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The Impact of individual decision making on campus sustainability initiatives

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THE IMPACT OF INDIVIDUAL DECISION MAKING ON CAMPUS
SUSTAINABILITY INITIATIVES

by

Aurali Ella Dade

Bachelor of Science
Texas Tech University
1998

Master of Science
Texas Tech University
1999

A dissertation submitted in partial fulfillment of
the requirement for the

**Doctor of Philosophy in Environmental Science
Department of Environmental and Public Affairs
College of Urban Affairs**

**Graduate College
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THE GRADUATE COLLEGE

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Aurali Ella Dade

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May 2010

ABSTRACT

The Impact of Individual Decision Making on Campus Sustainability Initiatives

by

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Institutions of Higher Education (IHEs) have increasingly committed to become more sustainable in recent years. Despite this commitment, academic publications in the sustainability field assert that progress has been slower at IHEs than expected and that most IHEs have found sustainability initiatives difficult to implement. Comprehensive sustainability initiatives require cooperation from a broad set of constituents with diverse and sometimes conflicting goals. Creating a sustainable IHE also requires changes in both physical infrastructure and individual behavior. Any number of institutional factors can advance or limit progress towards these objectives.

Previous investigations have assessed individual case studies, compared IHEs in a region, and surveyed IHE administrators and students to describe sustainable practices. Most previous research into campus sustainability has lacked a quantitative focus. In this study, I extend previous work by quantitatively analyzing how individuals with operational responsibilities at IHEs make decisions about sustainability and what impact these decisions have upon the overall goal of a sustainable IHE.

The focus population for this research is mid-level decision makers and research faculty (MLD-RF) at IHEs. For this study MLD-RF is defined as mid-level decision

makers heading environmental health and safety, facilities maintenance, and purchasing departments as well as research faculty with laboratories at IHEs.

The goals of this research are to evaluate MLD-RF's attitudes towards sustainability and understand variability in these attitudes among MLD-RF. Also, this research will evaluate how MLD-RF impact overall campus sustainability activities and the extent to which MLD-RF communicate their campus sustainability activities. Finally, this research will assess the extent and type of support for sustainability at these IHEs within the purview of MLD-RF.

The methodologies used in this study include content analysis and survey. For both methodologies, IHEs were selected for inclusion using a stratified random sampling design. The content analysis was web-based and focused on MLD-RF websites as well as central sustainability websites. The survey was on-line and fed into a database for analysis. Statistical analysis was performed on both the content analysis and survey methodologies to provide generalizable results for individuals managing campus sustainability. Using these two methodologies allows for triangulation of data and an assessment of validity.

There were significant differences between different types of MLD-RF but all had positive reactions toward the concept of sustainability. Facilities maintenance respondents were the most positive toward and most involved in campus sustainability. The level of involvement by all MLD-RF was lower than what their interest level would predict. MLD-RF should be targeted by sustainability coordinators for inclusion in campus sustainability initiatives.

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environmental problems, policy, and law. Dr. William Smith challenged my perspective of the world and the role of technology in our lives. Dottie Shank had a constant smile for me and her supportive words meant a tremendous amount during personally and academically challenging times.

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CHAPTER 1

INTRODUCTION

Sustainable development became a focus of international environmental policy after the publication of the *Brundtland Report, Our Common Future*, in 1987 (Barlett & Chase, 2004). Since the initial popularization of the phrase, academics have debated the meaning of sustainable development, also called sustainability. There is also debate whether the concept is the most appropriate pathway to social justice, environmental protection, and economic prosperity (Mawhinney, 2002).

Despite controversies and confusion about the meaning, countless government, public, and private organizations have adopted sustainability as a guiding principle in an attempt to simultaneously address environmental, social, and economic concerns (Meadowcroft, 2005). International organizations now recognize education as vital to the pursuit of sustainability (United Nations, 2007). Institutions of Higher Education (IHEs) therefore have a special place in the international vision for a sustainable future.

In the United States alone there are over 4,000 IHEs (United States Department of Education Institute of Education Sciences, 2007), accounting for a \$364 billion a year industry that employs millions and leads to local economic development (National Center for Education Statistics, 2007). Beyond the economic impact, IHEs train future leaders and have an enormous impact on the environment and attitude of communities in which the IHEs reside (Elder, 2008; Lewis & Hearn, 2003).

IHE's traditional missions include (Rosenstone, 2003):

- Advancing knowledge through basic research and creative activities;

- Extending knowledge through providing a liberal education to students that allows them to think creatively and understand broad topics including physical, social, cultural, economic, and political aspects of our world;
- Disseminating knowledge through publication and civic education.

The public has also increasingly expected IHEs to solve societal problems, such as environmental, social, and economic issues, by utilizing applied research (Dautremont-Smith, Gamble, Perkowitz, & Rosenfeld, 2007). Reductions in public financial support and public demands that IHEs become financially self-sustaining have also led to escalating IHE-private research enterprises leading to multifaceted focuses and strains on resources (Lewis & Hearn, 2003). This, along with conservative tendencies of IHEs leads to difficulty in implementing sustainability initiatives (Velazquez, Munguia, & Sanchez, 2005).

Past research into campus sustainability has evaluated practices and/or decision making by high level administrators, individuals within discrete universities, and students (Dahle & Neumayer, 2001; Kagawa, 2007; McIntosh, Caccoila, Clermont, & Keniry, 2001; Wolfe, 2001 for example). No in-depth study has focused exclusively on the decision-making process by individuals who lead operational efforts at IHEs. This research addresses that gap in the literature.

The focus population for this research is mid-level decision makers and research faculty (MLD-RF) at IHEs. For this study MLD-RF is defined as mid-level decision makers heading environmental health and safety, facilities maintenance and planning and construction, and purchasing departments as well as research faculty with laboratories at IHEs.

The goals of this research are to evaluate MLD-RF's attitudes towards sustainability and understand variability in these attitudes among MLD-RF. Also, this research will evaluate how MLD-RF impact overall campus sustainability activities and the extent to which MLD-RF communicate their campus sustainability activities. Finally, this research will assess the extent and type of support for sustainability at these IHEs within the purview of MLD-RF.

In this dissertation, I first review the literature related to sustainability focusing on the history of sustainability, sustainability in higher education, and decision making. Next, building on the literature review, I detail the research questions and hypotheses for this study. Following the research questions, I describe the methods used to answer the research questions. Results are then detailed by method with additional comparisons where needed. Finally, the discussion and conclusions detail the answers to the hypotheses and research questions, general conclusions about MLD-RF activities and attitudes about sustainability, and future directions for research related to MLD-RF and campus sustainability.

CHAPTER 2

REVIEW OF RELATED LITERATURE

It is important to review the literature related to sustainability and IHEs in order to show what is both known and not known and appropriate areas for additional study. The literature related to mid-level decision making about campus sustainability is varied, and, due to its interdisciplinary nature, overlaps several specialized fields. Connections between the environment, economics, and social issues are complex. This literature review therefore explores the history of sustainability and sustainability commitments, definition of sustainability, IHEs structure and sustainability, IHE sustainability literature, and cognitive and affective decision making. These areas were selected for review because they are necessary components of understanding the approach of this dissertation. The history of sustainability is critical to any current study of sustainability in order to understand the reasons for the development of the concept and how it has evolved over time. Many definitions exist for sustainability. This dissertation explores the definitions of sustainability to show the broad scope of this concept and also develop a definition appropriate for this study. In order to analyze participation and decision making about sustainability at IHEs it is vital to understand the structure of these institutions and what activities are currently occurring in the sustainability arena. The literature related to sustainability in higher education is especially critical to this study. The reason for inclusion in the literature review is to show gaps and opportunities for additional study. Finally, cognitive and affective decision making are included to show the ways in which MLD-RF may approach decision making at IHEs. At the end of this chapter I will relate these areas to the focus of the study.

History of Sustainability

In the United States and Europe sustainability has its roots in the conservation movement in the nineteenth century. Three schools of thought were active in this movement: natural resource management (conservation), wilderness preservation, and urban quality of life issues related to the environment (Wellock, 2007). During the Theodore Roosevelt era in the early 1900s, advocates of natural resource management in the United States included Gifford Pinchot and his contemporaries called conservationists. The conservationists believed in efficient management of natural resources so that they can be used, but also remain available for future generations. Advocates of wilderness preservation included John Muir and his colleagues. Preservationists believed in leaving land in its natural state to preserve its beauty and biodiversity (Wellock, 2007). These two schools of thought led to a division in focus for United States citizens concerned with preserving the environment. Throughout the early twentieth century, the United States government created the parks system but otherwise primarily focused on conservation rather than preservation (Wellock, 2007).

Until the 1940s, conservation activities by the United States government overshadowed both the preservation and urban environmentalism movements. During the 1950s and 1960s, the latter two movements began to coalesce and form the modern environmental movement (Wellock, 2007). During the late 1960s and early 1970s, people began to question the capacity of the earth to support established patterns of human consumption, and the assumption by policy makers that there were no practical limits to industrialization (Torgerson, 1995). The modern environmental movement's tenets became part of the public discourse in the industrialized world focusing on social

change through environmental policy planning and improving quality of life (Beckerman, 2002).

Environmentalists' questioned industrialization and the ability of humans to assert control over our natural environment; this led to skeptical and hostile reactions by proponents of industrialization (Torgerson, 1995). There was a backlash to environmentalism starting in the 1980s and continuing through the mid-1990s (Wellock, 2007). Environmentalists' criticism of unfettered development also led to tension between industrialized and developing countries. It became increasingly apparent that if the environmentalists were correct, the remainder of the world would not have the environmental resources to develop in the way that industrialized countries had (Carruthers, 2005).

The concept of sustainable development was borne out of this tension and was popularized by the 1987 *Brundtland Report, Our Common Future* (Barlett & Chase, 2004). The *Brundtland Report's* definition of sustainable development was "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." The report further specified that "sustainable development is not a fixed state of harmony, but rather a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development, and institutional change are made consistent with future as well as present needs" (United Nations, 1987).

Jacobs (1999) asserts that the authors of the *Brundtland Report* intentionally designed the concept of sustainable development to bridge the gap between economic development and environmental protection advocates. The central focus of the concept of sustainable

development was the process of development rather than on any particular practice, institution, or portion of the environment. This process for addressing environmental and social concerns while still allowing for development was broadly appealing to both wealthy and poorer nations (Meadowcroft, 2005).

Criticisms of the Brundtland definition of sustainable development include the analysis that “needs” may be different for future generations than for current generations. “Needs” change over time and it is difficult to predict what the future generations’ needs will be. A second criticism is that cultural differences lead people to understand sustainability in different ways. Also, development itself may alter the perceptions of what a true “need” is within different cultural contexts (Redclift, 2005).

International organizations and national governments quickly signed on to the sustainable development concept, which was broadly recognized at the Rio Earth Summit (Wright, 2002). Concurrent and subsequent declarations including the *Kyoto Declaration*, *Swansea Declaration*, *CRE-Copernicus Charter*, the *Thessaloniki Declaration*, and the *UN Decade of Education for Sustainable Development* expanded the international commitment to the concept of sustainable development (Wright, 2002).

The first commitment to sustainability in Higher Education was enacted in 1990 when a group of university leaders authored and committed to the *Talloires Declaration* (Wright, 2002). These presidents and chancellors stated that “universities have a major role in the education, policy formation, and information exchange necessary” to remedy environmental change caused by “inequitable and unsustainable production and consumption patterns that aggravate poverty in many regions of the world”. They also agreed to “set an example of environmental responsibility by establishing institutional

ecology policies and practices of resource conservation, recycling, waste reduction, and environmentally sound operations” (University Leaders for a Sustainable Future, 1990). The *Talloires Declaration* described key actions that IHEs could take to move toward sustainability and included a focus both internally and externally for improvement (University Leaders for a Sustainable Future, 2001). Most of the goals included in this declaration were vague and gave no clear direction for suggested changes and no deadlines (Barlett & Chase, 2004). A follow up survey of IHEs who had signed the *Talloires Declaration* found that in many cases senior level support was absent and there was a low level of general awareness about the declaration (Walton, 2000).

The *Talloires Declaration* was followed by the *Halifax Declaration* and *Lüneburg Declaration* (United Nations Educational, Scientific and Cultural Organization, 1991; United Nations Educational, Scientific and Cultural Organization, 2001). The *Halifax Declaration* emphasized ethical obligations and cooperation in pursuing sustainability, but did not give concrete goals or deadlines for implementation. The *Lüneburg Declaration* included a more specific commitment to “produce an action-oriented Toolkit for universities, managers, administrators, faculty and students designed to move from commitment to concrete action” (United Nations Educational, Scientific and Cultural Organization, 2001). This toolkit was to focus on research and education related to sustainability. Some researchers argue that despite these declarations concrete system-wide improvements of environmental education (Nair & Jones, 2001) and sustainable campuses have not materialized (Thompson & Green, 2005). Committing to these declarations also does not necessarily translate to implementation and it gives IHEs

publicity before taking any action; therefore there is a reward without cost or risk (Bekessy, Samson, and Clarkson, 2007).

The American College and University Presidents Climate Commitment of 2007 is the most recent sustainability commitment for higher education (American College and University Presidents Climate Commitment, 2009). By signing this commitment, IHE presidents and chancellors pledge resources toward realizing specific attainable sustainability goals including: an annual greenhouse gas inventory, two or more short term tangible actions that demonstrate commitment to the pledge, specific targets and timelines to achieve climate neutrality, and a commitment to detailed reporting (Dautremont-Smith et al., 2007). Currently there are over 650 signatories to this pledge and two annual reports have been released (American College and University Presidents Climate Commitment, 2009). As of the 2008 report, over three fourths of signatories were in good standing with fulfilling their commitments.

Sustainability Defined

Most authors do not distinguish between sustainability and sustainable development as separate concepts and use the terms interchangeably. Graedel (2002, p. 346) states that “sustainability and sustainable development are, for all practical purposes, synonyms, because one cannot imagine stopping development in its tracks”. There is however still considerable debate over the meaning of sustainability and how to best implement it. The particular definition used in any situation reflects the individual’s world views, political orientation, and focus (Mawhinney, 2002).

Most definitions of sustainability include an intersection of economic, environmental, and social domains to address concerns that will impact all of these areas (Barlett &

Chase, 2004). This triad of domains has been termed the “three pillars of sustainable development” or the “triple bottom line” (Elkington, 1998). Many researchers also agree that a central idea of sustainability must be “to ensure to the degree possible that present and future generations can attain a high degree of economic security and achieve democracy while maintaining the integrity of the ecological systems upon which all life and production depend” (Viederman, 1995, p.37).

Shriberg (2002b, p.13) proposed that most concepts of sustainability integrate several central themes: “long-term survival, integrity and maintenance of systems, limits, interdependence and – to a lesser degree – equity”. Others (Gladwin, Shelomith Krause, & Kennelly, 1995b; van Weenen, 2000; Bernard & Young, 1997; Thaman, 2002) argue that equity and cultural inclusion may be the most important concept of all and that sustainability should be considered an ethic, not simply a prescription for improving the environment or economy. Redclift (2005) points out that environmental and social objectives are often different and sometimes may be at odds with each other leading to difficult choices about priorities.

Sustainability as a concept can be perceived and interpreted in many different ways. Davidson (2000) describes sustainability as either “weak” or “strong”. Kallio, Nordberg, and Ahonen (2007) point out that both weak and strong sustainability are rational concepts. Advocates of each type of sustainability try to legitimate their perspective and institutionalize what they mean by sustainability, forcing the discussions around sustainability to be biased by their viewpoint.

Weak sustainability is intrinsically connected to an anthropocentric world-view with a focus on utilizing the natural environment. Concerns are framed in the context of the

environment, separate from development. Weak sustainability also does not evaluate intergenerational equity and considers the well being of other species as secondary to humans. Finally, the natural environment is viewed as a resource to be mastered, rather than something to be protected (Kallio et al., 2007).

Strong sustainability proponents refuse to treat humans as separate from nature. The focus is on how to balance human development and environmental integrity while keeping intergenerational equity as a central thesis. Strong sustainability advocates also argue that participatory, transparent, and democratic processes, as opposed to authoritative and coercive processes, are required to solve sustainability related dilemmas. (Kallio et al., 2007).

Shriberg (2002b) points out that most definitions of sustainability are vague enough that they are interpreted in various ways. Esty (2001, p. 74) argues that due to this vagueness sustainable development has become “a buzzword largely devoid of content” and that it is sometimes used when a lack of clarity is advantageous to solving problems. Maddox (2000) contends that vagueness can also be a benefit and allow for creativity in theories and implementation of the idea of sustainability. There may never be a consensus on a simple definition of sustainability. This lack of agreement on a common definition is not uncommon for large philosophical ideas and is not necessarily a negative since it leads to in-depth discussions (Gladwin, Kennelly, & Shelomith Krause, 1995a; Kidd, 1992).

For this study, I define sustainability as a process by which organizations attempt to improve the quality of life of those individuals associated with and surrounding the organization while balancing environmental, social and economic concerns. This

definition derives from definitions in the literature; it is a concise definition that can be used to focus on the organizational level since this study involves IHEs. This definition is preliminary, and will be evaluated against how MLD-RF define campus sustainability. This definition may prove to be inadequate or inconsistent with practice when compared with empirical findings of this study.

MLD-RF

For this study MLD-RF are defined as the mid-level decision makers and research faculty at IHEs in the United States. Mid-level decision makers are further specified as directors, or equivalent, of: planning and construction and facilities maintenance, purchasing, and environmental health and safety departments at IHEs. These operational decision makers typically have input on physical planning of the campus environment and communicate with the campus community about items of operational importance. Mieg (2006) calls this type of expert a “system expert” (as opposed to traditional academic experts) and argues that because of their local knowledge of the system in which they work, they must be included in evaluation of human-environmental systems in order for projects to be successful.

At IHEs facilities maintenance departments have the role of ensuring the long term usability of buildings through maintenance activities (APPA, 2007). Facilities maintenance managers typically make decisions about types of equipment and supplies to purchase for ongoing maintenance activities on campus. These managers generally have some flexibility in purchasing, permitting them to choose more sustainable products if justified within IHE policies (Noor and Pitt, 2009).

Planning and Construction departments at universities typically have the goal of guiding campus planning activities, new construction, and major renovations (Society for College and University Planning, 2007). They also may be responsible for producing and implementing the master plan of the institution and construction guidance documents. Cortese (2005) argues that focusing on educating decision makers in planning and construction and facilities maintenance departments would have the largest immediate impact on improving operational campus sustainability. At many campuses, facilities maintenance and planning and construction are overseen by a single administrator, often answering to an institution's president or vice president.

Environmental health and safety departments at IHEs typically have the role of assuring that their campus complies with regulations related to the environment and health and safety (Campus Safety Health and Environmental Management Association, 2008). They typically have responsibilities for environmental compliance areas such as: hazardous waste, water permitting and storm water pollution control, air permitting, and OSHA mandated requirements. Environmental health and safety departments have various reporting lines depending on the institution. They may report the Vice President for Business, Vice President for Research, or in a few instances, directly to the President of the University.

The primary purpose of purchasing departments at IHEs is to procure goods and services for the institution. For most state universities and colleges this means ensuring purchases are of the lowest overall cost and have a standard level of quality (National Association of College and University Business Officers, 2009). Purchasing directors typically manage the process of determining which vendors are preferred, sending

proposals or quotation requests, selecting proper procurement methods, and executing agreements for purchases for the IHE.

For this study, research faculty are defined as faculty at IHEs that have responsibility for research and/or teaching laboratories. Laboratories are among the most energy and waste intensive facilities on campuses, and therefore central to any effort to improve sustainability (Woolliams, Lloyd, & Spengler, 2005). Laboratory design and operation has traditionally focused on safety and science needs rather than energy efficiency (United States Environmental Protection Agency & United States Department of Energy, 2007). The College of Sciences was specifically selected for inclusion since this unit typically has the most laboratories with various uses of hazardous materials and energy intensive equipment such as chemical fume hoods. Wright, Ironside, & Gwynn-Jones (2008, 2009) published two recent articles that emphasized the disparity between attitudes and actions of research faculty related to sustainability. The survey of one institution found that 71% of laboratory and field researchers indicated that they were not conducting research in the most sustainable way in which they how to operate.

IHEs Structure and Sustainability

IHEs are complex organizations with diffuse hierarchical structures (Comm & Mathaisel, 2005). An IHE may have hundreds of buildings and grounds, with each building serving one or more purpose. Functions may range from housing students to performing state of the art research utilizing highly toxic materials. IHEs also have many operational requirements including food, water, transportation, and energy systems (McIntosh et al., 2001; Uhl, 2004). Administrators can find it challenging to develop and

implement sustainability initiatives due to this complexity in both physical operations and purpose.

IHEs share many characteristics with other complex organizations, but also have distinctive attributes. Stakeholders at an IHE typically include students, alumni, staff, faculty, administrators, vice presidents, a provost, and a president. In many IHEs there also is a governing body; typically a Board of Regents or some equivalent organization (Duderstadt & Womack, 2003). Other stakeholders that have input in decision making include student organizations, administrative committees, and faculty/staff senates.

Organizational structure and hierarchy among IHE's is much more complex than a simple listing of positions can demonstrate. Power is generally dispersed in IHEs (Eckel & Kezar, 2006). Goonen and Blechman (1999, p. 13) describe decision making in IHEs as "a complex process of balancing conflicting needs and interests while adhering to the law; the institution's mission, values, and standards; and the practical considerations necessary for its fiscal and operational health".

Academic departments at many IHEs view themselves as independent and hold the belief that they should make certain types of decisions (Duderstadt & Womack, 2003). In reality independence in decision making does vary by type of IHE and type of department. In many cases, administrators can find it difficult to steer the direction of the institution due to the low level of accountability faculty typically have to the IHE. Organizational goals may also be secondary to the professional demands of faculty. Performing research and publishing is more vital to long term careers than most administrative requests at their current institution of residence (Talburt, 2005).

Ward (2007) maintains that in general IHEs, especially public universities, were not designed in a manner compatible with the current model and growth of the student body. Public funding generally falls short of providing all of the resources required for IHEs to meet all of their goals. This can lead to enormous pressures on IHEs to continue to provide for students while grappling with inadequate resources. IHEs typically are highly conservative and immutable organizations (Comm & Mathaisel, 2005; Velazquez et al., 2005); therefore new initiatives such as sustainability may not be readily recognized as important or adopted.

Setting and meeting sustainability goals at IHEs is difficult. IHEs have complex organizational structures and physical environments, leading to challenges in adopting new initiatives. Although some critics argue that IHEs have been slow to move toward sustainability, there is currently an increasing awareness and activity focused on sustainability by regulators, faculty, staff, and students (Association for the Advancement of Sustainability in Higher Education, 2009).

IHEs generally have a broad spectrum of hazardous materials used and stored on campus (Robinson & Sorensen, 1980). These materials are typically located throughout campuses and utilized in various functions on a daily basis (United States Environmental Protection Agency, 2007b). Because of hazardous materials usage and energy intensive operations such as laboratories, universities have increasingly become the focus of environmental compliance regulations and sustainability standards. Some examples of initiatives aimed at laboratories include the United States Environmental Protection Agency/ United States Department of Energy Labs²¹ initiative (United States Environmental Protection Agency & United States Department of Energy, 2007) and the

United States Environmental Protection Agency laboratory waste proposed rule (United States Environmental Protection Agency, 2007a).

The Labs21 initiative is aimed at improving the environmental performance of laboratories. This is because laboratories use a large portion of hazardous chemicals at IHEs and more than twice as much energy than other commercial spaces on campus; an average of 39 kw hr/sq. ft. versus an average of 14.9 kw hr/sq. ft. (United States Department of Energy, 2003). The proposed laboratory waste rule is aimed at requiring knowledgeable individuals trained in RCRA to identify hazardous wastes prior to disposal rather than allowing source generators, such as untrained students, to perform the identification. Universities have also received increasing United States Environmental Protection Agency scrutiny in their regions via inspections and initiatives aimed at voluntary compliance (United States Environmental Protection Agency, 2007b).

Despite this governmental scrutiny, the popular press has touted IHEs for their green initiatives often emphasizing specific improvements (such as Egan, 2006; Galbraith, 2009; Foderaro, 2009; and Underwood, 2007). Research publications from the past decade point out that although IHEs are intense users of resources, few have pursued sustainability in a comprehensive manner (Creighton, 1998; Dahle & Neumayer, 2001; Taylor, 1999; Thompson & Green, 2005). Shriberg (2003) suggests that while IHE administrators use these popular press articles to put a positive spin put on the status of sustainability, closer inspection reveals that even those touted as “green universities” have fragmented sustainability programs.

Implementation of sustainability initiatives can be especially problematic at large state universities where funding tends to be low in comparison to the goals of the

institution (Jerman, Coull, Elzerman, & Schmidt, 2004). In addition, Edelstein (2004) points out that there is no motivation for decision makers and administrators to accept paradigm shifts: they tend to be comfortable in their positions, and conservatism allows for continued funding and staffing. Christensen, Thrane, Herreborg Jørgensen, & Lehmann (2009) use a case study from Aalborg University, one of the original signatories of the Copernicus Charter, to demonstrate how administrator's best intentions often do not become concrete sustainable actions. This was due in a large part to difficulty in communication within the IHE and resistance from the "technical service unit" similar to facilities maintenance in the United States.

Some researchers criticize small sustainability projects that lack a systemic focus (van Weenen, 2000; Creighton, 1998; Thompson & Green, 2005; Shriberg, 2002b; Henson, Missimer, & Muzzy, 2007 for example). Clugston (2000) points out that the idea of "picking the low hanging fruit" and focusing on easily obtainable small projects does have validity. In many instances, these small projects are the only ones that prove to be manageable for IHEs and may demonstrate that change toward sustainability is possible. Such projects result in improvements in sustainability and many times in cost savings (Breyman, 2000; Gladwin et al., 1995a). Shriberg (2002a) takes a more inclusive view and argues that pursuing incremental and systemic change simultaneously is critical to the success of campus sustainability initiatives. To date, systematic changes have not materialized at most IHEs; therefore, the current state of sustainability has been described as a "broad but shallow penetration" (Elder, 2008, p. 322).

Faculty increasingly recognize the importance of teaching hands-on sustainability and adding sustainability to their curriculum (American College and University Presidents

Climate Commitment, 2009; Christensen, Peirce, Hartman, Hoffman, & Carrier, 2007).

Despite this recognition, the National Wildlife Federations *Campus Environment 2008* report noted that curriculum connections to the environment and sustainability are slipping and that in 2008 students were “slightly less likely to be environmentally literate when they graduate in 2008 than in 2001” (National Wildlife Federation, 2008).

Despite what many researchers have observed about the slow move to operational sustainability at IHEs (Creighton, 1998; Dahle & Neumayer, 2001; Shriberg, 2002b for instance), awareness about and action relating to sustainability at IHEs appears to be increasing in the past few years.

The Association for the Advancement of Sustainability in Higher Education (AASHE) has the stated goal of advancing sustainability in higher education (Association for the Advancement of Sustainability in Higher Education, 2009), and currently has over 950 institutional member organizations. This association provides resources for campus sustainability, has a newsletter, various list-serve e-mail communication forums, and sponsors a biennial conference to promote sustainability in IHEs. AASHE frequently highlights campuses that are pursuing sustainability in areas such as buildings, transportation, waste, and curriculum. The same trend is occurring in Europe with the formation of organizations such as Higher Education Partnership for Sustainability in the United Kingdom (White, Johnston, Brookes, & Buckland, 2004).

IHE Sustainability Literature

There has been little systematic and philosophical treatment of campus sustainability in research publications. There also has been no evaluation of sources of sustainability information used by individuals at IHEs. Wright (2007) points out that many articles and

initiatives focus on case studies of individually successful programs and single unit successes at IHEs (Fisher, 2007; Gabrielli, 2007; Owens & Halfacre-Hitcher, 2006; Savanick, Baker, & Perry, 2007; University of Florida Controller's Office, 2007 for example). These case studies provide interesting insight and valuable information to others in the field; however, there is a need for further development of the theoretical framework regarding campus sustainability and empirical statistical evaluation of theories.

Sterling (2004) attempted to theoretically frame the possible mechanism for IHEs to become sustainable through deep learning and proposed four action response levels (Table 1) from very weak to very strong. The first level (very weak) is either absolute denial or a token response with the institution not understanding the importance of sustainability. The second response level (weak) is demonstrated through an accommodation or "bolt-on" of sustainability ideas and practice to the existing system, which remains largely unchanged. The third response level (strong) is demonstrated by a building in of sustainability ideas into the existing system, leading to major "greening" of operations. The final response (very strong) is a transformative change or redesign due to a paradigm change. Sterling proposes that this mechanism gives a path to sustainable campuses. He also asserts that IHEs must move progressively through all of these levels in order to achieve long term change.

Whole systems changes require what Sterling (2004) terms the "four Ps": paradigm, purpose, policy, and practice change. Systemic change in this context requires coordination and improvement of many individual elements.

Among important elements for change, suggested by other authors, are support from the top levels of the IHE, a written guidance document, a sustainability committee that meets regularly, individual leaders in all areas of campus, and full time campus positions that include environmental sustainability as part or all of their job function (Allen, 2000; Creighton, 1998).

A cultural shift may be the most vital component of enacting real systemic change at IHEs. Dobson (2007) demonstrates that attitudes are more important than behaviors when trying to make a long-term change. He states “sustainable development is at least as much about values as about techniques and technologies” (Dobson, 2007, p. 283). Most current efforts related to sustainability focus on techniques, technology, and incentives for behavior changes. Instead, Dobson argues, lasting change requires a focus on creating an ethic for sustainability. An ethic focuses on questions of justice and injustice; therefore people are more likely to change their behaviors long term if they feel like the change is the only ethical way to behave (Dobson, 2007).

Sustainability, as explained in the Brundtland report, is a process, not an end goal. Appropriate campus sustainability practice is a moving target due to the complexity of IHEs and continuous change in knowledge about sustainability (Sharp, 2002). Sharp (2002, p. 130) argues that “the complexity of the organization itself, compounded with the complexity of the environmental imperative thwart most attempts to gain organizational agreement on goals, alternatives and solution programs”. One moving target that will be addressed by this research is the attitudes of directors of operational units and how they make decisions about sustainability.

Cognitive and Affective Decision Making

Decision making related to sustainability is a complex process using past information, emotions, and current stimuli to reach conclusions. The two important decision processes reviewed in this research are cognitive and affective. In this section I will detail cognitive and affective decision making processes and then relate them to individual decision making about sustainability by MLD-RF.

Researchers in sociology and psychology fields have proposed many theories for how people make decisions. Long before modern analytic decision tools were developed, people relied on affect to make basic decisions such as which water sources were safe (Slovic, et al, 2005). As the social sciences became established as academic disciplines in the early 20th century, they generally viewed cognitive decision making as the best method for making good decisions; affect was measured by the extent to which decisions deviated from the cognitive ideal (Zajonc, 1980; Finucane, Alhakami, Slovic, & Johnson, 2000; Slovic, Finucane, Peters, & MacGregor, 2002). Many researchers felt that affect interfered in the decision process and negatively skewed good decision making (Peters & Slovic, 2007).

Zajonc (1980) proposed that affective reactions may occur independent of the cognitive decision making process, do not require previous cognitive processes, are made more quickly, and lead to more confidence about the decision. He also argued that affect serves as the initial reaction to a problem and can provide an orienting mechanism from which to start the decision process. Kunst-Wilson and Zajonc (1980) provided early evidence that when making decisions, affective discrimination may exist partially independently from cognitive thought processes.

Zajonc and Markus (1982) recognized that most preference literature had a cognitive focus but argued that preferences are primarily affective. Preferences for familiar objects may play a role in the decision process whether or not the person realizes that they are familiar with the object (Zajonc & Markus, 1982). The exposure-affect connection was strongly established in the literature and detailed in a meta-analysis by Bornstein (1989). This meta-analysis demonstrated that there is a strong connection between unreinforced exposures to stimuli and enhanced affect.

Damasio, Tranel, & Damasio (1990) found that certain individuals with brain damage retained their ability to reason, their memory, and basic intelligence, but could not associate affective feelings or emotions with anticipated outcomes. These individuals could not function socially because of their lack of affective input. Increasingly, decision researchers have argued that affect is a major part of good decision making (Slovic et al., 2005).

In the heuristic model proposed by Tversky and Kahneman (1974) people use mental shortcuts or rules of thumb (heuristics) when they make decisions. People unconsciously develop heuristics over time based on previous outcomes and inherent personal characteristics. They use heuristics to more quickly make decisions. Finucane et al. (2000), Slovic et al. (2002) and others propose an affect heuristic which provides a mental shortcut to retrieve a good or bad feeling about an object or question. The affect heuristic is experienced as a feeling or state that may or may not be conscious, and demarcates a positive or negative property of a stimulus (Slovic et al., 2002).

Recent experimental evidence suggests that the affect heuristic plays a significant role in judgment decisions and is not necessarily tied to previous analytic decision making in

a particular situation (for example Finucane et al., 2000; Slovic et al., 2002). The affect heuristic is thought to be more efficient than cognitive decision making when time or mental resources are limited (Slovic, et al, 2004).

The affect heuristic can be useful when making complex decisions because it allows the decision maker to get an initial feeling about the good or bad qualities of the choices (Slovic et al., 2005). Affect may also have the primary, rather than secondary, role in motivating behavior (Slovic & Peters, 2006). Slovic et al. (2005) propose an “affect pool” to explain how people make decisions using the affect heuristic. They argue that each person tags images in their minds with varying degrees of affect. Each person also has an “affect pool” that contains “all of the positive and negative markers associated (consciously or unconsciously) with the images.” The intensity of the markers varies by image. The affect heuristic works by consulting or “sensing” the affect pool when making decisions (Slovic et al., 2005, p. S36).

Slovic et al. (2002) detail two major concerns with affective decision making: deliberate manipulation of affective reactions and decisions that are not available for legitimate affective representation. Advertisers may deliberately manipulate affective reactions when advertising products that are not healthy. One example is cigarette smoking: most individuals now know that cigarette smoking is an unhealthy practice that can lead to cancer. However, if advertising is targeted to make young people feel that smoking is popular, this may influence them to start smoking (Slovic et al., 2002). Cigarette smoking is also a decision that is not amenable to affective representation. Most long term smokers feel negative toward smoking and wish that they had never started once they have experience with the habit. When starting the habit, individuals do not

have access to the negative affective reactions because they develop over time (Slovic et al., 2002).

Dual Process Theory

Epstein (1994) introduced the concept of two interacting modes of processing information for decision making: cognitive and experiential. The cognitive decision process is analytical and deliberate and relies on evidence and rules of logic. The experiential system uses metaphors, narratives and images that have attached affective feelings (Slovic et al., 2004). Epstein's "experiential" decision making is equated to affective decision making.

Cognitive decision making occurs when the decision maker weighs pros and cons and uses evidence to make decisions. Cognitive decision making is largely devoid of affective influence (Slovic et al., 2004). The cognitive system also is under the conscious control of the individual making the decision and includes the conscious evaluation of risks and benefits when making a decision (Hine, Marks, Nachreiner, Gifford, & Heath, 2007).

Table 2 (Slovic et al., 2004) details the differences between the experiential (affect) system and the analytic (cognitive) system for making decisions. In the experiential system people use their experience, knowledge and feelings to make decisions. They more rapidly make decisions based on the goodness or badness of a potential decision. In the analytic system people use logic and analytical appraisal to more slowly decide on a choice. The decision maker must use adequate logic and have evidence before making a decision.

Slovic et al. (2004) point out that both of these methods are rational and essential to the decision process. Although performing a cognitive evaluation is central to some decision making processes, relying on affect and emotion is quicker and easier and many times a more efficient way to resolve complex and uncertain decisions (Slovic et al., 2004). Finucane et al (2003) point out that these two decision processes are not mutually exclusive; instead there is a use of affect and reason in many decisions. Recent research on making risky decisions supports the concept of dual process decision making that uses both affective and analytic systems (Kahneman, 2003; Slovic et al., 2005; van Gelder, de Vries, & van der Plight, 2009).

The Affect Heuristic and Implicit Attitudes

Spence and Townsend (2007) argue that the affect heuristic, developed in the risk literature, and the construct of implicit attitudes, developed in the attitudes literature, have many similarities and may be equivalent concepts. Implicit attitudes can be defined as “the spontaneous associations that can be measured between attitude objects and their evaluations” (Spence & Townsend, 2007, p. 83). In other words, individuals develop feelings about objects that influence their decisions. While both theories are conceptualized and measured similarly, the theory of implicit attitudes is not as well developed and remains controversial (Spence & Townsend, 2007).

Spence and Townsend (2007) go on to describe three similarities between the affect heuristic and implicit attitudes. Both theories have been associated with affect, expressed as spontaneous, and associated with the affective decision process. The association of implicit attitudes with affect lacks empirical evidence, whereas the affect heuristic is strongly linked with the concept of affect. The affect heuristic has been linked to

spontaneity when experiential time-pressure conditions exist (for instance, Finucane et al., 2000), and implicit attitudes have been linked to spontaneous rather than deliberate behavior. Because the linkage between the affect heuristic and implicit attitudes is not well understood at this point and may describe disparate aspects of a similar phenomenon (Spence & Townsend, 2007) this study will focus on the affect heuristic in the decision process.

Affect and Environmental Issues

Recent studies have evaluated affect in relation to environmental problems. For example: Siegrist and Gutscher (2008) evaluated homeowners' degree of negative affect toward floods in relation to past experience; and Hine et al. (2007) evaluated homeowners' affective reactions to wood burning stoves.

As individuals make sustainability decisions, they must simultaneously weigh environmental, social, and economic impacts of those decisions. All decisions necessarily include both affective and cognitive decisions processes, and in such complex decisions, understanding the role of the two different processes will be salient to our understanding of the observed preferences and decisions. The importance of the affect heuristic relative to analytical decision processes may play a role in decision making by different subsets of MLD-RF in very different ways. For instance, one possibility is that facilities maintenance directors may have more negative affective reactions to sustainability than research faculty, leading to decision making that does not weigh the sustainability of their choice.

This chapter focused on the current literature related to sustainability in IHEs. Sustainability evolved out of concerns raised by conservationists, preservationists, and

urban environmentalists. Although no common definition of sustainability has been established, the debate surrounding the concept has led to additional awareness of the complex environmental, social, and economic issues surrounding modern society. There have been several declarations and commitments related to sustainability at IHEs with varying levels of success. The literature surrounding sustainability at IHEs tends to focus on individual organizations and how they are coping with sustainability initiatives. One area that is poorly understood is how decisions are made about sustainability at IHEs in general. The decision theory field describes both cognitive and affective decision making as complementary and sometimes conflicting processes.

The literature does not address how MLD-RF impact operational campus sustainability at IHEs, how MLD-RF act and make decisions about sustainability, and how sustainability initiatives are communicated to the broader campus community. This dissertation will attempt to answer some of these outstanding questions about how decisions are made, and specifically how MLD-RF make sustainability decisions. The focus of this research will be broader than previous research, involving all accredited IHEs in the United States, rather than focusing on individual institutions.

CHAPTER 3

RESEARCH QUESTIONS

From the outside, IHEs may appear to be the ideal organizations to lead the current movement toward sustainability. IHEs have faculty with academic knowledge and expertise that seems like it would contribute to sustainable practice. However, as described by Comm & Mathaisel (2005) IHEs have difficulty adapting to change. This difficulty likely stems from many factors including the IHE's structure, independence of academic units, and low accountability of certain employees. MLD-RFs attitudes and involvement potentially have a significant impact on adoption of sustainability initiatives. In order to understand the role of MLD-RFs in campus sustainability, this research evaluates MLD-RF's attitudes towards sustainability, and identifies key variability in attitudes among MLD-RF. Further, this research will evaluate how MLD-RF impact overall campus sustainability activities, as well as the extent to which MLD-RF communicate their campus sustainability activities. Finally, this research will assess the extent and type of support for sustainability at the selected IHEs within the purview of MLD-RF.

No previous quantitative analysis has investigated the impact of these key decision makers on operational campus sustainability. There are some surveys and case studies about how students and upper administration feel about sustainability, but none from MLD-RF. The first question in this study aims at understanding this important group of individual decision makers in relation to campus sustainability and asks:

A) How do MLD-RF think, decide, and act about sustainability?

1. How do MLD-RF define and interpret sustainability?

2. How does sustainability rank among MLD-RF priorities?
3. Do MLD-RF consider sustainability a core responsibility?
4. What sources of information do MLD-RF rely upon to inform their decisions about campus sustainability?
5. What affective reactions do MLD-RF have toward sustainability?
6. Is there variability in attitudes about sustainability between the different groups of MLD-RF?

The details about how sustainability initiatives are implemented at most IHEs are also unknown. It is not clear how thoroughly the majority of faculty and staff understand sustainability and how to implement it. It is also unknown what, if any, role MLD-RF have at the majority of IHEs. This leads to a second question:

B) Do MLD-RF have an impact on sustainability at IHEs?

7. What role do MLD-RF have in campus sustainability decision making at IHEs?
8. How much control and flexibility do MLD-RF have over decisions that impact sustainability?
9. To what extent do MLD-RF communicate their role in campus sustainability?

Finally, it is not clear how much support sustainability initiatives receive at the majority of IHEs. It is also not clear how integrated sustainability is into the operational functions at most IHEs. This leads to the final question and hypotheses:

C) What level of integration and support do IHEs have for operational campus sustainability?

10. Is sustainability included in mission statements, goals, and policies?
11. To what extent are sustainability efforts funded?
12. What types of funding are provided for sustainability efforts?
13. Do MLD-RF feel empowered to make decisions and believe that these decisions will be supported?

The research questions lead to the following hypotheses.

Research Question A: How do MLD-RF think, decide and act about sustainability?

H₀₁: MLD-RF are unable to define sustainability or believe that it means something unrelated to the study definition, **or** MLD-RF define sustainability in a manner that is not inclusive of environmental, social, and economic components.

H_{A1}: MLD-RF are able to define sustainability and believe that it has a meaning close to the study definition.

H₀₂: MLD-RF either do not rank sustainability in their set of priorities or rank it below all other priorities.

H_{A2}: MLD-RF rank sustainability in their set of priorities and rank it higher than at least one other priority.

H₀₃: MLD-RF do not consider sustainability a core responsibility.

H_{A3}: MLD-RF consider sustainability a core responsibility.

H₀₄: MLD-RF rely on personal knowledge when making decisions about sustainability.

H_{A4}: MLD-RF access information from other campus units (inside sources) or outside sources when making decisions about sustainability.

H₀₅: MLD-RF have positive affective reactions about sustainability.

H_{A5}: MLD-RF have negative affective reactions about sustainability.

H₀₆: There is no variability in attitudes about sustainability between groups of MLD-RF.

H_{A6}: There is variability in attitudes about sustainability between groups of MLD-RF.

Research Question B: Do MLD-RF have an impact on sustainability at IHEs?

H₀₇: MLD-RF do not have a role in campus decision making about sustainability or have a very limited involvement (e.g., provide input but not included in decision making).

H_{A7}: MLD-RF have an important role in campus decision making about sustainability.

H₀₈: MLD-RF have no control or flexibility to make decisions that impact operational campus sustainability.

H_{A8}: MLD-RF have control and/or flexibility when making decisions that impact operational campus sustainability.

H₀₉: MLD-RF communicate their role in campus sustainability only minimally ($\leq 20\%$ of websites).

H_{A9}: MLD-RF communicate their role in campus sustainability more than minimally ($< 20\%$).

Research Question C: What level of integration and support do IHEs have for operational campus sustainability?

H₀₁₀: Sustainability is not included in institutional or departmental mission statements, goals or policies.

H_{A10}: Sustainability is included in institutional and/or departmental mission statements, goals and policies.

H₀₁₁: IHE's do not provide funding to MLD-RF to support operational sustainability.

H_{A11}: IHE's provide funding to MLD-RF to support operational sustainability.

H₀₁₂: IHEs do not fund sustainability positions, capital improvements, or smaller operational improvement efforts.

H_{A12}: IHEs do fund sustainability positions, capital improvements, and smaller operational improvement efforts.

H₀₁₃: MLD-RF's do not feel empowered to make decisions about sustainability and/or they do not feel those decisions would be supported.

H_{A13}: MLD-RF feel empowered to make decisions about sustainability and believe that those decisions will be supported.

These hypotheses, derived from the research questions, will allow evaluation of specific gaps in the literature related to MLD-RF. It is probable that MLD-RF are a critical population in any integrated implementation of sustainability at any IHE. All of these hypotheses will help to understand the level of knowledge, integration, and involvement in sustainability by MLD-RF at their IHEs. The next chapter will detail the methodologies used to evaluate these hypotheses and understand the role, knowledge, and involvement of MLD-RF in the sustainability process.

CHAPTER 4

METHODS

In order to test the hypotheses, a web-based content analysis identified sustainability policies and initiatives at IHEs, with particular focus on areas over which MLD-RF have decision authority. Next, surveys evaluated attitudes among MLD-RF with respect to sustainability policies and initiatives. The surveys also measured self-reported impacts of MLD-RF's actions on policies and initiatives. Finally, findings from these two techniques were combined to evaluate the relationships among policies, attitudes, and impacts. Using two techniques to evaluate the same research questions allows for triangulation of the data and an analysis of validity and reliability of the findings (Aldridge & Levine, 2001).

A proportionate stratified random sampling design was utilized for both techniques in this study to assure representation of IHEs from all parts of the United States. A list of all accredited IHEs in the United States was obtained from the Council for Higher Education Accreditation (Council for Higher Education Accreditation, 2009). This list is categorized into the six recognized general accrediting agencies which consist of:

- The Middle States Commission on Higher Education
- The New England Association of Schools and Colleges
- The North Central Association of Colleges and Schools
- The Northwest Commission on Colleges and Universities
- The Southern Association of Colleges and Schools
- The Western Association of Schools and Colleges

Within each general accrediting agency group, a random sample was drawn using the SPSS random sampling function. A consistent proportion of IHEs was selected from each

of the six accrediting agencies to ensure a proportional representation from all IHEs in the United States.

Content Analysis of MLD-RF websites at IHEs

Policies and initiatives at IHEs were assessed through web-based content analysis. Websites were selected for analysis because web-based communication has become a common method for reaching a large target audience (Krippendorff, 2004). This methodology was selected because it allows for a quantitative evaluation of a sample from which generalizable conclusions can be made. When performed correctly, content analysis meets the standards of the scientific method including: objectivity, *a priori* design, reliability, validity, generalizability, replicability, and hypothesis testing (Neuendorf, 2002).

Content analysis attempts to provide objectivity through the use of standard measuring and coding. For this research, a content analysis matrix was designed along with coding rules to ensure standard measuring and coding.

A priori design requires that an analysis tool be developed prior to initiating data collection (Neuendorf, 2002). In content analysis, a tool is proposed and tested on a sample then refined before use in the final analysis. For this research, a tool was developed then tested by sampling sixteen institutions' websites to determine the variables available. A convenience sample of known universities followed by a stratified random sampling of accredited colleges and universities was utilized. The convenience sample of familiar institutions was used in order to ensure the search technique was working properly. All websites of interest were able to be located using the Bing® advanced search function with multiple key terms. The initial content analysis involved

websites belonging to five groups: Administration (e.g., chancellor, president, provost), Environmental Health and Safety, Facilities Management, Planning and Construction, and College of Sciences. This initial sampling yielded a total of 80 websites. Based on information on these 80 websites, the content analysis tool was refined. I determined that at many IHEs facilities management and planning and construction are one department. Also, I decided to include the central sustainability website rather than the President's website since the majority of President's sites did not mention sustainability. Finally, some of the questions were refined in a manner to better match website design while answering the research questions.

Reliability and validity are central concepts in any quantitative study. Reliability refers to the consistency of a measuring instrument; its ability to measure the same thing every time it is used (reproducibility). Reliability is important because it allows for confidence that the coder or survey design is not responsible for differences in outcome. Instead, there is a real reason for differences that can be explained based on the target population (Singh, 2007). Validity assesses the extent to which the concept measures the thing it was designed to measure. Validity is critical so that there is confidence in the results. If a measure is not valid, it may be evaluating something unrelated to the variables of interest for the study (Singh, 2007).

Reliability within content analysis refers to the extent to which a measure yields the same results on repeated trials by different coders. Reliability can be assured by using multiple coders for the analysis. At least ten percent of sites should be coded by a second human coder (Krippendorff, 2004; Lombard, Snyder-Dutch, and Bracken, 2008). For this study, twenty percent of the total websites were coded by another researcher who is

unfamiliar with the study. Intercoder reliability was measured using Krippendorff's agreement coefficient α calculated using an SPSS macro developed by Andrew F. Hayes (Hayes & Krippendorff, 2007). When a high degree of confidence is required, Krippendorff (2004) recommends setting the acceptable level of agreement as $\alpha \geq 0.8$. Because Krippendorff's alpha is conservative, an $\alpha \geq 0.667$ will allow for tentative conclusions to be drawn. Based on this information, $\alpha \geq 0.8$ will be considered acceptable for this study.

Validity within content analysis refers to whether the measurement procedure is really measuring the intended concept and whether the results are generalizable. There are several types of validity to be considered. Face validity can be verified through subsequent analysis of measurements throughout the course of the investigation (Neuendorf, 2002). External validity / generalizability is assured through a statistical sampling plan and detailed coding instructions. Construct validity is assured by using other methods to evaluate the results of the content analysis and by comparing predicted outcomes from the content analysis to websites that were not included in the analysis (Krippendorff, 2004).

Content analysis allows for generalization of data through random sampling design. This content analysis utilized a stratified random sampling methodology. Content analysis allows for replicability by using detailed coding and measuring schemes so that the analysis could be repeated by another investigator. Finally, content analysis allows for scientific hypothesis testing by measuring variables and examining relationships statistically to see if the predicted relationship holds true (Neuendorf, 2002)

The first step in performing a content analysis is unitizing, or methodically choosing units to be evaluated (Krippendorff, 2004). The units selected for this content analysis are the websites of interest (Sustainability, Environmental Health and Safety, Facilities Maintenance and Planning and Construction, Purchasing, and College of Sciences).

The second step in performing a content analysis is sampling the units of concern in a structured manner from the entire population of possible units (Krippendorff, 2004). In this content analysis, IHEs were selected through proportionate stratified random sampling.

Once an IHE was selected, a search was performed to find websites for the departments of interest if available. The search was performed using Bing® advanced search function using multiple terms for each type of website of interest. Bing® is the Microsoft search engine which was designed based on an algorithm (like most popular search engines) but allows for further refinement by subject and document type limiters, categorized subsets of related terms, and search history breadcrumbs (Johnson, 2009). This was useful for this search to limit the types of domains and the phrasing for websites of interest. For each website of interest, the search was attempted using various potential titles for the department. If a website was not located using the advanced search function, a search from the home page of the IHE was conducted using the IHE's search function. If this process still did not yield all of the websites of interest, an alphabetical listing of departments (if available) was viewed to confirm that the IHE did not have websites for the departments of interest.

The third step in content analysis is recording and coding the data (Krippendorff, 2004). The recording step must also be performed systematically and be transparent so

that another coder would have similar results if repeating the same research. For this research, once a website was selected, a combination of computer-aided text searching (find, find-next functions) and human coding (physically responding to questions in the data matrix) was employed to complete the content analysis matrix for each site. The refined content analysis data matrix is included as Appendix A.

IHE sustainability websites were analyzed as well as the four sites for the departments of interest. The decision to draw on sustainability websites rather than administrative websites was based on the pilot study in which only 15 of the 80 websites evaluated mentioned sustainability. This led to the preliminary conclusion that IHEs with sustainability programs may provide all of the sustainability information in one central website. When this is the case, more meaningful results will be obtained by evaluating the central sustainability website for participation by MLD-RF.

The content analysis addressed seven of the hypotheses based on the self directed questions. Responses to these self-directed questions allowed for completion of the content analysis data matrix. Appendix A delineates which of the ten hypotheses were addressed by each question in the content analysis. This data matrix, along with a coding guide (Appendix B), examine how sustainability is defined; whether sustainability is listed as a priority; whether sustainability is integrated into core responsibilities and mission statements; what sources of information are used; whether the site claims a major role in the campus sustainability process; and whether funding for sustainability is provided and detailed on the website. All variables were coded in a manner that permits categorical data analysis using nonparametric statistics. Nonparametric statistics were selected because of the complexity of the study design (categorical plus yes/no questions)

and the fact that the instrument was new and expected to be non-normal. This coding method was important so that quantitative analysis could be performed on the results of the content analysis. This analysis allowed for testing of the hypotheses.

Demographic information was also collected including: number of students, type of institution, and classification from the Carnegie Foundation. These demographics were selected because they could have an important impact on sustainability involvement by MLD-RF. There may be fewer or more resources devoted to sustainability depending on the student population. MLD-RF from private or public IHEs may have more involvement in the sustainability decision making process. Finally, research intensive IHEs may vary from two-year IHEs in the involvement of their MLD-RF in the sustainability process.

IHE's main sustainability sites were included in this analysis in order to provide additional information about the level of sustainability activity at IHEs. It also allowed for a determination of the level of involvement of MLD-RF conveyed by the main sustainability site compared to what MLD-RF websites indicate. Questions S1-S4 were used to determine whether any individual MLD-RF were listed as having a major role in the sustainability process on the main sustainability site.

The sample size for the content analysis was 400 IHEs. This was determined based on a power analysis using the standard deviation from the pilot study (0.39), a conservative effect size requirement of 0.23, a desired power of 0.95, and a significance criterion of less than 0.05. The required sample size from this analysis was 150 IHEs. 400 IHEs were sampled based on the assumption that at least 50% of IHEs selected would not have MLD-RF websites. This was to ensure that a sample was gathered that was

representative of a range of types of IHEs including: public and private institutions, institutions of varying size, and research/teaching emphasis. This sample was robust enough to allow for comparisons between types of institutions with a minimum of 20 IHEs per grouping. The minimum sample included 20 of each of the following: public institutions, private institutions, institutions with 2 year degrees, institutions with 4 year or more degrees, institutions with less than 5,000 students, institutions with between 5,000-15,000 students, and institutions with more than 15,000 students. Institutions were counted in more than one category. Institutions that do not have websites for any of the four of the departments of interest were excluded. Institutions without central sustainability websites were included.

Survey of MLD-RF at IHEs

A survey of MLD-RF at IHEs was used to assess several hypotheses. The survey was initiated via a standard e-mail sent to individual MLD-RF. As described in the literature review, the sampling frame for this research was four groups of individuals, including: research faculty, facilities maintenance/planning and construction administrators, purchasing administrators, and environmental health and safety/safety administrators at accredited universities. Research faculty are those faculty members who supervise laboratory operations. Mid-level decision makers are the directors or managers of the respective department responsible for the operational functions of their unit.

Online surveys are useful when the desired sample size is large and widely distributed geographically, there is a sampling frame, and interactive features will enhance the questionnaire. In addition, survey participants may be more willing to answer honestly compared to a technique in which their identity is not concealed, since they are not easily

identifiable. Response rates are improved when the target respondents have access to e-mail and the internet, (Sue & Ritter, 2007). This survey was designed to optimize return rates and credibility:

- there were thousands of potential respondents distributed throughout the United States;
- the survey was anonymous, which means that respondents are likely to be more honest than if they were identifiable;
- the respondents work at institutions where they generally will have access to e-mail and the internet,
- the sampling frame included all accredited IHEs in the United States (ie, the whole relevant population), and
- interactive features allowed different types of respondents to be directed to different questions. For example, the link to the MLD-RF survey for each accreditation agency was slightly different allowing for categorization without asking an explicit question.

Of the 4,000 IHEs in the United States, slightly less than 3,000 are accredited (CHEA, 2009). Of these accredited IHEs, approximately 50% have the MLD-RF of interest to this study. A power analysis using the standard deviation from the pilot study (1.1), a moderate effect size requirement of 0.36, a desired power of 0.9, and a significance criterion of 0.05 led to a required sample size of 392 individuals. Based on this analysis, the goal number of respondents was greater than 400. This number of respondents allowed for inferences to be made about the population (Sue and Ritter, 2007).

The survey employed standard social survey techniques for behavioral, cognitive, and demographic variables as outlined by Kent (2001) and Aldrige & Levine (2001). Likert scales or dichotomous responses comprise the majority of the questions. For hypothesis 5, the method refined in Peters & Slovic (2007) (originally described in Peters & Slovic, 1996) for determining affect was used. A holistic, bipolar, valenced question design was used to elucidate affective reactions to the term sustainability. Holistic refers to an overall affective reaction to a term (rather than asking for visualization or breaking down the term into different components). Bipolar refers to a scale that runs from negative to positive (rather than not at all positive to very positive). Valence refers to intrinsic positive or negative reactions to a stimulus, rather than asking for a selection of a discrete emotional reaction (Peters & Slovic, 2007).

A pilot survey was developed and distributed to eighty-one RF after IRB approval at the University of Nevada, Las Vegas. Reliability was measured using Cronbach's alpha. An $\alpha > 0.7$ is generally considered acceptable for factors that are unidimensional and sample sizes over 30 (Aldridge & Levine, 2001). Thirty-six faculty members responded to the survey from various departments on campus as outlined on Table 3.

Cronbach's alpha was used to measure internal consistency of the survey instruments for all questions evaluating the same hypothesis. An $\alpha > 0.7$ was considered acceptable, all matched questions had an $\alpha > 0.7$ ranging from 0.706 to 0.891.

E-mailed feedback from survey participants included: suggestions to differentiate between control and flexibility when making choices for their unit and add examples of each to the survey, to add a definition of what is meant by a "research faculty" member, and to add examples to what types of sources would be on-line versus in-person sources.

These three suggestions were incorporated into the final survey (Appendix C). A secondary pilot survey was not performed since these comments were all points of clarification rather than substantial additions of questions.

Based on the results of the pilot survey a final survey was developed. A sample of 1,000 IHEs was selected based on the SPSS random sampling function using a stratified (by regional accreditation agency) random sampling from the list of all accredited universities in the United States. A Bing® advanced search was used to identify the Directors/Deans of the departments of interest. The advanced search included using various potential titles for the department and MLD-RF of interest. If a MLD-RF was not located using the advanced search function, a search from the home page of the IHE was conducted using the IHE's search function. If this process still did not yield all of the websites of interest, a personnel directory (if available) was viewed to confirm that the IHE did not have the MLD-RF of interest.

A total of twelve surveys were set up on SurveyMonkey™, two surveys for each of the six accreditation agencies. An e-mail was sent directly to each person identified as the department director or equivalent for each MLD grouping at each institution. An e-mail was also sent to the Dean of Sciences or comparable position with a request for distribution to all laboratory faculty members at the IHE. A second reminder e-mail was sent approximately two weeks after the first e-mail to solicit participation. A final reminder e-mail was sent immediately prior to the survey closing. Respondents answered the survey questions and the responses were feed into a data matrix. Data were then evaluated using statistical techniques for categorical data using SPSS.

Non-parametric data analysis was performed for all sections of the results due to the complexity of the survey design and newness of the instrument. The Kruskal-Wallis statistic (for ordinal data) was used and is the nonparametric equivalent of ANOVA. The Kruskal-Wallis statistic was selected because of the categorical nature of the data. The Kruskal-Wallis test is used for comparisons of two or more samples for populations that are categorical, not normally distributed, or do not have equal variances (Singh, 2007). The Chi-square test was selected and used for comparisons of two or more samples that were nominal (Singh, 2007). These two tests evaluate the null hypothesis that all samples come from identical populations (in this case that all MLD-RF websites or respondents have identical communication and viewpoints). The Mann-Whitney test is the nonparametric equivalent of the t-test for ordinal data and was also selected because of the categorical nature of the data. Individual Chi-square tests were used for nominal comparisons. The Bonferroni correction (α/n) was used for the Mann-Whitney U tests to correct for Type 1 error, this correction was not recommended for the chi-square individual comparisons (Corder & Foreman, 2009). The Chi-square and Kolmogorov-Smirnov tests were used for hypothesis testing because they are nonparametric tests that allow for comparison of samples with a reference probability distribution (Corder & Foreman, 2009).

The methods of this dissertation were designed to allow for a quantitative evaluation of attitudes and actions of MLD-RF at IHEs. In the next section, results of the survey and content analysis described in this section will be detailed.

CHAPTER 5

RESULTS

In this section, the results from the content analysis and survey will be described. First, I will describe general characteristics of websites analyzed and survey respondents, followed by an analysis by type of MLD-RF. Finally, other characteristics from the results related to the hypotheses will be described.

Content Analysis

The content analysis was performed over a period of approximately three months by the primary and secondary coder. As described in the methods section, IHEs were selected in a stratified random manner. For each IHE, websites were identified where available. In this section, I will first describe the characteristics of the websites included in the content analysis, followed by a description of results by type of website.

Characteristics of Websites Analyzed

The Bing® and IHE website search technique identified 737 websites for inclusion in the content analysis database. Table 4 lists the number of websites that were located categorized by department and accreditation agency. The “grand total” row and column show the total number of websites located for each accreditation agency and the total number of websites located for each department type respectively. For department type, the total is followed by the percentage of sites located in grey. The largest number of websites was located for the safety function, followed by sciences, purchasing, facilities, and sustainability websites.

The science department website selected was the College of Science when available. If the IHE did not have a College of Science, another science department was substituted

for the analysis. Table 5 lists the grouped names of departments included in the science number from Table 4. Names were grouped where no categorization would be lost—for instance, biology and biological sciences were grouped. College level websites (e.g. Sciences, Liberal Arts and Sciences) accounted for sixty-eight percent of the sites included in the content analysis. Academic department level sites (e.g. Biology, Chemistry) accounted for thirty-two percent of the sites included in the content analysis.

The safety department includes those departments that handle campus safety functions. Table 6 lists the grouped names of the departments responsible for the safety numbers from Table 4. Sites with a primary focus on traditional environmental health and safety matters (i.e. OSHA and EPA compliance) accounted for forty percent of the websites included in the content analysis. Websites with a primary focus on public safety accounted for twenty-five percent of the websites included in the content analysis. Websites with all-inclusive safety responsibilities (i.e. OSHA, EPA, and public safety) accounted for thirty-five percent of the websites included in the content analysis.

The facilities department is the administrative unit responsible for maintenance and construction of facilities at the IHE. Table 7 lists the grouped names of departments included in the facilities number from Table 4. Departments with a primary focus on energy management and utilities accounted for two percent of all websites included in the content analysis. Departments with a focus on planning and construction accounted for nine percent of the websites included in the content analysis. The remaining eighty-nine percent of websites had a primary focus on facilities management.

The purchasing department is the administrative unit responsible for purchasing functions at the IHE. Table 8 lists the grouped names of the departments included in the

purchasing number from Table 4. Departments that focused solely on purchasing accounted for seventy-seven percent of the websites included in the content analysis. The remaining twenty-three percent of websites had additional areas of responsibility beyond purchasing.

The sustainability websites included various names for the function of improving campus sustainability. The grouped names of the sustainability websites are listed in Table 9. Sixty-three percent of the websites included a broader approach to sustainability in the name, while thirty-six percent of sites focused primarily on the environment.

Content Analysis Results by Self-Directed Question

The content analysis had a data matrix designed to answer questions related to the research questions and hypotheses (Appendix A). In this section each question will be presented as a frequency distribution followed by the Kruskal-Wallis, Chi-square and Mann-Whitney tests where needed to test for statistical significance of groupings by department. The Kruskal-Wallis test (for ordinal data) and Pearson Chi-square (for nominal data) was significant for every self-directed question when the sustainability websites were included in the analysis. Because sustainability websites were used as a comparison point, were not part of the groups of interest, and would result in a statistically significant result every time, they were not included in the Kruskal-Wallis, Chi square, or Mann-Whitney analysis of MLD-RF websites.

Question 1

Content Analysis Question 1 (is sustainability defined?) was designed to evaluate hypothesis 1 (MLD-RF are unable to define sustainability or believe that it means something unrelated to the study definition, **or** MLD-RF define sustainability in a manner

that is not inclusive of environmental, social, and economic components). Figure 1 presents the frequency distribution for this question. The majority (ninety-eight to ninety-nine percent) of websites for MLD-RF did not define sustainability. Sixty-three percent of sustainability websites explicitly defined the term sustainability.

The Chi-square statistic ($\chi^2=1.641$) based on MLD-RF websites was not significant ($p=0.650$).

Question 2

Question 2 (is the definition consistent with the study definition) was designed to evaluate hypothesis 1 (MLD-RF are unable to define sustainability or believe that it means something unrelated to the study definition, **or** MLD-RF define sustainability in a manner that is not inclusive of environmental, social, and economic components). Figure 2 presents the frequency distribution for the responses to this question with N/As excluded. For example, of the 2% of College of Science websites that defined sustainability, thirty-three percent had a definition that was consistent with the study definition. Of the sixty-three percent of sustainability websites that defined sustainability, fifty-four percent had definitions that were consistent with the study definition.

The Chi-square statistic ($\chi^2=7.518$) based on MLD-RF websites was not significant ($p=0.276$).

Question 3

Question 3 (how many times is sustainability mentioned on the main page?) was designed to evaluate hypothesis 2 (MLD-RF either do not rank sustainability in their set of priorities or rank it below all other priorities). Figure 3 presents the frequency distribution for grouped responses to this question. The majority of MLD-RF websites

did not mention sustainability on the main page (ninety-two to ninety-eight percent). The majority of sustainability websites mentioned sustainability between one and ten times.

The Kruskal-Wallis statistic ($H=8.3$) for MLD-RF sites was significant ($p=0.040$). To compensate for type I error inflation, the Bonferroni procedure led to a corrected alpha of 0.0125. Outcomes for significance of the Mann-Whitney statistic are presented on Table 10. Based on the corrected alpha, none of the differences are significant in the Mann-Whitney comparisons.

Question 4

Question 4 (how many times is sustainability mentioned on the interior pages?) was designed to evaluate hypothesis 2 (MLD-RF either do not rank sustainability in their set of priorities or rank it below all other priorities). Figure 4 presents the frequency distribution for responses to this question grouped in intervals. “N/A” is used to indicate websites for which there were no interior pages. The majority of MLD-RF websites did not mention sustainability on the interior pages. The combined total of the websites that did not have interior pages plus those that did not mention sustainability on the interior pages equaled seventy-eight to ninety-four percent. The majority of sustainability websites mentioned sustainability between one and fifty times on their interior pages.

The Kruskal-Wallis statistic ($H=18.191$) for MLD-RF sites was significant ($p<0.001$). Outcomes for significance of the Mann-Whitney statistic are presented on Table 11. Based on the corrected alpha, the differences between facilities and all other groups of MLD-RF were significant. Facilities had a higher percentage of websites that did not have interior pages and higher percentages of websites that mentioned sustainability on interior pages.

Question 5

Question 5 (is sustainability mentioned in the mission/goals/responsibilities?) was designed to evaluate hypotheses 3 (MLD-RF do not consider sustainability a core responsibility) and 10 (Sustainability is not included in institutional or departmental mission statements, goals or policies). Figure 5 presents the frequency distribution for responses to this question (N/A indicates websites for which there was no mission statement, goals, or listing of responsibilities). The majority of MLD-RF websites either did not mention sustainability or did not have mission statements, goals, or responsibilities listed (ninety seven to ninety eight percent). The majority of sustainability websites mentioned sustainability in their mission statement, goals, or responsibilities.

The Chi-square statistic ($\chi^2=7.518$) based on MLD-RF websites was not significant ($p=0.276$).

Question 6

Question 6 (how many policies on the site include sustainability?) was designed to evaluate hypothesis 10 (sustainability is not included in institutional or departmental mission statements, goals or policies). Figure 6 presents the frequency distribution for responses to this question: N/A indicates websites for which there were no policies. The majority of MLD-RF websites either did not have policies or did not mention sustainability in their policies (ninety seven to one hundred percent). The majority of sustainability websites did not have policies (eighty-four percent).

The Kruskal-Wallis H statistic ($H=199.81$) for MLD-RF sites was significant ($p<0.001$). Outcomes for significance of the Mann-Whitney statistic are presented on

Table 12. Based on the corrected alpha, the differences between all groups of MLD-RF, except for the safety-purchasing comparison, were significant. Science and Facilities had larger percentages of N/As and Safety and Purchasing had larger percentages of zeroes.

Question 7

Question 7 (does the site list sources for sustainability information?) was designed to evaluate hypothesis 4 (MLD-RF rely on personal knowledge when making decisions about sustainability). Figure 7 presents the frequency distribution for responses to this question. The majority of MLD-RF websites did not list sources for sustainability information (ninety-six to ninety-nine percent). The majority of sustainability websites did list sources for sustainability information (eighty-two percent).

The Chi-square statistic ($\chi^2=4.408$) based on MLD-RF websites was not significant ($p=0.221$).

Question 8

Question 8 (how many sources are from other universities?) was designed to evaluate hypothesis 4 (MLD-RF rely on personal knowledge when making decisions about sustainability). Figure 8 presents the frequency distribution for responses to this question. The majority of MLD-RF websites did not list sources for sustainability information, therefore were N/A on this chart (ninety-six to ninety-nine percent). For sites that did list sustainability sources, numbers were grouped into two categories: one to six and ten to twenty-four. Twenty-four percent of the sustainability sites included sources from other IHEs.

The Kruskal-Wallis statistic ($H=7.445$) based on MLD-RF websites was not significant ($p=0.059$), therefore no Mann-Whitney U tests were performed.

Question 9

Question 9 (how many sources are government?) was designed to evaluate hypothesis 4 (MLD-RF rely on personal knowledge when making decisions about sustainability). Figure 9 presents the frequency distribution for responses to this question. The majority of MLD-RF websites did not list sources for sustainability information, therefore were N/A on this chart (ninety-six to ninety-nine percent). For sites that did list sustainability sources, numbers were grouped into two categories: one to five and six to eleven. Forty-two percent of sustainability sites included sources from government.

The Kruskal-Wallis statistic ($H=7.5$) based on MLD-RF websites was not significant ($p=0.058$), therefore no Mann-Whitney U tests were performed.

Question 10

Question 10 (how many sources are commercial?) was designed to evaluate hypothesis 4 (MLD-RF rely on personal knowledge when making decisions about sustainability). Figure 10 presents the frequency distribution for responses to this question. The majority of MLD-RF websites did not list sources for sustainability information, therefore were N/A on this chart (ninety-six to ninety-nine percent). For sites that did list sustainability sources, numbers were grouped into two categories: one to five and six to eighteen. One sustainability website had thirty-five commercial sources. Fifty-one percent of sustainability websites included commercial sources.

The Kruskal-Wallis statistic ($H=7.469$) based on MLD-RF websites was not significant ($p=0.058$), therefore no Mann-Whitney U tests were performed.

Question 11

Question 11 (how many sources are nonprofit?) was designed to evaluate hypothesis 4 (MLD-RF rely on personal knowledge when making decisions about sustainability). Figure 11 presents the frequency distribution for responses to this question. The majority of MLD-RF websites did not list sources for sustainability information, therefore were N/A on this chart (ninety-six to ninety-nine percent). For sites that did list sustainability sources, numbers were grouped into three categories: one to five, six to fourteen, and sixteen to thirty-six. One sustainability website had seventy-one nonprofit sources. Seventy percent of sustainability websites included sources that were from nonprofit agencies (other than other IHEs).

The Kruskal-Wallis statistic ($H=7.477$) based on MLD-RF websites was not significant ($p=0.058$), therefore no Mann-Whitney U tests were performed.

Question 12

Question 12 (how many sources are other units within the IHE?) was designed to evaluate hypothesis #4 (MLD-RF rely on personal knowledge when making decisions about sustainability). Figure 12 presents the frequency distribution for responses to this question. The majority of MLD-RF websites did not list sources for sustainability information, therefore were N/A on this chart (ninety-six to ninety-nine percent). For sites that did list sustainability sources, numbers were grouped into three categories: one to five, six to twelve, and the final grouping contained one sustainability site with 18 sources and one with twenty-four sources from other units within their IHE. Fifty-nine percent of sustainability websites included sources from within their institution.

The Kruskal-Wallis statistic ($H=4.428$) based on MLD-RF websites was not significant ($p=0.219$), therefore no Mann-Whitney U tests were performed.

Question 13

Question 13 (does the site claim an important role in the sustainability process?) was designed to evaluate hypothesis 7 (MLD-RF do not have a role in campus decision making about sustainability or have a very limited involvement (e.g., provide input but not included in decision making)). Figure 13 presents the frequency distribution for responses to this question. The majority of MLD-RF websites did not claim an important role in the sustainability process (eighty-eight to ninety-nine percent), while one-hundred percent of sustainability sites did.

The Chi-square statistic ($\chi^2=25.542$) for MLD-RF sites was significant ($p<0.001$). Outcomes for significance of the individual comparison Chi-square statistics are presented on Table 13. The differences between facilities and all other groups of MLD-RF were significant. The facilities websites had a higher percentage of respondents claiming an important role in the sustainability process.

Question 14

Question 14 (does the site describe building new facilities sustainably?) was designed to evaluate hypothesis 12 (IHEs do not fund sustainability positions, capital improvements, or smaller operational improvement efforts). Figure 14 presents the frequency distribution for responses to this question. The majority of MLD-RF websites did not describe building new facilities sustainably (ninety-two to one hundred percent) while sixty-four percent of sustainability sites did.

The Chi-square statistic ($\chi^2=42.614$) for MLD-RF sites was significant ($p<0.001$). Outcomes for significance of the individual comparison Chi-square statistics are presented on Table 14. The differences between facilities and all other groups of MLD-RF were significant. Facilities had eight percent of websites describing building new facilities sustainably while the other MLD-RF had no websites that described building new facilities sustainably.

Question 15

Question 15 (does the site describe other funding for sustainability?) was designed to evaluate hypothesis 12 (IHEs do not fund sustainability positions, capital improvements, or smaller operational improvement efforts). Figure 15 presents the frequency distribution for responses to this question. The majority of MLD-RF websites did not describe building new facilities sustainably (ninety-three to one hundred percent) while seventy-seven percent of sustainability sites did.

The Chi-square statistic ($H=22.642$) for MLD-RF sites was significant ($p<0.001$). Outcomes for significance of the individual Chi-square comparisons are presented on Table 15. The differences between facilities department and all other departments was significant. Facilities had seven percent of websites describing other funding for sustainability while the other MLD-RF had either none or very few websites that described other funding for sustainability.

Question 16

Question 16 (does the site list a sustainability position?) was designed to evaluate hypothesis 12 (IHEs do not fund sustainability positions, capital improvements, or smaller operational improvement efforts). Figure 16 presents the frequency distribution

for responses to this question. The majority of MLD-RF websites did not describe a sustainability position (ninety-six to one hundred percent) while twenty-eight percent of sustainability sites did.

The Chi-square statistic ($H=14.740$) for MLD-RF sites was significant ($p=0.002$). Outcomes for individual Chi-square comparisons are presented on Table 16. The facilities department was significantly different than all other departments.

Question 17

Question 17 (is the position full time focused only on sustainability?) was designed to evaluate hypothesis 12 (IHEs do not fund sustainability positions, capital improvements, or smaller operational improvement efforts). Figure 17 presents the frequency distribution for this question removing all N/As. Of the departments that listed a sustainability position, the majority listed a full time person.

The Chi-square statistic for MLD-RF sites were identical to Question 16 due to the heavy influence of N/A results.

Questions 18 – 21

Questions 18 – 21 were only applicable to the sustainability websites. These questions evaluated whether sustainability websites listed any of the MLD-RF as having a major role in the sustainability process. Figure 18 presents the frequency distribution for the percentage of sustainability websites that list each group as having a major role in the sustainability process. Twenty-nine percent of websites listed the safety department as having a major role in the sustainability process, thirty-one percent of sustainability websites listed the purchasing department as having a major role in the sustainability process, seventy-six percent of sustainability websites listed the facilities department as

having a major role in the sustainability process, and seventy-six percent of sustainability websites listed research faculty as having a major role in the sustainability process.

Demographics

Demographic data on the university was also collected for all websites. Figure 19 shows the differences in public versus private institutions by type of website. Purchasing had the highest percentage of public websites with sixty-eight percent of websites from public institutions.

Purchasing websites were also the only ones that had a larger number of schools in the 5,000-15,000 size range than in the <5,000 size range (figure 20).

Survey

The e-mail addresses for the survey invitations were located during the summer of 2009. As described in the methods section, IHEs were selected in a stratified random manner. For each IHE, e-mails were identified where available. A total of 2,249 out of a potential 4,000 individuals had e-mails that were locatable. E-mails were sent to these individuals requesting participation in the survey during the fall of 2009. The survey remained open for approximately 1.5 months. In this section, I will first describe the characteristics of the respondents to the survey, followed by a description of results by type of MLD-RF.

Survey Respondent Characteristics

A total of four hundred eighty-one respondents who met the inclusion criteria responded to the survey. Fifteen individuals clicked the link to the survey but did not meet the inclusion criteria and were therefore excluded from the survey through an interactive feature in the survey design. Table 17 details the respondents by accreditation

agency and department. The grand total column indicates the percentage of individuals who took the survey of those who were invited to take the survey. Purchasing departments had a lower response rate compared to the other MLD with twenty percent responding in the facilities group and twenty-seven percent responding in the safety group. The survey had an overall response rate of approximately nineteen percent. The completion rate for the survey ranged from seventy percent for the purchasing group to eighty-seven percent for the research faculty.

All respondents were asked to identify a department with which they are affiliated. Research faculty were asked to specify their primary area of expertise near the end of the survey. Table 18 lists the departments for the RF group cross tabbed with current titles that were available as selection buttons on the survey along with numbers for those individuals that did not specify a department or title. Forty percent of respondents were in tenured or on a tenure-track faculty positions at their IHE (e.g. Assistant, Associate, or Full Professor). Seventeen percent of respondents were chairpersons of academic departments. Twenty-three respondents did not indicate either a department or a job title.

Table 19 lists the departments for the RF group cross tabbed with current titles for those individuals that selected other and specified a title. Assistant, Associate, and Full Deans were all grouped into the Dean category accounting for eighteen percent of respondents. Various other positions responded to the request for individuals who consider themselves faculty members that “supervise a teaching or research laboratory”. These include Directors, one Emeritus Professor, Instructors, and Laboratory Managers.

The respondents that considered themselves responsible for safety were asked to further specify their primary job function. Table 20 lists the number of respondents for

each category that was available for indicating primary job function. Twenty-seven percent of respondents considered their primary responsibility as security or police functions, the remaining seventy-three percent of respondents considered environmental health and safety as one of their primary responsibilities.

The respondents that considered themselves responsible for facilities were asked to further specify their primary job function. Table 21 lists the number of respondents for each category that was available for indicating primary job function. Only 4 percent of respondents did not consider facilities management as one of their primary job functions.

Purchasing directors were not given further options to specify other primary job functions.

The sample for this study was selected in a random way to attempt to ensure representation of all types of IHEs in all parts of the country. Although the response rate to this survey is typical for survey research, the results may be skewed toward those individuals who are particularly interested in sustainability. E-mail and telephone feedback from several sustainability coordinators indicated that the MLD-RF had forwarded the survey on to them because “it was about sustainability”. This likely accounted for the respondents who were eliminated from the survey.

Responses to Survey Questions

Survey questions were designed to evaluate the hypotheses. In this section, the responses to each question are presented as a frequency distribution, followed by the Kruskal-Wallis, Chi-square, and Mann-Whitney tests where needed to test for statistical significance of groupings by department.

Question 1

Question 1 (in your opinion how important are the following items to improving campus sustainability?) was designed to evaluate hypothesis 1 (MLD-RF are unable to define sustainability or believe that it means something unrelated to the study definition, **or** MLD-RF define sustainability in a manner that is not inclusive of environmental, social, and economic components). Figure 21 presents the frequency distribution for item 1a (choosing environmentally friendly products). The majority of MLD-RF consider choosing environmentally friendly products somewhat important (thirty-two to thirty-nine percent) or important (forty-six to fifty-nine percent) to improving campus sustainability.

The Kruskal-Wallis statistic ($H=4.856$) was not significant ($p=0.183$), therefore no Mann-Whitney U tests were performed.

Figure 22 presents the frequency distribution for item 1b (considering environmental impacts before construction projects are initiated). The majority of MLD-RF view considering environmental impacts before constructions projects are initiated as somewhat important (twenty to thirty-four percent) or important (sixty-three to seventy-two percent) to improving campus sustainability.

The Kruskal-Wallis statistic ($H=1.404$) was not significant ($p=0.705$), therefore no Mann-Whitney U tests were performed.

Figure 23 presents the frequency distribution for item 1c (purchasing locally). The majority of MLD-RF view purchasing locally as somewhat important (forty-two to fifty-two percent) or important (twenty-two to thirty-three percent). In contrast to the first two questions, the most prevalent response was somewhat important and a sizeable minority

(twelve to eighteen percent) indicated that purchasing locally is neither unimportant or important to campus sustainability.

The Kruskal-Wallis statistic ($H=4.408$) was not significant ($p=0.221$), therefore no Mann-Whitney U tests were performed.

Figure 24 presents the frequency distribution for item 1d (considering impacts on neighbors). The majority of MLD-RF view considering impacts on neighbors as important (forty-five to fifty-five percent) or somewhat important (thirty-four to forty-six percent).

The Kruskal-Wallis statistic ($H=1.473$) was not significant ($p=0.688$), therefore no Mann-Whitney U tests were performed.

Figure 25 presents the frequency distribution for item 1e (looking for options that will save money over time). The majority of MLD-RF view looking for options that will save money over time as important (sixty-two to eighty-eight percent) or somewhat important (eight to twenty-eight percent).

The Kruskal-Wallis statistic ($H=21.532$) was significant ($p<0.001$). Outcomes for significance of the Mann-Whitney statistic are presented on Table 22. Based on the corrected alpha (0.0125), there were significant differences between research faculty / facilities and research faculty / purchasing. The frequency of respondents from facilities and purchasing choosing “important” was higher than that of research faculty.

Figure 26 presents the frequency distribution for item 1f (looking for options that will enable development to continue). The majority of MLD-RF indicated that looking for options that will enable development to continue as important (forty-eight to sixty-five percent) or somewhat important (twenty-five to thirty-four percent).

The Kruskal-Wallis statistic ($H=11.84$) was significant ($p=0.008$). Outcomes for significance of the Mann-Whitney statistic are presented on Table 23. Based on the corrected alpha, the only comparison with significant differences was safety / faculty. A higher percentage of safety respondents considered enabling development to continue important.

Question 2

Question 2 (in your opinion campus sustainability is best defined to include the following concepts:) was designed to evaluate hypothesis 1 (MLD-RF are unable to define sustainability or believe that it means something unrelated to the study definition, **or** MLD-RF define sustainability in a manner that is not inclusive of environmental, social, and economic components). Figure 27 presents the frequency distribution for question 2. The majority of MLD-RF chose improving the environment, society, and the economy (all of the above) as the best definition of sustainability (fifty-eight to eighty-three percent). For those that indicated “other”, the responses ranged from individuals that did not know what sustainability meant to those that had very well defined ideas of what sustainability meant. The range of responses was diverse and included: “I really don't know what you mean by "sustainability", so I'm kind of at a loss as long as you keep throwing around a phrase that is clearly jargon without definition. I'm irritated.” to “Environmental Sustainability (in my opinion) is the implementation of a blend of environmental, greening ,energy conservation, social, economic, educational, and measureable initiative(s) that are recognized and deemed important to an organization, and that appropriate funding to assure the continued longevity of the sustainable program

can flourish both internal and external with recognition for the overall benefit of reducing ones carbon footprint and a steward of the global environment.”

The Chi-square statistic ($\chi^2=31.061$) was significant ($p=0.009$). Outcomes for significance of the individual Chi-square evaluations are presented on Table 24. Only the Purchasing/Faculty comparison was significantly different. Purchasing respondents overwhelming selected “all of the above” and “improving the environment” whereas faculty had a more split selection.

Question 3

Question 3 (how would you rate your role in decision making about campus-wide sustainability at your college/university?) was designed to evaluate hypothesis 7 (MLD-RF do not have a role in campus decision making about sustainability or have a very limited involvement (e.g., provide input but not included in decision making)). Figure 28 presents the frequency distribution for question 3. The majority of facilities directors rated their role as “major” (sixty-six percent). The majority of purchasing directors were equally split between a “minor” and “major” role (forty-seven percent each). The majority of research faculty and safety directors rated their role as “minor” (fifty-five and fifty-eight percent respectively). Those claiming sustainability as their primary responsibility made up eighteen percent of facilities directors, two percent of purchasing directors, three percent of research faculty, and four percent of safety directors.

The Kruskal-Wallis statistic ($H=110.119$) was significant ($p<0.001$). Outcomes for significance of the Mann-Whitney statistic are presented on Table 25. Based on the corrected alpha, all comparisons except for safety/purchasing were significantly different.

Question 4

Question 4 (approximately how often do you participate in campus-wide decision making about sustainability?) was designed to evaluate hypothesis 7 (MLD-RF do not have a role in campus decision making about sustainability or have a very limited involvement (e.g., provide input but not included in decision making)). Figure 29 presents the frequency distribution for question 4. Thirty-six percent of facilities directors stated that they participate in all decisions while only two percent stated that they never participate in campus-wide decisions about sustainability. Eleven percent of purchasing directors stated that they never participate in campus-wide decisions about sustainability while thirty-nine percent stated that they participate in campus-wide decision making about sustainability about once per month. Thirty percent of research faculty respondents indicated that they never participate in campus-wide sustainability decision making and thirty-six percent indicated that they only participate in campus-wide decision making about sustainability once per semester. Twenty-two percent of safety directors indicated that they never participate in campus-wide decisions about sustainability while thirty-three percent indicated that they only participate in campus-wide decisions about sustainability once per semester.

The Kruskal-Wallis statistic ($H=98.528$) was significant ($p<0.001$). Outcomes for significance of the Mann-Whitney statistic are presented on Table 26. Based on the corrected alpha, all comparisons except for safety/purchasing and safety/faculty were significantly different.

Question 5

Question 5 (approximately how often do you attend campus meetings/forums where sustainability is discussed?) was designed to evaluate hypothesis 7 (MLD-RF do not have a role in campus decision making about sustainability or have a very limited involvement (e.g., provide input but not included in decision making)). Figure 30 presents the frequency distribution for question 5. Thirty-seven percent of facilities respondents indicated that they attend campus meetings once per month where sustainability is discussed, eighteen percent indicated that they attend all meetings where campus sustainability is discussed and only one percent indicated that they never attend campus meetings where sustainability is discussed. Thirty-nine percent of purchasing directors indicated that they attend meetings where campus sustainability is discussed once per semester and thirty-nine percent indicated once per month. Eleven percent indicated that they never attend campus meetings where sustainability is discussed while six percent attend all meetings campus meetings where sustainability is discussed. Thirty-eight percent of research faculty indicated that they attended campus meetings where sustainability is discussed once per semester, twenty five percent never attend campus meetings where sustainability is discussed, and three percent attend all meetings where campus sustainability is discussed. Thirty-five percent of safety directors attend campus meetings where sustainability is discussed once per semester, eighteen percent never attend campus meetings where sustainability is discussed, and three percent attend all meetings where campus sustainability is discussed.

The Kruskal-Wallis statistic ($H=59.2$) was significant ($p<0.001$). Outcomes for significance of the Mann-Whitney statistic are presented on Table 26. Based on the corrected alpha, facilities was significantly different from all other departments.

Question 6

Question 6 (do you have an active role in these meetings/forums?) was designed to evaluate hypothesis 7 (MLD-RF do not have a role in campus decision making about sustainability or have a very limited involvement (e.g., provide input but not included in decision making)). Figure 31 presents the frequency distribution for question 6 with the N/As removed based on responses of “never” to question 5. In all cases, the majority of respondents indicated that they do have an active role in the meetings that they attend (fifty-three to eighty percent).

The Chi-square statistic ($H=17.877$) was significant ($p<0.001$). Outcomes for individual Chi-square comparisons are presented on Table 28. The facilities respondents were significantly different from all other respondents. A higher percentage of facilities respondents indicated that they do have an active role in meetings/forums.

Question 7

Question 7 (in your opinion how important is campus sustainability?) was designed to evaluate hypothesis 2 (MLD-RF either do not rank sustainability in their set of priorities or rank it below all other priorities). Figure 32 presents the frequency distribution for question 7. The majority of respondents in all categories of MLD-RF responded that campus sustainability is “important” (sixty to seventy-five percent). Very few respondents indicated that campus sustainability is “not at all important” (zero to three percent).

The Kruskal-Wallis statistic ($H=6.393$) was not significant ($p=0.094$), therefore no Mann-Whitney U tests were performed.

Question 8

Question 8 (if I were to rank my work priorities, I would rank campus sustainability as:) was designed to evaluate hypothesis 2 (MLD-RF either do not rank sustainability in their set of priorities or rank it below all other priorities). Figure 33 presents the frequency distribution for question 8. The majority of individuals in all groups indicated that campus sustainability was “equal to other priorities” (forty to sixty-one percent). None of the facilities respondents ranked campus sustainability as “much less important than other priorities” and only eleven percent ranked campus sustainability as “somewhat less important than other priorities”. Thirty-two to thirty-eight percent of the other groups of MLD-RF responded that campus sustainability was either “much less important than other priorities” or “somewhat less important than other priorities”.

The Kruskal-Wallis statistic ($H=15.239$) was significant ($p=0.002$). Outcomes for significance of the Mann-Whitney statistic are presented on Table 29. Based on the corrected alpha, the facilities/safety and facilities/research faculty comparisons were significantly different.

Question 9

Question 9 (campus sustainability is prioritized by: 9a me personally, 9b my department, 9c my college/university) was designed to evaluate hypothesis 2 (MLD-RF either do not rank sustainability in their set of priorities or rank it below all other priorities) and 10 (Sustainability is not included in institutional or departmental mission statements, goals or policies). Figure 34 presents the frequency distribution for question

9a. None of the respondents from facilities indicated that sustainability was “not at all a priority” to them personally and only eight percent indicated that it was “less of a priority than many other issues”. Twenty-three to thirty-one percent of the other groups of MLD-RF indicated that sustainability either was “not at all a priority” or “less of a priority than many other issues” to them personally.

The Kruskal-Wallis statistic ($H=16.908$) was significant ($p=0.001$). Outcomes for significance of the Mann-Whitney statistic are presented on Table 30. Based on the corrected alpha, the facilities/safety comparison was statistically significant.

Figure 35 presents the frequency distribution for question 9b. None of the respondents from facilities indicated that sustainability was “not at all a priority” to their department and only ten percent indicated that it was “less of a priority than many other issues”. Twenty-one to forty percent of the other groups of MLD-RF indicated that sustainability either was “not at all a priority” or “less of a priority than many other issues” to their department.

The Kruskal-Wallis statistic ($H=21.715$) was significant ($p<0.001$). Outcomes for significance of the Mann-Whitney statistic are presented on Table 31. Based on the corrected alpha, the facilities/safety and facilities/research faculty comparisons were statistically significant.

Figure 36 presents the frequency distribution for question 9c. The only group that indicated that campus sustainability was “not at all a priority” to their IHE was research faculty (seven percent). Thirty-four percent of research faculty indicated that sustainability was “less of a priority than many other issues” whereas only sixteen to seventeen percent of the MLD thought that this was true for their IHE.

The Kruskal-Wallis statistic ($H=29.999$) was significant ($p<0.001$). Outcomes for significance of the Mann-Whitney statistic are presented on Table 32. Based on the corrected alpha, research faculty were significantly different than all other groups.

Question 10

Question 10 (my department includes campus sustainability in: 10a mission statement, 10b goals, and 10c policies) was designed to evaluate hypothesis 10 (sustainability is not included in institutional or departmental mission statements, goals or policies). Figure 37 presents the frequency distribution for question 10a. The facilities respondents were the only department in which a majority indicated that sustainability was included in the mission statement (fifty-seven percent). The majority of all other respondents indicated that sustainability was not included in the department's mission statement (sixty-eight to seventy-nine percent).

The Chi-square statistic ($\chi^2=54.024$) was significant ($p<0.001$). Outcomes for significance of the individual Chi-square comparisons are presented on Table 33. The only comparison that was not significantly different was the comparison between purchasing and faculty respondents.

Figure 38 presents the frequency distribution for question 10b. Eighty-four percent of facilities and fifty-seven percent of safety respondents indicated that their department includes sustainability in goals. Fifty percent of purchasing respondents and thirty-eight percent of research faculty indicated that their department includes sustainability in goals.

The Chi-square statistic ($\chi^2=56.329$) was significant ($p<0.001$). Outcomes for significance of the Chi-square individual comparisons are presented on Table 34. The

facilities respondents were significantly different from all other respondents and the safety/faculty respondents comparison was also significantly different.

Figure 39 presents the frequency distribution for question 10c. The majority of MLD respondents indicated that their departments include sustainability in policies (sixty to eighty percent). Research faculty were fairly evenly split between departments that include sustainability in policies and those that do not (forty-five versus forty-nine percent).

The Chi-square statistic ($\chi^2=30.369$) was significant ($p<0.001$). Outcomes for significance of the Chi-square individual comparisons are presented on Table 35. The facilities respondents were significantly different than research faculty and safety respondents. Purchasing and research faculty respondents were also significantly different from each other.

Question 11

Question 11 (my college/university includes campus sustainability in: 11a mission statement, 11b goals, and 11c policies) was designed to evaluate hypothesis 10 (sustainability is not included in institutional or departmental mission statements, goals or policies). Figure 40 presents the frequency distribution for question 11a. Forty-five to forty-nine percent of MLD respondents believe that their IHEs include sustainability in their mission statement, however, only twenty-one percent of research faculty believed that their IHE included sustainability in the mission statement.

The Chi-square statistic ($\chi^2=33.551$) was significant ($p<0.001$). Outcomes for significance of the individual Chi-square comparisons are presented on Table 36. The research faculty respondents were significantly different from all other respondents.

Figure 41 presents the frequency distribution for question 11b. Sixty-eight to eighty percent of MLD respondents believed that their IHEs include sustainability in their goals while fifty-three percent of research faculty respondents believe that their IHE includes sustainability in their goals.

The Chi-square statistic ($\chi^2=24.203$) was significant ($p<0.001$). Outcomes for significance of the individual Chi-square comparisons are presented on Table 37. The research faculty respondents were significantly different from facilities and safety respondents.

Figure 42 presents the frequency distribution for question 11c. Seventy to seventy-seven percent of MLD respondents believed that their IHEs include sustainability in their policies while forty-nine percent of research faculty respondents believe that their IHE includes sustainability in their policies.

The Chi-square statistic ($\chi^2=29.931$) was significant ($p<0.001$). Outcomes for significance of the individual Chi-square comparisons are presented on Table 38. The research faculty respondents were significantly different from all other respondents. The safety and facilities respondents were also significantly different from each other.

Question 12

Question 12 (when making decisions about campus sustainability where do you obtain your information?) was designed to evaluate hypothesis 4 (MLD-RF rely on personal knowledge when making decisions about sustainability). Figure 43 presents the frequency distribution for question 12. The most prevalent response to this question was “primarily from off-campus sources” (thirty-five to sixty-nine percent).

The Chi-square statistic ($\chi^2=46.378$) was significant ($p<0.001$). Outcomes for significance of the individual Chi-square comparisons are presented on Table 39. The safety and research faculty respondents were significantly different from facilities and purchasing respondents.

Question 13

Question 13 (which group is most involved in campus sustainability at your college/university?) was designed to evaluate hypothesis 7 (MLD-RF do not have a role in campus decision making about sustainability or have a very limited involvement (e.g., provide input but not included in decision making)). Figure 44 presents the frequency distribution for question 13. Research faculty respondents chose faculty as the most involved group more often (twenty-eight percent) than the MLD respondents (seven to thirteen percent).

The Chi-square statistic ($\chi^2=26.020$) was significant ($p=0.002$). Outcomes for significance of the individual Chi-square comparisons are presented on Table 40. The research faculty respondents were significantly different than all other respondents.

Question 14

Question 14 (in your opinion, which on-campus group has the most influence on campus sustainability decision making?) was designed to evaluate hypothesis 7 (MLD-RF do not have a role in campus decision making about sustainability or have a very limited involvement (e.g., provide input but not included in decision making)). Figure 45 presents the frequency distribution for question 14. The majority of respondents from all groups felt that administration has the most influence on campus sustainability (sixty-one to sixty-eight percent).

The Chi-square statistic ($\chi^2=15.632$) was not significant ($p=0.075$).

Question 15

Question 15 (what is your primary on-campus source for sustainability information?) was designed to evaluate hypothesis 4 (MLD-RF rely on personal knowledge when making decisions about sustainability). Figure 46 presents the frequency distribution for question 15. Twenty-seven percent of research faculty respondents reported that they did not receive information about sustainability at their campus versus seven to fifteen percent of MLD reporting that they did not receive information at their campus. Of the research faculty respondents that did report receiving information on their campus, the primary source was faculty (twenty-one percent). Only two to eight percent of MLD respondents indicated that research faculty were the primary source of sustainability information on their campus.

The Chi-square statistic ($\chi^2=91.537$) was significant ($p<0.001$). Outcomes for significance of the individual Chi-square comparisons are presented on Table 41. All comparisons were significantly different except for the safety/purchasing comparison.

Question 16

Question 16 (which of the following departments would you be most likely to rely on for information about sustainability?) was designed to evaluate hypothesis 4 (MLD-RF rely on personal knowledge when making decisions about sustainability). Figure 47 presents the frequency distribution for question 16. Research faculty respondents were more likely than MLD respondents to rely on an academic department for sustainability information (twenty-seven percent versus five to thirteen percent). Facilities respondents

were more likely to rely on facilities or planning and construction than any other group of respondents (sixty-nine percent versus thirty-two to fifty percent).

The Chi-square statistic ($\chi^2=57.363$) was significant ($p<0.001$). Outcomes for significance of the Chi-square individual comparisons are presented on Table 42. The only comparison that was not significantly different was the safety/purchasing comparison.

Question 17

Question 17 (how often do you consider sustainability when making work related decisions?) was designed to evaluate hypothesis 3 (MLD-RF do not consider sustainability a core responsibility). Figure 48 presents the frequency distribution for question 17. The most prevalent response for facilities directors was “most of the time” (forty percent). For all other groups of respondents the most prevalent response was “sometimes”.

The Kruskal-Wallis statistic ($H=30.445$) was significant ($p<0.001$). Outcomes for significance of the Mann-Whitney statistic are presented on Table 43. Based on the corrected alpha, the facilities respondents were significantly different from all other respondents.

Question 18

Question 18 (do you consider campus sustainability one of your core responsibilities?) was designed to evaluate hypothesis 3 (MLD-RF do not consider sustainability a core responsibility). Figure 49 presents the frequency distribution for question 18. The majority of facilities respondents (eighty-five percent) responded that

sustainability is a core responsibility. For all other groups more individuals responded that sustainability was not a core responsibility (fifty-two to fifty-nine percent).

The Chi-square statistic ($\chi^2=46.528$) was significant ($p<0.001$). Outcomes for significance of the individual Chi-square comparisons are presented on Table 44. The facilities respondents were significantly different from all other respondents.

Question 19

Question 19 (how much control do you have in campus-wide sustainability decision making?) was designed to evaluate hypothesis 8 (MLD-RF have no control or flexibility to make decisions that impact operational campus sustainability). Figure 50 presents the frequency distribution for question 19. The majority of facilities respondents reported either “moderate” or “high” control in campus-wide sustainability decision making (forty-five and forty-three percent). The majority of purchasing respondents reported “moderate” control in campus-wide sustainability decision making (fifty-one percent). Both research faculty and safety respondents had a bimodal distribution.

The Kruskal-Wallis statistic ($H=111.564$) was significant ($p<0.001$). Outcomes for significance of the Mann-Whitney statistic are presented on Table 45. Based on the corrected alpha, all comparisons were significantly different except for the safety/purchasing comparison.

Question 20

Question 20 (how much flexibility do you have when making decisions for your laboratory/unit that could impact campus sustainability?) was designed to evaluate hypothesis 8 (MLD-RF have no control or flexibility to make decisions that impact operational campus sustainability). Figure 51 presents the frequency distribution for

question 20. The most prevalent response from facilities directors was “high” (sixty-three percent), for all other respondents “moderate” was the most prevalent response (thirty-six to forty-seven percent).

The Kruskal-Wallis statistic ($H=39.167$) was significant ($p<0.001$). Outcomes for significance of the Mann-Whitney statistic are presented on Table 46. Based on the corrected alpha, facilities respondents were significantly different than all other groups.

Question 21

Question 21 (I feel empowered to make decisions for my laboratory/unit that impact campus sustainability?) was designed to evaluate hypothesis 13 (MLD-RF’s do not feel empowered to make decisions about sustainability and/or they do not feel those decisions would be supported). Figure 52 presents the frequency distribution for question 21. Sixty-nine percent of facilities respondents felt “highly” empowered to make decisions compared with twenty-six to thirty-six percent of other respondents who felt “highly” empowered to make decisions.

The Kruskal-Wallis statistic ($H=37.764$) was significant ($p<0.001$). Outcomes for significance of the Mann-Whitney statistic are presented on Table 47. Based on the corrected alpha, facilities respondents were significantly different than all other groups.

Question 22

Question 22 (do you feel that decisions you make about campus-wide sustainability are supported?) was designed to evaluate hypothesis 13 (MLD-RF’s do not feel empowered to make decisions about sustainability and/or they do not feel those decisions would be supported). Figure 53 presents the frequency distribution for question 22. Ninety-two percent of facilities respondents felt that their decisions were either

“moderately” or “highly” supported compared to fifty to sixty-three percent from the other groups.

The Kruskal-Wallis statistic ($H=14.256$) was significant ($p=0.003$). Outcomes for significance of the Mann-Whitney statistic are presented on Table 48. Based on the corrected alpha, facilities respondents were significantly different than all other groups.

Question 23

Question 23 (do you feel that decisions you make about sustainability for your laboratory/unit are supported?) was designed to evaluate hypothesis 13 (MLD-RF’s do not feel empowered to make decisions about sustainability and/or they do not feel those decisions would be supported). Figure 54 presents the frequency distribution for question 23. Ninety-four percent of facilities respondents felt that their decisions were either “moderately” or “highly” supported compared with sixty-four to seventy-three percent from the other groups.

The Kruskal-Wallis statistic ($H=13.503$) was significant ($p=0.004$). Outcomes for significance of the Mann-Whitney statistic are presented on Table 49. Based on the corrected alpha, facilities respondents were significantly different than all other groups.

Question 24

Question 24 (my institution provides financial support for campus sustainability) was designed to evaluate hypothesis 11 (IHE’s do not provide funding to MLD-RF to support operational sustainability) and 12 (IHEs do not fund sustainability positions, capital improvements, or smaller operational improvement efforts). Figure 55 presents the frequency distribution for question 24. Research faculty were the only respondents with “no” as their highest percentage of response (forty-two percent).

The Chi-square statistic ($\chi^2=32.523$) was significant ($p<0.001$). Outcomes for significance of the individual Chi-square comparisons are presented on Table 50. Research faculty were significantly different than safety and facilities respondents. The facilities and purchasing respondents were also significantly different.

Affective Questions

Questions 25 through 30 were designed to evaluate affective reactions to sustainability (hypothesis 5). There were no significant differences between groups of respondents based on Kruskal-Wallis statistical evaluations. All measures were bipolar, holistic, valenced with a range of -3 to 3 (3 being positive).

Question 25

Question 25 asked: “when I hear the term sustainability I feel upset (-3) through happy (3).” The average response for this question was 1.15 = slightly happy (standard deviation 1.3). The frequency distribution is presented in Figure 56.

Question 26

Question 26 asked: “when I hear the term sustainability I feel angry (-3) through – friendly (3).” The average response for this question was 1.15 = slightly friendly (standard deviation 1.3). The frequency distribution is presented in Figure 57.

Question 27

Question 27 asked: “when I hear the term sustainability I feel annoyed (-3) through – enthusiastic (3).” The average response for this question was 1.2 = slightly enthusiastic (standard deviation 1.5). The frequency distribution is presented in Figure 58.

Question 28

Question 28 asked: “when I hear the term sustainability I feel disgust (-3) through – love (3).” The average response for this question was 0.79 = slight love (standard deviation 1.1). The frequency distribution is presented in Figure 59.

Question 29

Question 29 asked: “when I hear the term sustainability I feel afraid (-3) through – excited (3).” The average response for this question was 1.18 = slightly excited (standard deviation 1.2). The frequency distribution is presented in Figure 60.

Question 30

Question 30 asked: “I feel that campus sustainability initiatives are.” The frequency distribution for question 30 is presented in Figure 61. Eighty-four to ninety-five percent of MLD-RF felt that sustainability initiatives were either somewhat beneficial or very beneficial.

Demographics

Question 31 asked: “how many years have you a) been in your career field, b) been in your current position, c) worked in higher education, and d) been at your current college/university.” For question 31a, the vast majority of all respondents had been in their career field for greater than ten years (eighty-four to ninety-one percent) and the Kruskal-Wallis statistic ($H=2.216$) was not significant $p=0.529$. For question 31b, the frequency distributions were not significantly different (Figure 62), the Kruskal Wallis statistic ($H=6.947$) had a $p=0.074$.

The majority of respondents to question 31c (figure 63) had worked in higher education for greater than ten years; research faculty reported a longer time in higher

education than MLD (ninety three percent with at least five years versus seventy-six to eighty-three percent).

The Kruskal-Wallis statistic ($H=10.327$) was significant ($p=0.016$). Outcomes for significance of the Mann-Whitney statistic are presented on Table 51. Based on the corrected alpha, the facilities and faculty respondents were significantly different.

For question 31d (figure 64), the majority of respondents in all groups except facilities had been at their current institution for greater than ten years (fifty to fifty-five percent). Facilities respondents were fairly evenly split between “one to five years” (thirty-six percent), “five to ten years” (twenty-eight percent), and “greater than ten years” (twenty-nine percent).

The Kruskal-Wallis statistic ($H=13.290$) was significant ($p=0.004$). Outcomes for significance of the Mann-Whitney statistic are presented on Table 52. Based on the corrected alpha, the facilities respondents were significantly different than all other respondents.

Questions 32 and 33 were only posed to the research faculty. Question 32 asked: “what is your primary area of expertise?” The frequency distribution in Figure 65 shows that the most prevalent response was biology; those that selected “other” indicated various other areas of expertise.

Question 33 asked “what is your current title?” The frequency distribution in figure 66 shows that the most prevalent response was other; the most prevalent other titles were “dean”, “instructor”, and “director”.

Question 34 asked respondents to identify their age category, the responses were fairly evenly distributed between the thirty-five to forty-four, forty-five to fifty-four, and

fifty-five to sixty-four categories for all groups of respondents. The Kruskal-Wallis statistic ($H=3.779$) was not significant $p=0.286$.

Question 35 asked respondents to identify their sex (figure 67). All groups had more male respondents than female respondents.

The Chi-square statistic ($\chi^2=25.399$) was significant ($p<0.001$). Outcomes for significance of the Chi-square individual comparisons are presented on Table 53. The facilities respondents were significantly different than the purchasing and research faculty respondents. The safety respondents were also significantly different than the purchasing and research faculty respondents.

Question 36 asked respondents whether their university was public or private (figure 68).

More respondents were from public IHEs than private IHEs for all groups. Purchasing respondents were more heavily representative of public universities than any other group (eighty-one percent versus fifty-seven to sixty-two percent). Therefore, the Chi-square statistic ($\chi^2=9.276$) was significant with $p=0.026$. Outcomes for significance of the individual Chi-square comparisons are presented in Table 54. Based on the corrected alpha, the purchasing respondents were significantly different than all other respondents.

Question 37 asked respondents to identify the types of degrees offered at their IHE. Research faculty respondents were more evenly divided between types of degrees than other respondents (figure 69).

The Kruskal-Wallis statistic ($H=22.479$) was significant ($p<0.001$). Outcomes for significance of the Mann-Whitney statistic are presented on Table 55. Based on the corrected alpha, the research faculty were significantly different than all other groups.

Question 38 asked respondents for the population of their student body (figure 70). Research faculty respondents were more likely to be from smaller IHEs.

The Kruskal-Wallis statistic ($H=8.695$) was significant ($p=0.034$). Outcomes for significance of the Mann-Whitney statistic are presented on Table 56. Based on the corrected alpha, the purchasing/faculty comparison was the only one that was significantly different.

Evaluation of Other Characteristics

Multiple RF respondents were included from individual IHEs. The only IHE with sufficient data points for a Mann-Whitney comparison with the rest of the RF respondents was Beloit College with twelve respondents. The only questions where Beloit was significantly different than other research faculty were the two questions related to flexibility and control in decision making at their IHE and two of the affective questions. Respondents from Beloit College had a distribution that was bimodal rather than normal for the control question. They indicated that they had more flexibility in decision making than other respondents, and they indicated a more positive affective reaction to sustainability. Kruskal-Wallis and Mann-Whitney tests were repeated for these questions with Beloit college removed to determine if the respondents were skewing the outcomes. There were no changes in determinations of significance when Beloit college was removed from the analysis.

IHEs were chosen for inclusion in this study based on a stratified random sampling procedure with the strata being accreditation agency. Table 57 presents a listing of the six accreditation agencies and the states that are included in each accreditation agency.

Content Analysis by Accreditation Agency

In the content analysis, the number of websites analyzed varied by accreditation agency and by type of website. Table 58 presents the number of websites located and evaluated by type of site. This table also includes the percentage of available websites based on the total sample with average inclusion rate at the bottom of the table. The NW Comm and Western accreditation agencies had both the lowest numbers and lowest percentages of inclusion in the content analysis.

Based on Kruskal-Wallis, Chi-square, and Mann-Whitney evaluation of results, five questions had significant differences. The first was question 1. For this question, the Chi-square statistic ($\chi^2=22.498$) for accreditation agencies was significant ($p<0.001$). Outcomes for significance of the individual Chi-square comparisons are presented in table 59. The NW Comm accreditation agency accounts for a significant difference in results.

The second question that was significantly different between accreditation agencies was question 2. For this question, the Chi-square statistic ($\chi^2=24.342$) for accreditation agencies was significant ($p=0.007$). Outcomes for significance of the individual Chi-square comparisons are presented in Table 60. The NW Comm accreditation agency accounts for much the significant difference in results. These are the same numbers from question 1 since those that did not define sustainability were automatically N/A.

The third question that was significantly different between accreditation agencies was question 3. For this question, the Kruskal-Wallis statistic ($H=16.7$) for accreditation agencies was significant ($p=0.005$). To compensate for type I error inflation, the Bonferroni procedure led to a corrected alpha of 0.008. Outcomes for significance of the Mann-Whitney statistic are presented in Table 61. Based on the corrected alpha, the Southern accreditation agency accounted for the significant difference with greater than 90% of sites with zero mentions of sustainability on the main page. It was significantly different from the NCA-HCLL, New England, and NW Comm accreditation agencies.

The fourth question that was significantly different between accreditation agencies was question 12. For this question, the Kruskal-Wallis statistic ($H=11.6$) for accreditation agencies was significant ($p=0.041$). Outcomes for significance of the Mann-Whitney statistic are presented in table 62. Based on the corrected alpha, the only two accreditation agencies that were significantly different from each other were the Southern and Middle States.

The fifth question that was significantly different between accreditation agencies was question 13. For this question, the Chi-square statistic ($\chi^2=21.205$) for accreditation agencies was significant ($p=0.001$). Outcomes for significance of the individual Chi-square comparisons are presented in table 63. The Southern and Western accreditation agencies accounted for the statistical difference between accreditation agencies.

Survey by Accreditation Agency

In the survey, number of respondents varied by accreditation agency and by type of individual responding. Table 64 presents the number of surveys returned by type of site with a percentage of selected indicated and average response rate of MLD-RF at the

bottom of the table. The NW Comm and Western accreditation agencies had both the lowest numbers and lowest percentages of inclusion in the survey.

Based on Kruskal-Wallis and Mann-Whitney evaluation of results, four questions had significant differences between accreditation agencies. Two questions (1a and 1b) were statistically significant based on the Kruskal-Wallis statistic but had no significant comparisons in the Mann-Whitney evaluation with the corrected alpha of 0.008.

The first question with significant differences based on both evaluations was question 1c. For this question, the Kruskal-Wallis statistic ($H=18.5$) for accreditation agencies was significant ($p=0.002$). Outcomes for significance of the Mann-Whitney statistic are presented in Table 65. Based on the corrected alpha of 0.008, the NCA-HCLL accreditation agency was significantly different from the Middle States and Southern accreditation agencies.

The second question with significant differences based on both evaluations was question 8. For this question, the Kruskal-Wallis statistic ($H=11.5$) for accreditation agencies was significant ($p=0.042$). Outcomes for significance of the Mann-Whitney statistic are presented in Table 66. Based on the corrected alpha of 0.008, the New England accreditation agency was significantly different from the NCA-HCLL, Southern, and Western Accreditation agencies.

The final question with significant differences based on both evaluations was question 30. For this question, the Kruskal-Wallis statistic ($H=17.3$) for accreditation agencies was significant ($p=0.004$). Outcomes for significance of the Mann-Whitney statistic are presented in table 67. Based on the corrected alpha, the two comparisons that

were statistically significant were the comparison between the southern accreditation agency with the NCA-HCLL and New England accreditation agencies.

Other Comparisons

The percentage of websites and respondents belonging to public versus private institutions differed significantly by accreditation agency (Table 68). All accreditation agencies had more public than private schools except for the New England accreditation agency.

There were only two survey questions and two content analysis questions that had differences between public versus private schools based on a Mann-Whitney and Chi-square analysis. The survey questions that differed were how to define sustainability and which on-campus group was most involved in the sustainability process. Private IHE respondents were more likely to select “improving the environment” than public IHE respondents (nineteen versus thirteen percent). Public IHE respondents were more likely to select “all of the above” meaning improving the environment, economy, and society (seventy-one versus sixty-five percent). Public IHE respondents were more likely to indicate that administration is most involved in campus sustainability (forty-six versus thirty-six percent) and private IHE respondents were more likely to indicate that staff and students are more involved in the sustainability process (forty-five versus thirty-six percent). For the content analysis, public universities were more likely to mention sustainability on the main page (fifteen versus twelve percent). Private universities were less likely to have policies (sixty-four versus fifty-six percent with policies) and less likely to have zero mentions of sustainability in their policies (thirty-three versus forty-two percent).

The percentage of websites and respondents with different student populations by accreditation agency also differed significantly by accreditation agency (Table 69).

There was only one survey question that differed by student population and that was the on-campus sources where MLD-RF obtained information. Small IHEs (less than 5,000 students) were more likely to rely on academic departments than mid sized (5,000-15,000) or large (>15,000) universities (sixteen percent versus seven and four percent). Small IHEs were also much less likely to rely on a campus sustainability office (eight percent versus seventeen and thirty-one percent). This outcome may point to the fact that smaller universities are less likely to have an official campus sustainability office than larger universities. The majority of the questions in the content analysis showed a significant difference between the large university and the other categories. Large IHEs were more likely to define sustainability on their sites, have a definition that is consistent with the study definition, mention sustainability on their main page, include sustainability in their mission/goals/policies, include sources of sustainability information, claim an important role in the sustainability process, describe funding for buildings and other projects, and have a sustainability position.

In this chapter, the results from the content analysis and survey were described first by type of MLD-RF and then by other factors. In the next chapter, these results will be evaluated against the hypotheses and discussed in the context of the research questions.

CHAPTER 6

CONCLUSIONS, DISCUSSION, AND RECOMMENDATIONS

Conclusions and Discussion based on Results

The goals of this research were: to evaluate MLD-RF's attitudes toward sustainability and understand variability in these attitudes among MLD-RF; to evaluate how MLD-RF impact overall sustainability activities and the extent to which they communicate their campus sustainability activities; and to assess the extent and type of support for sustainability at IHEs within the purview of MLD-RF. In order to meet these goals three research questions were designed with supporting hypothesis.

This section explains how the results answer each research question. Each question along with hypotheses will be presented with a discussion of evidence that either supports the null hypothesis or allows for rejection of the null hypothesis. In general, the survey results were much more helpful in evaluating the hypotheses since such a large percentage of MLD-RF websites did not have information about sustainability.

Several factors can bias results from survey research. There is no verification mechanism to authenticate the data source. For instance, an environmental health and safety administrator could pass the survey along to an entry level environmental health and safety professional to complete. The target population was specifically director level individuals since they would have overall decision making responsibilities and presumably have expertise in the areas they supervise. An entry level individual responding to the survey would not be involved in the same type of decision making and would likely not have the broad scope and expertise of a director level respondent. With the increasing popularity of sustainability, social desirability may be an impediment to

accurate reporting of involvement. Finally, it is common for respondents to not take surveys seriously or provide misleading answers (Kent, 2001).

To address these uncertainties, data from both the content analysis and the survey were compared to determine the presence (if any) of trends within groups and differences between groups. This evaluation also included comparisons of whether survey and web based information are consistent. This two part (survey and content analysis) investigation also allows a determination of whether self reported involvement in sustainability programs is effectively communicated via websites at IHEs.

When there were differences between the content analysis and survey results, hypothesis testing was difficult. This is because lack of information about sustainability on websites could not necessarily be equated to lack of support for sustainability. Seven of the thirteen null hypotheses were rejected. Three hypotheses had evidence that supported the null hypothesis, and three hypotheses had results that were ambiguous.

Research Question A

Research question A along with the supporting null hypotheses, content analysis questions, and survey questions are detailed in Table 70. This section evaluates hypotheses 1 – 6, based on results associated with the relevant content analysis and survey questions. In general, MLD-RF understand the concept of sustainability and believe it is closely related to the study definition. Although MLD-RF believe that sustainability is personally important, they do not necessarily rank it high in their work priorities or consider it a core responsibility. They rely on outside information rather than personal knowledge for decision making about sustainability. They have positive

affective reactions about sustainability. Finally, there is much variability between groups of MLD-RF in their responses to the questions and their communication on websites.

Hypothesis 1

The overall evidence for hypothesis 1 led to a rejection of the null hypothesis and support of the alternate hypothesis (MLD-RF are able to define sustainability and believe it has a definition close to the study definition). Although the content analysis results were not helpful in making this determination, the survey results all supported this conclusion.

Because of the low number of MLD-RF sites defining sustainability in the content analysis, it is not possible to determine whether MLD-RF define sustainability in a manner that is consistent with the study definition. For instance, only two of the one hundred and thirty six facilities websites defined sustainability and were consistent with the study definition. Only one safety department defined sustainability; its definition differed from the study definition.

Sixty-three percent of the sustainability sites defined sustainability. Of the sites that defined sustainability, fifty-four percent had definitions that were consistent with the study definition. Many of the sustainability sites whose definitions were not consistent with the study definition used the Brundtland report basic definition of sustainable development, “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (United Nations, 1987), without providing additional definition. It was not clear on any of these websites that IHEs were accepting the underlying Brundtland construct; instead, they simply quoted the above section without providing further details. A sizeable minority of sustainability sites also

defined sustainability only in terms of environmental improvements and greening campuses and did not include social and economic components in their definitions.

For evaluation of survey question 1, the results were compared to an equal distribution (chi-square (χ^2)) and a normal distribution (Kolmogorov-Smirnov (Z)). All portions of question 1 were significantly different than the equal distribution (χ^2) and the normal distribution (Z); $p < 0.001$. The Spearman rank-order correlation coefficient (ρ) for all comparisons showed a strong positive correlation between all six portions of question 1 ($p \leq 0.001$). Results ranged from not important (-2) to important (2). All responses were slightly positive (means of 0.96 through 1.63). This supports the idea that MLD-RF understand that sustainability includes social, economic, and environmental dimensions.

Survey question 2 gave response options of “I don’t know”, and “improving the environment”, “improving society”, or “improving the economy”. These definitions were considered inconsistent with the study definition, therefore supportive of the null hypothesis. The option that was consistent with the study definition was “all of the above”. The “other” responses were hand keyed and either grouped with those supporting the null hypothesis or those that did not support the null hypothesis. When the results (132 inconsistent and 294 consistent with the study definition) were compared to the expected frequency for the null hypothesis, the chi-square statistic ($\chi^2 = 69$) was significant with $p < 0.001$. Fifty-eight to eighty-three percent of respondent chose the correct definition of sustainability in question 2.

The fact that such a high percentage of respondents were able to correctly define sustainability is interesting when compared to the low percent of MLD-RF websites that

mention and define sustainability. The survey had a couple of potential uncertainties. It is possible that the respondents were more knowledgeable about sustainability than the non-respondents, therefore more able to define sustainability than the general population. Also, the question design may have influenced the outcome, for instance the order in which the questions were asked or the fact that they were multiple choice could have aided individuals in their ability to define sustainability. Despite these uncertainties, the results support rejecting the null hypothesis and lend evidence to the alternate hypothesis that MLD-RF are able to define sustainability and believe that it has a meaning close to the study definition.

Hypothesis 2

The results are mixed for hypothesis 2 with results from both the content analysis and survey supporting null hypothesis 2 (MLD-RF either do not rank sustainability in their list of priorities or rank it below all other priorities). Two questions from the survey indicated that sustainability was important to MLD-RF personally. Based on these results, it appears that although sustainability may be important personally to MLD-RF it does not rank high in work priorities.

In the content analysis, the majority of MLD-RF websites did not mention sustainability on the main page (range of ninety-two to ninety-eight percent) or interior pages (range of seventy-eight to ninety-four percent). The websites that did mention sustainability typically listed it after other priorities. The results from the content analysis support the null hypothesis.

For the evaluation of the survey questions, results were compared to an equal distribution (χ^2) and a normal distribution (Z). All three questions were statistically

different than the equal distribution (χ^2) and the normal distribution (Z); $p < 0.001$ for all items. The Spearman rank-order correlation coefficient (ρ) for all comparisons showed a positive correlation ($p < 0.001$). For this analysis, results ranged from not important (-2) to important (2). Question 7 was positive with mean of 1.55 (standard deviation 0.8), question 8 was slightly negative with a mean of -0.11 (standard deviation 0.9), and question 9 was slightly positive with a mean of 0.29 (standard deviation 1.1). The results were mixed and do not strongly support rejecting the null hypothesis.

In this case, neither method leads to rejection of the null hypothesis. The conclusion based on the results from hypothesis 2 is that although MLD-RF as a group are aware of the concept of sustainability and consider it important it is not ranked high in their set of work priorities.

There were differences between MLD-RF in both the content analysis and the response to the survey. Facilities directors prioritize sustainability higher than other groups of MLD-RF. There were significant differences between facilities respondents and other groups in three of the five questions for hypothesis 2. Facilities respondents also had a mean that was higher than all other groups for the survey questions and had more websites with sustainability mentioned on both the main and interior pages for the content analysis.

Hypothesis 3

The results from the content analysis support the null hypothesis (MLD-RF do not consider sustainability a core responsibility). Although the results of the survey support rejecting the null hypothesis, when the survey is further analyzed by type of MLD-RF, it

shows that only the majority of facilities respondents indicated that sustainability is a core responsibility. Therefore, the null hypothesis cannot be rejected.

In the content analysis, the majority of MLD-RF websites did not mention sustainability in their mission statement, goals, or responsibilities or didn't have mission statements, goals, or responsibilities listed (range of ninety-seven to ninety-eight percent). The results from the content analysis do not support rejecting the null hypothesis.

For survey question 17 the results were compared to an equal distribution and a normal distribution. The responses to this question were significantly different than both the equal distribution (χ^2) and the normal distribution (Z); $p < 0.001$ in both cases. Results ranged from never (0) to always (4). The mean was 1.99 (standard deviation 1.0) describing an average response between sometimes and often for how often MLD-RF consider sustainability when making work related decisions. For question 18, fifty-three percent of respondents considered sustainability as a core responsibility. Results from both questions support rejecting the null hypothesis.

Although grouped results for MLD-RF support rejecting the null hypothesis, question 18 had mixed results when evaluated separately for the different MLD-RF. Facilities managers clearly consider sustainability a core responsibility. Eighty-five percent of respondents indicated that this was the case. However, all other groups of MLD-RF did not consider sustainability a core responsibility (fifty-two to fifty-nine percent said "no"). Also, facilities directors indicated significantly more frequent consideration of sustainability in work related decisions than all other groups. The results from the facilities respondents support the alternate hypothesis that MLD-RF consider

sustainability a core responsibility but the other MLD-RF respondents provided split feedback on this hypothesis.

Hypothesis 4

The evidence from the content analysis is inconclusive for this hypothesis. However, the survey supports rejecting the null hypothesis (MLD-RF rely on personal knowledge when making decisions about sustainability).

In the content analysis, the vast majority of websites did not list sources of sustainability information (ninety-six to ninety-nine percent). However, this does not necessarily indicate that they rely on their own knowledge. This is because a large percentage of MLD-RF sites did not mention sustainability and even those that mentioned it may not have listed a source of the information they describe. Eighty-two percent of sustainability websites did list sources.

For survey question 12, eighteen percent of respondents indicated that they do not make decisions about campus sustainability. Ten percent of respondents indicated that they rely on personal expertise. The remaining seventy-two percent of respondents indicated that they rely on information from other sources; forty-nine percent from off-campus sources and twenty-three percent from on-campus sources. This supports rejecting the null hypothesis since only ten percent of respondents indicated that they rely on personal knowledge for sustainability information. Facilities and research faculty respondents were slightly, but not significantly, more likely to rely on personal expertise.

For survey question 15, eighteen percent of all respondents indicated that they do not receive information about sustainability at their campus. Facilities, research faculty, and safety respondents were each more likely to indicate their own department as their

primary source of sustainability information as compared to other respondents. Forty-two percent of facilities respondents indicated that the facilities department was their primary source of information compared to fifteen to twenty-five percent of respondents from other groups. Twenty-one percent of research faculty indicated that faculty are their primary source for sustainability information compared with two to eight percent of respondents from other groups. Fifteen percent of safety respondents indicated that the safety department was their primary source compared to two to five percent of respondents from other groups. Purchasing was not given as a response option for this question. The same trend was mirrored in question 16. Twenty-three percent of all respondents indicated that they would not rely on any of the listed departments for information about sustainability. This result indicates that each type of respondent has more confidence in the knowledge of their department than any other unit. This could be a result of familiarity and communication within the department that does not reach other departments.

Hypothesis 5

All survey questions related to this hypothesis support the null hypothesis, that MLD-RF have positive affective reactions toward sustainability. No content analysis questions were used to evaluate this hypothesis.

The survey questions were compared to an equal distribution (χ^2) and a normal distribution (Z). All questions were statistically different than the equal distribution (χ^2) and the normal distribution (Z); $p < 0.001$ for all items. The Spearman rank-order correlation coefficient (ρ) for all comparisons showed a strong positive correlation ($p < 0.001$). The results all support the null hypothesis.

The group that had the most positive affective reaction to sustainability was the facilities maintenance respondents (mean range of 0.9 through 1.49) and the group that had the least positive affective reaction to sustainability was the safety respondents (mean range of 0.59 through 0.95). The question with the most positive responses on average was question 25.

Hypothesis 6

Hypothesis 6 was evaluated throughout the previous results sections. There was variability, supporting rejection of the null hypothesis. In the content analysis, six of seventeen questions had variability between types of MLD-RF that was statistically significant. In the survey, twenty-six of the forty-one non-demographic questions had statistically significant variability between types of MLD-RF.

The facilities/research faculty comparisons were the most different in both the content analysis and the survey (6 of 6 comparisons in the content analysis and 26 of 26 comparisons in the survey). This was followed by the facilities/safety comparisons (6 of 6 in the content analysis and 21 of 26 in the survey) and facilities/purchasing comparisons (6 of 6 in the content analysis and 16 of 26 in the survey). A portion of this variation may have been explained by the demographics. The facilities group indicated a significantly shorter longevity in higher education than research faculty. Facilities respondents also were significantly more likely to be male than research faculty or purchasing respondents. Finally, facilities respondents had also been at their current IHE for a significantly shorter period on average than any other group. The safety/purchasing comparison had no significant differences in the content analysis and only 2 in the

survey. All other pair wise comparisons had several questions with significant differences.

Research Question B

Research question B along with the supporting null hypotheses, content analysis questions, and survey questions are detailed in Table 71. In this section, the hypothesis will be evaluated and interpreted based on the questions in table 71. The combined evidence from the content analysis and survey measures indicate that MLD-RF have an important role in decision making about sustainability. They also have some control and flexibility when making decisions about campus sustainability. Although they have this involvement, they do not communicate their involvement effectively through their websites.

Hypothesis 7

Although the MLD-RF websites do not support rejecting the null hypothesis, the sustainability sites indicate a more important role for MLD-RF. The survey responses support rejection of the null hypothesis. The overall study therefore supports rejection of the null hypothesis.

Only four percent of MLD-RF websites indicated that they have an important role in campus sustainability. However, Twenty-nine percent of sustainability sites indicated that safety has a major role in campus sustainability, thirty-one percent of sustainability sites indicated that purchasing has a major role in campus sustainability, and seventy-six percent of sustainability sites indicated that facilities and research faculty have a major role in campus sustainability. The low number of MLD-RF sites describing a major role

in campus sustainability could be because they rely on the central sustainability site and do not communicate their role separately.

All three survey questions were statistically different than the equal distribution (χ^2) and the normal distribution (Z); $p < 0.001$ for all items. The Spearman rank-order correlation coefficient (ρ) for all comparisons showed a positive correlation ($p < 0.001$). For question 3, results ranged from no role (0) to primary responsibility (4) the respondents had a mean of 2.32 (standard deviation 0.9), the majority of respondents indicated a minor role (2) or a major role (3). For questions 4 and 5 results ranged from never (0) to participating in all decisions/meetings (4). Question 4 had a mean of 1.73 (standard deviation 1.3) and question 5 had a mean of 1.6 (standard deviation 1.1), the majority of respondents indicated participating once per semester (1) or once per month (2). Fifty-five percent of respondents indicated that they have an active role in the meetings/forums that they do attend. Results from the survey support rejecting the null hypothesis. Overall, there is more support for the alternate hypothesis, that MLD-RF have an important role in campus decision making about sustainability.

Facilities respondents reported significantly more involvement than any other group. The majority of facilities respondents indicated that they have: a major role in decision making about campus sustainability, they participate in all decisions about campus sustainability, they attend campus meetings about sustainability more often than any other group, and eighty percent indicated that they have an active role in the meetings.

Hypothesis 8

The responses to the survey questions showed that MLD-RF have some support and flexibility when making decisions about campus sustainability. This information supports rejection of null hypothesis 8.

Both survey questions were statistically different than the equal distribution (χ^2) and the normal distribution (Z); $p < 0.001$. The Spearman rank-order correlation coefficient (ρ) showed a positive correlation ($p < 0.001$). For question 19, results ranged from no control (0) to high control (4) the responses had a mean of 2.15 (standard deviation 1.3), the majority of respondents indicated neutral or moderate control. For question 20 results ranged from no flexibility (0) to high flexibility (4), the responses had a mean of 3.01 (standard deviation 1.1) with an average of moderate. Both results support rejecting the null hypothesis in support for the alternate hypothesis, that MLD-RF have control and/or flexibility when making decisions that impact operational campus sustainability.

Although MLD-RF as a group indicated that they have control in making campus-wide decisions about sustainability this differed by type of respondent. Facilities respondents were positive with eighty-seven percent indicating that they had either moderate or high control. Purchasing respondents were also positive with sixty percent of respondents indicating that they had either moderate or high control. Safety was nearly evenly split between positive and negative responses with forty percent indicating moderate or high control and forty-two percent indicating low or no control. Research faculty had a majority of negative responses with only twenty-six percent indicating moderate or high control and sixty-four percent indicating low or no control. The majority of all groups of respondents indicated that they had either moderate or high

flexibility in making decisions about sustainability for their unit. Facilities respondents were significantly more positive than all other groups for this question also.

Hypothesis 9

The evidence from all portions of the content analysis support null hypothesis 9. Although twenty-nine to sixty-seven percent of sustainability websites indicated that MLD-RF had a major role in the campus sustainability process, only two to eight percent of MLD-RF sites mention sustainability on their main page and only six to twenty-two percent of MLD-RF sites mention sustainability in interior pages (questions 3 and 4). Also, only two to three percent of MLD-RF sites mention sustainability in their mission, goals, or responsibilities.

Although most portions of the survey were positive and showed that the MLD-RF respondents support campus sustainability, very few MLD-RF websites even mentioned sustainability. There could be several reasons for this contradiction. A small percentage of MLD-RF indicated that sustainability was their primary responsibility in survey question 3 (two percent of research faculty and purchasing respondents, four percent of safety respondents, and twenty-one percent of facilities respondents). This was roughly equivalent to the percent of websites that mentioned sustainability on either the main or interior pages (six to twenty-two percent). Therefore, MLD-RF may only include sustainability on their website if it is their primary responsibility. Another possible reason for the lack of communication on their websites is that it may be policy of their IHE to place all sustainability related information on a central website. Finally, they may communicate information about sustainability in some other manner than through their websites.

Research Question C

Research question C along with the supporting null hypotheses, content analysis questions, and survey questions are detailed in Table 72. In this section, the hypothesis will be evaluated and interpreted based on the questions in Table 72.

The combined analysis of the content analysis and survey lead to mixed messages about whether sustainability is included in institutional and/or departmental mission statements, goals, or policies. It is not clear whether IHEs are including sustainability in these items and not effectively communicating them through the websites, or whether sustainability is not included in these items at all. IHEs provide some level of funding for operational sustainability, although it is not clear to what level sustainability positions, capital improvements, and smaller operational improvements are funded. Finally, MLD-RF feel empowered to make decisions about campus sustainability and feel that these decisions will be supported.

Hypothesis 10

The results for hypothesis 10 are mixed. Although MLD-RF indicate that sustainability is included in their department missions, goals, and policies, this is not reflected by what is communicated on the MLD-RF websites.

The majority of MLD-RF websites did not mention sustainability in their mission, goals, or responsibilities (ninety-seven to ninety-eight percent). This result supports the null hypothesis.

Survey question 9 was statistically different than the equal distribution (χ^2) and the normal distribution (Z); $p < 0.001$ for all items. The Spearman rank-order correlation coefficient (ρ) for all comparisons showed a positive correlation ($p < 0.001$). Results

ranged from not at all a priority (-2) to a top priority (2). Question 9b had a mean of 0.04 (standard deviation 1.0), the majority of respondents indicated that sustainability was equal to many other issues in priority to their department. Question 9c had a mean of 0.16 (standard deviation 1.0), the majority of respondents indicated that sustainability was either equal to many other issues in priority or somewhat more important than other issues to their university.

Thirty percent of respondents to question 10 indicated that sustainability is included in the department mission; fifty-six percent indicated that it is included in the department goals; and sixty-one percent indicated that it is included in the department policies. For question 11, thirty-eight percent of respondents indicated that sustainability is included in the university mission; sixty-six percent indicated that it is included in the university goals; and sixty-five percent indicated that it is included in the university policies. These results support rejecting the null hypothesis.

The results from the content analysis and survey disagree for hypothesis 10. Although thirty-six, fifty-six, and sixty-six percent of MLD-RF indicated that the department includes sustainability in the mission, goals, and policies respectively this was not supported by the content analysis. Ninety-seven to ninety-nine percent of sites did not mention sustainability in their missions, goals, or responsibilities and ninety-one to ninety-eight percent of policies do not mention sustainability. This difference is significant and difficult to explain. It is possible that the respondents were overwhelmingly from those IHEs that do include sustainability in their mission, goals, and policies. It is also possible that MLD-RF who responded to the survey assumed that sustainability was part of their mission, goals, and policies even though it was not.

Hypothesis 11

The survey results related to financial support for campus sustainability indicate that IHEs support operational efforts in this area. These results support rejecting the null hypothesis.

Forty-eight percent of respondents to survey question 24 indicated that their institution does provide financial support for sustainability. Safety and facilities respondents had significantly different responses to this question when compared with research faculty. Facilities respondents were most likely to indicate that their IHE provides financial support for sustainability (sixty-one percent of respondents). A high percentage of safety respondents also indicated that their institutions provide financial support for sustainability (fifty-seven percent). Forty-four percent of purchasing respondents and thirty-four percent of faculty respondents indicated that their institutions provide financial support for sustainability. All respondents were drawn from the same pool of IHEs therefore no significant difference would be expected.

There are a couple of explanations for this significant difference. Perhaps facilities and safety respondents were more likely to come from IHEs where financial support is provided for sustainability. Alternately MLD typically report through the operations side of the IHE. It is possible that they are more aware of financial support for sustainability initiatives and this information has not been effectively communicated to the research faculty on their campuses. Finally, funding may be more likely to be provided to MLD for projects for improvements in operational sustainability than to research faculty leading MLD to be more aware of the initiatives since they are directly involved in them.

Hypothesis 12

The content analysis results related to funding for campus sustainability are mixed. Although sustainability websites indicate that projects and processes are being funded, MLD-RF sites do not report this same level of funding.

None of the science, safety, and purchasing sites described building facilities sustainably. Eight percent of the facilities websites described building facilities sustainably. In contrast, sixty-four percent of the sustainability websites described building facilities sustainably. None of the science websites described other funding for sustainability. Only one percent of safety and purchasing sites described other funding for sustainability. Seven percent of facilities sites and seventy-seven percent of sustainability sites described other funding for sustainability. Only four percent of the facilities websites and one percent of safety websites described a sustainability position. Neither of the other MLD-RF websites described a sustainability position. Twenty-eight percent of sustainability websites described a sustainability position. Of the sites that did describe a sustainability position, ninety percent were full time positions.

These results are mixed. It is clear that some IHEs do provide funding for sustainability however, it is not described on most of the MLD-RF websites. The buildings and projects number matched fairly closely with the survey response to question 11 for the facilities respondents. This could mean that facilities respondents are most involved and knowledgeable about the projects going on at their IHE.

Hypothesis 13

The results from the survey indicate that MLD-RF feel empowered and supported to make decisions about sustainability, supporting rejection of the null hypothesis. All three

survey questions were statistically different than the equal distribution (χ^2) and the normal distribution (Z); $p < 0.001$ for all items. The Spearman rank-order correlation coefficient (ρ) for all comparisons showed a positive correlation ($p < 0.001$). For question 21 results ranged from not at all empowered (0) to highly empowered (5) the responses had a mean of 3.05 (standard deviation 1.1), the majority of respondents indicated that they were moderately empowered (3). Results to question 22 and 23 ranged from (0) no support to (4) highly supported. Question 22 had a mean of 3.0 (standard deviation 1.1) and question 23 had a mean of 3.21 (standard deviation 1.0) with the majority of respondents in both cases indicating moderate support.

All MLD-RF were more positive about decisions for their laboratory/unit than for campus wide decisions about sustainability. Facilities maintenance respondents felt more empowered to make all types of decisions (mean 1.35 through 1.6) as compared to the rest of the MLD-RF (mean 0.58 through 1.03).

The results related to the research questions demonstrated that there is variability between how much involvement MLD-RF report and how much they communicate through their websites. They report a higher level of involvement than they communicate. There is also variability between involvement of different types of MLD-RF in campus sustainability. Facilities respondents are the most involved. MLD-RF in general understand sustainability; have positive affective reactions to sustainability and believe it is personally important; feel empowered and supported to make decisions; feel that they have flexibility and control in decision making about sustainability; and are involved in campus decision making about sustainability. However, MLD-RF do not necessarily view sustainability as a work priority or core responsibility. MLD-RF

typically rely on outside information for decision making about campus sustainability. There are some continuing uncertainties related to the research questions. It is unclear whether MLD-RF include campus sustainability in departmental mission statements, goals, and policies and what level and types of funding are provided for operational campus sustainability.

General Conclusions and Discussion

In general, MLD-RF feel that sustainability is important and report involvement in the sustainability process. These feelings and involvement are not effectively communicated on MLD-RF websites, but their involvement is noted on sustainability websites. Despite these personal attitudes about sustainability, MLD-RF do not feel that it is a core responsibility or top priority for their unit.

Based on both the survey and content analysis, facilities respondents were typically the most positive about campus sustainability and most involved in campus sustainability. They also were the most likely to know about projects related to sustainability and most likely to communicate their involvement on their websites.

One interesting confounding factor for facilities respondents is that they had been at their current IHE and working in higher education for a significantly shorter time than all other groups of respondents. Their age was not significantly younger than other groups of respondents. Therefore, it is likely that they worked for another job sector prior to working in higher education. This may support the contention of Creighton (1998), Dahle and Neumayer (2001), and Shriberg (2002b) who all indicate that IHEs are behind in becoming sustainable as compared to the private sector. Another possibility is that IHEs are doing a better job of communicating sustainability efforts to their newer

employees. Finally, it is possible that facilities departments are much more involved in sustainability; and that the length of service has no real impact on whether an individual is likely to be involved in the sustainability process.

Purchasing directors were least likely to respond to the survey and had the lowest completion rate. They also were most likely to respond to the survey request in a negative fashion asking to be removed from the study. Two respondents from the purchasing department indicated that they were not interested and their entire IHE should not be contacted again. The purchasing directors that did respond were more likely to be from larger, public institutions. This low level of response may be due to time demands of the purchasing position or may indicate a lower level of interest in sustainability in this group as a whole. Interestingly, the lowest ranking of importance for all items in survey question 1 (in your opinion how important are the following items to improving campus sustainability?) was the one that asked about the importance of “purchasing locally”. This may also reflect a lack of communication or involvement related to sustainability from the purchasing unit.

Research faculty respondents were typically the least positive about and least involved with campus sustainability. Thirty percent of research faculty respondents indicated that they never participate in decision making about campus sustainability and nearly as many never attend meetings where campus sustainability is discussed. Also, although MLD-RF respondents were drawn from the same pool of IHEs, research faculty had a significantly lower opinion than MLD about how their IHE prioritized sustainability. This indicates that campus sustainability is supported to some extent at

many IHEs but this support is not necessarily communicated outside of the operational departments.

One interesting trend was that research faculty felt that they had more expertise and were more likely to rely on faculty for information about sustainability than any other group. Purchasing respondents rated faculty involvement low and were extremely unlikely to rely on faculty for information about sustainability. Safety and facilities respondents also rated faculty involvement low and were unlikely to rely on them for sustainability information. These results indicate a lack of communication and/or trust between the academic and administrative departments at the respondents' IHEs. Although many of these IHEs have science, engineering, business, and other academic departments that would conceivably have a high level of expertise about sustainability, this resource is clearly not being relied upon for typical MLD respondents.

Based on the overall results, it is not surprising that the facilities and research faculty respondents and websites had the most significant differences. One surprising outcome was that the comparison that had the second most significant differences was in the facilities/safety comparison. At many IHEs, the safety function is housed within the facilities department and/or they report to the same Vice President. The fact that their responses and websites were significantly different and that the facilities department was much more likely to be involved and knowledgeable seems counterintuitive. The safety department typically has scientific knowledge and responsibility for environmental compliance; therefore it would seem logical that they would be involved and/or knowledgeable about the sustainability activities on campus. This proved not to be the case.

One unexpected outcome was the low rating of student involvement and influence by MLD-RF. The case studies and surveys in the literature, student involvement is detailed as high. Also, suggestions in the literature typically recommend a high level of student involvement. Further research would be needed to determine if MLD-RF feel that student involvement and influence is actually low. MLD-RF had to select one group with the most involvement and influence and it is possible that they feel administrative involvement is higher but that students are involved as well.

Accreditation agency did not appear to have a large influence on attitudes and communication about sustainability. The comparison that had the most significant differences in the content analysis was the NW Comm/Southern comparison with four questions with significant differences. This comparison did not have any significant differences in the survey responses. The Southern accreditation agency was one of the larger accreditation agencies with 171 websites analyzed whereas the NW Comm was the smallest accreditation agency included with only 30 websites analyzed. The NW Comm websites included were significantly more likely to communicate about sustainability (define it, mention it on the main page, and claim an important role in the process). All other comparisons of accreditation agencies had two or less significant differences. This supports the conclusion that there are not major significant differences in accreditation agency requirements as they relate to sustainability.

The accreditation review mechanism for all six regional accreditation agencies varies, but all reviews include an evaluation of economic management practices and social justice issues (Council for Higher Education Accreditation, 2009). The New England accreditation agency discusses the environment in their standards and the NCA-HCLL

specifically mentions sustainability in their most recent accreditation standards. No clear pattern of the New England or NCA-HCLL accreditation agencies emerged during the evaluation process, therefore these minor sections in the accreditation standards appear to have no sizeable impact on whether an institution has adopted sustainable practices.

Other IHE demographics did not have a major impact on the outcomes of the self-directed content analysis questions or survey questions. For instance, for the comparison of public versus private IHEs, there were only statistically significant differences in two of the content analysis questions and two survey questions.

One item that had a major impact on the content analysis was size of the student population at an IHE. Larger institutions were much more likely to include sustainability verbiage, definitions, and roles on their MLD-RF websites. This may be due to the additional resources that are available at IHEs with larger student populations. With additional resources, sustainability positions and projects are more likely to be funded.

The analysis of the sustainability sites also provided some interesting findings. The central sustainability sites communicated more information and involvement in all areas related to sustainability (as would be expected). One finding was that the majority (84%) of sustainability websites did not include policies and the majority of MLD-RF websites also did not include policies that mention sustainability. This is in contrast to the sixty-one percent of MLD-RF respondents who indicated that sustainability is included in department policies. Since websites are now such a common means of communication at IHEs it is difficult to explain this difference.

Sustainability sites were the only type of site that included significant sources of information about sustainability. Twenty-four percent of these sites included links to

other IHEs with sustainability information; forty-two percent included links to government sites; fifty-one percent included links to commercial sites; fifty-nine percent included links to other units within their IHE; and seventy percent included links to other nonprofit agencies. This matches with the responses from MLD-RF that they obtain most of their information from outside sources.

The findings from the sustainability sites were much more closely matched to the findings of the survey than the findings from the MLD-RF websites. They indicated a fairly high level of involvement from all types of MLD-RF (twenty nine percent indicated safety department involvement, thirty-one percent indicated purchasing department involvement, and seventy-six percent indicated involvement from facilities and research faculty members). One difference was between the self-reported involvement of research faculty members (lower than other MLD-RF) and the level of involvement indicated on the sustainability websites (higher than other MLD-RF). This difference likely stems from the fact that not all faculty members are involved with the sustainability process. Since MLD were directors of their respective units, they were much more likely to be aware of involvement in sustainability initiatives.

Recommendations are based on the conclusions of the hypothesis testing, including conclusions about variation in communication and involvement by units.

Recommendations

Implications of this Research for Implementing Campus Sustainability

The response rate for this study was typical for surveys but still fairly low. It is possible that a one hundred percent response rate would have yielded a less positive reaction to sustainability. However, the sample of nearly 500 individuals was robust

enough to make some conclusions and recommendations that may be important for individuals implementing campus sustainability in the United States.

The first conclusion is that MLD-RF, individuals who make many critical decisions for IHEs, in general have a positive attitude toward sustainability and are willing to be involved in the process. The majority of MLD-RF who responded to the survey were able to define campus sustainability. A large majority of MLD-RF indicated that they felt that sustainability was either important or very important, yet many indicated that they do not prioritize sustainability process for their department/laboratory. The MLD-RF were specifically selected for inclusion in this study because of their academic or functional expertise and are important stakeholders in the campus sustainability process. The low level of communication about sustainability by MLD-RF was a negative surprise; however, their willingness to be involved was also surprising. This could be explained by the fact that respondents to the survey may have been more positive about sustainability than non-respondents (whose websites may have been analyzed). This may be a large untapped group of individuals who would be willing participants if invited to the campus sustainability discussion.

A second conclusion is that there may be major communication problems related to campus sustainability between the administrative and academic departments at many IHEs. This was demonstrated by the responses to the questions about support by IHEs for campus sustainability. Faculty respondents indicated a significantly lower rating for all questions where respondents were asked about institutional prioritizing of sustainability, IHEs including sustainability in goals, missions, or policies, or institutional funding for sustainability. Even though the respondents were drawn from the same IHEs,

the research faculty respondents felt that sustainability was prioritized and supported to a lesser extent than the MLD respondents. This finding is not surprising given the literature about difficulties in communication within IHEs and the traditional vertical hierarchy.

A telling response from research faculty was that the top response for where they received on campus information about sustainability was “I do not receive information about sustainability on my campus.” The top response from research faculty for the question “which of the following departments would you be most likely to rely on for information about sustainability” was “none of these departments” and the second place response was “an academic department”. Another confounding factor may be that faculty view sustainability as an administrative function. The number one choice for who faculty believed was most involved and had the most influence was “administration”. It is not entirely clear who they consider “administration” but this might indicate a bias toward believing sustainability is an administrative function.

This outcome is important for any IHE struggling with implementing sustainability initiatives. It may be especially important to not only include all types of MLD-RF in the sustainability discussions, but also for administrative departments to focus on communicating sustainability initiatives to academic departments and vice versa. This communication problem must be addressed for successful implementation of sustainability at most IHEs. Faculty typically have power and influence on both administration and students. It is important that the message about priority and action related to sustainability be communicated to this group.

This leads to the third conclusion, that the hierarchy of most IHEs may still make it difficult for sustainability initiatives to be implemented because there is not enough flexibility in roles for individuals in various units to all “own” the sustainability process. A small percentage of respondents claimed the “primary” role in the sustainability process although a larger minority indicated that they participate in all campus-wide decisions related to sustainability. A complex, multidimensional process like sustainability may need many individuals to “own” the process although not all individuals would be the primary owner. Solutions to this problem may include either assigning larger responsibilities related to sustainability to MLD-RF and other decision makers, or, integrating it into the work performance review process in some manner.

The recommendations for sustainability coordinators and champions from this research include:

- Carefully define what you mean by campus sustainability. Do not assume that all individuals are aware of the different components of sustainability. Many individuals and websites in this study indicated that sustainability was primarily environmental. If you want to convey a broader meaning for sustainability, you may need to make that explicit in all communication. The respondent who indicated that the term sustainability is “jargon” brought this point to focus. If you do not identify what you mean by the term, others may make assumptions that are not aligned with your expectations.
- Involve all of the stakeholders with expertise. The results showed that there were many more individuals with positive feelings toward sustainability than were involved. It is important to include all of the decision makers in larger

discussions even if actions are taken by a smaller subset of that group. If stakeholders are not involved in discussions, they are less likely to consider sustainability a core responsibility or include it in day-to-day actions. Also, this study demonstrated that MLD-RF were more likely to rely on their own department for expertise related to sustainability. Therefore, if a member of each stakeholder department is included in sustainability projects, communication is more likely to reach all areas of campus. Communicate to MLD-RF that they have valuable operational expertise that should be brought to the campus sustainability discussions.

- Know your constituency and what they can contribute to the goal of campus sustainability. Communication may need to be tailored toward a student, faculty, or staff perspective in order to effectively reach all members of your campus community. Academic faculty indicated in the survey that they were not receiving communication related to sustainability on their campus. Some tailoring of the message by academic faculty involved in the process may be needed in order to communicate with this group. Academic faculty members are much more involved in the daily life of students than operational managers, therefore, they are a vital audience to communicate sustainability initiatives.
- Don't make arbitrary divisions about who should be involved in the sustainability process. Much attention is focused on the faculty and student contributions to academic projects related to operational sustainability in the literature. Staff members should receive notice for their contributions and be included in academic projects in order to foster a sense of community. As the results of this

study show, there is a high level of interest in campus sustainability that may be tapped for involvement.

- Publicize your successes to all parts of the campus community. Don't assume that word of mouth will effectively spread information about initiatives and activities related to campus sustainability. You may have to ask for time on the agenda of department and/or college meetings in order to effectively communicate with all portions of the campus community. The results of this study indicate that most MLD-RF departments were not communicating contributions to sustainability initiatives and most MLD-RF relied on communication external to their IHE for sustainability information. Consider publicizing sustainability throughout all of the websites at your IHE.
- Find methods to integrate sustainability into the daily work activities of your various stakeholders. Unless they see sustainability as personal and part of their core responsibilities, it will be difficult to completely integrate sustainability into operations at any IHE. The results of this study showed that although sustainability was personally important to MLD-RF they were not considering it central to their work activities.
- Find ways to encourage across campus collaborations. Consider structuring the sustainability office as an independent office reporting directly to a high level of administration or having a shared reporting line through the operational and academic units. Evaluate ways to tie research about sustainability and sustainability in the curriculum to operational campus sustainability activities. Advertise funding opportunities for improving campus sustainability and give

preference for team projects that include individuals from across the university instead of in a single department. Encourage membership on the campus sustainability advisory board from all parts of campus.

- Take a pro-active approach to campus sustainability reporting. Agree on a common metric for reporting sustainability activities (such as the AASHE STARS program). Involve stakeholders from various groups on campus and publish metrics.
- Ensure that you have support for sustainability from the highest levels of the IHE. All groups of MLD-RF indicated that administration has the most impact and most influence on campus sustainability; this high level commitment appears central to promoting sustainability initiatives.

Future Research Directions

There were several outcomes of this research lacking clarity. The difference between reports of including sustainability in mission statements, goals, and policies and those that actually included these items on their websites was especially problematic. There may be some other reporting mechanism. However, policies are typically posted on websites at IHEs in the United States. A second issue was that there were differences between levels of support for sustainability reported by MLD-RF in the survey and those reported on the websites. Finally, outcomes from certain questions (such as where sustainability information was obtained and who has the most influence on campus sustainability) led to the conclusion that all of the optimal answers may not have been presented to the survey participants.

Further analysis of individual survey respondents in comparison to their websites would have been helpful. This could have been accomplished by collecting personally identifiable information of the survey participants. One issue that could have been resolved, for instance, is that all MLD-RF felt that administration was the most involved and had the most influence on campus sustainability (when compared with students, faculty, and staff). It would be interesting to follow up with respondents and determine who exactly they feel are “administration”. It would then be interesting to survey those “administration” individuals to determine if they felt they were the most involved and had the most influence at their IHEs. The difficulty with this is that it may have led to a lower response rate to the survey.

Future research into MLD-RF could include a broader survey sent to individuals who specifically participate in professional organizations related to their disciplines. Another method that might be helpful is identifying all research faculty at a limited number of institutions and inviting them individually to participate in a survey. Finally, a series of interviews with decision makers at institutions that are sustainability leaders and those that are not might add valuable insight into attitudes and participation.

Many of the questions on this survey have not previously been asked to a broad set of students or upper administrators (presidents or provosts). It would be useful to survey those groups with similar questions in order to evaluate differences between those groups and the MLD-RF. It would also be useful to survey a broader set of faculty at IHEs including those from non-science departments.

Case studies of institutions where the recommendations of this dissertation were implemented would be useful in order to determine if sustainability is advanced by increasing the involvement of MLD-RF in the process.

Campus sustainability initiatives have increased during the course of the work for this dissertation. The results of this study show a snapshot of the attitudes and involvement of MLD-RF in IHEs during the fall of 2009. Future repeat studies to gauge increased or decreased interest in sustainability would add additional generalizable knowledge in this field. A few additional questions that should be asked in future repeat studies include setting of the IHE (e.g. urban versus rural), including purchasing as a choice for the influence and involvement questions, and further clarifying what MLD-RF mean by the term “administration” in the influence and involvement questions.

Study Synopsis

This study was designed to evaluate MLD-RF’s attitudes toward sustainability and understand variability in these attitudes. It also was designed to evaluate how MLD-RF impact overall sustainability activities and the extent to which they communicate their campus sustainability activities. Finally, it was designed to assess the extent and type of support for sustainability at IHEs within the purview of MLD-RF. This was accomplished through a content analysis and survey of MLD-RF.

There is variability between groups of MLD-RF. In general, MLD-RF understand the concept of sustainability and believe it is closely related to the study definition and have positive affective reactions to sustainability. Although MLD-RF believe that sustainability is important to them personally and feel they have an important role in the sustainability process, they do not rank it high in their work priorities and do not consider

it a core responsibility. MLD-RF rely on outside information rather than personal knowledge for decision making about sustainability. They also have some control and flexibility when making decisions about campus sustainability and feel empowered to make decisions. They do not communicate their involvement effectively through their websites.

The results were mixed about whether sustainability is included in institutional and/or departmental mission statements, goals, or policies. IHEs provide some level of funding for operational sustainability, although it is not clear to what level sustainability positions, capital improvements, and smaller operational improvements are funded.

Directors of purchasing departments were least likely to respond to the survey, directors of facilities departments were the most involved and communicative about sustainability, research faculty were the least involved and least positive about campus sustainability.

MLD-RF should be included in decision making about sustainability because of their important operational roles and positive reactions to the concept. Communication between academic and operational departments should be improved to maximize sustainability efforts, and ownership and integration into daily work processes should be emphasized.

APPENDIX A

CONTENT ANALYSIS DATA MATRIX HEADINGS

Unique ID
University Name
Website
Agency
Website type
Name of Department
Q#1: Is Sustainability defined? (H1)
Q#2: Is definition consistent with the study definition? (H1)
Q#3: How many times is sustainability mentioned on main page? (H2)
Q#4: Interior pages? (H2)
Q#5 Is sustainability mentioned in the mission/goals/responsibilities? (H3/H10)
Q#6: How many policies on the site include sustainability? (H10)
Q#7: Does the site list sources for sustainability information? (H4)
Q#8: How many sources are from other universities? (H4)
Q#9: How many sources are government? (H4)
Q#10: How many sources are commercial? (H4)
Q#11: How many sources are nonprofit organizations (H4)
Q#12: How many sources other units within IHE? (H4)
Q#13: Does the site claim an important role in the sustainability process? (H7)
Q#14: Does the site describe building new facilities sustainability? (H12)
Q#15: Does the site describe other funding for sustainability? (H12)
Q#16: Does the site list a sustainability position? (H12)
Q#17: Is this a full time position focused on only sustainability? (H12)
Q#18: EH&S has a major role in sustainability? (H7)
Q#19: FM has a major role in sustainability? (H7)
Q#20: Purchasing has a major role in sustainability? (H7)
Q#21: Research Faculty have a major role in sustainability? (H7)
Number of Students
Type of Institution (pub/priv)
Undergraduate degrees offered?
Graduate degrees offered?
Basic Classification by Carnegie Foundation
Enrollment Profile
Size and Setting

APPENDIX B

CONTENT ANALYSIS CODING GUIDE

1. You will be given a Data Matrix pre-filled out with the websites in column A, UnivID in column B, and Sitetype in column C. You will complete columns D – Y for all of the websites in the list. Columns Z-AE will be completed by the primary coder. Columns V-Y will be prefilled with N/A for all types of websites except Sustainability Websites.
2. Click the link in column A to get on the internet and view the website. Once on the website, use the search function with your web browser to search for “sustain” on the main page. Only the term “sustainability” should be counted.
 - a. For column G, if sustainability is mentioned count how many times it is mentioned on the main page and place that number in the data matrix, if it is not mentioned place a “0” in the data matrix.
3. Search the interior pages for any mention of sustainability. You will want to make note of the pages that contain sustainability in order to answer column F and to return to them during the remainder of the steps. A demonstration of what is meant by “interior pages” is included as an Addendum. Please review the Addendum at this time if this is the first time performing these steps or if you need a refresher.

If sustainability is mentioned in the interior pages, count how many times it is mentioned on the interior page and place that number in column F of the data matrix, if it is not mentioned place a “0” in column F of the data matrix.
4. Review the site for a definition of sustainability
 - a. If sustainability is defined, choose Yes in column E of the data matrix, if not place a No in column E of the data matrix. If sustainability is not defined also place a N/A in column F of the data matrix.
 - b. *If* the definition of sustainability includes environmental, economic, and social, place a Yes in column F, if not, place a No in column F.
5. Search for “mission”, “goal”, or a listing of responsibilities. If a mission / goal statement or listing of responsibilities is located, review it for mention of sustainability. If there is no mission or goal statement on the site, place a “N/A” in column I in the data matrix. If the site contains a mission or goal statement place a yes in column I if sustainability is mentioned in the mission / goal statement and a no if sustainability is not mentioned.
6. Review the site for policies. Search the policies to determine if sustainability is mentioned. For column J record the number of policies that mention sustainability, if no policies mention sustainability put a “0”.
7. Review the site for sources related to sustainability (links to other websites).
 - a. If the site lists sources place a yes in column K of the data matrix. If the site does not list sources place a no in column I of the data matrix and an N/A in the data matrix in columns L through P and skip to # 8.
 - b. Determine how many sources are from other IHEs. Websites will typically end in “.edu”. Place the number of sources from other IHEs in the data matrix in column L, if none place a “0” in column L of the data matrix.

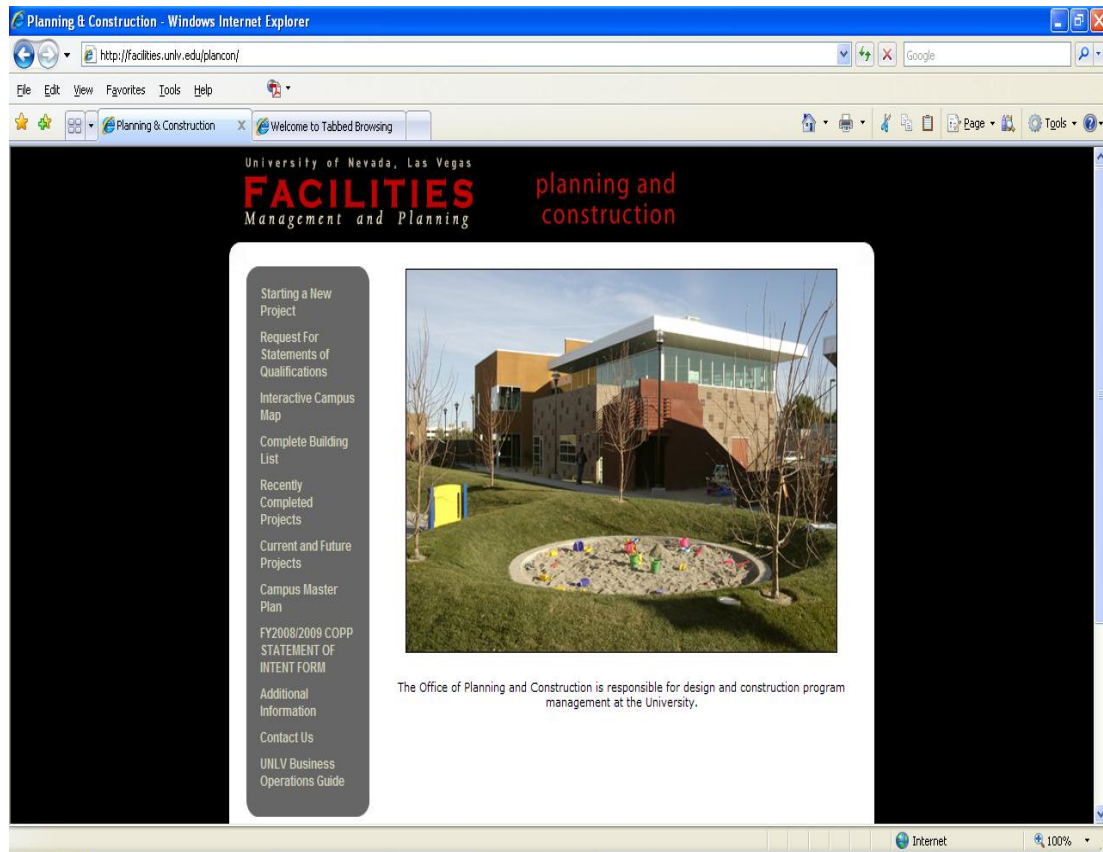
- c. Determine how many sources are from government agencies. The websites will typically end in “.gov”. Place the number of sources from government in column M of the data matrix, if none place a “0” in column M of the data matrix.
 - d. Determine how many sources are commercial. The websites will typically end in “.com”. Place the number of sources from commercial sources in column N of the data matrix, if none place a “0” in column N of the data matrix.
 - e. Determine how many sources are nonprofit organizations. The websites will typically end in “.org”. Place the number of sources from nonprofits in column O of the data matrix, if none place a “0” in column O of the data matrix.
 - f. Determine how many sources are from other units within the University or College that you are evaluating. Place the number of sources from the University or College that you are evaluating in column P in the data matrix, if none place a “0” in column P the data matrix.
8. If the site claims a role in sustainability that is “vital”, “central” or synonyms of these terms place a yes in column Q of the data matrix, if not place a no in column Q of the data matrix.
 9. If the site includes any mention of building “LEED” or sustainable buildings place a yes in column R of the data matrix, if not place a no in column R of the data matrix.
 10. If the site includes any information about funding or spending money on sustainability place a yes in column S of the data matrix, if not place a no in column S of the data matrix.
 11. If the site lists any positions related to campus sustainability put a yes in column T of the data matrix, if not place a no in column T of the data matrix.
 12. If you have a no in column T, place an “N/A” in column U. If you have a yes in column T evaluate the position to determine if it is a full time position dedicated to sustainability, if it is not place a no in column U of the data matrix, if it is place a yes in column U of the data matrix.
 13. For sustainability websites only.
 - a. Review the website to determine if Environmental Health and Safety (also called Risk Management & Safety, Safety Services or similar names) has a major role in campus sustainability. This would include policy development, serving on sustainability committees, serving as contact point for sustainability information, giving sustainability presentations, and similar activities). If Environmental Health & Safety has a major role in campus sustainability place a yes in column V of the data matrix, if not place a no in column V of the data matrix.
 - b. Review the website to determine if Facilities Maintenance (also called Facilities Management, Physical Plant, or similar) has a major role in campus sustainability. This would include policy development, serving on sustainability committees, serving as contact point for sustainability information, giving sustainability presentations, and similar activities). If Facilities Management has a major role in campus sustainability place a yes in column W of the data matrix, if not place a no in column W of the data matrix.

- c. Review the website to determine if Purchasing (also called Procurement, or similar) has a major role in campus sustainability. This would include policy development, serving on sustainability committees, serving as contact point for sustainability information, giving sustainability presentations, and similar activities). If Purchasing has a major role in campus sustainability place a yes in column X of the data matrix, if not place a no in column X of the data matrix.
 - d. Review the website to determine if Research Faculty (Faculty members from any of the academic departments that perform laboratory research such as Biology, Chemistry, Physics, Geology, Engineering, etc) has a major role in campus sustainability. This would include policy development, serving on sustainability committees, serving as contact point for sustainability information, giving sustainability presentations, and similar activities). If Research Faculty have a major role in campus sustainability place a yes in column Y of the data matrix, if not place a no in column Y of the data matrix.
14. At this point all rows and columns should be completed for the five websites from the institution that you are currently reviewing. If you have any blank spaces, revisit the instructions and go back to the website of concern to complete the data matrix. Save your data matrix in at least 2 locations so that no data will be lost if you have a problem with your computer. Once all spaces are complete for an institution move on to the next institution (the next five rows in your data matrix). Start back at #1 and repeat this process until you have evaluated all sites on your data matrix.

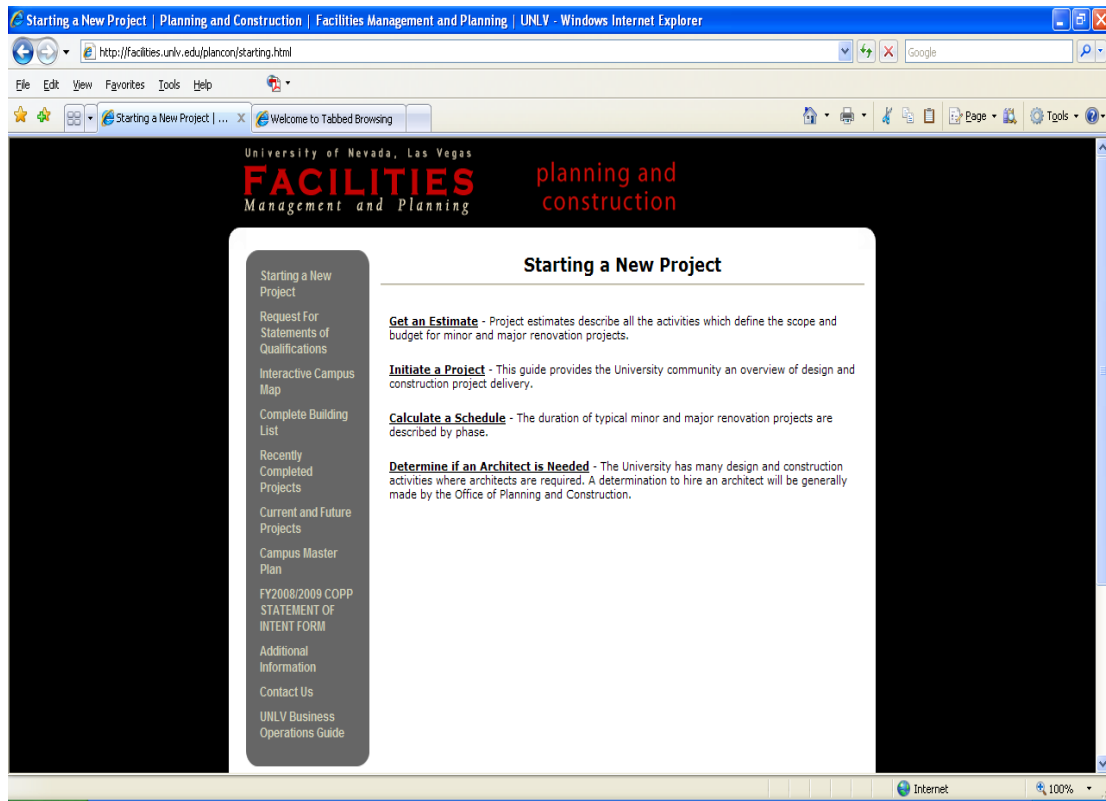
Addendum

This Addendum includes instructions of what is meant by a primary web page and what is meant by interior pages in this content analysis.

The below screen shot shows the UNLV **primary** Planning and Construction page.



Interior pages are accessible by clicking on the white links on the left hand navigation bar. The navigation bar may have different placement but will typically be a list such as the list in grey above. If you were to click on the white “Starting a New Project” link above it would take you to the interior site pictured below.



Further interior sites can be accessed by clicking on either the left hand navigation bar for a different topic or clicking on one of the hotlinks on the page such as “Determine if an Architect is Needed” if you were to click on that link you would go to another interior page pictured below.



You will always be able to tell which sites are part of the main site because they will begin with the same url at the top of the page. In this case they all begin with: <http://facilities.unlv.edu/plancon/>. You will want to verify the url before including it in the content analysis. Some of the links on the navigation bar do not take you to interior pages of the UNLV Planning & Construction website. For instance if you click on “UNLV Business Operations Guide” it will take you to the url: <http://hr.unlv.edu/StaffDevelopment/Business%20Operations%20Guide%20April%202007.pdf>. This site would not be included in the content analysis because it links to human resources (hr) rather than to an interior page on the website.

APPENDIX C

MLD SURVEY

Introductory Text

You are invited to participate in a research study titled the impact of individual decision making on campus sustainability initiatives. In order to participate in this survey you must be employed at a college or university in the United States and be classified as a faculty member with responsibilities for a research or teaching laboratory.

This survey is being administered by Aurali Dade and Dr. David Hassenzahl, Environmental Studies Department, University of Nevada, Las Vegas (702) 895-4440. Further information about the Environmental Studies department is available at: <http://environment.unlv.edu/>.

This research is intended to evaluate participation in and attitudes about campus sustainability. If you choose to participate you will be asked to complete a series of 39 questions related to campus sustainability on this website.

This survey is voluntary; you may choose to participate in the survey or refuse to participate at any point. There will be no compensation for the time involved in completing this survey. Although there are no immediately identifiable benefits of this survey, the information obtained will be utilized to draw conclusions that may aid in campus sustainability efforts at colleges/universities.

All information gathered in this study will be kept confidential and will be anonymous. No reference will be made in written or oral materials that could link you to this study. By clicking next below survey you authorize the investigators to use your responses in their research.

1. In your opinion how important are the following items to improving campus sustainability?

	Not Important	Somewhat Unimportant	Neither Unimportant or Important	Somewhat Important	Important
a) Choosing environmentally friendly products	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) Considering environmental impacts before construction projects are initiated	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c) Purchasing locally	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d) Considering impacts on neighbors	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e) Looking for options that will save money over time	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f) Looking for options that will enable development to continue	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

2. In your opinion campus sustainability is best defined to include the following concepts:

- ☐ Improving the environment
- ☐ Improving society
- ☐ Improving the economy
- ☐ All of the above
- ☐ I do not know
- ☐ Other (please specify): _____

3. How would you rate your role in decision making about campus-wide sustainability at your college/university?

- ☐ No role
- ☐ Knowledge but no role
- ☐ A minor role
- ☐ A major role
- ☐ Primary responsibility

4. Approximately how often do you participate in campus-wide decision making about sustainability?
- ☐ Never
 - ☐ Once per semester
 - ☐ Once per month
 - ☐ Once per week
 - ☐ I participate in all decisions
5. Approximately how often do you attend campus meetings/forums where sustainability is discussed?
- ☐ Never
 - ☐ Once per semester
 - ☐ Once per month
 - ☐ Once per week
 - ☐ I participate in all decisions
6. Do you have an active role in these meetings/forums (presenting or speaking)?
- ☐ Yes
 - ☐ No
7. In your opinion how important is campus sustainability?
- ☐ Not at all important
 - ☐ Somewhat unimportant
 - ☐ Neither unimportant or important
 - ☐ Somewhat important
 - ☐ Important
8. If I were to rank my work priorities, I would rank campus sustainability as:
- ☐ Much less important than other priorities
 - ☐ Somewhat less important than other priorities
 - ☐ Equal to other priorities
 - ☐ Somewhat more important than other priorities
 - ☐ Much more important than other priorities

9. Campus sustainability is prioritized by:

	Not at all a priority (not on the agenda)	Less of a priority than many other issues	Equal to many other issues in priority	Somewhat more important than other issues	A top priority
a) Me personally	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) My department	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c) My college/ university	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

10. My department includes campus sustainability in:

	Yes	No	I don't know
a) Mission statement	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) Goals	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c) Policies	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

11. My College/University includes campus sustainability in:

	Yes	No	I don't know
a) Mission statement	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) Goals	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c) Policies	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

12. When making decisions about campus sustainability where do you obtain information?

- ☐ Primarily from on-campus sources (e.g. e-mails, websites, handouts, publications)
- ☐ Primarily from off-campus sources (e.g. websites, publications, television programs)
- ☐ I have personal expertise that I rely upon
- ☐ I don't make decisions about campus sustainability

13. Which group is most involved in campus sustainability at your college/university?

- ☐ Students
- ☐ Faculty
- ☐ Staff
- ☐ Administration

14. In your opinion, which on-campus group has the most influence on campus sustainability decision making?

- ☐ Students
- ☐ Faculty
- ☐ Staff
- ☐ Administration

15. What is your primary on-campus source for sustainability information?

- ☐ Campus sustainability office
- ☐ Environmental health and safety department
- ☐ Facilities maintenance department
- ☐ Planning and construction department
- ☐ Academic faculty
- ☐ I do not receive information about sustainability at my campus
- ☐ Other (please specify): _____

16. Which of the following departments would you be most likely to rely on for information about sustainability?

- ☐ Environmental health and safety
- ☐ Facilities maintenance
- ☐ Planning and construction
- ☐ Academic faculty
- ☐ I wouldn't rely on any of these departments for campus sustainability information

17. How often do you consider sustainability when making work related decisions?

- ☐ Never
- ☐ Sometimes
- ☐ Often
- ☐ Most of the time
- ☐ Always

18. Do you consider campus sustainability one of your core responsibilities?

- ☐ Yes
- ☐ No

19. How much control do you have in campus-wide sustainability decision making (i.e. do you have control over sustainability decisions that would impact campus operations)?

- ☐ None
- ☐ Low
- ☐ Neutral
- ☐ Moderate
- ☐ High

20. How much flexibility do you have when making decisions for your laboratory/unit that could impact campus sustainability (i.e. are you able to select sustainable products/processes or are these dictated by another unit)?

- ☐ None
- ☐ Low
- ☐ Neutral
- ☐ Moderate
- ☐ High

21. I feel empowered to make decisions for my laboratory/unit that impact campus sustainability

- ☐ Highly
- ☐ Moderate
- ☐ Neutral
- ☐ Low
- ☐ N/A

22. Do you feel that decisions you make about campus-wide sustainability are supported?

- ☐ Highly
- ☐ Moderately
- ☐ Neutral
- ☐ Low support
- ☐ No support
- ☐ N/A

23. Do you feel that decisions you make about sustainability for your laboratory/unit are supported?

- ☐ Highly
- ☐ Moderately
- ☐ Neutral
- ☐ Low support
- ☐ No support
- ☐ N/A

24. My institution provides financial support for campus sustainability.

- ☐ Yes
- ☐ No
- ☐ I don't know

If yes, how? _____

When I hear the term sustainability I feel

- | | | | | | | | | |
|-------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------|
| 25. Upset | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Happy |
| 26. Angry | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Friendly |
| 27. Annoyed | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Enthusiastic |
| 28. Disgust | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Love |
| 29. Afraid | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Excited |

30. I feel that campus sustainability initiative are:

- ☐ Very detrimental
- ☐ Somewhat detrimental
- ☐ Neither detrimental or beneficial
- ☐ Somewhat beneficial
- ☐ Very beneficial

31. How many years have you:

	Less than one year	One to five years	Five to ten years	Greater than ten years
a) Been in your career field	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) Been in your current position	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c) Worked in higher education	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d) Been at your current college/university	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

32. What is your primary area of expertise (RF only)?

- ☐ Chemistry
- ☐ Biology
- ☐ Physics
- ☐ Geology
- ☐ Engineering
- ☐ Biochemistry
- ☐ Health Sciences
- ☐ Environmental Science
- ☐ Other (please specify): _____

33. What is your current title (RF only)?

- ☐ Assistant Professor
- ☐ Associate Professor
- ☐ Professor
- ☐ Chairperson
- ☐ Other (please specify): _____

34. Please identify your age category.

- ☐ Under 25
- ☐ 25-34
- ☐ 35-44
- ☐ 45-54
- ☐ 55-64
- ☐ 65 or older

35. Please identify your sex.

- ☐ Male
- ☐ Female

36. Is your college/university?

- ☐ Private
- ☐ Public

37. Does your university offer?

- ☐ 2 year degrees
- ☐ 2 and 4 year degrees
- ☐ 4 year degrees
- ☐ 4 year plus graduate degrees
- ☐ Only graduate degrees
- ☐ Only professional degrees

38. Approximately how many students attend your college/university?

☐ Less than 5,000

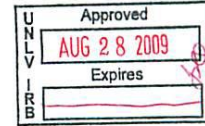
☐ 5,000-15,000

☐ More than 15,000

39. Please identify your current college or university (RF only): _____

APPENDIX D

IRB APPROVAL



Social/Behavioral IRB – Exempt Review Modification Approved

NOTICE TO ALL RESEARCHERS:

Please be aware that a protocol violation (e.g., failure to submit a modification for any change) of an IRB approved protocol may result in mandatory remedial education, additional audits, re-consenting subjects, researcher probation suspension of any research protocol at issue, suspension of additional existing research protocols, invalidation of all research conducted under the research protocol at issue, and further appropriate consequences as determined by the IRB and the Institutional Officer.

DATE: August 28, 2009
TO: Dr. David Hassenzehl, Environmental Studies
FROM: Office for the Protection of Research Subjects
RE: Notification of IRB Action by Dr. Paul Jones, Chair *PJH*
Protocol Title: **The Impact of Individual Decision Making on Campus Sustainability Initiatives**
Protocol #: 0904-3089

The modification of the protocol named above has been reviewed and approved.

Modifications reviewed for this action include:

- The inclusion of Directors of Purchasing as subjects.
- Updated email script for two separate groups of interest.
- Updated survey instrument based on results of pilot survey.
- Additional consent language added to separate consent pages for the two groups of interest in the study.

This IRB action does not change your exempt status.

PLEASE NOTE:

Attached to this approval notice is the **official Informed Consent/Assent (IC/IA) Form** for this study. The IC/IA contains an official approval stamp. Only copies of this official IC/IA form may be used when obtaining consent. Please keep the original for your records.

Should there be *any* change to the protocol, it will be necessary to submit a **Modification Form** through OPRS. No changes may be made to the existing protocol until modifications have been approved by the IRB.

If you have questions or require any assistance, please contact the Office for the Protection of Research Subjects at OPRSHumanSubjects@unlv.edu or call 895-2794.

Office for the Protection of Research Subjects
4505 Maryland Parkway • Box 451047 • Las Vegas, Nevada 89154-1047

EXHIBIT A

TABLES

Table 1 – Social and Educational responses to sustainability from Sterling, 2004

<i>Sustainability transition</i>	<i>Response</i>	<i>State of sustainability</i>	<i>State of Education</i>
1. Very Weak	Denial, rejection or minimum	No change (or token)	No change (or token)
2. Weak	“Bolt-on”	Cosmetic reform	Education about sustainability
3. Strong	“Build-on”	Serious greening	Education for sustainability
4. Very Strong	Rebuild or redesign	Wholly integrative	Sustainable education

Table 2 – Two modes of thinking: comparison of the experiential and analytic systems
adapted from Slovic et al., 2004

Experiential (Affective) System	Analytic (Cognitive) System
1. Holistic	1. Analytic
2. Affective: pleasure-pain oriented	2. Logical: reason oriented (what is sensible)
3. Associationistic connections	3. Logical connections
4. Behavior mediated by “vibes” from past experiences	4. Behavior mediated by conscious appraisal of events
5. Encodes reality in concrete images, metaphors, and narratives	5. Encodes reality in abstract symbols, words and numbers
6. More rapid processing: oriented toward immediate action	6. Slower processing: oriented toward delayed action
7. Self-evidently valid: “experiencing is believing”	7. Requires justification via logic and evidence

Table 3 - Departments and ranks of respondents to pilot survey

Expertise	Chair	Professor	Associate Professor	Assistant Professor	Other	Grand Total
Biochemistry			1			1
Biology			8	3		11
Chemistry	1		1	3		5
Climate Science			1			1
Dental Medicine		1				1
Engineering	1	3		2	1	7
Geology			1			1
Health Sciences	2		3	1	2	8
Physics		1				1
Grand Total	4	5	15	9	3	36

Table 4 - Number of IHEs included by accreditation agency and department

Department	Mid States	NCA-HCLL	New Eng	NW Comm	South	West	Grand Total
Science	36	59	20	8	44	12	179 (45%)
Safety	38	62	19	8	48	17	192 (48%)
Facilities	21	47	14	6	37	11	136 (34%)
Purchasing	29	47	12	8	40	11	147 (37%)
Sustainability	17	30	11	9	11	5	83 (21%)
Grand Total	141	245	76	39	180	56	737

Table 5 – Science department grouped names

Name of Department	Total
Applied Science	2
Arts and Sciences	48
Biology	42
Biology and Allied Health	2
Biology and Chemistry	2
Biomedical Sciences	2
Chemistry	3
Liberal Arts and Sciences	6
Math and Science	19
Natural and Health Sciences	2
Natural and Social Sciences	2
Natural Sciences	6
Natural Sciences and Business	1
Physical Sciences	2
Science	15
Science and Engineering	6
Science and Health	1
Science and Human Development	1
Science and Technology	5
Science, Health and Technology	1
Science, Mathematics, and Agriculture	1
Sustainable Agriculture	1
Natural and Physical Sciences	5
Environmental Science	4
Grand Total	179

Table 6 – Safety departments grouped names

Name of Department	Total
Environmental Health and Safety	66
Public Safety	34
Public Safety and Emergency Management	1
Public Safety and Environmental Health	1
Risk Management	3
Risk Management and Safety	2
Safety	67
Safety and Assurances	1
Safety and Risk Management	4
Security	12
Grand Total	191

Table 7 – Facilities departments grouped names

Name of Department	Total
Energy Management	2
Facilities	15
Facilities and Real Estate Services	1
Facilities Maintenance, Construction and Planning Department	1
Facilities Management	34
Facilities Operations	5
Facilities Planning	4
Facilities Planning and Management	4
Facilities Services	17
Facilities, Planning, and Construction	3
Physical Plant	42
Planning and Construction	1
Plant Operations	3
Plant Services	2
Utility Systems and Technical Support	1
Grand Total	135

Table 8 – Purchasing departments grouped names

Name of Department	Total
Accounting	2
Administrative Services	4
Business Affairs	4
Business and Finance	3
Business Office	6
Business Services	4
Controller	1
Finance and Administration	1
Financial Services	5
Materials Management	3
Procurement	24
Purchasing	88
Resource Management	1
Grand Total	146

Table 9 – Sustainability departments grouped names

Name of Department	Total
Environmental Sustainability	14
Green Campus	14
Resource Conservation	2
Sustainability	52
Grand Total	82

Table 10 - Mann-Whitney statistic significance for question 3

	Safety / Facilities	Safety / Purchasing	Safety / Science	Facilities / Purchasing	Facilities / Science	Purchasing / Science
p=	0.025	0.721	0.477	0.018	0.122	0.322

Table 11 - Mann-Whitney Significance Levels for Question 4

	Safety / Facilities	Safety / Purchasing	Safety / Science	Facilities / Purchasing	Facilities / Science	Purchasing / Science
p=	<0.001	0.364	0.285	0.006	0.003	0.97

Table 12 - Mann-Whitney significance levels for question 6

	Safety / Facilities	Safety / Purchasing	Safety / Science	Facilities / Purchasing	Facilities / Science	Purchasing / Science
p=	<0.001	0.305	<0.001	<0.001	<0.001	<0.001

Table 13 – Chi-square significance levels for question 13

	Safety / Facilities	Safety / Purchasing	Safety / Science	Facilities / Purchasing	Facilities / Science	Purchasing / Science
p=	0.002	0.887	0.07	0.007	<0.001	0.058

Table 14 – Chi-Square Significance Levels for Question 14

	Safety / Facilities	Safety / Purchasing	Safety / Science	Facilities / Purchasing	Facilities / Science	Purchasing / Science
p=	<0.001	1	1	<0.001	<0.001	1

Table 15 – Chi-square significance levels for question 15

	Safety / Facilities	Safety / Purchasing	Safety / Science	Facilities / Purchasing	Facilities / Science	Purchasing / Science
p=	0.002	0.414	0.334	0.022	<0.001	0.118

Table 16 – Chi-square significance levels for question 16

	Safety / Facilities	Safety / Purchasing	Safety / Science	Facilities / Purchasing	Facilities / Science	Purchasing / Science
p=	0.036	0.382	0.334	0.019	0.01	1

Table 17 - Survey responses by department and accreditation agency

Department	Middle States	NCA-HCLL	New England	NW Comm	South	Western	Grand Total
Science	11	67	9	7	49	15	158 (19%)*
Safety	25	45	11	5	42	7	135 (27%)
Facilities	12	42	9	6	30	14	113 (20%)
Purchasing	5	36	7	5	19	4	76 (13%)
Total	90	152	36	23	140	40	481

*Multiple respondents from single institutions based on request, total of 111 different IHEs. Percentage is based on number of institutions that responded of those invited to participate.

Table 18 - RF respondents by department and title

Department	Professor	Associate Professor	Assistant Professor	Chair	Other	Grand Total
Biochemistry	1	2			2	3
Biology	18	8	4	14	16	45
Chemistry	6	4	2	3	5	16
Engineering	2			1	4	3
Environmental Science	2	3	1	2	3	8
Geology		2			3	2
Health Sciences			1		1	1
Physics	3			4	1	7
Other	2		2	2	11	6
Grand Total	34	19	10	26	46	135

Table 19 - RF titles for individuals that selected “other” by department

Department	Dean	Director	Emeritus Professor	Instructor	Lab Manager	Grand Total
Biochemistry				1	1	2
Biology	10			6		16
Chemistry	4			1		5
Curriculum		1				1
Engineering	4					4
Environmental Science		1			2	3
Geology		2	1			3
Health Sciences	1					1
Other	8	1			1	10
Physics	1					1
Grand Total	28	5	1	8	4	46

Table 20 - Primary job function for safety respondents

Primary Job Function	Total
Campus Safety (Police or Security)	37
Environmental Health and Safety	69
Both Campus Safety and Environmental Health and Safety	29
Grand Total	135

Table 21 - Primary job function of facilities respondents

Facilities Management	60
Planning and Construction	4
Both Planning and Construction and Facilities Management	49
Grand Total	113

Table 22 - Mann-Whitney significance levels for question 1e

	Safety / Facilities	Safety / Purchasing	Safety / Faculty	Facilities / Purchasing	Facilities / Faculty	Purchasing / Faculty
p=	0.12	0.02	0.048	0.306	0.001	<0.001

Table 23 - Mann-Whitney significance levels for question 1f

	Safety / Facilities	Safety / Purchasing	Safety / Faculty	Facilities / Purchasing	Facilities / Faculty	Purchasing / Faculty
p=	0.373	0.483	0.002	0.897	0.034	0.036

Table 24 – Chi-square significance levels for question 2

	Safety / Facilities	Safety / Purchasing	Safety / Faculty	Facilities / Purchasing	Facilities / Faculty	Purchasing / Faculty
p=	0.241	0.066	0.059	0.289	0.213	0.003

Table 25 - Mann-Whitney significance levels for question 3

	Safety / Facilities	Safety / Purchasing	Safety / Faculty	Facilities / Purchasing	Facilities / Faculty	Purchasing / Faculty
p=	<0.001	0.032	0.002	<0.001	<0.001	<0.001

Table 26 - Mann-Whitney significance levels for question 4

	Safety / Facilities	Safety / Purchasing	Safety / Faculty	Facilities / Purchasing	Facilities / Faculty	Purchasing / Faculty
p=	<0.001	0.015	0.031	<0.001	<0.001	<0.001

Table 27 - Mann-Whitney significance levels for question 5

	Safety / Facilities	Safety / Purchasing	Safety / Faculty	Facilities / Purchasing	Facilities / Faculty	Purchasing / Faculty
p=	<0.001	0.535	0.099	<0.001	<0.001	0.032

Table 28 – Chi-square significance levels for question 6

	Safety / Facilities	Safety / Purchasing	Safety / Faculty	Facilities / Purchasing	Facilities / Faculty	Purchasing / Faculty
p=	0.001	0.604	0.422	0.018	<0.001	0.212

Table 29 - Mann-Whitney significance levels for question 8

	Safety / Facilities	Safety / Purchasing	Safety / Faculty	Facilities / Purchasing	Facilities / Faculty	Purchasing / Faculty
p=	0.001	0.351	0.846	0.03	<0.001	0.405

Table 30 - Mann-Whitney significance levels for question 9a

	Safety / Facilities	Safety / Purchasing	Safety / Faculty	Facilities / Purchasing	Facilities / Faculty	Purchasing / Faculty
p=	<0.001	0.231	0.028	0.013	0.039	0.451

Table 31 - Mann-Whitney significance levels for question 9b

	Safety / Facilities	Safety / Purchasing	Safety / Faculty	Facilities / Purchasing	Facilities / Faculty	Purchasing / Faculty
p=	<0.001	0.045	0.288	0.028	<0.001	0.317

Table 32 - Mann-Whitney significance levels for question 9c

	Safety / Facilities	Safety / Purchasing	Safety / Faculty	Facilities / Purchasing	Facilities / Faculty	Purchasing / Faculty
p=	0.341	0.664	<0.001	0.634	<0.001	<0.001

Table 33 – Chi-square significance levels for question 10a

	Safety / Facilities	Safety / Purchasing	Safety / Faculty	Facilities / Purchasing	Facilities / Faculty	Purchasing / Faculty
p=	<0.001	0.027	0.008	<0.001	<0.001	0.212

Table 34 – Chi-square significance levels for question 10b

	Safety / Facilities	Safety / Purchasing	Safety / Faculty	Facilities / Purchasing	Facilities / Faculty	Purchasing / Faculty
p=	<0.001	0.194	0.001	<0.001	<0.001	0.195

Table 35 – Chi-square significance levels for question 10c

	Safety / Facilities	Safety / Purchasing	Safety / Faculty	Facilities / Purchasing	Facilities / Faculty	Purchasing / Faculty
p=	0.007	0.738	0.067	0.096	<0.001	0.038

Table 36 – Chi-square significance levels for question 11a

	Safety / Facilities	Safety / Purchasing	Safety / Faculty	Facilities / Purchasing	Facilities / Faculty	Purchasing / Faculty
p=	0.084	0.963	<0.001	0.07	<0.001	0.001

Table 37 – Chi-square significance levels for question 11b

	Safety / Facilities	Safety / Purchasing	Safety / Faculty	Facilities / Purchasing	Facilities / Faculty	Purchasing / Faculty
p=	0.224	0.789	0.006	0.083	<0.001	0.061

Table 38 – Chi-square significance levels for question 11c

	Safety / Facilities	Safety / Purchasing	Safety / Faculty	Facilities / Purchasing	Facilities / Faculty	Purchasing / Faculty
p=	0.035	0.812	<0.001	0.12	<0.001	0.021

Table 39 – Chi-square significance levels for question 12

	Safety / Facilities	Safety / Purchasing	Safety / Faculty	Facilities / Purchasing	Facilities / Faculty	Purchasing / Faculty
p=	<0.001	0.01	0.812	0.102	<0.001	0.002

Table 40 – Chi-square significance levels for question 13

	Safety / Facilities	Safety / Purchasing	Safety / Faculty	Facilities / Purchasing	Facilities / Faculty	Purchasing / Faculty
p=	0.204	0.349	0.013	0.722	0.012	0.01

Table 41 – Chi-square significance levels for question 15

	Safety / Facilities	Safety / Purchasing	Safety / Faculty	Facilities / Purchasing	Facilities / Faculty	Purchasing / Faculty
p=	0.002	0.116	<0.001	0.008	<0.001	<0.001

Table 42 – Chi-square significance levels for question 16

	Safety / Facilities	Safety / Purchasing	Safety / Faculty	Facilities / Purchasing	Facilities / Faculty	Purchasing / Faculty
p=	0.033	0.328	<0.001	0.004	<0.001	0.01

Table 43 - Mann-Whitney significance levels for question 17

	Safety / Facilities	Safety / Purchasing	Safety / Faculty	Facilities / Purchasing	Facilities / Faculty	Purchasing / Faculty
p=	<0.001	0.84	0.658	<0.001	<0.001	0.889

Table 44 – Chi-square significance levels for question 18

	Safety / Facilities	Safety / Purchasing	Safety / Faculty	Facilities / Purchasing	Facilities / Faculty	Purchasing / Faculty
p=	<0.001	0.978	0.308	<0.001	<0.001	0.382

Table 45 - Mann-Whitney significance levels for question 19

	Safety / Facilities	Safety / Purchasing	Safety / Faculty	Facilities / Purchasing	Facilities / Faculty	Purchasing / Faculty
p=	<0.001	0.04	<0.001	<0.001	<0.001	<0.001

Table 46 - Mann-Whitney significance levels for question 20

	Safety / Facilities	Safety / Purchasing	Safety / Faculty	Facilities / Purchasing	Facilities / Faculty	Purchasing / Faculty
p=	<0.001	0.664	0.114	<0.001	<0.001	0.051

Table 47 - Mann-Whitney significance levels for question 21

	Safety / Facilities	Safety / Purchasing	Safety / Faculty	Facilities / Purchasing	Facilities / Faculty	Purchasing / Faculty
p=	<0.001	0.598	0.872	<0.001	<0.001	0.43

Table 48 - Mann-Whitney significance levels for question 22

	Safety / Facilities	Safety / Purchasing	Safety / Faculty	Facilities / Purchasing	Facilities / Faculty	Purchasing / Faculty
p=	0.002	0.673	0.865	0.001	0.002	0.871

Table 49 - Mann-Whitney significance levels for question 23

	Safety / Facilities	Safety / Purchasing	Safety / Faculty	Facilities / Purchasing	Facilities / Faculty	Purchasing / Faculty
p=	0.006	0.521	0.693	0.001	0.002	0.771

Table 50 – Chi-square significance levels for question 24

	Safety / Facilities	Safety / Purchasing	Safety / Faculty	Facilities / Purchasing	Facilities / Faculty	Purchasing / Faculty
p=	0.204	0.059	<0.001	0.021	<0.001	0.34

Table 51 - Mann-Whitney significance levels for question 31c

	Safety / Facilities	Safety / Purchasing	Safety / Faculty	Facilities / Purchasing	Facilities / Faculty	Purchasing / Faculty
p=	0.539	0.174	0.021	0.074	0.004	0.815

Table 52 - Mann-Whitney significance levels for question 31d

	Safety / Facilities	Safety / Purchasing	Safety / Faculty	Facilities / Purchasing	Facilities / Faculty	Purchasing / Faculty
p=	0.004	0.64	0.819	0.005	0.002	0.776

Table 53 – Chi-square significance levels for question 35

	Safety / Facilities	Safety / Purchasing	Safety / Faculty	Facilities / Purchasing	Facilities / Faculty	Purchasing / Faculty
p=	0.433	0.001	0.002	<0.001	<0.001	0.373

Table 54 – Chi-square significance levels for question 36

	Safety / Facilities	Safety / Purchasing	Safety / Faculty	Facilities / Purchasing	Facilities / Faculty	Purchasing / Faculty
p=	0.658	0.003	0.454	0.01	0.798	0.012

Table 55 - Mann-Whitney significance levels for question 37

	Safety / Facilities	Safety / Purchasing	Safety / Faculty	Facilities / Purchasing	Facilities / Faculty	Purchasing / Faculty
p=	0.192	0.735	<0.001	0.467	0.008	0.002

Table 56 - Mann-Whitney significance levels for question 38

	Safety / Facilities	Safety / Purchasing	Safety / Faculty	Facilities / Purchasing	Facilities / Faculty	Purchasing / Faculty
p=	0.695	0.117	0.134	0.048	0.247	0.005

Table 57 - Accreditation agency by state

Middle States Commission on Higher Education (Middle States)	Washington D.C., Delaware, Florida, Maryland, New Jersey, New York, and Pennsylvania
North Central Association of Colleges and Schools (NCA-HCLL)	Arkansas, Arizona, Colorado, Iowa, Illinois, Indiana, Kansas, Michigan, Minnesota, Missouri, North Dakota, Nebraska, Ohio, Oklahoma, New Mexico, South Dakota, Wisconsin, West Virginia, and Wyoming
New England Association of Schools and Colleges (New England)	Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont
Northwest Commission on Colleges and Universities (NW Comm)	Alaska, Idaho, Montana, Nevada, Oregon, Utah, and Washington
Southern Association of Colleges and Schools (Southern)	Alabama, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Texas, and Virginia
Western Association of Schools and Colleges (Western)	California and Hawaii

Table 58 - Websites Evaluated by Accreditation Agency

Department	Middle States	NCA-HCLL	New England	NW Comm	Southern	Western
Science	36 (58%)	60 (44%)	20 (65%)	8 (38%)	44 (42%)	12 (27%)
Safety	38 (61%)	63 (47%)	19 (61%)	8 (38%)	48 (45%)	18 (41%)
Facilities	21 (34%)	48 (36%)	14 (45%)	6 (29%)	38 (36%)	11 (25%)
Purchasing	29 (47%)	48 (36%)	12 (39%)	8 (38%)	41 (39%)	11 (25%)
Average inclusion rate	50%	41%	53%	36%	41%	30%

Table 59 – Chi-square statistic significance for question 1 by accreditation agency

	p=
Middle States vs. NCA-HCLL	0.862
Middle States vs. New England	0.235
Middle States vs. NW Comm	0.011
Middle States vs. Southern	0.030
Middle States vs. Western	0.304
NCA-HCLL vs. New England	0.258
NCA-HCLL vs. NW Comm	0.003
NCA-HCLL vs. Southern	0.029
NCA-HCLL vs. Western	0.333
New England vs. NW Comm	0.002
New England vs. Southern	0.620
New England vs. Western	0.981
NW Comm vs. Southern	< 0.001
NW Comm vs. Western	0.005
Southern vs. Western	0.634

Table 60 – Chi-square statistic significance for question 2 by accreditation agency

	p=
Middle States vs. NCA-HCLL	0.844
Middle States vs. New England	0.229
Middle States vs. NW Comm	0.012
Middle States vs. Southern	0.027
Middle States vs. Western	0.306
NCA-HCLL vs. New England	0.255
NCA-HCLL vs. NW Comm	0.003
NCA-HCLL vs. Southern	0.026
NCA-HCLL vs. Western	0.340
New England vs. NW Comm	0.002
New England vs. Southern	0.610
New England vs. Western	0.720
NW Comm vs. Southern	< 0.001
NW Comm vs. Western	0.005
Southern vs. Western	0.616

Table 61- Mann Whitney statistic significance for question 3 by accreditation agency

	p=
Middle States vs. NCA-HCLL	0.660
Middle States vs. New England	0.497
Middle States vs. NW Comm	0.071
Middle States vs. Southern	0.016
Middle States vs. Western	0.505
NCA-HCLL vs. New England	0.693
NCA-HCLL vs. NW Comm	0.095
NCA-HCLL vs. Southern	0.002
NCA-HCLL vs. Western	0.320
New England vs. NW Comm	0.243
New England vs. Southern	0.004
New England vs. Western	0.260
NW Comm vs. Southern	< 0.001
NW Comm vs. Western	0.049
Southern vs. Western	0.292

Table 62 - Mann Whitney statistic significance for question 12 by accreditation agency

	p=
Middle States vs. NCA-HCLL	0.187
Middle States vs. New England	0.719
Middle States vs. NW Comm	0.739
Middle States vs. Southern	0.004
Middle States vs. Western	0.110
NCA-HCLL vs. New England	0.484
NCA-HCLL vs. NW Comm	0.219
NCA-HCLL vs. Southern	0.057
NCA-HCLL vs. Western	0.377
New England vs. NW Comm	0.562
New England vs. Southern	0.028
New England vs. Western	0.209
NW Comm vs. Southern	0.012
NW Comm vs. Western	0.107
Southern vs. Western	0.738

Table 63 - Mann Whitney statistic significance for question 13 by accreditation agency

	p=
Middle States vs. NCA-HCLL	0.230
Middle States vs. New England	0.835
Middle States vs. NW Comm	0.435
Middle States vs. Southern	< 0.001
Middle States vs. Western	0.029
NCA-HCLL vs. New England	0.223
NCA-HCLL vs. NW Comm	0.101
NCA-HCLL vs. Southern	0.007
NCA-HCLL vs. Western	0.118
New England vs. NW Comm	0.579
New England vs. Southern	< 0.001
New England vs. Western	0.028
NW Comm vs. Southern	< 0.001
NW Comm vs. Western	0.013
Southern vs. Western	0.902

Table 64 - Survey responses by accreditation agency

Department	Middle States	NCA-HCLL	New England	NW Comm	Southern	Western
COS	48 48%	29 15%	9 18%	7 23%	49 28%	15 33%
Safety	25 29%	45 29%	11 25%	5 18%	42 28%	7 21%
Facilities	12 12%	42 22%	9 21%	6 21%	30 19%	14 33%
Purchasing	5 5%	36 18%	7 15%	5 16%	19 11%	4 10%
Average Response Rate	24%	21%	20%	19%	21%	24%

Table 65 - Mann Whitney statistic significance for question 1c by accreditation agency

	p=
Middle States vs. NCA-HCLL	0.003
Middle States vs. New England	0.012
Middle States vs. NW Comm	0.013
Middle States vs. Southern	0.516
Middle States vs. Western	0.137
NCA-HCLL vs. New England	0.619
NCA-HCLL vs. NW Comm	0.447
NCA-HCLL vs. Southern	0.002
NCA-HCLL vs. Western	0.505
New England vs. NW Comm	0.784
New England vs. Southern	0.027
New England vs. Western	0.4
NW Comm vs. Southern	0.027
NW Comm vs. Western	0.314
Southern vs. Western	0.253

Table 66 - Mann Whitney statistic significance for question 8 by accreditation agency

	p=
Middle States vs. NCA-HCLL	0.844
Middle States vs. New England	0.029
Middle States vs. NW Comm	0.581
Middle States vs. Southern	0.852
Middle States vs. Western	0.5
NCA-HCLL vs. New England	0.002
NCA-HCLL vs. NW Comm	0.378
NCA-HCLL vs. Southern	0.515
NCA-HCLL vs. Western	0.539
New England vs. NW Comm	0.072
New England vs. Southern	0.008
New England vs. Western	0.001
NW Comm vs. Southern	0.646
NW Comm vs. Western	0.193
Southern vs. Western	0.266

Table 67 - Mann Whitney statistic significance for question 30 by accreditation agency

	p=
Middle States vs. NCA-HCLL	0.164
Middle States vs. New England	0.077
Middle States vs. NW Comm	0.935
Middle States vs. Southern	0.167
Middle States vs. Western	0.277
NCA-HCLL vs. New England	0.361
NCA-HCLL vs. NW Comm	0.384
NCA-HCLL vs. Southern	<0.001
NCA-HCLL vs. Western	0.922
New England vs. NW Comm	0.183
New England vs. Southern	0.006
New England vs. Western	0.509
NW Comm vs. Southern	0.301
NW Comm vs. Western	0.443
Southern vs. Western	0.025

Table 68 – Private versus Public by Accreditation Agency

<u>Content Analysis</u>	Middle States	NCA-HCLL	New England	NW Comm	Southern	Western	Grand Total
Private	48.23%	30.20%	56.58%	25.64%	37.78%	39.29%	38.67%
Public	51.77%	69.80%	43.42%	74.36%	62.22%	60.71%	61.33%
<u>Survey</u>	Middle States	NCA-HCLL	New England	NW Comm	Southern	Western	Grand Total
Private	40.00%	33.33%	76.19%	26.32%	31.91%	37.93%	36.29%
Public	60.00%	66.67%	23.81%	73.68%	68.09%	62.07%	63.71%

Table 69 – Student population by accreditation agency

<u>Content Analysis</u>	< 5000	5000 – 15000	> 15000
Middle States	34.75%	49.65%	15.60%
NCA-HCLL	41.08%	38.17%	20.75%
New England	53.95%	39.47%	6.58%
NW Comm	71.79%	20.51%	7.69%
Southern	43.89%	38.33%	17.78%
Western	52.83%	32.08%	15.09%
Average	44.38%	39.18%	16.44%
<u>Survey</u>	< 5000	5000 – 15000	> 15000
Middle	43.90%	36.59%	19.51%
NCA	44.00%	28.67%	27.33%
New England	76.19%	14.29%	9.52%
Northwest	52.63%	36.84%	10.53%
Southern	38.95%	32.63%	28.42%
Western	37.93%	13.79%	48.28%
Average	44.51%	29.01%	26.48%

Table 70: Research question A: how do MLD-RF think, decide, and act about sustainability?

<i>H₀₁: MLD-RF are unable to define sustainability or believe that it means something unrelated to the study definition, or MLD-RF define sustainability in a manner that is not inclusive of environmental, social and economic components.</i>	
CA	1. Is Sustainability defined? 2. Is definition consistent with the study definition?
Survey	1. In your opinion how important are the following items to improving campus sustainability? 2. In your opinion campus sustainability is best defined to include the following concepts:
<i>H₀₂: MLD-RF either do not rank sustainability in their set of priorities or rank it below all other priorities.</i>	
CA	3. How many times is sustainability mentioned on main page? 4. How many times is sustainability mentioned on interior pages?
Survey	7. In your opinion how important is campus sustainability? 8. If I were to rank my work priorities, I would rank campus sustainability as: 9a. Campus sustainability is prioritized by me personally:
<i>H₀₃: MLD-RF do not consider sustainability a core responsibility.</i>	
CA	5. Is sustainability mentioned in the mission/goals/responsibilities?
Survey	17. How often do you consider sustainability when making work related decisions? 18. Do you consider campus sustainability one of your core responsibilities?
<i>H₀₄: MLD-RF rely on personal knowledge when making decisions about sustainability.</i>	
CA	7. Does the site list sources for sustainability information? 8. How many sources are from other universities? 9. How many sources from government? 10. How many sources are commercial? 11. How many sources are other nonprofit organizations 12. How many sources other units within IHE?
Survey	12. When making decisions about campus sustainability where do you obtain information? 15. What is your PRIMARY on-campus source for sustainability information? 16. Which of the following departments are you most likely to rely on for information about sustainability?
<i>H₀₅: MLD-RF have positive affective reactions about sustainability.</i>	
Survey	25. When I hear the term sustainability I feel upset (-3) through happy (3) 26. When I hear the term sustainability I feel angry (-3) through friendly (3) 27. When I hear the term sustainability I feel annoyed (-3) through enthusiastic (3) 28. When I hear the term sustainability I feel disgust (-3) through love (3) 29. When I hear the term sustainability I feel afraid (-3) through excited (3)
<i>H₀₆: There is no variability in attitudes about sustainability between groups of MLD-RF.</i>	

Table 71: Research question B: do MLD-RF have an impact on sustainability at IHEs?

<i>H₀₇: MLD-RF do not have a role in campus decision making about sustainability or have a very limited involvement (e.g., provide input but not included in decision making).</i>	
CA	13. Does the site claim an important role in the sustainability process?
Survey	3. How would you rate your role in decision making about campus-wide sustainability at your college/university? 4. Approximately how often do you participate in campus-wide decision making about sustainability? 5. Approximately how often to you attend campus meetings/forums where sustainability is discussed? 6. Do you have an active role in these meetings/forums (presenting or speaking)?
<i>H₀₈: MLD-RF have no control or flexibility to make decisions that impact operational campus sustainability.</i>	
Survey	19. How much control do you have in campus-wide sustainability decision making? 20. How much flexibility do you have when making decisions for your unit that could impact campus sustainability?
<i>H₀₉: MLD-RF communicate their role in campus sustainability only minimally (≤20% of websites).</i>	

Table 72: Research question C: what level of integration and support do IHEs have for operational campus sustainability?

<i>H₀₁₀: Sustainability is not included in institutional or departmental mission statements, goals or policies.</i>	
CA	5. Is sustainability mentioned in the mission/goals/responsibilities? 6. How many policies on the site include sustainability?
Survey	9. Campus sustainability is prioritized by: 10. My DEPARTMENT includes campus sustainability in: 11. My COLLEGE/UNIVERSITY includes campus sustainability in:
<i>H₀₁₁: IHE's do not provide funding to MLD-RF to support operational sustainability.</i>	
Survey	24. My institution provides financial support for campus sustainability:
<i>H₀₁₂: IHEs do not fund sustainability positions, capital improvements, or smaller operational improvement efforts.</i>	
CA	14. Does the site describe building new facilities sustainability? 15. Does the site describe other funding for sustainability? 16. Does the site list a sustainability position? 17. Is this a full time position focused on only sustainability?
<i>H₀₁₃: MLD-RF's do not feel empowered to make decisions about sustainability and/or they do not feel those decisions would be supported.</i>	
Survey	21. I feel empowered to make decisions for my unit that impact campus sustainability. 22. Do you feel that decisions you make about campus-wide sustainability are supported? 23. Do you feel that decisions you make about sustainability for your unit are supported?

EXHIBIT B

FIGURES

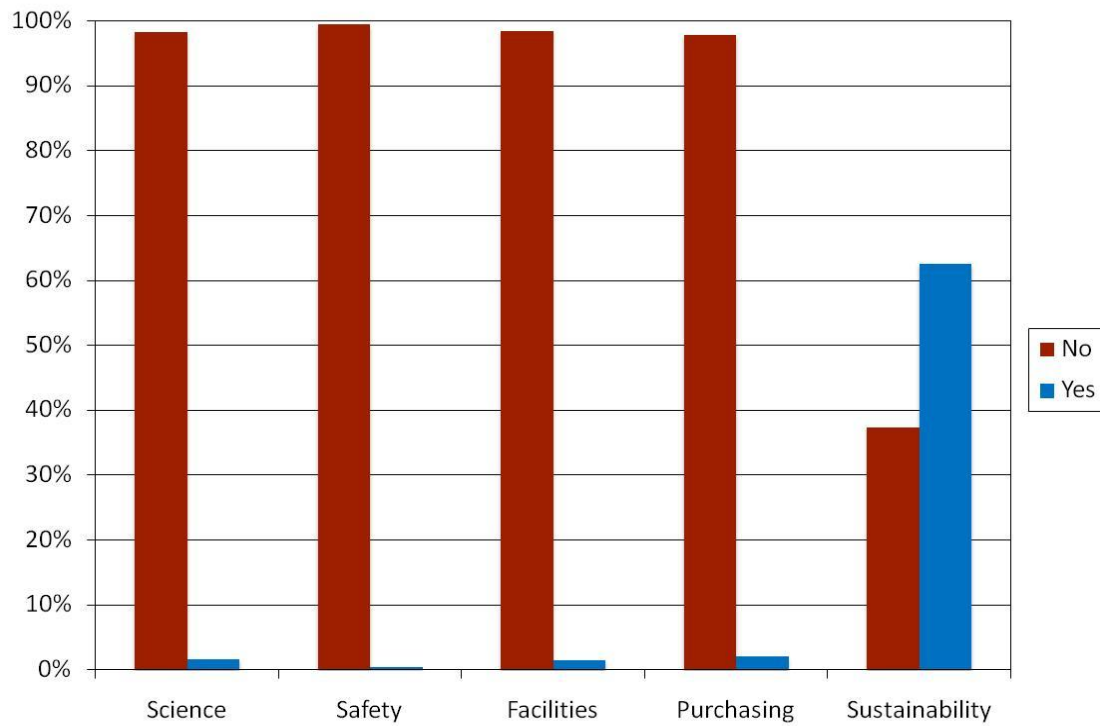


Figure 1 – Content analysis question 1, is sustainability defined?

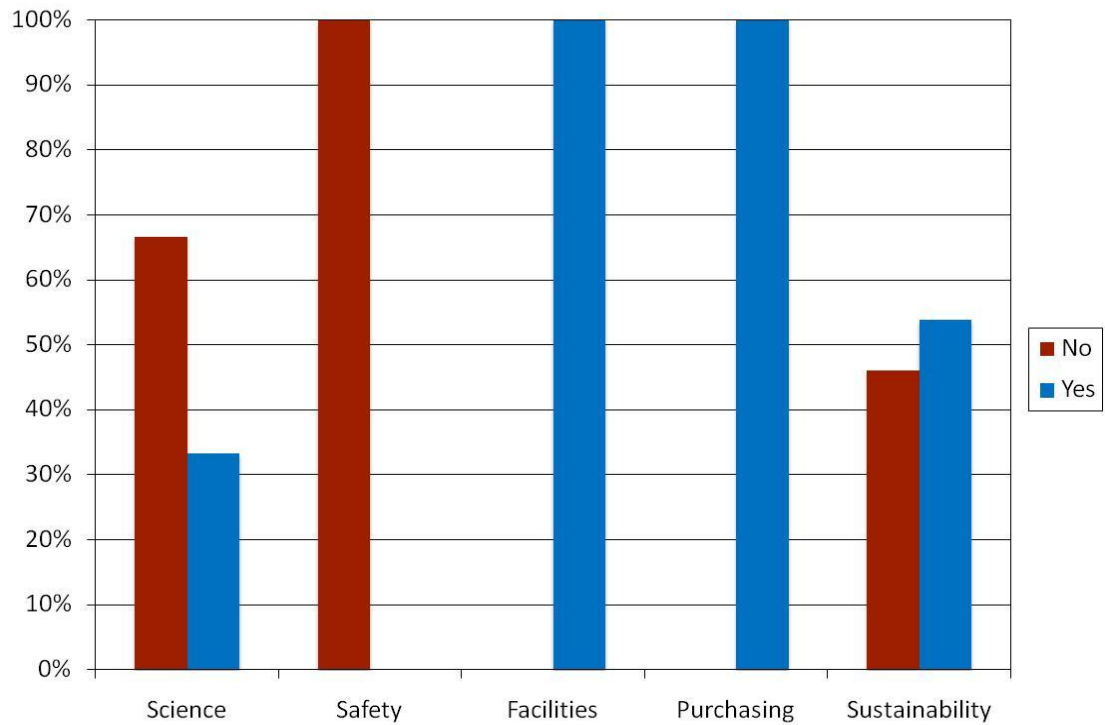


Figure 2 – Content analysis question 2, is the definition consistent with the study definition?

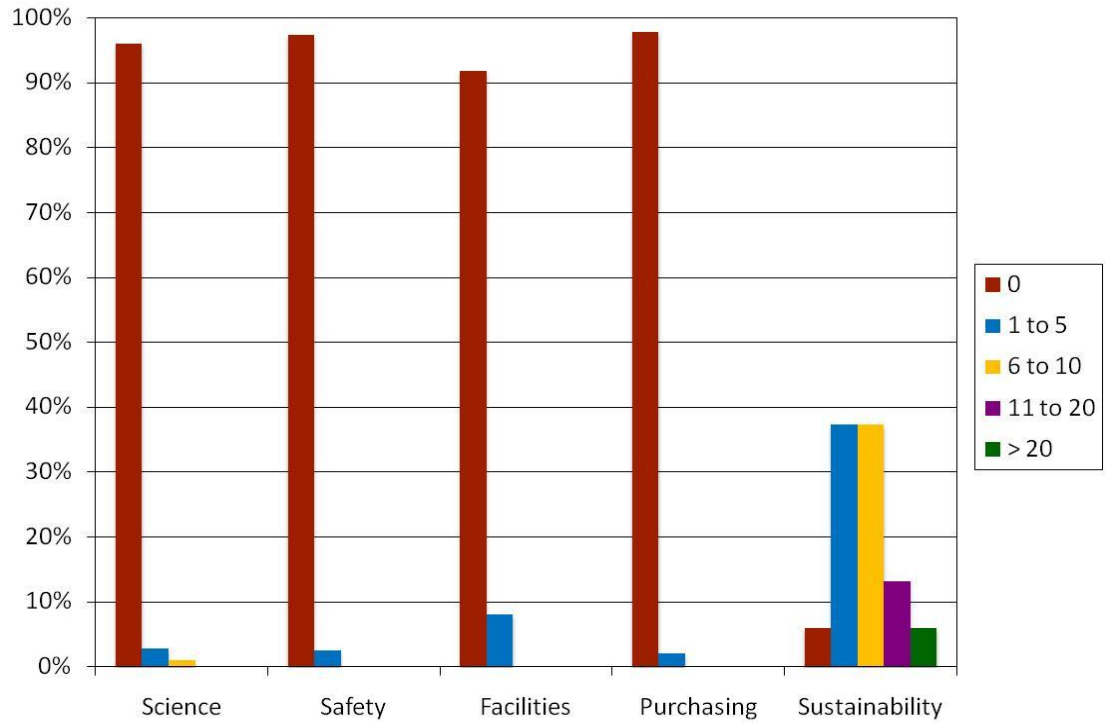


Figure 3 – Content analysis question 3, how many times is sustainability mentioned on the main page? Grouped by number of times mentioned.

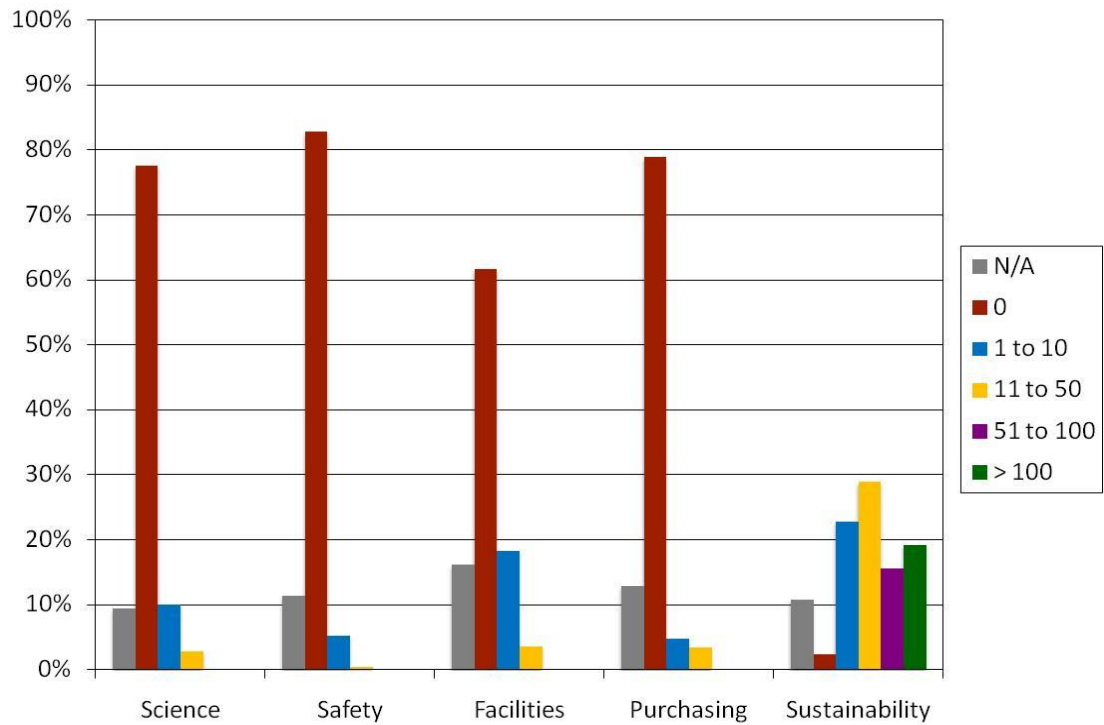


Figure 4 – Content analysis question 4, how many times is sustainability mentioned on the interior pages? Grouped by number of times mentioned.

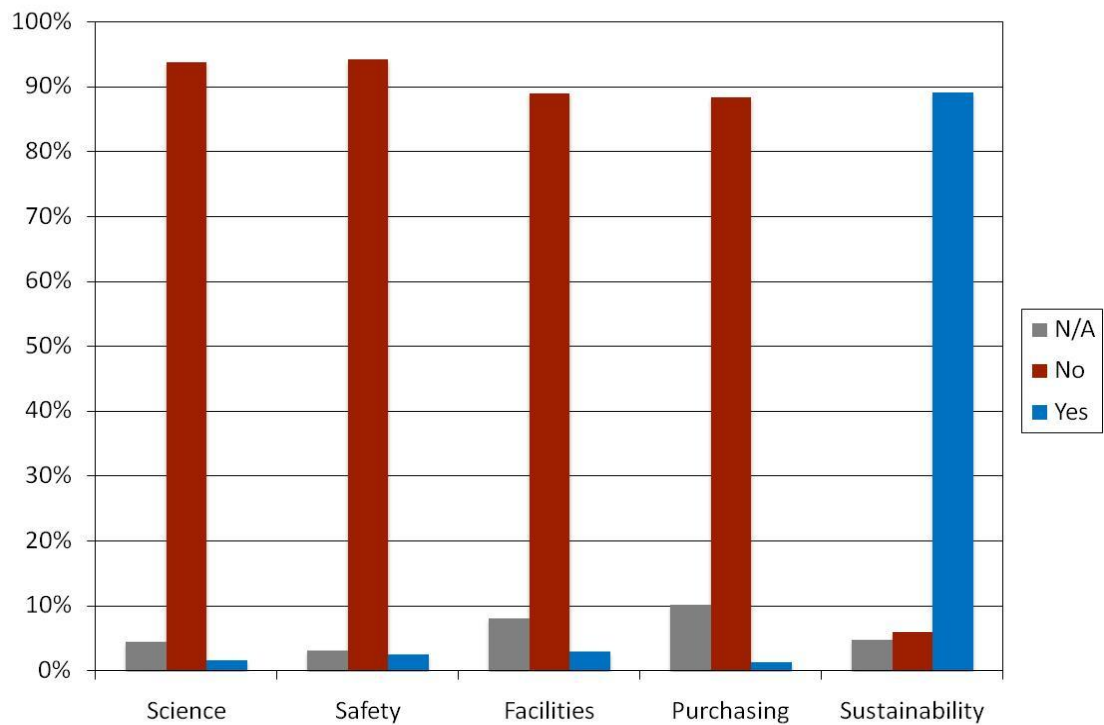


Figure 5 – Content analysis question 5, is sustainability mentioned in the mission/goals/responsibilities?

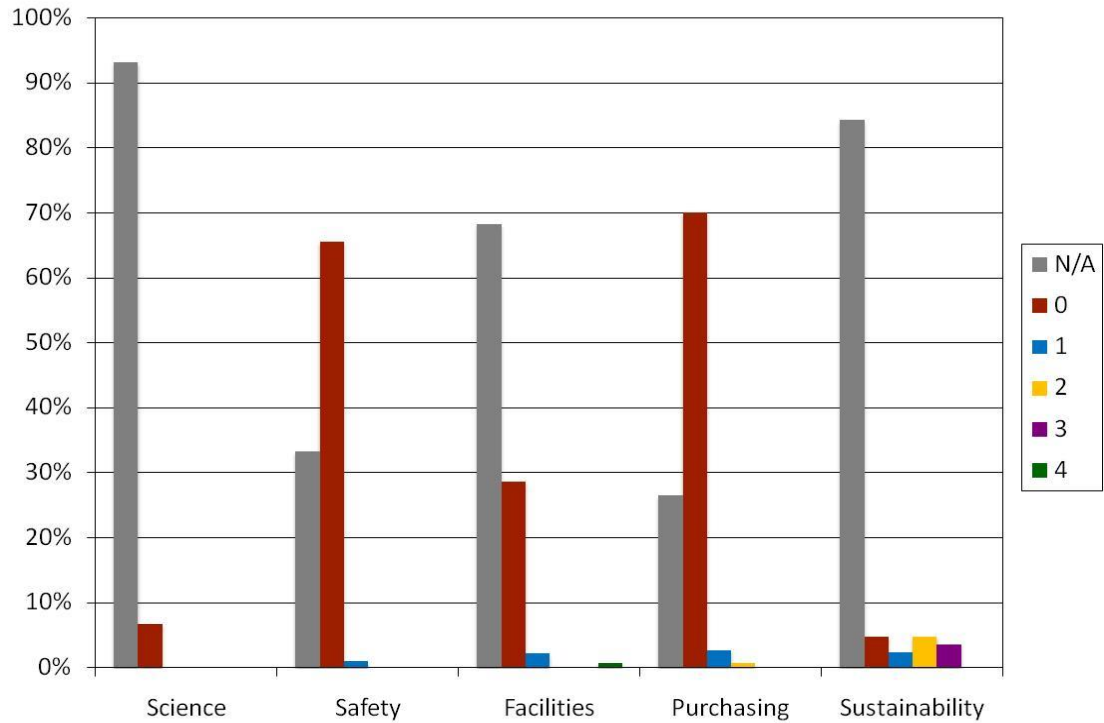


Figure 6 – Content analysis question 6, how many policies on the site include sustainability? N/A indicates no policies on site.

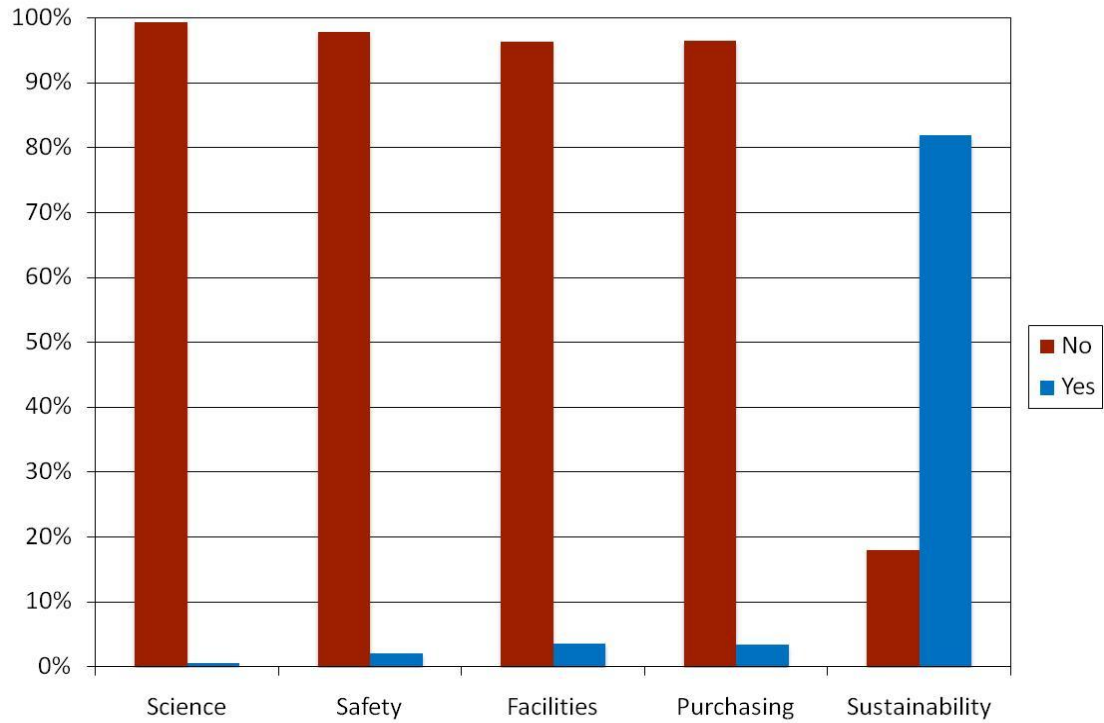


Figure 7 – Content analysis question 7, does the site list sources for sustainability information?

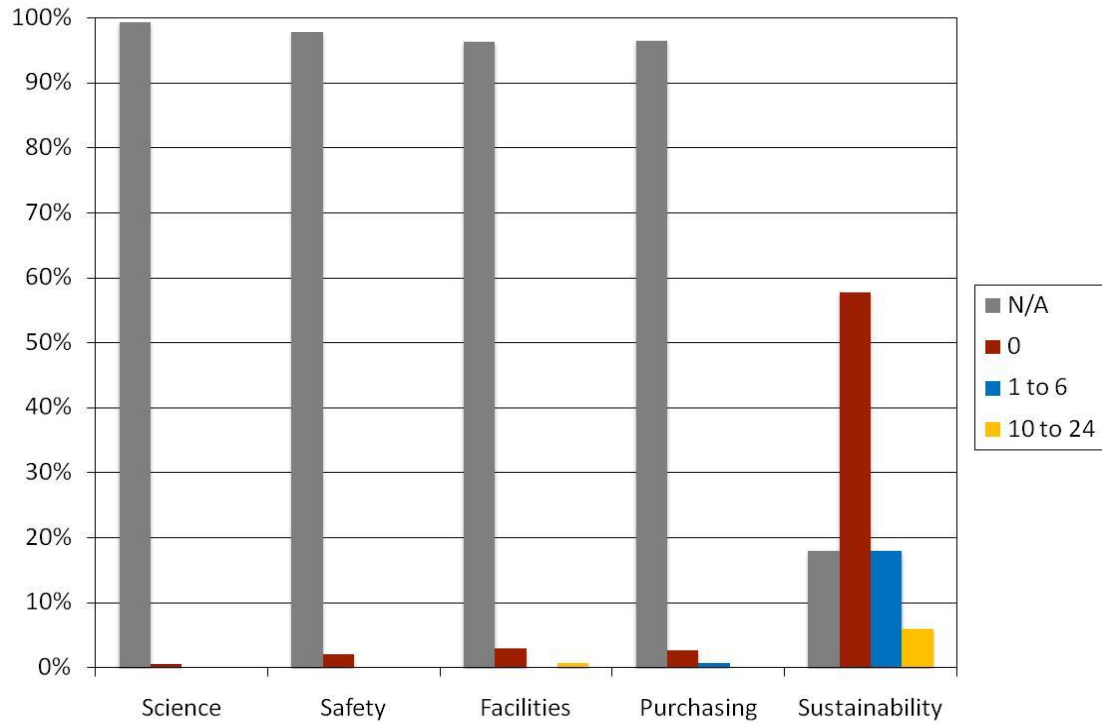


Figure 8 – Content analysis question 8, how many sources are from other universities? N/A indicates no sources on site; sources grouped by number of times mentioned.

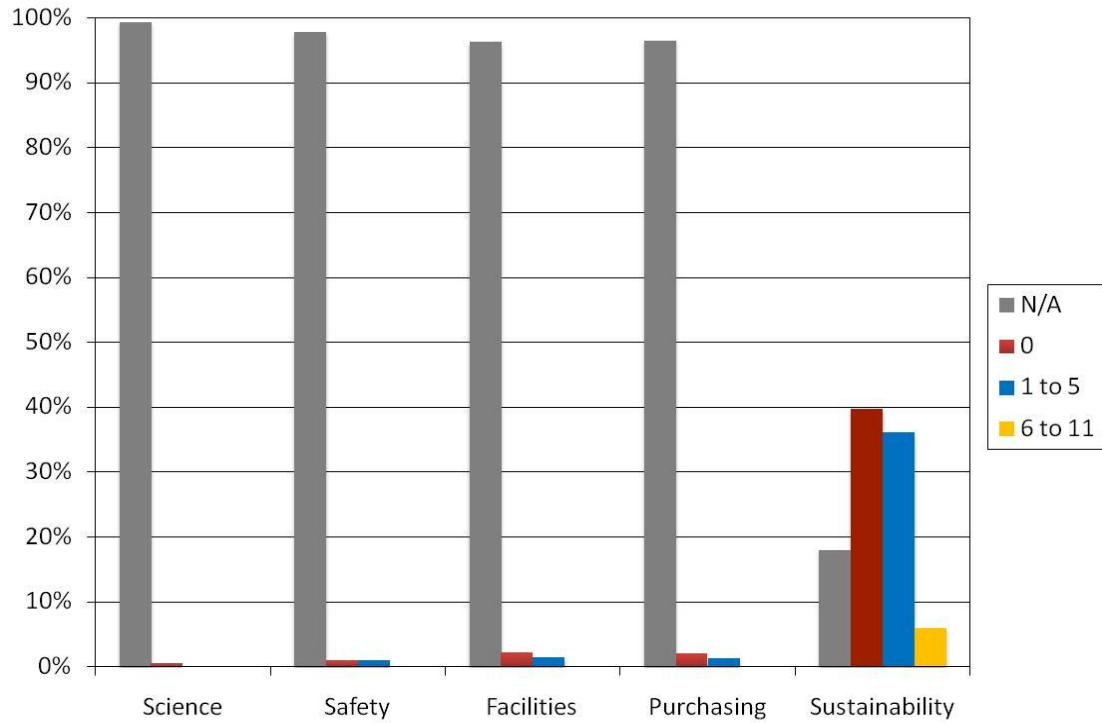


Figure 9 – Content analysis question 9, how many sources are government? N/A indicates no sources on site; sources grouped by number of times mentioned.

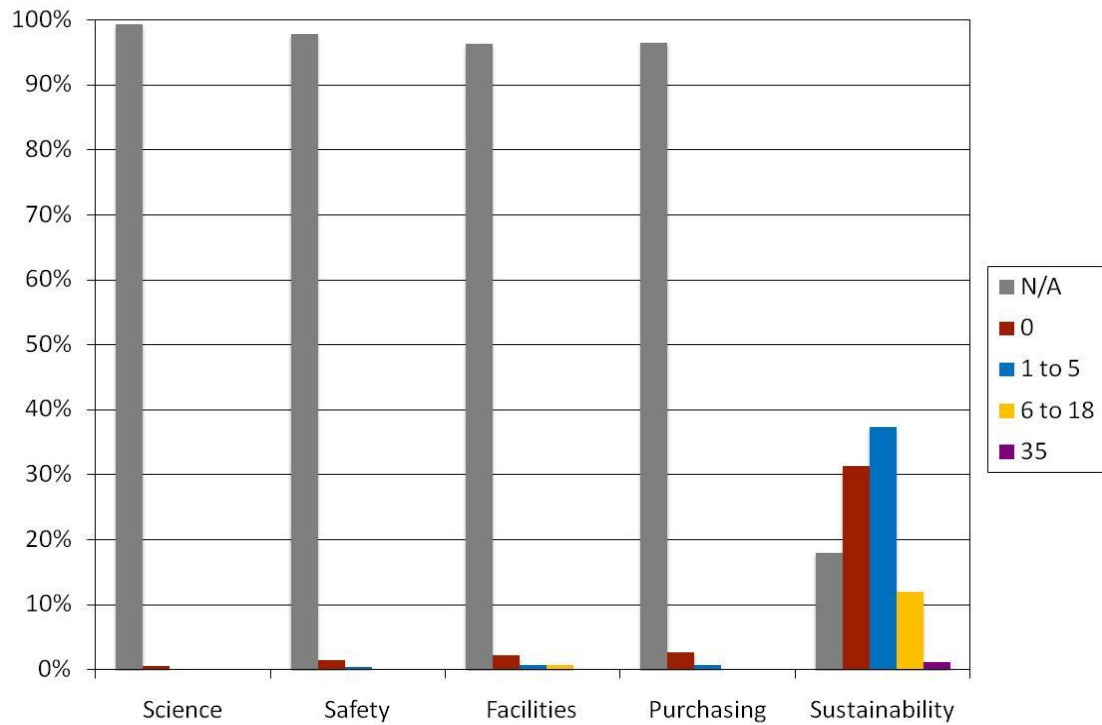


Figure 10 – Content analysis question 10, how many sources are commercial? N/A indicates no sources on site; sources grouped by number of times mentioned.

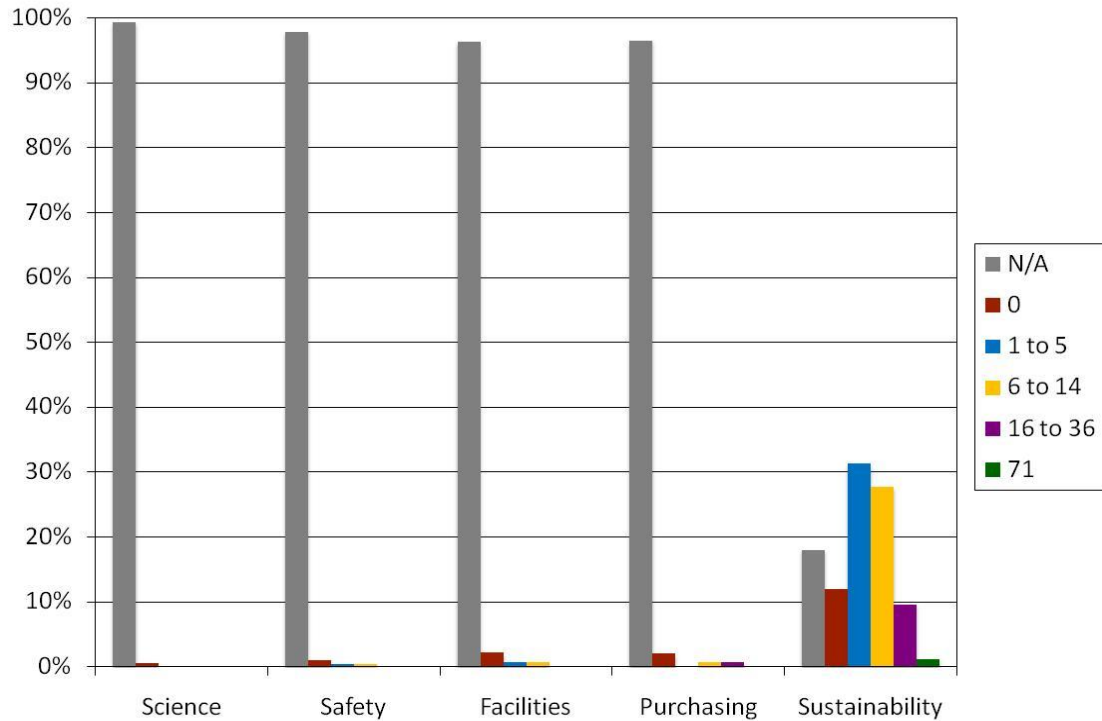


Figure 11- Content analysis question 11, how many sources are nonprofit? N/A indicates no sources on site; sources grouped by number of times mentioned.

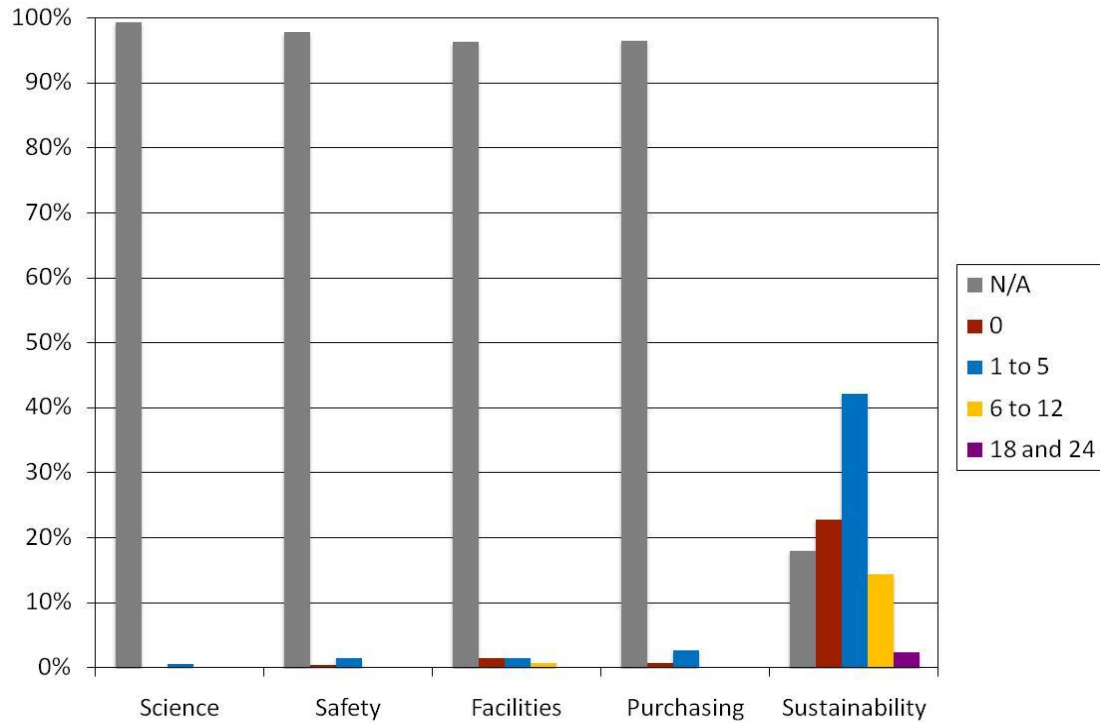


Figure 12 – Content analysis question 12, how many sources are other units within the IHE? N/A indicates no sources on site; sources grouped by number of times mentioned.

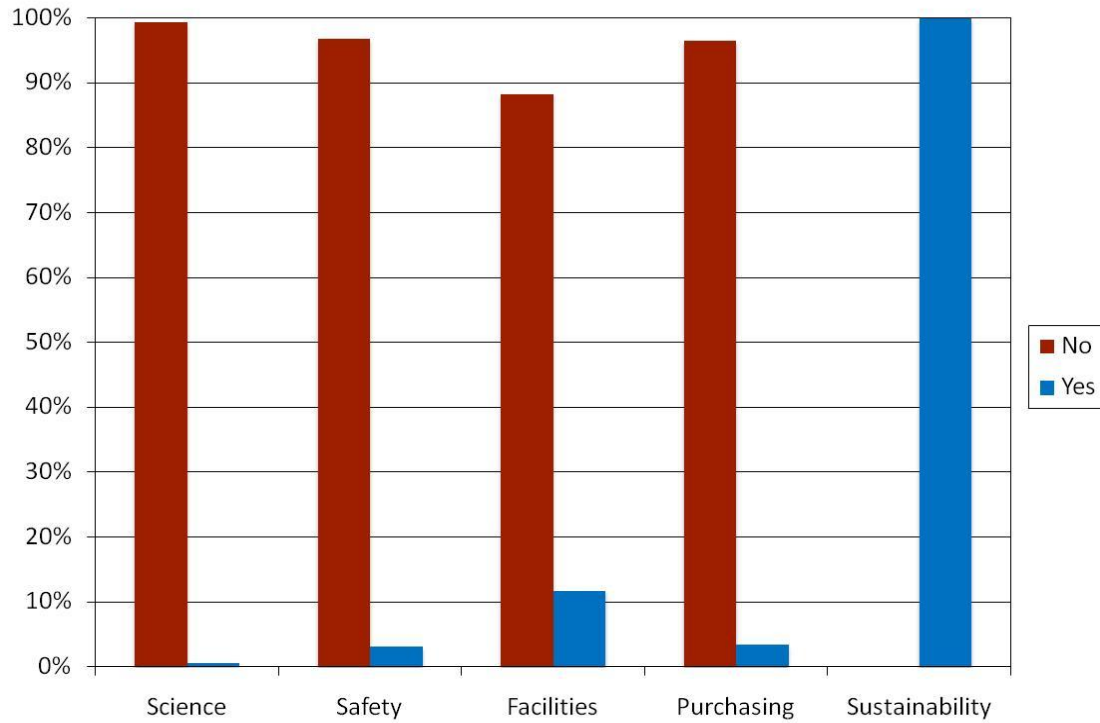


Figure 13 – Content analysis question 13, does the site claim an important role in the sustainability process?

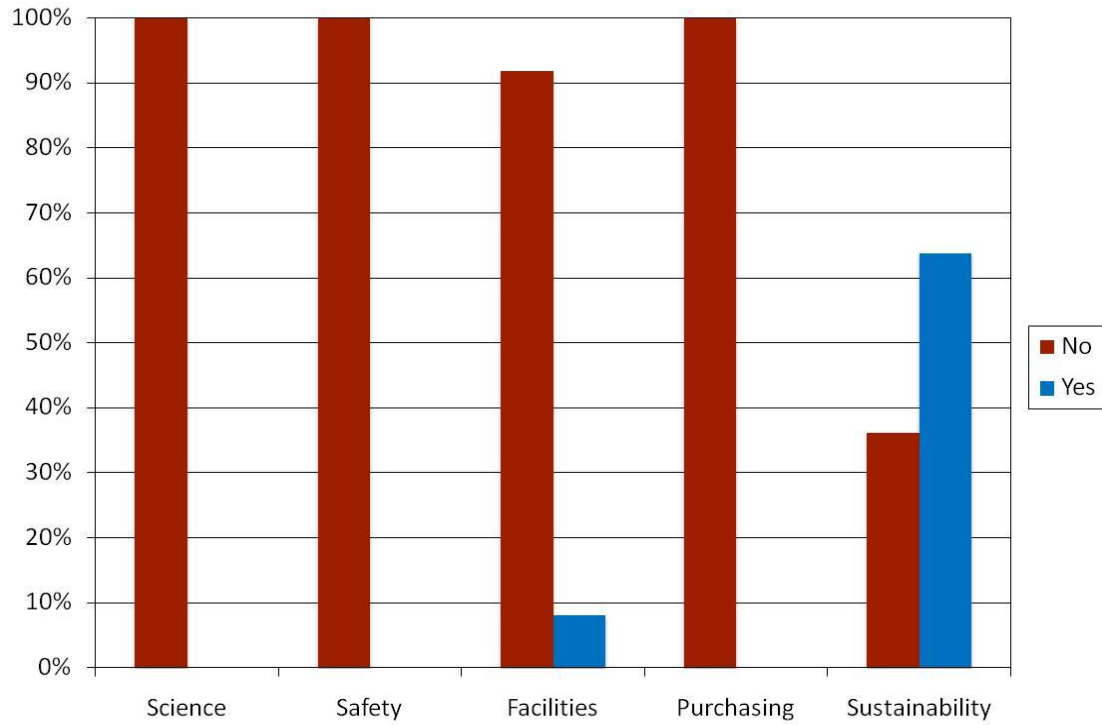


Figure 14 – Content analysis question 14, does the site describe building new facilities sustainably?

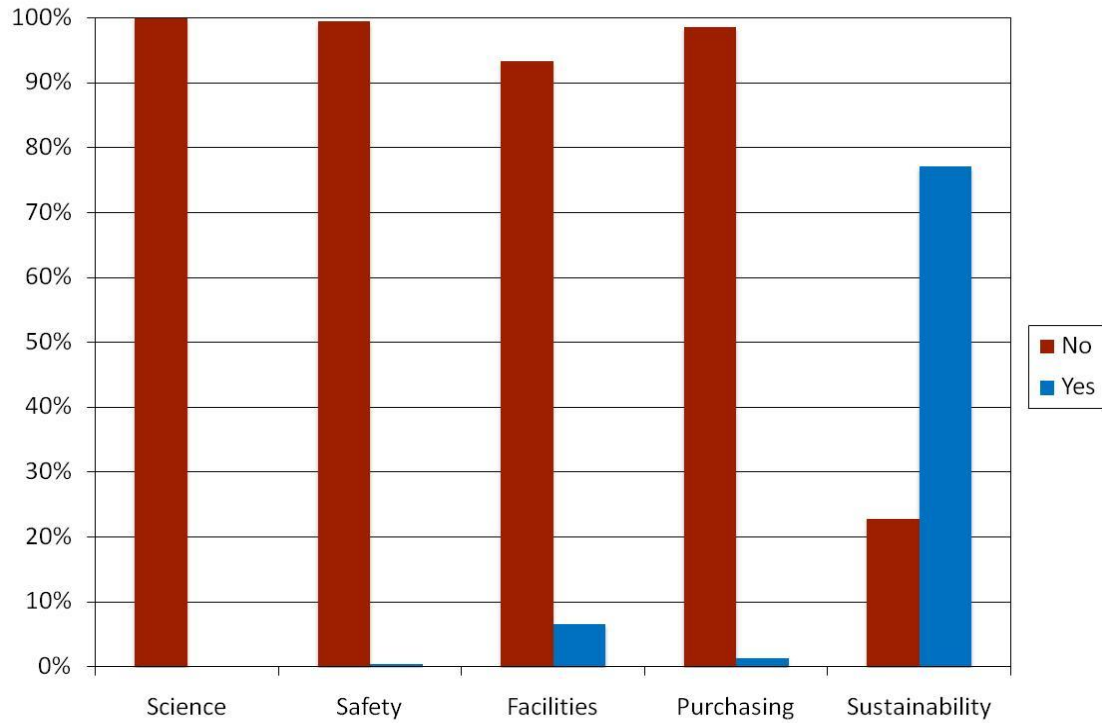


Figure 15 – Content analysis question 15, does the site describe other funding for sustainability?

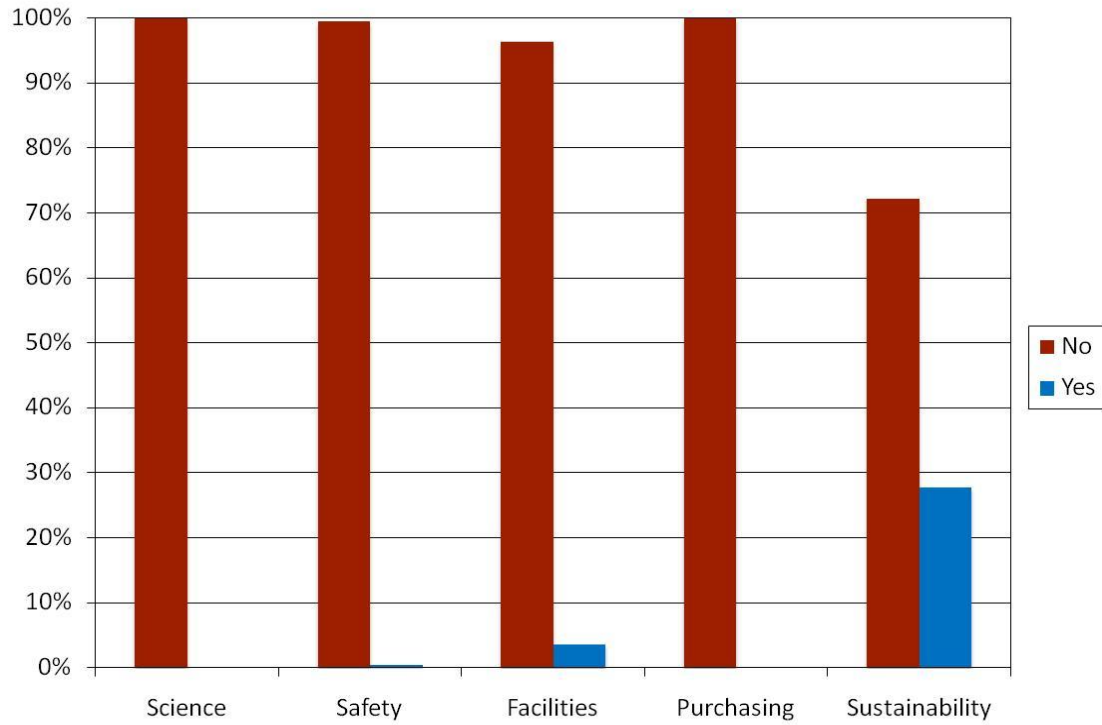


Figure 16 – Content analysis question 16, does the site list a sustainability position?

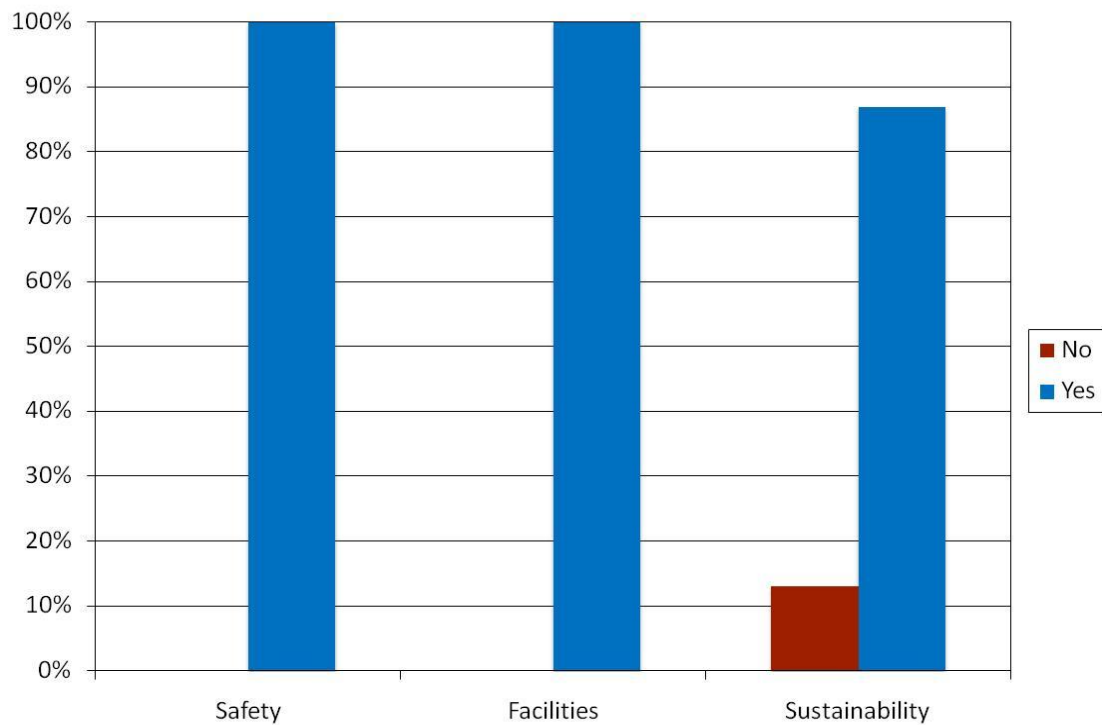


Figure 17 – Content analysis question 17, of those sites that list a sustainability position, is the position full time focused only on sustainability?

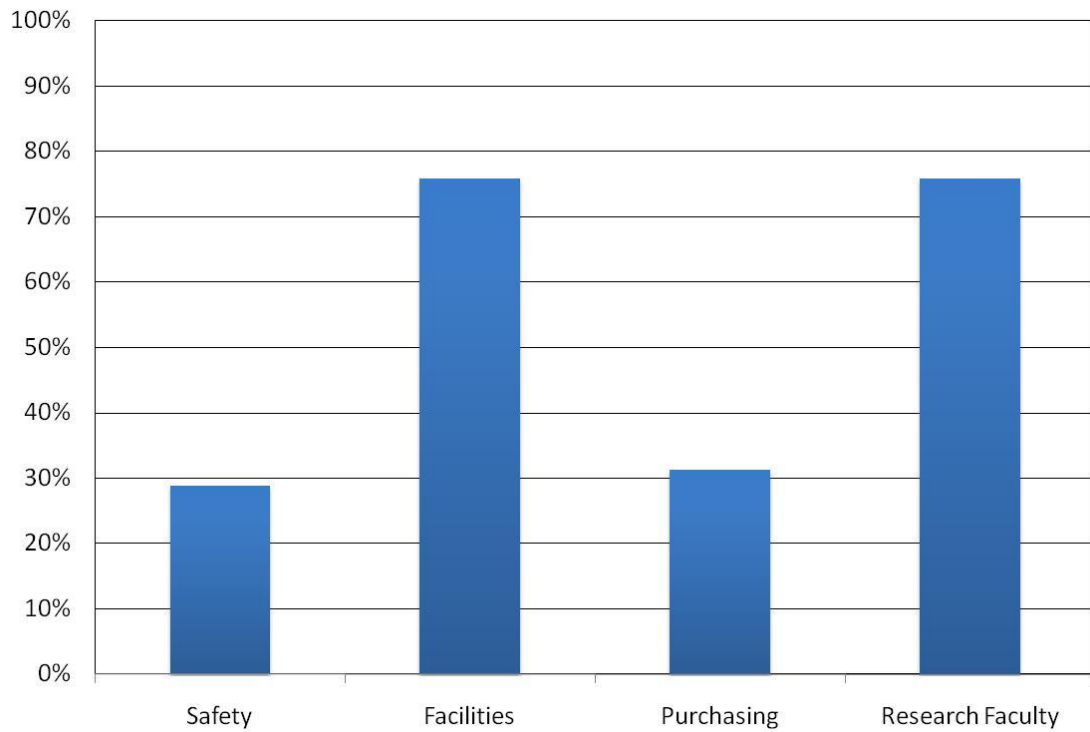


Figure 18 – Content analysis question 18, percent of MLD-RF with a major role in the sustainability process according to sustainability websites

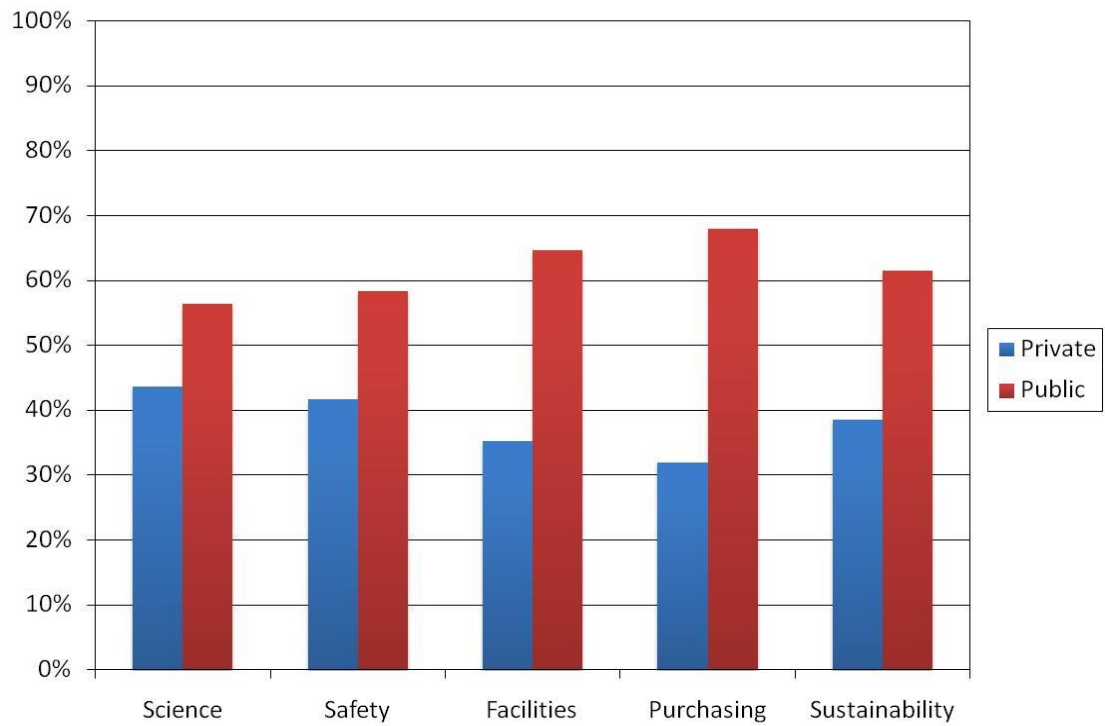


Figure 19 – Public versus private IHEs included in content analysis by type of website

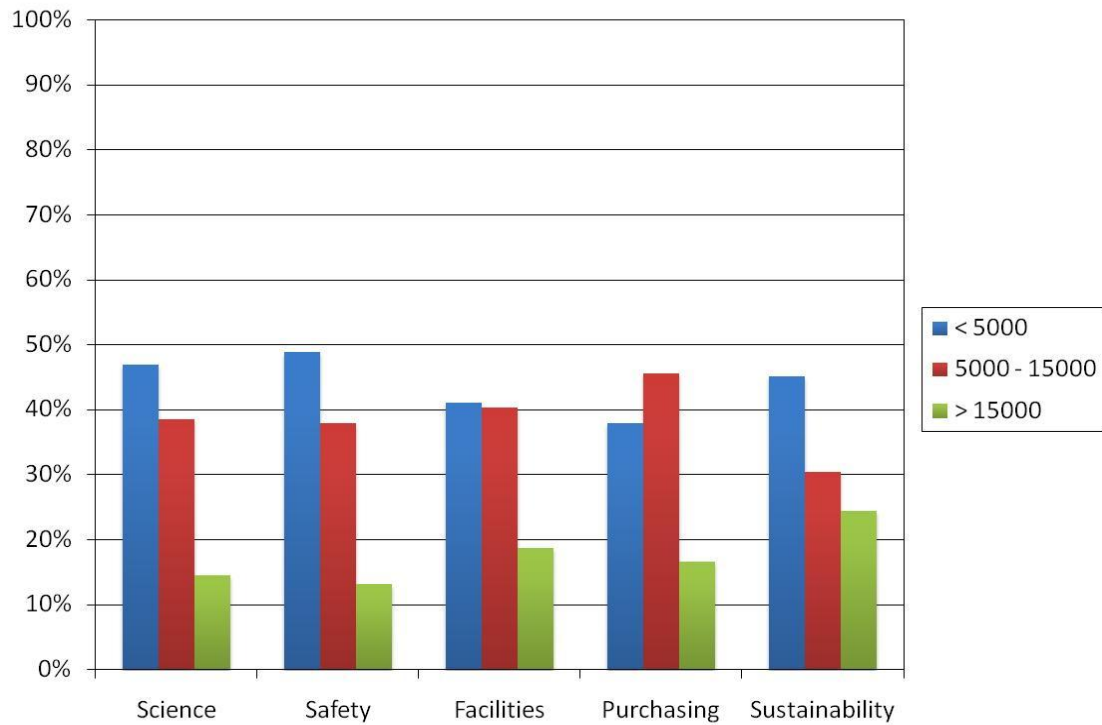


Figure 20 – Student attendance of IHEs in content analysis grouped by size categories and type of website

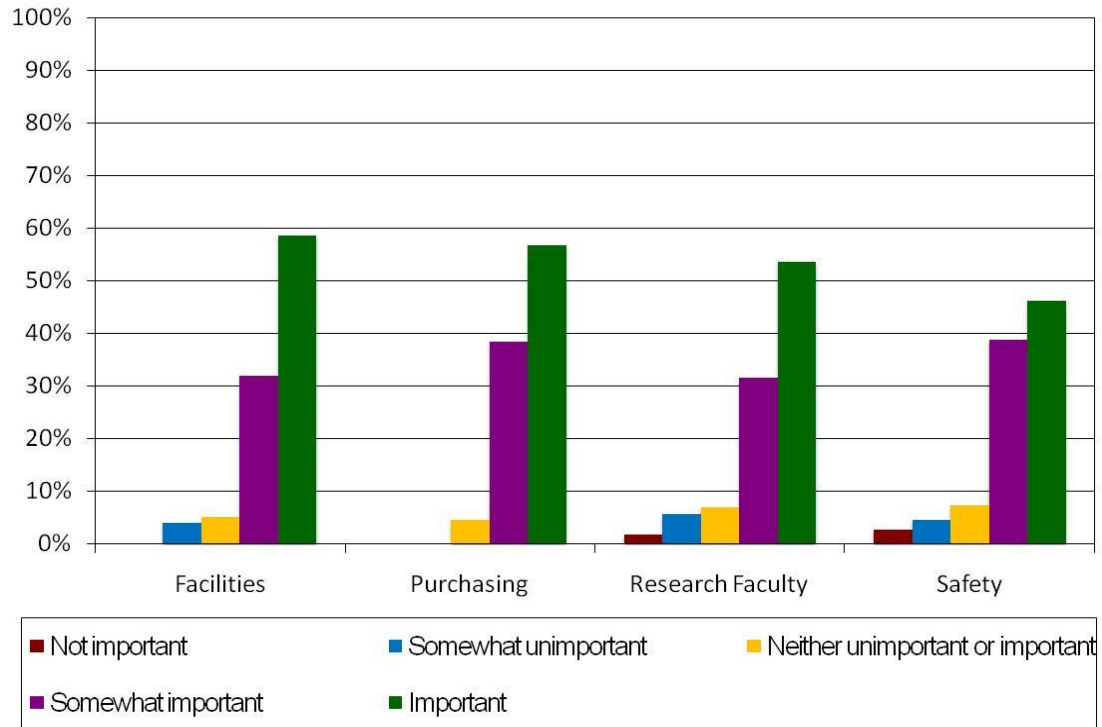


Figure 21 – Survey question 1a, How important is choosing environmentally Friendly products to campus sustainability?

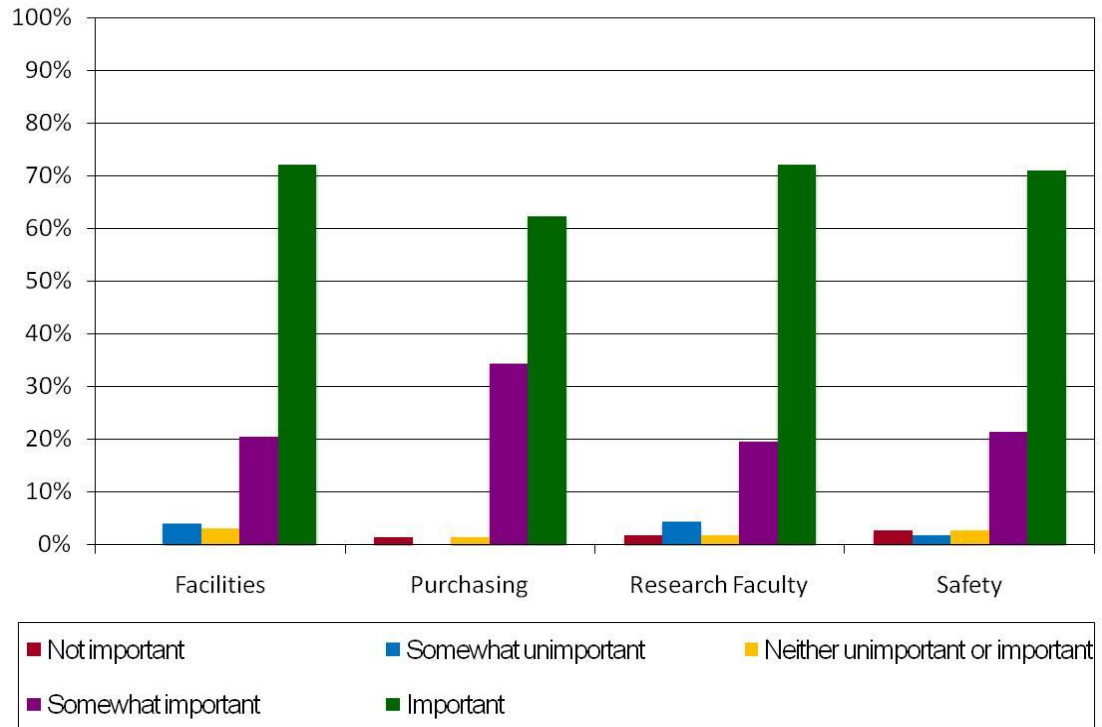


Figure 22 – Survey question 1b, how important is considering environmental impacts before construction projects are initiated to campus sustainability?

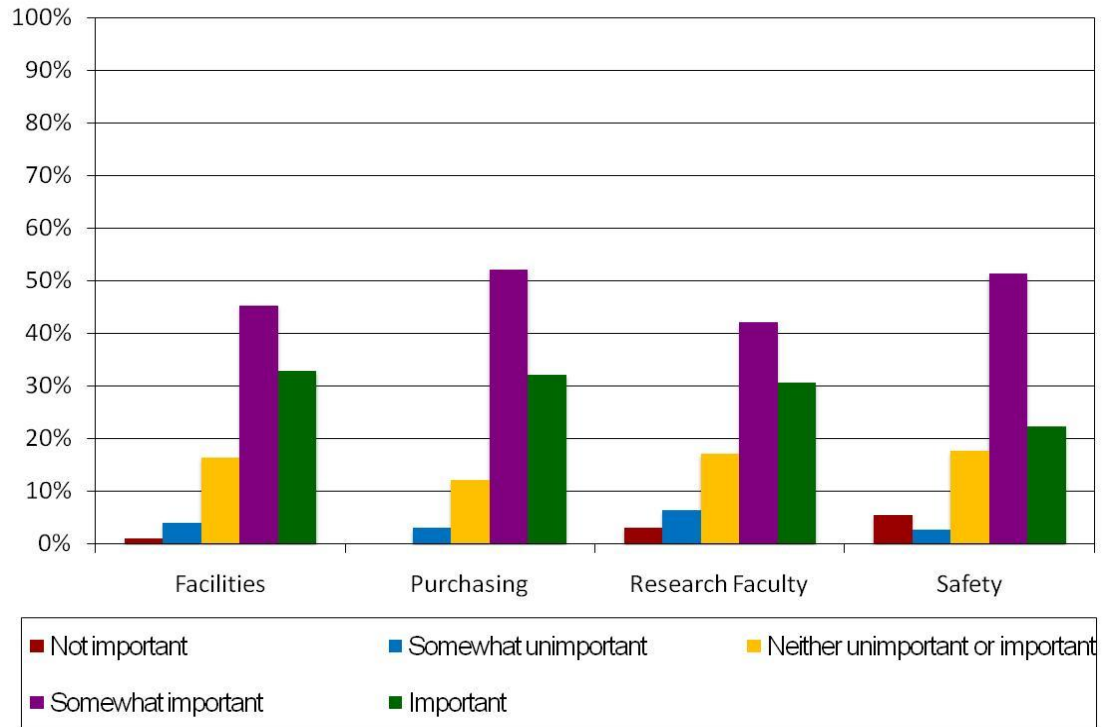


Figure 23 – Survey question 1c, how important is purchasing locally to campus sustainability?

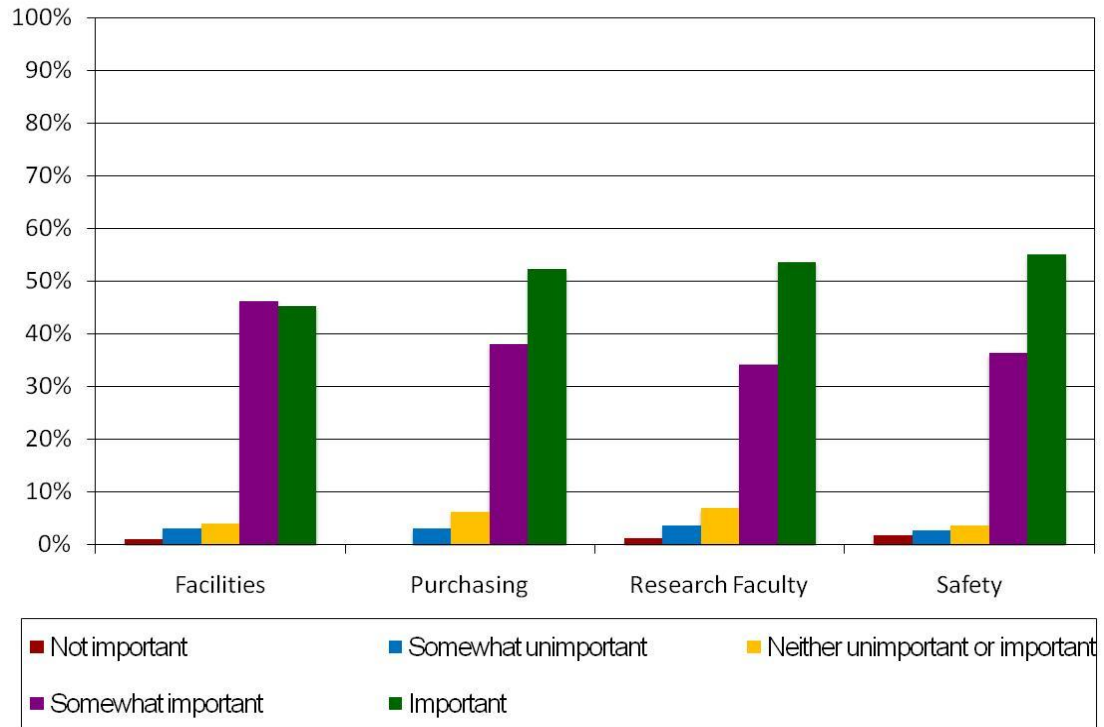


Figure 24 – Survey question 1d, how important is considering impacts on neighbors to campus sustainability?

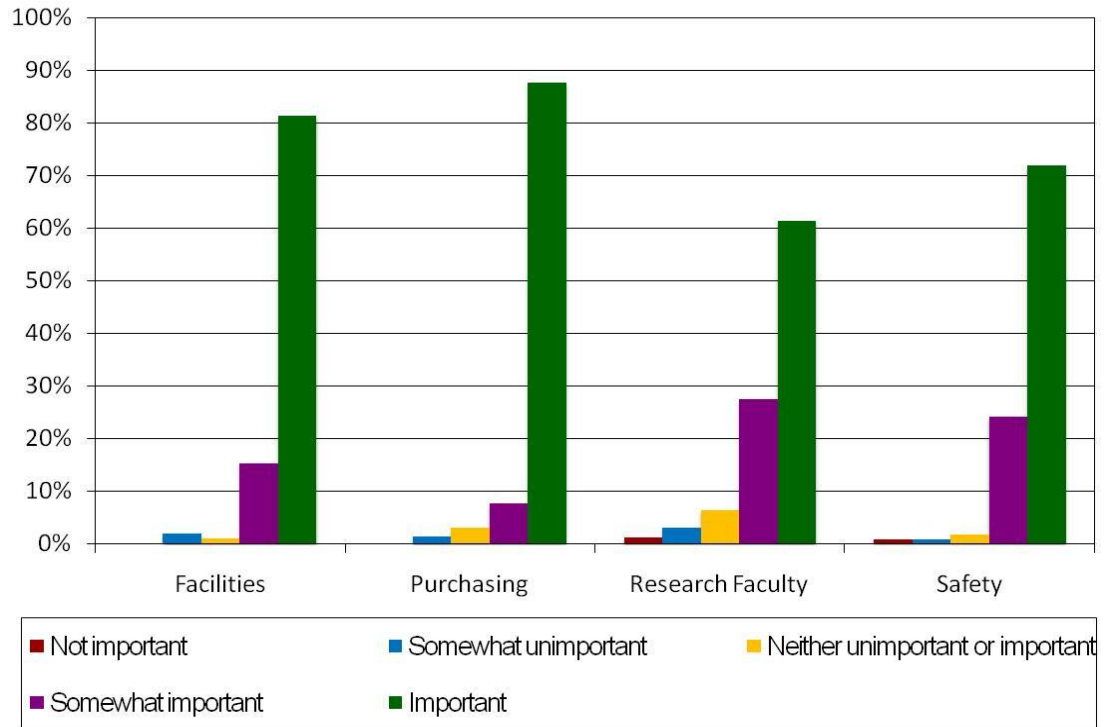


Figure 25 – Survey question 1e, how important is looking for options that will save money over time to campus sustainability?

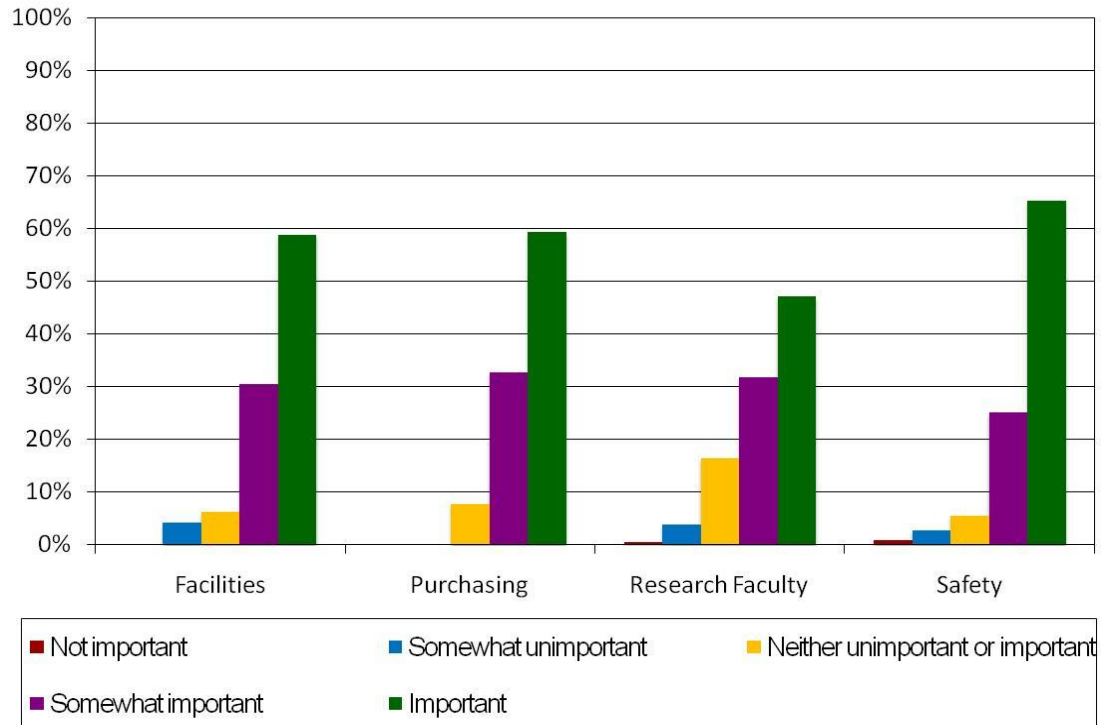


Figure 26 – Survey question 1f, how important is looking for options that will enable development to continue to campus sustainability?

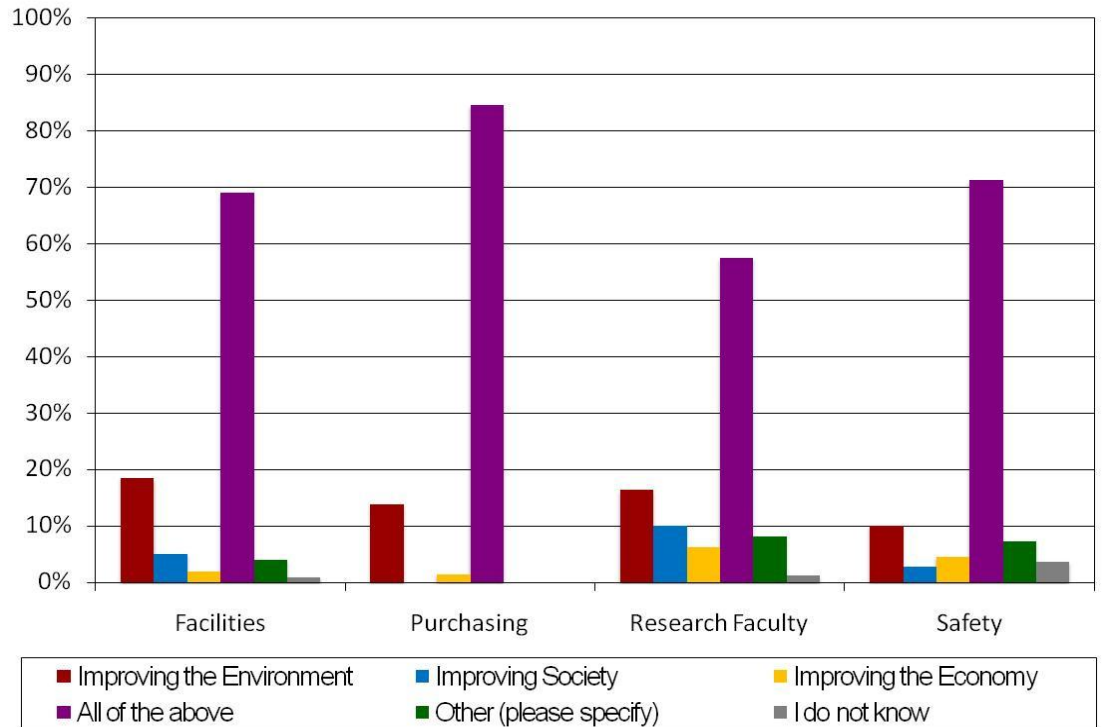


Figure 27 – Survey question 2, campus sustainability is best defined to include the following concepts

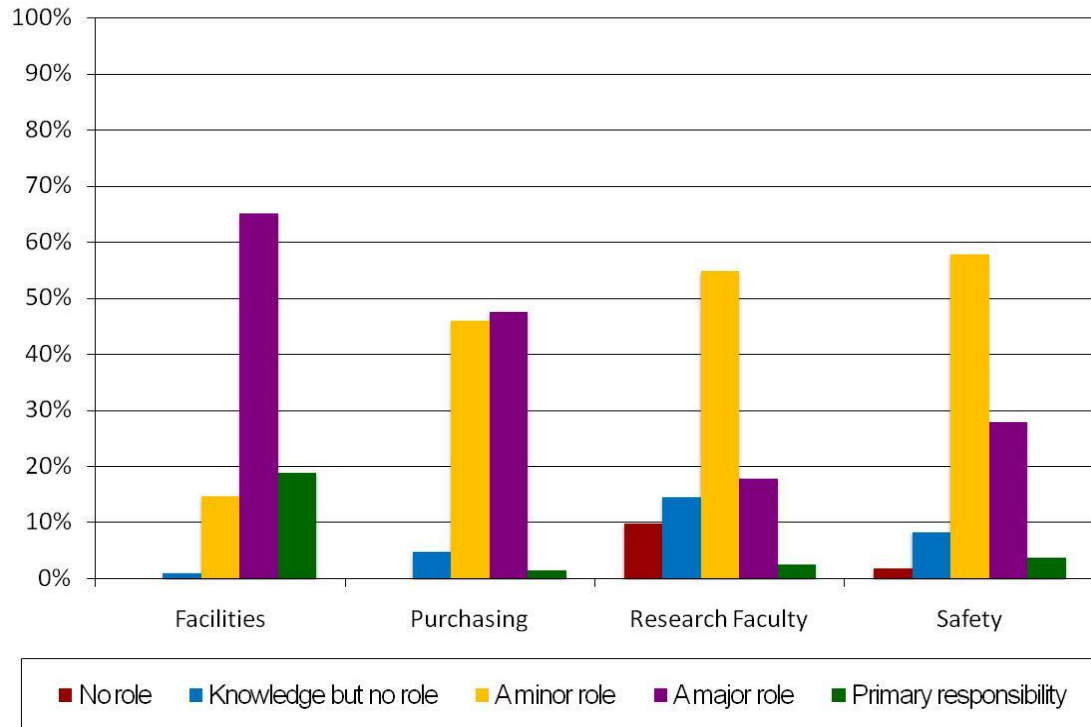


Figure 28 - Survey question 3, how would you rate your role in decision making about campus-wide sustainability at your college/university?

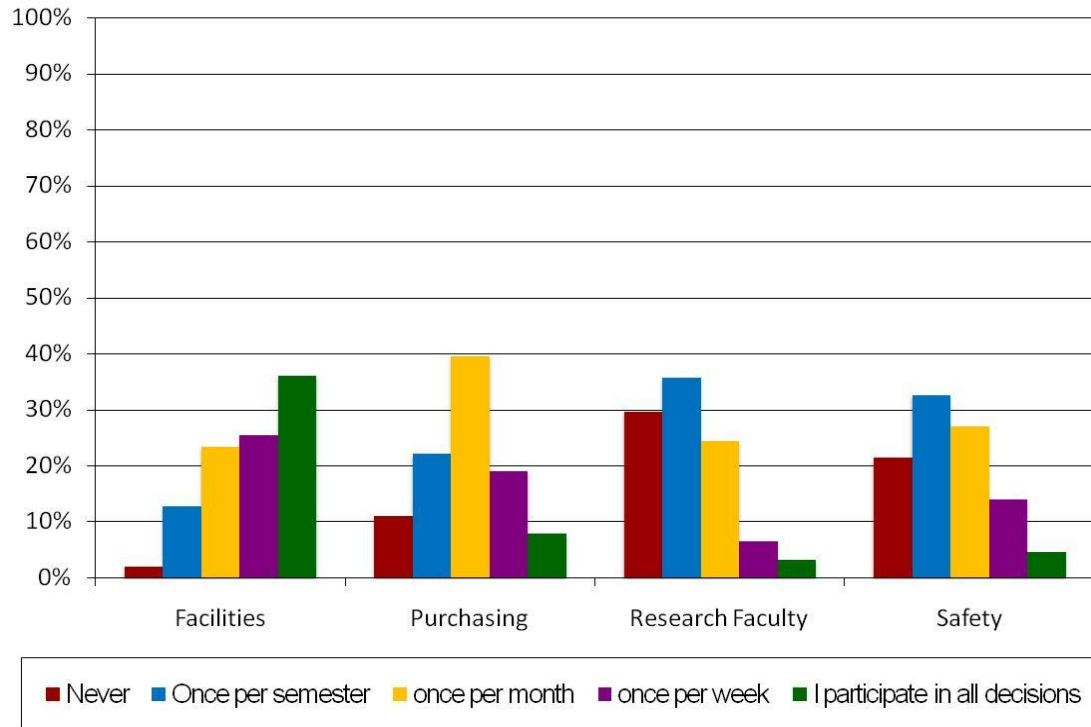


Figure 29 – Survey question 4, approximately how often do you participate in campus-wide decision making about sustainability?

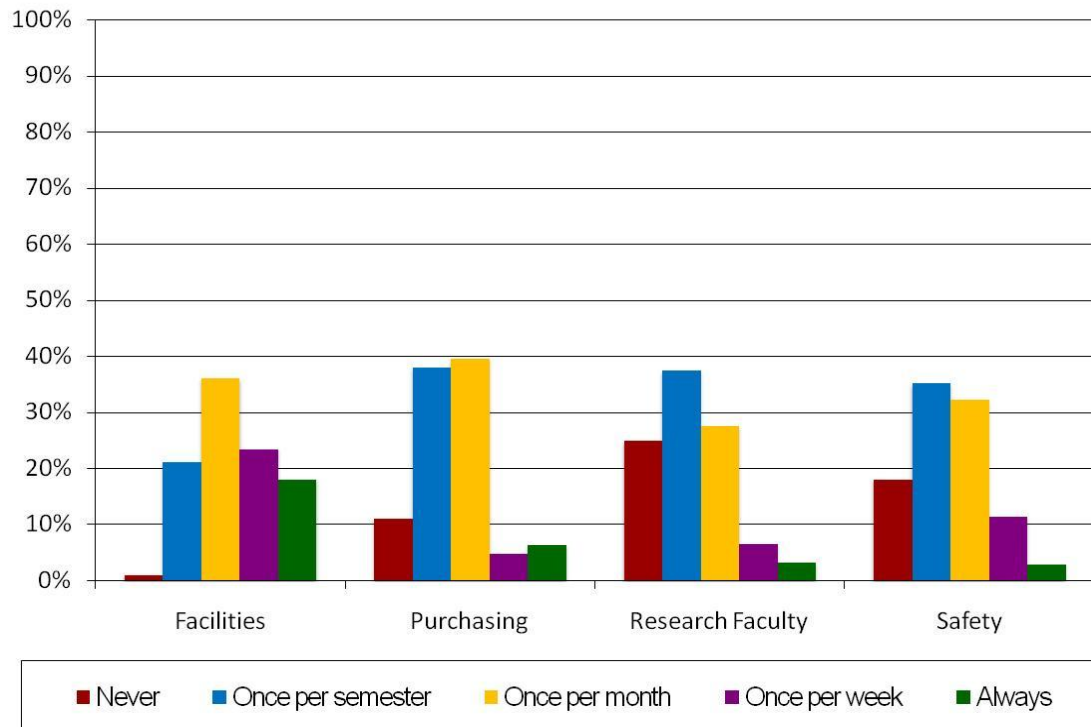


Figure 30 – Survey question 5, approximately how often do you attend campus meetings/forums where sustainability is discussed?

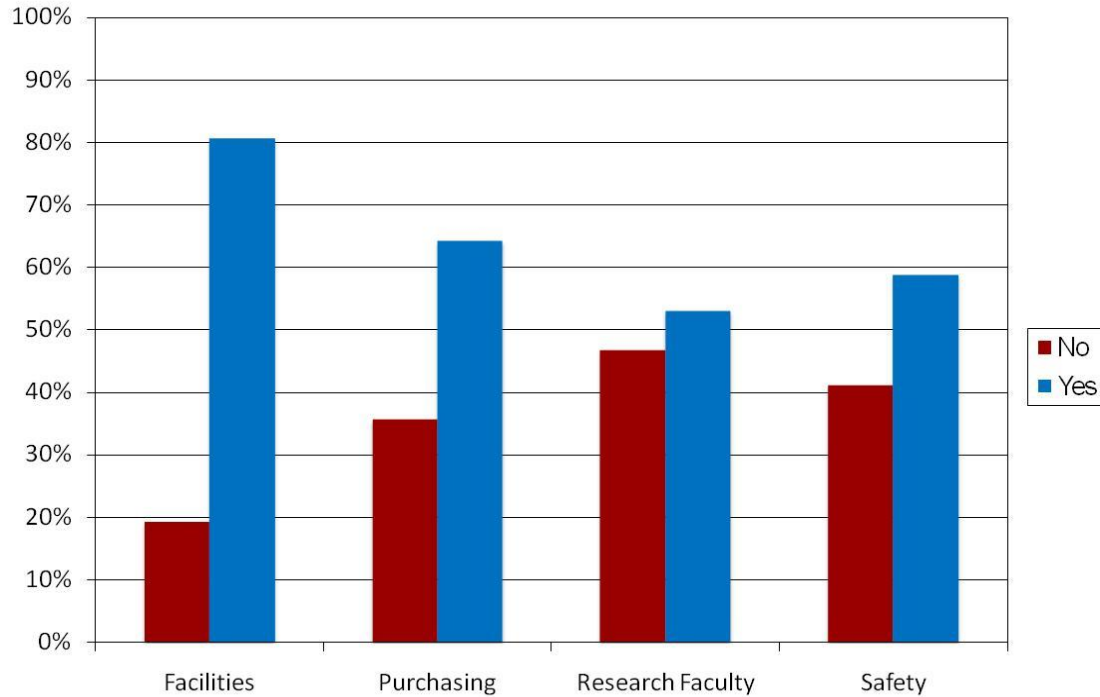


Figure 31 – Survey question 6, do you have an active role in these meetings/forums?

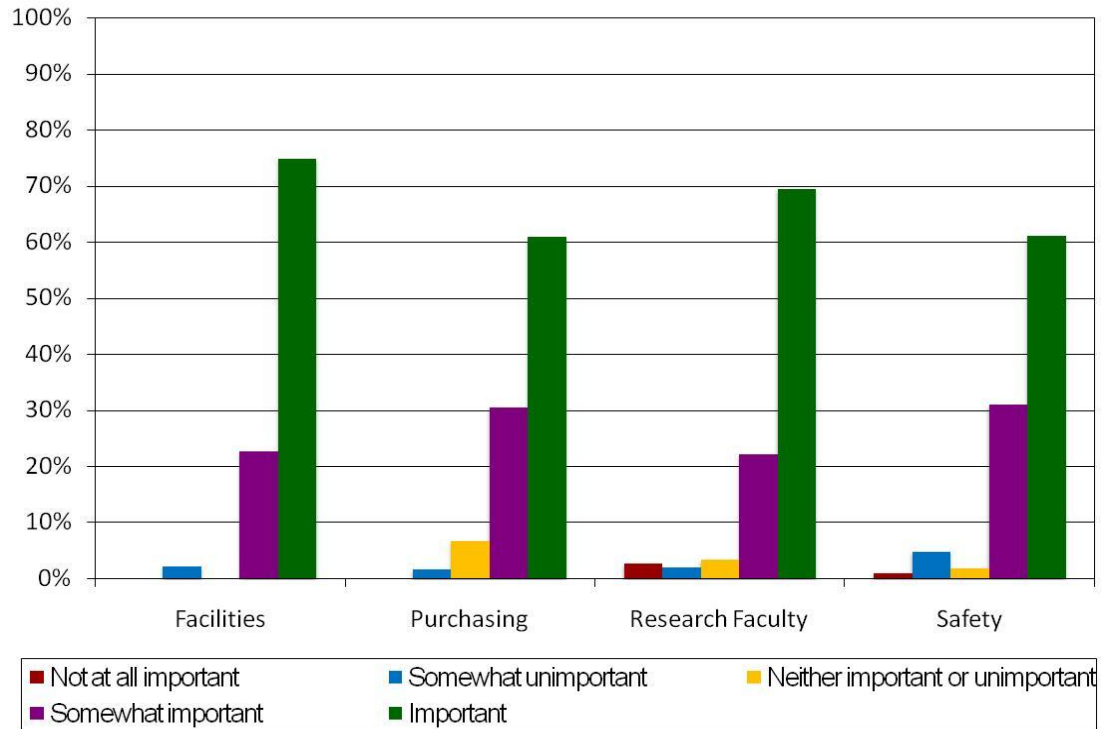


Figure 32 – Survey question 7, in your opinion how important is campus sustainability?

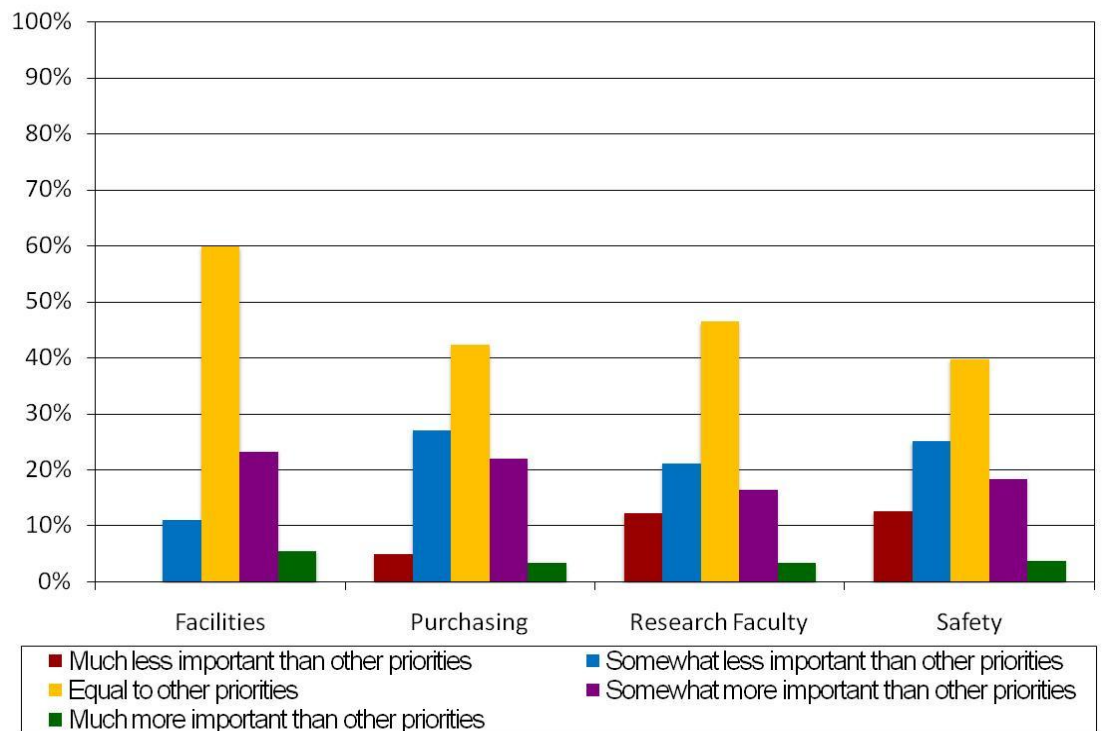


Figure 33 – Survey question 8, if I were to rank my work priorities, I would rank campus sustainability?

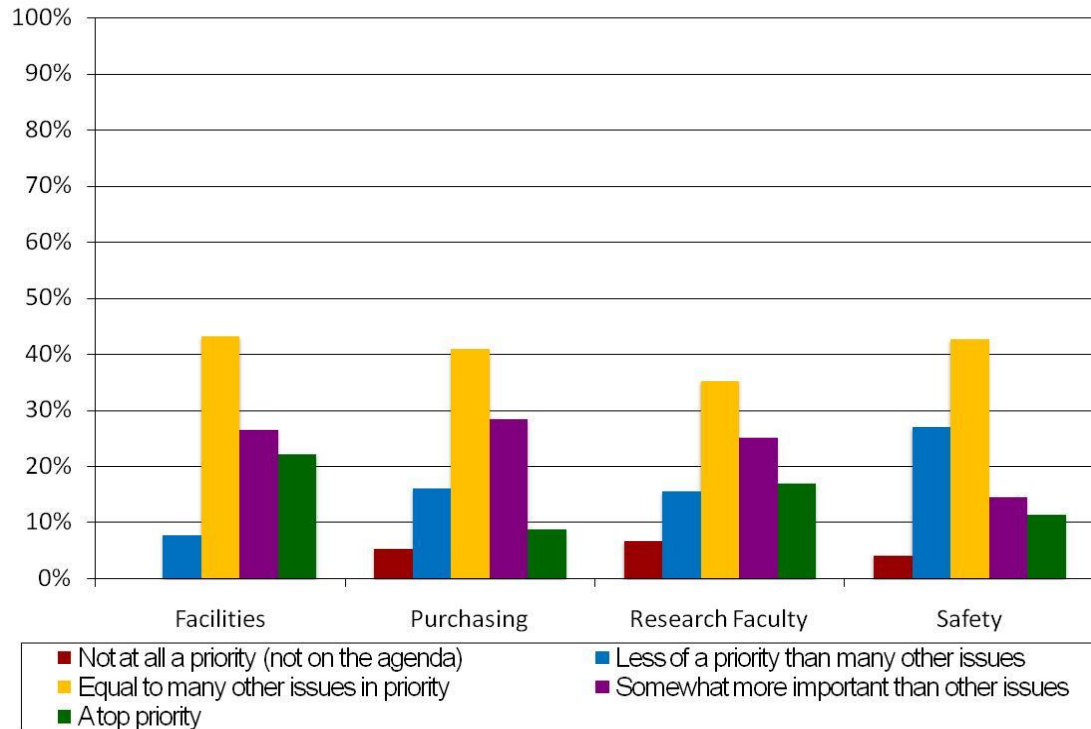


Figure 34 – Survey question 9a, campus sustainability is prioritized by me personally

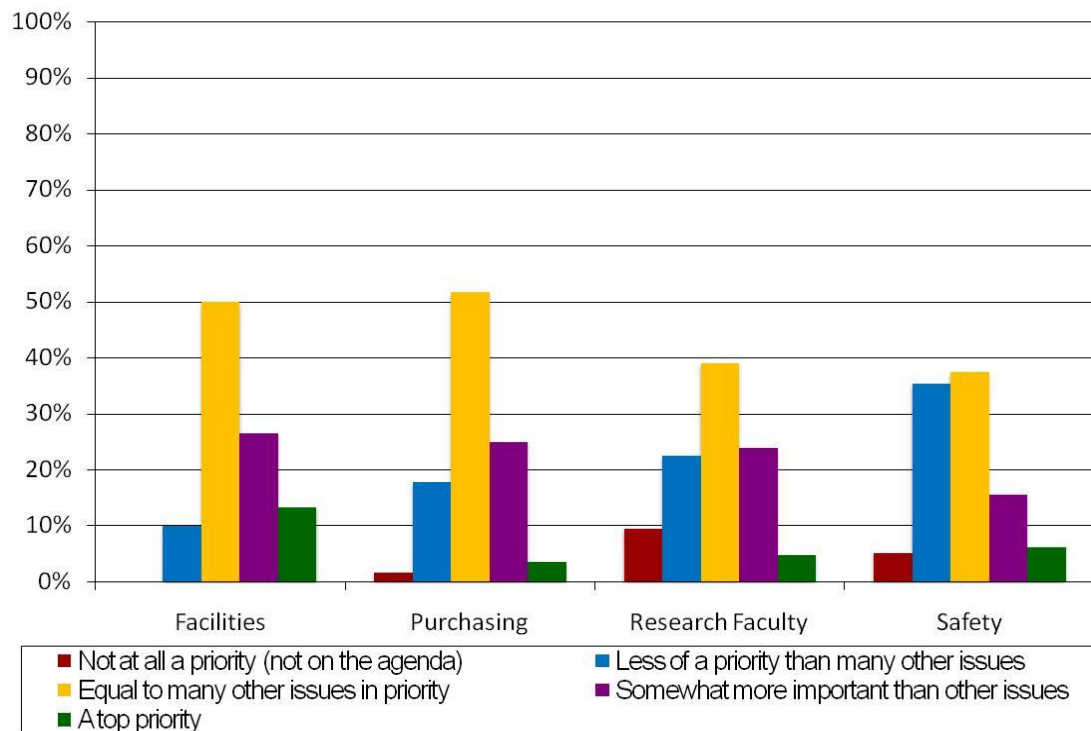


Figure 35 – Survey question 9b, campus sustainability is prioritized by my department

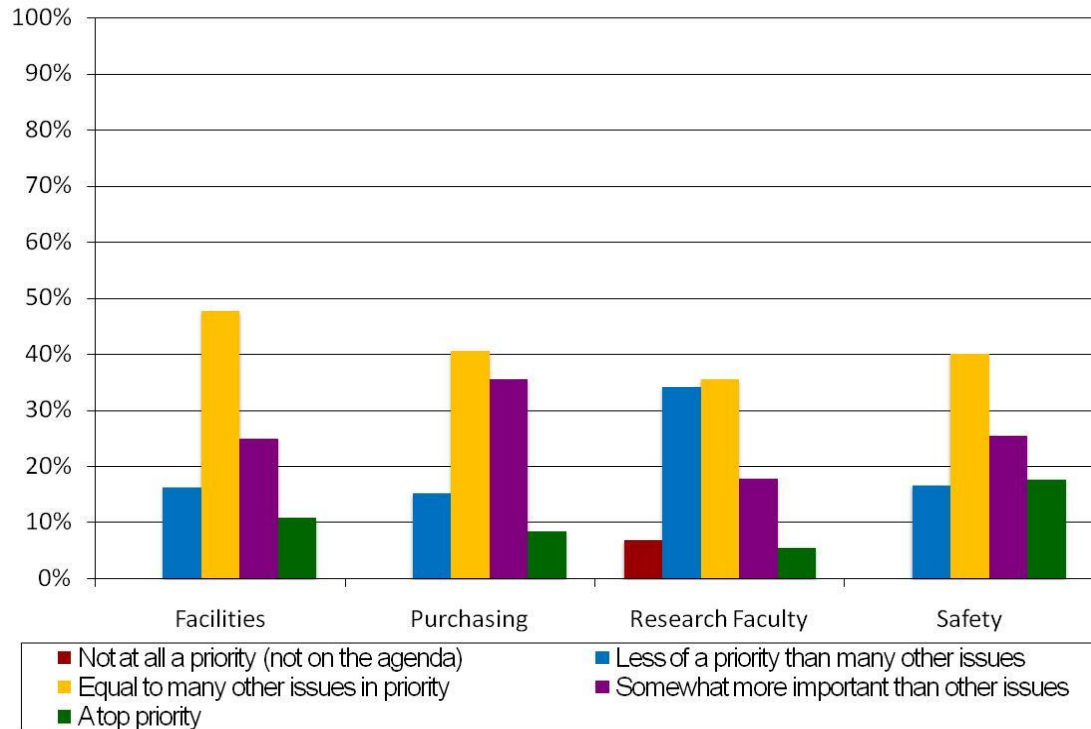


Figure 36 – Survey question 9c, campus sustainability is prioritized by my IHE

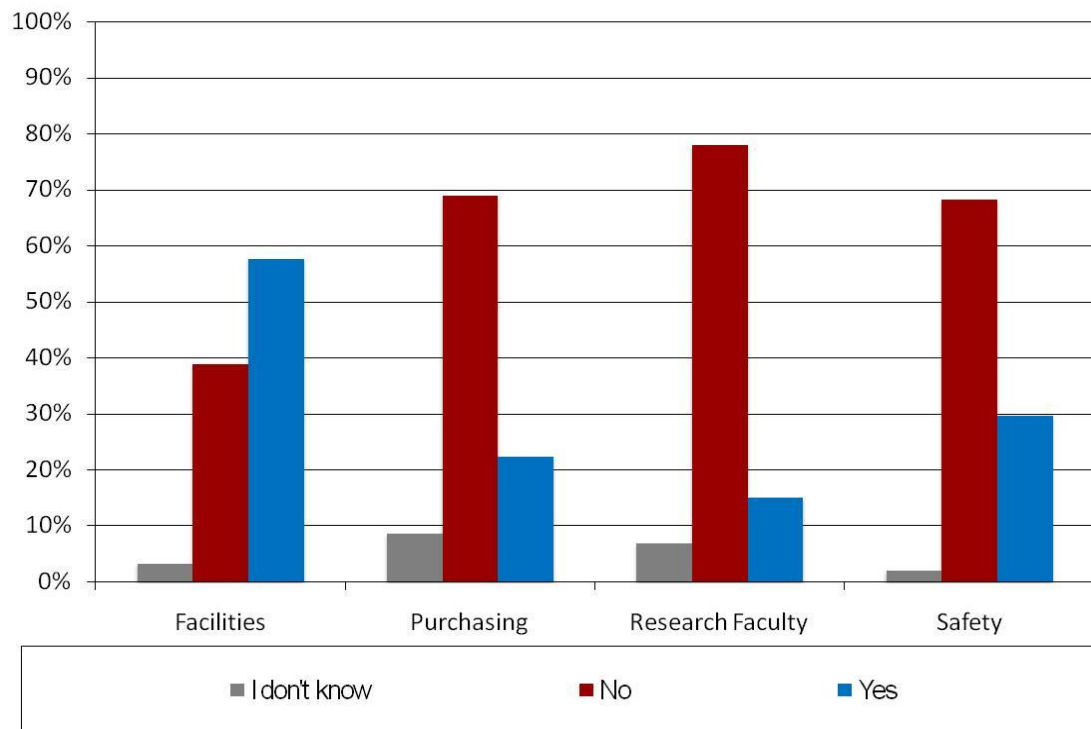


Figure 37 – Survey question 10a, my department includes sustainability in the mission statement

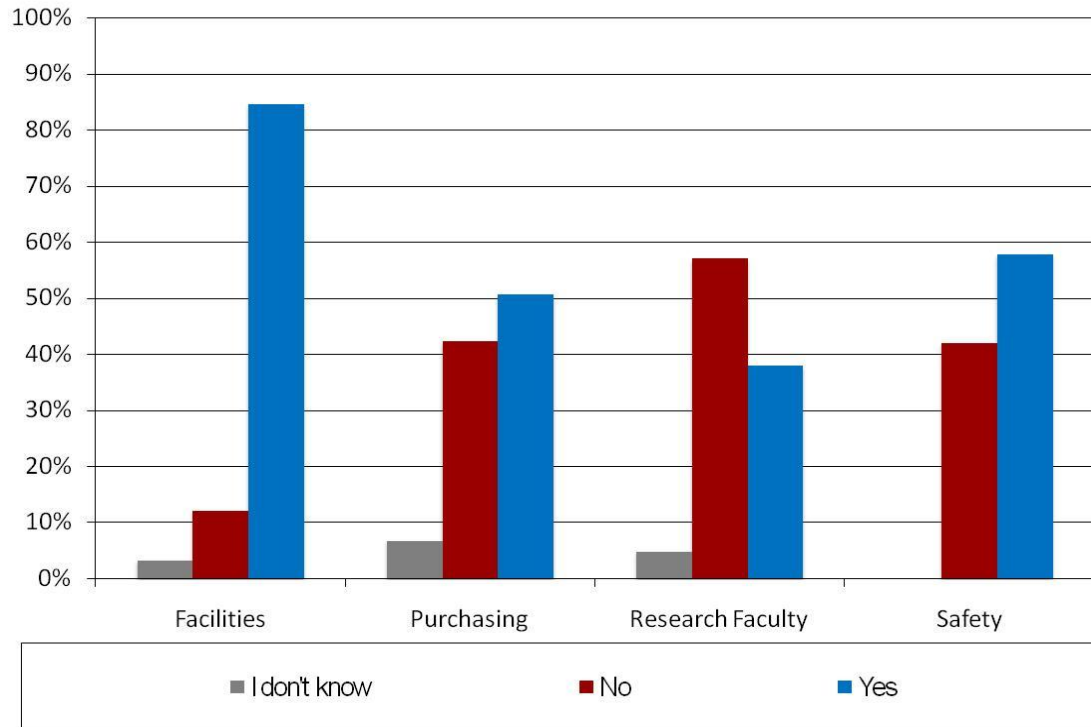


Figure 38 – Survey question 10b, my department includes sustainability in goals

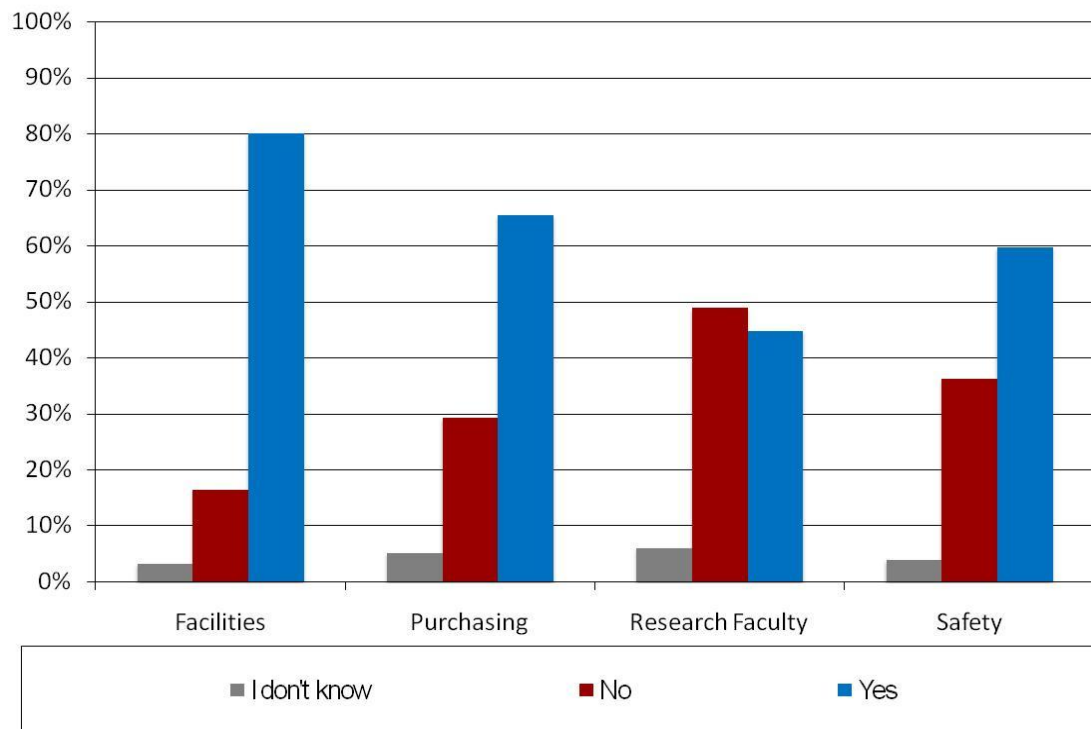


Figure 39 – Survey question 10c, my department includes sustainability in the policies

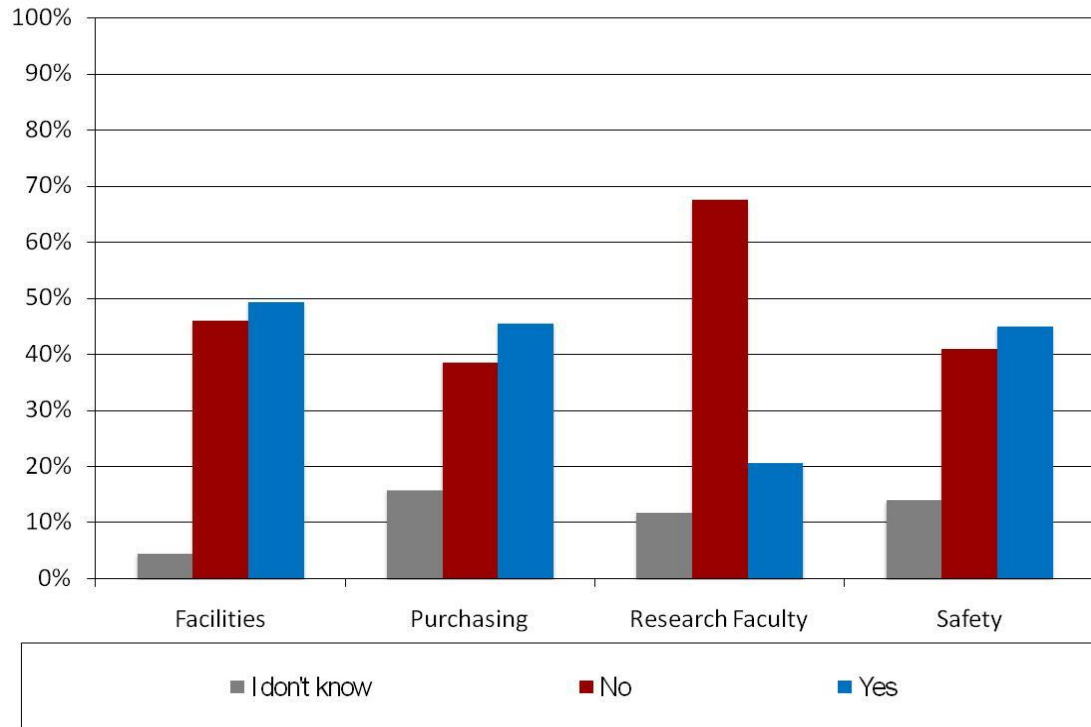


Figure 40 – Survey question 11a, my college/university includes sustainability in the mission statement

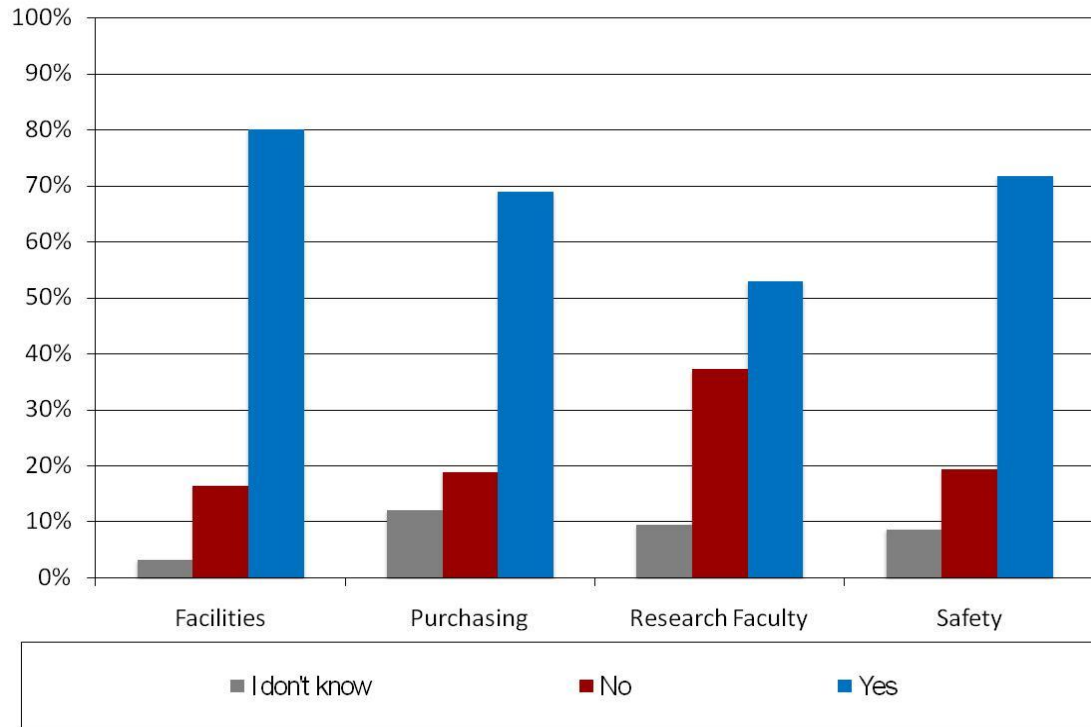


Figure 41 – Survey question 11b, my college/university includes sustainability in the goals

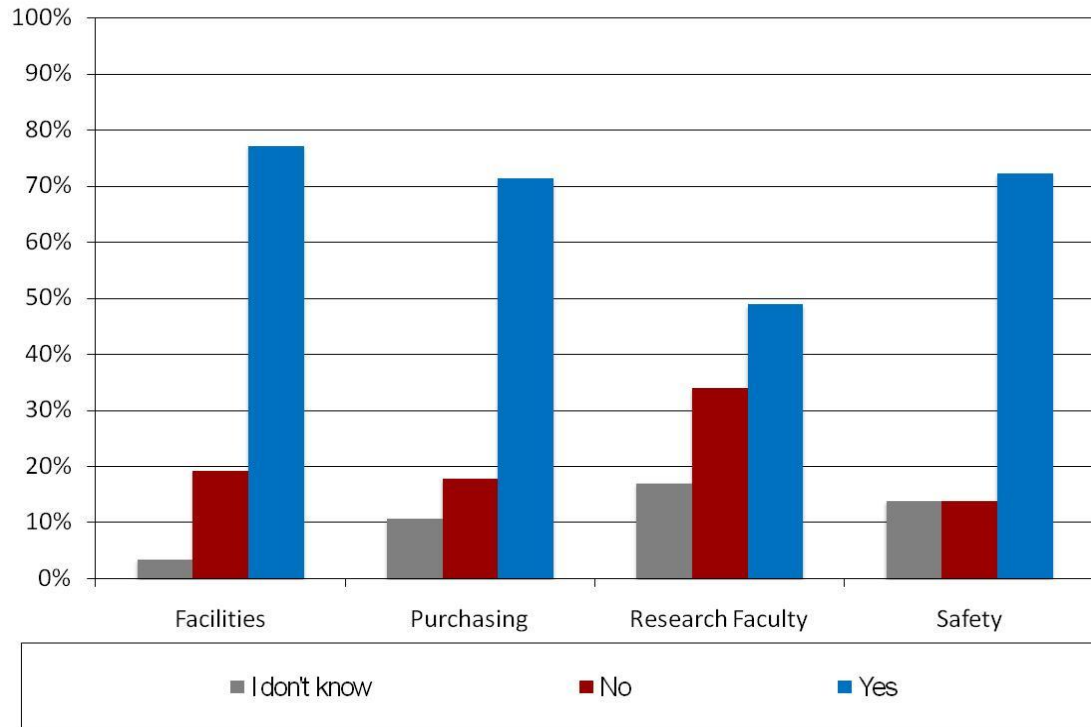


Figure 42 – Survey question 11c, my college/university includes sustainability in policies

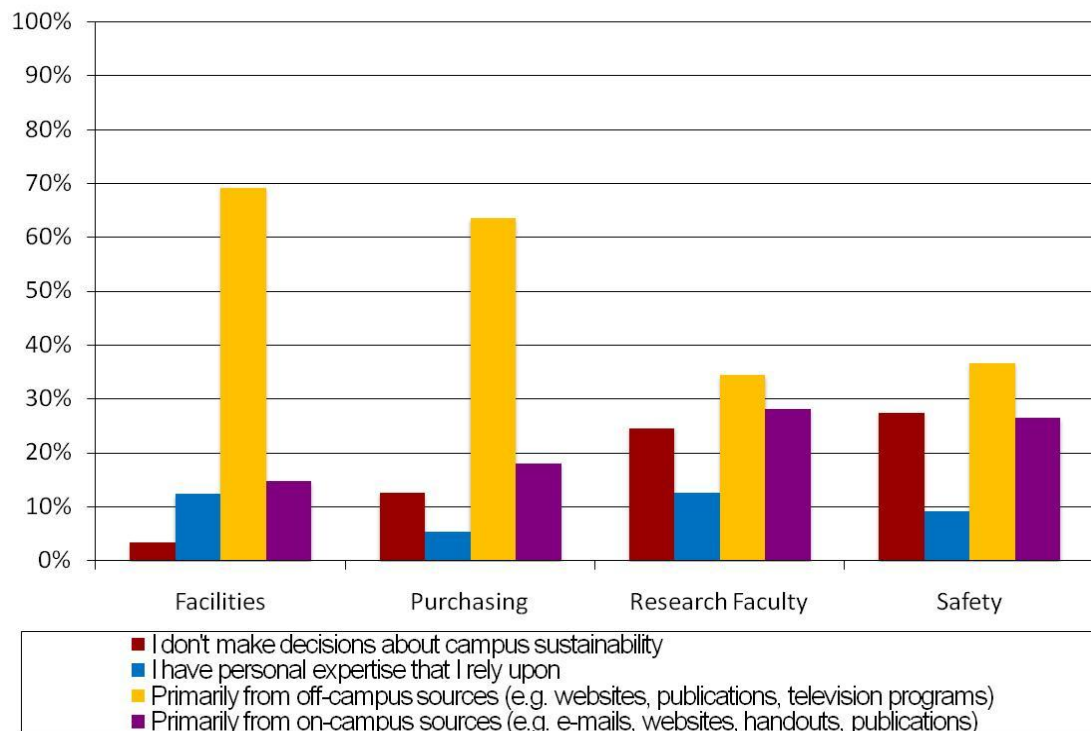


Figure 43 - Survey question 12, when making decisions about campus sustainability where do you obtain your information?

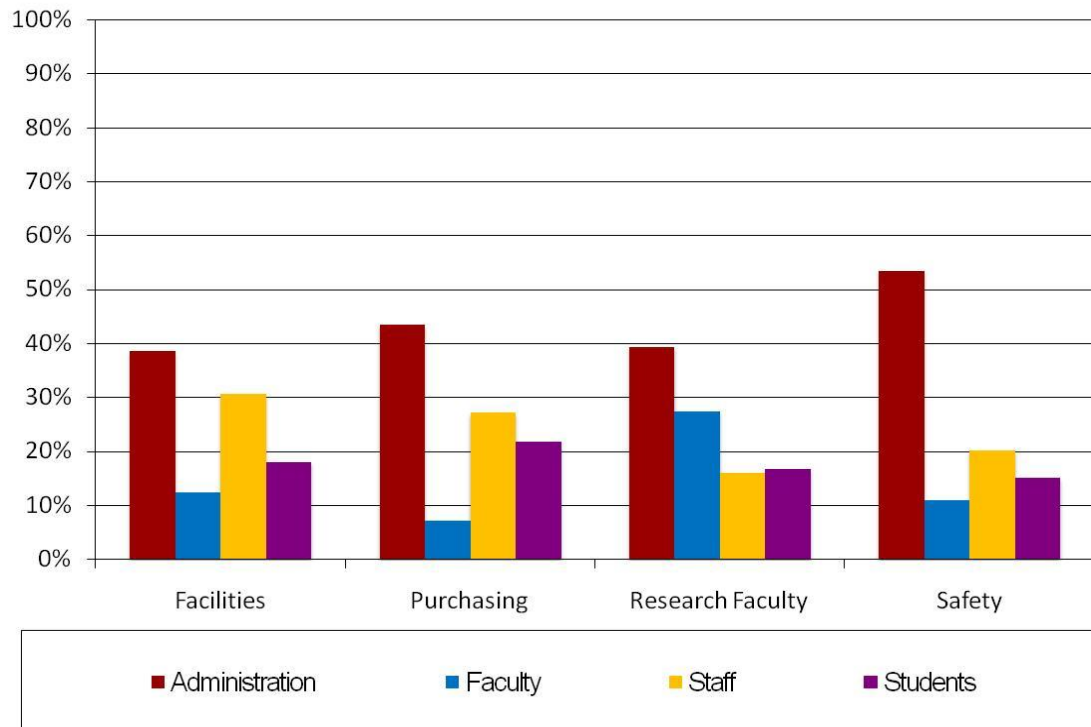


Figure 44 – Survey question 13, which group is most involved in campus sustainability?

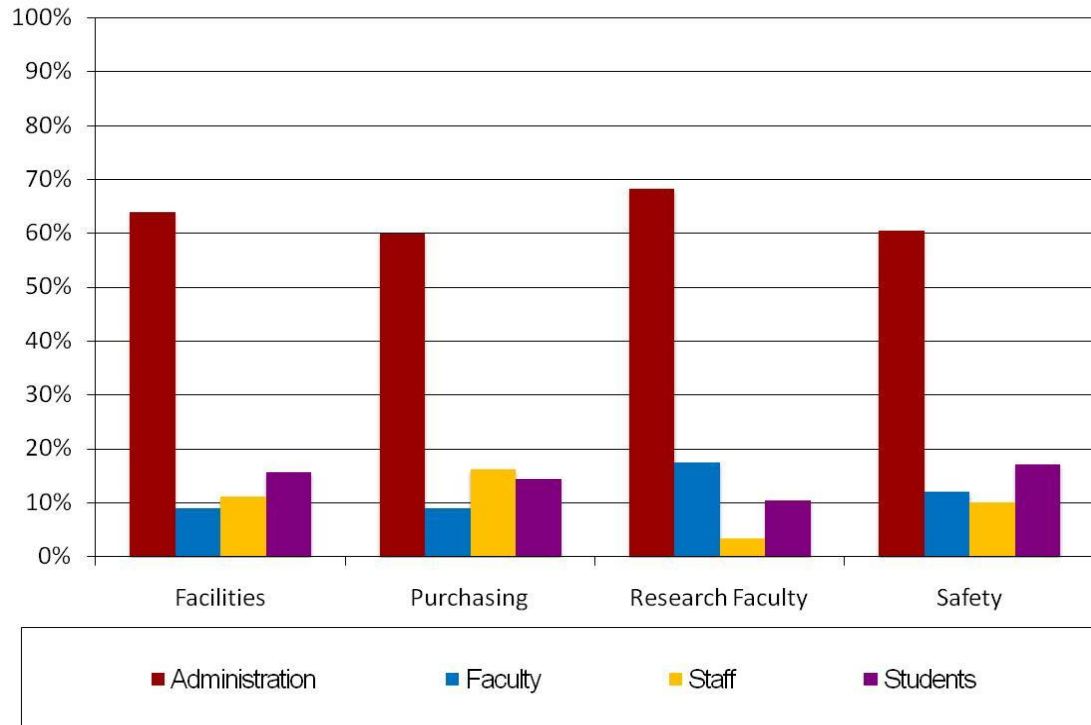


Figure 45 – Survey question 14, in your opinion, which on-campus group has the most influence on campus sustainability?

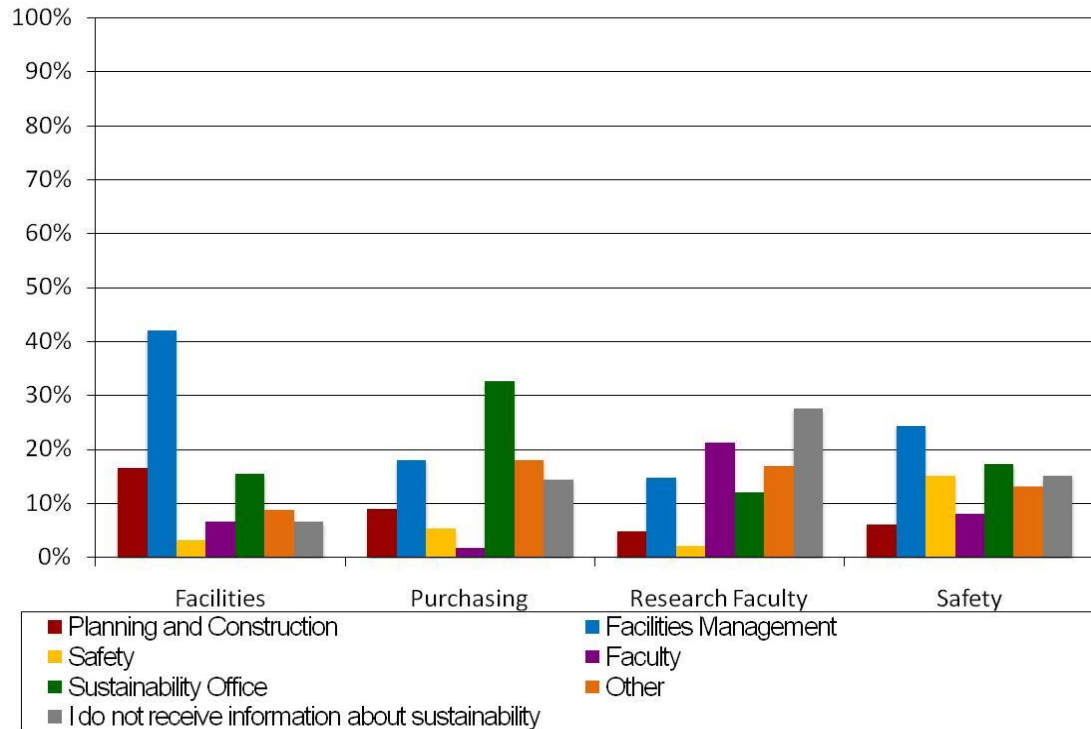


Figure 46 – Survey question 15, what is your primary on-campus source for sustainability information?

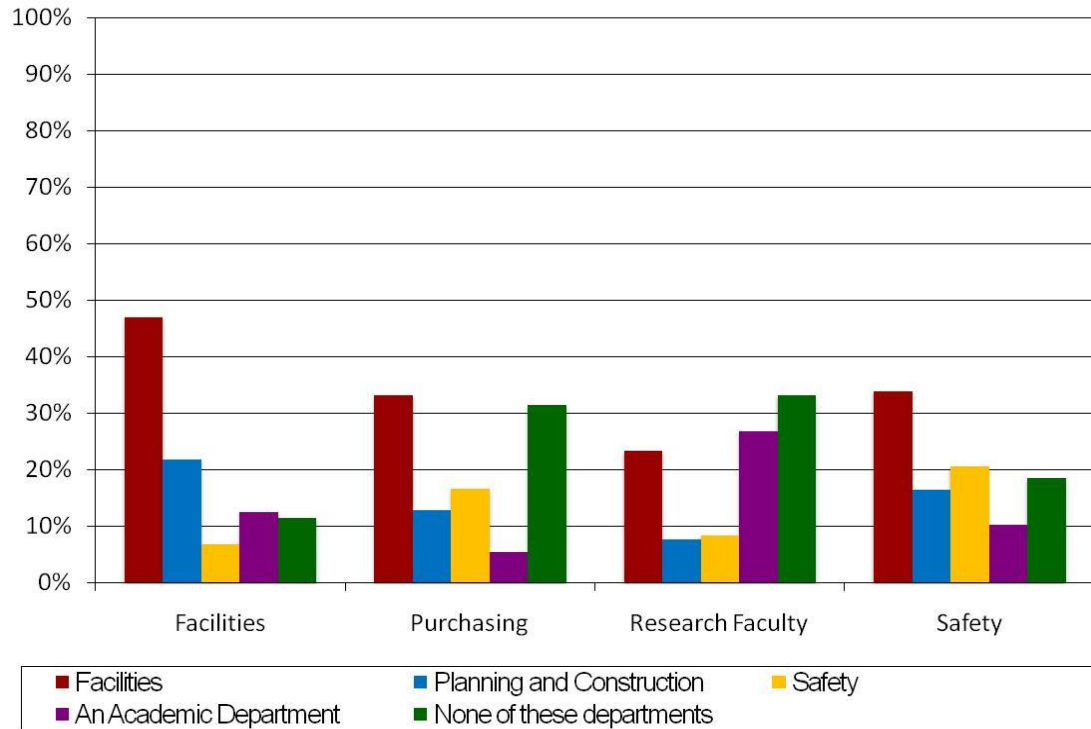


Figure 47 – Survey question 16, which of the following departments would you be most likely to rely on for information about sustainability?

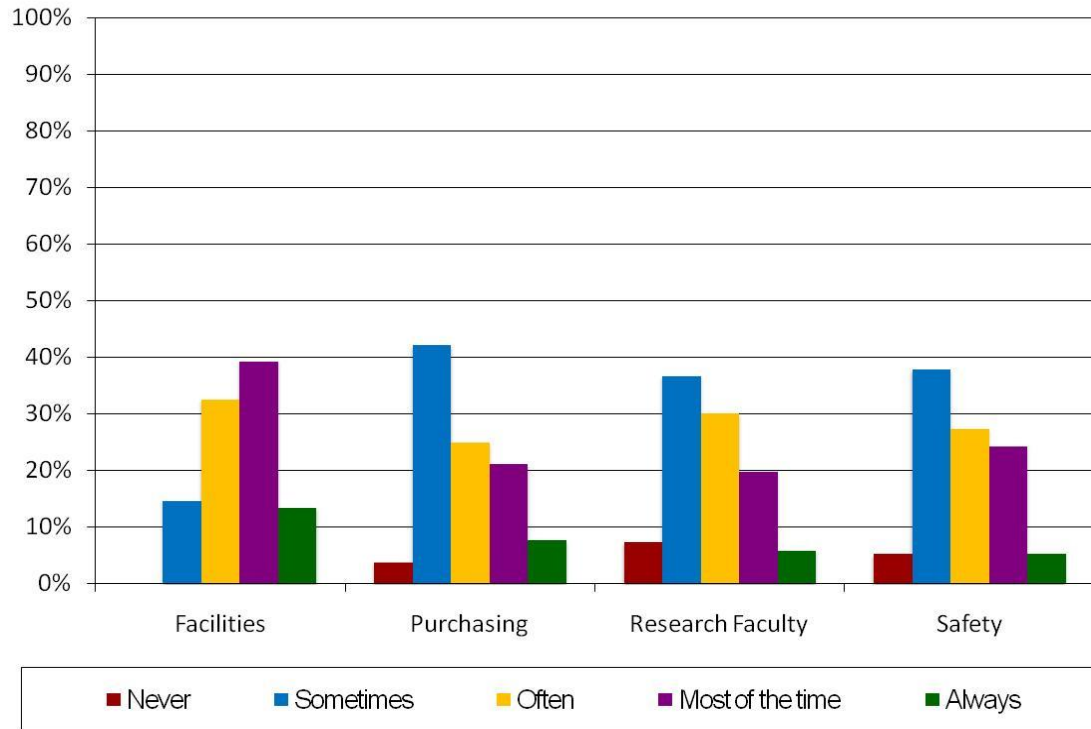


Figure 48 – Survey question 17, how often do you consider sustainability when making work related decisions?

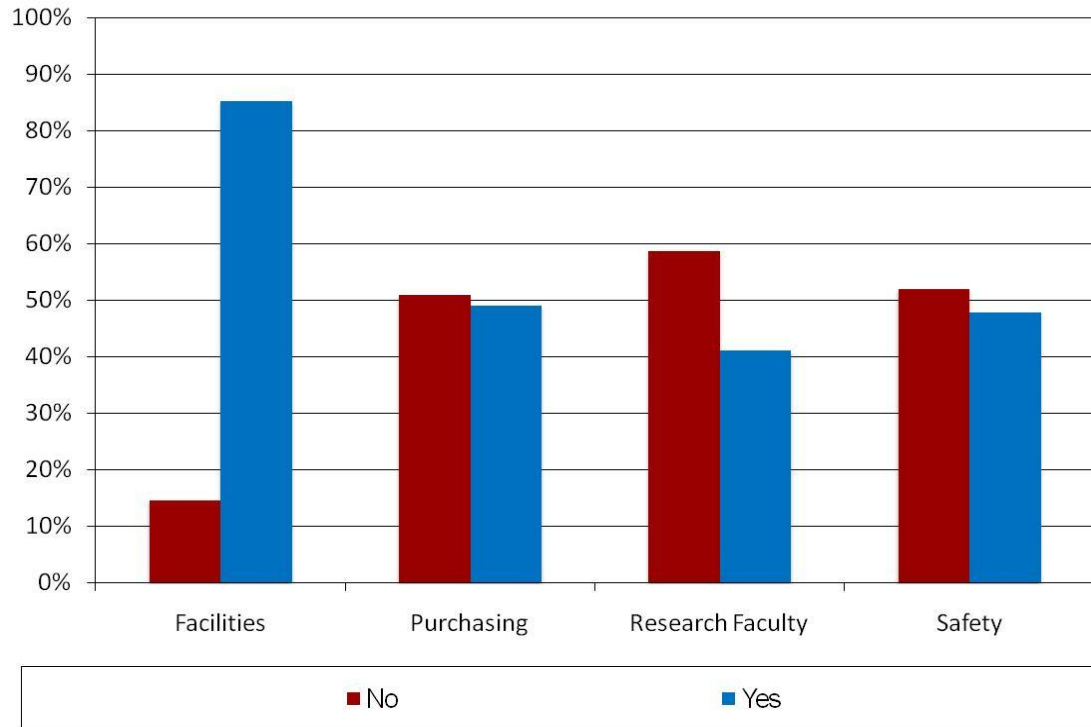


Figure 49 – Survey question 18, do you consider campus sustainability as one of your core responsibilities?

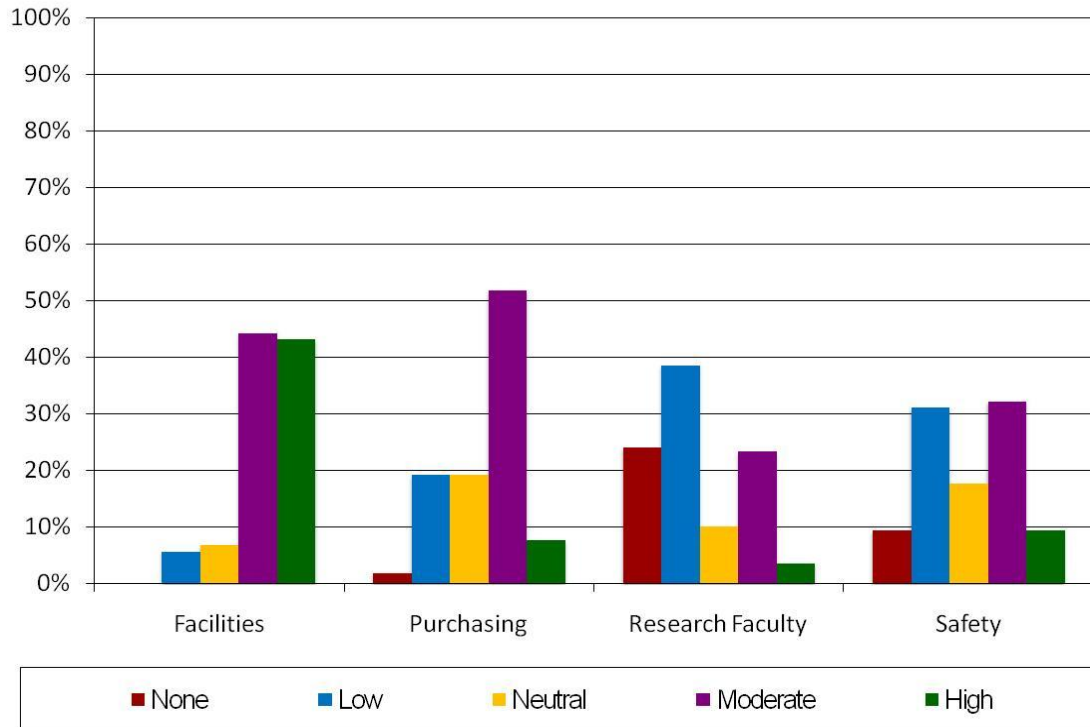


Figure 50 – Survey question 19, how much control do you have in campus-wide sustainability decision making?

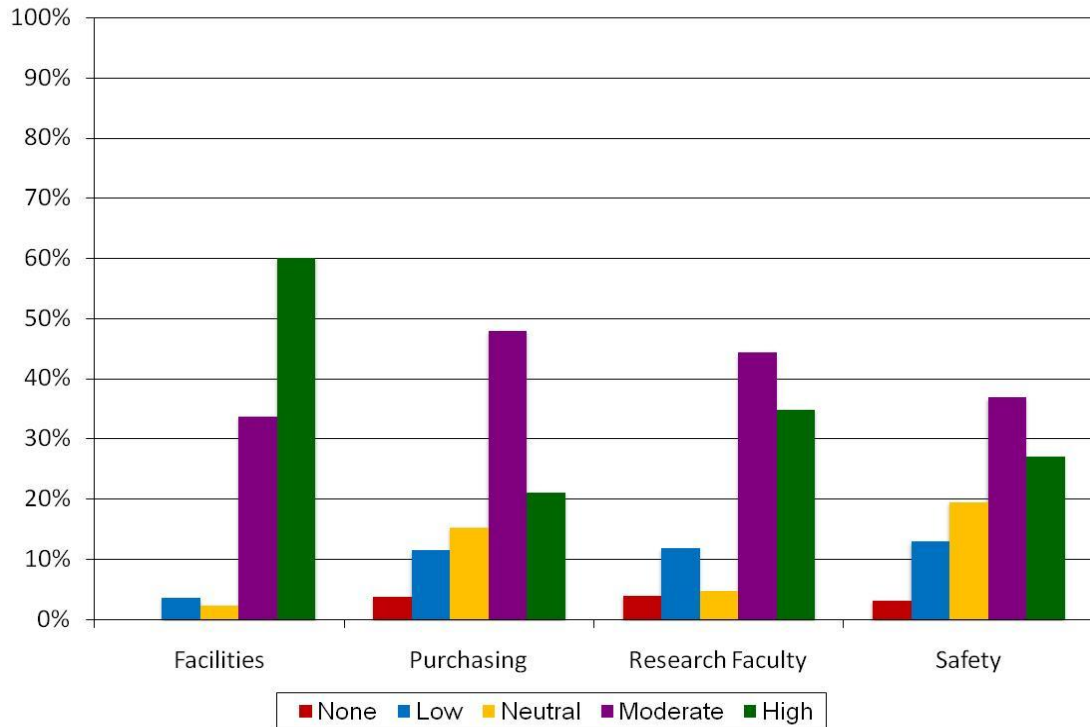


Figure 51 – Survey question 20, how much flexibility do you have when making decisions for your laboratory/unit that could impact campus sustainability?

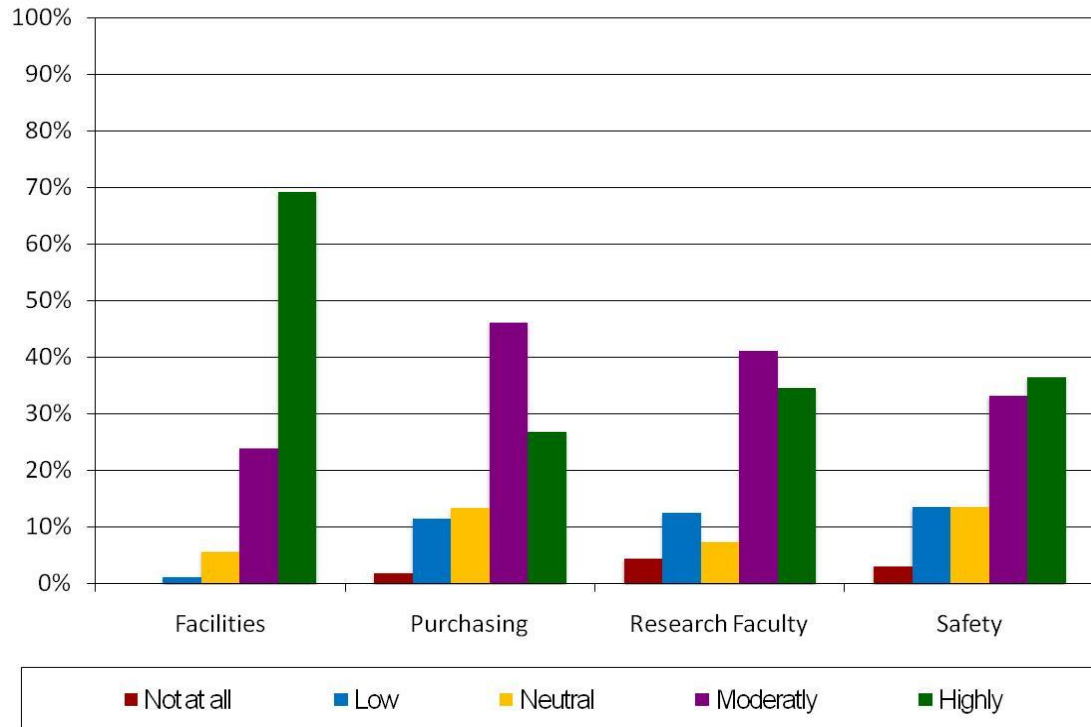


Figure 52 – Survey question 21, I feel empowered to make decisions for my laboratory/unit that impact campus sustainability

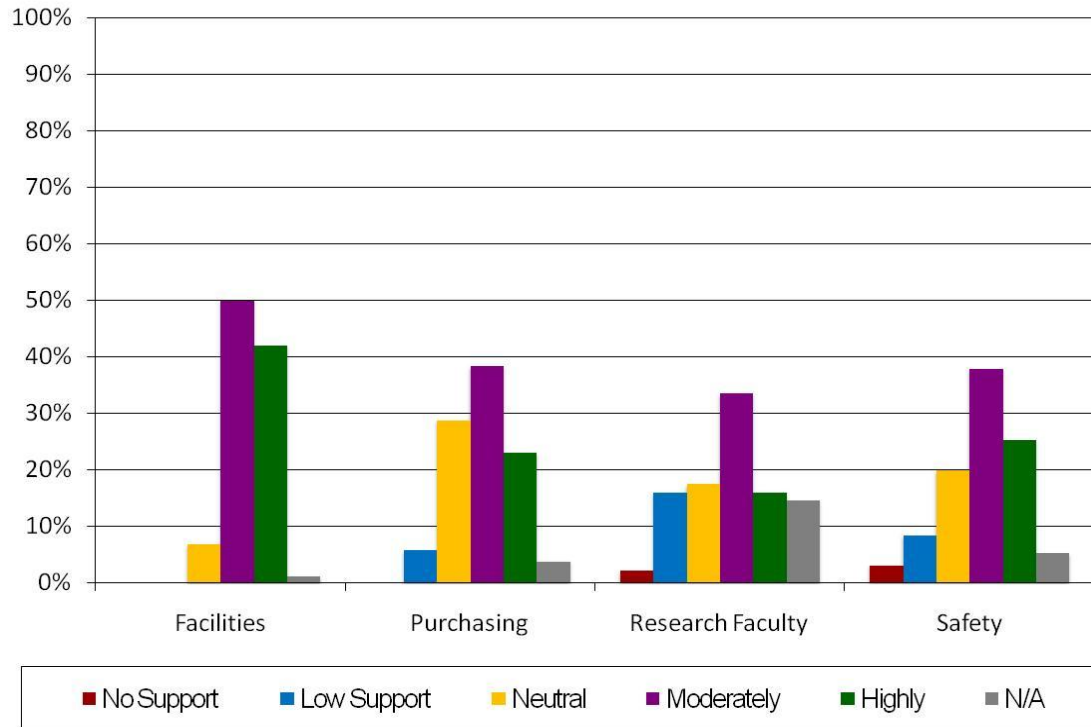


Figure 53 – Survey question 22, do you feel that decisions you make about campus-wide sustainability are supported?

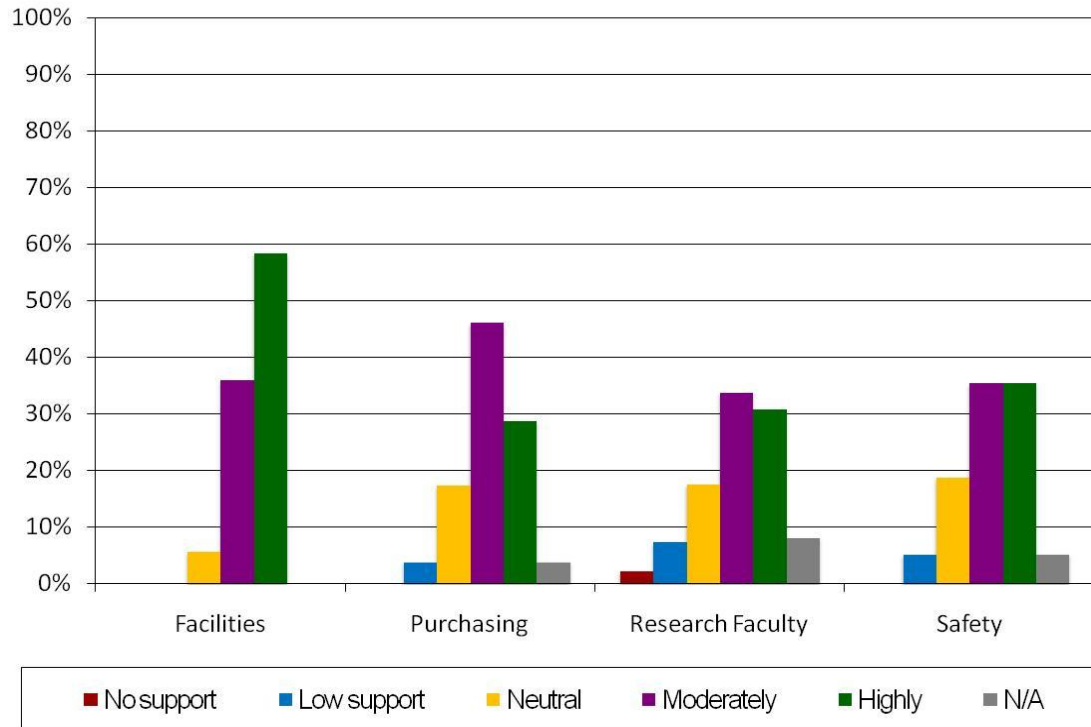


Figure 54 – Survey question 23, do you feel that decisions you make about sustainability for your laboratory/unit are supported?

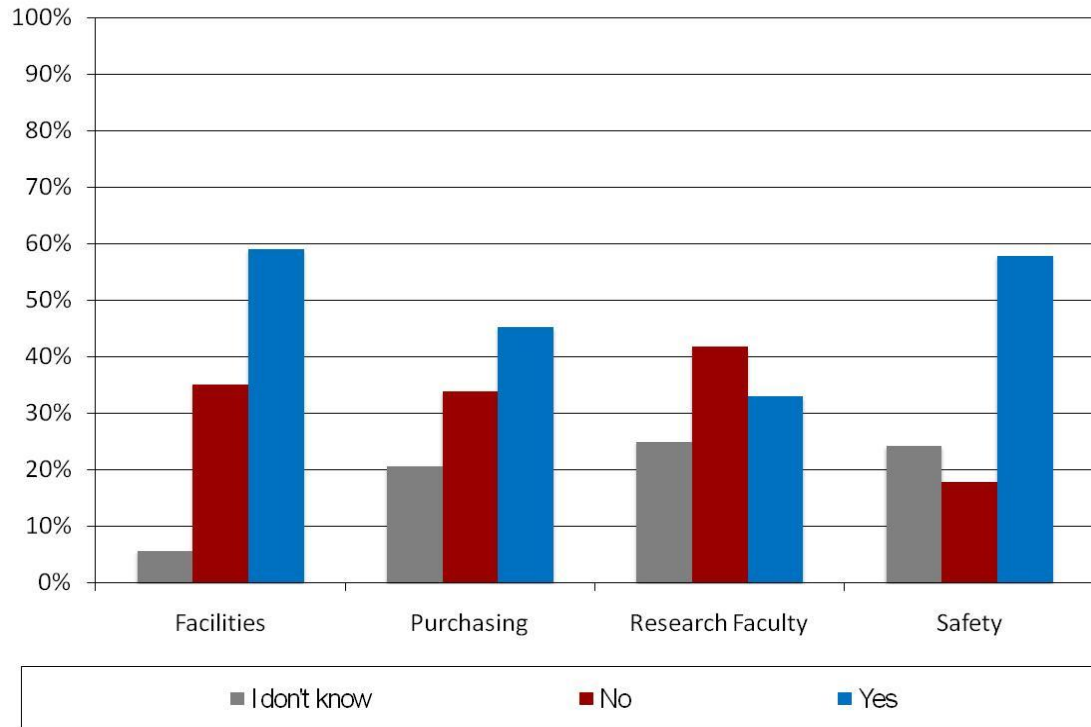


Figure 55 – Survey question 24, my institution provides financial support for campus sustainability

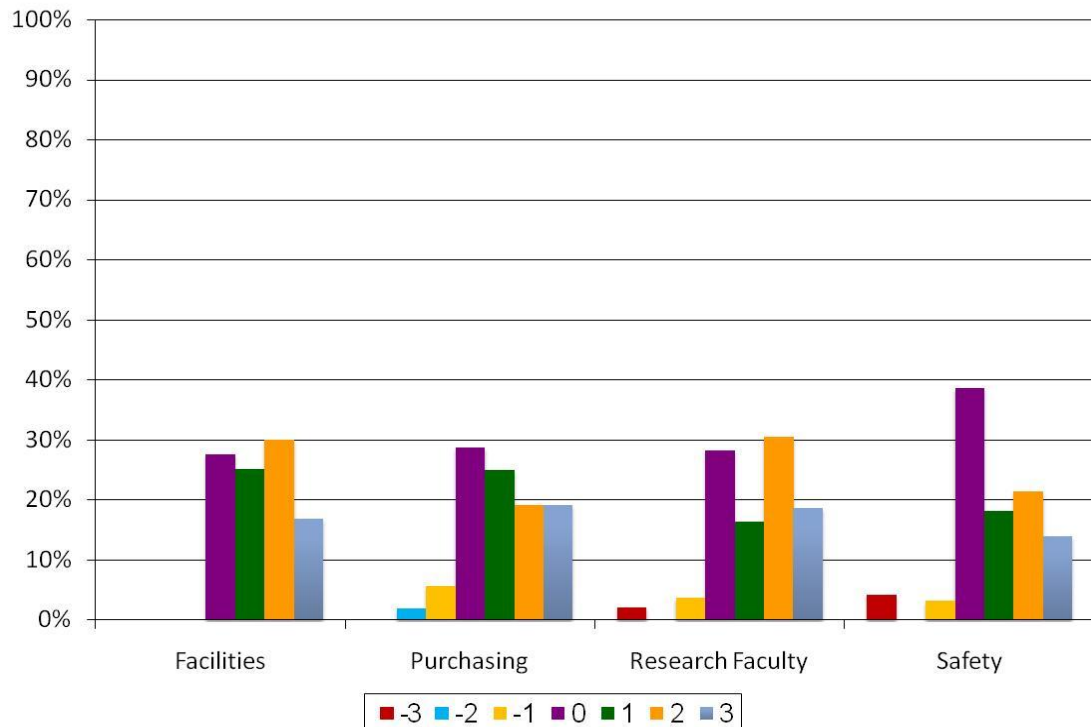


Figure 56 - Survey question 25, when I hear the term sustainability I feel upset (-3) through happy (3)

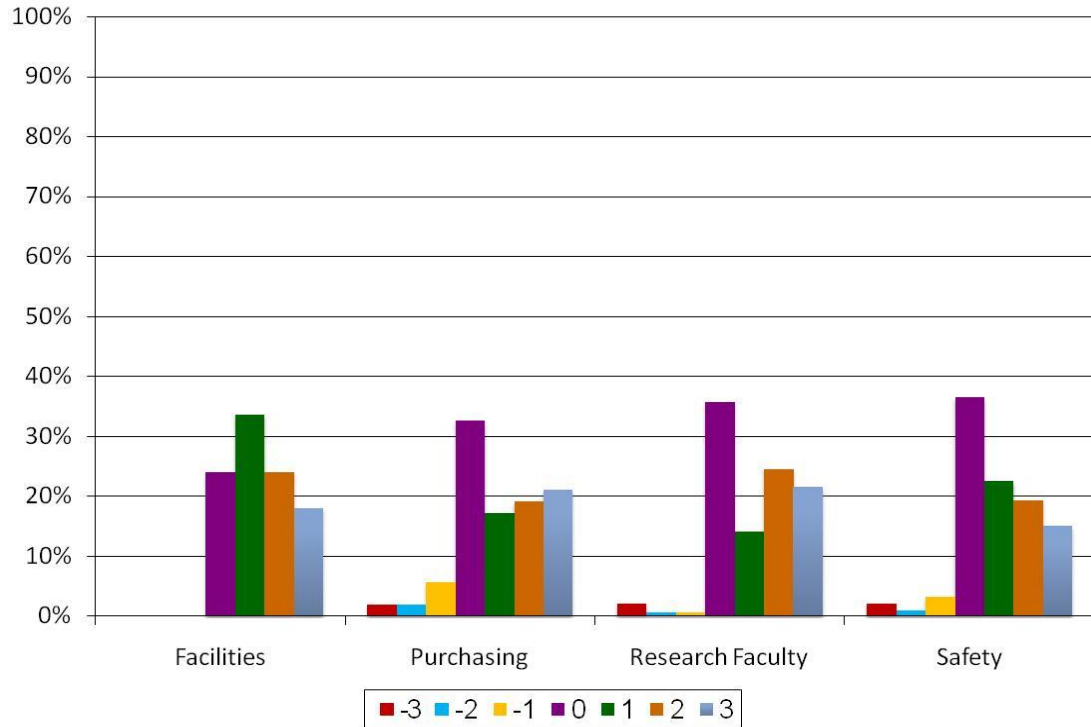


Figure 57 – Survey question 26, when I hear the term sustainability I feel angry (-3) through friendly (3)

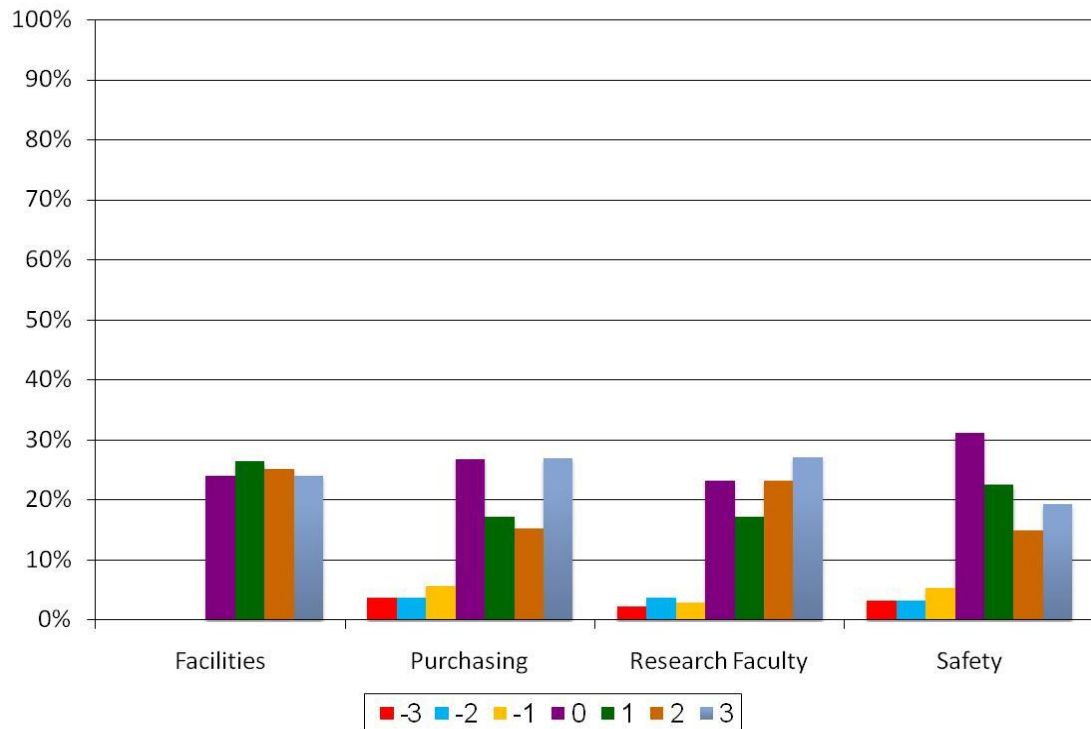


Figure 58 – Survey question 27, when I hear the term sustainability I feel annoyed (-3) through enthusiastic (3)

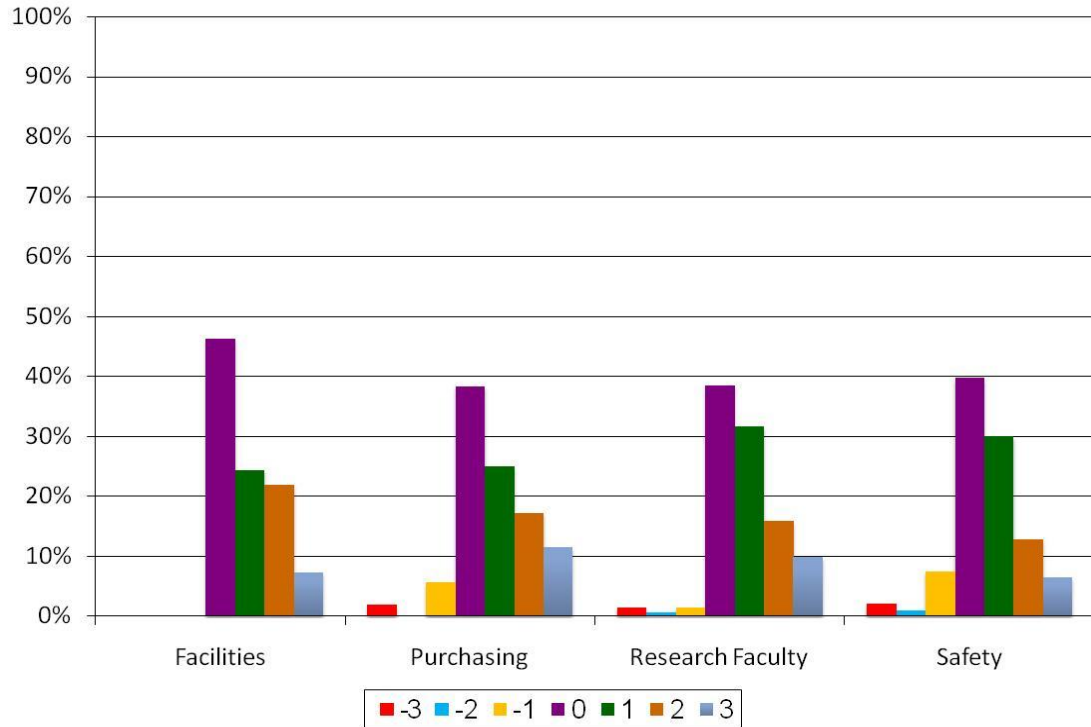


Figure 59 – Survey question 28, when I hear the term sustainability I feel disgust (-3) through love (3)

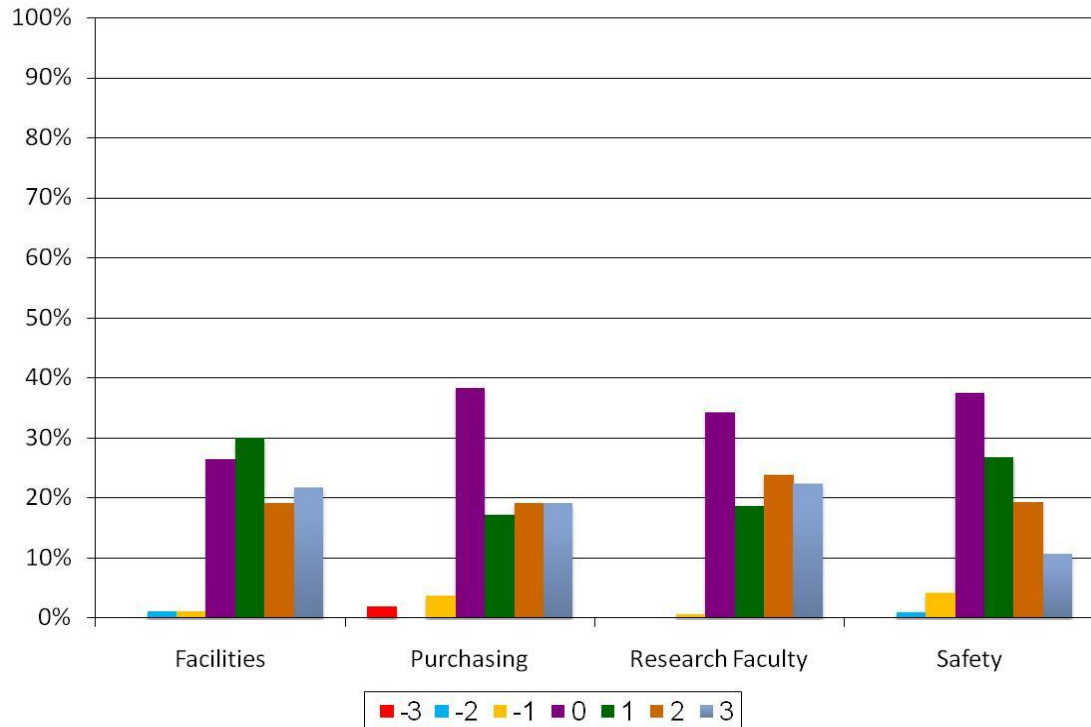


Figure 60 – Survey question 29, when I hear the term sustainability I feel afraid (-3) through excited (3)

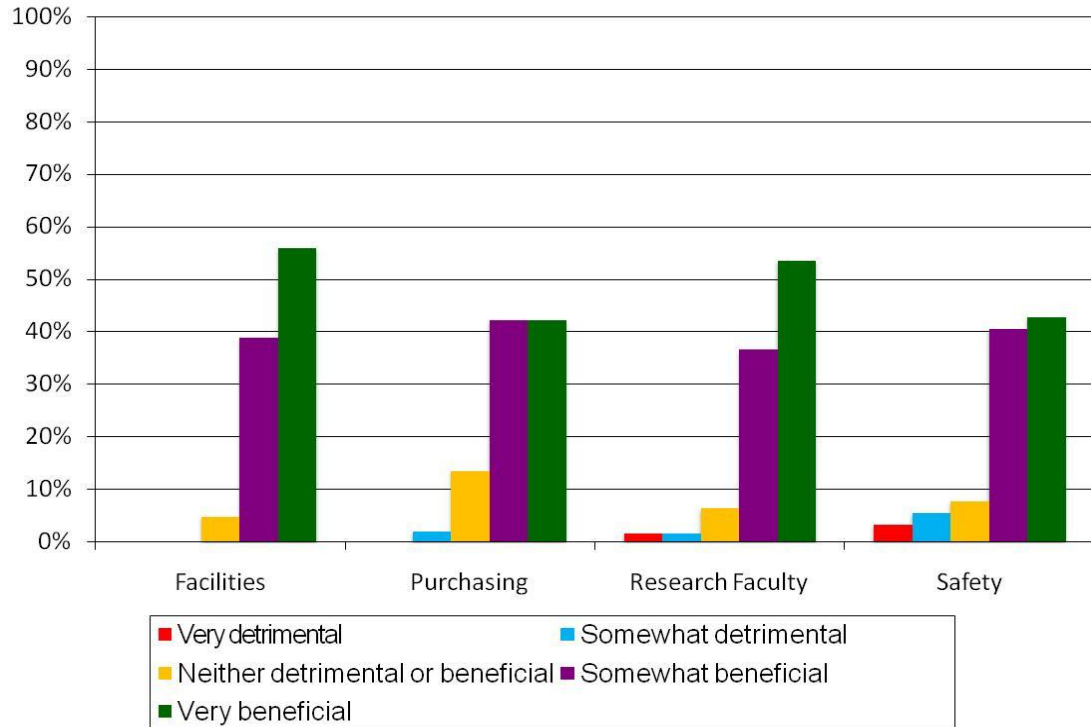


Figure 61 – Survey question 30, I feel that campus sustainability initiatives are

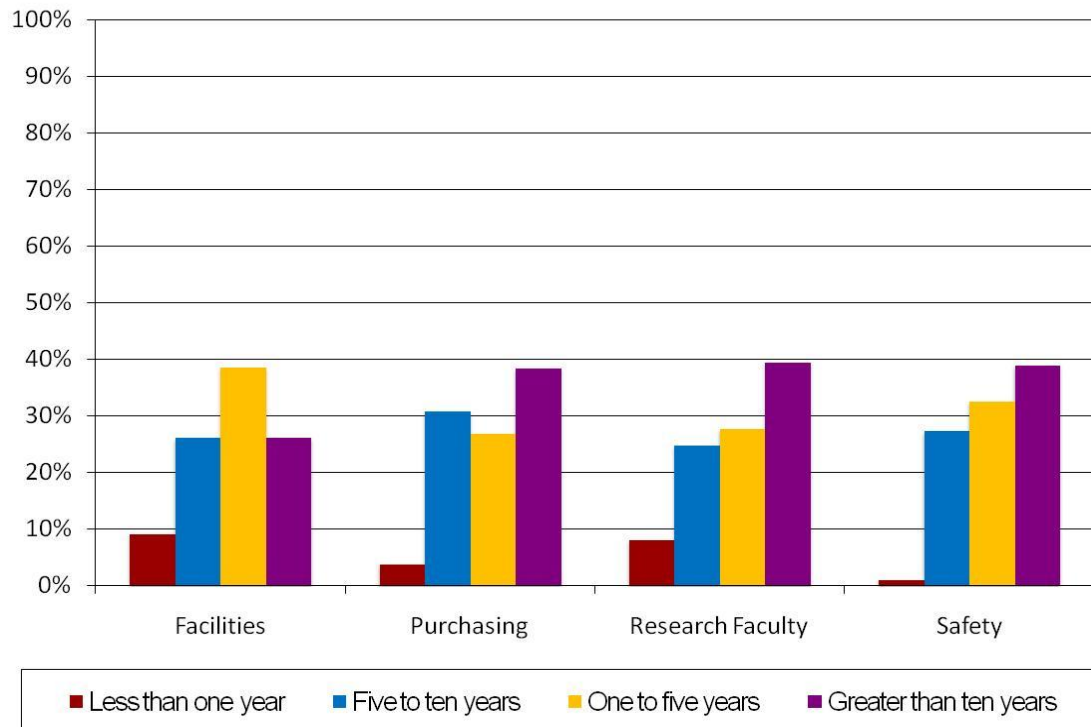


Figure 62 – Survey question 31a, how many years have you been in your current position?

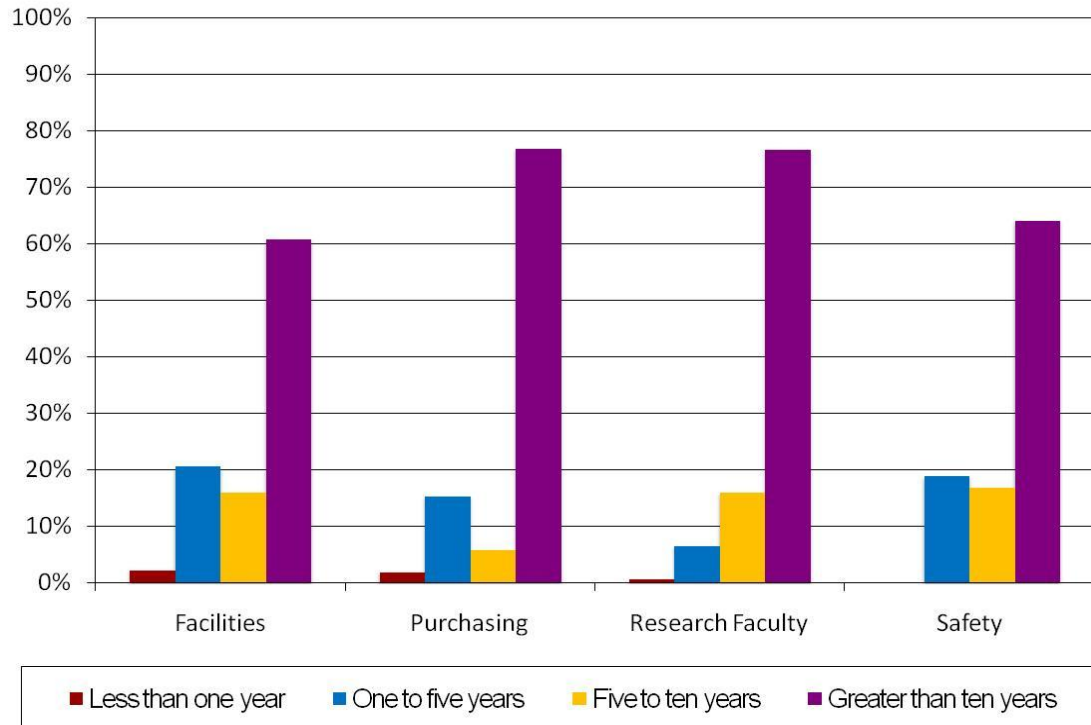


Figure 63 – Survey question 31b, how many years have you worked in higher education?

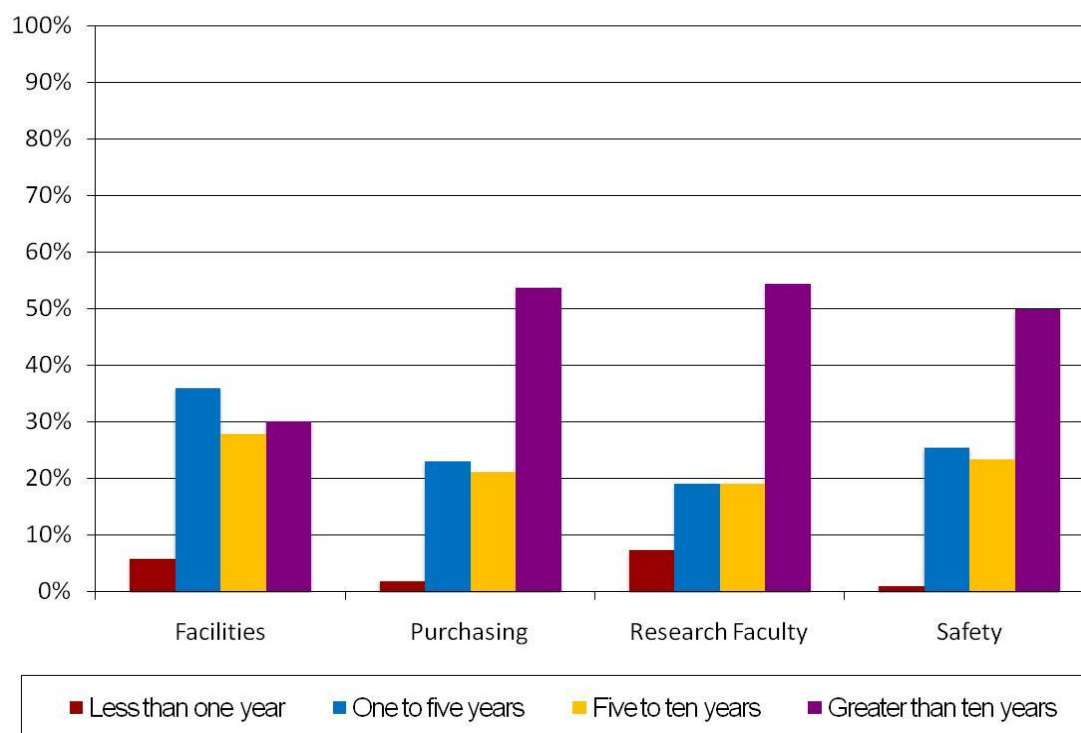


Figure 64 – Survey question 31c, how Many Years have you been at your current IHE?

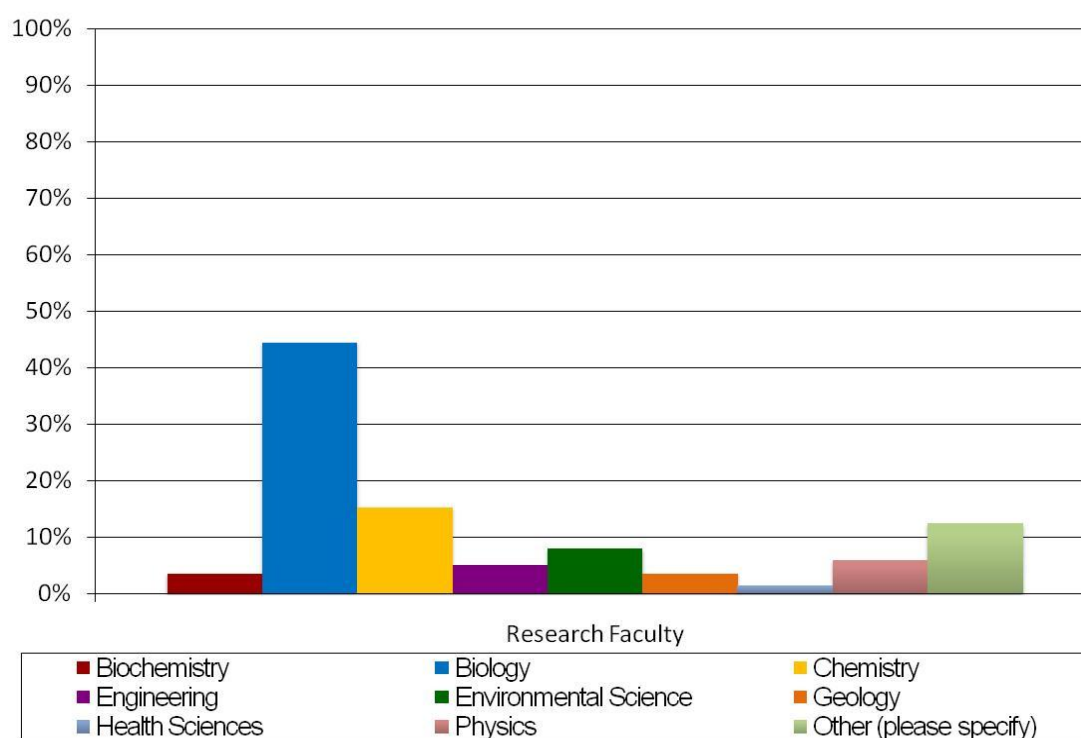


Figure 65 – Survey question 32, what is your primary area of expertise? Asked to research faculty only.

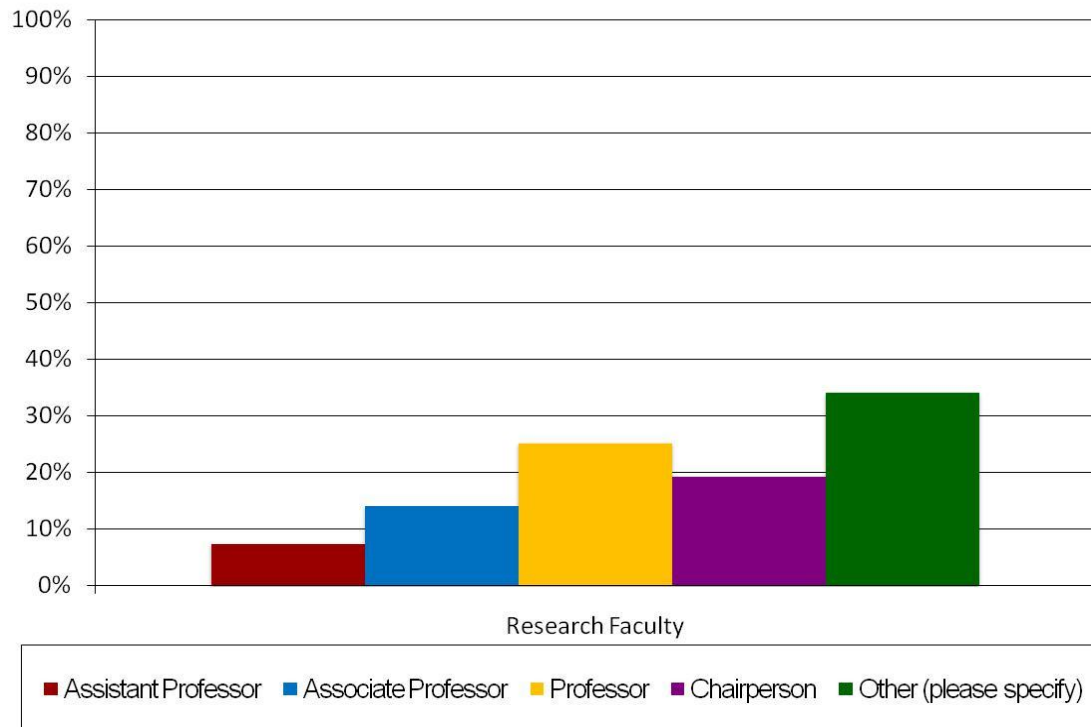


Figure 66 – Survey question 33, what is your current title? Asked to research faculty only.

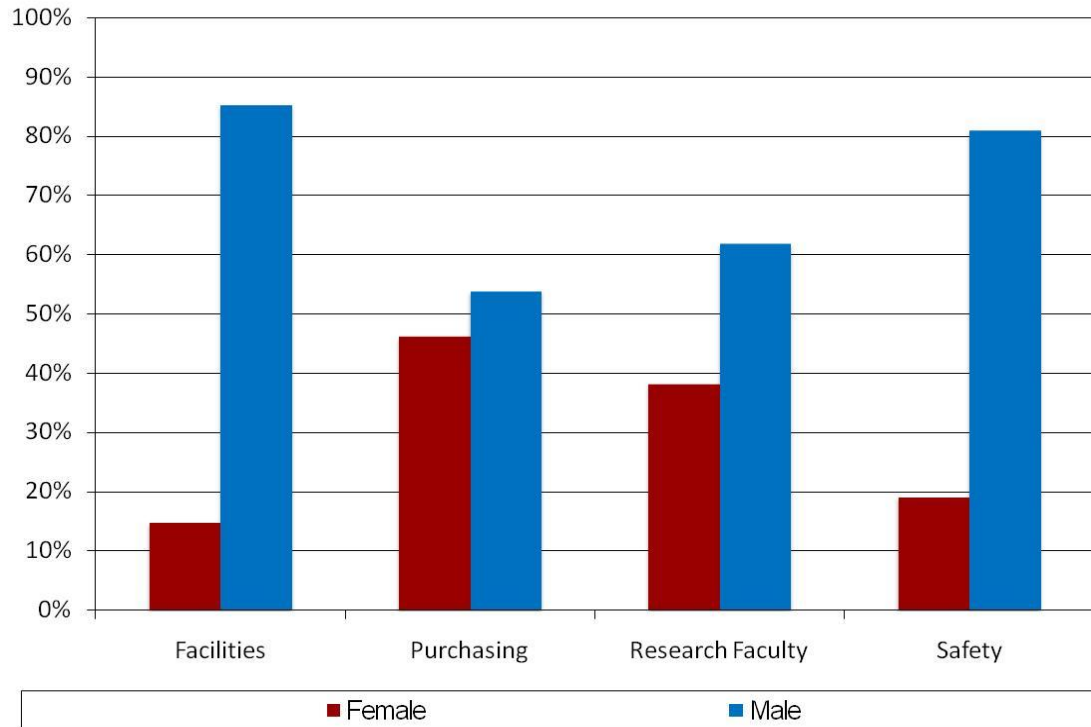


Figure 67 – Survey question 35, please Identify your Sex

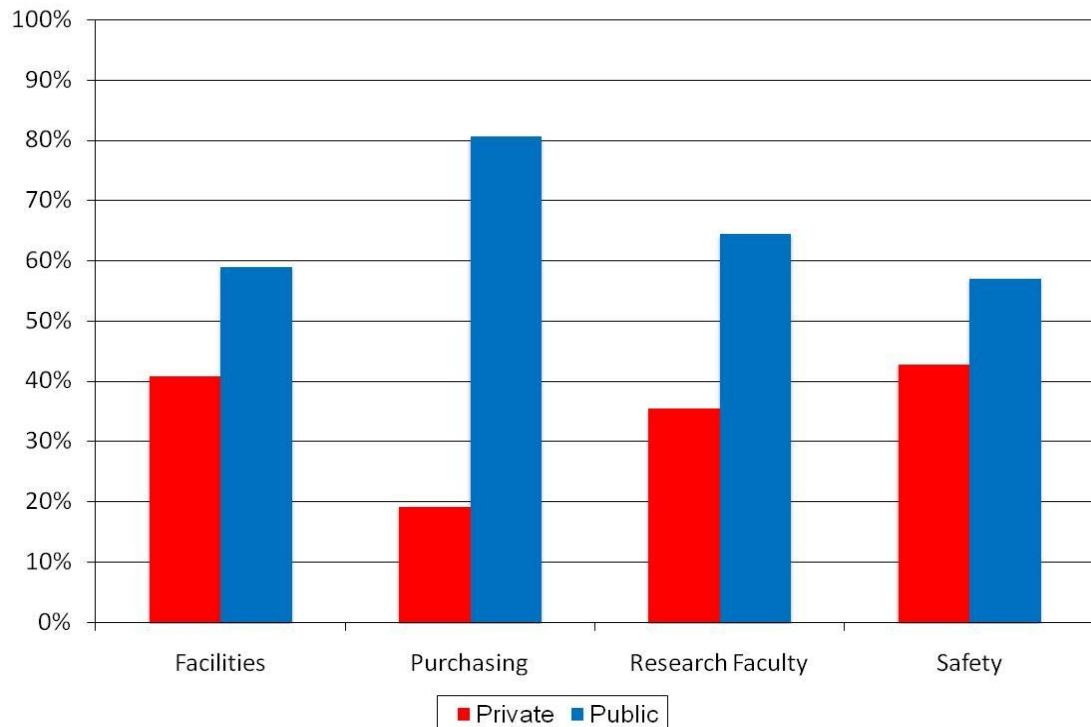


Figure 68 – Survey question 36, is your university public or private?

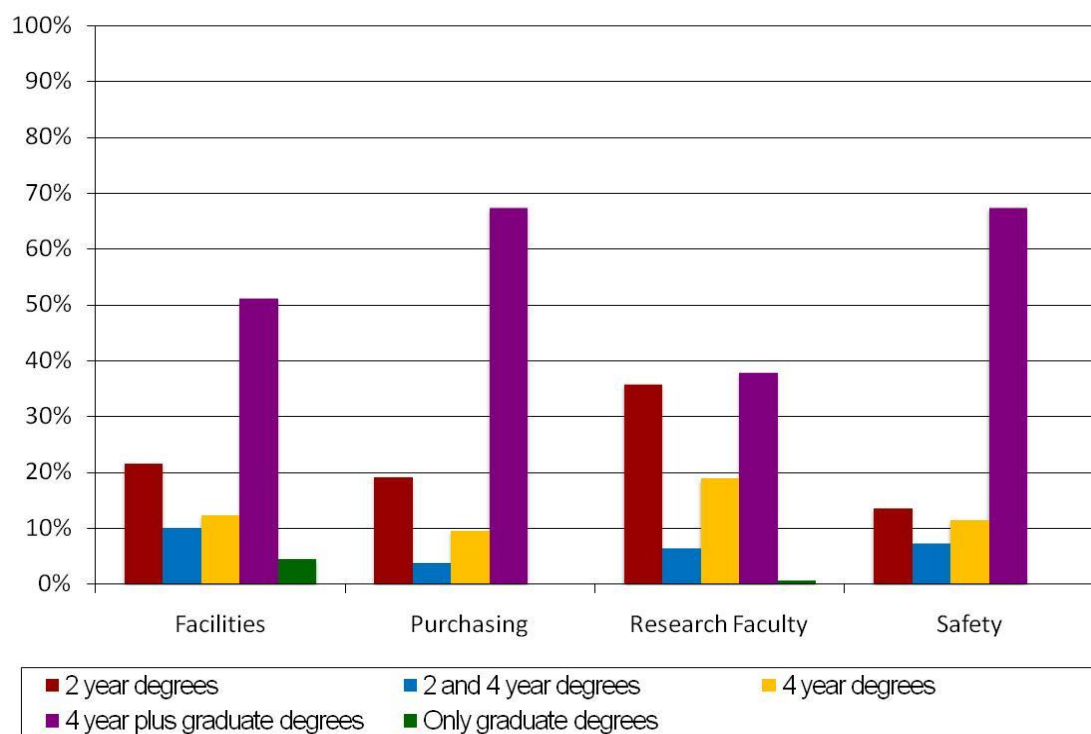


Figure 69 – Survey question 37, what degrees does your IHE Offer?

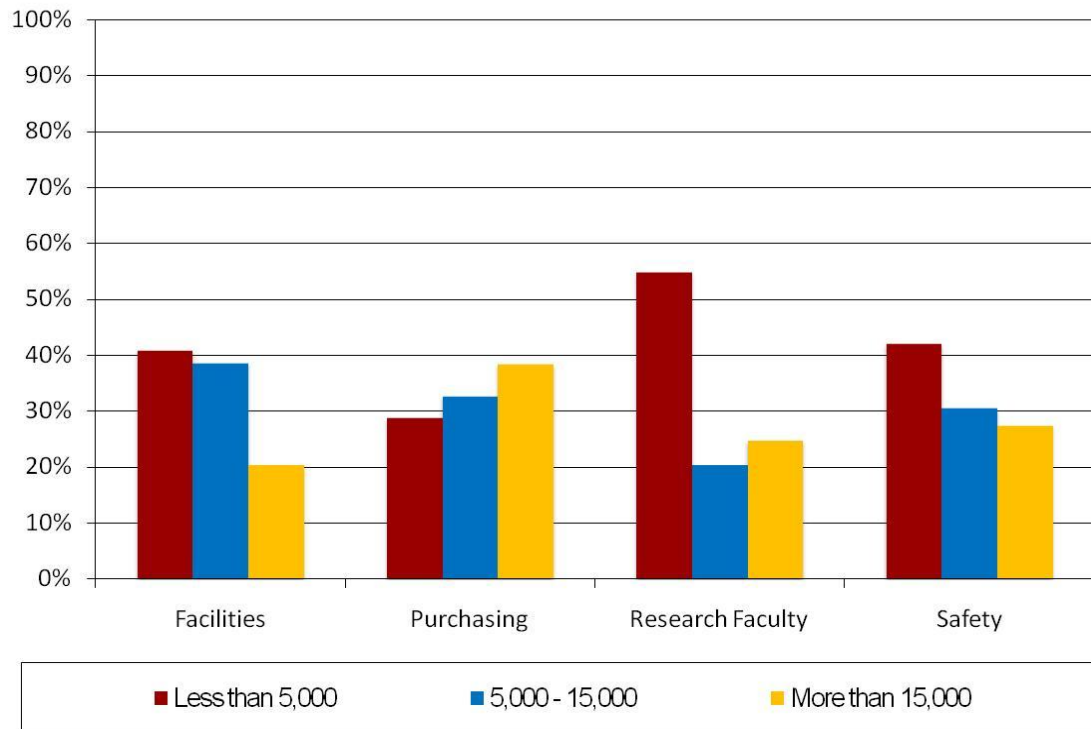


Figure 70 – Survey question 38, approximately how many students attend your IHE?

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