Thank you for your submission of New Project materials for this project. The Western Kentucky University (WKU) IRB has APPROVED your submission. This approval is based on an appropriate risk/benefit ratio and a project design wherein the risks have been minimized. All research must be conducted in accordance with this approved submission.

This submission has received Expedited Review based on the applicable federal regulation.

Please remember that informed consent is a process beginning with a description of the project and insurance of participant understanding followed by an *implied* consent form. Informed consent must continue throughout the project via a dialogue between the researcher and research participant. Federal regulations require each participant receive a copy of the consent document.

Please note that any revision to previously approved materials must be approved by this office prior to initiation. Please use the appropriate revision forms for this procedure.

All UNANTICIPATED PROBLEMS involving risks to subjects or others and SERIOUS and UNEXPECTED adverse events must be reported promptly to this office. Please use the appropriate reporting forms for this procedure. All FDA and sponsor reporting requirements should also be followed.

All NON-COMPLIANCE issues or COMPLAINTS regarding this project must be reported promptly to this office.

This project has been determined to be a Minimal Risk project. Based on the risks, this project requires continuing review by this committee on an annual basis. Please use the appropriate forms for this procedure. Your documentation for continuing review must be received with sufficient time for review and continued approval before the expiration date of May 15, 2013.

Please note that all research records must be retained for a minimum of three years after the completion of the project.

## CURRICULUM VITAE

**BRAD STINNETT**
Western Kentucky University
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1019 L.T. Smith Stadium East
Bowling Green, KY 42101
270.745.4329
brad.stinnett@wku.edu

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## ACADEMIC DEGREES

**University of Louisville, Louisville, KY**
Ph.D. in Educational Leadership and Organizational Development **2013**
Dissertation: "Sustainability and Collegiate Recreational Sports Facilities"
Note: Anticipated Graduation: August 2013

**Western Kentucky University, Bowling Green, KY**
M.A. in Student Affairs in Higher Education **1999**
Award: Most Outstanding Graduate Student

**Western Kentucky University, Bowling Green, KY**
B.S. in Physical Education **1997**
Minor: History
Received K-12 Kentucky Teacher Certification

## TEACHING EXPERIENCE

**Western Kentucky University - Bowling Green, KY**

| | | |
|---|---|---|
| RSA 590: | Practicum in Recreation and Sport | **2013** |
| RSA 515: | Recreation and Sport Facility Development | **2013** |
| RSA 513: | Recreation and Sport Administration | **2013** |
| REC/SPM 404(g): | Recreation Facility Management | **2011-13** |

| | | |
|---|---|---|
| SPM 450: | Sport Law (Web-Enhanced) | **2011** |
| PE/REC 483: | Technical Applications in PE/Recreation | **2002-2004** |
| UC 101: | Freshman Seminar/University Experience | **1999-2002** |

## PROFESSIONAL EXPERIENCE

**Western Kentucky University – Bowling Green, KY** **2013 – Present**
*Visiting Assistant Professor, Kinesiology, Recreation & Sport*
Instruct traditional and online graduate courses in the area of facility and event management; work with Division of Extended Learning and Outreach staff to market programs and collaborate with partnering organizations; work with KRS faculty to meet the needs of an increasingly diverse, multi-cultural, and technology-driven student population, approve and supervise practicum and capstone experiences, and advise students.

**Western Kentucky University – Bowling Green, KY** **2002 - 2013**
*Assistant Director – Facilities, Intramural-Recreational Sports*
Provided leadership and management for comprehensive campus recreational sports program; responsible for overall management and operations of the 128,000 square foot Raymond B. Preston Health & Activities Center; recruited, hired, trained, supervised, developed, and evaluated full-time professional staff, graduate assistants, and student employees;
charged with facility policy enforcement, scheduling, budgeting, risk management, maintenance, housekeeping, customer service, marketing, special events, and monitoring mechanical systems.

**Western Kentucky University – Bowling Green, KY**
*Facility Coordinator, Intramural-Recreational Sports* **1999-2002**
Managed evening operations of the Raymond B. Preston Health & Activities Center; supervised Graduate Assistants and student employees; served as departmental risk manager; coordinated locker rental service; assisted with marketing, discipline, maintenance, and special events.

**National Center for Drug Free Sport, Kansas City, MO** **2008 – Present**
*Certified Drug Testing Collector*
Contracted to administer drug testing services and drug abuse prevention programs to MLB, NFL, and NCAA athletes. Provided services at NCAA DIII Soccer Regional Tournament, NCAA DIII Swimming Championships, NCAA DII Basketball Regional Tournament, NCAA DI Baseball Regional Tournament, NCAA DIII Softball Regional Tournament, and numerous colleges/universities and professional sports organizations.

**Sun Belt Conference, New Orleans, LA** **2002 – Present**
*Operations Staff*
Serve as a Sideline Assistant for WKU Home Football Games. Previously assisted with operations for SBC Men's Basketball, Women's Basketball, and Softball Conference Championship events.

**Western Kentucky University – Bowling Green, KY** **2002 – Present**
*Operations Staff, Department of Intercollegiate Athletics*
Assist with the coordination of a variety of special events, including WKU Home Football
games, Kentucky High School Athletic Association championships, and other athletic related programming.

## SCHOLARY ACTIVITIES

**Stinnett, B.** (2013). *Sustainability and Collegiate Recreational Sports Facilities.* Dissertation in-progress. University of Louisville.

Gibson, F., Hey, W., Larson, B., Smith, D., **Stinnett, B**., Sutton, A., & Upright, P. (2011). *Retro Green: Sustainable Initiatives for Facility Renovations in Higher Education.* Proceedings of the 9th Annual Hawaii International Conference on Education. Honolulu, HI.

Spall, S. & **Stinnett, B.** (2009). *Informing professional practice: learning through practitioner inquiry.* Kentucky Council on Postsecondary Education Conference on the Scholarship of Teaching and Learning. Lexington, KY.

Gibson, F., Powell, S., & **Stinnett, B.** (2007). *A descriptive analysis of recreational sports facilities at NIRSA Colleges and universities,* 9th Annual Florida State University Sport Management Conference, Tallahassee, FL, September 13-14.

Little, A. & **Stinnett, B.** (1999). *Kentucky municipal and county recreation and park services study.* Master's Degree Independent Study at Western Kentucky University.

Gibson, F. & **Stinnett, B.** (1998). *Creating a facility dream team through pre-season student training.* Kentucky State NIRSA workshop, Northern Kentucky University.

## SERVICE

### PROFESSIONAL

- NIRSA Sustainability Committee, Consultant (2012-present)
- NIRSA Sustainability Committee, Chair (2010-2012)
- NIRSA Region II Conference Host Committee, Member (2011)
- NIRSA Career Service Exchange Consortium, Member (2011)
- KHSAA Football Championships, Contracted Employee (2009-present)
- NCAA Women's Basketball Regional Tournament, Facility Assistant (2009)
- Lindsey Wilson College Holloway Health & Wellness Center, Consultant (2009)
- National Center for Drug Free Sport, Drug Testing Collector (2008-present)
- NIRSA Facility Management Committee, Member (2007-2009)
- Kentucky State NIRSA Workshop Host Committee, Member (2008)
- NIRSA National Conference Host Committee, Member (2006)
- Kentucky State Director for NIRSA (2002-2004)
- KRPS Conference & Exhibition Host/Program Committee, Member (2003)
- Kentucky State NIRSA Workshop Host Committee, Member (2000)

### UNIVERSITY

- Christian Faculty & Staff Fellowship (2013-present)
- College of Health and Human Service Graduate Curriculum Committee (2013-present)

- School of Kinesiology, Recreation and Sport Feasibility Committee (2013)
- Campus Activities Board Advisory Council (2011-present)
- Director, Career Services Center Search Committee Chair (2011)
- Coordinator, Student Activities Search Committee Member (2010)
- Campus Partners Threat Assessment Team (2008-present)
- Director, Judicial Affairs Search Committee Member (2008)
- Intramural Coordinator Search Committee Member (2008)
- Football Game Day Operations (2007-present)
- Homecoming Queen Selection Committee (2007-present)
- Raymond B. Preston Health & Activities Center Expansion/Renovation Planning Committee (2006)
- Raymond B. Preston Health & Activities Center Expansion/Renovation Architect Selection Committee (2006)
- Assistant Director, Student Activities Search Committee Chair (2006)
- Sport Club Coordinator Search Committee Member (2006)
- Kinesiology, Recreation & Sport Practicum and Internship Supervisor (2005-present)
- Student Affairs in Higher Education Internship Supervisor (2005-present)
- Supervisor, Special Events Search Committee Member (2005)
- Division of Student Affairs Staff Development Committee (2003-2006)
- Raymond B. Preston Health & Activities Center Master Plan Committee (2003)
- Academic Advisor Search Committee Member (2003)

- Outdoor Recreation Coordinator Search Committee Member (2002)
- Staff Council (2001-2003)
- Facility Coordinator Search Committee Member (2001)
- Academic Advisor, Freshman Seminar Students (1999-2002)

**COMMUNITY**

- Living Hope Baptist Church, Deacon (2012-present)
- Warren County Parks and Recreation Girls Basketball, Board Member (2012-present)
- Commissioner, Division III Warren County Girls Youth Basketball League (2012-present)
- Warren County Juvenile Detention Center, Guest Speaker, "The Value of Education" (2012)
- Living Hope Baptist Church Connection Center Director Search Committee, Member (2012)
- Living Hope Baptist Church Connection Center, Consultant (2011-present)
- Warren County Parks and Recreation, Youth Sports Coach (2009-present)
- Living Hope Baptist Church Connection Center, Planning & Design Committee (2008-2010)
- Briarwood Elementary School, Parent Volunteer (2008-present)
- Upward Sports, Coach and Volunteer (2007-2010)
- Living Hope Baptist Church Recreation Committee, Member (2007-2009)
- City of Tompkinsville, KY Recreation and Wellness Center, Consultant (2007)
- City of Central City, KY Wellness Center, Consultant (2007)

## PROFESSIONAL DEVELOPMENT

**Affiliations/Memberships**

| | |
|---|---|
| International Association of Venue Managers | (2013-present) |
| Collegiate Event and Facility Management Association | (2013-present) |
| Kentucky Recreation and Parks Society | (2008-present) |
| WKU Hilltopper Athletic Foundation | (2002-present) |
| National Intramural-Recreational Sports Association | (1998-present) |
| Kentucky Intramural-Recreational Sports Association | (1998-present) |
| WKU Student Affairs Graduate Association | (1998-present) |
| WKU Alumni Association | (1997-present) |
| National Association of Student Personnel Administrators | (2003-2008) |
| American College Personnel Association | (2003-2008) |

**Certifications/Training**

| | |
|---|---|
| Online Teaching Summer Camp, Western Kentucky University | (2013) |
| AED/CPR/First Aid Instructor, American Red Cross | (2012-present) |
| Practicum/Internship On-Site Supervisor Training | (2011) |
| Blackboard Training, Western Kentucky University | (2011) |
| Human Subjects Research Training, Collaborative Institutional Training Initiative | (2009-present) |
| Drug Testing Collector, National Center for Drug Free Sport | (2008-present) |
| Certified Pool Operator, National Swimming Pool Foundation | (2006-present) |
| Fire Safety Training, Western Kentucky University | (2006-present) |
| Bloodborne Pathogens Training, Occupational Safety and Health Association | (2006-present) |
| AED/CPR/First Aid, American Red Cross | (1993-present) |
| Aquatic Facility Operator, National Recreation and Park Association | (2002-2006) |

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| K-12 Teacher Certification, Commonwealth of Kentucky | (1997-2002) |

**Conferences and Workshops**

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|---|---|
| National Intramural-Recreational Sports Association National Conference and Exposition | (1998-2012) |
| Kentucky State NIRSA Workshop | (1998-2012) |
| National Intramural-Recreational Sports Region II Conference | (2011) |
| Kentucky Council on Postsecondary Education Conference | (2009) |
| National Association for Student Personnel Administrators Mid-Manager's Institute | (2008) |
| National Intramural-Recreational Sports Association Outdoor Recreation Symposium | (2002) |
| National Intramural-Recreational Sports Association Aquatics Symposium | (2001) |
| Kentucky Association for Health, Physical Education, Recreation, and Dance Conference | (1996-1999) |

**AWARDS AND HONORS**

| | |
|---|---|
| WKU Department of Intramural-Recreational Sports, Outstanding Alumni Award | (2010) |
| WKU Staff Excellence Award Nominee | (2004) |
| WKU Department of Counseling and Student Affairs, Most Outstanding Graduate Student | (1999) |
| WKU President's List | (1996) |
| WKU Dean's List | (1995) |