SUSTAINABLE DEVELOPMENT AMONG FOUR–YEAR HIGHER EDUCATION INSTITUTIONS IN THE UNITED STATES: A GEOGRAPHIC AND ANTHROPOLOGICAL PERSPECTIVE

Kori Nadine Armstrong

Follow this and additional works at: https://aquila.usm.edu/dissertations

Part of the Nature and Society Relations Commons

Recommended Citation
https://aquila.usm.edu/dissertations/1956

This Dissertation is brought to you for free and open access by The Aquila Digital Community. It has been accepted for inclusion in Dissertations by an authorized administrator of The Aquila Digital Community. For more information, please contact aquilastaff@usm.edu.
SUSTAINABLE DEVELOPMENT AMONG FOUR–YEAR HIGHER EDUCATION INSTITUTIONS IN THE UNITED STATES: A GEOGRAPHIC AND ANTHROPOLOGICAL PERSPECTIVE

by

Kori Nadine Armstrong

A Dissertation
Submitted to the Graduate School,
the College of Arts and Sciences
and the School of Biological, Environmental, and Earth Sciences
at The University of Southern Mississippi
in Partial Fulfillment of the Requirements
for the Degree of Doctor of Philosophy

Approved by

Dr. David Cochran, Committee Chair
Dr. Bridget Hayden, Committee Member
Dr. Mark M. Miller, Committee Member
Dr. Thomas Patterson, Committee Member
Dr. Thomas O’Brien, Committee Member

December 2021
ABSTRACT

This dissertation investigates the factors that contribute to the cultural characteristics of sustainability among higher education institutions (HEIs) in the United States to shed light on how they represent themselves as sustainable. It documents four-year HEIs in the United States that self-identify as sustainable; evaluates how these institutions portray themselves to society as sustainable; and documents who is leading sustainability on U.S. college campuses.

This dissertation fills an important gap in the literature on sustainable development in higher education that Holm and others (2016) have identified. Although education for sustainable development (ESD) has been recognized as an important topic, and many higher education institutions have integrated sustainability components into their policies and procedures, there is a profound need to analyze the integration of sustainability into HEIs in a more holistic fashion (Holm et al. 2016). While scholars have published studies of HEIs and their commitment to sustainability, most of this literature is limited in scope and focuses on a single university or university sector. Other data sets, such as STARS Assessment Reports is based on self-reported information by universities willing to participate.

My goal is to understand sustainability in higher education more broadly through a systematic study of all four-year HEIs in the United States. By doing so, college and university administrators can better understand how to integrate sustainability on their campuses and communicate these efforts on their websites. Readers will also learn about some of the benefits of HEIs implementing sustainability and the growing importance of sustainability leaders in college and university communities.
ACKNOWLEDGMENTS

First and foremost, I would like to express my sincere gratitude to my advisor, Dr. David Cochran for his constant guidance, patience, and encouragement during the pursuit of my degree. He went above and beyond for me, and I could not have asked for a better mentor. Additionally, I would like to extend my heartfelt thanks to my committee members, Dr. Bridget Hayden, Dr. Thomas O’Brien, Dr. Thomas Patterson, and Dr. Mark Miller, for their insightful comments and encouragement. I am forever grateful to these individuals who unsparingly gave up time and knowledge to help me complete my degree.

I am especially grateful for the School of Biological, Environmental, and Earth Sciences and the Graduate School at the University of Southern Mississippi for providing me with financial support and the opportunity to gain professional experience as an educator through multiple years of graduate teaching assistantships. I was also fortunate to have received assistance during the data collection phase of this research from fellow students, including Lauren McCann and Valeria Rodriguez. They donated hours of their time towards this research and enhanced the quality of my work.

I want to thank my work family at New South Restaurant Group. Not only did they provide financial support throughout graduate school, but also moral support and lifelong friendships. I appreciate my General Manager, Jarred, for believing in me and offering me opportunities most Graduate students never receive.

I would like to thank my husband, Tyler, who was always there to listen to me when I needed to talk through my ideas or clean the house when I was stressed. I also
want to acknowledge my dog child, June, who lay next to me while I wrote most of my dissertation and cheered me up when I was upset.

Lastly, I owe my greatest debt of gratitude to my parents. They have continually supported me and have always encouraged me to pursue my own path. To my mom and dad, thank you for raising me the way you did and teaching me the value of hard work and perseverance.
DEDICATION

I dedicate this dissertation to Sustainability Leaders on and off college campuses.
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AASHE</td>
<td>Association for the Advancement of Sustainability in Higher Education</td>
</tr>
<tr>
<td>ACE</td>
<td>Action for Climate Empowerment</td>
</tr>
<tr>
<td>COPERNICUS</td>
<td>Cooperation Programme in Europe for Research on Nature and Industry through Coordinated University Studies</td>
</tr>
<tr>
<td>CRE</td>
<td>COPERNICUS Programme of the Association of European Universities</td>
</tr>
<tr>
<td>CSR</td>
<td>Corporate Social Responsibility</td>
</tr>
<tr>
<td>DESD</td>
<td>Decade on Education for Sustainable Development</td>
</tr>
<tr>
<td>EE</td>
<td>Environmental Education</td>
</tr>
<tr>
<td>EfS</td>
<td>Education for Sustainability</td>
</tr>
<tr>
<td>ES3</td>
<td>Earth Science, Environmental Sciences, and Environmental Studies</td>
</tr>
<tr>
<td>ESD</td>
<td>Education for Sustainable Development</td>
</tr>
<tr>
<td>GIS</td>
<td>Geographic Information Systems</td>
</tr>
<tr>
<td>GLSD</td>
<td>Global Learning for Sustainable Development</td>
</tr>
<tr>
<td>HE</td>
<td>Higher Education</td>
</tr>
<tr>
<td>HEI</td>
<td>Higher Education Institution</td>
</tr>
<tr>
<td>HEIs</td>
<td>Higher Education Institutions</td>
</tr>
<tr>
<td>IAU</td>
<td>The International Association of Universities</td>
</tr>
<tr>
<td>IBL</td>
<td>Inquiry-Based Learning</td>
</tr>
<tr>
<td>IEEP</td>
<td>International Environmental Education Programme</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Full Form</td>
</tr>
<tr>
<td>--------------</td>
<td>-----------</td>
</tr>
<tr>
<td>IJSHE</td>
<td>International Journal of Sustainability in Higher Education</td>
</tr>
<tr>
<td>IUCN</td>
<td>International Union for Conservation of Nature</td>
</tr>
<tr>
<td>NEEA</td>
<td>National Environmental Education Act</td>
</tr>
<tr>
<td>NGO</td>
<td>Non-Governmental Organization</td>
</tr>
<tr>
<td>NCES</td>
<td>National Center for Education Statistics</td>
</tr>
<tr>
<td>NWF</td>
<td>National Wildlife Federation</td>
</tr>
<tr>
<td>PBL</td>
<td>Problem-Based Learning</td>
</tr>
<tr>
<td>SAT</td>
<td>Sustainability Assessment Tool</td>
</tr>
<tr>
<td>SD</td>
<td>Sustainable Development</td>
</tr>
<tr>
<td>SHE</td>
<td>Sustainability in Higher Education</td>
</tr>
<tr>
<td>SWAT</td>
<td>Sustainability Web Assessment Tool</td>
</tr>
<tr>
<td>ULSF</td>
<td>University Leaders for a Sustainable Future</td>
</tr>
<tr>
<td>UN FCCC</td>
<td>United Nations Framework Convention on Climate Change</td>
</tr>
<tr>
<td>UNEP</td>
<td>United Nations Environment Programme</td>
</tr>
<tr>
<td>UNESCO</td>
<td>United Nations Educational, Scientific and Cultural Organization</td>
</tr>
<tr>
<td>UNFCC</td>
<td>United Nations Framework Convention on Climate Change</td>
</tr>
<tr>
<td>USM</td>
<td>The University of Southern Mississippi</td>
</tr>
<tr>
<td>WCOTP</td>
<td>World Confederation of Organization of the Teaching Profession</td>
</tr>
<tr>
<td>WSSD</td>
<td>World Summit on Sustainable Development</td>
</tr>
<tr>
<td>WWF</td>
<td>World Wildlife Federation</td>
</tr>
</tbody>
</table>
Contents

CHAPTER 1: INTRODUCTION ........................................................................................................... 1
    Introduction ................................................................................................................................. 1
    Overview of the Research Problem ............................................................................................ 3
    Research Questions .................................................................................................................... 5
    Intellectual Merit of Dissertation Research .............................................................................. 5
    Organization of Dissertation ...................................................................................................... 6

CHAPTER 2: LITERATURE REVIEW ................................................................................................. 8
    Introduction ................................................................................................................................. 8
    Sustainability and Sustainable Development ............................................................................ 8
    Assessing Sustainable Development in Higher Education ...................................................... 27
    Communication of Sustainable Development through the World Wide Web .......................... 34
    Geographic and Anthropological Perspectives of Sustainable Development ....................... 38

CHAPTER 3: METHODOLOGY .......................................................................................................... 45
    Study Design and Research Method .......................................................................................... 45
    Objective One: Identifying Sustainable Higher Education Institutions ............................... 47
    Objective Two: Evaluating Sustainable Universities ............................................................... 52
    Measuring Sustainability .......................................................................................................... 75
    Objective Three: Surveying Sustainability Leaders ................................................................. 78
    Geospatial Data Analysis and Map Production .......................................................................... 89

CHAPTER 4: THE CURRENT STATE OF SUSTAINABILITY AMONG AND WITHIN U.S. HIGHER EDUCATION INSTITUTIONS ............................................................. 95
    Objective One: Identifying Sustainable Higher Education Institutions .................................. 95
    Sustainability Among U.S. Public and Non-Profit Higher Education Institutions ................ 100
    Objective Two: Evaluating Sustainability within U.S. Higher Education Institutions ........... 114
    Sustainability within Dimensions of U.S Higher Education Institutions ............................. 136
    Campus Engagement – Training Sustainability Leaders ......................................................... 138
    Education ................................................................................................................................ 163
    Operations ................................................................................................................................. 170
    Sustainability-Oriented Research .............................................................................................. 239
    Areas Where Implementation and Communication of Sustainability Are Lacking ................ 243

CHAPTER 5: SUSTAINABILITY LEADERS ON SUSTAINABLE DEVELOPMENT IN HIGHER EDUCATION .................................................................................. 252
LIST OF TABLES

Table 2.1: Higher education campus sustainability tools used to assess the effectiveness of implementing sustainability throughout an HEI..............................29
Table 3.1: The Big Six Dimensions of Higher Education, its subgroups, and variables within these dimensions.................................................................55
Table 3.2: The evolution of dimensions of sustainability in higher education...........................................57
Table 3.3: Taylor’s (1999) web assessment questions. ..............................................................60
Table 3.4: Original Sustainability Web Assessment Tool.....................................................60
Table 3.5: HEI variables obtained from the National Center for Education Statistics and Carnegie Research database. ............................................................64
Table 3.6: Sustainability web assessment tool questions added after conducting first 50 Sustainable Universities. ............................................................................64
Table 3.7: Questions included in Sustainability Faculty and Staff Questionnaire.................................82
Table 3.8: Questions from the Pet Sustainability Coalition (PSC) survey that inspired the research’s Sustainability Faculty, and Staff Questionnaire. ............................................85
Table 3.9: Questions from the International Association of Universities’ (IAU) (2016, 11-23) Global Survey on Higher Education and Research for Sustainable Development that inspired my own questions.................................................................85
Table 3.10: The National Center for Education Statistics (NCES) locale framework four basic types and subtypes........................................................................................................91
Table 3.11: Datasets used to create maps for this study........................................................................91
Table 4.1: Sustainable and non-sustainable higher education institutions based on campus type............97
Table 4.2: Descriptive statistics of sustainable HEIs (N = 1,153). .........................................................102
Table 4.3: Sustainable and non-sustainable Public and Private Non-Profit higher education institutions. 104
Table 4.4: Sustainable and non-sustainable Public and Private Non-Profit higher education institutions. 106
Table 4.5: Average revenue and student population of sustainable and non-sustainable Public and Private Non-Profit institutions..........................................................106
Table 4.6: Average revenue of sustainable HEIs by institution type..................................................106
Table 4.7: Average student population of sustainable and non-sustainable Private Non-Profit and Public institutions.........................................................................................106
Table 4.8: Campus setting of sustainable and non-sustainable HEIs. ................................................107
Table 4.9: The average revenue of higher education institutions based by campus setting and presence of sustainability implementation structure. ........................................107
Table 4.10: Average student population, revenue, and tuition per HEI grade......................................115
Table 4.11: Comparison of higher-rated and lower-rated Public and Private Non-Profit HEIs (based on author’s grading criteria).........................................................115
Table 4.12: Distribution of total revenue for A and B graded HEIs.........................................................118
Table 4.13: Distribution of total revenue for A and B graded HEIs.........................................................118
Table 4.14: Six most common sustainability initiatives of low-revenue top rated HEIs.........................118
Table 4.15: Sustainability office availability by HEI revenue............................................................120
Table 4.16: Faculty and staff development and revenue of top-rated (A and B graded) HEIs. .................................................. 120
Table 4.17: Presence of sustainability research on top-rated HEI websites. ................................................................. 122
Table 4.18: Presence of sustainability research themes or opportunities on top-rated HEI websites. ........................ 122
Table 4.19: Sustainable development implementation structures among sustainable 1,153 Public and Private Non-Profit HEIs. .............................................................................................................................. 124
Table 4.20: Presence or lack of formal collaborative sustainability effort based on revenue .................................................. 126
Table 4.21: Presence or absence of sustainability office based on revenue. ................................................................. 130
Table 4.22: Presence or absence of sustainability office based on revenue (%). ......................................................... 130
Table 4.23: Presence or lack of formal collaborative sustainability effort based on sustainability grade. ......132
Table 4.24: Comparison of HEI with and without a sustainability-focused research institute. ............................... 135
Table 4.25: Number and percentage of HEIs with at least one variable within the Big Six Dimensions of Higher Education. .................................................................................................................. 137
Table 4.26: Number and percentage of higher education institutions with Campus Engagement variables. ............................................................................................................................... 139
Table 4.27: HEIs with at least one variable within the Big Six Dimensions of Higher Education. ........................................ 164
Table 4.28: Education variables. ................................................................................................................................. 164
Table 4.29: Frequency of four-year sustainability-focused academic programs among sustainable HEIs. 165
Table 4.30: Other forms of education with and without four-year sustainability-focused degree programs. ................................................................. 165
Table 4.31: Number and proportion of HEIs with at least one variable within Big Six Dimensions of Higher Education. ........................................................................................................................ 171
Table 4.32: Operation variable questions from sustainability web assessment tool (SWAT). ........................................... 171
Table 4.33: Revenue and student population of HEIs with and without sustainable waste programs. ............... 175
Table 4.34: Comparison of all sustainable higher education institutions and those with energy conservation efforts. .......................................................................................................................... 188
Table 4.35: Number and percentage of higher education institutions with at least one form of sustainable dining listed on their website. ............................................................................. 193
Table 4.36: Number and percentage of HEIs with sustainable transportation efforts on college campuses. ................................................................. 203
Table 4.37: Comparison of sustainable higher education institutions with and without sustainable transportation. ................................................................................................................................. 209
Table 4.38: Campus settings of sustainable higher education institutions with and without sustainable transportation. .......................................................................................................................... 209
Table 4.39: Operation variables that relate to water conservation occurring on college campuses. .......................... 213
Table 4.40: Operation variables that relate to campus gardens. ................................................................................... 233
Table 4.41: Variables related to sustainability research on college campuses. ............................................................. 241
Table 4.42: Comparison of HEIs with and without sustainability-focused research on their website. .............. 241
Table 4.43: Comparison of HEIs with and without sustainability-focused research centers on campus. ........... 241
Table 4.44: Variables within the Big Six dimensions of higher education where sustainability is lacking. ................................................................................................................................................ 245
Table 5.1: Gender, race, and age distribution of sustainability leader respondents. ............................................ 254
Table 5.2: Employment status and position of sustainability leader respondents. .................................256
Table 5.3: Sustainability-focused staffed office names. ........................................................................256
Table 5.4: Most common job titles provided by respondents. .................................................................257
Table 5.5: Most common academic programs faculty respondents were employed by. ...............................257
Table 5.6: Positions of female respondents. ..........................................................................................259
Table 5.7: Positions of male respondents. .............................................................................................259
Table 5.8: Employment status and positions of non-white/Caucasian respondents. ...............................260
Table 5.9: Level of education compared with respondents’ age and years of experience. .....................260
Table 5.10: Academic program categories (based on AASHE academic programs (AASHE 2020). .......263
Table 5.11: Academic backgrounds of respondents. ..............................................................................264
Table 5.12: Broader academic groupings. ..............................................................................................265
LIST OF ILLUSTRATIONS

Figure 2.1: The interconnected triad of sustainability found in sustainability and sustainable development literature illustrated in multiple ways. .................................................................12

Figure 3.1: Top eight search results when I entered University of North Dakota sustainability into the Google search engine. ........................................................................................................50

Figure 3.2: Key screenshot of the University of North Dakota Energy and Environmental Research Center homepage. ........................................................................................................51

Figure 3.3: Sustainability-related courses and degree programs listed on the University of Houston Office of Sustainability webpage (University of Houston 2021). .................................................................66

Figure 3.4: List of Anthropology sustainability-related course at the University of San Diego (University of San Diego 2020). ANTH 335 Nautical Archaeology and ANTH 339 Post Medieval Seafaring and EmplSource: (University of San Diego 2020). .................................................................67

Figure 3.5: The image shared among all HEIs that have adopted Aramark’s “What We’re Doing on Campus” webpage template (Stephen F. Austin State University 2020). .......................................................77

Figure 3.6: ArcMap’s webpage on geocoding (ArcMap 2020). ........................................................................93

Figure 4.1: Distribution of sustainable higher education institutions by state..............................................109

Figure 4.2: Distribution of sustainable higher education institutions by state and region ........................110

Figure 4.3: Sustainability among Four-Year Private Non-Profit HEIs ..........................................................112

Figure 4.4: Sustainability among Four-Year Public higher education institutions .................................113

Figure 4.5: The University of Vermont Eco-Representatives page ................................................................143

Figure 4.6: The University of Illinois – Chicago Sustainability Internship Program (SIP) webpage (University of Louisville 2021b). ........................................................................................................147

Figure 4.7: Western Michigan University student sustainability fee webpage (Western Michigan University 2021). ..................................................................................................................153

Figure 4.8: The University of Florida Green Gator Graduation chord challenge (Florida State University 2021). ..........................................................................................................................155

Figure 4.9 The University of Southern Mississippi sustainability programs and events webpage (University of Southern Mississippi 2021). ........................................................................157

Figure 4.10: Williams College Green Office program webpage elements (Williams College 2021). ........160

Figure 4.11: The Green Office Program report webpage from Boston University (Boston University 2021). .................................................................................................................................161

Figure 4.12: Duke University Green Lab Certification webpage (Duke University 2021). .........................162

Figure 4.13: North Carolina State University sustainability-related degrees webpage (North Carolina State University 2020). ................................................................................................167

Figure 4.14: Sustainable Related Programs, Courses & Certificates webpage title ..................................169

Figure 4.15: Grand Valley State University with sustainability integrated into them (Grand Valley State University 2021). ........................................................................................................169

Figure 4.16: Distribution of HEIs with sustainable waste management programs compared with all 1,153 sustainable HEIs ........................................................................................................175

Figure 4.17: Geographic distribution of HEIs practicing sustainable waste management ........................176

Figure 4.18: Geographic distribution of higher education institutions with sustainability energy efforts...189
Figure 4.19: The Aramark Green What We’re Doing on Campus webpage shown on the University of the Ozarks website. .................................................................................................................. 193

Figure 4.20: The Aramark Green Thread Platform What We’re Doing on Campus template found on the University of Mississippi website.................................................................................................. 194

Figure 4.21: The Aramark Green Thread Platform What We’re Doing on Campus template found on the University of South Florida website.................................................................................. 194

Figure 4.22: The University of Maine sustainability webpage provided by Sodexo (Sodexo My Way 2021). ........................................................................................................................................ 195

Figure 4.23: The University of Denver sustainability webpage provided by Sodexo (The University of Delaware 2021). .................................................................................................................................. 196

Figure 4.28: The University of Arkansas webpage dedicated to biking (University of Arkansas 2021). ...207

Figure 4.25: Geographic distribution of higher education institutions with sustainable transportation efforts. ........................................................................................................................................ 210

Figure 4.26: Geographic distribution of higher education institutions with water conservation efforts.......215

Figure 4.27: One of the many green roofs at Virginia Commonwealth University (2021)......................230

Figure 4.28: International Architecture Award-winning University of Miami Lakeside Village Student Community Housing that features multiple green roofs (Architecture Award by the Chicago (Jones Jr. 2021). .................................................................................................................. 230

Figure 4.29: The Naropa University Arapahoe Campus edible landscaping map.......................................232

Figure 4.30: The University of Maryland webpage dedicated to their four food gardens (University of Maryland 2021). ...................................................................................................................................... 235

Figure 4.31 Sustainability-focused student organizations listed on the Iowa State University Office of Sustainability website (Iowa State University 2020). ................................................................. 247

Figure 4.32: The American University webpage dedicated to social sustainability (American University 2021). ...................................................................................................................................... 248

Figure 5.1: Distribution of respondents based on their highest level of education.................................... 262

Figure 5.2: Grouped academic categories and disciplines within those groups. ......................................266
CHAPTER 1: INTRODUCTION

Introduction

With growing global awareness of environmental, economic, and social issues, higher education institutions (HEIs) are under greater pressure than ever to take the lead in disseminating ideas about sustainability across mainstream society (Svanstrom et al. 2008). HEIs certainly have important roles to play in the development of sustainable practices and a sustainability ethos (Lehmann et al. 2009; Aleixo et al. 2016). Their responsibilities include offering educational programs, sponsoring research, creating a culture of change on campus, and encouraging community outreach to address environmental, social, and economic dimensions of sustainability. Most importantly, HEIs have a role to play in developing leaders that can champion the cause of sustainability. Colleges and universities are historically known for their leadership in environmental and social movements and for creating leaders in the process (Lehmann et al. 2009). Many scholars believe that participation of HEIs in sustainability might encourage a cultural shift towards a more sustainable society while also developing a vital new symbol for university branding (Bowers 2001; Zou et al. 2015; An et al. 2018, 2).

Colleges and universities not only have the advantage of spearheading sustainability for ethical reasons; they also stand to benefit from adopting sustainability as a marketing and recruitment strategy (Badassare and Campo 2016, 421). Sustainable development roles can help HEIs save already scarce funds through resource conservation while also increasing their revenue by creating popular, new degree programs that build enrollment (Hart 2016; Sanchez et al. 2015, 14,899). As
sustainability becomes more prevalent within HEIs and American society, so will the efforts of for-profit businesses and non-profit organizations (Princeton Review 2020).

Many businesses and organizations today are creating positions dedicated to implementing sustainable development strategies and are anticipating job growth in occupations involved with corporate social responsibility (CSR) and environmental stewardship (Torpey 2018; Hamilton 2020). As a result, growing numbers of students are looking to obtain undergraduate and graduate degrees in sustainable development and related fields (Hart 2016; Best Colleges 2020). A 2016 study found the percentage of interest by applicants and parents in public and private schools increased by three percent for HEIs that signed the American College and University Presidents Climate Commitment (ACUPCC), a formal commitment of college and university presidents pledging to address climate change. Results from the Princeton Review 2020 College Hopes and Worries Survey show that the majority (66%) of the 12,845 surveyed teens and parents stated that having information about the commitment of a college or university to environmental issues would affect their decision to apply to or attend the school (Princeton Review 2020).

Advertising an institution’s sustainability-focused programs and activities through its website is an excellent way to celebrate its efforts and increase public awareness. Doing so also helps market the institution to prospective students who are interested in acquiring the skills and knowledge to make a profound impact on social, environmental, and economic sustainability (Reynolds and Cavanagh 2009; as cited by Sanchez et al. 2015, 14,899). One of the main communication methods between universities and their stakeholders is through their websites (Pegoraro 2006, 2). The internet plays a key role in
information transparency by enhancing communication, facilitating accountability, and increasing stakeholder access to information (Meijer 2009; Sanchez et al. 2015, 14,897; Hart 2016; Princeton Review 2020). Cervellon and Wernerfelt (2012) and Adams and Frost (2006) highlight the growing importance of the internet in the increasingly competitive contemporary global economy, not only to sell products but to support and promote the brand images of companies and organizations (Da Giau 2016, 73).

Overview of the Research Problem

Despite the growing importance of sustainability, studies investigating web-based sustainability communication remain scarce (Da Giau 2016, 73). A great deal more research is needed to determine what characteristics contribute to successful sustainability-focused websites of four-year higher education institutions (HEIs) in the United States (Pegoraro 2016, 2). The assessment of college and university sustainability web pages will also contribute to our understanding of how sustainability in higher education is defined and where and how it is being implemented within a higher education setting. Sustainability and sustainable development are terms that are widely used but difficult to define. Sustainability has multiple definitions and meanings, the two most basic of which are: 1) the ability to maintain ecological balance through time; and 2) not depleting the Earth of its resources. While some focus only on the environment, most of those involved in sustainability or sustainable development have adopted some form of the triple-bottom line approach and address three bedrock elements of the concept: economic development, social inclusion, and environmental sustainability (Murphy 2012; Sachs 2015). This dissertation aims to contribute to our understanding of
where sustainable development is occurring within HEIs and who is taking a triple-bottom line approach when implementing sustainability practices.

Although scholars, policy makers, and higher education leaders have recognized education for sustainable development (ESD) as an important topic, and many HEIs have integrated sustainability components into their policies and procedures, there is a great need to further analyze ESD and look for more holistic ways to continue this integration (Holm et al. 2016). While some research has been published on HEIs and their commitment to sustainability, most studies are limited in scope and focus on a single university or university sector. Data sets like the Association for the Advancement of Sustainability in Higher Education’s Sustainability Tracking, Assessment and Rating System Assessment (AASHE STARS) Reports and the National Wildlife Federation Campus Ecology Report are available to the public but are based on self-reported information by universities willing to participate and, as such, do not provide a systematic or comprehensive view of sustainability in higher education.

This dissertation seeks to shed light on sustainability in higher education through a systematic study of all four-year HEIs in the United States. It analyzes where sustainability efforts in four-year HEIs are occurring across the country and the specific contexts in which they are occurring (namely, urban-rural locations and red-blue political settings). Such information provides insight into the ties between HEIs and their home communities, regions, and states, and fills an important gap in the literature about sustainable development in higher education, as identified by Holm and others (2016).
Research Questions

This research identifies and analyzes the factors that contribute to the socio-political, economic, and cultural characteristics of sustainability among four-year higher education institutions (HEIs) in the United States using four sources of information: 1) the National Center for Education Statistics (NCES) database; 2) the Carnegie Classification dataset; 3) a sustainability web assessment tool (SWAT) that I created for this research; and 4) a survey instrument for sustainability faculty and staff at a sample of HEIs around the United States.

The objectives of this dissertation are to: 1) document four-year HEIs in the United States that self-identify as sustainable; 2) evaluate how these institutions portray themselves as sustainable through their internet presence; and 3) identify who leads sustainability initiatives on university campuses. This dissertation research seeks to answer the following research questions:

1) What is the current state of sustainability among U.S. higher education institutions?
2) Where is sustainability occurring within these institutions based on their websites?
3) Who are the leaders of sustainability efforts at these HEIs?

Intellectual Merit of Dissertation Research

This research documents the practices or characteristics of sustainability within higher education institutions (HEIs) in the United States and to evaluate how these institutions portray themselves as sustainable through their websites. In other words, this
dissertation seeks to understand which American HEIs are effectively integrating sustainability within their institutions, how they are doing so, and how they communicate these efforts to the public. To do this, I analyzed the sustainability-related webpages of all four-year HEIs to see where sustainability was occurring within these institutions and compared this data to internal and external variables collected from the National Center for Education Statistics (NCES) and the U.S. Census Bureau. Comparing the presence of sustainability with internal HEI variables shed light on if institution type, revenue, or student population play a role in the success of college and university sustainability efforts. I also examine the ties between HEIs and their communities, regions, and states by comparing the presence of sustainability with external variables such as the population size, income, and political views of the surrounding community.

Organization of Dissertation

Following this introductory chapter (Chapter One), the dissertation is organized in the following manner. Chapter Two contains a comprehensive literature review of sustainable development, its history, and its presence in higher education, as well as the communication of sustainable development through higher education institutions’ (HEIs) websites, specifically their sustainability landing pages. Chapter Three summarizes the methodology used to analyze the presence of sustainability among all four-year HEIs in the United States and the leaders of these efforts. Chapter Four focuses on which four-year colleges and universities in the United States are communicating sustainability through their websites, the level of sustainability among these institutions, and the revenue, student population, and location of these institutions. Chapter Five reports on a
survey of sustainability leaders at four-year HEIs across the United States. The conclusion chapter (Chapter Six) discusses the results of this dissertation and highlights their value to our understanding of the contemporary importance of sustainability within higher education.
CHAPTER 2: LITERATURE REVIEW

Introduction

Over the past fifty years, United States scholars and policymakers have played fundamental roles in challenging higher education institutions (HEIs) to take on the responsibility of creating large-scale change associated with a variety of environmental, social, and economic issues (Barlett 2008, 1089; Finlay and Massey 2012; Wright 2018). HEIs play a unique and important role in society as leaders, innovators, and problem-solvers. As institutions, they help mold the worldviews and priorities of future leaders in higher education, commerce, and government (Cortese 2003; Lozano 2006; Findler et al. 2018). Universities and colleges are the training grounds for current and future leaders in the development of sustainable communities (Stephens et al. 2008; Findler et al. 2018, 1).

Colleges and universities in the United States have made progress in taking on environmental, social, and economic issues, but they have a long way to go. Numerous studies have called for the reconstruction of universities so they can play a more engaged role as a laboratory for sustainability by providing critical and reflective knowledge that helps build capacity for future generations (Cole 2003; Barlett 2008; Sammalisto et al. 2015; Olusegun, et al. 2018; Filho, et al. 2018).

Sustainability and Sustainable Development

Knowing how to address sustainability issues is “one of the most significant translational research problems of our time (Proctor et al. 2015; as cited by Moore et al. 1).” Julia Moore and others (2017) argue that the two biggest challenges related to
sustainability are the lack of a standard definition and the overabundance of synonyms used to refer to it in the literature (Proctor et al. 2015; Moore et al. 2017). With over 80 published definitions, sustainability is difficult to define, measure, research, and implement, yet is a central concept of our time (Williams and Millington 2004; Vaughter et al. 2013; Sachs 2015, 1). The term is broad in scope and has been interpreted in many ways across a variety of academic fields and professions (Morelli 2011, 2).

Terms related to sustainability such as sustainable development can cause even more confusion. Much of the literature discussing sustainable development lacks clear, concise definitions. Like sustainability, sustainable development is used and interpreted in various ways and has multiple names and definitions. A general inability to succinctly define sustainability and sustainable development is evident in fields where sustainability professionals are employed. Sustainability has become an overused corporate buzzword and has been cited as one of the most corrupted and abused terms in corporate vernacular (Urban Intelligence Network 2011; Morelli 2011, 2; King 2013). Sustainability and related terms (like sustainable development and social responsibility) are often used to refer to anything that is good or positive in global society with little consideration of their meanings and implications (Du Pisani 2007, 83; Karoly 2011, 1).

Our Common Future, also known as the Brundtland Report, was produced in 1987 by the United Nations World Commission on Environment and Development. It contains what has become one of the most widely used definitions of sustainability: the ability of society to “[meet] the needs of the present without compromising the ability of future generations to meet their own needs (World Commission 1987, 43).” This definition is helpful conceptually, but it is not very specific (Stenzel 2010, 1). Some
argue that sustainability and sustainable development cannot be defined scientifically, but instead reflect specific philosophies or ideologies (Robinson 2004; Du Pisani 2007). Morelli (2011, 2) argues that although sustainability is vaguely defined and overused, the term can better serve a purpose when a descriptive phrase (i.e., *agricultural, economic, ecological, or social*) is added before it. This is evident in the debate between those who promote a three-pillar approach, believing that sustainability must simultaneously address the future of the economy, society, and the environment, and those who focus solely on the relationship between humans and nature. Commonly used alternative terms for sustainable development that focus on the environment include *ecodevelopment* and *green development* (Robinson 2004; Morelli 2011, 2; Opp and Saunders 2012; Moore et al. 2017, 2; Adams 2020).

**Three-Pillar Concept of Sustainability**

The three-pillar concept of sustainability simultaneously addresses the future of the economy, society, and the environment (Purvis et al. 2019). The Triple Bottom Line, a tool used to assess the effects of business activities on the economy, the environment, and society identifies actions that contribute to these facets (Stenzel 2010). Much of the contemporary sustainability literature utilizes the idea of an interconnected triad, most commonly characterized as three pillars (Moldan et al. 2012; Schoolman et al. 2012; Opp and Saunders 2012; Boyer et al. 2016), dimensions (Carter and Moir 2012), perspectives (Brown et al. 1987; Arushanyan et al. 2017), or aspects (Goodland 1995; Lozano 2008; Tanguay et al. 2010). All of these characterizations encompass environmental
(ecological), social, and economic goals, factors, or attributes seen in Figure 2.1 (Purvis et al. 2019, 681).

To better understand sustainability and sustainable development efforts among higher education institutions in the United States, it is important to have a general understanding of both terms’ origins, their evolution through time, and their involvement in higher education. This literature review will first outline the history of sustainability and sustainable development (SD), higher education’s role in sustainable development, past assessments of sustainable development in higher education, and the benefits of communicating sustainability to the public through the internet. This literature review will also address how anthropology and geography contribute to the integration of sustainable development in higher education.

A History of Sustainability and Sustainable Development

**Pre-Brundtland Report.** Some scholars see the roots of sustainability going back as far as Thomas Malthus (1766-1834) and William Stanley Jevons (1835-1882) who first articulated the connection between population growth and resource scarcity (Opps and Saunders 2012, 680; Baker 2016). More recently, in the 1950s, Fairfield Osborn and Samuel Ordway wrote about the Earth’s carrying capacity, the limits of natural resources, and the decline in resources and species diversity due to the human population growth and consumption (Baker 2016, 22).
Figure 2.1: The interconnected triad of sustainability found in sustainability and sustainable development literature illustrated in multiple ways.

Top left, three intersecting circles representing sustainability. Top right, a concentric circle approach. Bottom left, literal pillars of sustainability. Bottom right, three-Es of sustainability and three Ps of the Triple Bottom Line. Source for inspiration was Purvis et al. 2019, 682.
The three-pillar concept of sustainability originated in 1969 when the International Union for Conservation of Nature (IUCN) declared it was possible to achieve economic growth without harming the environment (Opp and Saunders 2012, 680; Adams 2020). Related themes came with the publication of *The Limits to Growth* (Meadows et al. 1972). Written by a group of researchers from the Massachusetts Institute of Technology (MIT), *The Limits to Growth* raised concern about the decline of natural resources and species diversity due to population growth, food production, resource use, and pollution. Although its dire forecast of the Earth reaching carrying capacity within 100 years has been criticized for not accounting for the transformative effects of technological innovation, its general premise has contributed to the sense of urgency broadly associated with sustainable development literature (Baker 2016).

In 1972, the same year that *The Limits to Growth* appeared in print, the United Nations (UN) Conference on the Human Environment in Stockholm (also known as the Stockholm Conference) convened. The first United Nations conference that focused on environmental issues, the Stockholm Conference created guidelines whose goal was to protect and improve the global human environment (General Assembly resolution 2581 (XXVI) 1969; United Nations 2019). The Stockholm Conference was a turning point in the development of international environmental politics and brought a dramatic increase in global awareness of environmental issues, environmental activism, and international environmental legislation (United Nations 2019). While 1972 was a pivotal year for sustainable development, the term did not appear in print until the publication of the *World Conservation Strategy: Living Resource Conservation for Sustainable Development* in 1980 (IUCN 1980). The aim of this publication was to promote greater
sustainable development through the conservation of plant and animal species (IUCN 1980, IV).

**Post-Brundtland Report.** In 1987, the United Nations Commission on Environment and Development (UNCED), also known as the Brundtland Commission, coined the term, *sustainable development* in their report titled *Our Common Future* also known as the *Brundtland Report* after the Commission’s chairwoman (Sachs 2015, 5). Although vague, the *Brundtland Report*’s definition is perhaps the most widely known definition of sustainable development (World Commission on Environment and Development 1987, 43; Huang et al. 2015, 1176). Some believe that the Brundtland definition serves more as a slogan than an actual basis for policy (Wilbanks 1994; Adams 2003, 5).

In June 1992, twenty years after the Stockholm Conference, UNCED was held in Rio de Janeiro. The Rio Summit, or Earth Summit, as it came to be known, was a response to the 1987 *Brundtland Report*. Attendees met to discuss current environmental issues and attempted to approach development with the economy, society, and environment in mind. During the Earth Summit, one-hundred-and-eight representatives supported three agreements: Agenda 21, the Rio Declaration on Environment and Development, and the Statement of Forest Principles (UN 1997). The Rio Declaration adopted the multi-generational concept of sustainable development introduced by the *Brundtland Report* five years earlier while Agenda 21 was the first document to call for the creation of sustainability indicators (UNCED 1992; Sachs 2015, 5; Huang et al. 2015, 1,176).
Agenda 21 is a non-binding action plan that called for all countries to develop national sustainable development strategies (NSDSs) (UNCED 1992). The 700-page document is divided into 40 chapters divided into four sections: Social and Economic Dimensions (Section I); Conservation and Management of Resources for Development (Section II); Strengthening the Role of Major Groups (Section III); and Means of Implementation (Section IV) (UNCED 1992, 6). Sections I and II address the three pillars of sustainable development while Section IV focuses on the integration of sustainable development through education, training, and public awareness at all age levels of Agenda 21 (UNCED 1992, 36.1-36.27).

Though intergenerational justice was an important factor in the 1990s, the primary focus of sustainable development evolved from a concern for future generations to a more holistic approach that sought to simultaneously address economic development, social equity, and environmental sustainability (Sachs 2015, 5-6). Over the next decade, it became widely accepted that sustainable development consisted of three pillars or dimensions: environment, economy, and society.

The holistic “Triple Bottom Line” approach first appeared in the 2002 United Nations World Summit on Sustainable Development (WSSD) Plan of Implementation, a result of the WSSD, also known as the Johannesburg Summit due to its location in South Africa (World Summit on Sustainable Development 2002, 2). The focus of the Johannesburg Summit was to find ways to efficiently respond to environmental degradation from local to global scales. To do so, members articulated central elements of sustainability and appropriate priorities for action (UN 2002). The summit resulted in the Johannesburg Plan of Implementation of the World Summit on Sustainable
Development, also known as Rio+10. It affirmed the need for the full implementation of sustainability, as called for in Agenda 21 (UN 2002). Though it did not solely focus on the application of sustainability into higher education systems around the world, the topic was acknowledged at the Johannesburg Summit.

The *triple-bottom line* approach remained an important focus of sustainable development 20 years after the 1992 Rio Earth Summit. In Rio+20, the General Assembly reaffirmed the need to achieve sustainable development through sustained, inclusive, and equitable social and economic growth (UN General Assembly 2012, Paragraph 4). The Rio+20 document calls increased equality, improved standards of living, and greater opportunities for all through the creation of clear and practical measures for addressing interrelated global challenges (UN General Assembly 2012, paragraph 4; United Nations 2019b). It was in this same document that the UN General Assembly called for the establishment of Sustainable Development Goals (SDGs) to address the three dimensions of development: economic development, social inclusion, and environmental sustainability (Sachs 2015, 6). The UN General Assembly published 17 SDGs in 2015 that were set to be achieved by 2030 (United Nations 2019b). All UN Member States adopted all 17 goals as part of the 2030 Agenda for Sustainable Development (United Nations 2019c).

The United Nations Framework Convention on Climate Change (UNFCCC) created the Paris Agreement in 2015 (UNFCCC 2020). The Paris Agreement brought together all nations to fight against climate change, adjust to its impacts, and assist developing countries in doing so (UNFCCC 2020). The Paris Agreement focuses on keeping global warming well below 2°C (3.6°F), enabling all nations to deal with the
impacts of climate change, and decreasing greenhouse gas (GHG) emissions in ways that are financially feasible (WWF 2020). The United States was one of the 197 countries that signed the Paris Agreement under President Obama, but became the first to officially exit it under President Trump (Denchak 2018; Hersher 2020; Kann 2020; Briggs 2021). The U.S. rejoined the Paris Accord in early 2021 under President Biden and, fortunately, the temporary divorce from the accord did not mean the country was completely uninvolved with the Paris Agreement’s mission (Hersher 2020; Briggs 2021). Many American states, cities, and for-profit and non-profit organizations pledged to reduce greenhouse gas (GHG) emissions, regardless of the actions of the federal government (Hersher 2020). The lack of federal leadership during that time proved the importance of institutions like colleges and universities to take on climate change as well as social and economic issues.

Sustainable Development in Higher Education

*Pre-Brundtland Report.* The first efforts involving sustainability and U.S. higher education institutions (HEIs) occurred during the environmental movement of the 1960s and 1970s (Calder and Clugston 2002, 625; Vaughter et al. 2013). Since then, multiple international initiatives have mentioned sustainable development in higher education, as well as the education sector in general (UN 1972; Casarejos 2017, 997). The 1972 Stockholm Declaration was the first initiative to refer to sustainability in higher education (Wright 2002, 106; UN 2019; Findler et al. 2019). The declaration presented 24 principles to achieve environmental sustainability, most of which focused on policy and legislation (UNEP 1972). The 19th principle of the Stockholm Declaration, however, called for the inclusion of environmental sustainability in higher education and
acknowledged that the environment and human beings existed interdependently (UNEP 1972, Principle 19; Calder and Clugston 2002, 625; Wright 2002, 106). The international movement of increasing environmental education within HEIs continued to make strides in September 1972 with the International Workshop on Environmental Studies in Higher Education and Teacher Training in Ontario, Canada (IUCN 1973). At this workshop, groups of university professors proposed new ideas regarding how teachers might incorporate environmental education into their curriculum (IUCN 1973).

The year 1974 was pivotal for the environmental education movement. Several significant international organizations partnered and convened meetings to engage experts, educators, and youth in planning for environmental education. In March 1974, the United Nations Educational, Scientific and Cultural Organization (UNESCO), the World Wildlife Federation (WWF), the International Youth Federation, and the African Wildlife Leadership Federation sponsored the Eastern Africa Youth Meeting on Environmental Conservation in Nairobi, Kenya. During the same year, the International Working Meeting on Environment in Educational Programmes met in Cairo, Egypt to create a comprehensive plan for environmental education (EE) in Arab States (UNESCO 1976, 6). Environmental and education experts attended the Pilot Seminar on Environment Education Methodology sponsored by United Nations Environment Programme (UNEP), the International Union for Conservation of Nature (IUCN), and the World Confederation of Organization of the Teaching Profession (WCOTP) that was held in August and September of 1974. In October 1974, Argentina hosted a Seminar on Education for the Conservation of Renewable Natural Resources in High School
Curricula (UNESCO 1976, 6). These meetings inspired and contributed to the creation of the Belgrade Charter.

The Belgrade Charter was the product of a 10-day workshop known as the International Environmental Education Workshop that occurred in October 1975 in Belgrade, Yugoslavia (present-day Serbia). It helped establish principles and guidelines for global environmental education (UNESCO 1976). The Belgrade Charter built upon the priority of education at the Stockholm Conference and continued to define the mission, goals, and objectives of environmental education and guidelines for EE programs (UNESCO 1976). Environmentalists still consider the workshop to be one of the starting points for developing institutionalized environmental education initiatives (Wright 2002, 106; Wright 2004).

In October 1977, United Nations Educational, Scientific and Cultural Organization (UNESCO) and the United Nations Environment Programme (UNEP) organized the first intergovernmental conference on environmental education in Tbilisi, Georgia (GDRC 1977). The result was the Tbilisi Declaration, a continuation of the Stockholm Declaration and the Belgrade Charter that set forth the principle of environmental education (EE) (UNESCO-UNEP 1978, 26-27; Sauvé 1996, 7). The declaration emphasized that environmental education should be accessible to everyone inside and outside of education, it clarified the goals, objectives, and characteristics of EE, and it offered guidelines for the implementation of environmental sustainability at HEIs (GDRC 1977; Wright 2002, 106). The principles of environmental education set forth by the Tbilisi Declaration embrace the fundamental elements of sustainable
development, namely, to consider the linkages between the environment, society, and the economy (Sauvé 1996, 8).

**Post-Brundtland Report.** Concern for both the environment and education waned in the United States during the 1980s under the Reagan Administration, but this changed with the Brundtland Report in 1987 (Calder and Clugston 2002, 626; Vaughter et al. 2013, 2253). In response to various environmental crises in the late 1980s, the report sought to pick up where the Stockholm Conference left off and drew attention to the importance of educating about sustainability and the environment (Calder and Clugston 2002, 626).

A ten-point action plan known as the Talloires Declaration jump-started the movement to integrate sustainability and environmental literacy into higher education institutions (HEIs) in 1990 (Calder and Clugston 2002, 626). The Declaration originated at an international conference in Talloires, France where attendees discussed the lack of environmental-related programs and sustainability efforts in HEIs. They agreed that universities, in their role as educators of the broader society, “bear profound responsibilities to increase the awareness, knowledge, technologies, and tools to create an environmentally sustainable future” and called for university leaders to step forward as sustainability leaders to increase environmental literacy in all disciplines (ULSF 1990, n.p.). The Talloires Declaration is considered the first (official) statement endorsed by university presidents, chancellors, and rectors created as a formal commitment to environmental sustainability in higher education (Calder and Clugston 2002, 626).
500 university leaders (170 of which were U.S. universities) in over 55 countries have signed the 10-point action plan (Carleton College 2020).

The U.S. government advanced environmental education with the passage of the National Environmental Education Act (NEEA) of 1990 (P.L. 101-619). This law required the EPA to serve as a national leader for improved environmental literacy (EPA NEEA 1990). The Environmental Protection Agency (EPA) established the Office of Environmental Education to promote and fund environmental education in elementary and secondary schools (EPA NEEA 1990).

**Environmental and Sustainable Development Education**

The 1990s were deemed the “International Decade of Environmental Education” with United Nations Educational, Scientific, and Cultural Organization (UNESCO) and United Nations Environment Programme (UNEP) leading the movement and working together to form the UNEP – UNESCO International Environmental Education Programme (IEEP) (Leal Filho et al. 2015). Sustainable development gained popularity and the terms education for sustainable development (ESD) and education for sustainability were first used at the Rio Earth Summit in 1992 (Calder and Clugston 2002, 626; Adams 2003; Wright and Horst 2013). Since its creation, the idea of ESD has become an important component of environmental policy making and sustainable development strategies (Wals and Kieft 2010, 11). The ESD movement also broadened to include social and economic aspects of sustainability instead of focusing only on environmental issues (Calder and Clugston 2002, 626).
The Rio Earth Summit triggered the UNESCO Interregional Workshop on Re-orienting Environmental Education for Sustainable Development in 1995 (UNESCO 1995; Scoullos 1995; Leal Filho et al. 2015, 113). UNESCO (1995) proposed sustainable development as the ultimate goal of human interactions with the environment and advocated to reorient environmental education (EE) and the entire education system to meet this goal (Owoade et al. 2017, 1). From the late 1990s onward, EE and ESD have become increasingly popular topics (UNECE 2005; Owoade et al. 2017, 2). Instead of focusing solely on the carrying capacity of natural systems, ESD supported development that tied the concern to social, political, and economic challenges faced by humanity, from local to global scales (Kahle and Gurel-Atay 2014).

Research and peer-reviewed publications on sustainable development increased through the late 1990s, although many believed that literature on ESD was still insufficient (Huisingh 2006; Liu 2011; Barth and Rieckmann 2016). As a result, the COPERNICUS Programme of the Association of European Universities (CRE), International Association of Universities (IAU), Association of University Leaders for a Sustainable Future (ULSF), and the United Nations Educational, Scientific and Cultural Organization (UNESCO) came together in 2000 to encourage HEIs to increase their support of sustainable development (ULSF 2015).

Education for sustainable development (ESD) was a topic at the 2002 World Summit on Sustainable Development (WSSD) held in Johannesburg, South Africa. The Summit resulted in the adoption of Resolution 57/254 that declared the time from 2005 to 2014 as the UN Decade on Education for Sustainable Development (DESD) (U.N. 2005; Liu 2011, 245; Leal Filho et al. 2015, 115). The U.N.’s Resolution 57/254 declaration
acknowledged the challenges of integrating sustainability into education systems. The challenges included moving beyond environmental education towards education for sustainable development, understanding the complexities of human and natural systems, and the need to address not only environmental, but social and economic issues as well. Another difficulty noted in the declaration is the importance of and need for data accessibility regarding sustainable development programs and activities around the world (UNESCO 2014b, 9).

The United Nations Educational, Scientific, and Cultural Organization (UNESCO) promoted the Decade on Education for Sustainable Development through numerous initiatives and reports, placing emphasis on integrating sustainability throughout the entire higher education system using a cross-disciplinary approach to enact large-scale change (UNESCO 2014b; Barth and Rieckmann 2012; Owoade 2017, 2). Reports like the “Learning for a Sustainable World” DESD M&E report series (published in 2009, 2012, and 2014) not only tracked the challenges and accomplishments of the DESD, but also provided materials to educate administrations, faculty, staff, and students on the importance of developing sustainable practices on campus. UNESCO coordinated partnerships with and between government stakeholders, private sectors, faith-based institutions, youth organizations, indigenous people, media groups, and others. They encouraged these groups to evaluate and monitor their sustainable development practices and share effective ESD practices (UNESCO 2014b).

The American Association of Sustainability in Higher Education (AASHE) was formed the first year of the Decade on Education for Sustainable Development, illustrating North America’s progress in implementing sustainable development into
higher education. Along with national and international efforts, regional groups and city-university partnerships were created during the Decade on Education for Sustainable Development to address the implementation challenges and strategies of sustainability in higher education (Barlett 2008, 1078). Education for sustainable development (ESD) was a topic at the World Conference on Sustainable Development (Rio+20) in 2012 (UN SDG Knowledge Platform).

The UNESCO World Conference on Education for Sustainable Development (ESD) concluded the Decade of Education for Sustainable Development in 2014. Held in November in Aichi-Nagoya, Japan, this conference resulted in the 2014 Aichi-Nagoya Declaration on Education for Sustainable Development (UNESCO 2014a). The declaration was a continuation of the Decade of Education for Sustainable Development and urgently called for further strengthening and growth of ESD. To create a more sustainable future, policymakers were encouraged to promote the integration of ESD into policies, workforce training, and education (UNESCO 2015). The Global Action Programme on Education for Sustainable Development, a follow-up program to the DESD launched at the UNESCO World Conference, acknowledged that achieving sustainability was a long-term commitment (UNESCO and SDG 2017, 3). It strived to achieve Target 4.7 of the Sustainability Development Goals (SDGs) that stated,

by 2030, . . . all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global
citizenship and appreciation of cultural diversity and of culture’s contribution to sustainable development (UNESCO 2017, 3).

Since the end of the Decade of Education for Sustainable Development, efforts to promote sustainability in higher education systems increased, specifically on increasing government participation in the education for sustainable development (ESD) movement. UNESCO and other agencies like the United Nations Framework Convention on Climate Change (UNFCCC) sought to support the mainstreaming of climate education through ESD under the Action for Climate Empowerment (ACE) programme (UNESCO Action for CE, iv). ACE focused on creating change through education, training, and public awareness.

Current Research on Sustainable Development in Higher Education

The number of peer-reviewed articles on higher education in sustainable development has increased dramatically since the Rio Earth Summit (Barth and Rieckmann 2016). The International Journal of Sustainability in Higher Education (IJSHE), launched in 2000, is the first peer-reviewed journal to focus solely on sustainability efforts in higher education to date. Yet, scholars note that most of the literature on sustainable development in higher education is based on individual case-studies or one dimension of higher education where sustainability initiatives are taking place (Vaughter et al. 2013, 2253; Corcoran et al. 2004). Research on sustainable development in higher education lacks comparative studies of sustainability policies and practices of multiple HEIs (Vaughter et al. 2013, 2253). There is also limited meta-analysis research of sustainable HEIs. Karatzoglou (2012) used a comparative analysis of

Much of the literature claims that sustainability issues must be addressed at scales larger than that of the individual (Ray and Anderson 2000). Many view HEIs as microcosms of society that have great influence on in broader society (Ferrer-Balas et al. 2007). In this manner, universities have the potential to serve as models of sustainability. HEIs can advance sustainability practices as well as mentor new sustainability leaders both on and off college campuses (Astin and Astin 2000; Stephens et al. 2008; Elder and MacGregor 2008).

Many researchers believe that universities should play a larger role in demonstrating and implementing sustainable practices for the rest of society to emulate (Orr and Eagen 1992; Cortese 2003; Corcoran and Wals 2004; Alshuwaikhat and Abubakar 2008; Ferrer-Balas et al. 2010; Basile 2012; Wright and Horst 2013). They see universities as models and testing grounds for the large-scale changes necessary to deal with environmental, social, and economic issues that we face today. Leal Filho (2010a; Leal Filho 2015, 4) notes that universities are strategically positioned to contribute to the development and implementation of education for sustainability. Alshuwaikhat and Abubaker (2008, 1,777) deem universities to be “small cities” that are responsible for modeling a sustainable future through curriculum and application (Cortese 2003; Corcoran and Wals 2004; Ferrer-Balasm et al. 2010; Basile 2012; Bonney 2014, 7).

Considering the critical role that universities play in the education of future leaders, many
argue that they have a moral duty to be at the cutting of edge of sustainability practice (Clugston and Caldar 1999; Wright and Horst 2013, 210).

Assessing Sustainable Development in Higher Education

As higher education institutions (HEIs) began to adopt more sustainable practices and became more involved in sustainable development, they attempted to systematically report their progress through sustainability assessment tools (SATs) (Shriberg 2002; Lozano 2006; Bullock and Wilder 2016; Saadation et al. 2011; Findler et al. 2019). SATs are defined as “instruments that provide HEIs with a systematic set of procedures and methods to measure, audit, benchmark, and communicate their SD efforts (Findler et al. 2019, 3).”

Past Assessments of Sustainable Development in Higher Education

One of the earliest major campus sustainability assessments in North America was Campus Ecology by April Smith and the Student Environmental Action Centers (SEAC) (Smith and SEAC 1993). Since Smith and SEAC’s work, many frameworks for sustainability reporting have been created. One of the most popular frameworks is Lozano’s (2006) Graphical Assessment of Sustainability in Universities (GASU), which is an altered version of the Global Reporting Initiative (GRI), the world’s most widely used sustainability reporting framework not centered on higher education (GRI 2017; Huber and Bassen 2019). The most popular higher education sustainability reporting framework is thought to be the Association for Sustainability in Higher Education’s Sustainability Tracking, Assessment (AASHE) and Rating System (STARS) report. The
STARS report consists of approximately 70 sustainability indicators centered around the academic, engagement, operation, innovation, planning, and administration dimensions of higher education (AASHE 2017).

Lozano’s (2006) GASU and the Association for the Advancement of Sustainability in Higher Education’s STARS report are the most widely used sustainability reporting tools, but they are not commonly recognized as applied sustainability reporting standards for HEIs (Huber and Bassen 2018, 220). Scholars like Huber and Bassen (2018) have recognized the absence of a standardized and universal sustainability framework and call for one that is accessible and capable of being completed in a cost-effective and timely manner (Lopatta and Jaeschke 2014; Sassen et al. 2014). Such a framework would be useful for holistic comparative sustainability studies of HEIs in the United States. Table 2.1: Higher education campus sustainability tools used to assess the effectiveness of implementing sustainability throughout an HEI describes some of the most prominent U.S. campus sustainability tools used to assess the effectiveness of implementing sustainability throughout an HEI. Many of these SATs inspired the sustainability web assessment tool (SWAT) used in this research.
Table 2.1: Higher education campus sustainability tools used to assess the effectiveness of implementing sustainability throughout an HEI.

<table>
<thead>
<tr>
<th>Framework/SAT</th>
<th>Description</th>
<th>Origin/Application</th>
<th>Date of Origin</th>
<th>Strengths</th>
<th>Weaknesses</th>
<th>Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Sustainability Assessment Questionnaire (SAQ)</td>
<td>Qualitative tool designed for the evaluation of the various objectives of universities to raise awareness about sustainable development to encourage debate on what sustainability in HEIs means, to give a picture of the state of sustainability in the institution, and to discuss about next steps towards sustainability</td>
<td>Developed in the United States by the University Leaders for a Sustainable Future (ULSF)</td>
<td>1999</td>
<td>Relatively simple to implement; allows for continual improvements by expanding consultation to more or new groups of experts (Gomez et al. 2015)</td>
<td>Does not match up to other SATs</td>
<td>N/A</td>
</tr>
<tr>
<td>Penn State Indicators Report (PENN)</td>
<td>It covers 33 different indicators of campus sustainability issues and rates each one using a 4-point system</td>
<td>Developed and used in the United States by the Penn State Green Destiny Council</td>
<td>2000</td>
<td>Holistic framework; Easily applicable; Most suited for developing countries but suitable for ranking universities in both developed and developing countries (Ragazzi and Ghidini 2017)</td>
<td>Some indicators are interrelated and are not clearly described in the ranking; Narrowed to eco-efficiency measures</td>
<td>69</td>
</tr>
<tr>
<td>Global Reporting Initiative (GRI)</td>
<td>Preeminent framework and guideline for voluntary corporate reporting on economic, environmental, and social performance to create transparency and consistency</td>
<td>Developed for international use of businesses and organizations</td>
<td>2000</td>
<td>Simple; Complements university ranking tools; Enables inter-organizational comparison (Findler et al. 2019)</td>
<td>Oversimplistic; Simplifies sustainability dimension to five indicators (Gomez et al. 2015)</td>
<td>15</td>
</tr>
<tr>
<td>National Wildlife Federation’s State of the Campus Environment Report</td>
<td>First large-scale higher education environmental performance survey; Web-based survey</td>
<td>Developed by the National Wildlife Federation (NWF) and used in the United States</td>
<td>2001</td>
<td>Grading system is focused on policies and practices</td>
<td>Not a comprehensive and holistic framework</td>
<td>N/A</td>
</tr>
<tr>
<td>Assessment Instrument for Sustainability in Higher Education (AISHE 2.0)</td>
<td>Focuses on the environmental aspect of sustainability; Narrative assessment (Gomez et al. 2015); One of the most complete and complex tools to address sustainability focused on education, but with less interest in environmental management or research</td>
<td>Developed in the Netherlands by the Dutch Committee on Sustainable Higher Education (CDHO) and extensively used in Europe and the United States</td>
<td>2001</td>
<td>Comprehensive and broad (Fonseca et al. 2011)</td>
<td>Limitations in assessing sustainable development in campus operations (Findler et al. 2019)</td>
<td>169</td>
</tr>
<tr>
<td>Campus Sustainability Assessment Framework (CSAF)</td>
<td>Oriented towards campus operations; Campus-based approach used (Berzosa et al. 2017)</td>
<td>Developed in Canada by Lindsay Cole to assist Canadian campuses with their sustainability objectives</td>
<td>2003</td>
<td>Active support from UNEP and MESA; Flexible and can be easily altered to fit the needs of individual units, faculties, and institution as a whole (Gomez et al. 2015)</td>
<td>Social responsibility issues and efforts not addressed</td>
<td>75</td>
</tr>
<tr>
<td>Framework/SAT</td>
<td>Description</td>
<td>Origin/Application</td>
<td>Date of Origin</td>
<td>Strengths</td>
<td>Weaknesses</td>
<td>Indicators</td>
</tr>
<tr>
<td>---------------</td>
<td>-------------</td>
<td>--------------------</td>
<td>----------------</td>
<td>-----------</td>
<td>------------</td>
<td>------------</td>
</tr>
<tr>
<td>Graphical Assessment of Sustainability in Universities (GASU)</td>
<td>Adapted GRI framework for sustainability assessment of HEIs; Aims to enable analysis and comparison of universities’ sustainability efforts</td>
<td>Developed by Rodrigo Lozano and extensively used in developed countries</td>
<td>2006</td>
<td>Relies on the explicit published course aims and outlines as a data source; Information usually easily accessible</td>
<td>Accuracy of the results depends on the accuracy/specifics of the syllabus</td>
<td>36</td>
</tr>
<tr>
<td>Sustainability Tracking, Assessment and Rating System (STARS)</td>
<td>Tool with most specific, quantitative indicators (Berzosa et al. 2017); Provides a framework that recognizes relative progress towards sustainability as an integral quantitative and qualitative tool, used in diagnosis but also to rate effort and progress (Martins and Borges 2015)</td>
<td>Developed by Association for the Advancement of Sustainability in Higher Education (AASHE) and extensively used in Europe and the United States; Not extensively used in developing countries</td>
<td>2006</td>
<td>Covers most important issues; Uses graphs to facilitate comparison universities’ efforts towards sustainability; It benchmarks universities for sustainable development (Gomez et al. 2015; Parvez and Agrawal 2019)</td>
<td>Does not include an exhaustive list of sustainability indicators; Difficult to apply to HEIs without GRI reports on sustainability available</td>
<td>59</td>
</tr>
<tr>
<td>Sustainability Tool for Assessing University’s Curricula Holistically - STAUNCH (RTM)</td>
<td>Focused on sustainability-centered curriculum to assess contribution to sustainable development; Assessment conducted through analysis of course syllabi</td>
<td>Created in the United Kingdom BRASS Research Center at Cardiff University (Lozano 2011)</td>
<td>2007</td>
<td>Comprehensive and holistic; Based on an exhaustive list of sustainability indicators; Detailed rationale methodology for calculating indicators; Active support from large organization (Gomez et al. 2015)</td>
<td>Functions in contexts where sustainable development is already advanced (Gomez et al. 2015); Each category has equal weighting, but subcategories are weighed differently. Some indicators are interrelated (Parvez and Agrawal 2019)</td>
<td>68</td>
</tr>
<tr>
<td>Unit-Based Sustainability Assessment Tool (USAT)</td>
<td>Designed to determine to what degree HEIs have integrated sustainability efforts into their core functions</td>
<td>Developed for use by the Swedish/African International Training Programme (ITP) on ‘Education for Sustainable Development in Higher Education’</td>
<td>2008</td>
<td>Comprehensive; Identifies barriers, drivers, incentives, and motivations (Shriberg 2002)</td>
<td>Little use of the term “sustainability”; Small sample within each college/university (Shriberg 2002)</td>
<td>69</td>
</tr>
<tr>
<td>UI GreenMetric World University Ranking (UI-GMR)</td>
<td>Aim is to assess policies and activities within green campuses so as to promote a sustainability culture in HEIs (Ragazzi and Ghidini 2017)</td>
<td>Developed at the University of Indonesia and used throughout the world</td>
<td>2010</td>
<td>Flexible framework for institutional comparisons; Process-orientation which helps prioritize and set goals through developmental stages (Lozano 2006, 966; Shriberg 2002, 157)</td>
<td>Difficult to comprehend; Motivations are potentially excluded</td>
<td>30</td>
</tr>
<tr>
<td>Framework/SAT</td>
<td>Description</td>
<td>Origin/Application</td>
<td>Date of Origin</td>
<td>Strengths</td>
<td>Weaknesses</td>
<td>Indicators</td>
</tr>
<tr>
<td>------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------</td>
<td>----------------</td>
<td>---------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>------------</td>
</tr>
<tr>
<td>Three-dimensional University Ranking (TUR)</td>
<td>Evaluates HEIs' performance in a way that enables inter-organizational comparison (Findler et al. 2019); Makes use of the triangle method (Gomez et al. 2015, 478)</td>
<td>Developed by Lukman et al. 2010 at the University of Maribor</td>
<td>2010</td>
<td>Known for being one of most comprehensive sustainability reports in North America; Well-written; (Nixon and Glasser 2002)</td>
<td>Weak in its coverage of sustainability issues; The process of defining the indicators and deciding which ones would be a part of the assessment is not transparently described. The performance criteria for each indicator and its associated performance rating are also not transparent</td>
<td>33</td>
</tr>
<tr>
<td>The College Sustainability Report Card (CSRC)</td>
<td>A grading system focused on policies and practices; The process includes selection, survey composition, data collection, verification and assessment (Parvez and Agrawal 2019)</td>
<td>Developed by the Sustainable Endowment Institute and used in the United States</td>
<td>2010</td>
<td>Well structured; Three-tier, holistic approach; guidelines provide organizations with a way to measure, understand and communicate their economic, social and environmental performance (GRI, n.d.; Lozano, 2006). Better suited for holistic integration of sustainability into HE (Yanez et al 2018)</td>
<td>Not created specifically for HEIs</td>
<td>N/A</td>
</tr>
<tr>
<td>Adaptable Model for Assessing Sustainability in Higher Education (AMAS)</td>
<td>Aim is to enable HEIs to assess sustainability along different implementation stages; Does not compete with other assessment tools or report systems, but instead, serves as a catalyst for institutions that have had difficulties adapting tools to fit their campus specific needs to start reporting on their sustainability performance</td>
<td>Developed in Chile by Gomez et al. 2015</td>
<td>2015</td>
<td>Clearly defines use of sustainability term through provision of definitions; Emphasizes (cross-functional sustainability as a process; Useful as a conversational and teaching tool; Probes questions that identify set goals and weaknesses (Shriberg 2002)</td>
<td>Subjective, qualitative, and impressionistic; Comparison of HEIs across space and time is limited</td>
<td>35/41</td>
</tr>
</tbody>
</table>
Assessing Sustainability Initiatives among Higher Education Institutions

There are three main approaches to assessing the sustainability efforts of HEIs: an accounts assessment, a narrative assessment, and an indicator-based assessment (Dalal-Clayton and Blass 2002; Alghamdi et al. 2016). An accounts assessment consists of gathering and converting raw data to a common unit of measure, such as currency or energy wattage, and generally refers to a narrow set of indicators that can easily be evaluated and compared (Dalal-Clayton and Bass 2002, 133; Alghamdi et al. 2016). An indicator represents a certain characteristic, attribute, or property of a system (Gallop 1997). Because the accounts approach only measures a limited number of sustainability indicators in higher education (i.e., water usage and carbon emissions) and is solely based on monetary values, I did not use it for this research (Dalal-Clayton and Bass 2002, 133; Alghamdi et al. 2016, 85).

A narrative assessment is a popular approach to measuring and analyzing sustainability (Dalal-Clayton and Bass 2002, 135). The approach consists of combining multiple sources of data such as text, graphics, maps, and tabular information as well as indicators if desired (Dalal-Clayton and Bass 2002, 135; Alghamdi et al. 2016, 85). While the approach is flexible and can be tailored to the needs and skills of its participants, it lacks a systematic framework necessary for comparative analysis, thereby limiting the value of narrative assessments for decision-making and monitoring (Dalal-Clayton and Blass 2002, 135).

I used an indicator-based tool to assess the sustainability-related webpages of higher education institutions in the United States. Indicator-based assessments are the most popular method used to measure the sustainability efforts of institutions (Alghamdi
et al. 2018, 85). As with narrative assessments, indicator-based tools can include text, maps, and graphical and tabular data, but are structured around indicators or variables (Dalal-Clayton and Bass 2002, 135). This method is more comprehensive, representative, measurable, and thus more appropriate for comparative analysis than accounts and narrative approaches (Dalal-Clayton and Bass 2002; Lozano 2006b; Ramos and Pires 2013). Indicator-based assessments also are more transparent and consistent in data collection and their results are more useful to policy and decision making than accounts and narrative assessments (Alghamdi 2016, 86).

A Need for Standardized Reporting Research

Despite progress in recent years, many researchers believe we are still in the early stages of sustainability assessment (Fien 2002; Ceulmans et al. 2015; Figler 2018; Huber and Bassen 2018). Of particular concern are the low numbers of participants in sustainability reporting, lack of financial support and human resources, and the absence of a universal reporting framework (Leal Filho 2000; Lopatta and Jaeschke 2014; Huber and Bassen 2018, 218). The difficulty of defining sustainability also hinders reporting, although an established framework would be advantageous for HEIs in that it would aid public messaging and support for the adoption of sustainable policy (Huber and Bassen 2018, 218). Creating a standardized sustainability report also has the potential to improve comparability and increase the number of studies that focus on HEIs (Fonseca et al. 2011; Leal Filho 2000; Lopatta and Jaeschke 2014; Huber and Bassen 2018, 218). Though there have been previous efforts to measure the sustainability of organizations, institutions, and corporations, Shriberg (2002) believes much of it lacks empirical evidence. Of particular
relevance to this dissertation, Ott, Wang, and Bortree (2016) call for research that explores how sustainability is communicated through webpages of corporations, nonprofits, and HEIs.

**Communication of Sustainable Development through the World Wide Web**

Nonprofit and for-profit organizations have benefited from integrating sustainability into their core management functions and initiatives (Chabowski et al. 2010, 59; Ott et al. 2016, 672). *Going green* and reporting sustainability initiatives are now seen as key business strategies and have been adopted by many companies around the world (Chabowski et al. 2010, 59; Craig and Allen 2013, 292; Bortree 2014; Ki and Shin 2014, 2; Ott et al. 2016, 672). The benefits for companies with a sound, well-messaged sustainability strategy include enhanced reputation (Kim and Lee, 2012), greater levels of trust and positive word-of-mouth communication (Hong and Rim 2010; Ott and Bortree 2016), stronger relationships with the public (Hall 2006), increased satisfaction among multiple stakeholders (Mincer 2008; Klettner et al. 2014), greater legitimacy and admiration of the organization (Bortree 2009; Thomas and Lamm 2012), and higher purchase intention among consumers (Juwaheer et al. 2012; Sass 2014).

Corporations are now viewing environmental initiatives as an element of competitive advantage (Chabowski 2010, 22). One example of this is a study by KPMG, a global network of professional firms providing audit, tax, and advisory services, which found a 9.0 percent increase in global businesses disclosing carbon emission reduction targets from 2015 to 2017 (KPMG 2011). The positive image of social and environmental
initiatives has caused many companies and organizations to establish goals for social and ecological sustainability (Frankental 2001; Ott et al. 2016, 672).

Higher education institutions (HEIs) are not commercial, corporate entities, but they behave in similar ways and use many of the same practices. Marketing strategies and public relations have significantly increased over the past century and play a key role in the higher education sector (Bok 2003). Scholars have linked the corporate culture of the late 20th century, the decline of student enrollment, and the reduction of government funding to the commercialization of higher education and the growing importance of marketing strategies in the higher education sector (Bok 2003; Newman et al. 2004; Tolbert 2014). Scholars such as Levy and Kotler (1969) and Krackenberg (1972) emphasize the importance of HEIs adopting marketing strategies. Krackenberg (1972) believes marketing strategies have long been adopted by HEIs and that they should be further embraced in order for HEIs to succeed. Kotler (1979) formally calls for a marketing agenda to be adopted by HEIs. Over the past 50 years, capitalist theory literature acknowledged how HEIs in the U.S. have adopted marketing culture and implemented branding campaigns to enhance their reputations and influence stakeholder perceptions (Tolbert 2014, 235).

HEIs have long participated in marketing (through magazines and newspapers), but the rise of the internet reshaped how HEIs communicate their brands to the public. Kittle and Ciba (2001) found that the percentage of HEIs in the U.S. that used the internet in their marketing campaigns jumped from 40 percent in 1996 to 100 percent in 2000 (Tolbert 2014, 238). With widespread use of the internet, e-marketing has become critical to the promotion of HEIs. Over the past two decades, scholars like Opuku, Abratt, and
Pitt (2006, 11) have encouraged HEIs to take advantage of positioning opportunity to shape their institutional identity and brand image. In their research on business schools, they conducted a computerized content analysis of the Internet text adopted by 11 South African businesses to communicate their brand personalities via the Internet. Their analysis found that institutions chose words to create specific brand personalities, allowing them to stand out against their competitors (Opuku et al. 2006).

Dawn Tolbert (2014) noted that HEIs have a vested interest in creating a brand position through internet marketing strategies. Effective advertisements capture the intended audience’s attention by awakening interest and arousing a desire to purchase the promoted product (Echtner and Ritchie 1993; Henthorne et al. 2016). Others have emphasized the benefits of using the internet as a competitive tool for business applications (Mittal et al. 2012, 10). A website not only communicates the products and services of an institution to a broad segment of society, but also its brand and characteristics (Meroño-Cerdan and Soto-Acosta 2005; Miranda et al. 2009; Mittal et al. 2012). Although websites are an integral part of e-business strategy and have numerous benefits, however, the simple existence of a website does not equate to success. For a website to be successful, it needs to possess decisive quality attributes that are easily communicated to the consumer (Kim and Niehm 2009; Galati et al. 2016, 310).

Assessing Virtual Sustainable Development Communication

With sustainability efforts becoming a key business strategy, communicating these efforts to stakeholders is important (Capriotti and Moreno 2007; Bortree 2011; Ott et al. 2016; Dade and Hazzendahl 2013). Capriotti and Moreno (2007), Kim and
Ferguson (2014), Kim and Rader (2010), Signitzer and Prexl (2008), Ott, Wang, and Bortree (2016), and Dade and Hassendahl (2013) have conducted studies of corporate social responsibility (CSR) and sustainability communication efforts on websites using web-based analysis. Researchers use various terms to describe CSR communication, including corporate sustainability communication, social responsibility communication, green communication, global responsibility communication, and environmental sustainability communication (Signitzer and Prexl 2008; Ki and Shin 2014; Ott et al. 2016).

Because the internet has become a key medium for communication, Ott, Wang, and Bortree (2016) noted the importance of web-based analysis as a way to understand how sustainability is communicated through the web landing pages of HEIs. Others like Dade and Hazzendahl (2013) have evaluated the sustainability efforts of corporations (like those in the oil and gas industry) through triple bottom line reporting on the internet. Dade and Hazzendahl (2013) conducted a content analysis of over 700 HEI websites to determine how and to what extent sustainability efforts are communicated either through an institution-wide website or within departmental websites. Each institutional website was evaluated and compared using a data matrix to better understand sustainability communication trends (Dade and Hazzendahl 2013, 254). I chose the method used by Dade and Hazzendahl because its qualitative perspective provides more concrete conclusions that are often missing from other studies (Neuendorf, 2002; Dade and Hazzendahl 2013, 256). Ott, Wang, and Bortree (2016) examined environmental sustainability content on websites across corporate, nonprofit, and HEIs to determine how these institutions define environmental sustainability and how environmental
sustainability initiatives are portrayed to the public. They noted the importance for institutions to keep not only shareholders, but all public stakeholders in mind when communicating sustainability initiatives.

Craig and Allen (2013) emphasize the relevance of stakeholders when communicating sustainability because of the impact they have on sustainability initiatives. They explain the importance of an organization’s workforce understanding their employer’s sustainability initiatives and the positive outcomes they have on society and/or the environment (Craig and Allen 2013, 296–297). Ott, Wang, and Bortree (2016, 675) explain that this philosophy of understanding applies to both internal and external stakeholders because both the internal and external stakeholders’ involvement in sustainability initiatives affect their interest and participation (Craig and Allen 2013).

Geographic and Anthropological Perspectives of Sustainable Development

At the turn of the millennium, geographers like Robert W. Kates and other natural and social scientists joined together to form the field of sustainability science (Kates et al. 2001; McCabe 2003, 91). The 2001 Science article titled “Sustainability Science” called for new studies to examine the fundamental character of interactions between nature and society. Such studies are needed to explore the global interaction processes for the ecological and social characteristics in particular places and economic sectors (Kates et al. 2001, 641). Of the six central questions raised by the article, one of the most important for anthropologists and geographers to consider is: “What determines the vulnerability or resilience of the nature-society system in particular kinds of ecosystems and livelihoods?
(Kates et al. 2001, 641)." The following section delves into how geographers and anthropologists can answer this question.

**Geographic Perspectives on Sustainable Development in Higher Education**

Given its focus on the spatial relationships between humans and the environment, geography is well-suited to the study of sustainability and sustainable development (Wilbanks 1994, 545; Bednarz 2006). Some of the oldest thematic traditions in geography, including spatial analysis, area studies, and human-environment dynamics, serve as foundations for sustainability research and problem solving (Bonney and Duram 2016, 3). In part because of these traditions, many see geography as an appropriate, even ideal, home for sustainability studies. The substantial body of sustainability research produced by geographers strengthens this position (Bennett 2013; Adams 1990).

Geography is an inherently interdisciplinary field that bridges the physical and social sciences and that focuses on understanding the complex relationship between the Earth and its natural and social systems (Bednarz 2006; Liu 2011, 254; Bonney and Duram 2016). Sustainable development is defined by the relationships between humans and the environment and relates sustainability issues to spatial-pattern issues (Wilbanks 1994, 545). Both geography and sustainability science center around human and environmental interactions and both study inclusive and contradictory trends that advance humanity toward a more sustainable future (Kates and Parris 2003; Liu 2011, 254).

Geographical research contributes to understanding the effects humans have on their surrounding environments and offers solutions to negative anthropogenic impacts (Bonney and Duram 2016, 547). Geography also offers theoretical frameworks and
methodologies that are beneficial to sustainability research (Bonney 2016). Geographic methods and theories offer holistic ways of studying sustainability issues and the complexities of human and environmental systems at various scales (Bonney 2016, 2). Geographical research illuminates the interdependent relationship between political, spatial, socio-cultural, economic, and environmental phenomena that other disciplines do not. Geography also focuses on the flows between nature and society and the spatial manifestations that arise from them (Wilbanks 1994, 546). Interpretations of sustainable development and sustainability strategies vary from place to place and among different stakeholders. This makes geographical imagination an invaluable resource in addressing sustainability issues (Haughton and Counsell 2004; Grindsted 2015).

An obvious contribution of the geographical perspective to sustainability research and sustainable development is visualization (Wilbanks 1994, 549). Visual images, such as digital maps, are becoming increasingly useful in understanding sustainable development and are beneficial in illustrating regional trends of sustainability in higher education. Geographers and researchers from allied fields have long understood the importance of maps when studying sustainable development. The sociologist, Thomas F. Gieryn (1995), refers to his own approach in sustainability research as espousing a cartographic perspective (Holm and Martinsen 2015, 73-74). The spatio-temporal dimensions of sustainability call for the use of cartography to understand its interactions, dimensions, and complexities at various scales (Grindsted 2015). Given the nature of geographical research, its importance to sustainability science and to higher education institutions must be considered in terms of curriculum development and research.
Sustainability issues cannot be fully understood without the perspective and data geography provides on human interactions with the environment.

**Anthropological Perspectives on Sustainable Development in Higher Education**

Anthropological perspectives have been largely absent from recent sustainable development literature, but anthropologists have been making significant contributions to social, environmental, and economic themes related to sustainability for decades (McCabe 2003; DeLind and Link 2004; Haenn and Wilk 2006; Crate and Hitchcock 2008; Barlett 2008). Where the discipline is lacking is the acknowledgment of its contributions and the absence of engagement in sustainability debates by anthropologists (Barlett 2008; Crate and Nuttall 2009; Trostle 2010; Singer 2011). Anthropologists are increasingly recognizing their potential to make contributions to sustainability science and to extend the focus from environmental to social and economic issues (McGabe 2003; Stone 2003; Singer 2011). Stone (2003), for example, called for anthropology to directly engage with the concept of sustainability in order to better understand the entanglement between human, environmental, and economic systems.

Over the past 17 years, anthropologists have answered Stone’s call from 2003. This is evident with the increasing development of sub-disciplines such as *environmental anthropology* and the *anthropology of sustainability* (Dove and Carpenter 2008; Kopnina and Shoreman-Oimet 2017; Maida 2017, 12; Brightman and Lewis 2017). *Environmental anthropology* gained popularity in the 1990s though its roots can be traced as far back as the mid-20th century when Julian Steward introduced the concept of *cultural ecology* (Kopnina and Shoreman-Oimet 2017, 11; Townsend 2018, 6). *Environmental*
anthropology includes subfields such as ecological anthropology (Hardesty 1977; Kottak 1990), cultural ecology (Steward 1968), political ecology, and the anthropology of nature (Sutton and Anderson 2004; Kopnina and Shoreman-Oimet 2017, 11). Kay Milton (1996; 2002) proposed three key ways in which anthropological knowledge must contribute to the environmental cause: through the study of human-environment relations, or anthropology as human ecology; by being ‘trans-cultural’ interpreters of environmental knowledge and practice; and studying environmentalism itself as a cultural practice and an object of analysis (Kopnina and Shoreman-Oimet 2017, 5).

Contributors for the Routledge Handbook of Environmental Anthropology focus on the analysis and resolution of human-induced environmental issues created and what the term environment means for people. The anthropology of sustainability focuses instead on social, behavioral, and cultural dimensions of sustainability, what the concept of sustainability means to different people from material, social, and culturally symbolic perspectives, and through the lens of human rights and social justice (Kopnina and Shoreman-Oimet 2017, 4; Brightman and Lewis 2017). The anthropology of sustainability examines cultural processes from the perspective of the unique and specific interests and needs of societies rather than through universalist perspectives and methodologies to address environmental, social, and economic problems (Maida 2007, 12).

Anthropologists, and specifically applied anthropologists, have increasingly begun to contribute to sustainability debates (McGabe 2003). Henrietta Moore and Anna Tsing have called for the rethinking of anthropology and how it is practiced to better address sustainability issues (Brightman and Lewis 2017, 22). Moore (2017)
acknowledges and praises geographers for recognizing that social/spatial relations must always be spatio-temporal and are formed in multiplicity and are constantly emerging and declining (Moore 2017, 72; Brightman and Lewis 2017, 25). Brightman and Lewis (2017) propose that anthropological research methods and collaborations need to be further expanded and developed to address the complexities of environmental, economic, and social issues, but acknowledge the already existing contributions of anthropological theory and methods.

While anthropologists have been criticized for letting other disciplines such as geography take the lead in sustainability research, the field contributes critical perspectives that are clearly needed in sustainability science (Adger et al. 2003). Like geography, anthropology is a discipline that bridges multiple disciplines and connects social and natural scientists around the study of different problems and issues, including sustainability. Katherine Homewood (2017) encourages collaboration with other disciplines to improve the understanding and creation of solutions by incorporating insights and methodologies from wide-ranging disciplines. Homewood states that anthropology is in the position to combine qualitative and quantitative analysis, evidence, and critique to influence the actions of policymakers resulting in beneficial changes (Homewood 2017; as cited by Brightman and Lewis 2017, 22). Laura Rival (2017) shows the importance of challenging the assumptions of other disciplines. She also calls for anthropology of sustainability to reach out to international institutions and other related policy-making bodies. Anthropologists such as Mauro Almeida (2017) stress that the anthropology of sustainability offers the possibility of non-condescending
anthropological activism that addresses real-world problems like socioeconomic issues and climate change.

**Geography and Anthropology’s Role in Creating Change**

Most geographers and anthropologists view diversity, equity, and inclusion not simply as desirable, but essential to the success of sustainable development. As social scientists, they recognize that global society is characterized by systemic inequalities, oppressions, and exclusions, as well as polarizing worldviews. Therefore, it is important to promote critical dialogue and practices aimed at dismantling these injustices while also addressing the social and environmental challenges of our time. To successfully advance sustainable development, it is important to expand the inclusion of historically underrepresented groups, engage directly with multiple cultures, and produce research that addresses issues of social and environmental justice in a diverse range of domestic and international communities.

Both anthropology and geography are well placed to integrate qualitative and quantitative analysis, evidence, and critique in ways that carry weight with policymakers (Bonney 2016; Moore 2017; Brightman and Lewis 2017). Anthropologists and geographers alike have begun to shape positive change by engaging more systematically with institutions and policy-making bodies (Grindsted 2015). They are finding ways to communicate cultural and cognitive diversity, and its impact on social conflict and human behavior in the physical world, to decision makers at all levels (Almeida 2017). Though it is an ambitious project, anthropology and geography are both well placed to facilitate a shift in ideology of progress and development.
CHAPTER 3: METHODOLOGY

Study Design and Research Method

This research is exploratory and descriptive, and focuses on describing the phenomenon of sustainability at four-year colleges and universities in the United States. I chose a mixed qualitative-quantitative approach for this research to produce a broad and balanced view of sustainable development in higher education (Glatthorn and Joyner 2005). This approach incorporates both qualitative and quantitative aspects to answer the research questions of this study.

Grounded Theory

I used Grounded Theory (GT) as the overarching research model used for this dissertation. Grounded Theory first came about in 1967 with the publication of Glaser and Strauss’s, The Discovery of GT: Strategies for Qualitative Analysis (Clarke and Charmaz 2014, xxii). The term refers to the generation of theory through the flexible yet systematic collection and analysis of data (Clarke and Charmaz 2014). Grounded Theory involves finding and following an empirical problem in the field rather than pursuing a research question wholly defined in advance (Clarke and Charmaz 2014, xxii). It allowed me to build rather than test theory, thereby minimizing my own subjectivity in the process of knowledge production (Patton 2015, 110). Grounded Theory is known for its “iterative approach, inductive beginnings, comparative methods, and theoretical objectives (Clarke and Charmaz 2014, xxiii).” I followed the principles of Grounded Theory by systematically and simultaneously collecting and analyzing my data (Glaser and Strauss 1967; as cited by Clarke and Charmaz 2014, xxiii).
While conducting my research, Grounded Theory allowed me to be systematic and creative at the same time (Patton 2015). The research method is disciplined, permits biases and subjectivity, and allows for creativity and flexibility (Morse 2009, 13-19). Grounded Theory allowed me to go into my research with the goal of better understanding what is occurring on the websites of higher education institutions across the U.S. in terms of communicating sustainability without any preconceived biases. I was able to focus on better understanding what was occurring in higher education in terms of sustainable development (SD) instead of trying to mold my research around my hypothesis that environmentally sustainable universities would be most common in the west and northeast regions of the United States.

Grounded theory provided me with the analytical tools needed to handle a large amount of raw data in this research. Using grounded theory allowed me to have a set of coding procedures that offered standardization and rigor when analyzing the websites of HEIs. I created a sustainability web assessment tool (SWAT) that allowed me to compare, sort, and synthesize data from HEI webpages. Yet what grounded theory offered the most was the ability to continue to code and elaborate on existing codes. Grounded theory allowed me to engage with my data and discover analytic gaps that I otherwise would have missed.

I utilized the ongoing practice of coding and comparing throughout the research process and identified patterns as they emerged. To raise the theoretical level of my research process. Memo writing has multiple benefits, such as engaging the researcher with their data, identifying potential analytic gaps, and creating paper chapters and sections (Charmaz and Bryant 2008, 374). Memo writing also allows ideas to develop
early on in the research and identify potential anomalies (Charmaz and Bryant 2008, 375).

**Objective One: Identifying Sustainable Higher Education Institutions**

Objective One of this dissertation involves conducting a comprehensive review of the websites of every four-year *Public, Private Non-Profit, and Private For-Profit* higher education institution (HEIs) in the United States to identify which of them had an administrative unit (an office or center), an academic unit (a school, department, or program), research institute, or collaborative effort (committee/council) that focused on at least one pillar of sustainability. I will refer to these structures (departments, committees, offices/teams/working groups, centers, and councils) as *sustainability implementation structures* after Rachel Shawe and others (2019). Between August 2017 and May 2018, I created a nationwide sample of four-year higher education institutions (HEIs) that had at least one sustainability implementation structure listed on their websites. I named this sample *Sustainable Universities*.

I derived the list of four-year U.S. HEIs from the National Center for Education Statistics’ College Navigator (NCES) in August of 2017. I included only HEIs with Bachelor’s and advanced degrees in this dataset while excluding all institutions that offered only Certificate and/or Associate’s programs. I included all 50 states and Washington D.C. in the study, but excluded U.S. territories, such as American Samoa, Federated States of Micronesia, Guam, Marshall Islands, Northern Marianas, Palau, Puerto Rico, and the Virgin Islands. I exported the NCES data as an Excel spreadsheet so
I could merge it with my sustainability web assessment and Sustainability Faculty and Staff online questionnaire data and input these data into Excel for cross-tabulation.

I created two additional columns in my Excel spreadsheet to fit the research design plan. One column titled State consisted of the U.S. state acronyms while the second column was titled Sustainable?. Under the Sustainable? column, answers were either “Yes,” or “No”, depending on whether or not a sustainability implementation structure was found on an HEI’s website. For an HEI to be classified as sustainable, it had to have sustainability implementation structure (a staffed office, academic department, research center, and/or a formal collaborative effort, such as a committee or council, with the term sustainability, conservation, environment, nature, or a similar term in the name).

To determine if an HEI had a sustainability implementation structure, I entered the name of the higher education institution, the state it resided in, and the term sustainability into the Google search engine. I chose Google because it commands over 70% of the global online search market (Lavania et al. 2013; Sharma et al. 2017, 90). Besides having the highest market share, Google also has a highly rated web crawler service that provides comprehensive coverage and relevancy (Lavania et al. 2013, 338). Its web crawler service prioritizes web sites that are frequently updated, filters links by quality and quantity, and selects informational pages over commercial sites (Lavania et al. 2013, 338). The Google search engine technology generates relevant search results using the phrase directly entered into the search engine as well as texts that are analogous but are not lexicographically similar (Abhishek and Hosanagar 2007, 89; Martinez-Gil and Aldana-Montes 2013, 339). For example, when searching sustainability, similar
terms such as *environmental, conservation,* and/or *natural resources* appear on the results homepage. An example of this can be seen in Figure 3.1, which shows the results of a search using as key words, “The University of North Dakota” and “sustainability”. Not only did web titles with sustainability in them appear, but pages titled *Environmental Science and Public Policy, Environmental Studies,* and *Department of Earth System Science and Policy* also appeared within the top ten results. As seen in Figure 3.1, web pages like that of the Department of Earth System Science and Policy at the University of North Dakota had *sustainability* listed within the webpage. Some webpages, such as the University of North Dakota Energy and Environmental Research Center shown in Figure 3.2 did not include the phrase *sustainability,* but had similar phrases like *environmentally friendly,* *cost-effective energy and environmental solutions, critical energy challenges,* and *economy.*

I was able to find the most relevant web pages related to sustainability using the Google search engine. Typically, I was able to conduct my research associated with Objective One and determine if there was a sustainability implementation structure on campus by going through the first page of the Search Engine Results Pages (SERPs) in Google. Each SERP contains 10 organic results, or links to web pages that appear as a result of the search engine’s algorithm (Schultheib and Lewandowsk 2019, 1). From these web pages, I could navigate through the sustainability web pages of all four-year HEIs collected from the National Center for Education Statistics.
Figure 3.1: Top eight search results when I entered University of North Dakota sustainability into the Google search engine.
Figure 3.2: Key screenshot of the University of North Dakota Energy and Environmental Research Center homepage.
Between August 2017 and May 2018, I assessed a total of 2,725 four-year higher education institutions from 50 U.S. states and Washington D.C. to determine if they had a sustainability implementation structure listed on their campus website. This data set included six types of HEIs: Four-Year, Primarily Associate's, Private For-Profit; Four-Year, Primarily Associate's, Private For-Profit; Four-Year, Primarily Associate's, Private Non-Profit; Four-Year, Primarily Associate's, Public; Four-Year Public; and Four-Year Private Non-Profit. Although I initially included Private For-Profit HEIs in the data set, I decided to exclude them from analysis because many Private, For-Profit HEIs, such as the University of Phoenix, The Art Institute, and DeVry University are primarily online, are not unique to a specific location, and have been criticized for their lack of quality education and campus experience (Liu 2011).

**Objective Two: Evaluating Sustainable Universities**

To better understand where sustainability is being implemented within higher education institutions (HEIs), I evaluated the sustainability-focused webpages of all four-year universities with a sustainability implementation structure listed on their website. I used content analysis to assess HEI sustainability web page content and how colleges and universities define and communicate sustainability through their websites. I examined the sustainability web pages of 1,270 four-year universities using the sustainability web assessment tool (SWAT) and grading system I created for this dissertation research based on previously published assessment tools (Taylor 1999).
Creating a Sustainability Web Assessment Tool

Holland and Cole (1997) emphasize the importance of describing how a sustainability assessment tool (SAT) or framework is designed, who is involved in the process, where inspiration was drawn from, and the scope and type of indicators chosen for the SAT (Holland 1997, 39-45; Cole 2003). To decrease subjectivity, I followed Evans and King (1999, 343) and used a model consisting of categories, factors, weights, ratings, and a total score for my sustainability web assessment tool (SWAT). Francisco Miranda and others (2009) stress the importance of choosing categories and attributes that are critical to a web site’s value in order to create a successful web assessment tool. The first step in creating my SWAT was to select categories (dimensions within higher education where sustainability is present) and factors/attributes (sustainability indicators within dimensions of higher education). To do this, I studied past sustainability assessment tools and literature on sustainable development in higher education.

Dimensions of Higher Education

I organized sustainability indicators into content categories or dimensions of higher education based on dimensions found in Calder and Clugston’s (2003) “Seven Critical Dimensions of University Life,” the National Wildlife Federation’s (2008) Ecology Report Card, the United Nations Environment Program’s (2012) International Platform for Sustainability Performance in Education, and the AASHE (2015) STARS Report. Based on the sustainability dimensions emphasized by the sources mentioned above, I constructed the following nine sustainability dimensions for this study: institutional framework; faculty and staff development; education and research; on-
campus experiences and student life; outreach and services; operations; dining; transportation; and assessment and reporting. These dimensions evolved into the Big Six and Big Dozen Dimensions of Sustainability in Higher Education (Table 3.1 and Table 3.2).

The Big Six Dimensions of Sustainability in Higher Education seen in Table 3.1 and Table 3.2 closely follow Calder and Clugston’s (2003) dimensions of higher education. I first grouped the variable questions into six dimensions of higher education: Education, Research, Operations, Campus Engagement, Outreach (and Services), and Assessment and Reporting to analyze where HEIs prioritize sustainability based on their webpages. After analyzing the Big Six dimensions based on HEI type, campus size and setting, and Carnegie classification, I broke down Operations and Campus Engagement to better understand where within those dimensions sustainable initiatives were occurring (Table 3.2).

**Sustainability Indicators**

Cole (2003, 21) defines a sustainability indicator as “a package of data [that] simplifies, quantifies, and communicates complex and detailed information so decision-makers, policy-shapers, and the public” can understand and use it. I selected indicator selection criteria for this research from a variety of past literature and sustainability assessment tools. I developed specific indicators by taking inspiration from Taylor’s (1999) study, Calder and Clugston’s (2002) chapter on sustainability in various sectors of higher education, the National Wildlife Federation, and the AASHE STARS Report.
<table>
<thead>
<tr>
<th>The Big Six Dimensions</th>
<th>Subgroups of the Big Six Dimensions</th>
<th>Variable questions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Assessment and Reporting</strong></td>
<td><strong>Assessment and Reporting</strong></td>
<td>Are sustainability awards and affiliations listed on the website?</td>
</tr>
<tr>
<td>Framework</td>
<td>Campus engagement</td>
<td>Has a staffed office been established with the mandate to incorporate sustainability into various facets of institutional life – not just academic?</td>
</tr>
<tr>
<td>Education</td>
<td>Education/curriculum</td>
<td>Does the HEI have a four-year (env.) sustainability-focused academic program?</td>
</tr>
<tr>
<td>Framework</td>
<td>Campus engagement</td>
<td>Is there a committee focused on sustainability?</td>
</tr>
<tr>
<td>Public Engagement/Outreach and Services</td>
<td>Public Engagement/Outreach and Services</td>
<td>Does the university look at social sustainability?</td>
</tr>
<tr>
<td>Campus Engagement</td>
<td>Faculty Development</td>
<td>Are workshops, webinars, seminars being held to educate faculty on integrating SD into their academic/administrative work? Are sustainability certification courses offered to departments or offices?</td>
</tr>
<tr>
<td>Education/Curriculum</td>
<td>Education/Curriculum</td>
<td>Is there an environmental sustainability-oriented undergraduate major at HEI?</td>
</tr>
<tr>
<td>Education/Curriculum</td>
<td>Education/Curriculum</td>
<td>Number of environmental sustainability-oriented undergraduate majors at HEI</td>
</tr>
<tr>
<td>Education/Curriculum</td>
<td>Education/Curriculum</td>
<td>Does the HEI offer at least one sustainability-focused major, degree program, or the equivalent for graduate students?</td>
</tr>
<tr>
<td>Education/Curriculum</td>
<td>Education/Curriculum</td>
<td>Environmental sustainability-focused minor, concentration, or certificate programs? (Yes/No, #)</td>
</tr>
<tr>
<td>Education/Curriculum</td>
<td>Education/Curriculum</td>
<td>The number of the environmental sustainability-focused graduate-level degree program?</td>
</tr>
<tr>
<td>Education/Curriculum</td>
<td>Education/Curriculum</td>
<td>Are sustainability-related courses and/or programs that don’t have sustainability, environmental, conservation, or similar term listed on the website?</td>
</tr>
<tr>
<td>Education/Curriculum</td>
<td>Education/Curriculum</td>
<td>Does the website list sustainability-related courses without a sustainability degree program?</td>
</tr>
<tr>
<td>Research</td>
<td>Research</td>
<td>Does the HEI have at least one environmental/sustainability-focused research center?</td>
</tr>
<tr>
<td>Research</td>
<td>Research</td>
<td>Is there a page where sustainability research themes/opportunities are listed? (MIT)</td>
</tr>
<tr>
<td>Research</td>
<td>Research</td>
<td>Does the HEI offer research funding for environmental sustainability?</td>
</tr>
<tr>
<td>Outreach and Services</td>
<td>Public Engagement/Outreach and Services</td>
<td>Are there sustainability-focused community service projects/collaboration at the HEI?</td>
</tr>
<tr>
<td>Outreach and Services</td>
<td>Public Engagement/Outreach and Services</td>
<td>Is the HEI working to protect/conserve the surrounding natural environment, such as a habitat restoration/protection project? (NWF)</td>
</tr>
<tr>
<td>The Big Six Dimensions</td>
<td>Subgroups of the Big Six Dimensions</td>
<td>Variable questions</td>
</tr>
<tr>
<td>------------------------</td>
<td>------------------------------------</td>
<td>--------------------</td>
</tr>
<tr>
<td>Campus Engagement</td>
<td>On-Campus Experiences/Student Life</td>
<td>Is there at least one student group on campus whose mission includes environmental responsibility in their mission, Words/phrases coded for “yes”; “environment or environmental,” “stewardship,” “sustainable future,” sustainability,” “nature,” natural resources,” preservation,” and/or “conservation?”</td>
</tr>
<tr>
<td>Campus Engagement</td>
<td>On-Campus Experiences/Student Life</td>
<td>Does the HEI offer sustainability-focused internship ambassador programs? (NWF) (This includes Eco-Representatives)</td>
</tr>
<tr>
<td>Campus Engagement</td>
<td>On-Campus Experiences/Student Life</td>
<td>Are students awarded/recognized for being “environmental/sustainability” leaders by given spotlight or profile?</td>
</tr>
<tr>
<td>Campus Engagement</td>
<td>On-Campus Experiences/Student Life</td>
<td>Is there a section solely listing/discussing potential environmental/sustainability careers?</td>
</tr>
<tr>
<td>Operations</td>
<td>Building</td>
<td>Are there LEED or eco-friendly buildings on campus?</td>
</tr>
<tr>
<td>Operations</td>
<td>Energy</td>
<td>Are there sustainable energy initiatives on campus?</td>
</tr>
<tr>
<td>Operations</td>
<td>Waste</td>
<td>Is there a recycling/waste management program on campus? (This does not include composting)</td>
</tr>
<tr>
<td>Operations</td>
<td>Waste</td>
<td>Composting on campus?</td>
</tr>
<tr>
<td>Operations</td>
<td>Water</td>
<td>Is there a water conservation effort on campus?</td>
</tr>
<tr>
<td>Operations</td>
<td>Food and Dining</td>
<td>Does the HEI have a vegetable garden? (includes rooftop and greenhouses)</td>
</tr>
<tr>
<td>Operations</td>
<td>Food and Dining</td>
<td>Is/Are there environmentally-sustainable dining service(s)?</td>
</tr>
<tr>
<td>Operations</td>
<td>Food and Dining</td>
<td>Is the Dining Services page titled “What We’re Doing on Campus”? (Aramark)</td>
</tr>
<tr>
<td>Operations</td>
<td>Transportation</td>
<td>Is there a transit program on-campus? * Free or discounted bus passes to students/faculty/staff? (NWF)</td>
</tr>
<tr>
<td>Operations</td>
<td>Transportation</td>
<td>Does the HEI promote eco-conscious transportation (carpool/bus/bike/walking, etc.)?</td>
</tr>
<tr>
<td>Operations</td>
<td>Transportation</td>
<td>Electric Car Fleet and/or charging station?</td>
</tr>
<tr>
<td>Operations</td>
<td>Transportation</td>
<td>Bike Rental or Sharing program? (NWF)/ Promote biking? (Lanes)</td>
</tr>
<tr>
<td>Assessment and Reporting</td>
<td>Reporting</td>
<td>Is an environmental report made accessible through the institution’s web site?</td>
</tr>
</tbody>
</table>
Table 3.2: The evolution of dimensions of sustainability in higher education.

<table>
<thead>
<tr>
<th>Initial Dimensions</th>
<th>The Big Six Dimensions</th>
<th>Subgroups of the Big Six</th>
</tr>
</thead>
<tbody>
<tr>
<td>Institutional Framework</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Education and Research</td>
<td>Education</td>
<td>Education</td>
</tr>
<tr>
<td></td>
<td>Research</td>
<td>Research</td>
</tr>
<tr>
<td>On-Campus Experiences and Student Life</td>
<td>Campus Engagement</td>
<td>On-Campus Experiences and Student Life</td>
</tr>
<tr>
<td>Faculty and Staff Development</td>
<td>Outreach (and Services)</td>
<td>Faculty and Staff Development</td>
</tr>
<tr>
<td>Outreach and Services</td>
<td>Outreach (and Services)</td>
<td>Outreach (and Services)</td>
</tr>
<tr>
<td>Operations</td>
<td>Operations</td>
<td>Grounds</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Waste</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Energy</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Water</td>
</tr>
<tr>
<td>Dining</td>
<td></td>
<td>Food and Dining</td>
</tr>
<tr>
<td>Transportation</td>
<td></td>
<td>Transportation</td>
</tr>
<tr>
<td>Assessment and Reporting</td>
<td>Assessment and Reporting</td>
<td>Assessment and Reporting</td>
</tr>
</tbody>
</table>
Though I derived some questions and variables from the AASHE STARS Assessment Report, not all were included because the STARS Assessment is highly detailed and cannot be filled out using only an HEI website. Evans and King (1999) follow the rule that the sustainability assessment tool model should not have an excessive number of attributes. While my 45-variable sustainability web assessment tool may seem long, it is much shorter than AASHE’s 171-variable assessment tool.

I also derived sustainability indicators for the SWAT by studying the sustainability web pages of the “Greenest Universities in the United States” found on BestColleges.com (2018). BestColleges.com identifies 15 U.S. colleges and universities that have earned the highest STARS ratings, thereby distinguishing themselves as the nation’s greenest schools (BestColleges 2018). They set a standard for what is considered a successful HEI in terms of environmental sustainability. This process was subjective and qualitative because the term sustainability can be interpreted differently by different stakeholders (Waheed et al. 2011, 359).

The web assessment tool I created is similar to that of Taylor (1999). Taylor assessed the websites of 390 U.S. universities to determine their acceptance level of sustainability principles at the end of the 1990s (Taylor 1999, 1). Robert Taylor (199) created a questionnaire containing four questions based on education, operations, and outreach to understand the state of environmental sustainability in higher education institutions (Table 3.3). Taylor derived his survey questions from various environmental sustainability models in higher education such as the Ramapo Model, Penn State Model, National Wildlife Federation (1998) Campus Ecology Report Card (Edelstein 1998; as cited by Taylor 1999). Even in the late 1990s when the internet was still relatively new,
Taylor noted that web sites were important information sources. HEI web pages “project the values and image of the institution to the broader world (Taylor 1999, 2).” The relevance of the internet in representing higher education institutions has only become more significant since Taylor’s 1999 study.

Evaluating HEIs’ commitment to sustainability based on their webpages was budget friendly since I was able to conduct my research without spending money on travel and lodging expenses. All the data needed for this research can be collected as long as one has internet access, which saves a great deal of time and money. Though Taylor’s (1999) study was very inspirational to this dissertation research, his questionnaire is overly simple. I ended up creating a more detailed web assessment tool that could help better me understand where sustainability was occurring within college campuses. Instead of focusing on four basic questions (Table 3.3), I wanted to delve deeper into understanding how sustainability is communicated on the websites of American colleges and universities. Table 3.3 is the original sustainability web assessment tool (SWAT) while the final SWAT can be found in Appendix A. The SWAT in Appendix A includes the variable questions I added after I began assessing sustainable HEI webpages.

The first portion of the sustainability web assessment tool (SWAT) seen in Table 3.4 was not answered through the web assessment, but downloaded from the National Center for Education Statistics and the Carnegie Classification (CCIHE 2018) data. I merged the NCES and Carnegie Classification data with the web assessment data after all web assessments were completed.
### Table 3.3: Taylor’s (1999) web assessment questions.

<table>
<thead>
<tr>
<th>Question</th>
<th>Answers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1. Does the institution display an interest in the natural environment in its mission statement?</td>
<td>Yes/No</td>
</tr>
<tr>
<td>Q2. Does the institution list or discuss any environmental projects?</td>
<td>Yes/No</td>
</tr>
<tr>
<td>Q3. Does the institution have an environmental major(s)?</td>
<td>Yes/No (If yes, multidisciplinary, professional, dept.-based?)</td>
</tr>
<tr>
<td>Q4. Does the institution engage in environmental outreach?</td>
<td>Yes/No</td>
</tr>
</tbody>
</table>

### Table 3.4: Original Sustainability Web Assessment Tool.

<table>
<thead>
<tr>
<th>Sustainability Web Assessment Tool</th>
<th>University: HEI Demographics (College Navigator 2018)</th>
<th>Sustainability Leader:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elements</td>
<td>Variable Questions</td>
<td>Possible answer</td>
</tr>
<tr>
<td>IF1</td>
<td>Institutional Framework: Institutional Mission, Structure, and Planning</td>
<td></td>
</tr>
<tr>
<td>IF2</td>
<td>Is there a written declaration linking education about environmental responsibility to the school's mission or intent? Words/phrases coded for “yes”: “environment or environmental,” “stewardship,” “sustainable future,” sustainability,” “nature,” natural resources,” preservation,” and/or “conservation.” (Taylor 1999)?</td>
<td>Yes/No</td>
</tr>
<tr>
<td>A1</td>
<td>Are sustainability awards and affiliations listed on the website?</td>
<td>Yes/No</td>
</tr>
<tr>
<td>A2</td>
<td>Has the AASHE STARS Award shown?</td>
<td>Yes/No</td>
</tr>
<tr>
<td>A3</td>
<td>AASHE STARS Type (Platinum, Silver Gold)</td>
<td>(Platinum, Silver, Bronze Gold)</td>
</tr>
<tr>
<td>A4</td>
<td>STARS SCORE</td>
<td>##</td>
</tr>
<tr>
<td>IF2</td>
<td>Has a staffed office been established with the mandate to incorporate sustainability into various facets of institutional life – not just academic?</td>
<td>Yes/No</td>
</tr>
<tr>
<td>IF2</td>
<td>The difficulty of finding contact information to HEI sustainability leader (Easy/Difficult)</td>
<td>Easy/Difficult/ N.A.</td>
</tr>
<tr>
<td>IF2</td>
<td>Where is the sustainability entity housed, or does it stand alone?</td>
<td>Easy/Difficult/ N.A.</td>
</tr>
<tr>
<td>IF2</td>
<td>Stands alone/ specific academic dept./both</td>
<td>Easy/Difficult/ N.A.</td>
</tr>
</tbody>
</table>
### Table 3.4: (Continued).

#### Sustainability Web Assessment Tool

<table>
<thead>
<tr>
<th>Category</th>
<th>Question</th>
<th>Response Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Faculty and Staff Development</td>
<td>FD1 Is there one assigned sustainability leader (coordinator/director), or is it a collaborative effort (committee)?</td>
<td>One / collaborative / both</td>
</tr>
<tr>
<td></td>
<td>FD2 Are workshops, webinars, seminars being held to educate faculty on integrating SD into their academic/administrative work? Are sustainability certification courses offered to departments/offices?</td>
<td>Yes / No</td>
</tr>
<tr>
<td>Education Structure</td>
<td>ED1 Are all students required to take a core general education course with an in-depth focus on environmental awareness?</td>
<td>Yes / No</td>
</tr>
<tr>
<td></td>
<td>ED2 Number of environmental sustainability-oriented undergraduate majors at HEI</td>
<td>#</td>
</tr>
<tr>
<td></td>
<td>ED3 Is the sustainability program interdisciplinary (or only offers classes from one department)?</td>
<td>Inside Dept. / Interdisciplinary / Both / N.A.</td>
</tr>
<tr>
<td>Research (Note: This will not include a publication from a single student/ faculty member)</td>
<td>ED4 Does the HEI offer at least one sustainability-focused major, degree program, or the equivalent for graduate students?</td>
<td>Yes / No</td>
</tr>
<tr>
<td></td>
<td>ED5 Environmental sustainability-focused minor, concentration, or certificate programs? (Yes / No, #)</td>
<td>Yes / No, #, type</td>
</tr>
<tr>
<td></td>
<td>ED6 The number of the sustainability-focused graduate-level degree program (STARS Assessment).</td>
<td>#, (Master’s, Ph.D., or Both)</td>
</tr>
<tr>
<td>On-Campus Experiences/ Student Life</td>
<td>ED7 Is environmental sustainability research occurring on or off campus</td>
<td>Yes / No</td>
</tr>
<tr>
<td></td>
<td>ED8 Does the HEI have at least one environmental/sustainability-focused research center?</td>
<td>Yes / No</td>
</tr>
<tr>
<td></td>
<td>ED9 Is there a page where sustainability research themes/ opportunities are listed?</td>
<td>Yes / No, #</td>
</tr>
<tr>
<td></td>
<td>OC1 Is there at least one student group on campus whose mission includes environmental responsibility in their mission, Words/phrases coded for “yes”: “environment or environmental,” “stewardship,” “sustainable future,” sustainability,” “nature,” natural resources,” preservation,” and/or “conservation?”</td>
<td>Yes / No</td>
</tr>
<tr>
<td></td>
<td>OC2 Does the HEI offer sustainability-focused internship ambassador programs? (This includes Eco- Representatives)</td>
<td>Yes / No</td>
</tr>
<tr>
<td></td>
<td>OC3 Are students awarded/recognition for being &quot;environmental/sustainability” leaders by given spotlight or profile?</td>
<td>Yes / No</td>
</tr>
<tr>
<td></td>
<td>OC4 Is there a section solely listing/discussing potential environmental/sustainability careers?</td>
<td>Yes / No</td>
</tr>
<tr>
<td>Table 3.4: (Continued).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sustainability Web Assessment Tool</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Outreach/Services</strong></td>
<td>OS1</td>
<td>Are there sustainability-focused community service projects/collaboration at the HEI?</td>
</tr>
<tr>
<td></td>
<td>OS2</td>
<td>Is the HEI working to protect/conserve the surrounding natural environment, such as a habitat restoration/protection project?</td>
</tr>
<tr>
<td><strong>Operations</strong> (Waste, Energy, Water, Buildings and Grounds, Food and Living)</td>
<td>OP1</td>
<td>Are there LEED or eco-friendly buildings on campus?</td>
</tr>
<tr>
<td></td>
<td>OP2</td>
<td>Are there sustainable energy initiatives on campus?</td>
</tr>
<tr>
<td></td>
<td>OP3</td>
<td>Is there a recycling/waste management program on campus? (This does not include composting)</td>
</tr>
<tr>
<td></td>
<td>OP4</td>
<td>Is there a water conservation effort on campus?</td>
</tr>
<tr>
<td></td>
<td>OP5</td>
<td>Does the HEI have a sustainable landscaping program (native landscaping)? (NWF)</td>
</tr>
<tr>
<td></td>
<td>OP6</td>
<td>Does the HEI have a vegetable garden? (includes rooftop and greenhouses)</td>
</tr>
<tr>
<td><strong>Dining Services</strong></td>
<td>DS1</td>
<td>Is/Are there environmentally-sustainable dining service(s)?</td>
</tr>
<tr>
<td></td>
<td>DS2</td>
<td>Is the Dining Services page titled “What We’re Doing on Campus? (Aramark) (Note: This will not be included in the cumulative grade. If it is, it will be a deduction)</td>
</tr>
<tr>
<td><strong>Transportation</strong></td>
<td>TR1</td>
<td>Is there a transit program on-campus? * Free or discounted bus passes to students/faculty/staff? (NWF)</td>
</tr>
<tr>
<td></td>
<td>TR2</td>
<td>Does the HEI promote eco-conscious transportation (carpool/bus/bike/walking, etc.)? (NWF)</td>
</tr>
<tr>
<td></td>
<td>TR3</td>
<td>Electric Car Fleet and/or charging station?</td>
</tr>
<tr>
<td></td>
<td>TR4</td>
<td>Bike Rental or Sharing program? Promotes biking (bike lanes, repair station)?</td>
</tr>
<tr>
<td><strong>Assessment and Reporting</strong></td>
<td>AS1</td>
<td>Is an environmental report made accessible through the institution’s web site?</td>
</tr>
<tr>
<td></td>
<td>AS2</td>
<td>List the ways the HEI self-assessing its sustainability efforts.</td>
</tr>
<tr>
<td></td>
<td>AS3</td>
<td>Is the HEI conducting an annual greenhouse gas (GHG) emissions inventory?</td>
</tr>
<tr>
<td><strong>HEI Website Overall</strong></td>
<td>CUM1</td>
<td>Overall website grade in showing environmental/sustainability efforts at HEI:</td>
</tr>
</tbody>
</table>
While assessing the first 50 *Sustainable Universities*, I recognized and added other indicator questions (Table 3.5). I created a column (ET2) dedicated to notes and keywords where I listed any keyword(s) that fit within and outside the initial SWAT. For example, if an HEI’s website had an exceptional webpage illustrating their sustainable transportation efforts, I entered *TRANSPORTATION* into the Notes/Keywords column. By doing so, I was able to look back and find HEIs that were models for practicing and advertising their sustainable transportation efforts. Column ET2 (Notes/keywords) was also helpful in finding trends, such as sustainable religious HEIs (coded *religion*) or HEIs that dedicated web space to marine conservation efforts (coded *marine conservation*).

Question ET1 (Does the university look at social sustainability?) was one of my most important additions to the sustainability web assessment tool. All sustainable universities that had a social dimension of sustainability also focused on environmental sustainability. No sustainable HEI excluded the environmental dimension of sustainability.
Table 3.5: HEI variables obtained from the National Center for Education Statistics and Carnegie Research database.

<table>
<thead>
<tr>
<th>University: Sustainability Leader:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elements</td>
</tr>
<tr>
<td>Variable Questions</td>
</tr>
<tr>
<td>HEI Demographics (College Navigator 2018)</td>
</tr>
<tr>
<td>Public/Private</td>
</tr>
<tr>
<td>State</td>
</tr>
<tr>
<td>Geographic Region</td>
</tr>
<tr>
<td>Size of full-time student enrollment</td>
</tr>
<tr>
<td>Tuition</td>
</tr>
<tr>
<td>Location (rural, urban, suburban, small-town)</td>
</tr>
</tbody>
</table>

Table 3.6: Sustainability web assessment tool questions added after conducting first 50 Sustainable Universities.

<table>
<thead>
<tr>
<th>Etc.</th>
<th>ET1</th>
<th>Does the university look at social sustainability?</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>ET2</td>
<td>Notes/keywords</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AV</td>
<td>Does the HEI offer research funding for environmental sustainability?</td>
<td>Yes/No</td>
<td></td>
</tr>
<tr>
<td>AW</td>
<td>On-campus apiary?</td>
<td>Yes/No</td>
<td></td>
</tr>
<tr>
<td>AX</td>
<td>Are sustainability-related courses and/or programs that don’t have sustainability, environmental, conservation, or similar term listed on the website?</td>
<td>Yes/No</td>
<td></td>
</tr>
<tr>
<td>AY</td>
<td>Does the website list sustainability-related courses without a sustainability degree program?</td>
<td>Yes/No</td>
<td></td>
</tr>
<tr>
<td>AZ</td>
<td>List A+ is HEI is considered having top-rated sustainability initiatives (if you feel HEI hits all the marks)</td>
<td>A+ or N/A</td>
<td></td>
</tr>
</tbody>
</table>
Indicator questions AX (Are sustainability-related courses or academic programs that don’t have sustainability, environmental, conservation, or similar term listed on the website?) and AY (Does the website list sustainability-related courses without sustainability degree program?) merit further explanation. Many Sustainable Universities listed sustainability-related programs or courses without sustainability, environmental, conservation, or a similar term listed in the title. Some HEIs, like the University of Houston, list their sustainability-related degree programs on one of their sustainability webpages. The University of Houston provided a list of courses both with and without sustainability (or a similar term) for students who were interested in the sustainability-related courses within the degree programs shown in Figure 3.3.

While assessing the webpages of the first 50 Sustainable Universities, I noticed that some HEIs did not have academic programs dedicated to sustainability but had lists of sustainability-related courses from various disciplines. I created indicator question AY (Does the website list sustainability-related courses without sustainability degree program?) to assess how many HEIs have this characteristic. Some HEIs listed courses focused on introducing sustainability, environmental ethics, or similar education for sustainable development (ESD) concepts while institutions like the University of San Diego (Figure 3.4) listed all courses that had sustainability components.
Figure 3.3: Sustainability-related courses and degree programs listed on the University of Houston Office of Sustainability webpage (University of Houston 2021).
Figure 3.4: List of Anthropology sustainability-related course at the University of San Diego (University of San Diego 2020). ANTH 335 Nautical Archaeology and ANTH 339 Post Medieval Seafaring and Empire. Source: (University of San Diego 2020).
The list of sustainability-related courses found on the University of San Diego webpage shows how sustainability has been adopted and integrated by courses throughout campus. For example, many archaeology courses at the University of San Diego have adopted eco-conscious theory and methods. While the environmental, social, and economic dimensions of sustainability is easily seen in some of the University of San Diego course descriptions, it is more difficult to see the sustainability component, such as the course entitled, “Post-Medieval Seafaring and Empire”. From this, we learn that it is important to explain how sustainability is part of the course.

After assessing the first 50 Sustainable HEIs, I created column AZ (A+ Sustainable HEIs) to highlight those HEIs that were particularly effective in communicating their sustainability efforts. Many HEIs that received A+ were high revenue, private institutions like Harvard University, Stanford University, and Yale University that fulfilled all of my SWAT questions and more. While I added indicator questions after assessing the first 50 Sustainable Universities, I also removed some questions because I could not easily answer them by looking at the web pages of HEIs. For example, indicator question IF1 (Is there a written declaration linking education about environmental responsibility to the school's mission, or intent to do so?) is a helpful question that Robert Taylor asked in his 1999 web assessment, but it took too much time to find while I assessed all 1,153 Sustainable University webpages.

Although some HEIs included sustainability or a similar term linking environmental responsibility to their missions and included their mission statements on their sustainability web pages, most did not. As a result, I had to conduct independent searches for the mission statements of most HEIs. Only one of the first 50 Sustainable
Universities had a written declaration linking education about environmental responsibility to its mission. I removed question ED1 (Are all students required to take a core general education course with an in-depth focus on environmental awareness?) because I found that very few of the first 50 Sustainable Universities listed a mandatory class focused on sustainability.

**Conducting Web Assessments**

I repeated the Google search I conducted in Objective One, typing the institution's name, the state, sustainability, and/or environmental, to understand where sustainability is occurring within the HEIs that I determined were sustainable. Opening each web page listed on the first two pages of the Search Engine Results Pages (SERPs), I assessed each Sustainable HEI based on my sustainability web assessment tool (SWAT). If I could not find the answer to a question by navigating through the HEI sustainability pages, I returned to Google to search for each specific sustainability indicator. If the sustainability web page did not list sustainability-related courses, I calculated the number of environmental- or sustainability-focused academic programs based on the general lists of academic programs for each HEI.

I could not find a way to effectively conduct web assessments of higher education institutions using data scraping or coding and had to manually assess higher education institution sustainability web pages. To save time, I organized a research team of two students from the University of Southern Mississippi who wanted to gain research experience with research. I trained them to use the sustainability web assessment tool and assigned 100 to 150 sustainable HEIs for each of them to assess. The training was
conducted in-person and through a video tutorial. Once they watched the video tutorial, research team members assessed five samples of higher education institutions and sent me the results to check. This allowed my team members to identify and clear up any confusion before conducting web assessments for the research and it helped me to verify that they were conducting their work correctly. I checked 10 percent of the 250 web assessments my research team assessed for quality control.

Recruiting a research team was very helpful because it allowed me to make sure that my web assessment tool was concise and could easily be repeated by other scholars in the future (Cole 2003). I, as the creator, easily understand my self-created web assessment tool, but others should be able to use it too. I removed repetitive and unnecessary questions from the web assessment tool to ensure the web assessments were straightforward and easier to complete. I removed the question FD1 (Is there one assigned sustainability leader (coordinator/director) or is it a collaborative effort (committee)?) to shorten the SWAT because it could be answered later using other variables. The final sustainability web assessment tool used to evaluate all 1,270 Sustainable Universities can be found in the Appendix A for reference.

**Analysis of the Initial Data**

Once I assessed all Sustainable Universities, I merged my SWAT data with the National Center for Education Statistics (NCES) and Carnegie Classification (CCIHE) 2018 Public data. When all of the data was merged, I coded all Yes and No responses into numerical values (1 for Yes and 2 for No), created maps depicting the spatial distributions of all four-year HEIs included in my NCES list, and conducted descriptive
statistical analysis of institutions based on types. Though I downloaded HEIs with Bachelor’s and Advanced degrees in this dataset and excluded all institutions that offered the only Certificate and/or Associate’s programs from NCES, that primarily offered Associate’s degrees were included in the NCES data set. I decided to remove Primarily Associate’s HEIs and Private For-Profit institutions after the initial analysis, leaving only Four-Year Public and Four-Year Private Non-Profit (referred to as Private Not-for-Profits by NCES).

**Type of Institutions Excluded After Initial Data Analysis**

After assessing all 1,270 Sustainable Universities, I conducted descriptive analysis and created maps to answer where among institution types and campus settings sustainability was occurring. I removed Private Non-Profit, Private For-Profits, and all Primarily Associate’s institutions from the data set, leaving a total of 1,153 Public and Private Non-Profit HEIs to assess. Though I considered including Four-Year, Primarily Associate’s, Public HEIs in the final data collection, I ended up excluded them because they did not match with my research goal of documenting sustainability in higher education institutions focusing on four-year degrees.

**Four-Year, Private For-Profit Institutions.** I excluded Four-Year, Private For-Profits shortly after beginning data analysis. Private For-Profit institutions like Argosy University, DeVry University, Strayer University, Alliant International University, the University of Phoenix, and the Phoenix Institute of Herbal Medicine and Acupuncture have been criticized for not providing a quality education or a campus experience since
they are often online (Liu 2011; Deming et al. 2012; Liu and Belfield 2014; Hodgman 2018). Although I removed these institutions from my research, it is important to briefly discuss what these HEIs are doing in terms of sustainability marketing. For example, DeVry University offers a Bachelor’s Degree Specialization in Renewable Energy. The program’s webpage states, “Let’s Engineer a More Sustainable World” and discusses the possibilities of renewable energy education. The University of Phoenix offers a Bachelor of Science in Environmental Science and an undergraduate online course on Environmental Sustainability and Issues in Environmental Sustainability. The University of Phoenix also offers a Master’s in Health Administration with a concentration in Sustainability Management. As a group, however, I only found 14 out of a total of 284 Private For-Profit HEIs with sustainability implementation structures.

**Four-Year, Primarily Associate’s, Private For-Profit Institutions.** Of the 1,270 sustainable institutions, five were Four-Year, Primarily Associate's, Private For-Profit while only five of 176 Four-Year, Primarily Associate's, Private For-Profit were deemed sustainable. One sustainable Four-Year Primarily Associate’s Private For-Profit institutions had a staffed office, another had a staffed office and an academic program, while the rest had sustainability committees listed on their webpages. One of the five sustainable Four-Year, Primarily Associate's, Private For-Profits is Jamestown Business College (JCC) of New York, which is an institution that not only has an Environmental Science program but also built its Science Center to meet LEED Gold certification standards. On its sustainability web page, Jamestown Business College offers tips for green living, internship opportunities, and a timeline of their sustainability initiatives on
campus. Though there is a small percentage of *Primarily Associate's, Private For-Profit* HEIs involved in sustainability in the United States, Jamestown Business College has proven it can be done and can offer guidance to those not only in its class but also to larger institutions. Although a few *Private For-Profit* HEIs had sustainability implementation structures, I excluded this institution type because many, including the National American Universities, the Art Institute of Pittsburgh-Online Division, Bryant and Stratton Colleges, and Brown Mackie Colleges have been scrutinized because of their quality and often offer primarily online courses (Liu 2011; Deming et al. 2012; Liu and Belfield 2014; Hodgman 2018).

*Four-Year, Primarily Associate’s, Private Non-Profit Institutions.* From a total of 107 *Primarily Associate’s, Private Non-Profit* HEIs, I found a total of 13 sustainable institutions. Again, although it was beneficial to look at these institutions to understand their approach to sustainability branding, I removed them from this research. This group included institutions such as Herzing University, Remington College, Concordia College, along with a large number of rabbinical colleges (Rabbinical College of Long Island of New York, Talmudical Institute of Upstate New York). Some of these HEIs are questioned about their quality while specialty institutions like the rabbinical colleges only focus on one degree. I removed these institutions from the research, but there were some interesting examples of sustainability branding among them. For example, Johnson and Wales University-Denver has an interdisciplinary Sustainable Food Systems (B.S.) program along with an earth-conscious culinary program whose chef-instructors use their position of influence to help solve global issues of food security, food waste, and other
sustainability-related issues (Johnson and Wales University-Denver 2020). An Associate’s degree program at San Diego Mesa College in California, has a sustainability program on campus and an Environmental Sustainability Committee that works to integrate sustainability throughout campus. Two of the 13 sustainable Primarily Associate's, Private Non-Profit institutions had a staffed office, six had a sustainability-focused committee, and four had a four-year academic program.

**Four-Year, Primarily-Associate’s, Public Institutions.** I found that 86 (70%) of the 122 Four-Year, Primarily Associate's, Public HEIS have a sustainability implementation structure. Clover Park Technical College of Washington has an Environmental Sciences and Technology Program. Forty-seven percent (40/86) of sustainable Primarily Associate’s Public HEIs had at least one four-year academic programs while 63% (54/86) had a committee focused on sustainability. Eight percent (7/86) of the sustainable Primarily Associate's, Public HEIs had a sustainability-focused research center. Though I considered including Four-Year, Primarily Associate's, Public HEIs in the final data collection, I removed them from further data analysis because most of the environmental-focused four-year academic programs they offered were online and there was a lack of sustainable development on these campuses.

**Conclusion**

Once I identified where sustainability was occurring (based on institution type and setting) among all institution types, I removed all HEIs that were not Four-Year Public and Four-Year Private, Non-Profit HEIs. I then created a “grading system” for
sustainable *Four-Year Public* and *Four-Year Private Non-Profits* to understand the level of sustainable development within sustainable *Four-Year Private Non-Profit* and *Public HEIs*.

**Measuring Sustainability**

I studied past sustainability measurement tools by Taylor (1999), Ott, Wang, and Bortree (2010), and Cole (2003) to determine the best way to measure sustainability among colleges and universities. Similar to Ott, Wang, and Bortree (2016, 677), I coded each sustainability category “Yes” or “No.” These codes indicate whether there was no information about a particular category (e.g., air and climate) on the sustainability website, giving it the score of “0” (No information = 0). If I found information about a category (e.g., recycling) on the HEI’s website, the category received a score of “1” (Yes, information = 1).

I coded some questions using higher score values. For example, I changed the Question ED2 (How many sustainability-oriented undergraduate majors does the HEI have?) to fit my grading system. For this question, I gave HEIs with 1 to 4 undergraduate programs a “1”, HEIs with 5 to 9 undergraduate programs a “2”, and HEIs with 10 or more undergraduate programs a “3”. I did the same for ED6 (Give the number of environmentally sustainable graduate degrees offered?) to fit my grading system. I gave HEIs with 1 to 4 graduate degree programs 1 point, HEIs with 5 to 9 graduate programs 2 points, and HEIs with 10 or more graduate programs 3 points. I deducted a point for the any HEIs that answered yes to the variable question DS2 (Is the Dining Services page titled “What We’re Doing on Campus?”) because the identical corporate branding
webpage template provided by Aramark does not represent what the institution is doing internally to promote sustainability (Figure 3.5). Judson University- Illinois, Louisiana Tech, Loras College-Iowa are among some of the HEIs that use this webpage template that has adopted Aramark’s “What We’re Doing on Campus.”

**Grading Sustainable Higher Education Institutions**

I tallied all web assessment points for each sustainable higher education institution to create a sustainability score system. Approximately 20% of HEIs had a sustainability score of <= 5, approximately 20% of HEIs had a score >= 6 and <= 13, 20% of HEIs has a score >= 14 and <= 21, and 20% of HEIs had a score >= 22 and < 28. Based on this distribution of scores, I devised the following grading system to describe HEIs according to their level of sustainability. HEIs with a score of 0-6 were graded F, HEIs with score of 7-13 were graded D, HEIs with score of 14-20 were graded C, HEIs with score of 21-27 were graded B, and HEIs with score ≥ 28 were graded A. This grading system provides a way to measure the success rate of HEI sustainability webpages and where HEIs are in integrating sustainability across their campuses. An HEI that received an F in this study should not be seen as failing, but as being in the early stages of implementing sustainability into their institution.
Figure 3.5: The image shared among all HEIs that have adopted Aramark’s “What We’re Doing on Campus” webpage template (Stephen F. Austin State University 2020).
Quantitative Data Analysis

Descriptive Statistics. I used SPSS software and Excel to edit and analyze my research data. I performed Descriptive Statistics tests in SPSS using a sustainability score I created using the sum of scores for each HEI and their sustainability indicators, student population, tuition, and revenue. I also created pivot tables in Excel and created maps using ArcMap 10.1.4 to illustrate my data and find trends. I computed the number and percentage distribution of sustainable higher education institutions across demographic categories. These demographic variables are type of HEI (with five categories: Four-Year Primarily Associates Public, Four-Year Primarily Associates Non-Profit, Four-Year Private For-Profit, Four-Year Private Non-Profit, Four-Year Public), campus setting (with four categories: cities, towns, suburbs, and rural), geographic region (Northeast, South, West, and Midwest), and sustainability grade (A, B, C, D, F). I computed the mean and standard deviation for the sustainability scores, median student population, median tuition, and median revenue for each demographic group. I computed the median for student population, tuition, and revenue due to the high levels of skew in the distribution of the data for those variables.

Objective Three: Surveying Sustainability Leaders

To gain a better understanding of sustainable development in higher education and the leaders of these initiatives, I created and administered an online Sustainability Faculty and Staff Questionnaire. The following section explains the process of creating, administering, and analyzing the data of the online survey.
**Sustainability Leaders**

Participants in this study consisted of 150 sustainability leaders from four-year higher education institutions across the United States between 2018 and 2019. There are various bodies of literature attempting to define sustainability leadership since the topic emerged in the early 2000s among North American educational researchers (Galpin and Whittington 2012; Visser and Courtice 2011, 2). The term emerged due to pressure to bring sustainable development into the education system (Fullan, 2005; Hargreaves and Fink, 2004, 2003; as cited by Pepper and Wildly 2008, 616). Visser and Courtice (2011, 2) define a sustainability leader as “someone who inspires and supports action towards a better world.” The Sustainability Leadership Institute (2011) provides a more formal definition that states sustainability leaders are “individuals who are compelled to make a difference by deepening their awareness of themselves concerning the world around them (Sustainability Institute 2011; as cited by Visser and Courtice 2011, 3). For this study, a sustainability leader is defined as anyone who holds a position at an HEI sustainability implementation structure and whose job is to contribute to one or more of the three pillars of sustainability: the environment, society, and the economy. I created a list of sustainability leaders and their contact information during Objective One. I tried to gather the information of at least two emails from each institution that were from different sustainability implementation structures.

Surveying SLs in higher education is a way to gain a better understanding of who is leading sustainability initiatives on college campuses and what qualified them to do so. From the first section of my Sustainability Faculty and Staff Questionnaire, I was able to better understand which academic programs are training sustainability leaders in higher
education and how that may affect how sustainability is implemented on college campuses. I was also able to identify if women and minority groups play a role in leading sustainability initiatives and where within HEIs these groups are located.

**Instrument (Questionnaire) Development**

I created the *Sustainability Faculty and Staff Questionnaire* to understand more about the sustainability leaders in higher education and their role in the sustainability implementation structures of their HEIs. The instrument consists of 23 questions of various styles and is divided into four sections and six themes: 1) Information about the sustainability leaders (SLs); 2) The state of sustainability at the respondent’s HEI; 3) External collaboration; 4) Student, faculty, and staff engagement; 5) Communication and promotion of HEI sustainability efforts; and 6) Strengths and weaknesses of HEIs’ sustainability efforts.

The ten questions in the first section of the questionnaire consists of demographic questions, including the name of the higher education institution where the respondent worked, geographical location, age, gender, ethnicity, level of education, academic background, employment status and position, years of experience, and influences of perceptions (Table 3.7). The second section (Q20 and Q21) of the questionnaire addresses sustainability at the respondent’s HEI through multiple-choice questions. The independent variables for the *Sustainability Faculty and Staff Questionnaire* included the higher education institution that employed participants, geographical location, age, gender, ethnicity, level of education, academic background, employment status and
position, and years of experience while the dependent variable was the sustainability leader’s perception of sustainability within their institution.

Questions centered on understanding which dimensions of sustainability (environmental, social, economic) are addressed, in which sectors of higher education (education; research; faculty and staff development; mission; operations, outreach, and services; student life; and/or other) sustainability are occurring, and which sector is not getting enough attention in terms of sustainability. Two questions (Q22 and Q23) focus on external collaboration, asking what levels their institution collaborates with others on sustainable development and if their institution engaged with other higher education institutions in sustainable development.

The next section (Q24, Q25, Q26, and Q27) focuses on campus engagement and education. Questions asked if undergraduate and graduate students must take a course on issues related to the environment or sustainability. I asked to what extent does the sustainability leader’s institution provide significant faculty and staff development opportunities to enhance understanding, teaching, and research in sustainability. This question is multiple-choice with the following options: don’t know, any, a little, quite a bit, and a great deal.

Two questions (Q28 and Q29) measure the perceptions of sustainability leaders with regard to the sustainability web pages of their institutions. The last three questions in the Sustainability Faculty and Staff Questionnaire (Q30, Q31, and Q32) are open-ended and ask respondents to describe their HEIs’ strengths in terms of sustainability. I also asked respondents to share their thoughts about how their institution could improve its sustainability efforts regarding education, research, and practice.
Table 3.7: Questions included in Sustainability Faculty and Staff Questionnaire.

| Q1 | Please list the name of your higher education institution. |
| Q2 | What is the ZIP code of your institution? |
| Q3 | What is your year of birth? |
| Q4 | Which gender category would you assign for yourself when asked? Please feel free to whichever applied to you (woman, man, non-binary, agender, two-spirit, genderqueer, etc.) |
| Q5 | Which race/ethnicity best describes you? |
| Q6 | What is the highest level of education you have completed? |
| Q7 | What is your academic background? (Please feel free to list as many degrees and minors as desired.) |
| Q8 | What is your current employment status at your institution? |
| Q9 | What is your current position at your institution? |
| Q12 | In what year did you begin working in the position that you currently hold? |
| Q20 | Which of the following types of sustainability are addressed at your institution? (Select all that apply) |
| Q21 | Which sector at your institution is the greatest priority given to in terms of sustainable development? |
| Q22 | What sector(s) at your institution is not getting enough attention to sustainable development? (Can apply to multiple) |
| Q23 | At what levels does your institution collaborate with others on sustainable development? (Can apply to multiple) |
| Q24 | Is your institution engaged with other higher education institutions in sustainable development? |
| Q25 | Are undergraduate students required to take a course on issues related to the environment or sustainability? |
| Q26 | Are graduate students required to take a course on issues related to the environment or sustainability? |
| Q27 | To what extent does your institution provide significant faculty and staff development opportunities to enhance understanding, teaching, and research in sustainability? |
| Q28 | How effectively do you think your institution's website illustrates its sustainability efforts? |
| Q29 | How satisfied or dissatisfied are you with your institution's efforts to promote sustainability? |
| Q30 | Please describe the greatest strengths of your institution in terms of sustainability. |
| Q31 | Please describe the greatest weakness of your institution in terms of sustainability. |
| Q32 | Please share your thoughts on how your institution can improve its sustainability efforts regarding education, research, and practice. |
For the purpose of this dissertation, I analyzed the first ten questions of the questionnaire shown in Table 3.7 (Q1 – Q12). These questions consist of demographic questions, including the name of the higher education institution where the respondent worked, geographical location, age, gender, ethnicity, level of education, academic background, employment status and position, and years of experience (Table 3.7).

**Inspiration for Instrument Development**

I was inspired by various past sustainability-related surveys and assessment tools such as such as the Association for the Advancement of Sustainability in Higher Education’s (AASHE’s) 2017 Higher Education Sustainability Staffing Survey Report, the Pet Sustainability Coalition (PSC) survey template, and the International Association of Universities’ (IAU) (2016) Global Survey on Higher Education and Research for Sustainable Development. I used AASHE’s 48-question survey meant for individuals in paid sustainability positions at North American colleges and universities as inspiration on how to organize my online questionnaire. Similar to the AASHE 2017 Higher Education Sustainability Staffing Survey Report, the beginning of my online questionnaire begins with understanding respondent demographics and where sustainability leaders work (both geographically and within their institution) while the end focuses on more personal questions such as the challenges of implementing sustainable development in higher education and the satisfaction levels of respondents. I adapted four questions I found in the 2017 Pet Sustainability Coalition (PSC) survey template and six from the International Association of Universities’ (IAU) (2016) Global Survey on Higher
Education and Research for Sustainable Development for my online questionnaire (Table 3.8 and Table 3.9).

The Pet Sustainability Coalition provides the pet industry businesses with a customizable sustainability 23 question-survey template to help better identify employee ideas, knowledge, and barriers to sustainability. Though it is meant for pet-centered businesses, the questions I adapted from the PSC survey help capture what colleges and university employees see as the biggest opportunities or challenges for their institution when adopting sustainability. The International Association of Universities’ (IAU) is a membership-led non-governmental organization working in higher education made up of more than 650 higher education institutions.

The objective of the International Association of Universities’ Global Survey on Higher Education and Research for Sustainable Development is to identify how higher education institutions incorporate sustainable development into teaching, learning, and research, and their day-to-day operations (GUNI 2019). Adopting and adapting questions from previous surveys that were already tested for validity and reviewed by experts and following a similar organization structure strengthened my questionnaire (Fink 2003). It also allows for comparisons of these results with past and future data. Since the Association for the Advancement of Sustainability in Higher Education has published their AASHE Staffing Survey Report every two to three years since 2008, I was able to compare the respondent demographic data from my questionnaire to past results.
Table 3.8: Questions from the Pet Sustainability Coalition (PSC) survey that inspired the research’s Sustainability Faculty, and Staff Questionnaire.

On a scale of one to five, how important do you think sustainability is to our company's overall business success (1=Very Important, 5=Not Important?)
In what sustainability areas is our company performing well or making valuable progress?
What are sustainability areas missing or contain gaps?
What goals would you like to see our company achieve concerning sustainability?

Table 3.9: Questions from the International Association of Universities’ (IAU) (2016, 11-23) Global Survey on Higher Education and Research for Sustainable Development that inspired my own questions.

What is sustainable development for your institution? (IAU 2016, 11)
- Environmental issues
- Climate change
- Cultural considerations
- Societal considerations
- Other?

Are you familiar with the concept of the ‘Whole Institutional Approach’?
- Yes
- No

Has your institution adopted a ‘Whole Institution Approach’?
- Yes
- No

How is sustainable development being governed at your institution?
- University level
- Faculty level
- Department level
- Individuals
- No official organization
- Other

Is your institution engaged with other HEIs in sustainable development?
- Yes
- No

At what levels does your institution collaborate with other HEIs on sustainable development?
- At local level
- At regional level
- At national level
- At global level
Assessing the Validity of the Questionnaire

When creating my online questionnaire, I followed the recommendations of Fink (2003), Burkey and Kuechler (2003), and others (Podsakoff et al 2003). I made sure that I asked purposeful questions, avoided biased words or phrases, and kept the survey uncluttered and easy for respondents to complete by using the Qualtrics Survey Software. I provided a brief rationale for the survey in the email invitation (Appendix B) and on the first page (See Appendix C, Section 1) of the questionnaire, began the survey with an easy question, and made it short enough for respondents to complete in less than 20 minutes. Based on results from pre-testing and Qualtrics’ time estimate, my questionnaire takes approximately 8 minutes to complete. Since various response choice types are a critical component of a well-designed survey, I used a combination of text entry and multiple-choice questions (Podsakoff, et al. 2003). Qualtrics provided respondents with the ability to select all multiple choice answers that applied to questions such as Which of the following types of sustainability are addressed at your institution?; What sector(s) at your institution is not getting enough attention to in terms of sustainable development?; and At what levels does your institution collaborate with others on sustainable development?.

Once I finished creating the online questionnaire, Qualtrics allowed me to preview it to ensure that it was straightforward and had a systematic flow. I tested for face validity by sharing a draft version of the survey instrument with people who were not in my field of study or part of a sustainability-related course, academic department, research institute, staffed office, or collaborative effort to identify if the survey appeared reasonable. They pilot tested the instrument to ensure that the skip logic and other online
survey functions worked properly. I tested my questionnaire for content validity by having my research committee review the questionnaire. I used input collected from the face validity group and the content validity group to update and improve the instrument before I finalized and sent it to potential respondents.

**Sampling**

Since my goal was to solicit input from sustainability leaders from every four-year higher education institution with a sustainability implementation structure, I used a purposeful sampling approach. Purposeful sampling is a form of non-random sampling where the researcher sets out to find people whose position or circumstance make them suitable for participating in a research activity (Bernard 2002; Lewis and Sheppard 2006; Tongco 2007; Creswell and Clark 2011; Etikan 2016). While I chose candidates who shared similar goals, I solicited input from a broad sampling frame of sustainability leaders from education, research, administrative, and other dimensions of higher education to attain multiple perspectives (Etikan 2016, 3).

**Consent**

I provided information regarding the research and the voluntary nature of their participation to the research participants at the beginning of the online-survey (see Appendix C). After reading about risks, the confidentiality statement, and participants' assurance, participants had to select “I agree” at the bottom of the first page to indicate that they had read the consent information and agreed to participate in the study. Once this was done, participants were redirected to the questionnaire. This procedure meant
that participants could not view the survey questions until they indicated their voluntary participation.

**Distribution Procedure**

I submitted a proposal to the University of Southern Mississippi Institutional Review Board for permission to proceed with the study in February 2019 (Appendix D). Once the Institutional Review Board approved my research, I distributed the *Sustainability Faculty and Staff Questionnaire* through the online survey platform on October 7, 2019. I created an anonymous questionnaire link that respondent could share with others who were involved and interested in sustainable development in higher education. I also shared the questionnaire link on the AASHE bulletin, so all sustainability leaders had an opportunity to participate. I kept the questionnaire open for several weeks, giving sustainability leaders time to complete it and share it with other sustainability leaders in higher education.

Researchers have shown that reminder emails help increase web-based survey response rates and avoid non-response error (Spitz et al. 2007; Fricker 2008). With this in mind, I sent out a three reminder emails in October, November, and December of 2019. I gathered 39 additional emails from universities whose sustainability leaders had not yet participated in and emailed them in November followed by a reminder in December. I closed the survey portal on January 10, 2020. At that time, 169 individuals had completed questionnaire. After removing incomplete responses, I ended up with 157 complete questionnaires, seven of which the respondents did not identify their institutions. I linked 150 of the 157 respondents’ data with the National Center for Education Statistics
Data Analysis of Sustainability Faculty and Staff Questionnaire

Following the administration of the questionnaire, I downloaded the response data from Qualtrics into an Excel spreadsheet. I merged the responses with the National Center for Education Statistics (NCES) data, web assessment data, and the 2018 Carnegie Classification of Higher Education Institutions data. I cross-tabulated my data to explore the age, gender, ethnicity, level of education, academic background, employment status and position, years of experience, and geographical location of the respondents (Table 3.7).

Geospatial Data Analysis and Map Production

Geovisualization is exploratory itself and refers to the “ability of graphics, maps, and images to make spatial relationships visible (Crampton 2001, 244).” With its primary objective being to discover spatial patterns in the data through interactive visualization, geovisualization uses modern interactive software to render changes to a map in real-time, allowing users to adjust the mapped data on the fly, add or strip away data layers during data exploration, or query the map interactively (Crampton 2001). It is a “questioning or sense-making activity” instead of being an answer-delivery model, and its emphasis on the data exploration process makes it ideal for this research (MacFachren and Kraak 1997, 335). To understand the spatial distribution of four-year higher education institutions with a sustainability implementation structure (academic
Data Collection. I collected country, state, and county boundary files from the United States Census Bureau MAF/TIGER geographic database in ready-made shapefile format (U.S. Census 2018). I gathered 2016 county-level political data from Github (2020) and obtained 2016 socio-economic data from the U.S. Census Bureau and the Bureau of Economic Analysis. I downloaded ready-made 2018 population data shapefiles from the U.S. Census Bureau. The HEI data I downloaded from the National Center for Education Statistics (NCES) is based on the U.S. Census Bureau data, so I was able to use the campus setting variable found in the NCES data set when I created my maps. The NCES campus setting variable (also known as locale classifications) is broken down into the four basic types shown in Table 3.10 (NCES 2017). Table 3.11 contains the data sources I used to create my maps.
Table 3.10: The National Center for Education Statistics (NCES) locale framework four basic types and subtypes.

City – Large: Territory inside an Urbanized Area and inside a Principal City with population of 250,000 or more.
City – Midsize: Territory inside an Urbanized Area and inside a Principal City with population less than 250,000 and greater than or equal to 100,000.
City – Small: Territory inside an Urbanized Area and inside a Principal City with population less than 100,000.

Suburban – Large: Territory outside a Principal City and inside an Urbanized Area with population of 250,000 or more.
Suburban – Midsize: Territory outside a Principal City and inside an Urbanized Area with population less than 250,000 and greater than or equal to 100,000.
Suburban – Small: Territory outside a Principal City and inside an Urbanized Area with population less than 100,000.

Town – Fringe: Territory inside an Urban Cluster that is less than or equal to 10 miles from an Urbanized Area.
Town – Distant: Territory inside an Urban Cluster that is more than 10 miles and less than or equal to 35 miles from an Urbanized Area.
Town – Remote: Territory inside an Urban Cluster that is more than 35 miles from an Urbanized Area.

Rural – Fringe: Census-defined rural territory that is less than or equal to 5 miles from an Urbanized Area, as well as rural territory that is less than or equal to 2.5 miles from an Urban Cluster.
Rural – Distant: Census-defined rural territory that is more than 5 miles but less than or equal to 25 miles from an Urbanized Area, as well as rural territory that is more than 2.5 miles but less than or equal to 10 miles from an Urban Cluster.
Rural – Remote: Census-defined rural territory that is more than 25 miles from an Urbanized Area and also more than 10 miles from an Urban Cluster.

Table 3.11: Datasets used to create maps for this study.

<table>
<thead>
<tr>
<th>Dataset</th>
<th>Source</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA Administrative Boundaries</td>
<td>U.S. Census Bureau TIGER</td>
<td>2018</td>
</tr>
<tr>
<td>US Counties</td>
<td>U.S. Census Bureau TIGER</td>
<td>2018</td>
</tr>
<tr>
<td>US Nation (Country)</td>
<td>U.S. Census Bureau TIGER</td>
<td>2018</td>
</tr>
<tr>
<td>U.S. States</td>
<td>U.S. Census Bureau TIGER</td>
<td>2018</td>
</tr>
<tr>
<td>U.S. Population (County Level)</td>
<td>U.S. Census Bureau Dataset</td>
<td>2018</td>
</tr>
<tr>
<td>U.S. General Election Presidential Results by County</td>
<td>Github (2020)</td>
<td>2016</td>
</tr>
<tr>
<td>U.S. Per Capita Income by State and County</td>
<td>U.S. Census Bureau</td>
<td>2016</td>
</tr>
<tr>
<td>U.S. Per Capita Income by State</td>
<td>Bureau of Economic Analysis</td>
<td>2016</td>
</tr>
<tr>
<td>Sustainability Web Assessment Tool (SWAT) Results</td>
<td>Author</td>
<td>2018</td>
</tr>
<tr>
<td>Sustainability Faculty and Staff Questionnaire Results</td>
<td>Author</td>
<td>2018</td>
</tr>
</tbody>
</table>
Besides focusing solely on the relationship between sustainable higher education institutions and variables outside of higher education, it was important for me to understand the presence of sustainability within these colleges and universities. Higher education demographics from the National Center for Education Statistics provided information on the demographics (e.g., student population, school size) and the data collected from the sustainability web assessment tool allowed me to gain insight into what types of higher education institutions were successfully integrating sustainability into their websites. To create thematic maps and articulate spatial relationships, I joined a CSV file that contained locational data from Objective One, Two, and Three using ArcMap10.4.1.

**Geocoding Higher Education Institutions.** To visualize where sustainable higher education institutions (HEIs) are located, I geocoded all sustainable HEIs. Absolute input data was provided by the National Center for Education Statistics (NCES). I geocoded this table of physical addresses using the Geocode Addresses dialog box in ArcMap found on the ArcGIS website seen in Figure 3.6 (ArcMap 2021).
Figure 3.6: ArcMap’s webpage on geocoding (ArcMap 2020).
**Outcome of Statistical and Cartographic Results**

The creation of my maps illustrates the geographical patterns of sustainable development in four-year higher education institutions in the United States based on sustainability indicators from my sustainability web assessment tool (SWAT), the results from my Sustainability Faculty and Staff Questionnaire, and data gathered from the National Center for Education Statistics, the U.S. Census, and other sources. Through a combined approach of geographic analysis and visualizations, I gained a better understanding of how HEIs communicate sustainability through their websites and how the meaning of sustainability varies based on place. The combination of thematic data and demographic data allowed me to better understand the relationship between higher education institutions and their surrounding community.
CHAPTER 4: THE CURRENT STATE OF SUSTAINABILITY AMONG AND WITHIN U.S. HIGHER EDUCATION INSTITUTIONS

This dissertation research investigates the current state of sustainability in higher education institutions in the United States. It asks which four-year institutions are promoting sustainability and how are they doing so. To answer this question, I: 1) documented the presence of sustainability among U.S. HEIs; 2) evaluated the presence of sustainability within sustainable HEIs; and 3) identified the leaders of sustainability in higher education. The first section of this chapter focuses on identifying sustainable higher educations (Objective One) and the second half reports on where sustainability is occurring within higher education institutions (Objective Two).

Objective One: Identifying Sustainable Higher Education Institutions

Objective One focuses on the current state of sustainability in the U.S higher education system. To accomplish this objective, I analyzed the websites of every four-year higher education institution (HEI) in the United States to determine if they had an administrative unit (an office or center), academic unit (a school, department, or program), research institute, and/or or collaborative effort (committee/council) that focused on at least one of the three pillars of sustainability. For the purpose of this research, I will refer to any college or university that has a sustainability implementation structure such as a sustainability-focused administrative unit (an office or center), academic unit (a school, department, or program), research institute, and/or or collaborative effort (committee/council) as sustainable. It is important to mention that the goal of this research is not to define what sustainability is but rather to evaluate how and
to what degree higher education institutions in the United States represent themselves as sustainable.

As seen in Table 4.1, I assessed 2,724 four-year higher education institutions from 50 U.S. states to obtain a holistic perspective of where sustainable development was occurring among American HEIs. Of the 2,724 HEIs I assessed, 1,271 had sustainability implementation structures and were therefore deemed sustainable. The remaining 1,453 institutions had no sustainability implementation structures and were classified as non-sustainable.

After I conducted my initial analysis to understand which American higher education institutions had sustainability entities listed on their webpages, I removed Private For-Profit and Primarily Associate’s HEIs, leaving only Public and Private Non-Profit HEIs for further analysis (Figure 4.1). Though I removed Private For-Profit and Primarily Associate’s institutions, I want to briefly discuss each HEI type’s relevance in understanding the state of sustainability among all four-year higher education institutions in the United States (Objective One).

**Four-Year Higher Education Institutions Excluded from Further Data Analysis**

As seen in Figure 4.1, higher education institutions that primarily offer four-year degree programs made up a small percentage (14.8%) of the National Center for Education Statistics (NCES) database and a smaller percentage (8.2%) of sustainable HEIs. Though I excluded these institutions from the model after preliminary analysis, it is important to briefly discuss what these institutions are doing regarding sustainability and how they have used the term sustainability to market themselves.
Table 4.1: Sustainable and non-sustainable higher education institutions based on campus type.

<table>
<thead>
<tr>
<th>Campus type</th>
<th>Non-sustainable</th>
<th>Sustainable</th>
<th>Total count per campus setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Four-Year, Private Non-Profit</td>
<td>777</td>
<td>670</td>
<td>1,447</td>
</tr>
<tr>
<td>Four-Year, Public</td>
<td>105</td>
<td>483</td>
<td>588</td>
</tr>
<tr>
<td>Four-Year, Private For-Profit</td>
<td>270</td>
<td>14</td>
<td>284</td>
</tr>
<tr>
<td>Four-Year, Primarily Associate's, Private For-Profit</td>
<td>171</td>
<td>5</td>
<td>176</td>
</tr>
<tr>
<td>Four-Year, Primarily Associate's, Public</td>
<td>36</td>
<td>86</td>
<td>122</td>
</tr>
<tr>
<td>Four-Year, Primarily Associate's, Private Non-Profit</td>
<td>94</td>
<td>13</td>
<td>107</td>
</tr>
<tr>
<td>Total</td>
<td>1,453</td>
<td>1,271</td>
<td>2,724</td>
</tr>
</tbody>
</table>
Although it was rare, I found that some of the *For-Profit* HEIs used sustainability as a way to market themselves – an example being DeVry University who offers a Bachelor’s Degree Specialization (not a degree) in Renewable Energy. The sustainability-focused web page of Devry states, “Let’s Engineer a More Sustainable World” and discusses the possibilities of renewable energy education. The University of Phoenix offers a Bachelor of Science in Environmental Science and Environmental Sustainability and Issues in Environmental Sustainability course online for undergraduates and a Master’s in Health Administration with a concentration in Sustainability Management.

*Primarily Associate’s Institutions.* Though all institutions chosen from the National Center for Education Statistics (NCES) had four-year degree programs, the list I downloaded from NCES included institutions that primarily offered associate's degrees. I excluded these institutions from the geographic analysis part and further analysis because they represented such a small percentage of the entire dataset and did not fit my goal of studying sustainability among institutions that offered four-year degrees.

I excluded *Primarily Associate’s Private For-Profit* institutions like National American Universities and Brown Mackie Colleges because, like *Private For-Profit* institutions, these institutions are primarily online based and have been criticized for their quality of education (Liu 2011; Deming et al. 2012; Liu and Belfield 2014; Hodgman 2018). The five sustainable *Primarily Associate's, Private For-Profit* institutions were not deemed sustainable because they had one academic program centered around the environmental pillar of sustainability like one may think. Of the five sustainable
Primarily Associate’s, Private For-Profit institutions, I found one institution had a staffed office, one had a staffed office and an academic program, while the other three had sustainability committees listed on their web pages. One sustainable Primarily Associate’s Private For-Profit HEI, Jamestown Business College (JBC) of New York, not only had an environmental science program but a science center built to meet LEED Gold certification standards. On their sustainability webpage, Jamestown Business College offered tips for green living, internship opportunities, and a timeline of their sustainability initiatives on campus. Though I only found a small number and percentage of Primarily Associate’s, Private For-Profit higher education institutions involved in the higher education sustainability movement, Jamestown Business College (JCC) proved it can be done and can offer guidance to those not only in its class but to larger institutions.

I excluded Primarily Associate’s, Private Non-Profit HEIs after initial analysis. These HEIs offer four-year degree programs, but many, like Herzing University and Remington College, are primarily online and tend to focus on highly sought-after degrees such as nursing, business, or technical programs. Other HEIs like the Rabbinical College of Long Island and Talmudical Institute of upstate New York were dedicated to offering religious-focused four-year degrees. Though I removed them from the sample, it is still beneficial to include some mention of sustainable Primarily Associate’s, Private Non-Profit HEIs to see where they are in terms of communicating sustainability. For example, Johnson and Wales University-Denver has an interdisciplinary Sustainable Food Systems (B.S.) program along with an earth-conscious culinary program whose chef-instructors use their position of influence to help solve global issues of food security, sustainability and reducing food waste (JWU 2020). Likewise, San Diego Mesa College in California
has an Associate’s degree in Sustainability and an Environmental Sustainability Committee that integrates sustainability across campus. I found that two of the thirteen sustainable Primarily Associate’s, Private Non-Profit HEIs have a staffed office, six have a sustainability-focused committee, and four institutions have at least one sustainability-focused four-year academic program.

**Primarily Associate’s, Public Institutions.** Of the 122 four-year, Primarily Associate’s Public HEIs, 86 (70.5%) are sustainable while 36 (29.5%) are non-sustainable. Almost half (47%) of the 86 sustainable Primarily Associate’s Public HEIs had at least one four-year academic program, a prominent example being the Clover Park Technical College of Washington Environmental Sciences and Technology Program. Another 54 (63%) have a committee that focuses on campus sustainability. Seven (8%) of the 87 sustainable Primarily Associate’s Public HEIs have a sustainability-focused research institute. Though I considered including four-year, Primarily Associate’s Public HEIs in the final data collection, I decided to remove them since I removed all other Primarily Associate’s that had significantly lower sustainability scores compared to Four-Year Private Non-Profit and Four-Year Public HEIs.

**Sustainability Among U.S. Public and Non-Profit Higher Education Institutions**

After excluding Private For-Profit HEIs and Primarily Associate’s HEIS, I had a sample of 1,153 Public and Private Not-For-Profit sustainable HEIs. I then explored relationships between the following institutional and socio-demographic variables: type of HEI, geographical location (US region), student population, tuition (called net price by
the NCES), and revenue and sustainability in *Four-Year Public* and *Four-Year Private Not-For-Profit* HEIs in the United States. I wanted to see if institution type, campus setting, campus location (region and state), size (based on student population), tuition (called net price by the NCES), and Carnegie classification played a role in the presence and level of sustainability implementation among American four-year higher education institutions. I computed the sum of scores across indicators for each HEI. The mean sustainability score for the sample of HEI was 17 (SD = 10). I categorized HEIs into five sustainability grade levels (A, B, C, D, F) based on their sustainability scores. The distribution of HEIs, and the mean (SD) sustainability scores for each grade level and other HEI demographic variables are presented on Table 4.2.
Table 4.2: Descriptive statistics of sustainable HEIs (N = 1,153).

<table>
<thead>
<tr>
<th>HEI characteristic</th>
<th>HEI (%)</th>
<th>Sustainability score mean</th>
<th>Student population median</th>
<th>Revenue [x 107], in USD median</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Private Non-Profit</td>
<td>670 (53.3%)</td>
<td>17.11</td>
<td>2,306</td>
<td>7.7</td>
</tr>
<tr>
<td>Public</td>
<td>483 (38.8%)</td>
<td>19.55</td>
<td>9,835</td>
<td>23.0</td>
</tr>
<tr>
<td><strong>Region</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northeast</td>
<td>339 (28.5%)</td>
<td>17.84</td>
<td>3,144</td>
<td>12.0</td>
</tr>
<tr>
<td>South</td>
<td>356 (30.9%)</td>
<td>16.77</td>
<td>4,592</td>
<td>14.2</td>
</tr>
<tr>
<td>West</td>
<td>173 (16.3%)</td>
<td>17.66</td>
<td>4,383</td>
<td>12.4</td>
</tr>
<tr>
<td>Midwest</td>
<td>285 (24.3%)</td>
<td>20.48</td>
<td>3,712</td>
<td>9.0</td>
</tr>
<tr>
<td><strong>Sustainability grade</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>260 (21.0%)</td>
<td>32.55</td>
<td>6,702</td>
<td>21.8</td>
</tr>
<tr>
<td>B</td>
<td>245 (20.2%)</td>
<td>23.70</td>
<td>5,428</td>
<td>18.6</td>
</tr>
<tr>
<td>C</td>
<td>233 (19.3%)</td>
<td>16.99</td>
<td>4,139</td>
<td>12.1</td>
</tr>
<tr>
<td>D</td>
<td>208 (19.8%)</td>
<td>9.98</td>
<td>3,216</td>
<td>8.4</td>
</tr>
<tr>
<td>F</td>
<td>207 (19.6%)</td>
<td>2.95</td>
<td>2,406</td>
<td>1.4</td>
</tr>
</tbody>
</table>
As seen in Table 4.2, *Public* universities had higher sustainability scores, larger student populations, and annual revenue. The student population mean for *Public* HEIs was four times higher than *Private, Non-Profit* HEIs. HEIs with the highest sustainability scores (A-graded) had higher student populations, tuition, and annual revenue medians. HEIs within and closest to urban areas have higher revenues, student populations, and sustainability scores on average than rural HEIs. Sustainability scores of HEIs in city, suburb, and town settings are similar, but I found that HEIs in rural campus settings are lower. HEIs in the Midwest region have the highest sustainability score average and student tuition, but receive the least annual revenue and the second lowest student population median.

Objective One focuses on identifying HEIs formally engaging in sustainability, creating a snapshot of where these HEIs are located, and documenting how much revenue they receive. As seen in
Table 4.3, 82.1% of Public HEIs are sustainable, while 46.3% of Private, Non-Profit HEIs have a sustainability implementation structure listed on their website. There is a higher frequency of sustainable Non-Profit HEIs in the United States than Public institutions (Table 4.3).
Table 4.3: Sustainable and non-sustainable Public and Private Non-Profit higher education institutions.

<table>
<thead>
<tr>
<th>Campus type</th>
<th>Sustainable</th>
<th>Non-sustainable</th>
<th>Total count per campus setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Four-Year, Public</td>
<td>483</td>
<td>105</td>
<td>588</td>
</tr>
<tr>
<td>Four-Year, Private Non-Profit</td>
<td>670</td>
<td>777</td>
<td>1,447</td>
</tr>
<tr>
<td>Total</td>
<td>1,153</td>
<td>882</td>
<td>2,035</td>
</tr>
</tbody>
</table>
The average tuition for full-time beginning students has no relationship with which types of institutions implement sustainability (Table 4.4). The primary difference between Public and Private Non-Profit institutions is how they are funded. Public schools are heavily funded by state governments and receive some contributions from donors, which enables them to charge lower tuition rates to students. Private Non-Profit universities and colleges are supported primarily by their own endowment funds, students’ tuition fees, and contributions from individual donors (Edmit 2021).

As seen in Table 4.5 and Table 4.6, sustainable HEIs receive more annual revenue than non-sustainable HEIs. Table 4.4 shows that the average revenue for Public HEIs is three times more than that of Private Non-Profits. There is not only a dramatic difference between the revenue of Public and Private Non-Profit HEIs, but also between sustainable and non-sustainable HEIs. As seen in Table 4.6, the average revenue for sustainable Public and Private Non-Profit institutions is higher than the average revenue of non-sustainable HEIs. Table 4.7 shows that the average student population is four times higher than non-sustainable HEIs.

Though I found no difference in the average sustainability score of HEIs in cities and HEIs in rural areas or HEIs in town and HEIs in rural areas, a low percentage (7.6%) of sustainable HEIs are located in rural and town settings while 89.3% were located in suburbs and cities (Table 4.8).
Table 4.9 shows that HEIs in city campus settings have the highest revenue average followed by HEIs in town settings while HEIs in suburb campus setting receive the least funding.

Table 4.4: Sustainable and non-sustainable Public and Private Non-Profit higher education institutions.

<table>
<thead>
<tr>
<th>Type of HEI</th>
<th>Number of HEIs</th>
<th>Percentage of sustainable institutions</th>
<th>Average tuition</th>
<th>Revenue average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private Non-Profit</td>
<td>1,447</td>
<td>46.3%</td>
<td>$17,761</td>
<td>$161,695,173</td>
</tr>
<tr>
<td>Public</td>
<td>588</td>
<td>82.1%</td>
<td>$12,684</td>
<td>$552,322,411</td>
</tr>
<tr>
<td>Total</td>
<td>2,035</td>
<td>57.3%</td>
<td>$16,293</td>
<td>$274,564,370</td>
</tr>
</tbody>
</table>

Table 4.5: Average revenue and student population of sustainable and non-sustainable Public and Private Non-Profit institutions.

<table>
<thead>
<tr>
<th></th>
<th>Revenue average</th>
<th>Student population average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-sustainable</td>
<td>$59,033,934</td>
<td>1,912</td>
</tr>
<tr>
<td>Sustainable</td>
<td>$439,436,742</td>
<td>8,394</td>
</tr>
<tr>
<td>All institutions</td>
<td>$274,564,370</td>
<td>5,153</td>
</tr>
</tbody>
</table>

Table 4.6: Average revenue of sustainable HEIs by institution type.

<table>
<thead>
<tr>
<th>Institution type</th>
<th>Sustainable</th>
<th>Non-sustainable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private Non-Profit</td>
<td>$309,590,980</td>
<td>$34,165,971</td>
</tr>
<tr>
<td>Public</td>
<td>$619,554,053</td>
<td>$243,056,857</td>
</tr>
<tr>
<td>All institutions</td>
<td>$439,436,742</td>
<td>$59,033,934</td>
</tr>
</tbody>
</table>

Table 4.7: Average student population of sustainable and non-sustainable Private Non-Profit and Public institutions.

<table>
<thead>
<tr>
<th>Institution type</th>
<th>Average student population of sustainable HEIs</th>
<th>Average student population of non-sustainable HEIs</th>
<th>Average student population of all HEIs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private Non-Profit</td>
<td>4,275</td>
<td>1,278</td>
<td>2,669</td>
</tr>
</tbody>
</table>

107
<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Public</td>
<td>14,107</td>
<td>6,632</td>
<td>12,783</td>
</tr>
<tr>
<td>All institutions</td>
<td>8,394</td>
<td>1,912</td>
<td>5,594</td>
</tr>
</tbody>
</table>
Table 4.8: Campus setting of sustainable and non-sustainable HEIs.

<table>
<thead>
<tr>
<th>Campus setting</th>
<th>Sustainable</th>
<th>Non-sustainable</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>City</td>
<td>73.9%</td>
<td>69.8%</td>
<td>73.5%</td>
</tr>
<tr>
<td>Suburb</td>
<td>18.4%</td>
<td>18.1%</td>
<td>18.4%</td>
</tr>
<tr>
<td>Town</td>
<td>7.0%</td>
<td>9.7%</td>
<td>7.3%</td>
</tr>
<tr>
<td>Rural</td>
<td>0.6%</td>
<td>2.3%</td>
<td>0.8%</td>
</tr>
<tr>
<td>Total</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

Table 4.9: The average revenue of higher education institutions based by campus setting and presence of sustainability implementation structure.

<table>
<thead>
<tr>
<th>Campus setting</th>
<th>Average revenue of sustainable HEIs</th>
<th>Average revenue of non-sustainable HEIs</th>
<th>Average revenue of all HEIs</th>
</tr>
</thead>
<tbody>
<tr>
<td>City</td>
<td>$644,612,975</td>
<td>$80,410,063</td>
<td>$397,740,065</td>
</tr>
<tr>
<td>Suburb</td>
<td>$51,406,628</td>
<td>$17,180,821</td>
<td>$33,406,389</td>
</tr>
<tr>
<td>Town</td>
<td>$336,842,111</td>
<td>$41,043,909</td>
<td>$202,653,578</td>
</tr>
<tr>
<td>Rural</td>
<td>$153,918,340</td>
<td>$39,245,301</td>
<td>$112,827,167</td>
</tr>
<tr>
<td>Total</td>
<td>$439,436,742</td>
<td>$59,033,934</td>
<td>$274,564,370</td>
</tr>
</tbody>
</table>
Regions and States

Before beginning this research, I hypothesized that the majority of HEIs with at least one sustainability implementation structure would be located on the West Coast and North Atlantic Coast region. The maps shown in Error! Reference source not found. and Figure 4.2 illustrate the number and percentage of sustainable Public and Private Non-Profit colleges and universities per state and the locations of all sustainable Private Non-Profit and Public HEIs. More than 43.3% of the HEIs located in the New England, Middle Atlantic, and South Atlantic (based on U.S. Census Bureau divisions) have sustainability implementation structures. In the Northeast, 89.5% of all Public and Private Non-Profit HEIs in Vermont and 83.3% of New Hampshire are sustainable. New York and Pennsylvania have the highest frequency of sustainable Public and Private Non-Profit HEIs in the country. On the West Coast, less than 16% of California’s 454 Public and Private Non-Profit HEIs have sustainability implementation structures but this state has the third highest number (71) of sustainable Public and Private Non-Profit HEIs in the country. The reason for New York, Pennsylvania, and California’s high numbers of sustainable Public and Private, Non-Profit HEIs is because these states have high overall numbers of colleges and universities.
Figure 4.1: Distribution of sustainable higher education institutions by state.

The number within each state is the total number of sustainable HEIs/ the total number of Public and Private HEIs within each state. The legend illustrates the percentage of sustainable HEIs per state.
Figure 4.2: Distribution of sustainable higher education institutions by state and region.

The number within each state is the total number of sustainable HEIs within each state while the legend illustrates the percentage of sustainable HEIs per state.

The dots laid over the map are the locations of each Four-Year Private Non-Profit and Four-Year Public HEI deemed sustainable.
Figure 4.3 provides insight into the *Private Non-Profit* sustainable HEIs and shows that 74.6% (53/71) of sustainable HEIs in California were *Private Non-Profit* institutions. California, Washington, and Oregon do not have high percentages of sustainable HEIs because of the low number of sustainable *Public* HEIs in these states. Florida and the stretch of states from Iowa to New Hampshire have high percentages of sustainable *Private Non-Profit* colleges and universities. Figure 4.4 illustrates sustainable *Public* higher education institutions across the United States, with the majority of sustainable higher education institutions in the Midwest and South being *Public*. Figure 4.1, Figure 4.2, Figure 4.3, and Figure 4.4 illustrate where sustainable colleges and universities are most predominant. The following section illustrates the relationship between campus settings and the location of sustainable HEIs.
Figure 4.3: Sustainability among *Four-Year Private Non-Profit* HEIs.

The number within each state is the total number of sustainable Private Non-Profit HEIs within each state while the legend illustrates the percentage of sustainable HEIs per state. The dots laid over the map are the locations of each Four-Year Private Non-Profit HEI deemed sustainable.
Figure 4.4: Sustainability among Four-Year Public higher education institutions.

The number within each state is the total number of sustainable Public HEIs within each state while the legend illustrates the percentage of sustainable HEIs per state.

The dots laid over the map are the locations of each Four-Year Public HEI deemed sustainable.
Objective Two: Evaluating Sustainability within U.S. Higher Education Institutions

To better understand where and at what level sustainability is occurring within colleges and universities, I analyzed the webpages of every four-year higher education institution that I determined was sustainable based on my Sustainability Web Assessment Tool (SWAT) (Appendix A). I also created a grading system to see which HEIs have the highest presence of sustainability on their websites and which ones are at the beginning of developing sustainability across campus. In doing so, I was better able to understand how colleges and universities implement sustainability and the steps needed to integrate sustainability within their institutions and to effectively communicate these efforts through their websites.

Levels of Sustainability in Higher Education Institutions

I categorized HEIs into five sustainability grade levels (A, B, C, D, F) based on their SWAT sustainability scores to analyze the degree of sustainability among Sustainable Universities. The distribution of HEIs, and the mean (SD) sustainability scores for each grade level and other HEI demographic variables are presented in Table 4.10: Average student population, revenue, and tuition per HEI grade and

Table 4.11. By categorizing the sustainability scores and using letter grades, I was able analyze the level of sustainability integration among of individual and grouped HEIs;
Table 4.10: Average student population, revenue, and tuition per HEI grade.

<table>
<thead>
<tr>
<th>SWAT grade</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>F</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>#</td>
<td>265</td>
<td>245</td>
<td>230</td>
<td>207</td>
<td>206</td>
<td>1,153</td>
</tr>
<tr>
<td>%</td>
<td>23.0%</td>
<td>21.2%</td>
<td>19.9%</td>
<td>18.0%</td>
<td>17.9%</td>
<td>100%</td>
</tr>
<tr>
<td>Student population average</td>
<td>12,334</td>
<td>10,656</td>
<td>7,728</td>
<td>5,227</td>
<td>4,560</td>
<td>8,394</td>
</tr>
<tr>
<td>Total revenue average</td>
<td>$816,506,137</td>
<td>$644,758,139</td>
<td>$247,994,637</td>
<td>$189,899,565</td>
<td>$174,673,385</td>
<td>$439,436,742</td>
</tr>
<tr>
<td>Tuition average</td>
<td>$21,301</td>
<td>$20,553</td>
<td>$20,273</td>
<td>$18,362</td>
<td>$16,027</td>
<td>$19,472</td>
</tr>
</tbody>
</table>

Table 4.11: Comparison of higher-rated and lower-rated Public and Private Non-Profit HEIs (based on author’s grading criteria).

<table>
<thead>
<tr>
<th>Summary statistics (#)</th>
<th>A, B, and C HEIs</th>
<th>D and F HEIs</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>#</td>
<td>740</td>
<td>413</td>
<td>1,153</td>
</tr>
<tr>
<td>Total revenue average</td>
<td>$582,944,104</td>
<td>$182,304,909</td>
<td>$439,436,742</td>
</tr>
<tr>
<td>Student population average</td>
<td>10,347</td>
<td>4,894</td>
<td>8,394</td>
</tr>
<tr>
<td>Low-revenue HEIs (#)</td>
<td>108</td>
<td>134</td>
<td>242</td>
</tr>
<tr>
<td>Low-revenue HEIs (%)</td>
<td>14.6%</td>
<td>32.4%</td>
<td>21.0%</td>
</tr>
<tr>
<td>High-revenue HEIs (#)</td>
<td>591</td>
<td>246</td>
<td>837</td>
</tr>
<tr>
<td>High-revenue HEIs (%)</td>
<td>79.9%</td>
<td>59.6%</td>
<td>72.6%</td>
</tr>
</tbody>
</table>
As part of my research for Objective One, I found that student population and revenue are related to HEI sustainability and that HEIs with high sustainability grades tend to have higher revenue. As seen in Table 4.10, A and B graded HEIs have the highest revenue compared to the $275 million average of all sustainable institutions. The average total revenue for A-graded HEIs was $817 million compared to $174 million for F-grade HEIs.

Table 4.11 shows the difference between higher-rated (graded A, B, and C) and lower-rated (D and F) HEIs engaged in sustainability initiatives. Higher-rated and lower-rated sustainable HEIs had the following characteristics. First, lower-rated HEIs had lower total revenue (at an average of $59 million) than higher-rated HEIs that had an annual average revenue of $581 million. Second, the average student population was lower among lower-rated HEIs with an average of 4,894 students compared to the average student population of for higher-rated HEIs that was twice the amount (10,347). I found that where student population is low, revenue also tends to be low and so is the percentage of sustainable HEIs and top-rated sustainable HEIs.

In addition to my own analysis, there are published studies showing the relationship between student population and revenue like Peter Hinrichs’ (2017) Economic Commentary’s Trends in Revenues at US Colleges and Universities 1987-2013. Hinrichs (2017) explains that dependency on tuition is seen to be increasing in institutions with federal and state funding reducing, thus indicating a high degree of relationship between revenue and student population among both Public and Private Non-Profit institutions (Hinrichs 2017, 2).

**Sustainability Among the 66 Top-Rated, Low-Revenue Sustainable HEIs**

Once I identified a relationship between HEI revenue, student population, and the sustainability grade of an HEI, I focused on the outliers – those that received high
sustainability scores even though they were small and received the least funding. As seen in Table 4.12, 10.9% (29) of A-graded HEIs had a total revenue per annum of less than $50 million, while 15.1% (37) of B-graded HEIs were received revenue below $50 million. Most (98.4%) of the top-rated HEIs with revenue below $50 million had student populations smaller than 4,000 (Table 4.13).

I further analyzed the websites of the 66 low-revenue top-rated sustainable HEIs (listed in Appendix E) to determine why and how they integrated sustainability across their campus and effectively communicated these efforts through their websites even though they were small and poor in comparison to other HEIs. The 66 top-rated HEIs (Graded A or B on the sustainability score) that have low-revenue (below $50M) and mostly (98.4%) of student populations below 4,000 can be found in Appendix E. I found that these HEIs commonly have the variables listed on Table 4.13 while lacking the variables shown in Table 4.14.
Table 4.12: Distribution of total revenue for A and B graded HEIs.

<table>
<thead>
<tr>
<th>Total annual revenue</th>
<th>A-graded (#)</th>
<th>B-graded (#)</th>
<th>A-graded (%)</th>
<th>B-graded (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Missing</td>
<td>11</td>
<td>13</td>
<td>4.2%</td>
<td>5.3%</td>
</tr>
<tr>
<td>&lt;$50M</td>
<td>29</td>
<td>37</td>
<td>10.9%</td>
<td>15.1%</td>
</tr>
<tr>
<td>&gt;$50M-$100M</td>
<td>35</td>
<td>43</td>
<td>13.2%</td>
<td>17.6%</td>
</tr>
<tr>
<td>&gt;$100M-$150M</td>
<td>39</td>
<td>16</td>
<td>14.7%</td>
<td>6.5%</td>
</tr>
<tr>
<td>&gt;$150M-$200M</td>
<td>19</td>
<td>22</td>
<td>7.2%</td>
<td>9.0%</td>
</tr>
<tr>
<td>&gt;$200M</td>
<td>132</td>
<td>114</td>
<td>49.8%</td>
<td>46.5%</td>
</tr>
<tr>
<td>Total</td>
<td>265</td>
<td>245</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Table 4.13: Distribution of total revenue for A and B graded HEIs.

<table>
<thead>
<tr>
<th>Distribution of student population for A- and B-graded HEIs</th>
<th>Less than $50M average annual revenue</th>
<th>More than $50M average annual revenue</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;2,000 or (blank)</td>
<td>74.2%</td>
<td>11.2%</td>
<td>19.8%</td>
</tr>
<tr>
<td>2,000-3,999</td>
<td>24.2%</td>
<td>19.0%</td>
<td>19.8%</td>
</tr>
<tr>
<td>4,000-5,999</td>
<td>1.5%</td>
<td>9.3%</td>
<td>8.2%</td>
</tr>
<tr>
<td>6,000-8,000</td>
<td>0.0%</td>
<td>9.5%</td>
<td>8.2%</td>
</tr>
<tr>
<td>&gt;8,000</td>
<td>0.0%</td>
<td>51.0%</td>
<td>44.0%</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Table 4.14: Six most common sustainability initiatives of low-revenue top rated HEIs.

<table>
<thead>
<tr>
<th>Top five sustainability initiatives of top-rated, low-revenue HEIs</th>
<th>#</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Formal collaborative effort (committee, board, etc.) focused on sustainability</td>
<td>48</td>
<td>65.8%</td>
</tr>
<tr>
<td>Sustainability-oriented undergraduate degree program</td>
<td>33</td>
<td>45.2%</td>
</tr>
<tr>
<td>Sustainable waste management program on campus</td>
<td>33</td>
<td>45.2%</td>
</tr>
<tr>
<td>Sustainable energy initiatives on campus</td>
<td>23</td>
<td>31.5%</td>
</tr>
<tr>
<td>Eco-conscious transportation (carpool/bus/bike/walking)</td>
<td>22</td>
<td>30.1%</td>
</tr>
</tbody>
</table>
Sustainability Implementation Among Top-Rated, Low-Revenue HEIs

As seen in Table 4.15, 73.2% of low-revenue HEIs do not have staffed sustainability offices while 49.1% of HEIs with an annual revenue greater than $50 million have staffed offices focusing on sustainability. Although limited institutional budgets do not often allow for a staffed sustainability office, small low-revenue HEIs are able to offer formal sustainability leadership through collaborative efforts (committees or councils), academic programs, and research institutes as well as less formal leadership through faculty and staff development. These HEIs stood out against other low-revenue HEIs for their staffed offices, faculty and staff development programs, education, and research efforts.

Faculty and Staff Development. Although low-revenue HEIs—even those that received high sustainability scores—may not be able to afford to house and staff a sustainability office, they can create sustainability leadership across campus in other ways. As seen in Table 4.16, 72.7% of the 66 top-rated low-revenue HEIs offered at least a workshop, seminar, and/or certification program to educate their faculty and staff on how to integrate sustainability into their workspace, research activities, syllabi, and curriculum. This form of faculty and staff development is a cost-effective way that HEIs
can integrate sustainability across campus and uses a middle ground approach called for by some scholars (Moore 2005; Brinkhurst et al. 2011; O’Brien 2013).
Table 4.15: Sustainability office availability by HEI revenue.

<table>
<thead>
<tr>
<th>Sustainability office availability by HEI revenue</th>
<th>Less than $50M annual revenue</th>
<th>More than $50M annual revenue</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sustainability office present</td>
<td>27.7%</td>
<td>49.1%</td>
<td>44.3%</td>
</tr>
<tr>
<td>Sustainable office absent</td>
<td>72.3%</td>
<td>50.9%</td>
<td>55.7%</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Table 4.16: Faculty and staff development and revenue of top-rated (A and B graded) HEIs.

<table>
<thead>
<tr>
<th>Presence or absence of faculty development initiatives on campus</th>
<th>Less than $50M annual revenue</th>
<th>More than $50M annual revenue</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workshops, webinars, and seminars held to educate faculty and staff on sustainability listed on webpage.</td>
<td>72.7%</td>
<td>54.3%</td>
<td>56.8%</td>
</tr>
<tr>
<td>No workshops, webinars, and seminars held to educate faculty and staff on sustainability listed on webpage</td>
<td>27.3%</td>
<td>45.7%</td>
<td>43.2%</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>
Vieban (2002), Brinkhurst, Maurice, and Ackerman (2011) believe faculty and staff members are internal agents of change on university campuses and play a critical role in integrating and coordinating sustainability initiatives. Based on my assessment of their sustainability webpages, faculty and staff education initiatives were hosted by formal collaborative efforts such as committees, boards, or councils or through research efforts hosted by academic departments or research institutes. Engaging and educating faculty on how to green their offices or curriculum can be economical and easy for HEIs that lack funding or a salaried sustainability leader. HEIs interested in engaging their faculty and staff in sustainability can find resources online.

**Research Efforts.** Top-rated, small, low-revenue HEIs stand out against other small, low-revenue HEIs because they communicate sustainability research as well as research themes and opportunities on their webpages. Over half (70.0%) of the top-rated small, low-revenue HEIs have research institutes dedicated to sustainability. As seen in Table 4.17 and Table 4.18, 89.7% of the top-rated low-revenue HEIs communicated sustainability research and 68.2% listed sustainability-related research themes and opportunities on their webpages. Once again, not having the revenue to house or staff a sustainability-related research center or institute does not mean that an HEI cannot
succeed in its sustainability efforts. Instead, HEIs can implement and communicate environmental or sustainability-focused through their academic programs.
Table 4.17: Presence of sustainability research on top-rated HEI websites.

<table>
<thead>
<tr>
<th>Environmental or sustainability research for A and B graded HEIs</th>
<th>Less than $50M revenue per year</th>
<th>More than $50M revenue per year</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmentally sustainable research occurring on campus</td>
<td>89.7%</td>
<td>99.1%</td>
<td>98.0%</td>
</tr>
<tr>
<td>No environmentally sustainable research on campus</td>
<td>10.3%</td>
<td>0.9%</td>
<td>2.0%</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Table 4.18: Presence of sustainability research themes or opportunities on top-rated HEI websites.

<table>
<thead>
<tr>
<th>Sustainability research themes and opportunities for A and B graded HEIs</th>
<th>Less than $50M revenue per year</th>
<th>More than $50M revenue per year</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Page listing where sustainability research themes/opportunities are listed</td>
<td>68.2%</td>
<td>73.3%</td>
<td>72.6%</td>
</tr>
<tr>
<td>No page listing sustainability research themes and opportunities</td>
<td>31.8%</td>
<td>26.7%</td>
<td>27.4%</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>
Sustainability Implementation Structures

Once I collected the Sustainability Web Assessment Tool (SWAT) data for all 1,153 Public and Private Non-Profit HEIs, I focused on answering what sustainability implementation structures qualified them as sustainable. I determined if the sustainable HEIs had at least one academic department or program that offered a four-year undergraduate degree, staffed office, research institute, and/or a collaborative effort focused on sustainability or one of the three pillars of sustainability. Shawe and others (2019) refer to these structures (departments, committees, offices/teams/ working groups, centers, and councils) as sustainable development implementation structures. In this study, I call them sustainability implementation structures.

Table 4.19 shows that of the 1,153 Public and Private Non-Profit HEIs, 72.2% have four-year academic programs focused on at least one of the three pillars of sustainability, almost half (48.9%) have a sustainability-focused committee or other formal collaborative effort, 42.5% have a staffed sustainability office, and 37.9% have an environmental or sustainability-focused research center or institute. Sustainability implementation structures lead in integrating sustainability on college campuses. While some like staffed offices and sustainability-focused collaborative efforts may be
intentional in promoting sustainability and integrating it within campus life, all sustainability implementation structures play an important role in the development of sustainability in HEIs.
Table 4.19: Sustainable development implementation structures among sustainable 1,153 Public and Private Non-Profit HEIs.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Total institutions meeting these criteria</th>
<th>Proportion of institutions meeting these criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does the HEI have a four-year (environmental) sustainability-focused academic program?</td>
<td>783</td>
<td>67.9%</td>
</tr>
<tr>
<td>Is there a committee focused on sustainability?</td>
<td>564</td>
<td>48.9%</td>
</tr>
<tr>
<td>Is there a staffed sustainability office?</td>
<td>490</td>
<td>42.5%</td>
</tr>
<tr>
<td>Does the HEI have at least one environmental/sustainability focused research center?</td>
<td>438</td>
<td>37.9%</td>
</tr>
</tbody>
</table>
**Academic Programs**

Of the 1,153 Public and Private Non-Profit HEIs deemed sustainable, 783 (68.3%) have an academic program that offers a four-year degree that focuses on the environmental pillar of sustainability or includes social and/or economic within their focus. I will further discuss the types of academic programs that qualified HEIs as sustainable later in this chapter when I discuss the sustainability efforts within the Education dimension of U.S. higher education institutions. Although academic departments help create sustainability leaders by educating and preparing students for professional, post-graduate careers, they fail to implement sustainability across all administrative branches of higher education institutions. To establish cross-campus sustainability efforts, HEIs must create a formal collaborative effort and/or a campus sustainability office (Brown and Hamburger 2012).

**Formal Collaborative Efforts Committees, Boards, and Councils**

Almost half (48.9%) of the Public and Private Non-Profit HEIs I deemed sustainable have a formal collaborative effort such as a committee, council, or board centered around cross-campus sustainable development listed on their websites (Table 4.20). Adopting a formal collaborative effort is a cost-effective option for HEIs that do not have the financial and/or administrative support for major investments in sustainability.

Table 4.20 indicates that 72.3% of low-revenue (less than $50 million annual revenue) compared to 50.9% of high-revenue HEIs do not have sustainability offices on campus whereas only 27.7% of low-revenue HEIs have a sustainability office.
Table 4.20: Presence or lack of formal collaborative sustainability effort based on revenue.

<table>
<thead>
<tr>
<th>Presence or lack of a staffed sustainability office</th>
<th>Presence or lack of formal collaborative sustainability effort</th>
<th>Less than $50M annual revenue</th>
<th>More than $50M annual revenue</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>No sustainability office</td>
<td>No sustainability office (all)</td>
<td>72.3%</td>
<td>50.9%</td>
<td>55.7%</td>
</tr>
<tr>
<td></td>
<td>No collaborative effort</td>
<td>40.0%</td>
<td>34.7%</td>
<td>36.3%</td>
</tr>
<tr>
<td></td>
<td>Have collaborative effort</td>
<td>60.0%</td>
<td>65.3%</td>
<td>63.7%</td>
</tr>
<tr>
<td>Sustainability office present</td>
<td>Have formal collaborative effort</td>
<td>27.7%</td>
<td>49.1%</td>
<td>44.3%</td>
</tr>
<tr>
<td></td>
<td>No collaborative effort</td>
<td>91.0%</td>
<td>66.7%</td>
<td>70.1%</td>
</tr>
<tr>
<td></td>
<td>Have formal collaborative effort</td>
<td>9.0%</td>
<td>33.3%</td>
<td>29.9%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>
Sixty-four percent of all sustainable HEIs without a sustainability office have collaborative efforts. With a formal collaborative effort, institutions do not have to hire faculty and staff to integrate sustainability throughout the campus or pay for a site dedicated to sustainability efforts. Key stakeholders such as faculty, staff, students, and even community members from off-campus can volunteer their time and meet in the already existing conference rooms found throughout U.S. campuses. Of all of the sustainability implementation structures listed in Table 4.21, a formal collaboration effort such as a committee, council, board, or similar title is the most economically feasible and offers institutions interested in creating a formal sustainability initiative a place to begin.

Formal collaborative efforts allow for cross-campus collaboration and integration whereby administration, faculty, staff, and student representatives can work together and make recommendations to the administration regarding policies to promote sustainability on campus. A sustainability committee like that of Providence College have responsibilities that include acting in an advisory capacity to the university president in formulating and addressing sustainability goals and initiatives (Providence College 2021). Administration at Providence College formed the Sustainability Committee of Providence College after its President signed formal commitment called the Campus Compact Action Statement. As part of the Compact Action Statement, the President and Provost appointed a campus-wide committee to create a campus civic action plan known as the Campus Sustainability Plan (CSP). The Campus Sustainability Plan guides the
college in an on-going effort to create an institutional culture of sustainability, create a strategic set of measurable goals, projects, and steps to reduce the college’s carbon footprint, and implement sustainability policies that are inclusive of environmental education, facilities operations, management, academics, and community outreach. To address these broad issues across campus, the Sustainability Committee of Providence College formed subcommittees to focus on efforts like assessing carbon footprint and greenhouse gas inventory, evaluating campus energy use and conservation, promoting eco-friendly transportation to and through campus, integrating sustainability into curriculum and research across campus, developing community outreach programs, alumni development, student initiatives, eco-friendly purchasing, and food services.

Sharp (2009) and Brown and Hamburger (2012) explain that many campus sustainability offices were preceded or initiated by campus committees that were broadly represented by faculty, staff, and students. The Sustainability Committee of Providence College was designed with the goal to hire a full-time Campus Sustainability Coordinator and create a staffed office of sustainability, but an equally important goal of the committee was to collaborate with faculty and staff to educate all campus constituents on being better environmental stewards and protectors (Providence College 2021). By involving campus stakeholders in addressing sustainability-related issues, administration like those at Providence College are creating a campus culture that is invested in solving environmental, social, and economic issues instead of just lecturing about these problems in their classrooms. The Providence College sustainability website dedicates an entire page to its sustainability committee structure that any college or university wanting to take the first step in integrating sustainability throughout their institution can use as a
model (Providence 2021). The page even lists Suggested Working Groups or subcommittee groups that focus on addressing specific issues and efforts.

**Staffed Offices**

Only 44.1% of sustainable Public and Private Non-Profit HEIs have a sustainability office listed on their campus websites in comparison to the 564 (48.9%) that have formal collaborative efforts. Many sustainability offices are preceded by or initiated by formal collaborative efforts such as committees, councils, and boards (Sharp, 2009; Brown and Hamburger 2012). Simpson (2008) notes that collaborative efforts are cost effective, but their members have other responsibilities and cannot focus solely on sustainability. Staff hired solely to take on roles of implementing cross-campus sustainable development can do so by serving as liaisons for campus stakeholders.
Table 4.21 illustrates that HEIs with $200 million and above contributed to 33.3% of all sustainable institutions.

Table 4.22 indicates that one out of every three of the sustainable HEIs have revenues of $200 million or above and 60.7% of them had a sustainability office.
Table 4.21: Presence or absence of sustainability office based on revenue.

<table>
<thead>
<tr>
<th>Total revenue of sustainable HEIs</th>
<th>No sustainability office</th>
<th>Sustainability office present</th>
<th>Total number of HEIs</th>
<th>Average student population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than $50M</td>
<td>219</td>
<td>97</td>
<td>316</td>
<td>2,033</td>
</tr>
<tr>
<td>$50M- $99.9M</td>
<td>162</td>
<td>73</td>
<td>235</td>
<td>3,316</td>
</tr>
<tr>
<td>$100M-$149M</td>
<td>65</td>
<td>58</td>
<td>123</td>
<td>4,730</td>
</tr>
<tr>
<td>$150M-$200M</td>
<td>48</td>
<td>47</td>
<td>95</td>
<td>7,301</td>
</tr>
<tr>
<td>&gt;$200M</td>
<td>151</td>
<td>233</td>
<td>384</td>
<td>18,179</td>
</tr>
<tr>
<td>Total</td>
<td>645</td>
<td>508</td>
<td>1,153</td>
<td>8,394</td>
</tr>
</tbody>
</table>

Table 4.22: Presence or absence of sustainability office based on revenue (%).

<table>
<thead>
<tr>
<th>Total revenue of sustainable HEIs</th>
<th>No sustainability office</th>
<th>Sustainability office present</th>
<th>Revenue distribution (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than $50M</td>
<td>69.3%</td>
<td>30.7%</td>
<td>27.4%</td>
</tr>
<tr>
<td>$50M-$99.9M</td>
<td>68.9%</td>
<td>31.1%</td>
<td>20.4%</td>
</tr>
<tr>
<td>$100M-$149M</td>
<td>52.8%</td>
<td>47.2%</td>
<td>10.7%</td>
</tr>
<tr>
<td>$150M-$200M</td>
<td>50.5%</td>
<td>49.5%</td>
<td>8.2%</td>
</tr>
<tr>
<td>&gt;$200M</td>
<td>39.3%</td>
<td>60.7%</td>
<td>33.3%</td>
</tr>
<tr>
<td>Total</td>
<td>55.9%</td>
<td>44.1%</td>
<td>100%</td>
</tr>
</tbody>
</table>
Benefits of Collaborative Efforts and Staffed Offices

Once a formal sustainability initiative is in place, its effectiveness in implementing sustainability principles largely relies on its ability to leverage efforts by multiple campus offices and bridge the gap between higher education dimensions, particularly academics and operations (Brown and Hamburger 2012, 87). A sustainability committee or office of sustainability has the broadest influence on both academic and operational aspects of sustainability if placed high within the campus administrative structure. Collaborative efforts or sustainability offices positioned within a campus administrative structure are able to collaborate with the highest campus or university officials and a broad cross-section of campus (Brown and Hamburger 2012, 87). Simpson (2008) states that the most successful campus sustainable development occurs when involved with a diverse and comprehensive group of stakeholders. Hired staff can help organize cross-campus, collaborative efforts that engage diverse groups of stakeholders across campus.

Based on this research, top-rated HEIs (Graded A and B) had both a formal collaborative effort and a staffed office dedicated to sustainable development on campus (Table 4.23). For example, Willamette University, a Private Non-Profit that received an A sustainability grade, had a sustainability-focused executive committee, advisory board, and a staffed office. HEIs like Willamette prove that just because an
institution can afford to establish a sustainability office that does not mean they should get rid of the collaborative effort that helped jumpstart the initiative.
Table 4.23: Presence or lack of formal collaborative sustainability effort based on sustainability grade.

<table>
<thead>
<tr>
<th>Presence or lack of staffed sustainability office</th>
<th>Presence or lack of formal collaborative sustainability effort</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>F</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sustainability office absent</td>
<td>No sustainability office (all)</td>
<td>34</td>
<td>87</td>
<td>148</td>
<td>178</td>
<td>198</td>
<td>645</td>
</tr>
<tr>
<td></td>
<td>No formal collaborative effort</td>
<td>13</td>
<td>28</td>
<td>47</td>
<td>60</td>
<td>85</td>
<td>233</td>
</tr>
<tr>
<td></td>
<td>Formal collaborative effort present</td>
<td>21</td>
<td>59</td>
<td>101</td>
<td>118</td>
<td>113</td>
<td>412</td>
</tr>
<tr>
<td>Sustainability office present</td>
<td>Sustainability office present (all)</td>
<td>231</td>
<td>158</td>
<td>82</td>
<td>29</td>
<td>8</td>
<td>508</td>
</tr>
<tr>
<td></td>
<td>No formal collaborative effort</td>
<td>141</td>
<td>118</td>
<td>66</td>
<td>23</td>
<td>8</td>
<td>356</td>
</tr>
<tr>
<td></td>
<td>Formal collaborative effort present</td>
<td>90</td>
<td>40</td>
<td>16</td>
<td>6</td>
<td>0</td>
<td>152</td>
</tr>
</tbody>
</table>
HEIs like Willamette University can benefit from having both a collaborative effort and staffed office.

Table 4.23 shows that the higher the sustainability grade an institution had, the higher the frequency and percentage of sustainability offices.

Table 4.23 shows 39% of A-graded HEIs that have a sustainability office also have committees and councils that they collaborate through. Based on my web assessments, no “F” HEIs with a sustainability office have a sustainability committee, council, or board focused on sustainability efforts.

**Research Institutes**

I hypothesized that there would be fewer sustainability research centers or institutes among four-year *Public* and *Private Non-Profit* higher education institutions
than the 450 (35.4%) that actually exist. I found while conducting web assessments through the Sustainability Web Assessment Tool (SWAT) (Table 4.19). Research institutes and centers play an increasingly important role in the higher education system of the U.S. (Vincent et al 2015). Research centers and institutes have traditionally focused on supporting external research when it does not integrate well within departmental structures. This can be due to the size of the research task, its cost, its interdisciplinary nature, or because it requires a timeline that does not fit into traditional academic cycles (Stahler and Tash 1994; as cited by Vincent et al. 2015, 276). Yet, research centers and institutes have a transdisciplinary nature and applied approach that sustainability studies and education literature often call for, which makes them an ideal home for sustainability-focused research (Vincent et al. 2015, 276).

Interdisciplinary environmental and sustainability-focused institutes and centers (IESICs) not only facilitate research and support campus sustainability initiatives, but they also engage in collaborative problem-solving with internal and external partners that scholars have deemed essential for sustainable development (Vincent et al. 2015, 275). IESICs support collaborative sustainability problem-solving efforts among a wide range internal stakeholders (students, faculty, staff, and administration) and external stakeholders (community members, non-profit organizations, businesses, and government) that advance campus and community sustainability initiatives (Krizek et al.)
Though only a third of IESICs host formal academic programs, they are leading in implementing interdisciplinary education with rising number of degrees offered by these institutes over the past decade (Vincent et al. 2015, 282).

Table 4.24 shows that 438 (38%) of the sustainable Public and Private Non-Profit HEIs had a sustainability-focused research center or institute. Their average revenue of these HEIs is $625 million ($186 million higher than the average for all sustainable HEIs). I also found that the average student population of sustainable HEIs with sustainability-focused research institutes is 10,000 higher than the average for all sustainable HEIs.
Table 4.24: Comparison of HEI with and without a sustainability-focused research institute.

<table>
<thead>
<tr>
<th>Summary statistics</th>
<th>No sustainability focused research institute</th>
<th>Have at least one sustainability focused research institute</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of HEIs</td>
<td>715</td>
<td>438</td>
<td>1,153</td>
</tr>
<tr>
<td>Revenue average</td>
<td>$325,381,053</td>
<td>$622,234,800</td>
<td>$439,436,742</td>
</tr>
<tr>
<td>Student population average</td>
<td>6,996</td>
<td>10,675</td>
<td>8,394</td>
</tr>
<tr>
<td>A-graded HEIs</td>
<td>22</td>
<td>243</td>
<td>265</td>
</tr>
<tr>
<td>B-Graded HEIs</td>
<td>131</td>
<td>114</td>
<td>245</td>
</tr>
<tr>
<td>C-graded HEIs</td>
<td>171</td>
<td>59</td>
<td>230</td>
</tr>
<tr>
<td>D-graded HEIs</td>
<td>190</td>
<td>17</td>
<td>207</td>
</tr>
<tr>
<td>F-graded HEIs</td>
<td>201</td>
<td>5</td>
<td>206</td>
</tr>
<tr>
<td>Low-revenue HEIs</td>
<td>185</td>
<td>57</td>
<td>242</td>
</tr>
<tr>
<td>High-revenue HEIs</td>
<td>477</td>
<td>360</td>
<td>837</td>
</tr>
<tr>
<td>Low-revenue BUT top-rated (graded A and B)</td>
<td>20</td>
<td>46</td>
<td>66</td>
</tr>
<tr>
<td>Low-revenue and low-rated (graded D and F)</td>
<td>131</td>
<td>3</td>
<td>134</td>
</tr>
<tr>
<td>HEIs with formal collaborative sustainability effort</td>
<td>389</td>
<td>175</td>
<td>564</td>
</tr>
</tbody>
</table>
There are benefits for an HEI to have all four of the sustainability implementation structures that qualified the HEIs in this study as being sustainable. Academic programs and research centers lead more in educating students and applying research to solve environmental, social, and/or social issues while sustainability-focused committees and staffed offices lead in implementing sustainability throughout various dimensions of higher education. Avila and others (2017, 8) state that sustainable development implementation structures, whether they are a formal collaborative effort or ideally a staffed office, must be “trans and multidisciplinary and hierarchically multi-leveled” in order to prevent conflict of interest.

**Sustainability within Dimensions of U.S Higher Education Institutions**

To understand where within the *Four-Year Public* and *Four-Year Private Non-Profit* HEIs sustainability is occurring, I grouped the SWAT variables into the Big Six Dimensions of Higher Education that include Campus Engagement, Operations, Research, Outreach and Services, and Assessment and Reporting (Table 4.25). Through analysis of these groups, their subgroups, and sustainability variables, I was able to gain insight into where and how HEIs implement sustainability,
how they communicate these efforts through their webpages, and the benefits gained from doing so.
Table 4.25: Number and percentage of HEIs with at least one variable within the Big Six Dimensions of Higher Education.

<table>
<thead>
<tr>
<th>The Big Six Dimensions of Higher Education</th>
<th>HEIs with at least one variable within dimension (#)</th>
<th>HEIs with at least one variable within dimension (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Campus Engagement</td>
<td>1,067</td>
<td>92.5%</td>
</tr>
<tr>
<td>Education/Curriculum</td>
<td>1,061</td>
<td>92.0%</td>
</tr>
<tr>
<td>Operations</td>
<td>997</td>
<td>86.5%</td>
</tr>
<tr>
<td>Research</td>
<td>767</td>
<td>66.5%</td>
</tr>
<tr>
<td>Outreach and Services</td>
<td>686</td>
<td>59.5%</td>
</tr>
<tr>
<td>Assessment and Reporting</td>
<td>255</td>
<td>22.1%</td>
</tr>
<tr>
<td>Total number of sustainable institutions</td>
<td>1,153</td>
<td>100.0%</td>
</tr>
</tbody>
</table>
Campus Engagement – Training Sustainability Leaders

As seen in

Table 4.25, 92.5% of sustainable HEIs have at least one form of Campus Engagement listed on their website though the variables within the Campus Engagement (Table 4.26) are not the most common sustainability variable found among sustainable HEIs. Sustainability-focused internships, eco-ambassador programs, and/or sustainability representative programs are the most frequent form of Campus Engagement found among sustainable HEIs with only 65.7% of sustainable HEIs having some form of this variable.

While students and the bottom-up approach are invaluable to campus sustainability initiatives, scholars like Vieban (2002), Brinkhurst, Maurice, and Ackerman (2011, 340) have called for a middle-out approach where faculty and staff play a bigger role in campus sustainable development, asserting that they are the “internal agents of change on university campuses.” These stakeholders have an intimate understanding of the inner workings of universities and have diverse expertise, making
them invaluable resources while also providing free hands to further sustainable development on campus (Brinkhurst et al. 2011, 339).
Table 4.26: Number and percentage of higher education institutions with Campus Engagement variables.

<table>
<thead>
<tr>
<th>Dimensions of sustainability</th>
<th>Criteria</th>
<th>Total institutions meeting these criteria</th>
<th>Proportion of institutions meeting these criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Campus Engagement</td>
<td>Does the HEI offer sustainability-focused internships, eco-ambassador programs?</td>
<td>757</td>
<td>65.7%</td>
</tr>
<tr>
<td>Campus Engagement</td>
<td>Is there a section solely listing/discussing potential environmental/sustainability careers?</td>
<td>712</td>
<td>61.8%</td>
</tr>
<tr>
<td>Campus Engagement</td>
<td>Is there a student-led group that focuses on sustainability?</td>
<td>590</td>
<td>51.2%</td>
</tr>
<tr>
<td>Campus Engagement</td>
<td>Are workshops, webinars, seminars, being held to educate faculty on how to integrate SD into their academic/administrative work? Are departments/offices offered sustainability certification courses?</td>
<td>350</td>
<td>30.4%</td>
</tr>
<tr>
<td>Campus Engagement</td>
<td>Are students awarded/recognized for being &quot;environmental/sustainability&quot; leaders by given spotlight or profile?</td>
<td>349</td>
<td>30.3%</td>
</tr>
<tr>
<td>Total number of sustainable institutions</td>
<td></td>
<td>1,153</td>
<td>100%</td>
</tr>
</tbody>
</table>
**Student Engagement**

Curriculum is vital to learning about sustainability-related theories and concepts, but it is outside of the classrooms where students learn procedural knowledge (how to take action) to create change and get the job of their dreams after they graduate (Meza Rios 2018, 3). Other types of knowledge, such as social knowledge (how social norms affect people’s actions) and effectiveness knowledge (how perceptions and beliefs affect people’s actions) are also critical for sustainability leaders (Frisk and Larson 2011; Meza Rios 2018). Literature on education for sustainable development (ESD) calls for pedagogical innovations that provide interactive, experiential, transformative, and real-world learning to students (Steinemann, 2003; Rowe, 2007; Sipos et al., 2008; Brundiers et al 2009, 309). Results from the web assessments of the 1,153 sustainable *Four-Year Public* and *Four-Year Private Non-Profit* HEIs shows that the majority of sustainable American colleges and universities have some form of student engagement listed on their websites (Table 4.26).

**Internships, Eco-Representatives, and Sustainability Ambassadors.** Of the 1,153 sustainable *Public* and *Private Non-Profit* HEIs, 757 (65.7%) offer at least one sustainability-focused internship, eco-representative, or green ambassador program that
complement their degrees and allow students to gain experience in implementing sustainability. Internships and representative or ambassador programs can build leadership, problem-solving, communication, teamwork, and other transferable skills necessary for a successful career in sustainability, thus qualifying students for professional employment after they graduate (Arizona State University 2021a; SEAS 2021). Interns can network with industry professionals and transition from the role of student to professional more easily (Arizona State University 2021a).

There are a number of differences between internships and ambassador programs (Loretto 2019). Interns are most often college students or recent graduates who work, sometimes without pay, to gain employment experience, allowing them to apply the knowledge and skills learned in the academic program to a professional environment (Velazquez 2018). Campus representatives (or brand ambassadors) are students that are responsible for spreading the word about a specific brand they represent. The goal of campus representatives or ambassadors is to contribute to campus marketing campaigns like sustainability through a variety of tasks (Velazquez 2018). Though they have their differences, interns and campus representatives have a lot in common. Campus representatives and interns alike often receive compensation, discounts, and other benefits in exchange for their work. They both offer real world experience that can translate to skills on student resumes, making them more marketable to employers. Lastly, both receive invaluable networking opportunities that can help students find a job after graduation (Velazquez 2018).

Sustainability ambassadors and Eco-Representatives are brand ambassadors of their college or university’s formal sustainability efforts and student leadership program.
Appalachian State University, University of Vermont, Dickinson College, and University of Texas at Dallas all have webpages that successfully communicate eco-representative and ambassador programs. The Eco-Representatives Program at Appalachian State University is a competitive volunteer program associated with a course that helps students develop their leadership and peer-to-peer education skills while integrating campus sustainability into the residence halls of Appalachian State University. HEIs select eco-representatives to represent each residence hall’s sustainability efforts, engage the university community in sustainability education and outreach, and act as liaisons to their peers (Appalachian State University 2021). Eco-representatives like those at the University of Texas at Dallas work to create material for the rest of the campus and public community.

An effective website should be easily accessible and explain eco-representative roles, the benefits of the program, and how to become an eco-representative. Contact information, preferably both email and phone, are provided on the webpage for those interested in having an eco-representative attend an event, talk to a class, or consult an office on becoming more eco-friendly or socially responsible (Figure 4.5). The University of Vermont Eco-Representatives webpage is successful in that it provides a link for students to become an Eco-Representative, an annual report that highlights the work of the HEI’s reps and their current projects and activities (University of Vermont 2021).
Figure 4.5: The University of Vermont Eco-Representatives page.

Our Mission: The UVM Eco-Reps Program cultivates environmental responsibility by training student leaders to promote sustainable practices at the university and encourage environmentally responsible behaviors among peers.
An effective website should be easily accessible and explain the roles of an eco-representative, the benefits of the roles, and how to become an eco-representative (Figure 4.3). The University of Vermont Eco-Representatives webpage is successful in that it provides a link for students to become an eco-representative, an annual report that illustrates the annual impact of the HEI’s reps, and their current projects and activities (University of Vermont 2021). Successful HEI Eco-Representative webpages provide information on their current eco-representatives by providing brief bios about the student’s field, interests, and how they contribute to the campus sustainability initiative.

One-third (30.27%) of sustainable *Four-Year Public* and *Four-Year Private Non-Profit* HEI sustainability webpages give students recognition or awards for being environmental or sustainability leaders.

Sustainability-focused internship programs vary based on the higher education institution and where with those institutions they are required or offered. Most internships listed on the non-academic sustainability webpages are positions offered by a staffed sustainability office while the majority of internships listed on academic webpages are off campus. Some of these lists are short and offer only one or two positions within the sustainability-focused staffed office or operations sector. Others, like the one provided by the University of Louisville sustainability-focused office, are extensive and detailed. I found that some HEIs collaborate with external organizations to create sustainability-focused internship positions for students, while others place the responsibility of searching for off-campus internships in the hands of the student.

HEIs like the University of Notre Dame and Arizona State University provide plenty of resources on their webpages for students interested in gaining knowledge and
skills in the sustainability field. The Sustainability Studies program at the University of Notre Dame assists students by providing a list of internships hosted by sustainability-related industries and organizations at the local, national, and international levels. An Arizona State University webpage that focuses on sustainability internships lists organizations that past interns have worked for, step-by-step instructions for obtaining credited internships, and a link for students to schedule an appointment with an internship advisor (Arizona State University 2021).

Some of the top-rated sustainable HEIs acknowledge the educational value of internships and the value of connecting academia with applied learning and skill-building offered by internship positions. Arizona State University links student internships with academic coursework, allowing them to receive course credits while simultaneously building their resumes. The Arizona State University School of Sustainability screens each internship to ensure that they focus on sustainability and promote critical reflection of what students learn in the classroom (Arizona State University 2021).

The Sustainability Internship Program (SIP) at the University of Illinois at Chicago is unique in that it is a multi-year program that begins with a for-credit spring course. The Sustainability Internship Program invites students from all fields to participate and helps place them in the most appropriate internships, either on or off campus. The program also offers weekly seminars, field outings that cover a range of educational and skill building topics, leadership development, and project management experience to students (University of Illinois at Chicago 2021). Sustainability Internship Program interns are expected to develop a work plan and project goals, meet regularly with an experienced mentor, share experiences with other SIP interns, attend weekly
seminars and outings, and present their project results at a virtual poster presentation (University of Illinois at Chicago 2021). The University of Illinois at Chicago recruits SIP mentors and advisors through its website, engaging faculty and staff from all disciplines to help students prepare for life after graduation (see Figure 4.6). Colleges and universities who want their students to have the ability to determine their post-graduation career path, network with industry professionals, and facilitate the transition from student to professional can take inspiration from HEIs like the University of Illinois at Chicago and other HEIs in this section.

**Careers for Future Sustainability Leaders: What Can You Do with This Degree?** Before students can gain experience and skills, network with professionals in their field, or learn about the organizational culture of their field, they must first choose a career path and obtain the education needed for that path. Advertising possible career paths is useful to academic departments as a recruiting tool. The 712 (61.75%) sustainable HEIs that listed sustainability-related careers on their webpages are marketing their academic programs to students in search of career paths. To market themselves to potential students, academic programs often list jobs or careers students can obtain with the degrees they offer. HEIs often title these lists as *What You Can Do with a [(fill-in-blank)] Degree*. The webpage may also list the average salaries of these jobs, projected job growth and openings, and hiring percentages.
SIP Mentor Information

A resource page for UIC faculty and staff that wish to mentor an intern from the Office of Sustainability.

A SIP student can provide your department...

Goals
A motivated student intern can you help accomplish organizational goals.

New
You’ll have the opportunity to implement new programs or jumpstart sustainability projects.

100%
You’ll work with a committed intern that is coordinated through the Office of Sustainability.

Your Role as a Mentor
- Devise a sustainability project(s) to be researched or accomplished in Spring 2019
- Identify a supervisor that will provide oversight to the project and intern
- Create a project timeline and project goals with the student intern
- Provide feedback for intern throughout the internship and evaluate project success as part of the intern’s final letter grade

What the Office of Sustainability Will Provide
- Recruit interns and coordinate interview process in order to select the most qualified intern for your project
- Be available as a resource for the mentors and interns
- Facilitate and run the weekly Sustainability Seminar
- Review the student’s progress and final presentation
- Review student assignments
- Assign a letter grade to the student upon the completion of the internship

Figure 4.6: The University of Illinois – Chicago Sustainability Internship Program (SIP) webpage (University of Louisville 2021b).
Some websites list the careers of alumni and a short biography describing their career paths. While it is common for academic degree programs’ web pages to list jobs students can obtain with their degrees, some sustainability-focused staffed offices like that of Tufts University list sustainability-related jobs on their webpages. The Tufts University Office of Sustainability webpage dedicated to sustainability job resources provides a link to a TuftsGetGreen blog webpage that frequently posts green jobs and internships. Tufts University students can sign up to receive weekly email updates about sustainability-related job openings, internships, fellowships, and other career opportunities. The TuftsGetGreen provides links to other job bulletins along with off-campus education resources, network groups, scholarships, fellowships, and reading material pertaining to green jobs (Tufts University 2021).

The Earth Institute at Columbia University offers a webpage dedicated to professional development so students can start planning their sustainability career as soon as they begin their degree (Columbia University Earth Institute 2021). The page provides resources for sustainability career planning through the Earth Institute Professional Development Program. The program strives to help students and alumni to achieve their sustainability-related career goals by offering skill-building seminars, networking opportunities, and tools that, when used together, prepare students to pursue job opportunities in sustainability and related fields. The program complements existing Columbia University career services such as resume and cover letter review (Columbia University Earth Institute 2021).
**Student-Led Sustainability Groups.** Many college webpages list student organizations that address various aspects of environmental, social, and economic sustainability. Extracurricular activities (ECAs) like student groups improve the likelihood of getting into graduate school, provide hands-on skills and training, and can increase students’ self-esteem (Kaufman and Gabler 2004; Stuart et al. 2011, 205). Studies have found that some student groups offer leadership roles that employers favor (Tchibozo 2005). Participating in student groups can indicate reliability, responsibility, and maturity – all characteristics that are attractive to employers and help students obtain jobs after graduation (Sattinger 1998; Stuart et al. 2011, 205).

Approximately half (51.17%) of the *Four-Year Public* and *Four-Year Private Non-Profit* HEIs deemed sustainable in this research have a student-led group that focuses on sustainability (Table 4.26). Some of these groups only focus on the environmental pillar of sustainability while some, like the University of Iowa, take a three-pillar approach and address social and economic sustainability. The University of Iowa and University of Washington are examples of HEIs with many sustainability-related student groups. Both HEIs list dozens of student groups dedicated to sustainability and the environment with links to each group’s websites and/or social media pages. The University of Wisconsin at Madison is another example of an effective university website dedicated to listing all
registered sustainability-related student organizations and dividing them into sections based on their mission.

**Other Student Engagement Efforts**

Outside of the previously discussed initiatives used to engage students with sustainability, I found other variables that engage students with campus sustainability efforts including green student fees, pledges, chords, campus events, and green Greek life. By assessing the webpages of HEI webpages dedicated to student engagement like that of Susquehanna University and Lewis and Clark, I was able to gain an understanding how higher education institutions define and implement sustainability-focused student engagement. While some engagement initiatives center on environmental conservation, others like Truman State University in Kirksville, Missouri, list engagement programs that connect students with nature. Some student engagement programs focus on training sustainability leaders.

Truman State University in Kirksville, Missouri provides reading materials such as green guides and host a summer excursion trip to get students, Truman University also lists its 400-acre farm on Truman Sustainability webpage dedicated to sustainability outreach. The Sustainability Outreach page of Truman University lists student-led groups, sustainability-centered conferences. The HEI engages students into the natural environment though programs like Student Run Sustainable Enterprises bike co-op, Sustainability Life Skills Program, and Wilderness and Outdoors Program (Truman University 2021).
The University of Georgia and Iowa State University host a webpage dedicated to the national Greeks Go Green chapter that focuses on promoting sustainability throughout the sorority and fraternity community. The goal of the Go Green Group is to help other campus groups promote sustainability though their events and philanthropies and assist Greek members with their sustainability goals.

**Sustainability Fees.** While budgetary and financial concerns prevent some HEIs from participating in sustainable development, many of their students have sought and found alternative ways to promote sustainability, including the establishment of sustainability or green fees (Gonzalez-Ramirez 2021, 2). Western Michigan University is proud to be Michigan's first college or university to adopt a sustainability fee and a model for HEIs wanting to follow suit. Since its establishment in 2010, the $8 per semester, $4 per summer session fee, has funded 100% of three different accounts and the general operating fund of the Office for Sustainability. Up to $100,000 is available annually through the Student Sustainability Grant (SSG) to fund student-authored proposals that promote a campus culture of sustainability and have the potential to benefit all Western Michigan University students.

Some may think students would be opposed to sustainability fees, but the University of Michigan and Southern Illinois University provide examples of students actually initiating and promoting sustainability fees. For example, 73% of Southern Illinois University students voted for the $10 per semester Green Fee in a campus-wide referendum. HEIs like Western Michigan University and Georgia College are successful because they are transparent and let students know how their money is allocated. The
Western Michigan University *Student Sustainability Fee* webpage explains the history of the student sustainability fee and where the funds from the fee are implemented (Georgia College 2021). The Western Michigan University Student Sustainability Grant Allocations Committee is 100% student led and includes representatives from all academic colleges and both undergraduate and graduate students who decide where money is allocated (Table 4.7). The HEI websites discussed in this section are models for those interested in creating their own sustainability fee.

*Green Cords and Pledges.* Colleges and universities like the University of North Texas, University of Florida, and Virginia Tech engage their students through green graduation cords or sustainability pledges. These programs are cost-effective ways to hold campus stakeholders accountable for taking steps to be more eco-conscious. Pledges and requirements to obtain a green cord vary by institution. Some consist of campus stakeholders going online and making a commitment to adopt green habits. HEIs like the New York University and Florida State University have *Green Graduation Pledges* where graduating students pledge to lead socially and environmentally conscious lives after they leave campus (Florida State University 2021; New York University 2021).

Not only are sustainability-focused events important in engaging students and other stakeholders; they are also important in bringing sustainability efforts to non-sustainability-focused events, such as athletic competitions or concerts. Cornell University provides a Green Events Guide on their Sustainable Campus webpage that helps students, faculty, and staff make campus events (particularly sporting events) and programs not centered on sustainability more eco-friendly.
Figure 4.7: Western Michigan University student sustainability fee webpage (Western Michigan University 2021).
HEIs like the University of Florida (Figure 4.8) have a point system so students can gain a green cord through a variety of activities. The University of North Texas Environmental Volunteerism Graduation Cord page and the web pages of University of Florida dedicated to green cords are models for those interested in creating their own program. Both webpages are informative and explain to students the benefits of participating in green cord programs.

Green pledges are another cost-effective way HEIs can engage students in campus sustainability efforts. Students at institutions like University of Washington, University of Rochester, and Emory University can easily go to their schools’ website to pledge to be more eco-friendly. Most of the green pledges I found were not only for students, but also for other campus stakeholders. For example, the Green Pledge of the University of Baltimore strives to engage students, faculty, staff, and alumni in adopting green habits (University of Baltimore 2021). HEIs like the New York University and Florida State University have *Green Graduation Pledges* that graduating students pledge to lead socially and environmentally conscious lives after they have left campus (Florida State University 2021; New York University 2021).
Figure 4.8: The University of Florida Green Gator Graduation chord challenge (Florida State University 2021).
Campus Events. To engage students and other campus stakeholders, HEIs like the University of Southern Mississippi host sustainability events and programs (Error! Reference source not found.). To be effective, HEIs need to communicate with stakeholders about when and where sustainability-related events are occurring. Cornell University has a page dedicated to annual sustainability events where students can gain knowledge, win prizes, and help co-create an enduring culture of sustainability on campus through participation (Cornell University 2021). While most HEIs focus on the environmental pillar of sustainability during their events, some include diversity, inclusion, and addressing social issues.

HEIs like Ohio State University are promoting waste reduction at football games. Ohio State University claims its stadium is the largest in the country to achieve zero waste by diverting 90 percent or more of materials from the landfill (Hardcastle 2013). American HEIs participate in the annual Game Day Recycling Challenge, a competition that requires participants to measure and report the amounts of recyclable materials, organic food waste, and trash generated at one or more regular season home football games (Szczepanski 2019). In the Fall 2018 Challenge, the 65 participating HEIs recycled or composted 2.5 million pounds of gameday waste, illustrating the importance of the event recycling initiatives (Szczepanski 2019).
Office of Sustainability
Programs and Events

- Campus Sustainability Month
- Swap Table
- EcoEagle Bike Program
- Adopt A Spot
- Campus Race to Zero Waste
- Earth Week
- Trashion Fashion Show
- Move Out Madness
- Move In Madness

Figure 4.9 The University of Southern Mississippi sustainability programs and events webpage (University of Southern Mississippi 2021).
Recycling competitions occur not only on gamedays, but also during national events and competitions like RecycleMania and Earth Day. Through the annual recycling competition, campuses reduce their usage of plastic and waste stream. Besides tracking and reporting, RecycleMania campuses launch educational awareness campaigns and host engagement activities. The RecycleMania “Mug Shots” campaign recognizes campus stakeholders for using reusable cups and mugs instead of single-use plastic bottles (Jones 2019). Greening events and recycling competitions can instill long-term eco-friendly habits that continue after graduation.

**Faculty and Staff Engagement**

Only 30.4% (350) of sustainable Public and Private Non-Profit HEIs mentioned some form of faculty and staff development on their sustainability webpages. Sustainability-focused faculty and staff development efforts include workshops, webinars, or seminars on how to integrate sustainable development (SD) into everyday work. While administrative and student leadership is important, focusing only on top-down or bottom-up leadership can devalue faculty and staff input and expertise (Harrill et al. 2015). It is important that faculty and staff be involved in integrating sustainability into their syllabi and office roles and understand the value of these actions for sustainability to occur throughout college campuses (Harrill et al. 2015).

**Greening Curriculum Programs.** HEIs like Pennsylvania State University offer tools to faculty on how to integrate sustainability into their syllabi (Fuertes-Camacho et al. 2019). The *PennSustainability Integrating Sustainability Across the Curriculum*
(ISAC) Program helps faculty introduce environmental sustainability into their courses. The Pennsylvania Sustainability Office hires undergraduate and graduate summer research assistants to create syllabi, lectures, assignments, texts, and/or tests that incorporate environmental themes. Pennsylvania State University and Santa Clara University host workshops on how to integrate sustainability into various disciplines. The Santa Clara University Sustainability Across the Curriculum Program offers training and funding for faculty education and keep inventory of every class that includes sustainability principles in the teachings, building their reputation as a leader in higher education (Santa Clara University 2021).

**Green Office and Lab Programs.** HEIs are also creating green office programs to help staffed offices, academic departments, and research labs be more sustainable (Williams College 2021). Williams College provides a checklist on its website to help make campus offices or labs more eco-friendly and sometimes socially inclusive (Figure 4.10). Boston University takes a more formal approach by offering green office or lab certifications. Boston University offers four certification levels for departments: Certified, Silver, Gold, and Platinum (Figure 4.11). To reduce the environmental impact of its labs, Duke University offer green lab certification to research and instructional staff through their sustainability-focused website (Figure 4.12). The certification process is based on the completion of a checklist of items that is available on the website and includes a resource guide for implementation (Duke University 2021).
Figure 4.10: Williams College Green Office program webpage elements (Williams College 2021).
Figure 4.11: The Green Office Program report webpage from Boston University (Boston University 2021).
Environmental Impact of Labs

Labs use five times as much energy as an office or classroom space. A lot of this energy is in the form of electrical generation for refrigerators, testing equipment, and cleaning systems. As a result, this energy comes from a coal source from Duke's utility company. In addition to increased energy, labs utilize hazardous chemicals and large volumes of consumable supplies. Green lab certification provides research and instructional staff with the opportunity to reduce the environmental impact of their labs.

Duke Green Lab Certification

Obtaining Green Lab Certification

Duke Green Lab Certification is awarded based on completion of a checklist of items. The checklist is available here and is accompanied by this resource guide to implementation. There are three levels of certification, Bronze, Silver, and Gold.

- Bronze: Most labs by default, already qualify for Bronze. It is achieved by completing at least the prerequisite items on the checklist.
- Silver: Requires that the prerequisite items be completed plus 50% of applicable points in other areas.
- Gold: Requires the prerequisite items plus 90% of applicable points from other areas.

Labs must be recertified on an annual basis. Certified labs will receive signage to place on their door and an image to post to their lab website. In addition they will receive recognition from the University for their achievement.

Figure 4.12: Duke University Green Lab Certification webpage (Duke University 2021).
Education

Although 92.0% of sustainable HEIs have some form of sustainability-related education, the type of formal education and curriculum varies based on the institution (Tables 4.27 and 4.28). The most common type of education found on sustainable Four-Year Public and Four-Year Private Non-Profit HEI websites is the presence of at least one four-year environmental or sustainability-focused academic program (Appendix F). As seen in Table 4.29, 67.9% of sustainable Public and Private Non-Profit HEIs offer at least one four-year degree that focuses on one or more dimensions of sustainability. The majority (62.8%) of sustainable HEIs have one to four four-year undergraduate degree programs while only 1.0% have more than ten.

Table 4.30. Those with the most programs (ten or more) have the highest student populations and revenues.

Almost half (49.3%) of sustainable Public and Private Non-Profit HEIs offer at least one sustainability-related minor, concentration, or certificate.

Table 4.30. Some 61% of those with degree programs also have a sustainability-related minor, concentration, or certificate program. Approximately 39% of HEI minors, concentrations, certificate programs are housed outside of a four-year sustainability or environmental-focused academic department. These programs are generally within academic units such as Geography, Economics, Social Sciences, and others. Only a few research institutes or staffed offices are housed in minors, concentrations, or certificate programs, but they do exist.
Table 4.27: HEIs with at least one variable within the Big Six Dimensions of Higher Education.

<table>
<thead>
<tr>
<th>The Big Six Dimensions of Higher Education</th>
<th>HEIs with at least one variable within dimension (#)</th>
<th>HEIs with at least one variable within dimension (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Campus Engagement</td>
<td>1,067</td>
<td>92.5%</td>
</tr>
<tr>
<td>Education/Curriculum</td>
<td>1,061</td>
<td>92.0%</td>
</tr>
<tr>
<td>Operations</td>
<td>997</td>
<td>86.5%</td>
</tr>
<tr>
<td>Research</td>
<td>767</td>
<td>66.5%</td>
</tr>
<tr>
<td>Outreach and Services</td>
<td>686</td>
<td>59.5%</td>
</tr>
<tr>
<td>Assessment Reporting</td>
<td>255</td>
<td>22.1%</td>
</tr>
<tr>
<td>Total number of sustainable institutions</td>
<td>1,153</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

Table 4.28: Education variables.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Total institutions meeting these criteria</th>
<th>Proportion of institutions meeting these criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does the HEI have a four-year sustainability-focused academic program?</td>
<td>783</td>
<td>67.9%</td>
</tr>
<tr>
<td>Are there any minors, concentrations, certificate programs?</td>
<td>568</td>
<td>49.3%</td>
</tr>
<tr>
<td>Does the HEI offer at least one sustainability/environmentally focused graduate program?</td>
<td>419</td>
<td>36.3%</td>
</tr>
<tr>
<td>Are there sustainability-related courses and/or programs that do not have sustainability, environmental, conservation, or similar term listed in title?</td>
<td>323</td>
<td>28.0%</td>
</tr>
<tr>
<td>Does the website list sustainability-related courses without sustainability degree program?</td>
<td>292</td>
<td>25.3%</td>
</tr>
</tbody>
</table>
Table 4.29: Frequency of four-year sustainability-focused academic programs among sustainable HEIs.

<table>
<thead>
<tr>
<th>Frequency of four-year sustainability-focused academic programs</th>
<th>Frequency of sustainable HEIs</th>
<th>Average total revenue</th>
<th>Average student population</th>
<th>Average net price</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>3</td>
<td>$316,764,441</td>
<td>6,033</td>
<td>$17,072</td>
</tr>
<tr>
<td>1-4</td>
<td>724</td>
<td>$439,083,222</td>
<td>8,797</td>
<td>$20,709</td>
</tr>
<tr>
<td>5-9</td>
<td>48</td>
<td>$1,115,681,929</td>
<td>15,329</td>
<td>$20,008</td>
</tr>
<tr>
<td>10+</td>
<td>11</td>
<td>$1,615,370,801</td>
<td>29,346</td>
<td>$16,220</td>
</tr>
<tr>
<td>Data not available</td>
<td>5</td>
<td>$366,695,730</td>
<td>9,635</td>
<td>$20,503</td>
</tr>
<tr>
<td>Total</td>
<td>1,153</td>
<td>$439,436,742</td>
<td>8,394</td>
<td>$19,472</td>
</tr>
</tbody>
</table>

Table 4.30: Other forms of education with and without four-year sustainability-focused degree programs.

<table>
<thead>
<tr>
<th>Other forms of education</th>
<th>Four-year academic program present</th>
<th>Four-year academic program absent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sustainability-focused research on campus</td>
<td>65.1%</td>
<td>34.9%</td>
</tr>
<tr>
<td>Minors, concentrations, certificate programs</td>
<td>61.0%</td>
<td>24.1%</td>
</tr>
<tr>
<td>At least one sustainability-focused graduate program</td>
<td>46.3%</td>
<td>15.1%</td>
</tr>
</tbody>
</table>
Of the 783 HEIs with a sustainability-focused major, 363 (46.3%) provide education for sustainable development past the undergraduate level and offer at least one environmental or sustainability focused graduate program. A higher percentage of graduate programs focus on the social dimensions of sustainability in comparison to undergraduate programs and minors. A good example is Augusta University, which offers a Master's degree in *Sustainable Communities*. Graduate programs tend to take a three-pillar approach to sustainability instead of just environmental issues that many of the undergraduate four-year degree programs did.

*Sustainability-Related Academic Programs.* During the assessment of the first 50 HEI websites, I found that some sustainability web pages listed academic programs related to sustainability or one of its three pillars, but did not have *sustainability*, *environmental*, *conservation*, or a similar term in the program names. In total, I found that 323 HEI webpages listed such programs, one being North Carolina State University. Titled *Find Sustainability-Related Degrees*, the university webpages list more than 121 undergraduate and graduate degrees, minors, and certificates that relate to sustainability. Many of the programs did not include sustainability-related terms such as *environmental*, *natural*, or *conservation*, but some did. An example of this is seen in Figure 4.13 where Agricultural Science and Agricultural Leadership are listed as sustainability-related degrees by North Carolina State University. Many of the degree programs found on sustainability-related programs lists are related to agriculture or ocean sciences.
Figure 4.13: North Carolina State University sustainability-related degrees webpage (North Carolina State University 2020).
**Sustainability-Related Courses.** I found that some HEIs dedicate a webpage to list sustainability-related courses. Some have four-year sustainability or environmental degree programs while others do not. Webpages like that of the Grand Valley State University Office of Sustainability lists courses that integrate sustainability into their curriculum (Figure 4.14 and Figure 4.15). Such pages often highlight courses that focus on environmental, social, and economic issues. Institutions like Grand Valley State University and the University of San Diego integrate sustainability across various disciplines versus institutions that only have a few academic programs with courses that address environmental, social, and/or economic issues. From these findings, I realized there are various ways that HEIs can educate students about sustainability and train them to be future sustainability leaders without a sustainability-focused, four-year degree program.

**Growth of Environmental and Sustainability Studies.** The number of environmental and sustainability science degrees has increased dramatically over the past decade (Abbonizio 2020; Adkins 2020). In 2001, 43.0% of HEIs offered a major or minor environmental or sustainability studies based on data from the National Wildlife Federation (2001, 72). I found that 72.2% of Public and Private Non-Profit HEIs offer at least one sustainability-related degree, illustrating that environmental and sustainability-focused academic programs are becoming increasingly popular on college campuses.
Sustainability Related Programs, Courses & Certificates

Figure 4.14: Sustainable Related Programs, Courses & Certificates webpage title.

<table>
<thead>
<tr>
<th>INTEGRATED SUSTAINABILITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>GPY/PA 209 Introduction to Urban and Regional Planning</td>
</tr>
<tr>
<td>IDS 180 Sustainability as a Lifestyle</td>
</tr>
<tr>
<td>SOC 280 Social Problems</td>
</tr>
<tr>
<td>ANT 340 Culture and Environment</td>
</tr>
<tr>
<td>SOC 385 Social Class Inequality</td>
</tr>
<tr>
<td>SS 384 Social Inequalities</td>
</tr>
<tr>
<td>SW 300 Pluralism in American Society</td>
</tr>
</tbody>
</table>

Figure 4.15: Grand Valley State University with sustainability integrated into them (Grand Valley State University 2021).
Most programs included in the National Wildlife Federation Campus Report (2021) and that of O’Reilly and others (2000) are housed in biology and chemistry departments and do not include sustainable development in their curriculum (Calder and Clugston 2002, 632). Although I did not collect the sustainability-related degree titles listed by all sustainable HEIs, the Association for the Advancement of Sustainability in Higher Education (AASHE 2021) data corroborates my findings that the majority of academic programs center on the environmental dimension of sustainability. Some academic department webpages explain the importance of including the social and economic pillars of sustainability in their courses and research, but most focus on environmental conservation and restoration.

**Operations**

A large percentage (86.5%) of sustainable four-year Public and Private Non-Profit HEIs have some form of sustainability initiative in the Operations dimension of their institution (Table 4.31). As seen in Table 4.32, over half of all four-year Public and Private Non-Profit HEIs have a sustainable waste management system, conserve water and energy on campus, promote eco-conscious transportation, and/or have an on-site vegetable garden. Colleges and universities can save money or even profit from integrating sustainability into their facilities and operations and provide the most tangible results that can be audited.
Table 4.31: Number and proportion of HEIs with at least one variable within Big Six Dimensions of Higher Education.

<table>
<thead>
<tr>
<th>The Big Six Dimensions of Higher Education</th>
<th>HEIs with at least one variable within dimension (#)</th>
<th>HEIs with at least one variable within dimension (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Campus Engagement</td>
<td>1,067</td>
<td>92.5%</td>
</tr>
<tr>
<td>Education/Curriculum</td>
<td>1,061</td>
<td>92.0%</td>
</tr>
<tr>
<td>Operations</td>
<td>997</td>
<td>86.5%</td>
</tr>
<tr>
<td>Research</td>
<td>767</td>
<td>66.5%</td>
</tr>
<tr>
<td>Outreach and Services</td>
<td>686</td>
<td>59.5%</td>
</tr>
<tr>
<td>Assessment Reporting</td>
<td>255</td>
<td>22.1%</td>
</tr>
<tr>
<td><strong>Total number of sustainable institutions</strong></td>
<td><strong>1,153</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>

Table 4.32: Operation variable questions from sustainability web assessment tool (SWAT).

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Total institutions meeting these criteria</th>
<th>Proportion of institutions meeting these criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Institutions</td>
<td>1,153</td>
<td>100.0%</td>
</tr>
<tr>
<td>Is there a recycling/waste management program on campus?</td>
<td>846</td>
<td>73.4%</td>
</tr>
<tr>
<td>(This excludes composting)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are there sustainable energy initiatives on campus?</td>
<td>810</td>
<td>70.3%</td>
</tr>
<tr>
<td>Is/Are there environmentally sustainable dining service(s)?</td>
<td>757</td>
<td>65.6%</td>
</tr>
<tr>
<td>Are there LEED or eco-friendly buildings on campus?</td>
<td>702</td>
<td>60.9%</td>
</tr>
<tr>
<td>Does the HEI promote eco-conscious transportation</td>
<td>659</td>
<td>57.2%</td>
</tr>
<tr>
<td>(carpool/bus/bike/walking?)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is there a water conservation effort on campus?</td>
<td>652</td>
<td>56.6%</td>
</tr>
<tr>
<td>Is there a transit program on-campus? * Free or discounted bus passes to students/faculty/staff?</td>
<td>601</td>
<td>52.1%</td>
</tr>
<tr>
<td>Does the HEI have a vegetable garden?</td>
<td>592</td>
<td>51.3%</td>
</tr>
<tr>
<td>Does the HEI have sustainable landscaping program (native landscaping/drought-tolerant landscaping)?</td>
<td>549</td>
<td>47.6%</td>
</tr>
<tr>
<td>Bike Rental or Sharing program?</td>
<td>540</td>
<td>46.8%</td>
</tr>
<tr>
<td>Composting on campus?</td>
<td>478</td>
<td>41.5%</td>
</tr>
<tr>
<td>Electric Car Fleet and/or charging station?</td>
<td>339</td>
<td>29.4%</td>
</tr>
<tr>
<td>Is there an on-campus apiary?</td>
<td>289</td>
<td>25.1%</td>
</tr>
<tr>
<td>Is the Dining Services page titled “What We’re Doing on Campus?”</td>
<td>130</td>
<td>11.3%</td>
</tr>
</tbody>
</table>
**Sustainable Waste Management**

In 2017, Americans generated an average of 4.51 pounds of waste per day (Cho 2020). Of the 267.8 million tons of municipal solid waste generated by Americans that year, only 94.2 million tons were recycled or composted (EPA 2018; Cho 2020). What items end up in recycling bins often end up not being recycled due to contamination (Cho 2020). With a federal recycling program absent in the United States, recycling decision-making is currently in the hands of American communities and large institutions like universities (Cho 2020).

Because they feed and house students and other stakeholders, maintain grounds, and operate multiple offices and facilities, HEIs are like small towns in that they produce large volumes of waste. Members of the Columbia University Greens found that each college student on average produces 640 pounds of solid waste each year and estimated that college students in the United States alone contribute over 200 million tons of waste in a year (Snipes et al 2010; Baxter 2020). Waste prevention is cited as one of the first ways American colleges and universities implemented sustainable development into their practices (Bluestone 1995). Its long establishment among U.S. HEIs may be the reason recycling is one of the most common forms of sustainability communicated through their websites (Bluestone 1995). Over three-quarters (73.5%) of U.S. Public and Private Non-Profit webpages listed sustainable waste management on their webpages, mostly as recycling (Appendix F and Table 4.32).

Recycling reduces what ends up in landfills, decreases air and water pollution, and conserves natural resources and energy (Stanford University 2021). Through
recycling, Stanford University reduces greenhouse gas emissions by approximately 2,447 metric tons of carbon equivalent, which is analogous to 12,131 barrels of oil or taking 1,889 cars off the road each year (Stanford University 2021). In addition to benefiting the environment and future generations, recycling can also save HEIs money. HEIs can save and even make money by reducing waste and trash pick-ups. For example, the Waste Reduction and Recycling (WRR) office at North Carolina State University makes $104,565 and avoids landfill fees of $136,400 by recycling 1,860 tons of material each year (Davis 2011).

I found some HEI sustainable waste management incentives as part of comprehensive campaigns while others were isolated initiatives in bookstores or cafeterias. Offices, classrooms, and photocopying centers offer abundant opportunities for reducing waste. For example, office surplus supplies and exchange programs like those at Washington University in St. Louis and the University of Oregon make surplus office supplies accessible to staff and faculty and save over $15,000 each year in office supply costs (Washington University 2020; University of Oregon 2021). University bookstores like the one at Paul Smith College do not offer free plastic shopping bags but instead sell reusable canvas bags for $2.00. Canvas bags eliminate the need for more than 50,000 plastic bags each year, reducing pressure on local landfills and saving Paul Smith College money (Rion 2020).

**Analysis of Institutions with Sustainable Waste Management.** As shown in Table 4.33, the average revenue of HEIs with a sustainable waste management effort on their website is $377,155,615 higher and has a student population two times larger than
those who do not. Over half (51.0%) of these HEIs with sustainable management programs are located in city settings while 4% are in rural regions (Figure 4.16). Kreiger and others (2013) found that recycling rates lessen in low-population density, rural, and relatively isolated communities because of the distance between them and recycling centers. Such distances make recycling difficult as well as both economically and energetically inefficient (Kreiger et al. 2013).

Figure 4.17 shows that the majority of HEIs practicing sustainable waste management are located in the Northeast, although states like Iowa and Kentucky also have high percentages of sustainable HEIs with sustainable waste programs. Many of these states also have well-established curbside recycling systems and deposit return systems (DRS) (Edwards and Grushack 2020, 20). Deposit Return Systems (DRS), commonly known as “bottle bills”, place a small, fully refundable deposit (a nickel or a dime) for beverage containers (Edwards and Grushack 2020, 20).
Table 4.33: Revenue and student population of HEIs with and without sustainable waste programs.

<table>
<thead>
<tr>
<th>Summary Statistics</th>
<th>All sustainable HEIs</th>
<th>HEIs with sustainable waste management</th>
<th>HEIs without sustainable waste management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of sustainable HEIs</td>
<td>1,153</td>
<td>846</td>
<td>307</td>
</tr>
<tr>
<td>Average, total revenue</td>
<td>$439,436,742</td>
<td>$539,858,923</td>
<td>$162,703,308</td>
</tr>
<tr>
<td>Average student population</td>
<td>8,394</td>
<td>9,776</td>
<td>4,586</td>
</tr>
</tbody>
</table>

Figure 4.16: Distribution of HEIs with sustainable waste management programs compared with all 1,153 sustainable HEIs.
Figure 4.17: Geographic distribution of HEIs practicing sustainable waste management.
Implementing and Branding Campus Sustainable Waste Management. For those interested in starting their own sustainable campus waste program, CleanRiver (2021) suggests first conducting a waste audit to see the volume and type of waste that is generated on campus. CleanRiver is an international recycling firm that has consulted for companies like Google, Tesla, and HEIs like Bentley University. The team explains that waste audits provide HEI stakeholders with a snapshot of campus waste and creates starting point for setting attainable diversion rate goals (CleanRiver 2021). Branding encourages students and other stakeholders to take ownership of their campus and its recycling program and engaging in sustainable waste management efforts. Trash and recycling are tangible ways for HEIs to communicate their commitment to sustainability (Montaya 2021).

Composting

I separated composting from recycling and other sustainable waste management programs because they are different processes and often occur in separate places on campus. Recycling collection often occurs in campus buildings and is then taken off-campus for processing, while composting occurs outside in gardens and campus landscaping. Compost collection can occur within dining facilities or on a small-scale within campus offices and student residential living. Wherever it is occurring on U.S. campuses, composting is good for the environment and society, as well as the image of those universities practicing it.

Food waste accounts for the largest landfill deposit, with over 35 million tons of food (equating to $100 billion) being wasted each year. HEIs in the United States are
responsible for approximately 3.6 million tons of that food waste (Merrow et al. 2012; Luecke 2015, 1). Food waste has negative economic and environmental consequences (Merrow et al. 2012, 5). Rotting food in landfills produces methane (CH4), the second most prevalent greenhouse gas in the United States (EPA 2014b; Luecke 2015). Composting offers a solution to keep organic material out of landfills by breaking it down to a form that can be reused (University of Rochester 2021). HEIs like St John’s University, the University of Maryland, and the University of Mississippi have adopted composting and refer to it as part of their sustainability branding on their websites.

Most composting systems found on HEI websites are small garden compost beds or barrels paid for by grants or garden fees. Some institutions like the University of Rochester and the University of Wisconsin at Madison composted on a large scale through collaboration with external partners. In 2020, the University of Rochester collaborated with Waste Management (WM) to pilot a new local compost operation that only composted material from the university. Waste Management collected 2.2 tons of food waste per week with a total of nearly 27 tons collected between August and December (University of Rochester 2021).

It is important to remember that this research is based solely on HEI webpages. Composting may be present on college campuses, but just not communicated to the public. In 2018, the Association for the Advancement of Sustainability in Higher Education (AASHE) STARS program identified 753 U.S. programs, with 351 campuses self-identifying that they were composting (Kirchoff 2019, 1). These numbers show that many HEIs do not self-identify with composting and are not advertising their efforts.
website. Like recycling, HEIs can communicate that helping the environment and society is part of the institution’s values.

**Energy Conservation**

Campus sustainable energy initiatives are the third most common sustainability variable found on sustainable colleges and university webpages. Over half (67.7%) of sustainable Public and Private Non-Profit HEIs have some form of sustainability energy initiative listed on their webpage (Table 4.32). These numbers are hopeful since over two-thirds of the energy we currently consume in the U.S. is wasted (Van Geet et al. 2018). American colleges and universities consume high amounts of energy, spending six to seven billion dollars annually on energy and utilities (Lo 2013; Van Geet et al. 2018; Electric Choice 2020). American HEIs spend an average of $1.10 per square foot on electricity and 18¢ per square foot on natural gas annually, with campus buildings with dimensions around 50,000 square feet consuming more than $100,000 worth of energy each year (Energy Star 2020). Not only do these numbers represent a significant financial expense, but building energy usage is one of the largest sources of campus greenhouse gas emissions (Energy Star 2020). Becoming more energy efficient saves HEIs money, reduces their carbon footprint, and exhibits environmental leadership (Energy Star 2020).

Energy efficiency is an important issue for HEIs to address in order to become more environmentally and financially sustainable (Jomoah et al. 2013; Energy Star 2020). Higher education institutions in the United States (and across the world) share a common goal of making their campuses more energy efficient. Improved energy
efficiency can cut overall energy use up to 60 percent (Environment American 2021). Opportunities for improved efficiency are enormous (Department of Energy 2015). Energy efficiency measures are the economical way to meet energy needs and reduce associated emissions (Van Geet et al. 2018). Many universities and colleges in America are doing everything from investing in solar panels and other green technology to making low-cost adjustments such as switching to LED light bulbs and installing motion sensor lights to conserve energy (Electric Choice 2021). Energy conservation on college campuses happens within campus buildings, on top of those buildings, and across college campus landscapes.

**Energy Efficient Campus Buildings.** Buildings contribute to about 33% of total energy consumption and are a main source for worldwide CO₂ emissions (Tan et al. 2016). Campus buildings consume more than four-fifths of the energy used by universities in the United States (Environment America 2021). Many university buildings are outdated and not designed to be energy efficient. Existing systems and components play an important role in the overall energy performance of institutional buildings (Ruparathna et al. 2016). Mechanical systems, lighting systems, building envelopes, and heating, ventilation, and air-conditioning (HVAC) consume a great deal of energy (Tan et al. 2016). HEIs can achieve up to 25% of savings if they replace these systems with up-to-date energy efficient models and use them appropriately (Ruparathna et al. 2016).

HEIs like Aquinas College in Michigan and the University of Wisconsin – Oshkosh have dramatically reduced energy costs by simply adopting LED lights. Other HEIs like the University of Maryland have saved money by installing occupancy sensors,
daylight sensors, and smart breakers in their campus buildings. To create a more eco-friendly and economical building envelope, researchers call for the use of new materials and better insulation when making renovations (Ruparathna et al. 2016; Wang et al. 2018). Innovations like ventilated double skin façade, glazing, and shading systems can improve the thermal performance of building and reduce heat gain or loss depending on the season (Ruparathna et al. 2016).

Besides technological updates and innovations, energy conservation in campus buildings can occur through stakeholder engagement. HEIs like Tufts University and the University of Vermont engage students and other stakeholders by hosting lightbulb exchanges and a month-long dormitory energy competition called *Do It in the Dark* (Vermont Cynic 2006). HEIs like the University of Montana provide brochures on their websites listing ways stakeholders can save electricity in the classroom, offices, and dorms.

*Powering Colleges Campuses - Green Energy Initiatives on College Campuses*

Solar, wind, geothermal, hydro, bioenergy, and other clean energy sources are efficient, pollution-free, virtually inexhaustible, safer, and abundant depending on the resource and HEI location (Environment America 2021). Clean energy technology is good for the health of the planet and its inhabitants, and is often economical (University of Florida 2021b).

Green energy can help reduce pollution dramatically. In 2016, wind energy across the U.S. achieved greenhouse gas emission reductions equivalent to taking 33.7 million cars off the road, which is more than all the cars in California, Texas and Florida.
combined (Environment America 2021c). The two utility-grade wind turbines owned by Carleton College of Northfield, Minnesota supply 55 to 70 percent of the college’s electricity demand and reduces carbon dioxide emissions equivalent to those produced by almost 1,400 passenger vehicles. MIT is eliminating 17 percent of its carbon emissions by purchasing 73% of university power from a 650-acre, 60-megawatt solar farm. Its long-term goal is to reduce its greenhouse gas emissions by at least 32% by 2030 (Michigan Institute of Technology 2021).

**Education and Research Benefits.** Green energy provides research and educational opportunities for faculty and students (Environment America 2021). Engineering programs based on clean energy create pre-professional learning opportunities for students in design, production, and management of on-campus solar farms (Environment America 2021). As leaders in research and innovation, universities and colleges have played an important role in solar energy technology innovation ever since the University of Delaware established the world’s first laboratory dedicated to photovoltaic research and development in 1972 (Environment America 2021). Higher education institutions like Arizona State University and Pennsylvania State University are researching and prototyping the next generation of solar technology and including students in these research activities. In 2016, Arizona State University (2021b) produced more solar energy than any other HEI in the country, enough to meet nearly half of its peak daytime energy demand and avoid carbon dioxide emissions equivalent to the annual emissions of nearly 5,000 cars (Environment America 2021). Arizona State University has deployed solar panels and solar heating systems at 89 locations on its four
campuses and its research park as part of its Solarization Initiative (Arizona State University 2021b). At Carleton College, students from various disciplines participate in learning and researching their wind turbines. Students have studied everything from wind speeds to energy generation to the impacts wind turbines have on birds and bats to the corrosive impacts of salty coastal air, important for advancing understanding of offshore wind turbines (Carleton College 2021).

**Monetary Benefits.** In addition to reducing pollution, clean energy can save HEIs money. HEIs can achieve up to 25% of savings by improving their buildings’ energy performance, and clean energy technology can increase these savings (Department of Energy 2015; Ruparathna et al. 2016). HEIs like Guilford College and the University of Arkansas at Fayetteville are using solar-water-heaters to reduce the conventional energy needed to supply hot water by 40% to 80% and energy costs by more than 50% (Gumerman et al. 2012, 1). The University of Arkansas at Fayetteville saves over $10,000 per year by simply heating their indoor Olympic-sized swimming pool throughout the year (University of Arkansas 2010). A 1,920-square-foot solar hot water array of 48 solar panels on the roof of the Health, Physical Education and Recreation Building heats the 730,000-gallon pool (University of Arkansas 2010).

Clean energy can be cost-effective, but it often requires a large initial investment (Environment America 2021; NREL 2021). Many perceive installing solar or wind energy technology as expensive. In fact, solar installation prices have decreased dramatically (70%) since 2010. Onshore wind energy prices have dropped by 90 percent
since the 1980s and is now often cheaper than energy from fossil fuels, especially when accounting for tax incentives (Environment America 2021c).

Colleges and universities fund campus green initiatives in various ways. Students can raise enough money to install and manage green energy projects, as did the student body of Northwestern University in 2011 to pay for solar panels (Fellman 2011). Grants and other funding opportunities are also available (Fellman 2011). In 2004, Carleton College became the first college in the U.S. to own an active utility-grade wind turbine, located 1.5 miles east of campus, and added a second turbine in 2011 (Carleton College 2021). A $150,000 grant from the Minnesota Department of Commerce funded the first turbine of Carleton College while the second turbine was gifted by two environmentally minded alumni (Carleton College 2021). Carleton College sold their electricity and renewable energy credits to the local utility for the first 10 years until 2014, making the turbines sources of revenue for the college.

If an HEI cannot make a financial commitment to installing clean energy on campus, it can directly purchase energy from producers and/or partner with other HEIs or their local communities to invest in regional clean-energy power plants (NREL 2020). Those with limited space or financial restrictions can opt to purchase renewable energy generated off-site. HEIs can enter into power purchase agreements with utility companies to install green-energy technology on campus without upfront capital costs (Environment America 2021c; NREL 2021). Such procurements require no upfront costs and can generate long-term cost savings (Environment America 2021c). They also provide a fixed price over a long contract term (typically 20 years), thus offering protection from volatile energy prices (Environment America 2021c). Some states allow Net Metering Credit
Purchase Agreements (NMAs) so HEIs can purchase net metering credits from a renewable energy producer. NMAs help offset carbon emissions and finance renewable energy projects (Environment America 2021c).

**Microgrids and Energy Storage.** Some U.S. universities and colleges are installing microgrids and energy storage systems on campus to achieve climate goals. Microgrids are self-contained electric grids that can operate as an *island* independent of the central power grid allowing campuses to keep the lights on even if there is an outage on the main grid (Environment America 2021d) the already self-contained nature of many campuses makes colleges’ perfect candidates for developing microgrids. Microgrids can continue to function even during central grid outages. This resiliency can be an important benefit to colleges concerned about power outages affecting the function of their research labs (Environment America 2021d). After universities like State University of New York (SUNY) - New Paltz, Princeton, Rutgers University lost power during Hurricane Sandy, many HEIs are motivated to secure their campus power supply to be more resilient in the face of central grid power outages (SUNY New Paltz 2018).

**The Role of Place in Green Energy Incentives.** The type of clean energy technology an HEI adopts often is based on its location (Fthenakis et al. 2009). HEI campuses such as the University of Delaware, Carleton College, the University of Massachusetts, and Saint Francis University in Pennsylvania are uniquely suited to host wind energy on campus. Such institutions are well-located for the installation of full-scale turbines in open fields or micro-turbines on rooftops (Environment America 2021c).
The United States, especially the Southwest and Southeast regions, is endowed with a vast solar resource (Fthenakis et al. 2009, 8; Gumerman et al. 2012, 1). There is at least 250,000 square miles of land suitable for constructing solar power plants in the Southwest alone, and a large percentage of that is public land (Fthenakis et al. 2009, 8). Southeastern HEIs like the University of Arkansas at Fayetteville and Guilford College in Greensboro, North Carolina use the sun’s rays to heat their solar water heaters. Guilford College produce more than 9,000 gallons of hot water each day using 200 panels (Guilford 2021). Though there are regions where the resource is more abundant, all 50 states have the potential to generate more solar power than is currently needed (Environment America 2014).

Colleges and universities in favorable areas, particularly in the West, can take advantage of geothermal resources (Snelling et al. 2017). A benefit of geothermal energy is that unlike solar or wind energy, geothermal energy is not dependent on weather conditions (Snelling et al). The Oregon Institute of Technology (Klamath Falls, Oregon) implemented geothermal heating in the 1960s, far ahead of its time (Braulick et al. 2020). The Oregon Institute of Technology actually moved its campus to take advantage of geothermal resources since that part of Oregon has a fault system that produces an unusual amount of geothermal energy (Braulick et al. 2020). Today the Oregon Institute of Technology heats 12 buildings using geothermal sources on campus, saving around one million dollars a year in heating costs (Braulick et al. 2020).

Further expansions are in the works that, when implemented, will make the institution the first campus in the world to supply all its heating and electrical energy from a geothermal resource directly under campus (Braulick et al. 2020).
College in New Jersey, Allegheny College in Pennsylvania completed the construction of their first geothermal system in 2006 (Braulick et al. 2020). The institution estimate that the school will recover the costs of the installation within 4 to 6 years from natural gas savings (Braulick et al. 2020). The National Renewable Energy Laboratory (NREL) provides a map of potential geothermal resources in the United States and areas ideal for the development of enhanced geothermal systems (NREL 2020).

**Analysis of Sustainable Institutions with Energy Conservation Initiatives.** As seen in Table 4.33, the average revenue of HEIs that listed energy initiatives on their webpage is higher than the average revenue of sustainable HEIs that did not illustrate the relationship between revenue and sustainable development among U.S. higher education institutions. When I compared my map (Figure 4.18) with Database of State Incentives for Renewables & Efficiency® (DSIRE 2021) maps showing energy policies and incentive by state, I found that the states with the highest frequency and percentage of HEIs with sustainable energy efforts were the ones with the most policies and incentives. While many HEIs focus on improving established green energy initiatives like solar and wind.
Table 4.34: Comparison of all sustainable higher education institutions and those with energy conservation efforts.

<table>
<thead>
<tr>
<th></th>
<th>All sustainable HEIs</th>
<th>Sustainable HEIs with energy conservation efforts</th>
</tr>
</thead>
<tbody>
<tr>
<td>HEIs (#)</td>
<td>1,153</td>
<td>810</td>
</tr>
<tr>
<td>Average total revenue</td>
<td>$439,436,742</td>
<td>$560,554,003</td>
</tr>
<tr>
<td>Average student population</td>
<td>8,394</td>
<td>9,994</td>
</tr>
</tbody>
</table>
Figure 4.18: Geographic distribution of higher education institutions with sustainability energy efforts.
California, Texas, Rhode Island, and New York have the highest numbers of HEIs with energy conservation efforts. Over 80% of the HEIs in Minnesota and Illinois advertise sustainable energy through their webpages. Maps found in the DSIRE Policies and Incentives by State (2021) and Energy Sage (2020) reports reveal that California, Texas, and Minnesota have the highest number of policies and incentives. According to a study by Proudlove and colleagues (2019, 7), California, New York, Rhode Island, Michigan, Virginia, and Arizona had 10 or more Solar Policy and Rate Design Actions in 2019.

**Sustainable Dining Services**

Many universities are paying attention to their campus dining facilities’ role in sustainability to reduce their ecological footprints. Over half (65.7%) of HEIs have a sustainability dining initiative listed on their website (Appendix F). Dining facilities are part of campus ecological footprints and arguably have the most room for influence since they consume up to five times more water, energy, and waste than all other buildings on campus (Curry 2008; as cited by Babich and Smith 2010, 182). Students, administrators, and staff come together in cafeterias and other campus dining facilities. These stakeholders are increasingly becoming more interested in knowing who grew their food and how far it traveled before reaching the dining hall.

College and university dining services (CUDS) can operate more sustainably in a variety of ways, and some schools have begun to explore these new initiatives by providing funds specifically for sustainability projects (Chen 2010, 5; Berg 2013, 2). Popular areas of focus include equipment upgrades in the kitchen, trayless dining,
reusable cups and containers, campus or community gardens, composting, and streamlining existing campus recycling operations such as by converting campus vehicles to run on used vegetable oil from the dining hall (Chen et al. 2011, 3). Sustainable kitchen can reduce food, water, energy, organic and non-organic waste, and the subsequent costs (Sarjahani et al. 2009; Babich and Smith 2010, 182). Research shows that these types of projects have quantifiable resource and cost savings and relatively short payback periods (Berg 2013, 1).

While engaging with the campus community is not always the primary focus of dining services, they can encourage behavior changes in staff and students. Outreach efforts such as posters or flyers can help explain programs including trayless dining or a new composting system, producing both reductions in resource use and increased campus awareness of sustainability initiatives. Though the following initiatives vary in scale, they all share the common goal of reducing operating costs through adopting more sustainable practices (Berg 2013).

College and university dining services (CUDS) that include a more social aspect of sustainability included healthy food choices and teaching students good eating habits (Strohbehn and Gregoire 2004). HEI webpages dedicated to sustainable dining include a variety of initiatives such as promoting locally grown food, organic, cage free, certified human raised and handled, grass fed, fair-trade certified, domestic rainforest alliance certified, protected harvest certified, shade-grown bird-friendly coffee, marine stewardship council products (Barlett 2011). Others promoted lists of best choices or good alternatives such as seafood watch guides or co-op or profit-sharing information while a few advertised social responsibility policies (Barlett 2011).
**What We (Aramark) Are Doing On Campus.** Of the 757 (65.7%) HEIs that had a sustainability dining initiative listed on their website, 17.1% advertised them through the Aramark sustainable dining webpage template like the ones in Figure 4.19, Figure 4.20, and Figure 4.21. The Aramark Higher Education Green Thread program provides a template to HEIs like the College of Charleston, University of Tennessee – Knoxville, and University of South Florida. As I was conducting my web assessments, I began seeing the webpages like the one shown in Figure 4.19 titled *What We’re Doing On Campus*. Upon further investigation, I found that these pages are a template from Aramark’s Green Thread™ Environmental Sustainability Platform (Aramark 2016).

Green Thread reinforces Aramark’s commitment to reducing food waste and decreasing the overall cost of waste both environmentally and financially. The goal of the platform is to minimize waste before it is generated by ensuring that 100% of its locations implement Aramark’s food management practices and accurately track food waste (Aramark 2016). Peggy Barlett (2011, 107) points out that Aramark is one of three big food service corporations that have adopted sustainability to gain a competitive edge. Sodexo, another large food provider, provides a template similar to Aramark’s. Unlike Green Thread whose pages are almost identical, universities seemed to be able to personalize their Sodexo templates (Figure 4.22 and Figure 4.23),
Table 4.35: Number and percentage of higher education institutions with at least one form of sustainable dining listed on their website.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Total institutions meeting these criteria</th>
<th>Proportion of institutions meeting these criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is/Are there environmentally sustainable dining service(s)?</td>
<td>757</td>
<td>65.65%</td>
</tr>
<tr>
<td>Is the Dining Services page titled “What We’re Doing on Campus?”</td>
<td>130</td>
<td>11.27%</td>
</tr>
<tr>
<td>Total institutions</td>
<td>1,153</td>
<td>100.00%</td>
</tr>
</tbody>
</table>

Figure 4.19: The Aramark Green What We’re Doing on Campus webpage shown on the University of the Ozarks website.
Figure 4.20: The Aramark Green Thread Platform What We’re Doing on Campus template found on the University of Mississippi website.

Figure 4.21: The Aramark Green Thread Platform What We’re Doing on Campus template found on the University of South Florida website.
Figure 4.22: The University of Maine sustainability webpage provided by Sodexo (Sodexo My Way 2021).
Figure 4.23: The University of Denver sustainability webpage provided by Sodexo (The University of Delaware 2021).
While I was writing this dissertation, I revisited the webpages of HEIs like the University of the Ozarks and the University of South Florida to find that their Green Thread pages were almost identical to those from two years before (Figure 4.29 and Figure 4.30). I cannot confirm the same for Sodexo though I did see Figure 4.24’s template multiple times while assessing HEI webpages in 2019. From this, I gather that HEIs that have these web templates are not making progress in terms of sustainability or they are at least not communicating them through the templates provided by their food suppliers.

\textit{Eco-Friendly Buildings}

University stakeholders tend to spend the majority of their time in campus buildings. While these spaces are learning space where sustainability can be taught inside and outside of the curriculum, they can also be consumers of energy and natural resources. Sixty percent of the sustainable \textit{Four-Year Public} and \textit{Four-Year Private Non-Profit} HEIs I assessed listed green building designs on their sustainability webpages (Appendix F). The World Green Building Council WGBC 2020, n.p.) defines a green building as “a building that, in its design, construction or operation, reduces or eliminates negative impacts and can create positive impacts on our climate and natural environment.” They “preserve precious natural resources and improve our quality of life (WGBC 2020, n.p.).” The goal of green building design is to reduce CO2 emissions, energy use, and water use while creating an atmosphere where students can be healthy and learn (USGBC 2020). Universities across the country are building to green standards set forth by the United States Green Building Council (USGBC), a non-profit
organization that promotes sustainability in how buildings are designed and built. The organization created the Leadership in Energy and Environmental Design (LEED) rating system, which is a certification process that provides verification that a building is environmentally sustainable. Green buildings, like those that are LEED certified, are a global solution for college campus communities (USGBC 2020). Many, but not all, of these buildings were LEED-certified.

All HEIs that list green buildings on their websites also advertise their energy conservation efforts. Since most of their energy comes directly or indirectly from fossil fuels, the buildings sector accounts for about 76% of electricity use and 40% of global energy-related CO2 and associated greenhouse gas (GHG) emissions (Department of Energy 2015; USGBC 2020). As with energy conservation efforts, greening buildings require additional upfront costs compared to traditional buildings, many institutions receive financial assistance through tax benefits and incentives provided by federal, state, and local governments. All HEIs that listed green buildings on their websites also advertised their energy conservation efforts. Since most of their energy comes directly or indirectly from fossil fuels, the buildings sector accounts for about 76% of electricity use and 40% of global energy-related CO2 and associated greenhouse gas (GHG) emissions (Department of Energy 2015; USGBC 2020). As with energy conservation efforts, greening buildings require additional upfront costs in comparison to traditional buildings, many institutions receive financial assistance through tax benefits and incentives provided by federal, state, and local governments as well as non-profit organizations (EPA 2016). Incentives include expedited building permits, tax credits, grants, and reduction or waivers of fees.
Green buildings also have long-term environmental and economic advantages (USGBC 2015). According to USGBC, green building owners report a return on investment for existing buildings of 19.2% and 9.9% for new buildings (LB&B Associates Inc. 2018). Operating costs for green buildings significantly cheaper than conventional buildings (McGraw Hill Construction 2012; as cited by USGBC 2015). With green buildings consuming 25% less energy and 11% less water than non-LEED-complaint buildings, they have a higher return on investment than traditional buildings (Fowler et al. 2011; LB&B Associates Inc. 2018). Green buildings also make businesses including HEIs more attractive to their consumers. According to the USGBC report titled *The Business Case for Green Building*, 61% of corporate leaders believe that sustainability leads to market differentiation and improved financial performance (Hill 2011; as cited by USGBC 2015).

LEED-certified buildings use 25% less energy and cost 19% less in aggregate operational costs than conventional buildings (GSA 2011; as cited by USGBC 2015). The University of Hawaii saved $3.4 million in 2014 alone based on its efforts at reducing energy usage through its LEED certified buildings (Gill 2015; as cited by USGBC 2015). With many universities lacking funding, this kind of savings could dramatically help their annual budget. By focusing on efficient systems including maintenance systems that produce low emissions, there are cost savings attached. Green buildings following LEED standards produce 34.0% less CO₂, keeping the air clean and cutting costs (LB&B Associates Inc. 2018).

Along with being cost effective, green building and architecture has been proven to increase productivity and employee satisfaction (USGBC 2015). Scholars have found
that LEED lighting designs decrease employee headaches, improve mental and physical health, and increase productivity (USGBC 2015). In 2015, 55% of businesses in the United States rated greater health and well-being as their top social reasons for building green (tied with encouraging sustainable business practices) - up from only 29% in 2008 (USGBC 2015). A McGraw-Hill 2013 survey cited increased employee health and worker productivity as the two most important social reasons to build green in every international market to participate in the survey (as cited by USGBC 2015).

Recent scholarly research into the effects of LEED certification on 562 financial institutions (93 LEED certified and 469 non-certified) found that the “annual utilities cost per employee in green facilities was $675.26 lower than in non-green facilities (USGBC 2015). Not only did utilities cost lower for these financial institutions, but those who worked in LEED-certified branches were found to be more productive and engaged in their work (Conlon and Glavas 2012; as cited by USGBC 2015). This finding coincides with a behavioral study whose results demonstrated that companies which adopt more rigorous environmental standards are associated with higher labor productivity—an average of 16% higher--than non-green firms (Delmas et al. 2012; as cited by USGBC 2015). This productivity not only benefits the faculty and staff of colleges and universities, but more importantly, the students by creating better environments to study in.

Lastly, a benefit of having green buildings on university and college campuses is that it provides a highly visible example of how the university is environmentally sustainable. As stated in Chapter One of this dissertation, students are becoming increasingly aware of and concerned about environmental issues. These students are
Looking to attend higher education institutions that are motivated to reduce their environmental impact. Web pages dedicated to sustainability-focused operation typically had a section committed to green or LEED buildings and their benefits. These pages often listed campus green buildings along with a brief history and features. Some HEIs describe how they incorporated sustainability goals into their campus planning and construction, current and future projects, and the successes of past projects. Harvard University has developed their own Green Building Standards that can be found on its website.

**Living in Buildings: A Form of Campus Engagement.** Some HEIs are integrating sustainability into student residential life. While this may only mean having residential buildings LEED certified, some like the University of Michigan, Berea College, North Carolina State University, and University of Missouri are immersing students into sustainability by creating sustainability-themed communities, eco-villages, or living laboratories. The Sustainable Living Experience (SLE) Theme Community at the University of Michigan provides students with a residential experience and community rooted in experiential learning and community engagement related to sustainability. The Ecovillage on the campus of Berea College in Kentucky is an ecologically sustainable residential and learning complex designed to meet housing needs for student families, childcare for campus children, and provide a living/labor opportunity for students interested in sustainability. The complex includes 50 apartments, a state-of-the-art Child Development Laboratory (CDL), a Commons House, and a Sustainability and Environmental Studies (SENS) demonstration house.
Key features of the Ecovillage apartments include solar tubes and compact fluorescent lighting, low-flow toilets and showerheads, low-VOC carpets and paints, ceiling fans, and outdoor clotheslines for drying clothes. In additional to individual garden plots for each apartment, the Ecovillage also includes several raised garden beds and a permaculture “food forest” for the use of all residents. It provides ecological and socially conscious sustainable housing for student families and childcare for their children. The college provides a brochure for the village on their website.

**Sustainable Transportation**

Of the 1,153 sustainable *Four-Year Public* and *Four-Year Private Non-Profit* HEIs I assessed, 659 (57.2%) promote eco-conscious sustainable transportation either through the promotion of carpooling, walking, or biking, ridesharing, having a transit program, having charging stations on campus, or discouraging the use of single-occupancy cars by passing on the full costs of parking to drivers (Table 4.36). Transportation accounts for 30% of energy demand in the U.S. and surpassed electricity generation as the leading source of greenhouse gas emissions in the United States in 2016 (EPA 2017; as cited by Triantafyllidis 2018, 1).
Table 4.36: Number and percentage of HEIs with sustainable transportation efforts on college campuses.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Total institutions meeting these criteria</th>
<th>Proportion of institutions meeting these criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total institutions</td>
<td>1,153</td>
<td>100.00%</td>
</tr>
<tr>
<td>Does the HEI promote eco-conscious transportation (carpool/bus/bike/walking?)</td>
<td>659</td>
<td>57.16%</td>
</tr>
<tr>
<td>Is there a transit program on-campus? * Free or discounted bus passes to students/faculty/staff?</td>
<td>601</td>
<td>52.12%</td>
</tr>
<tr>
<td>Bike Rental or Sharing program?</td>
<td>540</td>
<td>46.83%</td>
</tr>
<tr>
<td>Electric Car Fleet and/or charging station?</td>
<td>339</td>
<td>29.40%</td>
</tr>
</tbody>
</table>
Many colleges and universities disregard the environmental effects of transportation in the past (Norton et al. 2007). While most campuses are designed to be pedestrian-friendly, they are situated in a society that encourages driving at every opportunity (Kaplan 2013). The auto-friendly culture of the United States pressures HEIs to build parking lots and roadways while neglecting non-motorized infrastructure such as bike lanes and sidewalks (Toor and Havlick 2004). Yet many colleges and universities have recognized the benefits of sustainable transportation and the roles they play in influencing travel behavior (Millard-Ball et al. 2004).

I have already established that HEIs shape the habits, not only of their inhabitants, but also their surrounding community (Larkham 2000). HEIs generate a large amount of the traffic in their communities and often are responsible for deciding how to use land and implement policies (Ellis 2003; Delmelle and Delmelle (2012). Since many colleges and universities have control over road networks, parking facilities, and land use on their campuses, they are in a position to experiment with and implement transportation policy changes that shift away from automobiles (Bond and Steiner 2006, 125). These policy changes can enhance the sustainability of the university transportation system and that of the surrounding community (Miller 2001; Bond and Steiner 2006, 126).

Many HEIs have worked to create a more sustainable transportation networks and implement transportation demand management (TDM) programs that attempt to stimulate non-automobile commuting (Bond and Steiner 2006, 126). One such institution is the University of Florida, a large public university that partnered with the local transit agency to provide viable alternatives to automobile commuting. In the
University of Florida case study, Bond and Steiner (2006, 126) observed that a combination of parking restriction, parking pricing, unlimited-access transit, and transit service improvements resulted in a substantial modal shift. In addition to creating cleaner and quieter campuses, sustainable transportation reduces the number of drivers on and around campus as well (Environment America 2017).

**Transit Systems Near and On College Campuses.** Transit systems are the most common form of sustainable transportation found on the websites of sustainable HEIs. The majority (91.2%) of HEIs that promote eco-conscious transportation do so through the promotion of public transportation or transit systems such as buses or trains. Some of these systems are small-scale and only transport students around campus, but the majority travel outside of campus. Some HEIs own and operate, but the majority collaborate with the surrounding city, suburb, or town’s public transportation system is common.

HEIs like the University of Kansas and University of Utah collaborate with transit agencies to provide innovative transit pass programs. The University of Utah provides a UTA Ed Pass to all students, faculty, and staff (University of Utah 2021). The pass includes unlimited transit access to UTA buses and trains in an effort to become a car-free campus. Many HEIs fund free transit passes through student fees or innovative partnerships with local municipalities. Transit pass programs like the one at the University of Utah decrease the need for parking, reduce college attendance costs, attract and retain students, provide students with access to housing and jobs, and increases transportation equity (Brown et al. 2001, 235; as cited by Balsas 2003, 37). The
University of Alabama has a parking garage where commuting students can park and ride the bus to get around the large campus. HEIs that offer free or discounted access to transit services, as well as shuttle bus and night-time transportation services, appeal to students who do not own a vehicle, making them more accessible to low-income students who cannot afford cars (Environment America 2017).

**Walking and Biking.** Walking and bicycling are complementary modes of transportation to get to and around colleges. A high percentage of students live on campus and more students, faculty, and staff live within reasonable walking and cycling distances. Less than half (46.8%) of sustainable colleges and university websites advertised their campus as being bike-friendly whether it was through a Bike-Share program, bike-friendly infrastructures such as tire-filling stations or bike-lanes, or a Bike Campus Award like the University of Arkansas’ webpage shown in Figure 4.29. Bicycles offer riders speed and flexibility over short distances, and they use less energy, produce no air or noise pollution, and take up little space (Tolley 1996). Bikes are also inexpensive and accessible to those who do not own a car (Tolley 1996, 215).
The League of American Bicyclists certified the University of Arkansas as a Bicycle-Friendly in 2016. In 2019 the U of A was given a gold rating. The League of American Bicyclists is a nationally recognized organization that bases its awards on the following 5 characteristics: Engineering, Education, Encouragement, Enforcement, and Evaluation.

- **Equity, Diversity, and Inclusion** - To truly achieve the vision of a Bicycle Friendly America for everyone, Equity, Diversity & Inclusion (EDI) are the essential lenses through which all other elements must be viewed.
- **Engineering** - Campus has made a significant investment in its bicycle facilities and has invested in making the streets around the campus bicycle friendly. Engineering standards meet the currently recognized safety standards and regular training is provided for staff.
- **Education** - Bicycling educational materials are provided to all students, staff, and faculty. Safety classes are offered on a regular basis and the campus actively promotes safe bicycling.
- **Enforcement** - Officers are familiar with laws relating to bicyclists and work with the bicycling community on campus to disseminate safety information to motorists and cyclists. Some officers are patrolling on bikes and provide safety outreach on-bike.
- **Evaluation** - A significant percentage of students, faculty and staff bike to campus more than twice a week. Goals have been set for campus-wide bike use.

**BIKE SHARE**

Figure 4.24: The University of Arkansas webpage dedicated to biking (University of Arkansas 2021).
Electric Vehicles on College Campuses. Like bikes, electric vehicles (EVs) are quiet, energy efficient, have zero emissions, and are kind to the environment (Hovet 2018). As EVs become more popular in the United States, more public spaces are installing EV charging stations (Hovet et al. 2018). Research on the introduction of EV charging stations has only begun, scholars already recognize college campuses as unique locations to promote the adoption of electric vehicles (Hovet et al 2018). They employee, home, and teach large populations, tend to embrace innovative technology, and provide needed space for the installation of EV charging stations. HEIs tend to have more access to grants, research awards, financial incentives, and other sources of funding that other organizations may not have access to (Villarreal 2020). They can also leverage outreach, advocate for improved policy, improve technology through research, housing charging infrastructure, and enhance marketing outreach.

Analysis of Where Sustainable Transportation is Occurring. As seen in Table 4.37 and Table 4.38, HEIs with sustainable transportation are located in cities and where revenue and student population is higher than areas outside of urban areas (Table 4.8). Scholars have cited external factors such as city, state, and federal policies and incentives play a key role in the presence of sustainable transportation efforts (Lutsey et al 2015; Farrell and Weinmann 2017). As seen in Table 4.44, 50% of
all sustainable HEIs that listed public transportation, bike-friendly initiatives, electric vehicle fleets and charging stations, carpooling, or other environmentally focused transportation efforts on their website are located in cities while only 5.6% are located in rural campus settings.
Table 4.37: Comparison of sustainable higher education institutions with and without sustainable transportation.

<table>
<thead>
<tr>
<th>Summary statistics</th>
<th>Sustainable HEIs (#)</th>
<th>Sustainable HEIs with a sustainable transportation program</th>
<th>Sustainable HEIs with NO sustainable transportation program</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sustainable HEIs (#)</td>
<td>1,153</td>
<td>659</td>
<td>494</td>
</tr>
<tr>
<td>Average revenue</td>
<td>$439,436,742</td>
<td>$628,746,815</td>
<td>$233,321,971</td>
</tr>
<tr>
<td>Average student population</td>
<td>8,394</td>
<td>11,161</td>
<td>5,381</td>
</tr>
</tbody>
</table>

Table 4.38: Campus settings of sustainable higher education institutions with and without sustainable transportation.

<table>
<thead>
<tr>
<th>Campus setting</th>
<th>Sustainable HEIs (#)</th>
<th>Sustainable HEIs (%)</th>
<th>Sustainable HEIs that promote sustainable transportation (#)</th>
<th>Sustainable HEIs that promote sustainable transportation (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>City</td>
<td>581</td>
<td>50.4%</td>
<td>344</td>
<td>52.2%</td>
</tr>
<tr>
<td>Suburb</td>
<td>277</td>
<td>24.0%</td>
<td>164</td>
<td>25.0%</td>
</tr>
<tr>
<td>Town</td>
<td>231</td>
<td>20.0%</td>
<td>129</td>
<td>19.6%</td>
</tr>
<tr>
<td>Rural</td>
<td>64</td>
<td>5.6%</td>
<td>22</td>
<td>3.3%</td>
</tr>
<tr>
<td>Total</td>
<td>1,153</td>
<td>100.0%</td>
<td>659</td>
<td>100.00%</td>
</tr>
</tbody>
</table>
Figure 4.25: Geographic distribution of higher education institutions with sustainable transportation efforts.
Nicholas Lutsey and others (2015) assessed leading electric vehicle promotion activities in United States cities and found that cities are leading in the electric vehicle market. The scholars cite cities as being a focal point for collaboration among governments, the EV industry, utilities, and advocacy (Lutsey et al. 2015, 42). Lutsey and colleagues (2015) also identify city, state, and federal policies and incentives as driving forces of electric vehicle usage. They found cities to have their own sustainable transportation incentives such as EV purchase subsidies, fee reductions, tax credits, rebates, parking benefits, and carpool lane access (Lutsey et al. 2015, 26-27).

The map in Error! Reference source not found. shows the geographic state-by-state distribution of sustainable HEIs with sustainable transportation programs. By comparing this map with that Office of Energy Efficiency and Renewable Energy (2015) showing state electric vehicle supply equipment (EVSE) incentives as of July 2015. Some states offer some form of direct and indirect incentives, as well as other regulatory, infrastructure, and utility policy actions to promote electric vehicles in the cities investigated in this study (Lutsey et al. 2015, 28).

Data and maps from the Office of Energy Efficiency and Renewable Energy (2015), the Institute for Local Self-Reliance (Farrell and Weinmann 2017), and the National Bureau of Economic Research (Holland et al. 2015) shed light on why states like Louisiana, Utah, California, and Texas have high numbers of HEIs with some form of sustainable transportation on campus. These states all have state or utility-sourced EV incentives (Farrell and Weinmann 2017). The state of California offers rebates and tax credits while Utah and Texas receive grants from their state government. (Office of Energy Efficiency and Renewable Energy 2015). Both Louisiana and Oklahoma stand
out among their neighbors, and are among the few states in the U.S. that have tax-credits and exemptions for driving an EV. Louisiana offers a 50% tax credit for the cost of electric charging equipment. Oklahoma, the neighbor of Texas and Louisiana, has a 75% tax credit for the cost of commercial charging infrastructure less than half of the HEIs in Oklahoma advertised sustainable transportation on their webpages (EIA 2021).

**Water Conservation**

Approximately half (56.5%) of all sustainable Public and Private Non-Profit HEIs identify at least one form of water conservation on their websites (Table 4.39). Drought and water shortages in regions around the globe have forced the improvement of water resources management and conservation efforts. States in the arid southwest, including Texas, have incorporated water conservation strategies into their state water plans to reduce demand during drought conditions (Zellner 2014, v). As small communities, campus buildings and landscapes consume a great deal of water. They are also home to some of the most innovative ideas for water conservation, water management technology, and conservation policies (Zellner 2014). Water conservation can be a powerful tool to promote sustainability on university campuses (Marinho et al.)
2013, 1). Other than resource and financial savings, it aims to support technological and behavior innovation towards a more balanced relationship between human activities and nature (Marinho et al. 2013, 1).
Table 4.39: Operation variables that relate to water conservation occurring on college campuses.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Total institutions meeting these criteria</th>
<th>Proportion of institutions meeting these criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total institutions</td>
<td>1,153</td>
<td>100.00%</td>
</tr>
<tr>
<td>Are there LEED or eco-friendly buildings on campus?</td>
<td>702</td>
<td>60.88%</td>
</tr>
<tr>
<td>Is there a water conservation effort on campus?</td>
<td>652</td>
<td>56.55%</td>
</tr>
<tr>
<td>Does the HEI have sustainable landscaping program (native landscaping/drought-tolerant landscaping)?</td>
<td>549</td>
<td>47.61%</td>
</tr>
</tbody>
</table>
California, Texas, Idaho, Florida, Colorado, Arkansas, New York, and Illinois are among the greatest consumers of water in the United States (USGS 2015). Most of the water withdrawn by California is for irrigation while Texas and Florida withdraw a large among of water for thermoelectric power. As seen in Error! Reference source not found., these states have a high frequency of HEIs that not only consume water, but offer a place for water conservation innovations. Approximately half (40.1–61.5%) of sustainable HEIs in California, Colorado, Montana, and Pennsylvania have some form of water conservation effort listed on their websites, and an even smaller percentage of sustainable HEIs in Florida and New York are communicating water conservation efforts through their webpages. Luckily, over 60% of the sustainable HEIs in Texas are conserving water in buildings on campus, through landscaping, education, and/or research.
Figure 4.26: Geographic distribution of higher education institutions with water conservation efforts.
Water Conservation in (and sometime on) Campus Buildings

To reduce the use of water in campus buildings, low flow showerheads, faucets, toilets, and urinals are standard practice for U.S. colleges (AASHE 2019). HEIs like the University of Wisconsin-Whitewater and Boston University use dual flush toilets to conserve water in campus restrooms. Dual-flush toilets allow direction flushing, one way for solid waste and one way for liquid waste, facilitating water conservation (Patterson 2019; University of Wisconsin-Whitewater 2021; Boston University 2021). In addition to low-flow and dual flush toilets, HEIs like Boston University are updating to sensor-based or auto-flush toilets. Boston University’s auto-flush toilets use 1.5 gallons of water, are more sanitary because they do not have handles to touch, and ensure that toilets are always clean for the next stall visitor (Boston University 2021). Colleges like Vanderbilt University have water-free urinals that use liquid chemicals and gravity instead of the average 3.5 to 5.5 gallons a regular toilet uses per flush (Vanderbilt University 2021). Water-free urinals alone save Vanderbilt up to 40,000 gallons of water each year (Vanderbilt University 2021).

Colleges and universities also reduce restroom and dining water consumption by 32.0% to 54.0% by switching from traditional manual faucets to low-flowing water faucets and automatic sensor faucets that turn off when not in use (Harmon 2016, 2). HEIs like Duke University have saved water by installing hand sanitizers in bathrooms and other common areas for quick sanitation purposes. Installing low-flowing water faucets and foot-valves in dining halls and labs have helped HEIs like California State University San Marcos reduce their water usage (Negrea 2013).
Dorms, apartments, and other affiliated residential areas on campuses conserve water by updating not only their toilets and sinks, but also showers. While traditional showerheads use approximately 3.5 gallons of water per minute, the low-flow showerheads at Virginia Tech use 2.5 gallons of water per minute, saving the institution 23 million gallons of water and about $45,000 each year (Virginia Tech 2013). HEIs like the North Carolina State University, the University of Maryland, Amherst College, and Oberlin College save water and money by installing timers and meters in their showers. At North Carolina State University, the Division of Academic and Student Affairs (DASA) and the student-led North Carolina State Stewards partnered to install educational shower timers in 50 suites in Bragaw Hall. These timers are multi-use, showing users the length of their shower as well as air temperature and humidity (Ferjani 2019). The educational shower meters at the University of Maryland measure how many gallons are used per shower based on time, providing data for faculty and student research. By collecting data from the meters, the student-led Team Shower Power can provide insight and suggestions for eco-friendly shower lengths. Amherst College uses water flow rate sensors to measure how much water students consume per shower and have an alarm that notifies students of excessive water usage (Gong 2020).

**Recovering Waste Water Inside and On Campus Buildings.** Some universities are getting creative in conserving water. Universities like the University of Colorado – Boulder have established greywater systems that capture and reuse water from sinks and showers in washing machines and toilet flushing (University of Colorado Boulder 2021a). The Williams Village North at the University of Colorado – Boulder has a
greywater system that collects and processes up to 2,200 gallon of water each day (University of Colorado Boulder 2017, 2021a). The University of Connecticut has a water reclamation facility that collects, filters, cleans, and distributes greywater throughout campus for irrigation, flushing toilets, industrial uses, cooling and heating (University of Connecticut 2013). The system makes groundwater drinkable, reducing water pollution and the demand for potable water by 20% during peak seasons (University of Connecticut 2021a).

Institutions like Rice University have learned to capture the condensation from seven of the HVAC systems of their campus buildings to reuse throughout campus (Rice University). The reused condensation is mostly used as makeup water for the central plant’s cooling towers and saves the university from having to purchase 14 million gallons of water per year. Condensate recovery not only saves resources and money, but also helps Rice University receive LEED credits (Adams 2017). College and university landscapes are other consumers of water and potential places for water conservation to occur.

*Sustainable Landscaping*

Almost half (47.6%) of sustainable HEIs lists some form of sustainable landscaping on their website (Table 4.32). Though not all of these institutions did so, the majority of HEIs that practice sustainable landscaping conserve water. Sustainable landscaping is a growing trend on college campuses in response to escalating environmental concerns (Chapman 2013, 54). There are multiple interpretations of what a sustainable landscaping is, but
they all center around the idea that it should be an attractive environment that is suitable for the local climate and requires minimal inputs such as fertilizer, water, pesticides, labor, gasoline, and associated resources such as energy and transportation of plants to campus (Chapman 2013, 54; Klett and Cummins 2014, 1). Sustainable landscaping consists of numerous practices that address environmental issues related to the design, construction, implementation, and management of landscapes on higher education campuses (Chapman 2013, 54). The practice reduces water and air pollution, creates aesthetically pleasing campuses, increases ecological diversity/biodiversity, fosters an atmosphere of learning, and strengthen stakeholders’ connections with nature (IWF 2011, 8).

Sustainable landscaping is good for the environment and wellbeing of campus inhabitants, and it is also financially responsible. Conventional landscaping is costly and labor intensive (O’Brien et al. 2001; Fichtner 2011; Macedo et al. 2012). The American lawn is one of the most pervasive and harmful practices in landscape design (Bormann et al. 2001; Ghys 2013). Lawns occupy over 45.6 million acres, making it the largest irrigated crop in the United States and beating corn (Lindsey 2005; Tallamy 2007; Brown 2009; IWF 2011). Geographer Paul Robbins (2007) cites the lawn as one of the fastest growing landscapes while Virginia Scott Jenkins (2006) explains the negative consequences of America’s obsession with the lawn. Lawns are monocultures that lack biodiversity and require vast amounts of water, gas, fertilizer, pesticides, herbicides, and energy that result in pollution (Brown 2009; IWF 2011). The consequences of a conventional approach to design and landscaping highlight the need for a transformative shift to more ecologically sustainable campus grounds (IWF 2011, 6). Sustainable
landscaping and native landscaping reduce maintenance costs through the reduction of water use, fertilizers, and pesticides (IWF 2011, 8).

The campus landscape, like its buildings, is a physical embodiment of a college’s values and a vital part of campus life (AASHE 2013). It provides a space for study, research, play, outdoor events, aesthetic appreciation, and even food production (AASHE 2013). Because campus landscapes are visible and accessible, landscape initiatives are a great way to build awareness and promote learning among the entire campus community as well as the surrounding community (AASHE 2013). Its visibility and accessibility also make it a vital for student recruitment. A survey by APPA (2006) found that outdoor spaces and an attractive campus were important criteria in student decisions to attend or stay at an institution.

Besides benefitting the campus ecosystem and looking attractive, sustainable landscaping transforms the landscape into an outdoor learning environment for students, faculty, staff, and the local community (Kermath 2007; Chapman 2013). For example, campuses that have landscaping and horticulture programs like University of California - Davis and the University of Vermont can study the variety of vegetation on campus, pollinators at risks, invasive plant species, and species interaction, treating the campus as a “living lab” (AASHE 2015; IWF 2011, 8). Pacific University in Oregon uses its campus landscape in various ways – from researching edible and medicinal plants, pollinators and other insects, to art classes (Pacific University 2021). Texas Women’s University, an HEI in the narrow monarch butterfly migration path, transformed its campus lawn into sustainable pollinators gardens (EPA 2017). These gardens provide Learn by Doing research and educational opportunities pertaining to pollinators through a $15,000 grant
from the EPA (EPA 2017; Headley 2017). Understanding human and environment interactions are essential for a sustainable future and ecologically friendly landscapes provide a classroom for this (Cortese 2003; as cited by IWF 2011, 8).

**Native Landscaping.** Native plant gardens bestow tremendous benefits on communities and natural habitats and are the superior choice when it comes to reducing a school’s impact on the climate (NWF 2009). They benefit the environment, its inhabitants, and can improve ecological and sustainable literacy, inspiring stakeholders to engage in more sustainable practices (Chapman 2015, 54). Requiring less chemical herbicide, native plant species are healthier for humans that work closely with them, along with other human and non-human animals on and off campus (Kermath 2007; Chapman 2013). In addition to being beneficial for the environment and its inhabitants, it can save HEIs money due to the use of less resources (Bousselot et al. 2010).

Non-native plants that are not adapted to local environments require more input and energy than native plants (Bousselot et al. 2010, 2). Many indigenous grass species like the buffalo grass cultivar grow slower and shorter heights than non-native varieties, meaning they require less mowing and hence, less fuel (NWF 2009). The Graduate School of Management at UC Davis integrated UC Verde® buffalo grass into their landscape as part of their LEED Gold certification with the U.S. Green Building Council. UC Verde® buffalo grass requires less water, and only needs to be mowed once every several weeks unless a meadow is desired, which only requires once a year (UC Davis California Center for Urban Horticulture 2020). Native trees and shrubs also require less maintenance, meaning less use of landscaping tools (NWF 2009). Planting native
perennials means that they do not need to be replaced every year and require less maintenance and water (IWF 2011).

Campuses that settle for conventional landscapes pose potential threats to the well-being of wild birds, fish, amphibians, and mammals. Lawns of commercial turfgrass, though aesthetically pleasing to some, inhibit biodiversity. They do not offer a viable food source or habitat for many wildlife species (Dale 2020). Native wildlife species need four essential resources: food, water, shelter, and a place to raise young in order to survive. As more wild space is converted to conventional landscapes, native plant and animal species lose these quality resources and face fierce competition on from invading species (IWF 2011, 4). The cultivation of invasive grasses on the landscape discourages biodiversity within the ecosystem and with limited or no edible fruit trees grown, animals are left at the margins of these landscapes creating dysfunctional system (UC Davis California Center for Urban Horticulture 2020).

The desire to attract students by cultivating grasses, high maintenance trees and herbs in developing an ideal landscape outweighs sustainable practices to protect the environment (Macedo et al. 2012). Purdue University (West Lafayette, IN) and the University of Florida are using native plants to restore natural habitats, promote pollinator activity and enhance natural pest control on their campuses along with cutting fuel consumption. Other HEIs like Purdue University are filling the spaces between their forested woodlots with native fauna and extensive wildflower area, removing the need to be mow or spray herbicides and pesticides (NWF 2009).

Although Purdue does not currently have a formal plan for promoting native plants, the University of Florida has a relatively mature native plant program (Dale
2020). For the past 30 years, most plants added to the campus have been native or low impact as part of their Master Plan which includes a concerted effort to remove and replace invasive non-native plant species with native plants (NWF 2009). Part of a campus-wide effort to nurture native plants throughout the grounds, the University of Florida native tree walk helps students and visitors learn about the value of imperiled native plant populations and provides a guide for planting native and non-native pollinator plants that are beneficial to Florida landscapes (NWF 2009; Mallinger et al. 2019).

*Drought-Tolerant Landscaping.* Maintaining the lawns in this country requires vast amounts of water. Lawn irrigation on the east coast of the United States accounts for 30% of water use; on the west coast water used for irrigation is 60% of available water (Bormann et al. 2001; as cited by Brown 2009, 61). Drought tolerant landscaping, or xeriscaping, requires little to no water input in addition to normal rainfall due to design (Macedo et al. 2012). The need for watering and the prevention of water waste can occur through the choice of grass type. Using ground covers native to this region like native grasses, clover, moss, or other ground-cover plants would prevent the need for additional watering. The mat-like nature of grass requires watering across the whole surface of the landscape, typically through the use of inefficient and wasteful sprinkler systems (Macedo et al. 2012). HEIs can reduce water consumption by as much as 50% like replacing turf with drought-tolerant landscaping the way Scripps College and Pomona College in California did (Inland Valley Daily Bulletin 2015).
What water is required for campus flora is used effectively and at specific times of the day (Pouya and Pouya 2018, 101). Many HEIs water plants at night or early in the morning to avoid evaporation and fungal growth that can occur when watering in the afternoon (Bayramoğlu 2016; as cited by Pouya and Pouya 2018, 101). Plants at Chapman University are watered between 11:00 PM to 4AM in short increments to minimize water loss due to evaporation (Chapman University 2020, 57). Water drip systems replace sprinklers to save water and rain sensors are used to turn off irrigation systems when needed (Pouya and Pouya 2018).

At California State University Northridge, facility managers have worked to meet university, state, and local water conservation goals for many years. Completed projects include turf removal, irrigation shutdowns, and low flow plumbing fixtures. Building on these initiatives, in 2016 they completed a series of resource management strategies with a campus-wide irrigation efficiency project as its centerpiece (University of California Berkley 2021). Efficient irrigation systems have multiple benefits including utility cost savings, water savings, labor savings, and student learning opportunities (Berkeley University 2021). At California State University Northridge, a campus-wide irrigation efficiency project saved an estimated 39-million gallons, $150,000 in annual costs, surpassing local conservation goals by six percent (University of California Berkley 2021).

The University of California Berkeley Facilities Services staff have integrated smart irrigation management into 90% of the campus’ irrigation systems, automating and connecting them to a weather station (University of California Berkley 2021). The University of California Berkley smart water irrigation system is an adaptive plants and
crops irrigation system that has a water delivering schedule that uses real time data to ensure all plants have enough water to grow while reducing water waste (Chen et al. 2018). Turnkey weather-based irrigation systems provide the irrigation system real-time or predicted weather information so that grounds are not over watered demonstrated water savings between 20 and 40 percent, depending on climate, soil, and vegetation profile (GSA 2015, 1). HEIs are getting creative where they obtain water for their irrigation systems such as the University of Colorado - Boulder who saved an estimated $440,000 in one year by using ditch water in place of City water to water their campus (University of Colorado Boulder 2021b).

Elon University, a Private university in North Carolina, irrigates 37% of its campus primarily with reclaimed stormwater (Elon University 2021). Elon University began irrigating with reclaimed stormwater in the 1980s. Initially, this system only served a portion of the campus’s irrigation needs. This has expanded over the years and now most of the main campus’ automatic irrigation systems are connected to the lakes for reclaimed stormwater use. The majority of the stormwater from Elon’s campus is directed into the three lakes on campus that are connected to a highly efficient irrigation system (Elon University 2021). The system has a central control system, flow meters, and is connected to a weather station on campus (Elon University 2021). All of these features help minimize waste by irrigating only when needed. This system is beneficial to the local watershed in that it prevents sediment and other materials from entering nearby natural waterways (Elon University 2021).
Rain Gardens and Cisterns. Bioretention facilities or rain gardens, like the 5,200 square foot garden at the University of Kentucky, allow rainwater runoff the opportunity to be absorbed from impervious urban areas like roofs, sidewalks, and driveways (University of Kentucky 2021). A rain garden is a shallow depression planted with native wetland or wet prairie wildflowers, grasses, shrubs, and plants (Brown 2009; Brennan and Aranovitch 2015). Water from the rooftops like the University of Kentucky Student Recreation Center is distributed along the 4 to 8 feet deep garden, where the water is held until it is slowly absorbed into the soil (University of Kentucky 2020). By reducing the flow rate and allowing for infiltration, plants act as a sponge, soaking up the polluted water and, filtering out impurities (Brown 2009). The water is then filtered back into the water table rather than the sewer system (Pouya and Pouya 2018, 102; University of Kentucky 2021). These gardens provide food and shelter for birds, butterflies, and beneficial insects, such as mosquito-devouring dragonflies (Brown 2009, 87). They also retard flooding and contribute to the overall aesthetic quality of the university campus landscape (Tarpey et al. 2017). As both a powerful green initiative and beautification project, rain gardens are becoming more and more common on college campuses (Brennan and Aranovitch 2015). The use of bio-retention facilities is much more cost effective than traditional stormwater methods and it has the added benefit of treating water as a resource rather than as waste (Brown 2009, 87).

Some HEIs like Georgetown University are installing rain barrels and cisterns to collect stormwater before it reaches campus and storing it for future use. Up to 600 gallons of rainwater can be captured from a 1000 square foot roof for every inch of rain (Brown 2009, 74). HEIs can use this water in place of water purchased off-site to water
their landscapes (Brown 2009, 74). This system not only reduces stormwater runoff and provides water for landscaping, but also reduces potable water demand within HEI buildings while saving money.

*Stormwater Management.* While lack of precipitation drives sustainable landscaping initiatives, abundance of rain can also call for other sustainable practices. As cities, suburbs, and towns expand, pervious vegetative landscapes are replaced with impermeable surfaces such as buildings, roads, parking lots, sidewalks that I call grey landscapes (Brown 2009). These landscape modifications result in increased flooding, erosion, water pollution (Barbosa 2012). Impervious surfaces also create urban “heat islands,” or localized areas of especially warm temperatures. This heat island effect can warm stormwater runoff and consequently, water temperatures in streams, causing stress for aquatic wildlife. (Heat Island Impacts 2011; as cited by IWF 2011, 6). Impervious surfaces are costly to both humans and the environment (Brown 2009, 81).

A majority of *Public and Private Non-Profit* colleges and universities (73.5%) are responsible for creating impermeable landscapes (NCES 2017). Sustainable HEIs like Georgetown University and the University of Wisconsin - Milwaukee are recreating their landscapes to decelerate surface water runoff and mitigate the heat island effect by implementing initiatives that reduce impervious surfaces (IWF 2011, 7). To do so, they install permeable and porous parking lots, sidewalks, pedestrian areas, other hardscape areas (Pouya and Pouya 2018, 102). These porous pavement and permeable surfaces have just enough space to let water runoff seep into the ground. As runoff water makes it way to the ground, the porous surfaces filter the water and catching up to 80% of pollutants.
(Gardner et al. 2011; as cited by Pouya and Pouya 2018, 102). HEIs also address stormwater management by planting native plants whose extensive roots can decrease erosion and filter pollutants from the water before they reach natural watersheds (IWF 2011).

**Trees on Campus.** Trees play a major role in sustainable landscaping and global climate change (Brown 2009). Tree roots prevent erosion, stormwater runoff, and filter water while their tops provide homes for a variety of species. Studies by the Center for Urban Forest Research and Arbor Day Foundation have proven trees can contribute to substantial energy cost savings (Peper et al. 2007; Brown 2009, 69). The University of Illinois at Chicago is among the many universities that participate in the Tree Campus USA program. Their website provides a report on the environmental benefits of trees and a self-guided exploration of the campus forest (University of Illinois at Chicago 2021).

Campus landscapes are highly visible representations of their relationship with nature and can therefore foster a biocentric ethos for sustainability (Chapman 2013, 54). The physical appearance of a campus landscape can illustrate its relationship with nature and contributions to creating a more sustainable future (Chapman 2013, 54). Current obstacles to comprehensive sustainable landscaping are primarily a lack of knowledge base for this type of design. Initial funding is also often a barrier despite long-term cost effectiveness of reduced maintenance, water use, and food production in these landscapes (Macedo et al 2012, 2). Sustainable landscaping begins with an appropriate design that includes functional, cost efficient, visually pleasing, environmentally friendly, and maintainable areas (Klett and Cummins 2014, 1).
**Pesticide, Herbicide, and Fertilizer Reduction.** Many colleges and universities practice sustainability landscaping by reducing their use of pesticides and herbicides that are harmful to the environment and its inhabitants (Pesticides and Wildlife 2010; as cited by IWF 2011). HEIs like the University of California - Davis have adopted integrated pest management (IPM) techniques such as modifying cultural practices, manipulating habitats, biological control, and the use of resistant plant species (University of California - Davis 2020). Adelphi University in Garden City, New York has adopted 100% natural, organic techniques to maintain the flora on its campus. The grounds staff only uses organic fertilizers that are fish and seaweed-based natural nutrients and natural pest management methods (Adelphi University 2021).

**Green Roofs.** Green roofs, also known as ecoroofs, vegetated roofs, and living roofs absorb water, allowing little to no stormwater runoff to reach the ground (Brown 2009, 82-87; Yang et al. 2015, 5). Besides reducing and filtering water runoff, these multilayered vegetated roofs like the ones in Figure 4.27 and Figure 4.28 reduce greenhouse gas emissions, water, and air pollution (Yang et al. 2015, 5). Green roofs are also aesthetically pleasing and make campuses more attractive to stakeholders and guests.
Figure 4.27: One of the many green roofs at Virginia Commonwealth University (2021).

Figure 4.28: International Architecture Award-winning University of Miami Lakeside Village Student Community Housing that features multiple green roofs (Architecture Award by the Chicago (Jones Jr. 2021).
Green roofs can save money by extending the lives of roofs up to 40 years (Yang 2015, 5). Because of their insulative capacity, green roofs also reduce energy costs and noise pollution from outside (Yang 2015, 5). Universities and colleges in northern regions that receive ample rain and snow are subject to stormwater runoff throughout the year. The University of Michigan, University of Iowa, Emory University, and Kansas State University are some of the many HEIs that have adopted green roofs.

**Edible landscaping.** Edible landscaping is an alternative to the traditional lawn and has multiple benefits. Environmental and economic benefits of edible landscaping include increasing biodiversity, and reducing water consumption, the need for maintenance, and pollution output increasing biodiversity (Macedo et al. 20120). Social benefits include offering a setting for campus stakeholders and community members engage in hands-on learning about fruits, vegetables, herbs, and medicinal plants. The University of Pittsburgh edible landscapes are a source of fresh produce for local food pantries in attempts to alleviate food insecurity (University of Pittsburgh 2021). Edible landscaping varies in size from a small flowerbed to a campus wide garden like that of Naropa University in Colorado (Figure 4.29). A map of the campus-wide garden and orchard can be viewed by the public who are welcomed to walk through, qualifying it as a community garden.
Figure 4.29: The Naropa University Arapahoe Campus edible landscaping map.
Table 4.40: Operation variables that relate to campus gardens.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Total institutions meeting these criteria</th>
<th>Proportion of institutions meeting these criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total institutions</td>
<td>1,153</td>
<td>100.00%</td>
</tr>
<tr>
<td>Does the HEI have a vegetable garden?</td>
<td>592</td>
<td>51.34%</td>
</tr>
<tr>
<td>Is the HEI working to protect/conserve the surrounding natural environment such as a habitat?</td>
<td>503</td>
<td>43.63%</td>
</tr>
<tr>
<td>Composting on campus?</td>
<td>478</td>
<td>41.46%</td>
</tr>
<tr>
<td>Is there an on-campus apiary?</td>
<td>289</td>
<td>25.07%</td>
</tr>
</tbody>
</table>
Vegetable Gardens

Approximately half (51.3%) of the 1,153 sustainable Four-Year Public and Four-Year Private Non-Profit HEIs I analyzed have a vegetable garden on campus (Table 4.40 and Appendix F). The size of these gardens varies from small gardens led by students to outdoor classrooms that expand multiple acres. Some gardens are vertical or on rooftops while some are part of the campus landscape. Often students are responsible for creating and maintain campus vegetable gardens through either a garden club or project. Sometimes these gardens evolve into larger gardens over time. An example of this is the evolution of the University of Maryland Community Learning Garden that started as a graduate student project in 2010, but later became a joint venture between undergraduates, graduates, faculty, and staff. Over time, the University of Maryland garden evolved into multiple gardens meant educate not only campus stakeholders, but the surrounding community. Figure 4.30 is a screenshot of the University of Maryland food gardens webpage. Larger gardens with staff hired to maintain them are typical of large, high-revenue HEIs. Such gardens typically offer educational and student engagement such as internships.
The Community Learning Garden is one of four campus food gardens, each with a special mission.

**St. Mary’s Garden:**
Harmonizing different groups through language-learning and gardening

**JFarm (Am Ha’Arez Hillel Garden):**
Building community through culture and environmental education

**Community Learning Garden:**
Learning and teaching about community health and sustainable agriculture

**Chef’s Garden:**
Leading the campus towards healthy eating and fresh produce

Figure 4.30: The University of Maryland webpage dedicated to their four food gardens (University of Maryland 2021).
Many HEIs use their gardens to educate the campus and surrounding community. Successful learning gardens benefit multiple schools on campus, allowing interdisciplinary connections. The College of Arts and Sciences at the University of Tennessee in Chattanooga houses the school’s Teaching and Learning Garden, but the engaged and experiential teaching and learning space is available to all academic disciplines. Just like student gardens, teaching and learning gardens can strengthen interdisciplinary collaboration. They can also create a relationship between the campus and surrounding community.

The University of Washington College of Education provides an example of how HEIs can create a successful community garden program. The department partnered with external stakeholders to create more culturally and community relevant, field-based learning opportunities where college and K-3 Seattle students learn through outdoor learning gardens. University of Washington learning garden project is funded by a $2.9 million NSF grant and is a great example of how campus gardens can be funded. (University of Washington College 2017).

Community gardens can be fairly inexpensive due their voluntary nature, but experience high turnover since inexperienced students make up the majority of garden volunteers (Pederson and Robinson 2018). A solution to this problem is pulling knowledge and skills from various academic programs and offices. Faculty and students from various science degree programs such as botany, geology, or agriculture can offer knowledge while also gaining experience. HEIs also benefit from recruiting veteran gardeners from on campus or off campus. Some HEIs have both staff and voluntary positions dedicated to maintaining their community gardens Luther College offers
internship positions such as Gardens Director, Gardens Network Manager, and Gardens Director to assist these staff members. Their website provides a model for those who want to make their garden a top priority while also offering students hands-on experience.

**Campus Apiaries**

One-quarter (25.1%) of sustainable Four-Year Public and Four-Year Non-Profit had an apiary on or near their campus (Table 4.32). Information on campus hives tended to be found within HEIs that had a vegetable garden, sustainable landscaping initiative, or a research institute. I found that research institutes, academic programs, staffed and voluntary gardens were responsible for caring for campus hives. Sustainability offices and student-led groups also led apiary initiatives on their campus.

Through web analysis, I found most campus apiaries hosted by research institutes academic department websites. The Young Harris College / University of Georgia Beekeeping Institute is dedicated to honeybee education, research, and engagement. The research institute hosts a graduate program as well as external outreach through beekeeping classes to the internal and external community. The Center for Human and Environmental Sustainability at Sweet Briar College houses a 20-hive apiary. The research center partners with a local business and active student-led beekeepers club to maintain the hives and manage events. Sweet Briar succeeds in creating interdisciplinary collaboration through their apiary program. While fields within the natural sciences can study bees and their impact on the environment, business students are able to market honey and other bee products, providing them hands-on experience.
HEIs without research institutes or academic programs able to host an apiary can have student groups keep their bees. Student-managed apiaries are found at colleges like Roanoke College and the University of Texas at Austin and illustrates how beekeeping happens in various campus settings. Other HEIs like North Carolina State University have community apiaries. Similar to community gardens, these apiaries bring together campus stakeholders and the local community (Davis 2017).

Grant funding can help jump-start small apiaries while honey and related product sales can help maintain, expand, or improve bee-yards. With the decline of honeybee populations worldwide, bees are just as much as a buzzword as sustainability. Having bees on campus during a time when bee populations are declining helps to market HEIs as the centers of efforts towards solving real-world issues while creating environmental stewards. One award found among those who listed their sustainability-awards on their sustainability webpages was the Bee Campus award. Southern Oregon University in Ashland became the nation’s first certified Bee Campus in 2015 after months of collaboration between Southern Oregon University Landscape Services Department, pollinator gardens, and the Bee City USA non-profit (Southern Oregon University 2021).

**Human-Animal Relations on College Campuses.** Some universities are offering their green landscapes as homes for non-human species besides honeybees. HEIs like Southern Oregon University and the University of North Carolina are turning their campuses into pollinator sanctuaries for bees, bats, and butterflies. Though it is rare, some HEIs are turning their campuses into wildlife and wildlife habitats (Bosci et al. 2018). Many of these institutions such as Warren Wilson College transform their
campuses into wildlife friendly ecosystems through grant funding (Bosci et al. 2018). These spaces not only provide homes for wildlife, but are classrooms for students, better the environment, and save money through the reduction of maintenance costs (NWF 2021). HEIs like Aquinas College house goats on their campuses to reduce invasive plants, pests, mowing costs (Aquinas College 2021). The small percentage of HEIs that welcome other species on their campuses are taking the holistic style of thinking that many sustainability scholars call for a step further (Barrett and Grizzle 1999; Phillips 2020).

**Sustainability-Oriented Research**

While the majority of American colleges and universities include preparing students to help create a better society somewhere in their mission statements goals, many fail to implement this ideal (Rowe 2007, 324; as cited by Brundiers and Wiek 2010, 2). HEIs are being increasingly pressured to produce concrete and directly applicable solutions to hard-to-solve real-world social, environmental, and economic problems (Khoo, 2013; Fahy and Rau, 2013b; Clark et al., 2016; Rau 2018, 267). Sustainability-oriented research has often been described as focusing on studying and solving real-world wicked problems such as climate change, the overuse of resources, poverty, and social conflict (Kates et al. 2001; van Kerkhoff and Lebel 2006; Wiek 2007). Wicked problems are defined as being long-term, urgent, highly complex, and cannot be solved by simple solutions (Funtowicz and Ravetz 1993; Liu et al. 2007). Colleges and universities have begun to redirect their research and educational focus to
balance basic research with applied research to solve such wicked problems (Corcoran and Wals 2004; Cortese 2003; Elder 2008; as cited by Brundiers and Wiek 2010, 3).

As seen in Table 4.27, 66.5% (767) of sustainable HEIs have some form of sustainability-oriented research on their website. While only 443 (38.4%) sustainable Four-Year Public and Four-Year Private Non-Profit HEIs had a research institute centered around sustainability or the environment, 639 (55.4%) communicated that sustainability or at least the environmental pillar of sustainability research occurred on campus. HEIs that listed some form of environmental or sustainability-focused research on their website received twice as much revenue than HEIs that did not. As seen in Table 4.41, Table 4.42, and Table 4.43, the average revenue of HEIs with sustainability-focused research and research centers are twice as high as those that do not. HEI size based on student population is also higher among sustainable HEIs with research listed on their website. I found only 24% of low-revenue HEIs (<$50M) have a research center, illustrating the importance of revenue in being able to fund a research institute.
Table 4.41: Variables related to sustainability research on college campuses.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Total institutions meeting these criteria</th>
<th>Proportion of institutions meeting these criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total institutions</td>
<td>1,153</td>
<td>100.00%</td>
</tr>
<tr>
<td>Is environmental/sustainability focused research occurring on campus?</td>
<td>639</td>
<td>55.4%</td>
</tr>
<tr>
<td>Is there a page where sustainability research themes/opportunities are listed?</td>
<td>506</td>
<td>43.9%</td>
</tr>
<tr>
<td>Does the HEI offer research funding for environmental sustainability?</td>
<td>497</td>
<td>43.1%</td>
</tr>
<tr>
<td>Does the HEI have at least one environmental/sustainability focused research center?</td>
<td>438</td>
<td>38.0%</td>
</tr>
</tbody>
</table>

Table 4.42: Comparison of HEIs with and without sustainability-focused research on their website.

<table>
<thead>
<tr>
<th>Summary statistics</th>
<th>Environmental or sustainability-focused research present</th>
<th>Environmental or sustainability-focused research absent</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of HEIs</td>
<td>639</td>
<td>514</td>
<td>1,153</td>
</tr>
<tr>
<td>Total revenue average</td>
<td>$570,176,225</td>
<td>$276,902,638</td>
<td>$439,436,742</td>
</tr>
<tr>
<td>Average student population</td>
<td>9,814</td>
<td>6,628</td>
<td>8,394</td>
</tr>
<tr>
<td>Land Grant HEIs (#)</td>
<td>67</td>
<td>51</td>
<td>16</td>
</tr>
</tbody>
</table>

Table 4.43 Comparison of HEIs with and without sustainability-focused research centers on campus.

<table>
<thead>
<tr>
<th>Summary statistics</th>
<th>Environmental or sustainability-focused research center present</th>
<th>Environmental or sustainability-focused research center absent</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of HEIs</td>
<td>438</td>
<td>715</td>
<td>1,153</td>
</tr>
<tr>
<td>Average revenue</td>
<td>$625 151 913</td>
<td>$325 669 967</td>
<td>$439 436 742</td>
</tr>
<tr>
<td>Average student population</td>
<td>10,675</td>
<td>6,996</td>
<td>8,394</td>
</tr>
<tr>
<td>Land Grant HEI (#)</td>
<td>51</td>
<td>16</td>
<td>67</td>
</tr>
<tr>
<td>Total A-graded HEIs</td>
<td>243</td>
<td>22</td>
<td>265</td>
</tr>
<tr>
<td>Total B-graded HEIs</td>
<td>114</td>
<td>131</td>
<td>245</td>
</tr>
<tr>
<td>Total C-graded HEIs</td>
<td>59</td>
<td>171</td>
<td>230</td>
</tr>
<tr>
<td>Total D-graded HEIs</td>
<td>17</td>
<td>190</td>
<td>207</td>
</tr>
<tr>
<td>Total F-graded HEIs</td>
<td>5</td>
<td>201</td>
<td>206</td>
</tr>
</tbody>
</table>
I found that many HEIs without sustainability-focused research centers still communicate the research on their website. Academic programs often list research that their students are currently involved in while some lists research themes and opportunities on their homepage. Sustainability-focused staffed offices and collaborative efforts are the least to list research opportunities on their websites, but those that do allow for a transdisciplinary approach to addressing sustainability-related issues while also marketing their institution to potential enrollees. HEIs with high sustainability grades and/or Land Grant HEIs house many of the sustainability-focused research centers. Over 90% of HEIs that received an A sustainability grade had an environmental or sustainability-focused research center.

The National Resource Council (1995, 7) calls for changes to industrial processes, types and amounts of resources used in these processes, and the resulting products to achieve sustainable economic growth. To do so, the world must evolve towards a more energy-efficient society that uses resources responsibly, and minimizes waste during industrial processes. With this in mind, many technology and trade programs among HEIs have integrated environmentally conscious research into their programs not because it is the ethical thing to do, but because it is smart. With green jobs and technologies on the rise, higher education institutions are marketing themselves by researching green technology and offering training for future eco-engineers and scientists (Dell’Anna 2021).

While scientific and technological research can contribute to overcoming sustainability challenges, scholars in the field tend to focus on addressing the environmental and sometimes economic dimensions of sustainability. Miller and others
(2008) encourage those in science and technology fields to acknowledge the social dimensions of their research topic in order to better understand and solve sustainability challenges (Miller et al. 2008; Schoolman et al. 2012). The lack and necessity of social sustainability is not isolated to the science and technology field, but a trend among higher education institutions, and research in general (Fien 2002).

The sole focus on the environmental pillar of sustainability is a common theme in society and the academic world (Fien 2002, 144; Bijl 2011). Most of the literature found in journals such as the International Journal of Sustainability in Higher Education focus on the environmental and sometimes economic dimensions of sustainable development (Yencken and Wilkinson 2002). John Fien (2002, 144) provides two explanations for this phenomenon: 1) Because the sustainability movement in higher education is relatively new and many scholars may not identify their research with sustainable development goals due to lack of knowledge; and 2) Most sustainability advocates come from natural science fields. Whatever the reason, social sustainability is lacking a presence on U.S. higher education institution websites. To address this issue, it is beneficial to analyze the institutions that are including the social pillar of sustainable.

**Areas Where Implementation and Communication of Sustainability Are Lacking**

While it is important to study where and how sustainability is most commonly integrated into college campuses, it is equally, if not more important, to understand which sustainability variables colleges and universities implement or publicize the least. Though 59.5% of the sustainable HEIs had at least one Outreach and Services variable listed on
their website, less than half of these institutions had any of the *Outreach and Services* variables seen in Table 4.44, one of them being social sustainability.

**Social Sustainability**

All 1,153 *Public* and *Non-Profit* HEIs included in this study were deemed sustainable because they had at least one staffed office, research center, four-year degree program, or formal collaborative effort dedicated to addressing ecological issues. Many of these institutions only addressed the environmental pillar of sustainability while some included the economic pillar of sustainability on their webpages through illustrating the financial advantages of green purchasing and technology. Of all the HEIs I assessed, 38% illustrated a holistic, three-pillar philosophy on their webpage while zero university websites excluded the environmental pillar of sustainability. While 100% of the 1,153 *Public* and *Non-Profit* HEI websites in this study had a sustainability implementation structure focused on solving environmental challenges, only 40.3% acknowledged the social dimension of sustainability on their sustainability-focused webpage.
Table 4.44: Variables within the Big Six dimensions of higher education where sustainability is lacking.

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Criteria</th>
<th>Sustainable HEIs (#)</th>
<th>Sustainable HEIs (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outreach and Services</td>
<td>Are there sustainability-focused community service projects/collaboration at the HEI?</td>
<td>561</td>
<td>48.7%</td>
</tr>
<tr>
<td></td>
<td>Is the HEI working to protect/conserve the surrounding natural environment such as a habitat?</td>
<td>503</td>
<td>43.6%</td>
</tr>
<tr>
<td></td>
<td>Does the university look at social sustainability?</td>
<td>465</td>
<td>40.3%</td>
</tr>
<tr>
<td>Assessment and Reporting</td>
<td>Are sustainability awards and/or affiliations listed?</td>
<td>370</td>
<td>32.1%</td>
</tr>
<tr>
<td></td>
<td>Is the AASHE Award Shown on website? (Yes/No)</td>
<td>302</td>
<td>26.2%</td>
</tr>
<tr>
<td></td>
<td>Is an environmental report made accessible through the institution's website?</td>
<td>255</td>
<td>22.1%</td>
</tr>
<tr>
<td></td>
<td>Total institutions</td>
<td>1,153</td>
<td>100.0%</td>
</tr>
</tbody>
</table>
Social sustainability is a vague concept that is difficult to define (Littig 2005). Wolff and Ehrstrom (2020, 3) cite the difficulty to define social sustainability as a possible reason it is hard to purposefully combine it with the other two pillars of sustainability. The term’s vagueness could also be responsible for its near absence in higher education, particularly in academic departments and research institutes. By assessing the webpages of institutions that referenced social sustainability on their webpages, I was better able to see what the term means to them. For example, the Iowa State University Office of Sustainability webpage organizes their sustainability-related student groups by sustainability dimensions and then into three categories: philanthropy, diversity, and leadership (Figure 4.31). From this, I gained a better understanding how social sustainability is defined in very different ways. The Iowa State University webpage illustrates that diversity, philanthropy, and leadership are traits of social sustainability, but it also tells that Iowa State University does not share their definition of social sustainability with HEIs like the American University who include environmental sustainability in their definition.

On their webpage dedicated to social sustainability (Figure 4.32), the American University in Washington D.C. states that “social sustainability encompasses topics such as human health, access to resources, and environmental justice (American University 2021). Many HEIs that promoted social sustainability on their webpages often referred to equity and climate or environmental justice. The American University, Seattle University, the University of Washington, and North Carolina State University promote the idea that all environmental issues involve social issues (North Carolina State University 2021; University of Washington 2021).
Figure 4.31 Sustainability-focused student organizations listed on the Iowa State University Office of Sustainability website (Iowa State University 2020).
Figure 4.32: The American University webpage dedicated to social sustainability (American University 2021).
A common theme among the HEIs that dedicated a webpage to social sustainability was environmental justice. The EPA defines environmental justice as “the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation and enforcement of environmental laws, regulations and policies (EPA 2021).” The Environmental Justice Toolkit, the Environmental Justice Advisory Group at North Carolina State University, the Seattle University Center for Environmental Justice and Sustainability, and the Environmental Justice Master of Science program at the University of Michigan are examples of formal university efforts addressing socio-environmental issues and possibly increase the promotion of the social dimension of sustainability HEIs.

**Community Outreach**

Almost half (48.7%) of sustainable HEIs participate in some form of community outreach. Colleges and universities can bring stability to communities during times of need by sharing their knowledge and resources with them. Community outreach promotes an inclusive process of planning and development that engages campus stakeholders and the surrounding community. Collaborations between these groups brings stability to communities and improve their quality of life while also increasing the legitimacy of HEIs (Berchin et al. 2019). Community outreach can occur through community-based research, education outreach, community gardens and farmer’s markets, food banks, co-ops, extension offices), internships, service-learning projects, and/or student groups. The City College of New York has a Sustainable Outreach and Education webpage that serves as a model for an all-encompassing webpage that lists the institution’s goals and strategies regarding sustainable outreach and education, internship, training, and
fellowship opportunities, current research and opportunities, collaboration efforts and opportunities, and useful links (City College of New York 2021). While the majority (approximately 80%) of community outreach was dedicated to socio-economic sustainability, some community outreach efforts focused on benefitting their surrounding environment.

**Preservation and Conservation of Lands and Water**

Of the 1,153 sustainable HEIs I assessed, 43.6% listed on the websites some sort of work that protected or conserved lands and habitats off campus. Historically, American colleges and universities, and specifically Land-Grant HEIs, have owned or managed renewable natural resources (Muller and Maehr 2000). These institutions are in a unique position to study, research, and address environmental issues through natural resource management and conservation biology programs (Muller and Maehr 2000). There is a growing concern, however, regarding the world's quickly depleting resources, and this has led to an increase in how institutions utilize these areas. According to College Factual (2021), natural resources and conservation was the 26th most popular major nationwide in 2018 to 2019. Though there are only approximately 100 colleges in the U.S. that offer a natural resource management or conservation degree of some kind, College Factual (2021) projected that careers in this field will increase by 7.4% from 2016 and 2026. The 3.9% increase (26,936 -28,018) in natural resources and conservation degrees awarded between 2017 and 2018 proves academic degrees focused on conserving natural resources (College Factual 2021).

As with any dimension of sustainability in higher education, colleges and universities can implement sustainability throughout the campus even with financial barrier. To do so, identifying low-revenue top-rated HEIs that use their platform to solve
real-world issues like habitat loss and species endangerment is the first step. Acknowledging the role each pillar of sustainability plays in these issues is also essential to being truly sustainable based on sustainable development literature.
CHAPTER 5: SUSTAINABILITY LEADERS ON SUSTAINABLE DEVELOPMENT IN HIGHER EDUCATION

The third research question of this dissertation asked, “Who are the sustainability leaders at the sustainable higher education institutions?” Visser and Courtice (2011, 2) define a sustainability leader as “someone who inspires and supports action towards a better world.” The Sustainability Leadership Institute (2011), as cited by Visser and Courtice (2011, 3), defines sustainability leaders as “individuals who are compelled to make a difference by deepening their awareness of themselves with the world around them. I define a sustainability leader (SL) as anyone who works for an HEI sustainability entity such as an academic program, research institute, or staffed office, or is part of a formal collaborative effort such as a committee or council.

To better understand the state of sustainability within four-year higher education institutions (HEIs) in the United States, who leads these initiatives, and the roles and backgrounds of these sustainability leaders, I administered an online Sustainability Faculty and Staff Questionnaire through Qualtrics. The questionnaire portal was open between October 2019 and January 2020. I received over 169 responses and ended up with 150 completed surveys. I conducted descriptive statistical analysis in Excel to learn who my respondents were.

Demographics of Sustainability Leaders in Higher Education

The first section of the Sustainability Faculty and Staff Questionnaire examines who the respondents are as Sustainability Leaders (SLs) at four-year higher education institutions in the U.S. Questions focus on socioeconomic characteristics such as age,
gender, race/ethnicity, years of experience, the highest level of education, academic background, employment status, and position held by respondents at their institutions. For the purpose of this dissertation, I used this section to understand who are the sustainability leaders in higher education, their positions within HEIs, and the degrees that qualified them for their positions.

The average age of respondents is 45 with the majority (27.3%) ranging between 41 and 50 years old (Table 5.1). Out of the 150 completed questionnaire that were originally included in the data set, 48.7% are females while 48.0% are males and 2.0% reported other genders. The even distribution in the male and female genders is very different from race/ethnicity where 88.0% of participants answered to being White/Caucasian. Of the 72 respondents who answered that they were male, 70 (92.1%) were White/Caucasian while 72 (98.6%) of the 73 who identified as female were White Caucasian.

Survey respondents represented a cross-section of HEIs from all regions and most states in the U.S., with the highest numbers employed by institutions in Pennsylvania (19), California (10), and New York (10). Half of the respondents were employed by HEIs in cities (Table 5.1). More than 25% of respondents were from Pennsylvania, California, and New York. Most HEIs in California are located in Los Angeles or San Francisco, many in New York are in New York City, and a large number of Pennsylvania’s HEIs are found in between Pittsburgh and Philadelphia. The rural HEIs that employed respondents were in highly populated states like Ohio, New York, and California while HEIs in city settings were from Alabama, Indiana, and North Dakota.
Table 5.1: Gender, race, and age distribution of sustainability leader respondents.

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>73</td>
<td>48.7%</td>
</tr>
<tr>
<td>Male</td>
<td>72</td>
<td>48.0%</td>
</tr>
<tr>
<td>Non-binary</td>
<td>3</td>
<td>2.0%</td>
</tr>
<tr>
<td>Preferred not to answer</td>
<td>2</td>
<td>1.3%</td>
</tr>
<tr>
<td><strong>Race/ethnicity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White/Caucasian</td>
<td>132</td>
<td>88.0%</td>
</tr>
<tr>
<td>Multiple Ethnicity/Other</td>
<td>7</td>
<td>4.7%</td>
</tr>
<tr>
<td>Hispanic American</td>
<td>4</td>
<td>2.6%</td>
</tr>
<tr>
<td>Asian</td>
<td>3</td>
<td>2.0%</td>
</tr>
<tr>
<td>Preferred not to answer</td>
<td>3</td>
<td>2.0%</td>
</tr>
<tr>
<td>Null</td>
<td>1</td>
<td>0.7%</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less Than 21</td>
<td>1</td>
<td>0.7%</td>
</tr>
<tr>
<td>21-30</td>
<td>23</td>
<td>15.3%</td>
</tr>
<tr>
<td>31-40</td>
<td>34</td>
<td>22.7%</td>
</tr>
<tr>
<td>41-50</td>
<td>41</td>
<td>27.3%</td>
</tr>
<tr>
<td>51-60</td>
<td>34</td>
<td>21.7%</td>
</tr>
<tr>
<td>61-70</td>
<td>12</td>
<td>8.0%</td>
</tr>
<tr>
<td>Greater than 70</td>
<td>2</td>
<td>1.3%</td>
</tr>
<tr>
<td>Null</td>
<td>3</td>
<td>2.0%</td>
</tr>
<tr>
<td><strong>Region</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northeast</td>
<td>49</td>
<td>32.7%</td>
</tr>
<tr>
<td>South</td>
<td>42</td>
<td>28.0%</td>
</tr>
<tr>
<td>West</td>
<td>30</td>
<td>20.0%</td>
</tr>
<tr>
<td>Midwest</td>
<td>29</td>
<td>19.3%</td>
</tr>
<tr>
<td><strong>Campus setting</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>City</td>
<td>75</td>
<td>50.0%</td>
</tr>
<tr>
<td>Suburb</td>
<td>36</td>
<td>24.0%</td>
</tr>
<tr>
<td>Town</td>
<td>34</td>
<td>22.7%</td>
</tr>
<tr>
<td>Rural</td>
<td>5</td>
<td>3.3%</td>
</tr>
</tbody>
</table>
Respondents’ Roles within Their Institutions

The majority of participants (91.3%) were employed by their HEIs in a full-time capacity while 11 (7.3%) were employed on a part-time basis (Table 5.2). Based on responses for Question 9 (What is your current position at your institution?), half of the respondents were primarily staff members who worked for a sustainability-focused staffed office or physical plant. The administrative units in which respondents work are listed in Table 5.3 and the positions respondents identified as their job titles are listed in Table 5.4. Of the 150 original respondents, 60 (40%) were faculty members commonly employed by the academic programs are listed in Table 5.5.

As shown in Table 5.2, a small percentage of respondents held other positions such as council members and/or chairs (3.3%) or staff employed by sustainability-focused research institutes (3.3%). Three respondents (2%) worked in higher education administrative roles, having titles such as Vice President, Assistant to the Dean of Students, and Assistant to the Provost. One of the respondents (0.7%) was employed as a work-study,
graduate assistant who worked in a sustainability-focused office, while another respondent worked in *Media Relations*. 
Table 5.2: Employment status and position of sustainability leader respondents.

<table>
<thead>
<tr>
<th>Current Employment Status at Institution</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full-time, salaried</td>
<td>134</td>
<td>89.3%</td>
</tr>
<tr>
<td>Full-time, hourly</td>
<td>6</td>
<td>4.0%</td>
</tr>
<tr>
<td>Part-time, salaried</td>
<td>5</td>
<td>3.3%</td>
</tr>
<tr>
<td>Part-time, hourly</td>
<td>5</td>
<td>4.3%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Position</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sustainability Office of Physical Plant Staff Member</td>
<td>75</td>
<td>50.0%</td>
</tr>
<tr>
<td>Faculty Member</td>
<td>60</td>
<td>40.0%</td>
</tr>
<tr>
<td>Council Member</td>
<td>5</td>
<td>3.3%</td>
</tr>
<tr>
<td>Research Centre/Institute Staff</td>
<td>5</td>
<td>3.3%</td>
</tr>
<tr>
<td>Administrative Position</td>
<td>3</td>
<td>2.0%</td>
</tr>
<tr>
<td>Work Study/ Graduate Assistant</td>
<td>1</td>
<td>0.7%</td>
</tr>
<tr>
<td>Media Relations Staff</td>
<td>1</td>
<td>0.7%</td>
</tr>
</tbody>
</table>

Table 5.3: Sustainability-focused staffed office names.

- Office of Sustainability
- Center for Sustainability
- Facilities Services and Planning
- Center for Sustainability and the Environment
- Green Initiatives
- Center for Sustainable Environment
- Recycling
- Sustainability and Facilities Administration
- Energy Services
- Environmental Center
Table 5.4: Most common job titles provided by respondents.

<table>
<thead>
<tr>
<th>Job Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sustainability Coordinator</td>
</tr>
<tr>
<td>Sustainability Manager</td>
</tr>
<tr>
<td>Director (of Sustainability)</td>
</tr>
<tr>
<td>Sustainability and Transportation Project Manager</td>
</tr>
<tr>
<td>Sustainability Analyst</td>
</tr>
<tr>
<td>Climate Action Analyst</td>
</tr>
<tr>
<td>Sustainability Staff Member</td>
</tr>
<tr>
<td>Director of Sustainability and Campus Improvements</td>
</tr>
<tr>
<td>Sustainability and Alternative Transportation Manager</td>
</tr>
</tbody>
</table>

Table 5.5: Most common academic programs faculty respondents were employed by.

<table>
<thead>
<tr>
<th>Academic Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental Studies</td>
</tr>
<tr>
<td>Sustainability Studies</td>
</tr>
<tr>
<td>Biology</td>
</tr>
<tr>
<td>Sustainability Education</td>
</tr>
<tr>
<td>Sustainability</td>
</tr>
<tr>
<td>Geography</td>
</tr>
<tr>
<td>Sustainability Agriculture</td>
</tr>
<tr>
<td>Sustainability and the Environment</td>
</tr>
<tr>
<td>Agroecology</td>
</tr>
</tbody>
</table>
Women and Minority Group Respondents

Although there was an even distribution of male and female respondents, I examined whether women held as many leadership positions as men (for example, Director, Coordinator, Manager, Chief, or Chair) or held such positions as staff, faculty, or committee members of sustainability-focused entities. Interestingly, I found that the distribution of males and females with graduate degrees in leadership positions with formal job leadership titles such as Director, Coordinator, Manager, Chief, or Chair (Table 5.6 and Table 5.7) was nearly equal, with 43.7% male and 37.5% female. The majority of women held leadership positions in sustainability-focused staffed offices and research institutes, whereas males held positions in academic programs. This suggests that sustainability offices might open up opportunities for women who currently only make up one-third of full-time tenure-track faculty in U.S. higher education (Colby and Fowler 2020).

When analyzing the employment status and position of the 14 racial/ethnic minority sustainability leaders who participated in the questionnaire, I found the majority (86.6%) were full-time salaried employees (Table 5.8). Forty percent of non-White/Caucasian respondents were staff members of sustainability-focused staffed offices of physical plants with five of them having formal leadership titles such as Director or Coordinator. Three others of
racial/ethnic minority status held formal leadership positions in sustainability-focused committees, research institutes, or academic programs. Half of minority respondents’ HEIs were in city campus settings while only one was located in rural campus settings.
### Table 5.6: Positions of female respondents.

<table>
<thead>
<tr>
<th>Female positions</th>
<th>Percentage of female respondents</th>
<th>Age average</th>
<th>Average years of experience</th>
</tr>
</thead>
<tbody>
<tr>
<td>Director of Staffed Office</td>
<td>37.5%</td>
<td>49</td>
<td>6.5</td>
</tr>
<tr>
<td>Faculty Member</td>
<td>33.9%</td>
<td>57</td>
<td>5.1</td>
</tr>
<tr>
<td>Staff Member</td>
<td>12.5%</td>
<td>40</td>
<td>4.5</td>
</tr>
<tr>
<td>Administrative Position</td>
<td>1.8%</td>
<td>32</td>
<td>0.0</td>
</tr>
<tr>
<td>Associate Chancellor/Director, Staff Member</td>
<td>1.8%</td>
<td>40</td>
<td>21.0</td>
</tr>
<tr>
<td>Council Member</td>
<td>1.8%</td>
<td>68</td>
<td>5.0</td>
</tr>
<tr>
<td>Media Relations Staff</td>
<td>1.8%</td>
<td>32</td>
<td>4.0</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
<td>48</td>
<td>5.2</td>
</tr>
</tbody>
</table>

### Table 5.7: Positions of male respondents.

<table>
<thead>
<tr>
<th>Male position</th>
<th>Percentage of male respondents</th>
<th>Age average</th>
<th>Average years of experience</th>
</tr>
</thead>
<tbody>
<tr>
<td>Director</td>
<td>43.7%</td>
<td>45</td>
<td>3.6</td>
</tr>
<tr>
<td>Faculty Member</td>
<td>31.8%</td>
<td>52</td>
<td>6.1</td>
</tr>
<tr>
<td>Staff Member</td>
<td>11.1%</td>
<td>51</td>
<td>8.3</td>
</tr>
<tr>
<td>Council Member</td>
<td>3.2%</td>
<td>62</td>
<td>8.5</td>
</tr>
<tr>
<td>Administrative Position</td>
<td>3.2%</td>
<td>46</td>
<td>8.0</td>
</tr>
<tr>
<td>Faculty Member, Committee Member</td>
<td>1.6%</td>
<td>36</td>
<td>13.0</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
<td>47</td>
<td>5.5</td>
</tr>
</tbody>
</table>
Table 5.8: Employment status and positions of non-white/Caucasian respondents.

<table>
<thead>
<tr>
<th>Current employment status at institution</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full-time, salaried</td>
<td>12</td>
<td>80.0%</td>
</tr>
<tr>
<td>Full-time, hourly</td>
<td>1</td>
<td>0.6%</td>
</tr>
<tr>
<td>Part-time, salaried</td>
<td>0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Part-time, hourly</td>
<td>1</td>
<td>%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Position</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sustainability Office of Physical Plant Staff Member</td>
<td>6</td>
<td>40.0%</td>
</tr>
<tr>
<td>Faculty Member</td>
<td>5</td>
<td>33.3%</td>
</tr>
<tr>
<td>Council Member</td>
<td>1</td>
<td>0.6%</td>
</tr>
<tr>
<td>Research Centre Staff</td>
<td>1</td>
<td>0.6%</td>
</tr>
<tr>
<td>Administrative Position</td>
<td>0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Work-Study/ Graduate Assistant</td>
<td>1</td>
<td>0.6%</td>
</tr>
<tr>
<td>Media Relations Staff</td>
<td>0</td>
<td>0.0%</td>
</tr>
</tbody>
</table>

Table 5.9: Level of education compared with respondents’ age and years of experience.

<table>
<thead>
<tr>
<th>Highest level of education</th>
<th>Average age</th>
<th>Average years of experience</th>
</tr>
</thead>
<tbody>
<tr>
<td>Some college but no degree</td>
<td>35</td>
<td>1.3</td>
</tr>
<tr>
<td>Bachelor’s degree</td>
<td>30</td>
<td>5.3</td>
</tr>
<tr>
<td>Master’s degree</td>
<td>44</td>
<td>5.7</td>
</tr>
<tr>
<td>Doctoral degree</td>
<td>49</td>
<td>5.7</td>
</tr>
<tr>
<td>Total</td>
<td>44</td>
<td>5.8</td>
</tr>
</tbody>
</table>
Academic Background of Sustainability Leader Respondents

To understand the academic background of respondents and to learn about what degrees one might need to become a higher education sustainability leader, I asked participants about their educational attainment. Of the 150 original respondents, 126 (84%) of participants had graduate degrees, while 22 (14.6%) had four-year bachelor’s degrees, leaving only four (2.7%) respondents without at least a four-year degree (Figure 5.1). Participants with doctoral degrees were found to have a higher average age (49) and slightly higher experience (5.8 years) in their sustainability role than the five-year average of all the respondents (Table 5.9).

Academic Degrees and Minors of Respondents

Question 7 of the Sustainability Faculty and Staff Questionnaire asked respondents to list their academic degrees and minors. I categorized the answers of the 142 respondents who answered Question 7 into a list of 22 academic program categories inspired by AASHE’s (2021) academic program types (Table 5.10, Table 5.11, and Figure 5.2), and then grouped them into the following broader categories: Science, Technology, Engineering, and Mathematics (STEM), Humanities, Arts, and Social Sciences (HASS), Sustainability, Policy, Planning, and Management, Education, and Interdisciplinary Studies academic program categories (Figure 5.2 and Table 5.10). Most respondents listed more than one degree and/or minor and one of the responses could be categorized as two different AASHE academic program types. For example, I categorized Architectural Engineering as both Engineering and Architecture and Construction.
Figure 5.1: Distribution of respondents based on their highest level of education.
Table 5.10: Academic program categories (based on AASHE academic programs (AASHE 2020).

<table>
<thead>
<tr>
<th>Academic Program Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental Studies and Sciences (includes Environmental Management, Natural Resources, and Conservation)</td>
</tr>
<tr>
<td>Sustainability Studies and Sciences</td>
</tr>
<tr>
<td>Engineering (includes Materials Sciences)</td>
</tr>
<tr>
<td>Technology and Trades</td>
</tr>
<tr>
<td>Biological Sciences (includes Ecology, Botany, Veterinary Sciences)</td>
</tr>
<tr>
<td>Physical and Earth Sciences (Chemistry, Geology, Atmospheric Sciences, Marine Sciences, etc.)</td>
</tr>
<tr>
<td>Urban, Community, and Regional Planning</td>
</tr>
<tr>
<td>Engineering (includes Materials Science)</td>
</tr>
<tr>
<td>Social Sciences (Economics, Geography, Political Science, Sociology, etc.)</td>
</tr>
<tr>
<td>Agriculture</td>
</tr>
<tr>
<td>Business, Management, and Finance</td>
</tr>
<tr>
<td>Public Administration and Policy (includes Higher Education Administration)</td>
</tr>
<tr>
<td>Computer Information Sciences (includes Geospatial Technologies GIS and remote sensing)</td>
</tr>
<tr>
<td>Law and Legal Studies</td>
</tr>
<tr>
<td>Design</td>
</tr>
<tr>
<td>Architecture and Construction</td>
</tr>
<tr>
<td>Education</td>
</tr>
<tr>
<td>Humanities (includes English language and Literature, History, Philosophy, Religion)</td>
</tr>
<tr>
<td>International and Global Studies</td>
</tr>
<tr>
<td>Health Sciences and Medicines</td>
</tr>
<tr>
<td>Recreation, Leisure, and Tourism</td>
</tr>
<tr>
<td>Communication, Media Studies, and Journalism</td>
</tr>
<tr>
<td>Behavior Sciences (Social Work, Counseling, Psychology, etc.)</td>
</tr>
<tr>
<td>Fine and Performing Arts</td>
</tr>
<tr>
<td>Mathematics</td>
</tr>
<tr>
<td>Interdisciplinary Studies</td>
</tr>
</tbody>
</table>
Table 5.11: Academic backgrounds of respondents.

<table>
<thead>
<tr>
<th>Academic background categories (based on AASHE academic programs)</th>
<th>Number of respondents that listed academic category as background</th>
<th>Percentage of 22 academic categories listed</th>
<th>Percentage of 142 respondents who listed academic background</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental Studies and Sciences</td>
<td>60</td>
<td>21.3%</td>
<td>42.3%</td>
</tr>
<tr>
<td>Biological Sciences</td>
<td>42</td>
<td>14.9%</td>
<td>29.6%</td>
</tr>
<tr>
<td>Social Sciences</td>
<td>27</td>
<td>9.6%</td>
<td>19.0%</td>
</tr>
<tr>
<td>Humanities</td>
<td>23</td>
<td>8.2%</td>
<td>16.2%</td>
</tr>
<tr>
<td>Physical and Earth Sciences</td>
<td>20</td>
<td>7.1%</td>
<td>14.1%</td>
</tr>
<tr>
<td>Engineering</td>
<td>15</td>
<td>5.3%</td>
<td>10.6%</td>
</tr>
<tr>
<td>Public Administration and Policy</td>
<td>14</td>
<td>5.0%</td>
<td>9.9%</td>
</tr>
<tr>
<td>Business, Management, and Finance</td>
<td>11</td>
<td>3.9%</td>
<td>7.7%</td>
</tr>
<tr>
<td>Sustainability Studies and Sciences</td>
<td>10</td>
<td>3.5%</td>
<td>7.0%</td>
</tr>
<tr>
<td>Education</td>
<td>8</td>
<td>2.8%</td>
<td>5.6%</td>
</tr>
<tr>
<td>Urban, Community, and Regional Planning</td>
<td>7</td>
<td>2.5%</td>
<td>4.9%</td>
</tr>
<tr>
<td>International and Global Studies</td>
<td>6</td>
<td>2.1%</td>
<td>4.2%</td>
</tr>
<tr>
<td>Communication, Media Studies, and Journalism</td>
<td>6</td>
<td>2.1%</td>
<td>4.2%</td>
</tr>
<tr>
<td>Behavior Sciences</td>
<td>6</td>
<td>2.1%</td>
<td>4.2%</td>
</tr>
<tr>
<td>Fine and Performing Arts</td>
<td>6</td>
<td>2.1%</td>
<td>4.2%</td>
</tr>
<tr>
<td>Health Sciences and Medicines</td>
<td>4</td>
<td>1.4%</td>
<td>2.8%</td>
</tr>
<tr>
<td>Architecture and Construction</td>
<td>5</td>
<td>1.8%</td>
<td>3.5%</td>
</tr>
<tr>
<td>Recreation, Leisure, and Tourism</td>
<td>3</td>
<td>1.1%</td>
<td>2.1%</td>
</tr>
<tr>
<td>Agriculture</td>
<td>3</td>
<td>1.1%</td>
<td>2.1%</td>
</tr>
<tr>
<td>Computer Information Sciences</td>
<td>2</td>
<td>0.7%</td>
<td>1.4%</td>
</tr>
<tr>
<td>Interdisciplinary Studies</td>
<td>2</td>
<td>0.7%</td>
<td>1.4%</td>
</tr>
<tr>
<td>Mathematics</td>
<td>2</td>
<td>0.7%</td>
<td>1.4%</td>
</tr>
<tr>
<td>Total</td>
<td>282</td>
<td>100.0%</td>
<td></td>
</tr>
</tbody>
</table>
Table 5.12: Broader academic groupings.

<table>
<thead>
<tr>
<th>Grouped academic categories</th>
<th>Number of respondents that listed discipline within the grouped academic category as their background</th>
<th>Percentage of 142 respondents who listed academic background</th>
</tr>
</thead>
<tbody>
<tr>
<td>Science, Technology, Engineering, and Mathematics (STEM)</td>
<td>109</td>
<td>76.7%</td>
</tr>
<tr>
<td>Humanities, Arts, and Social Sciences (HASS)</td>
<td>57</td>
<td>40.1%</td>
</tr>
<tr>
<td>Policy, Planning, and Management</td>
<td>29</td>
<td>20.4%</td>
</tr>
<tr>
<td>Sustainability Studies and Sciences</td>
<td>6</td>
<td>4.2%</td>
</tr>
<tr>
<td>Education</td>
<td>6</td>
<td>4.2%</td>
</tr>
<tr>
<td>Interdisciplinary Studies</td>
<td>2</td>
<td>1.4%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>142</strong></td>
<td><strong>--</strong></td>
</tr>
</tbody>
</table>
Figure 5.2: Grouped academic categories and disciplines within those groups.
Of the broad category groups shown in Figure 5.2, 56.4% of the academic degrees, minors, and concentrations listed by respondents were *Science, Technology, Engineering, and Mathematics (STEM)*. Approximately three-quarters (109/76.7%) respondents listed a STEM degree as a degree or minor they had earned (refer to Table 5.12). As seen in Table 5.10, respondents most commonly listed *Environmental Studies and Sciences* degrees and/or minors when asked about their academic background. A total of 60 respondents (42.3%) listed *Environmental Studies and Sciences* as their degree(s) and/or minor(s) with *Biological Sciences (including Ecology)* as the second most listed academic category at 29.6% (Table 5.11). Most academic programs that fell within the *Environmental Studies and Sciences* category included *Environmental Science* and *Environmental Studies*, as well as a few related degree programs (Figure 5.2). *Biological Sciences* consisted mostly of *Biology* and Biology-related degrees or minors, but also included *Ecology* degrees and minors (Figure 5.2).

One respondent had a background in *Veterinary Medicine and Veterinary Pathobiology*, which I found intriguing. This respondent along with others whose backgrounds were disciplines typically not thought of when thinking about sustainability prove that anyone in higher education can take on the role of addressing sustainability
issues such as environmental degradation and an interdisciplinary approach can be taken when integrating sustainability into the education sector of higher education.

A total of 57 respondents (40.1%) had at least one Humanities, Arts, and Social Sciences (HASS) degree, minor, or certificate. Within the HASS category, 27 respondents listed a degree or minor that fell under the Social Sciences category, 10 (37.0%) of them having a background in Geography while five (29.6%) listed Sociology and three listed Anthropology as degrees or minors. Twenty-three (16.2%) respondents had backgrounds in Humanities (Figure 5.2). Although the majority of those who listed Humanities degrees fell under previously discussed academic categories, some had backgrounds in Urban, Community, and Regional Development and Public Administration and were leader’s sustainability-focused staffed-offices or academic programs. A few outliers had backgrounds in the Fine and Performing Arts though they did not have formal leadership titles like director or coordinator.

Twenty-nine (20.4%) respondents listed Policy, Planning, and Management degrees, minors, and/or concentrations (Table 5.11). Academic program categories listed under Policy, Planning, and Management (Figure 5.2) accounted for 12.4% of the academic backgrounds provided by respondents, the most popular being Public Administration and Policy. The majority of respondents with backgrounds in Public Administration and Policy (57.1%) held formal leadership roles, such as Manager, Director, or Coordinator while one was a Vice President of a university. There was an even distribution of men and women who held various positions at their HEIs with backgrounds in Business, Management and Finance (7.7%), Urban, Community, and Regional Planning (4.9%); and Recreation, Leisure, and Tourism (2.1%).
Relatively few respondents (7%) identified academic backgrounds in *Sustainability Studies and Sciences* when answering Question 7. This likely has to do with the fact that few sustainability programs existed prior to the early 2000s when most respondents would have been in college. There was an even distribution between males and females with backgrounds in *Sustainability Studies and Sciences*, with both genders having the same distribution of those with formal leadership roles.

A small percentage (7.0%) of respondents listed academic backgrounds in *Education* or *Interdisciplinary Studies* (Table 5.11). These individuals were either in administrative roles or were leaders (with titles such as *director, coordinator*, and *manager*) of sustainability-focused staffed offices. Respondents who listed *Interdisciplinary Studies* for their academic backgrounds both held formal leadership roles within their institutions.

While it is reasonable to assume that sustainability leaders at a higher education institution would hold degrees in sustainable development or a STEM field, based on the responses for Question 7, there are clearly substantial numbers of staff, faculty and even directors and coordinators of sustainability-focused offices, academic programs, or research institutes whose academic backgrounds are in other disciplines. To implement sustainability across campus using a three-pillar and transdisciplinary approach, it is important to have sustainability leaders from all academic backgrounds. This research illustrates that sustainability leaders do not have to have a background in environmental or sustainability studies or sciences, but in many other fields.
CHAPTER 6: CONCLUSION

Many HEIs have already introduced sustainability components into their organizations, and scholars have highlighted the need to study education for sustainable development in action for the purpose of designing more holistic ways to integrating it even more into higher education communities (Holm et al. 2016). While there is a growing body of literature on sustainability in higher education, most studies are limited in scope (Holm et al. 2016). Past research has often been case-specific and non-systematic, meaning we could not see the bigger picture of where sustainability occurs among U.S. higher education institutions (HEIs) and what that means. This dissertation helped determine what characteristics contribute to sustainability in higher education and how sustainable development is implemented on college campuses.

This research aimed to address the factors that add to the practices or characteristics of sustainability activities within higher education institutions (HEIs) in the United States and how these institutions portray themselves as sustainable through their websites. In other words, regardless of the research conducted on sustainability and education for sustainable development (ESD) in higher education, it was important to understand which American HEIs are effectively integrating sustainability into their institutions, how they are doing so, and how they communicate these efforts to the public.

To do this, I focused on three broad research questions:

1) What is the current state of sustainability among U.S. higher education institutions?

2) Where is sustainability occurring within these institutions based on their websites?

3) Who are the leaders of sustainability efforts at these HEIs, and what roles do they play in implementing sustainability?
To answer these questions, I accomplished three objectives: 1) document four-year HEIs in the United States that self-identified as sustainable; 2) understand how these institutions portrayed themselves as sustainable through their internet presence; and 3) understand who leads sustainability initiatives on university campuses.

**Objective One: The State of Sustainability Among American HEIs**

To address Objective One, I first assessed the websites of all 2,724 U.S. four-year higher education institutions to see which institutions have sustainability implementation structures and found that almost half (46.7%) were sustainable. I compared this data with internal and external variables and found that HEIs with sustainability efforts had higher revenue and student populations. I also found that a large percentage (73.9%) of sustainable HEIs were located in city campus settings since a large percentage of all U.S. colleges and universities are set in urban areas and less than one percent are located in rural settings.

**Objective Two: Sustainability Within the Sample**

To answer where sustainability was occurring within sustainable HEIs, I assessed the webpages of 1,153 four-year Public and Private Non-Profit HEIs using the sustainability web assessment tool I created for this research. I also created a grading system to better understand which HEIs have the highest presence of sustainability on their websites and which ones are at the beginning of developing sustainability across campus based on their webpages. By completing these tasks, I was better able to
understand how colleges and universities implement sustainability, the benefits of doing so, and the steps a university should take to integrate sustainability into its institutional structure and to effectively communicate these efforts through their websites.

**Level of Sustainability**

I found that the main factors that contribute to an HEI’s degree of sustainability are student population and revenue, and that A and B- graded HEIs have higher revenue and student population averages than other HEIs. I also found that HEIs with lower grades tend to not have staffed offices and rely on four-year degree programs and campus operations to promote sustainability. To understand how HEIs with low revenue can succeed in implementing sustainability throughout their campus. I studied the 66 HEIs that received A and B sustainability grades even though they received less than $50 million in annual revenue. These HEIs stood out against other low-revenue HEIs because they engage faculty, staff, and students through applied learning and research to achieve high marks for sustainability.

**Sustainability Implementation Structures.**

Another goal related to Objective Two was to understand where sustainability integration occurs within HEIs. I found that sustainability implementation most often occurs through academic programs followed by formal collaborative efforts that 48% of sustainable HEIs had. Less than half of sustainable HEIs had a sustainability office. I found that almost half (45.8%) of those with sustainability offices receive over $200 million in revenue and have two times more students than the average sustainable HEI.
illustrating the relationship between revenue and the presence of these implementation structures. One-fifth (19.0%) of the HEIs with a sustainability-focused staffed office receive less than $50 million in revenue, proving it is possible to create a staffed office on a low budget.

Only 35.4% of sustainable HEIs have a sustainability-focused research center or institute dedicated to one or more of the three sustainability pillars, and over 90% belonged to A-graded HEIs that had high revenue. Though sustainability-focused research centers are not essential for sustainability research to occur at an HEI, they are most effective at hosting transdisciplinary applied research that addresses real-world issues at the local, regional, national, and sometime global level. Thirteen percent of research institutes are housed in institutions that receive less than $50 million in revenue a year, indicating the possibility of creating a research center regardless of revenue. From my web assessments, I found that many sustainability-focused research institutes are part of collaborative efforts among HEIs, government agencies, and/or non-profit organizations that often provide funding.

**Sustainability within Higher Education Institutions**

The second part of Objective Two focused on understanding where sustainability efforts were prioritized within U.S. colleges and universities. I grouped my SWAT sustainability variables into the *Big Six Dimensions of Higher Education*. Through analysis of these groups, their subgroups, and sustainability variables, I was able to gain insight into where and how HEIs implement sustainability and communicate it through their webpages. I found that HEIs most commonly integrate sustainability through
operations, education, and student engagement programs, while they rarely prioritize applied research that addresses all three pillars of sustainability and benefits local communities and environments.

**Operations.** Sustainable waste management programs are the most common variable found on sustainable HEI websites. Most (86.5%) of sustainable HEIs integrate sustainability though their operations. I found *Operations* variables such as recycling, energy conservation, dining services, eco-friendly buildings, water conservation, sustainable transportation including public transportation, and on-campus gardens on over half of sustainable HEI webpages and are common among lower-revenue HEIs. Given that most of all sustainable HEIs are located in urban areas and less than 6% are in rural settings, I recognized that many of the variables within the *Operations* dimension, such as recycling infrastructure and public transit systems, already exist in cities and suburban areas. I intend to further analyze campus operations in rural campus settings to see how they are integrating these variables on their campuses and if they extend out into the surrounding community.

Over half of all sustainable HEIs do not have sustainable landscaping, biking, composting, electric vehicles, or apiaries listed on their websites. Biking, composting, electric vehicles, and apiaries tend to occur within other *Operations* variables. For example, I often found the promotion of sustainability through biking within webpages dedicated to sustainable transportation, and composting often occurs within sustainable waste management or campus garden programs. One possible explanation for why I did not find these variables on most campus sustainability webpages is that they tend to be
established after other variables, which suggests they might be the next step for an
institution to integrate sustainability, may not be a priority, or are just not communicated
on the HEI website.

*Campus Engagement and Education.* Campus Engagement and Education were
the most common of the Big Six Dimensions I found on sustainable HEI websites, with at
least 92% of HEIs having at least one variable from each of these dimensions listed on
their webpages. I found through my web analysis that whereas sustainability education is
quite common among American colleges and universities, HEIs tend to focus on the
environmental dimension of sustainability and rarely include the social and economic
pillars of sustainability in their curriculum of natural science courses. Almost half
(49.3%) of all sustainable HEIs had minors, concentrations, certificates, or pathways
center around at least one of the three sustainability pillars. These offerings reside within
either a sustainability-focused academic program or other academic programs such as
Geography, Economics, and Anthropology. Sustainability minors, concentrations, and
pathways offered by these programs tended to address all three pillars of sustainability.

Much of the literature on sustainability in higher education calls on HEIs to
integrate sustainability throughout their organizational structures and all academic fields
in order to address the complex problems of present day (Bacon 2010; McMahon 2012;
Bart 2013). HEIs like Grand Valley State University and North Carolina State University
integrate sustainability throughout their curriculum. These universities have webpages
dedicated to listing academic courses from various disciplines that either focus on
sustainability or integrate sustainability into the curriculum. Most HEIs that provide these
lists have an academic program dedicated to sustainability, but they offer a model for a college or university that does not have such a program and/or want to integrate sustainability across multiple academic disciplines. Many of the top-rated HEIs that integrate sustainability across their curriculum do so by offering resources that help faculty integrate sustainability into their curriculum and/or research no matter what the discipline. Less than one-third of all sustainable HEIs list these faculty engagement initiatives on their websites, showing a gap that needs to be filled.

I found that although 92.5% of all sustainable HEIs list some form of campus stakeholder engagement, less than 70% offer sustainability-focused internships, eco-ambassador programs, or sustainability representatives or promoted sustainability-related careers on their website. Only half of sustainable HEIs have at least one sustainability-centered student group on their website. These institutions are failing to market sustainability to current and potential students.

**Research.** Sustainability-focused research often occurs within education programs, but approximately 30% of the research I found while conducting web assessments were housed within independent research institutes in HEIs. Most (91.7%) of these webpages list research themes and opportunities to students and 81% offer funding opportunities to students through their website. Many of these institutes do not include social or economic dimensions of sustainability within their research like Bjornberg and colleagues (2015) call for. Instead, they focus on addressing environmental issues and creating environmentally conscious technology.
Areas Where Sustainability Is Lacking

From my web assessments and data analysis, I found that the social pillar of sustainability is often not included in education and research. Only 40% of four-year Public and Private Non-Profit HEIs mention social sustainability on their academic program, research center, or campus sustainability webpage. Though 59.5% of sustainable HEIs have some form of Outreach and Services variable, less than half of these institutions have any the most common Outreach and Services variable with 48.7% having at least one sustainability-focused community project or collaboration listed on their website. Only 43.6% of sustainable HEIs list an effort to protect or restore natural environments including forests, prairies, marshes, freshwater, and marine ecosystems.

Academic programs and research centers that include social sustainability on their webpages sometimes apply their skills to community-service projects or partner with local community stakeholders to address environmental, social, and/or economic problems though most community outreach efforts are through campus community gardens and other projects led by sustainability offices. I found HEIs with social sustainability have a higher revenue average than those that do not and are closer to urban centers.

Objective Three: Surveying Sustainability Leaders

I created and distributed an online questionnaire to the sustainability leaders working or volunteering at these institutions in order to learn about who is leading sustainability in higher education. Though there was an even distribution of male and female respondents, the majority (88.5%) of respondents were White, reflecting that few
minorities are in sustainability leadership positions at present. When analyzing the employment status and position of the 14 racial/ethnic minority respondents, I found that most (89.2%) were full-time salaried employees and 57.1% held formal leadership titles such as Director or Coordinator of a sustainability implementation structure.

Half (51.0%) of the respondents were employed by a Sustainability Office and 38.2% were faculty members employed by a sustainability-focused academic program. Most of the respondents had at least a Master’s degree in the Science, Technology, Engineering, and Mathematics (STEM) field though the backgrounds of other respondents illustrate that anyone in higher education can take on the role of addressing sustainability issues through higher education.

**Discussion**

A central goal of this research was to answer Holm and colleagues’ (2016) call for further discussion and promotion of sustainability in higher education and to analyze the integration of sustainability into HEIs in a systematic and holistic fashion. From analyzing their websites and surveying their sustainability leaders, I gained an understanding of where U.S. colleges and universities are in terms of sustainability. This holistic approach helped me identify trends among HEIs and topics of future research. Through this research, I found that there are environmental, social, and economic benefits to implementing sustainability on college campuses and communicating these efforts through HEI websites. These benefits can be potential solutions to HEIs that are experiencing a decline in enrollment and a disconnect with their surrounding
communities and workforce (Weerts 2005; Roseboom and Blagg 2018; Czarapata and Willimas 2021).

**Benefits of Sustainable Development in Higher Education**

As revenue and student enrollment decline across the United States, colleges and universities across the country are looking for solutions. Most *Sustainability Faculty and Staff Questionnaire* respondents agreed that lack of funding and the need for more revenue to implement sustainability are major issues among U.S. higher education institutions (HEIs). The continuous relationship between revenue and the presence of sustainable development among American HEIs highlights the importance of money when it comes to integrating sustainability into the higher education system. It is important to recognize that a large source of revenue for American colleges and universities are students, with Hinrichs’ (2017) study indicating a strong dependency on tuition fees as source.

**An Enrollment Crisis among American Colleges and Universities**

This dissertation found a consistently strong relationship between student enrollment and high revenue, which has also been highlighted in other studies (Hinrichs 2017). American colleges and universities depend a great deal on student tuition and fees as sources of revenue (Hinrichs 2017). Because of this dependency and the decline in student enrollment over the past decade, the U.S. higher education system is experiencing an enrollment crisis (Whitford 2021). During the COVID-19 pandemic, many students opted to take a break from school instead of adapting to online learning and risking their GPA. Additionally, international student enrollment decreased by 72% (Li and Lalani
2020; ICE 2020). Many potential students, especially those from low-income populations, did not enroll in online courses because they did not have access to computers or reliable internet or were left jobless and unable to afford tuition (Barber et al. 2021).

Though COVID-19 led to the closure of some college campuses and caused significant reductions in student admissions, enrollment was already on the decline before the pandemic (Wiley 2021). Over the past decade, college enrollment has gradually decreased for various reasons, with two of the most commonly cited causes being the economy and lower birth-rates (Nadworny 2019; Nietzel 2020). In a survey conducted by Inside Higher Ed and Gallup, only 34% of the HEIs polled indicated to have met their enrollment target in the fall of 2017 while 85% of the senior admission staff were uncertain of meeting their institutional enrollment targets for the next year (Jaschick 2017). With the decrease in student enrollment and decline in revenue, higher education institutions (HEIs) are having to find ways to attract new students, and sustainability may be a possible solution (Pew Charitable Trusts 2019).

**Increasing Student Enrollment through Sustainability**

Colleges and universities can increase student enrollment using sustainability as a platform to implement change not only outside of the campus but within the institution itself. In a 2016 study by Jeff Selingo, less than one-third of Americans had a four-year degree and almost 40% were college dropouts, thus illuminating a problem. Selingo (2016) found that most young adults were told from an early age that going to college equated to a better life and was the inevitable step after high school. Many students
choose career paths based on familiarity and not passion, resulting in them either dropping out or graduating with a degree that is not relevant to their future employment. Selingo (2016) also found over half (65%) of the students who did graduate struggled to find employment due to not knowing their career options and not having the qualifications to obtain jobs within their field of study. Education and campus engagement initiatives illustrated on the webpages of over 90% of the sustainable HEIs I assessed may be a possible solution to such issues.

**Creating Leaders for a Growing Field**

Companies are searching for professionals who have the skills and knowledge to create and apply sustainability strategies, resulting in an increase in sustainability-related careers (University of Wisconsin 2021). To attain these jobs, students need to be able to analyze and develop solutions for sustainability challenges, communicate them to other stakeholders, and lead collaborative efforts to address such complex problems (Allen et al. 2014). Leadership roles in the sustainability or the corporate social responsibility field require content knowledge that classrooms offer, as well as soft skills learned through application (Allen et al. 2014; Batbold et al. 2021).

Many employers urge students to participate in internship programs, and some even require prior experience to qualify to entry-level positions (Humphreys 2013; Batbold et al. 2021). Past studies show that most employers believe recent graduates lack critical thinking skills, written and oral communication skills, and working as a team (AAPU 2007, as cited by Batbold et al. 2021). Student engagement initiatives such as internships, ambassador programs, and representative programs offered by 65.6% of the
sustainable HEIs assessed provide students with the experience and knowledge needed to lead in addressing sustainability challenges and acquire a sustainability-related career once they graduate (Allen et al. 2014, 47; Batbold et al. 2021, 1). These programs can help students figure out what they want to do once they graduate and assist them in networking within their career field so they can be hired for those positions.

Student engagement programs can be mutually beneficial relationships that help the university and surrounding communities and/or environments (Hayles 2019). In addition to benefitting students, internship programs can also benefit organizations that are directing the internships. On-campus internships and other student leadership positions such as eco-representatives and sustainability ambassadors are a cost-efficient less authoritative method of educating students and other campus stakeholders (Shook and Keup 2012; Acendano 2019). HEIs like Western Michigan University are able to distribute knowledge throughout the university and expand campus sustainability efforts through sustainability leadership positions (Batbold et al. 2021, 2).

**Campus Outreach and Social Sustainability.** Off-campus internships enhance the relationship between academia and external stakeholders such as businesses, organizations, and/or the community they impact (Hayles 2019). Education for sustainable development (ESD) literature calls for HEIs to solve real-world problems (Vaughter et al. 2013). To do so, they promote applied real-world learning and hands-on research that not only benefits the relationship between the HEI and its surrounding community, but provides students critical thinking skills (Hayles 2019). While classrooms are beneficial in teaching concepts, theories, and methods, the field is where
they are put into practice, reinforcing what is taught in class. The most successful and impressive HEI websites illustrated HEIs treating their campuses as living laboratories where students were surrounded and engaged in a community that act as models for future sustainable communities. Yet for college campuses to be successful models of societies off campus, there needs to be a diverse student population that represents the outside population – not just rich kids whose families can afford to send them to college. To succeed in achieving all of the United Nations’ sustainable development goals (SDGs), HEIs must address all three pillars of sustainability – not just environmental, but socio-economic issues.

Education is one of the greatest freedoms in a democratic society and it can greatly empower low-income minority students and help them enter professional careers (Johnson 2009). With this in mind, colleges and universities should lessen their dependency on student tuition and fees and seek other sources of revenue. Sustainability initiatives, specifically those within the Operations and Research dimension of higher education, can be possible revenue sources for HEIs.

**Sustainability as a Source of Revenue**

I described in Chapter Four how integrating sustainability into campus operations can save money. Water and energy conservation and generation save colleges and universities millions while sustainable landscaping methods, recycling, sustainable buildings, and dining services save natural resources and lower procurement costs. Another possible way HEIs can save money through sustainability is through sustainability-related research. In the wake of increased sustainability initiatives and
green projects, HEIs can acquire revenue for their labs and other learning amenities from environmentally centered research projects, especially if they are well integrated with the corporate world (Dolgin 2018).

Many HEIs generate little income from their research because they do not market it (Marcus 2020). Relatively few patents and startups are produced by HEIs, and very little money is earned from licensing inventions (Marcus 2020). While American colleges and universities receive approximately $75.6 billion from the federal government and other sources in support of research, little financial gain comes from it (Marcus 2020). Yet, some of the nation’s top universities have benefitted from the research that happens on their campuses such as Stanford University. The university is associated with technology breakthroughs, including Google and Hewlett Packard, and in 2006, earned $4.5 million in research-related income that included licensing revenue, returns on equity stakes, and other windfalls (Farrell 2008). Based on this success and the success of other universities listed in the Forbes article by Maureen Farrell (2008), HEIs are encouraged to take research and commercialization more seriously. By doing so, they can generate exclusive income of up to $50 million in license revenue every year.

**Relevance through Sustainability**

While natural science, technology, and engineering fields can increase revenue through research, social sciences and other academic disciplines play an important role in addressing the lack of social sustainability research and community outreach found among sustainable HEIs (Chalker-Scott and Tinnemore 2009). Colleges and universities have been criticized for being disconnected from their surrounding communities and
local environments and are perceived as “arrogant and out of touch” with their surroundings (Weerts 2005, 43). As a result, many scholars are urging higher education institutions to engage with their local communities (Weerts and Sandmann 2010). Academic disciplines like geography, anthropology, economics, business, and sociology can address complex sustainability issues, improve their local communities, and tighten the gap between them and those around them – something those in engineering and technology sciences do not have the skill for.

Chalker-Scott and Tinnemore (2009) cite lack of funding for the absence of community research, education programs, and other forms of outreach, this being especially true for rural Public HEIs that received less state funding per student than average HEI (ARRC 2021). Only 29% of young adults living in rural areas enroll in college (Dennon 2021). With students playing such a vital role in the livelihood of HEIs, rural community outreach can be a driver for increasing enrollment at rural college campuses. I intend to study community engagement through environmental conservation and habitat restoration in rural areas in and outside of the South.

**Implementing Sustainability In and Across College Campuses**

I found that the majority of higher education institutions are still young in their sustainability efforts, but are beginning to recognize their roles in leading cultural shifts through holistic thinking and application. These green HEIs can look to those who have been implementing sustainability into their campus for decades. By assessing the webpages of HEIs at all stages of campus sustainable development, I found out how an
institution can go about formally integrating sustainability throughout their institution and the economic, environmental, and social benefits from doing so.

**Leadership through the Development of Implementation Structures**

Throughout the research, I found that leadership and collaboration are essential to integrating sustainability throughout a college campus. This research provides guidance on how to implement sustainability through the formation of a sustainability implementation structure whether it begins through the development of an interdisciplinary academic program, research center, or a formal collaborative effort such as a committee or board initiated by administration, faculty, staff, or students.

**Four Year Degree Programs.** The most common sustainability implementation structure found through this study was four-year degree programs focused on at least one of the three pillars of sustainability, mostly environmental. Literature focusing on sustainability science and education for sustainable development (ESD) often warns against the one-sided trend of “going green” and neglecting the social and economic issues of the world (Schwarzin et al. 2012; Disterheft et al. 2013, 18). In response, HEIs are increasingly creating sustainability-focused programs outside of the environmental field that acknowledge the social and economic issues in their curriculum (Vincent et al. 2013; as cited by O’Byrne 2015). These programs are often inter- and trans-disciplinary in nature and focus on learning through addressing real-world social, economic, and environmental problems (O’Byrne 2015).

Some HEIs have the resources to create an independent academic school like the School of Sustainability at Arizona State University while many universities implement
sustainability through already-existing structures like courses, degree programs, and departments (Sammalisto and Lindhquist 2008). Anthropology, geography, and economic studies often house sustainability education due to their interdisciplinary nature while some research centers take on the responsibility or utilizing existing faculty and courses to teach an array of courses across disciplines (Sammalisto and Lindhquist 2008; O’Byrne 2015).

**Research Centers.** Though research centers are less common than academic programs and require more revenue, they are sites for establishing a formal sustainability effort. The federal government, non-profit, and for-profit organizations have begun offering more funding for interdisciplinary research to address growing environmental, social, and economic issues (Vincent et al. 2014, 14). If present, research centers are well suited to identify sustainability issues on and off campus and possibly solve complex problems that other sustainability implementation structures do not have the capacity to deal with.

Sustainability-focused academic programs and research centers, if implemented the way that scholars call for, can integrate sustainability into all of their curriculum and research. An academic program alone, however, cannot integrate sustainability across all dimensions of an institution. To establish cross-campus sustainability efforts, HEIs need to create a formal collaborative and/or a campus sustainability office (Brown and Hamburger 2012).
**Formal Collaborative Efforts.** Almost half (48.9%) of the Public and Private Non-Profit sustainable HEIs have a formal collaborative effort such as a committee, council, or board centered around cross-campus sustainable development listed on their website. Collaborative efforts are cost-effective ways for HEIs to integrate sustainability. They do not require hired staff or offices and they promote cross-campus collaboration that connects campus administration and students through the leadership of faculty and staff. Sharp (2009) and Brown and Hamburger (2012) explain that many campus sustainability offices are preceded or initiated by campus committees of faculty, staff, and students.

Formal collaborative efforts such as committees, councils, boards, or similar titles are the most economically feasible sustainability implementation structure and offer institutions interested in creating a formal sustainability initiative a place to begin. With a formal collaborative effort, institutions do not have to hire faculty or staff to integrate sustainability throughout the campus or pay for a site dedicated to housing sustainability efforts. Key stakeholders such as faculty, staff, students, and even community members from off-campus can volunteer their time and meet in the already existing conference rooms found throughout U.S. campuses.

Formal collaborative efforts such as sustainability committees allow for a collaborative cross-campus effort that engages administration, faculty, staff, and student representatives to work together and make recommendations administration regarding policies to promote sustainability on campus. A campus sustainability-focused webpage can serve as a place for members of sustainability-focused efforts to communicate with other campus stakeholders and off-campus communities. Through their sustainability
webpage, they can provide information on current initiatives, encourage dialogue, investment, visitorship, and civic activity (Arnold 2012).

**Staffed Offices.** Simpson (2008) notes that although the formation of collaborative efforts is expedient and cost effective, members and even leaders of these groups have other responsibilities and cannot focus solely on cross-campus sustainable development. A hired staff-member such as a sustainability coordinator or director can focus on integrating sustainability throughout the college campus and beyond (Disterheft and et al. 2013, 12). Staff hired to take on the role of implementing cross-campus sustainable development can also serve as liaisons for campus stakeholders. They can facilitate communication and collaboration between administration, faculty, staff, students, and the external community that many of the *Sustainability Faculty and Staff Questionnaire* respondents called for.

**Physical Plants and Other Campus Spaces.** Campus physical plants can house young sustainability efforts, particularly a small, staffed office. Implementing sustainability through an HEI’s physical plant is tangible, accessible, and economically feasible given that all universities have one. Physical plants are also good homes new sustainability efforts because universities often implement sustainability through operation efforts such as recycling, water, and energy conservation before anything else. Physical plants have the resources to assess the costs and impacts of their operations, reduce their carbon footprint and natural resource consumption, save money, and measure their progress. The visibility of sustainable operations can also be used to communicate an institution’s values and commitment to sustainability.
While conducting my web assessments, I identified four campus spaces where sustainability is integrated: campus buildings, dining facilities within sustainable buildings, campus landscapes, and grey landscapes within campus landscapes. Grey landscapes are landscapes related to transportation such as parking lots, walkways, and streets and named after the color of concrete, pavement, and gravel used to create these landscapes. More than half of the sustainable universities I studied had integrated sustainability into their buildings and landscapes mainly through their operations. I intend to further identify how sustainability occurs within these landscapes and identify other spaces within buildings and landscapes where sustainability is implemented.

Revenue plays an important role in the implementation of sustainability and leadership, mission, structure, and planning are often barriers to integrating sustainability across a college campus. Formal collaborative efforts and/or a staffed office housed within a physical plant are options for those HEIs that are wanting to integrate sustainability across campus, but do not have a surplus of funds.

**Final Takeaways**

Colleges and universities have a role to play in developing leaders who can champion the cause of sustainability (An et al. 2018). They are historically known for their leadership in environmental and social movements and for creating leaders in the process (Lehmann et al. 2009). Many scholars believe that participation of HEIs in sustainability might encourage a cultural shift towards a more sustainable society while also developing a vital new symbol for university branding (Bowers 2001; Zou et al. 2015; An et al. 2018, 2). To do this, HEIs need to promote social sustainability and community outreach.
Higher education institutions not only have the advantage of spearheading sustainability for ethical reasons; they also stand to benefit from adopting sustainability as a marketing and recruitment strategy (Badassare and Campo 2016, 421). Sustainable development roles can help HEIs save already scarce funds through resource conservation efforts while also increasing their revenue by creating popular, new degree programs that build enrollment (Hart 2016; Sanchez et al. 2015, 14,899). As sustainability becomes more prevalent within HEIs and American society, so will the efforts of for-profit businesses and non-profit organizations (Princeton Review 2020).

This research provides a snapshot of where sustainability is thriving, but more importantly, lacking in higher education. Future research on HEIs engaging with their communities using a three-pillar approach can help HEIs find relevance within their communities and society as a whole. I intend to further study the socioeconomic and environmental benefits of colleges and universities reaching out to low-income communities, both in rural and urban settings.

While it is important to realize that HEIs are part of a larger social community, it is equally important to realize they are part of larger ecosystems that include both human and non-human species. Multispecies sustainability strengthens the holistic approach stressed by sustainable development literature (Rupprecht et al. 2020; Thomsen and Thomsen 2021). I call for further research on HEIs that practice multispecies sustainability both on and off their campuses, particularly land-grant institutions that tended to focus more on natural conservation and wildlife management than other HEIs. Doing so allows scholars to promote sustainability within and outside of college.
campuses and acknowledge all stakeholders when addressing environmental, social, and economic pressures.
### APPENDIX A - WEB ASSESSMENT TOOL (REVISED)

<table>
<thead>
<tr>
<th>Data Collection Instrument</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>University: SL</strong> Sustainability Leader:</td>
</tr>
<tr>
<td><strong>Elements</strong></td>
</tr>
<tr>
<td>Variable Questions</td>
</tr>
<tr>
<td>Public/Private</td>
</tr>
<tr>
<td><strong>HEI Demographics (College Navigator 2018)</strong></td>
</tr>
<tr>
<td>State</td>
</tr>
<tr>
<td>Geographic Region</td>
</tr>
<tr>
<td>Size of full-time student enrollment</td>
</tr>
<tr>
<td>Tuition</td>
</tr>
<tr>
<td>Location (city, suburban, town, rural)</td>
</tr>
<tr>
<td><strong>Awards</strong></td>
</tr>
<tr>
<td>A1/E Are sustainability awards and affiliations listed on website?</td>
</tr>
<tr>
<td>A2/F AASHE STARS Award shown?</td>
</tr>
<tr>
<td>A3/G AASHE STARS Type</td>
</tr>
<tr>
<td><strong>Framework</strong></td>
</tr>
<tr>
<td>IF2/J Has a staffed office been established with the mandate to incorporate sustainability into various facets of institutional life – not just academic?</td>
</tr>
<tr>
<td>IF3/K Difficulty of finding contact information to HEI sustainability leader</td>
</tr>
<tr>
<td>IF4/L Where is the sustainability entity housed or does it stand alone?</td>
</tr>
<tr>
<td><strong>Faculty and Staff Development</strong></td>
</tr>
<tr>
<td>FD1/M Is there one assigned sustainability leader (coordinator/director), or is it a collaborative effort (committee)?</td>
</tr>
<tr>
<td>FD2/N Are workshops, webinars, seminars, being held to educate faculty on how to integrate SD into their academic/administrative work? Are departments/offices offered sustainability certification courses?</td>
</tr>
<tr>
<td>Code</td>
</tr>
<tr>
<td>------</td>
</tr>
<tr>
<td>ED1</td>
</tr>
<tr>
<td>ED2/P</td>
</tr>
<tr>
<td>ED3/Q</td>
</tr>
<tr>
<td>ED4/R</td>
</tr>
<tr>
<td>ED5/S</td>
</tr>
<tr>
<td>ED6/T</td>
</tr>
<tr>
<td>ED7/U</td>
</tr>
<tr>
<td>ED8/V</td>
</tr>
<tr>
<td>ED8/W</td>
</tr>
<tr>
<td>OC1/X</td>
</tr>
<tr>
<td>OC2/Y</td>
</tr>
<tr>
<td>OC3/Z</td>
</tr>
<tr>
<td>OC4/AA</td>
</tr>
<tr>
<td>OS1/AB</td>
</tr>
<tr>
<td>OS2/AC</td>
</tr>
<tr>
<td>Index</td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td>OP1/AD</td>
</tr>
<tr>
<td>OP2/AE</td>
</tr>
<tr>
<td>OP3/AF</td>
</tr>
<tr>
<td>OP4/AG</td>
</tr>
<tr>
<td>OP5/AH</td>
</tr>
<tr>
<td>OP6/AI</td>
</tr>
<tr>
<td>DS1/AJ</td>
</tr>
<tr>
<td>DS2/AK</td>
</tr>
<tr>
<td>TR1/AL</td>
</tr>
<tr>
<td>TR2/AM</td>
</tr>
<tr>
<td>TR3/AN</td>
</tr>
<tr>
<td>TR4/OA</td>
</tr>
<tr>
<td>AS1/AP</td>
</tr>
<tr>
<td>AS2/AQ</td>
</tr>
<tr>
<td>ET1/AT</td>
</tr>
<tr>
<td>ET2/AU</td>
</tr>
<tr>
<td>AV</td>
</tr>
<tr>
<td>AW</td>
</tr>
<tr>
<td>AX</td>
</tr>
<tr>
<td>AY</td>
</tr>
<tr>
<td>AZ</td>
</tr>
<tr>
<td>ET</td>
</tr>
<tr>
<td>CUM1/AS</td>
</tr>
</tbody>
</table>
APPENDIX B - ONLINE QUESTIONNAIRE INVITATION

Dear Prospective Survey Participant,

The attached questionnaire is part of my (Kori Nadine Armstrong’s) doctoral research. The overarching goal of this dissertation is to document four-year higher education institutions (HEIs) in the U.S. that self-identify as being environmentally sustainable and evaluate how these institutions portray themselves in terms of environmental sustainability.

The attached questionnaire is designed to obtain a more in-depth look into the political setting and identification of sustainability within the university itself by surveying Sustainability Leaders from four-year U.S. universities (public and private) that have an identifiable entity that includes the word sustainability or a similar variant of the term. Sustainability Leaders “individuals who are compelled to make a difference by deepening their awareness of themselves in relation to the world around them (The Sustainability Institute 2011).” Feel free to share this link with other Sustainability Leaders at your four-year university and other four-year universities, whether they be faculty, staff, or a student.

By agreeing to participate in the study, you will be giving your consent for the researcher or principal investigator to include your responses in her data analysis. Your participation in this research study is strictly voluntary, and you may choose not to participate without fear of penalty or any negative consequences. You will be able to withdraw from the survey at any time and all survey responses will be deleted, including the informed consent agreement.

An informed consent agreement will appear on the first screen page of the survey. There will be no individually identifiable information, remarks, comments or other identification of you as an individual participant. All results will be presented as aggregate, summary data. If you wish, you may request a copy of the results of this research study by writing to the researcher at kori.armstrong@eagles.usm.edu.

The survey will last no more than 10 minutes. Your participation will contribute to the current literature on environmental sustainability in higher education and would be greatly appreciated.

If you decide to participate after reading this letter, you can access the survey from the link below.

Thank you for your consideration,

Kori Nadine Armstrong

Follow this link to the Survey:
Take the Survey

https://usmuw.co1.qualtrics.com/CP/Register.php?OptOut=true&RID=MLRP_9KRoSCAqPy6zNWZ&LID=UR_8jQcdAldhGNie1&DID=EMD_eXoN0r4mTdfkOLX&BT=dXNdXc&_=1
APPENDIX C - SUSTAINABILITY FACULTY AND STAFF QUESTIONNAIRE

Sustainability Faculty and Staff Questionnaire

Start of Block: Consent

QA Section 1. Authorization

THE UNIVERSITY OF SOUTHERN MISSISSIPPI

AUTHORIZATION TO PARTICIPATE IN RESEARCH PROJECT

PURPOSE: The present study is designed to obtain a more in-depth look into the political setting and identification of sustainability within the university itself by surveying Sustainability Leaders from four-year U.S. universities (public and private) that have an identifiable entity that includes the word sustainability or a similar variant of the term in their name.

DESCRIPTION OF STUDY: Participation will consist of completing an online questionnaire.

BENEFITS: Participants will benefit from the study by having access to the results of the research, thus gaining knowledge about other university Sustainability Leaders across the United States.

RISKS: No foreseeable risks, beyond those present in routine daily life, are anticipated in this study. If participants find they are distressed by participating in this research, they should notify the researcher immediately. Do not participate in this study if you are younger than 18 years of age.

CONFIDENTIALITY: Data that does not have the names and contact information of university Sustainability Leaders may be shared or published online, but the names of the participants in this study will remain confidential. Data gathered from the present study will be stored in a secure location for five years, at which time it will be destroyed. Findings will be presented in aggregate form with no identifying participant information.

PARTICIPANT ASSURANCE: Whereas no assurance can be made concerning results that may be obtained (since results from investigational studies cannot be predicted), the researcher will take every appropriate precaution consistent with the best scientific practice. Participation in this project is completely voluntary, and participants may withdraw from this study at any time without penalty, prejudice, or loss of benefits. Questions concerning the research should be directed to Kori Nadine Armstrong at (205)-499-9454 (or e-mail at kori.armstrong@usm.edu). This project and this consent form have been reviewed by the USM Institutional Review Board, which ensures that research projects involving human participants follow federal regulations. Any questions or concerns about your rights as a research participant should be directed to the Chair of the Institutional Review Board, The University of Southern Mississippi, Box 5116, Hattiesburg, MS 39406, (601) 266-5997. By selecting "I agree", you are agreeing to the conditions described above.

- I agree (1)
- I disagree (2)

End of Block: Consent

Start of Block: Demographics (Base/Universal)

Q1 Please list the name of your higher education institution.
Q2 What is the ZIP code of your institution?

Q3 What is your year of birth?

Q4 Which gender category would you assign for yourself when asked? Please feel free to whichever applied to you (woman, man, non-binary, agender, two-spirit, genderqueer, etc.)

Q5 Which race/ethnicity best describes you?
   □ American Indian or Alaskan Native (1)
   □ Asian (2)
   □ Black or African American (3)
   □ Hispanic American (4)
   □ Native Hawaiian or Pacific Islander (5)
   □ White/ Caucasian (6)
   □ Multiple Ethnicity/ Other (please specify) (7)
   □ Prefer not to answer (8)
Q6 What is the highest level of education you have completed?
- Less than high school degree (1)
- High school graduate (high school diploma or equivalent including GED) (2)
- Some college but no degree (3)
- Associate degree in college (2-year) (4)
- Bachelor's degree in college (4-year) (5)
- Master's degree (6)
- Doctoral degree (7)
- Professional degree (JD, MD) (8)

Q7 What is your academic background? (Please feel free to list as many degrees and minors as desired.)

Q8 What is your current employment status at your institution?
- Full-time, salaried (1)
- Full-time, hourly (2)
- Part-time, salaried (3)
- Part-time, hourly (4)

Q9 What is your current position at your institution?

Q12 In what year did you begin working in the position that you currently hold?

Q20 Which of the following types of sustainability are addressed at your institution? (Select all that apply)
- Environmental (1)
- Social (2)
- Economic (3)
Q21 Which sector at your institution is the greatest priority given to in terms of sustainable development?
- Education/Curriculum (1)
- Faculty and Staff Development (2)
- Mission, Structure, and Planning (3)
- Operations (4)
- Outreach and Services (5)
- Research (6)
- Student Life (7)
- Other (please specify) (8)

Q22 What sector(s) at your institution are not getting enough attention to in terms of sustainable development? (Can apply to multiple)
- Education/Curriculum (1)
- Research (2)
- Operations (3)
- Outreach and Services (4)
- Faculty and Staff Development (5)
- Student Life (6)
- Mission, Structure, and Planning (7)

Q23 At what levels does your institution collaborate with others on sustainable development? (Can apply to multiple)
- Local-level (1)
- Regional-level (2)
- National-level (3)
- Global-level (4)
Q24 Is your institution engaged with other higher education institutions in sustainable development?
○ Yes (1)
○ Unsure (2)
○ No (3)

Q25 Are undergraduate students required to take a course on issues related to the environment or sustainability?
○ No (1)
○ Yes, (please specify) (2)
○ Unsure (3)

Q26 Are graduate students required to take a course on issues related to the environment or sustainability?
○ No (1)
○ Yes, (please specify) (2) ________________________________________________
○ Unsure (3)

Q27 To what extent does your institution provide significant faculty and staff development opportunities to enhance understanding, teaching and research in sustainability?
○ Don't know (1)
○ None (2)
○ A little (3)
○ Quite a bit (4)
○ A great deal (5)
Q28 How effectively do you think your institution's website illustrates its sustainability efforts?
- Extremely effective (1)
- Very effective (2)
- Moderately effective (3)
- Slightly effective (4)
- Not effective at all (5)

Q29 How satisfied or dissatisfied are you with your institution's efforts to promote sustainability?
- Extremely satisfied (1)
- Moderately satisfied (2)
- Slightly satisfied (3)
- Neither satisfied nor dissatisfied (4)
- Slightly dissatisfied (5)
- Moderately dissatisfied (6)
- Extremely dissatisfied (7)

Q30 Please describe the greatest strengths of your institution in terms of sustainability.

Q31 Please describe the greatest weakness of your institution in terms of sustainability.

Q32 Please share your thoughts on how your institution can improve its sustainability efforts regarding education, research, and practice.

End of Block: Demographics (Base/Universal)
APPENDIX D - DISSERTATION IRB SUBMISSION

Name: Kori Armstrong
Organization: School of ASBEES
Address: 118 College Drive, Hattiesburg, MS 39406 Phone: kori.armstrong@usm.edu

Attach active (non-expired) CITI Common Course certificate.
Kori Armstrong CITI CompletionReport3901499.pdf

Attach active (non-expired) CITI Human Subjects Research Course certificate.
CITI Human Subjects Research - Armstrong, Kori.docx
2 Describe the P.I.'s expertise and qualifications to perform this research.

The P.I. has taken 40 hours of geography courses at USM to better prepare for qualitative and quantitative research. Experience in qualitative research has also been gained through research conducted for the P.I.'s Master's thesis research in Cultural Anthropology. Here, ethnographic research was conducted using an open-ended questionnaire and participatory research with Southern beekeepers. The P.I. also has experience in creating and distributing online questionnaires using Qualtrics software.

3 Are you the primary contact?
   ✔ Yes

4 Research purpose?
   Undergraduate Project
   Honor's Thesis Project
   ✔ Graduate Project
   Master's Thesis Doctoral Project Doctoral Dissertation Faculty or Staff Project

5 Is this project externally funded?
   ✔ No Yes

6 Are there other USM affiliated investigators?
   ✔ No Yes

7 Are there any Non-USM affiliated investigators?
   ✔ No Yes

8 Will other individuals (non-investigators) be involved in data collection?
   No ✔ Yes *required
   Describe the role(s) of the non-investigators and their training.
   Either indicate names and affiliations in the below text box, or upload files.
   Files pertaining to non-investigators.

9 Are external organizations participating in the project?
   ✔ No Yes

10 Briefly describe the project and its goal(s) in two to three paragraphs.

This dissertation research proposes to identify the factors that contribute to the cultural characteristics of sustainability among higher education institutions (HEIs) in the United States to shed light on how they represent themselves as sustainable. Its objectives are to: 1) to document four-year HEIs in the United States that self-identify as sustainable; 2) to evaluate how these institutions portray themselves to society as sustainable; and 3) to analyze spatial and regional patterns of HEI sustainability in the United States.

To achieve these goals, I will use data from the National Center for Education Statistics, analyze publicly available university websites, and administer a survey to a sample of sustainability leaders in higher education.
There are clearly many pitfalls in evaluating an HEI’s commitment to sustainable development based on public domain data and internet research. Taylor (1999) points out that the internet may not, “reflect all the sustainability efforts that an institution is making (Taylor 1999, 2).” Misrepresentation of the sustainability achievements of larger and/or wealthier institutions might also result simply from their capability to support more extravagant websites (Taylor 1999, 2). With greater access to the internet and web development tools, this bias is hopefully less likely to occur than it used to be. Regardless of possible inaccuracies, institutional websites are an important representation of HEIs with regard to sustainability. The internet specifically can provide insight into how an institution perceives itself in terms of sustainable development and whether or not it “places priority on sustainability and the study of the natural world (Taylor 1999, 2).”

11 Are any participants under 18 years of age?  ✔ No *required
For adult participants, how will you verify that they are over 18?

    ✔ Questionnaire or interview Other

Indicate consent procedures.

    ✔ Signed informed consent *required
    Attach consent form or HIPAA documentation.
    Online/anonymous informed consent
    Oral presentation
    Request waiver of consent
    Detail procedures for obtaining participants’ consent

Consent is gained from participants at the beginning of the online survey. Participants must click "Agree" to show they understand the conditions explained at the beginning of the survey. After clicking "Agree", participants are then allowed to take the survey.

12 Is the consent in English?  ✔ Yes

13 Describe participant population, number of participants to be included, and criteria for selection.
The participant population will be faculty and staff from universities that are deemed sustainability leaders. This means that they are faculty member of an entity that includes the word sustainability or a similar concept such as environmental or conservation, whether it be a staffed office, research center, or academic department.

14 How will participants be recruited?
Check all that apply.
Class announcement
Oral Announcement
✔ Email announcement *required
Attach the email announcement.
Posted campus advertisement SONA
Other
15 How many interactions will be required with each participant?

0

✓ 1

2-3

4-9

10 or more

What is the maximum length of each interaction?

✓ Less than 10 minutes  Less than an hour  Less than three hours  Three hours or more

*required

Where will interactions take place?

Check all that apply.

USM campus

Off campus ✓ Online

16 Indicate means of data collection.

Check all that apply.

Personal Interview ✓

Questionnaire *required

Attach questionnaire.

17 Do any of the following apply to your study?

Use of human biological samples?

✓ No Yes

Use of physical exercise?

✓ No Yes

Medical examinations or procedures?

✓ No Yes

Use of drugs or biological products?

✓ No Yes

18 Give a step by step explanation of data collection procedures.

After creating a list of environmentally sustainable higher education institutions, the first step in Objective 3 is to gather the names and contact information of preferably two sustainability leaders (SLs) at each Green University. SLs in higher education are important contacts and can provide valuable contextual information regarding how an institution identifies itself as sustainable. Higher education sustainability leaders can point out where their institution is lacking in terms of sustainability and offer insight on how their institution can improve.

Surveying SLs in higher education is a way to gain a better understanding of the sustainability initiatives taking place on campus that may not be seen on the university webpage. Surveying SLs will allow me to better understand the politics and hierarchy of sustainability units in U.S. HEIs, the units’ relationship with administration, faculty, the student body, and the community outside of campus. My survey will also look at how these relationships affect the integration of sustainability in a HEI at various levels.

I created an online survey using Qualtrics software to distribute to sustainability leaders in higher education across the United States. Titled “Sustainability Staffing Questionnaire,” the 24-question survey asks sustainability leaders questions pertaining to the state of sustainability at their institution (See Table 1). The survey focuses on the demographics of sustainability leaders, their role at their institution, where in their institution sustainability efforts are occurring, where sustainability efforts are lacking, and the
effectiveness of their institution’s website in portraying sustainability efforts. These questions will allow me to understand the role that HEIs play in promoting sustainability.

Many of the questions in my staffing questionnaire are derived from the 48-question 2017 AASHE Sustainability Staffing Survey and the International Association of Universities’ 2017 Global Survey on Higher Education and Research for Sustainable Development. Some questions are also pulled from the Pet Sustainability Coalition’s customizable employee survey template. I excluded certain sections of the IAU Survey and the 2017 AASHE Survey, such as Salary and Employee Benefits, and Budgeting to reduce the overall length of my survey to a manageable size and to avoid redundant or seemingly irrelevant questions.

The Sustainability Staffing Questionnaire was distributed via email from October to December of 2019. In November of 2019, reminder alerts were sent to the sustainability leaders who have not completed the initial survey. This process will be repeated two weeks later in an effort to increase response rates. The survey has now been closed, data will soon be analyzed.

19 Are participants anonymous? Note: Anonymous means that even investigators cannot associate the data with individual participants and vice versa, not merely that identities will not be revealed. In order to be anonymous, electronic surveys must be conducted via websites that do not link responses to email addresses or other identifiers. Personal interviews are not anonymous.
   ✔ No ✓ Yes

20. Does your research involve sensitive information? Note: Sensitive information may include (but is not limited to) information about sexual activity, drug usage, criminal behavior, financial or medical data, and religious views.
   ✓ No Yes

21 Does your research involve hidden video or audio recordings or deception? Note: Deception includes any information or procedure that misleads a participant intentionally.
   ✓ No Yes

22 Indicate all potentially vulnerable participants involved in the study.
   - Children
   - Mentally ill patients
   - Nursing home patients
   - Pregnant females
   - Prisoners
   - HIV positive individuals
   - Other
   ✔ Not applicable

23 How will you maintain confidentiality?
   Check all that apply.
   ✓ Anonymous data
   ✓ Electronic data will be password protected
   ✓ Physical data will be locked in a file drawer
   - Public/non-confidential data

24 Describe the storage of data and plans for its disposal.
The anonymous data will be stored in the password protected Qualtric Survey Software on my password protected laptop and office computer at the University of Mississippi campus. Statistical analysis will be conducted on my password protected office computer. Once the collected data has been analyzed and the results are published, the data will remain on my password-protected computer. A backup of the data will be loaded onto a flash-drive that will be stored in a locked-firebox at my home. This data will not be destroyed for at least 10 years.
Identify the risks, inconveniences, or discomforts participants are likely to experience.
Check all that apply.
Physical Psychological Financial Occupational Legal
Social
Other ✓
None

Describe any potential benefits participants may gain as a result of participation.
Data results will be distributed to participants after my dissertation is published, offering knowledge about the state of sustainable development in higher education.

Are there incentives given to participants?
✓ No Yes
### APPENDIX E - 66 TOP RATED LOW-REVENUE INSTITUTIONS

<table>
<thead>
<tr>
<th>Top-rated HEIs</th>
<th>Grade</th>
<th>Total revenue</th>
<th>City, State</th>
<th>Type</th>
<th>Campus setting</th>
<th>Student population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eureka College</td>
<td>A</td>
<td>$15,137,253</td>
<td>Eureka, Illinois</td>
<td>Private Non-Profit</td>
<td>Town</td>
<td>672</td>
</tr>
<tr>
<td>Judson University</td>
<td>A</td>
<td>$20,638,008</td>
<td>Elgin, Illinois</td>
<td>Private Non-Profit</td>
<td>City</td>
<td>1,298</td>
</tr>
<tr>
<td>Monmouth College</td>
<td>A</td>
<td>$32,931,338</td>
<td>Monmouth, Illinois</td>
<td>Private Non-Profit</td>
<td>Town</td>
<td>1,147</td>
</tr>
<tr>
<td>Clarke University</td>
<td>A</td>
<td>$24,234,845</td>
<td>Dubuque, Iowa</td>
<td>Private Non-Profit</td>
<td>City</td>
<td>1,043</td>
</tr>
<tr>
<td>Maharishi University of Management</td>
<td>A</td>
<td>$33,213,000</td>
<td>Fairfield, Iowa</td>
<td>Private Non-Profit</td>
<td>Town</td>
<td>1,689</td>
</tr>
<tr>
<td>Simpson College</td>
<td>A</td>
<td>$33,318,865</td>
<td>Indianola, Iowa</td>
<td>Private Non-Profit</td>
<td>Town</td>
<td>1,608</td>
</tr>
<tr>
<td>Morningside College</td>
<td>A</td>
<td>$37,905,851</td>
<td>Sioux City, Iowa</td>
<td>Private Non-Profit</td>
<td>City</td>
<td>2,902</td>
</tr>
<tr>
<td>Graceland University-Lamoni</td>
<td>A</td>
<td>$39,017,649</td>
<td>Lamoni, Iowa</td>
<td>Private Non-Profit</td>
<td>Rural</td>
<td>2,233</td>
</tr>
<tr>
<td>Cornell College</td>
<td>A</td>
<td>$40,613,755</td>
<td>Mount Vernon, Iowa</td>
<td>Private Non-Profit</td>
<td>Town</td>
<td>978</td>
</tr>
<tr>
<td>Coe College</td>
<td>A</td>
<td>$42,084,179</td>
<td>Cedar Rapids, Iowa</td>
<td>Private Non-Profit</td>
<td>City</td>
<td>1,406</td>
</tr>
<tr>
<td>Buena Vista University</td>
<td>A</td>
<td>$42,598,547</td>
<td>Storm Lake, Iowa</td>
<td>Private Non-Profit</td>
<td>Town</td>
<td>2,114</td>
</tr>
<tr>
<td>Central College</td>
<td>A</td>
<td>$42,918,068</td>
<td>Pella, Iowa</td>
<td>Private Non-Profit</td>
<td>Town</td>
<td>1,248</td>
</tr>
<tr>
<td>Kansas Wesleyan University</td>
<td>A</td>
<td>$18,825,627</td>
<td>Salina, Kansas</td>
<td>Private Non-Profit</td>
<td>Town</td>
<td>766</td>
</tr>
<tr>
<td>Southwestern College</td>
<td>A</td>
<td>$23,651,901</td>
<td>Winfield, Kansas</td>
<td>Private Non-Profit</td>
<td>Town</td>
<td>1467</td>
</tr>
<tr>
<td>Aquinas College</td>
<td>A</td>
<td>$35,425,714</td>
<td>Grand Rapids, Michigan</td>
<td>Private Non-Profit</td>
<td>City</td>
<td>1,764</td>
</tr>
<tr>
<td>Westminster College</td>
<td>A</td>
<td>$21,547,765</td>
<td>Fulton, Missouri</td>
<td>Private Non-Profit</td>
<td>Town</td>
<td>876</td>
</tr>
<tr>
<td>Top-rated HEIs</td>
<td>Grade</td>
<td>Total revenue</td>
<td>City, State</td>
<td>Type</td>
<td>Campus setting</td>
<td>Student population</td>
</tr>
<tr>
<td>------------------------------------</td>
<td>-------</td>
<td>---------------------</td>
<td>----------------------</td>
<td>--------------------</td>
<td>----------------</td>
<td>--------------------</td>
</tr>
<tr>
<td>Mckendree University</td>
<td>B</td>
<td>$48,293,646</td>
<td>Lebanon, Illinois</td>
<td>Private Non-Profit</td>
<td>Suburb</td>
<td>2,902</td>
</tr>
<tr>
<td>Goshen College</td>
<td>B</td>
<td>$309,72,619</td>
<td>Goshen, Indiana</td>
<td>Private Non-Profit</td>
<td>City</td>
<td>870</td>
</tr>
<tr>
<td>Indiana University-Kokomo</td>
<td>B</td>
<td>$44,643,153</td>
<td>Kokomo, Indiana</td>
<td>Public</td>
<td>City</td>
<td>4,106</td>
</tr>
<tr>
<td>Manchester University</td>
<td>B</td>
<td>$46,652,078</td>
<td>North Manchester, Indiana</td>
<td>Private Non-Profit</td>
<td>Town</td>
<td>1,598</td>
</tr>
<tr>
<td>Briar Cliff University</td>
<td>B</td>
<td>$24,469,733</td>
<td>Sioux City, Iowa</td>
<td>Private Non-Profit</td>
<td>City</td>
<td>1,316</td>
</tr>
<tr>
<td>Mount Mercy University</td>
<td>B</td>
<td>$31,855,113</td>
<td>Cedar Rapids, Iowa</td>
<td>Private Non-Profit</td>
<td>City</td>
<td>1,886</td>
</tr>
<tr>
<td>Loras College</td>
<td>B</td>
<td>$45,108,987</td>
<td>Dubuque, Iowa</td>
<td>Private Non-Profit</td>
<td>City</td>
<td>1,524</td>
</tr>
<tr>
<td>Sterling College</td>
<td>B</td>
<td>$15,998,144</td>
<td>Sterling, Kansas</td>
<td>Private Non-Profit</td>
<td>Rural</td>
<td>678</td>
</tr>
<tr>
<td>Newman University</td>
<td>B</td>
<td>$24,411,724</td>
<td>Wichita, Kansas</td>
<td>Private Non-Profit</td>
<td>City</td>
<td>3,170</td>
</tr>
<tr>
<td>Haskell Indian Nations University</td>
<td>B</td>
<td>$25,120,571</td>
<td>Lawrence, Kansas</td>
<td>Public</td>
<td>City</td>
<td>820</td>
</tr>
<tr>
<td>Baker University</td>
<td>B</td>
<td>$40,961,595</td>
<td>Baldwin City, Kansas</td>
<td>Private Non-Profit</td>
<td>Town</td>
<td>2,726</td>
</tr>
<tr>
<td>Finlandia University</td>
<td>B</td>
<td>$12,905,577</td>
<td>Hancock, Michigan</td>
<td>Private Non-Profit</td>
<td>Town</td>
<td>507</td>
</tr>
<tr>
<td>Minneapolis College of Art And Design</td>
<td>B</td>
<td>$22,034,694</td>
<td>Minneapolis, Minnesota</td>
<td>Private Non-Profit</td>
<td>City</td>
<td>803</td>
</tr>
<tr>
<td>University of Minnesota-Rochester</td>
<td>B</td>
<td>$40,565,424</td>
<td>Rochester, Minnesota</td>
<td>Public</td>
<td>City</td>
<td>435</td>
</tr>
<tr>
<td>University of Minnesota-Crookston</td>
<td>B</td>
<td>$47,146,267</td>
<td>Crookston, Minnesota</td>
<td>Public</td>
<td>Town</td>
<td>2,676</td>
</tr>
</tbody>
</table>
## APPENDIX F - SUSTAINABILITY WEB ASSESSMENT RESULTS

<table>
<thead>
<tr>
<th>Big Six Dimensions of Sustainability</th>
<th>Sustainability Variable</th>
<th>HEIs with variable</th>
<th>HEIs with variable</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Campus Engagement</strong></td>
<td>Sustainability-focused internships, eco-ambassador, or similar program</td>
<td>757</td>
<td>65.7%</td>
</tr>
<tr>
<td></td>
<td>Section listing environmental/sustainability careers</td>
<td>712</td>
<td>61.8%</td>
</tr>
<tr>
<td></td>
<td>Student-led group focused on sustainability</td>
<td>590</td>
<td>51.2%</td>
</tr>
<tr>
<td></td>
<td>Resources provided to assist faculty and staff with integration of sustainability into</td>
<td>350</td>
<td>30.4%</td>
</tr>
<tr>
<td></td>
<td>academic/administrative work</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Students awarded/recognized for being &quot;environmental/sustainability&quot; leaders</td>
<td>349</td>
<td>30.3%</td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td>Four-year sustainability-focused academic program</td>
<td>783</td>
<td>67.9%</td>
</tr>
<tr>
<td></td>
<td>Minor, concentration, certificate program</td>
<td>568</td>
<td>49.3%</td>
</tr>
<tr>
<td></td>
<td>Sustainability/environmentally focused graduate program</td>
<td>419</td>
<td>36.3%</td>
</tr>
<tr>
<td></td>
<td>Sustainability-related courses and/or programs without *sustainability, environmental,</td>
<td>323</td>
<td>28.0%</td>
</tr>
<tr>
<td></td>
<td>*conservation, or similar term listed in title</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sustainability-related courses without sustainability degree program</td>
<td>292</td>
<td>25.3%</td>
</tr>
<tr>
<td>Big Six Dimensions of Sustainability</td>
<td>Sustainability variable</td>
<td>HEIs with variable</td>
<td>Percent of HEIs with variable</td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>----------------------------------------------------------------------------------------</td>
<td>--------------------</td>
<td>------------------------------</td>
</tr>
<tr>
<td><strong>Operation</strong></td>
<td>Sustainable waste management program (excludes composting)</td>
<td>846</td>
<td>73.4%</td>
</tr>
<tr>
<td></td>
<td>Sustainable energy initiative</td>
<td>810</td>
<td>70.3%</td>
</tr>
<tr>
<td></td>
<td>Sustainable dining service</td>
<td>757</td>
<td>65.7%</td>
</tr>
<tr>
<td></td>
<td>Eco-friendly buildings</td>
<td>702</td>
<td>60.9%</td>
</tr>
<tr>
<td></td>
<td>Promotion of eco-conscious transportation (carpool/bus/bike/walking)</td>
<td>659</td>
<td>57.2%</td>
</tr>
<tr>
<td></td>
<td>Water conservation effort</td>
<td>652</td>
<td>56.6%</td>
</tr>
<tr>
<td></td>
<td>Promotion of transit program</td>
<td>601</td>
<td>52.1%</td>
</tr>
<tr>
<td></td>
<td>Vegetable garden</td>
<td>592</td>
<td>51.3%</td>
</tr>
<tr>
<td></td>
<td>Sustainable landscaping program</td>
<td>549</td>
<td>47.6%</td>
</tr>
<tr>
<td></td>
<td>Bike-friendly campus</td>
<td>540</td>
<td>46.8%</td>
</tr>
<tr>
<td></td>
<td>Composting on campus</td>
<td>478</td>
<td>41.4%</td>
</tr>
<tr>
<td></td>
<td>Promotion of electric vehicles</td>
<td>339</td>
<td>29.4%</td>
</tr>
<tr>
<td></td>
<td>On-campus apiary?</td>
<td>289</td>
<td>25.01%</td>
</tr>
<tr>
<td></td>
<td>Dining Services page titled “What We’re Doing on Campus”</td>
<td>130</td>
<td>11.3%</td>
</tr>
<tr>
<td><strong>Research</strong></td>
<td>Environmental/sustainability focused research</td>
<td>639</td>
<td>55.4%</td>
</tr>
<tr>
<td></td>
<td>Sustainability research themes/ opportunities listed</td>
<td>506</td>
<td>43.9%</td>
</tr>
<tr>
<td></td>
<td>Funding for environmental/ sustainability research</td>
<td>497</td>
<td>43.1%</td>
</tr>
<tr>
<td></td>
<td>Environmental/sustainability focused research center</td>
<td>438</td>
<td>38.0%</td>
</tr>
<tr>
<td><strong>Outreach and Services</strong></td>
<td>Sustainability-focused community service projects/collaborations</td>
<td>561</td>
<td>48.7%</td>
</tr>
<tr>
<td></td>
<td>Conservation of local natural environment</td>
<td>503</td>
<td>43.6%</td>
</tr>
<tr>
<td></td>
<td>Social sustainability acknowledged</td>
<td>465</td>
<td>40.3%</td>
</tr>
<tr>
<td><strong>Assessment and Reporting</strong></td>
<td>Sustainability awards and/or affiliations listed</td>
<td>370</td>
<td>32.1%</td>
</tr>
<tr>
<td></td>
<td>AASHE award shown on website</td>
<td>302</td>
<td>26.2%</td>
</tr>
<tr>
<td></td>
<td>Environmental report on website</td>
<td>255</td>
<td>22.1%</td>
</tr>
</tbody>
</table>


Buchanan, A. 2016. The role of institutions of higher education in water conservation in Los Angeles. April 25. Occidental College, student paper.


Ceulemans, K., I. Molderez, and L. van Liedekerke. 2015. Sustainability reporting in higher education: A comprehensive review of the recent literature and paths for further research *Journal of Cleaner Production* 106: 127-143.


339


DMI. 2018. *Five key challenges facing higher education.*
https://digitalmarketinginstitute.com/blog/5-key-challenges-facing-us-higher-education (last accessed 30 September 2020).


Edmit, 2021. What’s the difference between a public and private university?.


Electric Choice. 2020. *See electric rates from energy providers that serve your area.*
https://www.electricchoice.com/blog/25-of-the-most-energy-efficient-colleges/

Electric Choice. 2021. *Twenty-five of the most energy efficient colleges.*


Ferrer-Balas D, H. Buckland, and M. de Mingo. 2009. Explorations on the university’s role in society for sustainable development through a systems transition approach: Case-study of the Technical University of Catalonia (UPC) *Journal of Cleaner Production* 17: 1,075–1,085.


Ghys, M. 2013. The american lawn: Culture, nature, design and sustainability. The Graduate School of Clemson University. May.


Gilbert, D.U., A. Rasche, and S. Waddock. Accountability in a global economy: The emergence of international accountability


Grand Valley State University with sustainability integrated into them (Grand Valley State University 2021).


Harrison, R.T., and C. Leitch. 2010. Voodoo institution or entrepreneurial university?: Spin-off companies, the entrepreneurial system and regional development in the UK. *Regional Studies* 44(9): 1,241-1,262.


Holdsworth, S.C., S. Wyborn, S. Bekessy, and I. Thomas. Professional development for education for


Karatzoglou, B. 2013. An in-depth literature review of the evolving roles and contributions of universities to education for sustainable deve


Kent State University, 2021. Tree Campus USA. https://www.kent.edu/stark/tree-campus-usa

Kerhoff, L.V. and L. Lebel. 2006. Linking knowledge and action for sustainable development


Leal Filho, W., U.M. Azeiteiro, F. Alves, and P. Moltan-Hill. (Eds), *Handbook of theory and practice of sustainable development in higher education : Volume 4*


Leuphana University of Lüneburg, Germany and University of Zurich, Switzerland

Vienna University of Economics and Business, Austria

Levy, B. L., and R.W. Marans. 2012. Towards a campus culture of environmental sustainability:


Li, C. and F. Lalani. 2020. The COVID-19 pandemic has changed education forever. This is how. *World Economic Forum* April 29


Lukman, R., D., Krajnc, and P. Glavič. 2009. Fostering collaboration between universities regarding regional sustainability initiatives – the University of Maribor. *Journal of Cleaner Production*.


362


Milman, O. 2018. Americans waste 150,000 tons of food each day – equal to a pound per person. The Guardian. https://www.theguardian.com/environment/2018/apr/18/americans-waste-food-
fruit-vegetables-study (last accessed on 16 October 2021).


MIT is neutralizing 17 percent of the campus’ carbon emissions by purchasing 73% of their power from a 650-acre, 60-megawatt solar farm and intend to reduce its greenhouse gas emissions by at least 32% by 2030 (Michigan Institute of Technology 2021).


Rau, H., G. Goggins, and F. Fahy, 2018. From invisibility to impact: Recognizing the scientific and societal relevance of interdisciplinary sustainability


https://olemiss.campusdish.com/Sustainability/WhatWeAreDoing (last accessed on 15 October 2021).


University of Oregon. 2021. *UO revives the campus surplus office furniture program.*
January 4.
https://around.uoregon.edu/content/uo-revives-campus-surplus-office-furniture-program (last accessed on 15 October 2021).

University of Phoenix. 2019. Bachelor of Science in Environmental Science Degree.

https://www.sustainable.pitt.edu/what-pitt-is-doing/pollinators-at-pitt/ (last accessed on 15 October 2021).


https://www.usm.edu/sustainability/programs_events.php (last accessed 17 October 2021).


https://sustainability.utk.edu/impact/energy/ (last accessed on 15 October 2021).


University of Washington. 2017. Learning garden project is funded by a $2.9 million NSF grant and is a great example of how campus gardens can be funded. UW College of Education. July 12. https://education.uw.edu/news/learning-gardens-aim-grow-student-engagement-science (last accessed 17 October 2021).


