

Report on the Study Group on Climate Change Participatory Workshop

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The **SGCC-PMW** Report



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INTRODUCTION

The Report on the Study Group on Climate Change Participatory Workshop (SGCC-PW report) summarizes the work that our class, “Environmental Integration II: Collecting and Analyzing Information” (ENV 201/202), has done over the course of the semester on how Smith College can respond to climate change.

As part of this semester-long effort, we have been given the opportunity to collaborate with the SGCC and to participate in their community engagement efforts.

Last April, we conducted two participatory workshops on Smith and climate change in order to gauge the priorities and concerns of the Smith community.

A total of about 60 community members participated the workshops. We were amazed by the energy, the dedication, and the enthusiasm of the workshop participants.

During the workshops, we worked with the community on the 6 following themes to assess the priorities and concerns of

the Smith community relative to climate change:

- Vulnerability to Climate Change
- Using our Values and Guiding Principles to define our Responses to Climate Change
- Mitigation to Climate Change
- Adaptation to Climate Change
- Investment and Climate Change
- Our Curriculum, Co-Curriculum and Climate Change

On day 1, we conducted a World Café exercise in order to build a collaborative understanding of the issues at hands.

On day 2, we built on the outcome of day 1 to discuss policy options that Smith could develop to respond to climate change.

In this report, we present and analyze the data collected during the workshop. We also formulate policy recommendations to the SGCC based both on the outcome of the workshop and our expert knowledge.

CLIMATE CHANGE IN NEW ENGLAND

An Overview

The climate of the Northeast is characterized by its dramatic seasonal changes. This includes a large daily and annual temperature range with fairly consistent precipitation (in the form of rain fall and snow fall) throughout all seasons. Climate change will disrupt these familiar weather patterns. While the full impacts of this global phenomenon will unfold over decades, local impacts are already manifesting in our community.

In a context of climate change, changing precipitation and temperature patterns will cause significant seasonal variations. Fall weather will feel warmer and is projected to be characterized by heavy rain events early in the season and extreme snow events later in the season. Winter will also see an increase in extreme snow events but an overall reduction in the amount of snow on the ground because higher temperatures will melt snow quickly. Warmer temperatures in the spring will cause early snowmelt and potential flooding. Summer will have increased drought events as temperatures rise and precipitation events decrease (Fan et al, 2015; NCA, 2013; Rawlins et al, 2012; Frumhoff et al, 2007).

Observed Changes

Data on average surface temperatures and precipitation over the past century reveal that the climate in the Northeast region has changed notably. Temperatures in the Northeast increased by an average of .16° F per decade, resulting in almost 2° F between 1895 and 2011 (Figure 1).

During this time precipitation has increased by 10%, or .4 inches per decade (Figure 2) (NCA, 2013). Furthermore, the Northeast has experienced significant change in extreme precipitation events, with a 71% increase in very heavy rainfall events (defined as the heaviest 1% of all daily events) from 1958 to

2012 (NCA, 2013). Compared to other regions in the United States, the Northeast is experiencing some of the most extreme changes in both precipitation and temperature increases (NCA, 2013). These observed changes will only increase in frequency and intensity in the future.

Projected Changes

The climate of New England will continue to experience significant change in the future. The area will experience warmer temperatures throughout the year, and more varied precipitation marked by longer periods of drought, but more extreme rainfall or snowfall events.

Temperature: Regional Climate Models predict that surface temperatures will increase significantly over the next decades, with a future warming between 4.5°F to 10°F (under a high emissions scenario). The Northeast will also experience increased frequency and intensity of heat waves, or consecutive days above 90°F (Figure 3).

Precipitation: As temperatures rise in the Northeast, moisture held in vegetation and soil will evaporate into the atmosphere at greater rates (NOAA, 2015). Since a warmer atmosphere holds more moisture, snowfall or rainfall will precipitate in greater quantities (Figure 4) (NOAA, 2015). While extreme precipitation events will increase in frequency and intensity, the high temperatures will also cause longer periods of drought that will be punctuated by these heavy precipitation events.

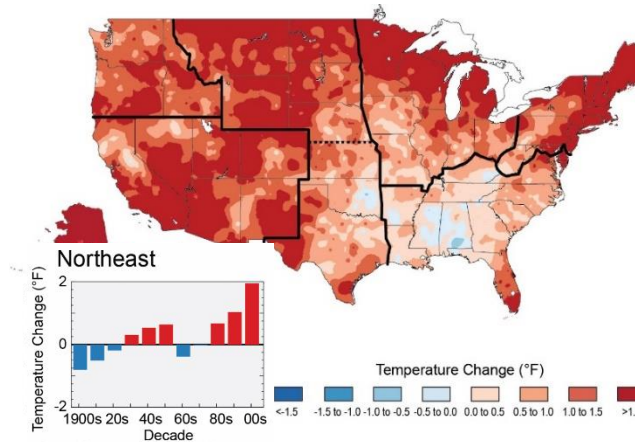


Fig. 1 **Observed U.S. Temperature Change** – map shows temperature changes over the past 22 years (1991-2012) compared to the 1901-1960 average. (Source: NOAA NCDC / CICS-NC.)

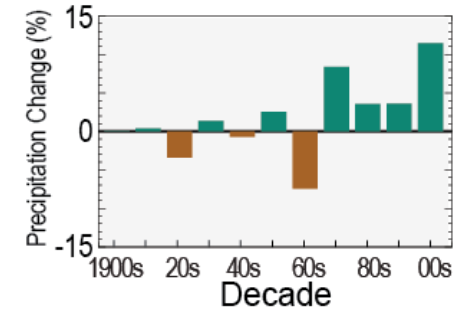


Fig. 2 **Observed Change in Very Heavy Precipitation by Decade** (Source: NOAA NCDC / CICS-NC.)

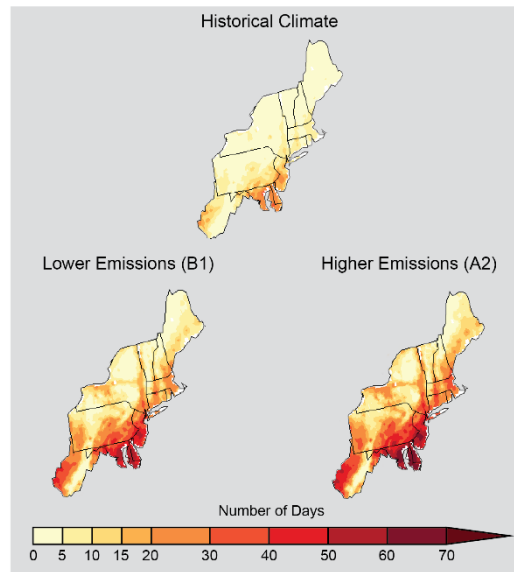


Fig. 3 **Projected Increases in the Number of Days over 90°F.** (Source: NOAA NCDC / CICS-NC.)

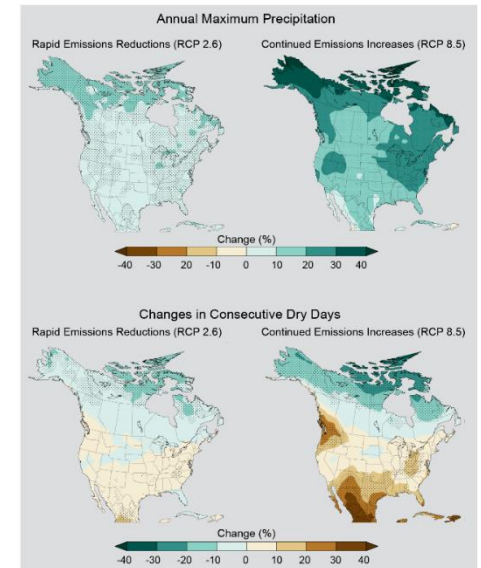


Fig. 4 **Annual Maximum Precipitation and Changes in Consecutive Dry Days** (Source: NOAA NCDC / CICS-NC.)

VULNERABILITY

What is Vulnerability?

Vulnerability is “the degree to which a system is susceptible to [experience] [...] the negative impacts of climate change (IPCC, 2007)”.

Our Task

In addition to expert-based knowledge, stakeholder engagement is a vital component of constructing a more complex and transactional analysis of campus vulnerability. In the report, we synthesize our academic knowledge of vulnerability and climate change at Smith College with the input from stakeholders. We conclude by outlining policies that address vulnerability to climate change at Smith College.

Vulnerability to Climate Change at Smith

Norton and Yohe’s assessment of climate change impacts in the United States suggested that climate change in the Northeast will result in increased temperatures, frequency and intensity of heat waves, and frequency of extreme precipitation events (Horton and Yohe, 2014).

Drastic increase in temperature will intensify the negative impacts of the following:

- Plant allergens
- Vector borne diseases
- Pests and weeds
- Invasive species

Increased frequency and intensity of heat waves will result in result in the amplification of the following:

- The urban heat island effect
- Demand of electricity for air conditioning
- Damaged crops

More variable and recurrent extreme weather precipitation events will result in additional:

- Flooding
- Crop damage
- Interruption of services such as transportation and electricity

These changes will impact Smith’s campus by disrupting food services, increasing flooding, and harming human health.

Summary of the Participatory Workshop

Day 1

Our goal for Day 1 was to determine which areas of campus will be most vulnerable to projected climate change and define the main tenets of on-campus vulnerability. Our group's conversation can be split into three categories.

Most vulnerable areas on campus: Participants used their personal knowledge of campus to determine what areas of campus have the highest vulnerability to projected climate changes. We determined that the science buildings, health center, and all buildings located on the 100-year floodplain are areas we should be most concerned about.

The Limits of the Smith Campus Emergency Preparedness Plan: During the portion of our discussion that focused on emergency preparedness, we learned that Smith is not prepared for projected climate changes. Climate change induced disasters will lead to the disruption of food services, and the college is only prepared to feed the student population for one week at a time. Smith College is not ready for an increase in flooding because it store some of our most important materials in basements. Lastly, our

campus will not be able to withstand increased temperatures because our buildings lack air conditioning.

A Need for Additional Research: We concluded our discussion with the general consensus that we need to generate questions for future research. In the future, we hope to collect a wider range of data to create a more comprehensive vulnerability assessment.

Day 2

The purpose of the second workshop was to identify the most vulnerable areas on campus and generate ideas about data collection for future vulnerability assessments. Given the complex nature of assessing vulnerability to climate change we developed a **Multi Criteria Assessment (MCA)** with the help of the Smith College Spatial Analysis Lab.

An MCA is a structured approach used to determine overall preferences among different options, where the options can accomplish several objectives (United Nations Framework on Climate Change, 2014). It is a decision making analysis tool that can be used when a single-criterion approach cannot accomplish the task at hand. The MCA model we used was created in ArcGIS, a geographic information system software.



Fig. 1 Participatory Workshop, April 2016

We started day two by explaining each **ArcGIS layer** used in our MCA.

We generated the layers using ArcGIS. All layers overlay a bird's-eye view of the Smith College campus.



Fig. 2 **Hazardous Trees** (Source: Data courtesy of Smith Botanical Garden)

In a context of increased extreme weather events, trees on campus may be a source of vulnerability. This map displays in orange the high-density of trees near potentially vulnerable areas. These potentially vulnerable spots are buildings, sidewalks, parking lots, roads, and walking paths.

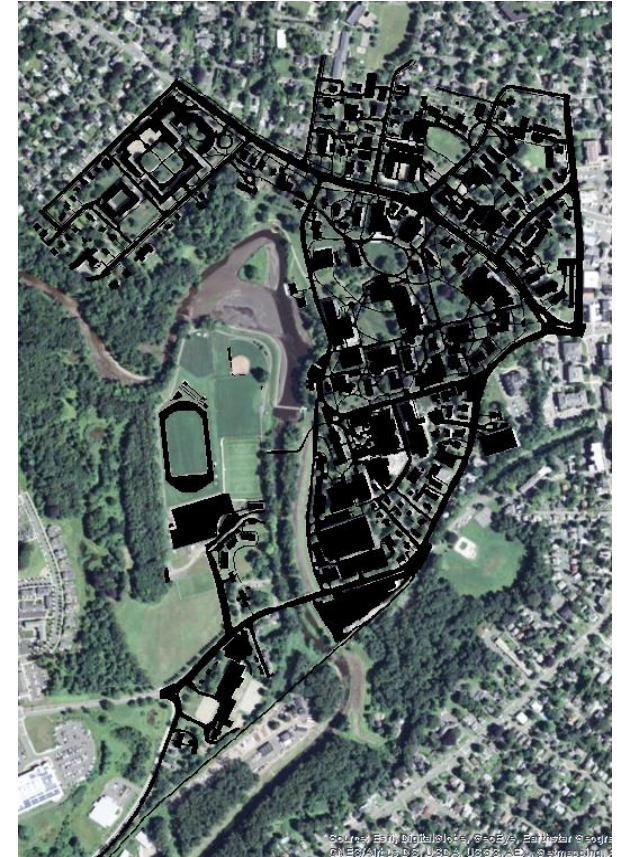


Fig. 3 **Impervious surfaces** (Source: Data courtesy of the Spatial Analysis Lab)

In a context of increased precipitations, increased runoff on impervious surfaces becomes a major concern. This map shows the permeability of the surfaces on the Smith College campus, from pavement, dirt, concrete, brick buildings, and grass. All surfaces with a permeability of greater than 70% are displayed in black.

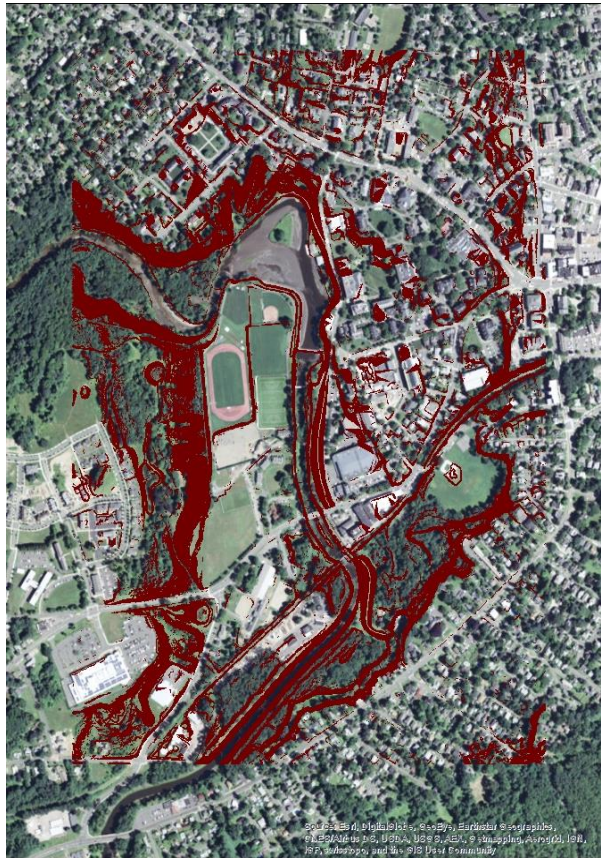


Fig. 4 **Dangerous slopes** (Source: Data courtesy of the Spatial Analysis Lab)

In a context of increased precipitations, runoff and soil erosion become particularly acute on slopes. This map shows slopes with an inclination greater than 12%.

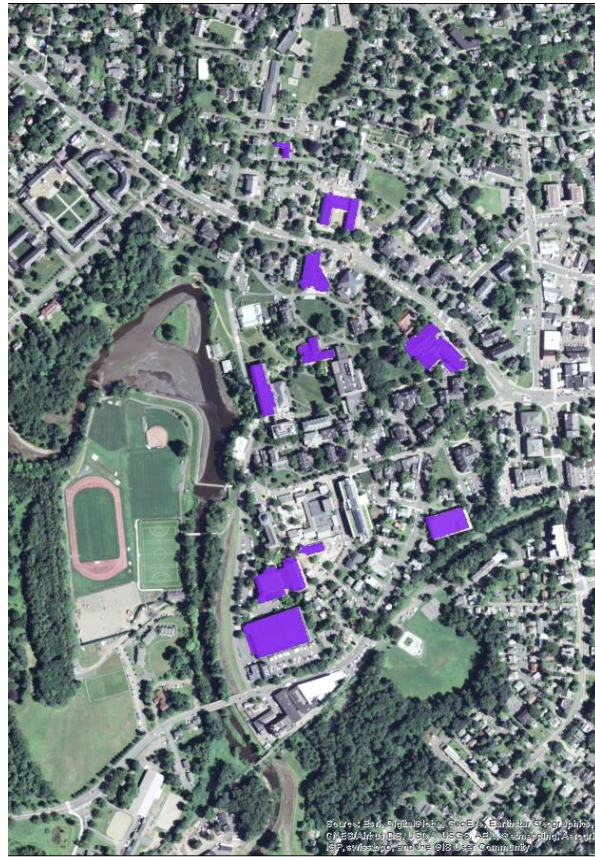


Fig. 5 **Flat roofs** (Source: Data courtesy of the Spatial Analysis Lab)

In a context of increased extreme weather events such as snowstorms, buildings with flat roofs may be particularly vulnerable. This map shows rooftops on campus. Flat roofs are indicated in purple.



Fig. 6 **Heat Islands** (Source: Data courtesy of the Spatial Analysis Lab)

In a context of warmer temperatures and more frequent heatwaves, the campus will experience the heat island effect. The heat island effect develops on a surface when great heat exposure and absorption happens without equitable reflection of heat. This map shows key hot spots in orange that have a concentration of impervious surfaces greater than 70%.

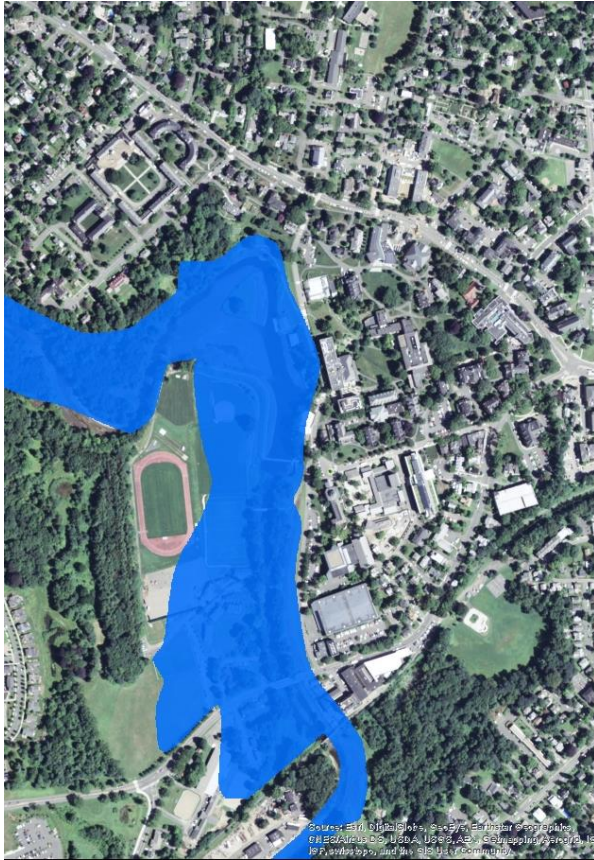


Fig. 7 **Flood plain** (Source: Data courtesy of the Spatial Analysis Lab)

In a context of increased extreme weather events, buildings located on the flood plain will be highly vulnerable. This map shows the 100-year and the 500-year floodplain in blue.

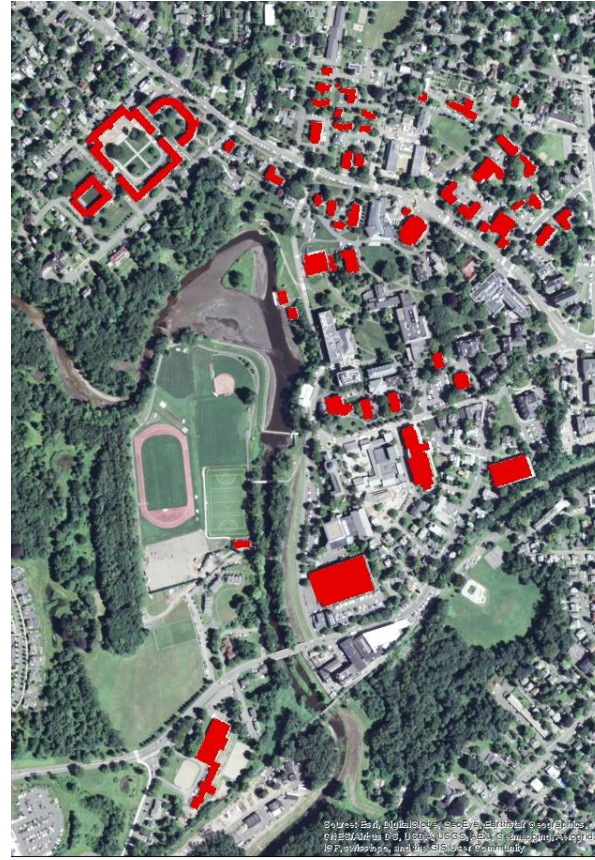


Fig. 8 **Buildings without air conditioning** (Source: Data courtesy of the Spatial Analysis Lab)

In a context of warmer temperatures and more frequent heatwaves, buildings without air conditioning systems will could overheat. This map shows the buildings without an air-conditioning system in red.

As part of the **participatory GIS-based MCA**, Participants ranked the layers on a scale of 0 to 10. 0 means that the participant does not perceive that particular layer as a source of vulnerability. In contrast, 10 means that the participant perceive that layer as a major source of vulnerability.

Maps on Figure 9 were generated by the participants. Participant 1 (**map 1**) was greatly concerned by flooding and the heat island effect. Areas of highest vulnerability are the Indoor Track and Field, the tennis courts, Scales House, and the Smith College Parking Garage.

Participant 2 viewed the heart island effect and lack of air conditioning as the two greatest areas of concern in the immediate future (**map 2**). Buildings throughout campus appear to be most vulnerable.

Map 3, generated by participant 3, looks similar to the two previous maps but the areas lining Paradise Pond are more red, showing a greater concern towards slope than the previous maps. The Quad also appears to be of high concern. Another difference is that the Quad is all red.

Participant 4 (**map 4**) gave each possible source of vulnerability on the Smith Campus equal ratings. The map displays great concern for vulnerability on central campus as opposed to near the pond.

For Participant 5 (**map 5**), the highest ranked factors were the heat island effect and flooding, both ranked as 9. They were followed closely by no AC, which was given a ranking of 8.

For Participant 6 (**map 6**), the greatest factor of concern was the heat island effect, followed by AC, and then the flood plain. *Map 6's* main areas of vulnerability include the ITT, parking garage, and tennis courts because these are the areas that will be harmed the most by no AC, flooding, and heat islands.

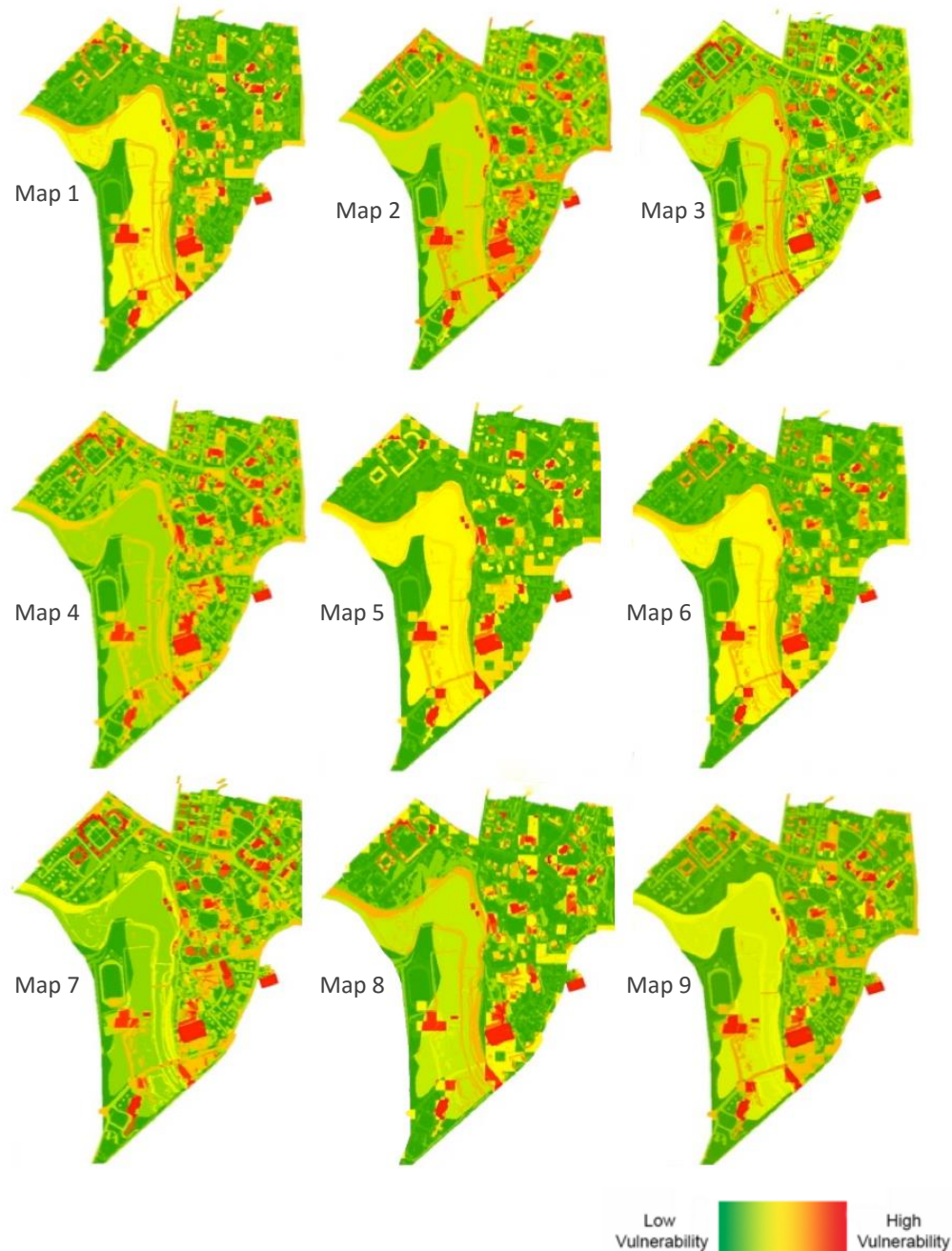


Fig. 9 Outcome of the GIS-based Participatory MCAs

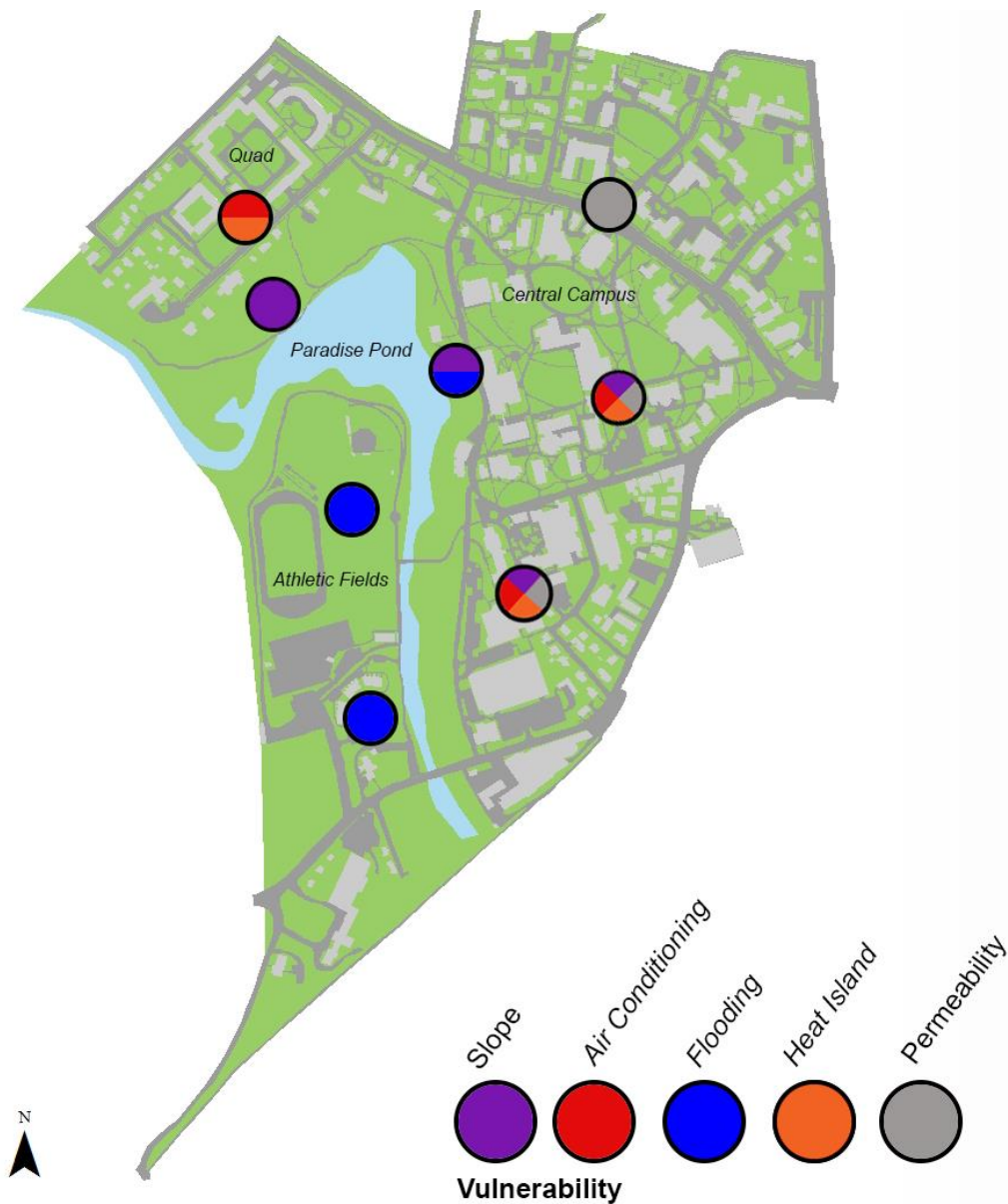


Fig. 10 Climate Vulnerability on Campus

Map 7, emphasizes vulnerability in the Quad, which is due to Participant 7’s high ranking of lack of AC as the primary cause of vulnerability on campus.

Similarly, the heat island effect and buildings without AC were primary causes of concern for Participant 8, as shown by **Map 8**.

Even though the individual maps all varied slightly, there were some areas of campus that overlapped and appeared on all of them. **The Indoor Track and Tennis Facility (ITT) and Equestrian Facilities appear on red on all the maps.**

Map 9 located in is an “average” map of the other eight, meaning that each of the factors were averaged together to create the new map. For example, all of the eight priority ranking for hazardous trees were averaged to generate a combined number.

Areas of campus that appear most vulnerable are:

- the Equestrian Facilities;
- the area consisting of the ITT, Sage Hall, and Mendenhall, the Smith College Parking Garage;
- several houses including Scales, Cutter-Ziskind, and Northrup-Gillet;
- academic buildings such as Sabin-Reed, Neilson Library, and Hillyer.

Our **final vulnerability map** (figure 10) synthesizes the outcomes of the participatory workshop and our own expertise and highlights areas of high vulnerability on campus.

Policy Recommendations

The vulnerability group has crafted a couple of recommendations for the SGCC to consider after conducting the participatory workshops, synthesizing ArcGIS data, and conducting diverse analysis on the best ways for the Smith College campus to reduce vulnerability and best brace for climate changes.

Conducting a Climate Vulnerability Assessment at Smith College

Policy Statement: Smith College does not have a current vulnerability assessment. We need one in order for productive decision making to take place. We recommend engaging students and the community in the data collection process.

Rationale: We have identified specific data that will enhance our vulnerability assessment. We recommend that we improve our modeling technique by assessing air quality on campus, collecting data about the strength of our roofs, and conducting microclimate analyses. We can study air quality through sensors on campus, which will help us understand the extent of our vulnerability to air pollution. We also need to improve data collection in regard to the college's roofs. In order to do this, Smith needs to conduct research on the history of flat roofs on campus to find which roofs are degraded and need improvement. Researchers can collect this data from past work orders on leaking roofs. Lastly, The college should

conduct a microclimate analysis to determine how different areas of campus differ in terms of air quality and soil quality. All of this research will help create a more thorough assessment. We need to improve and widen our methods of data collection in order to address these missing sets of data. Smith should collaborate with the city and county to widen its data collection. We also believe it will be helpful to engage students in these issues, and suggest building vulnerability data collection projects into GIS workshops and a wide range of classes. Engaging students in data collection is less expensive than hiring outside analysts, and gives students the opportunity to gain research experience. These new methods for collecting data will help the college create a more accurate vulnerability assessment in the future.

How it will help Smith adapt/mitigate to climate change: Expanding data collection methods will allow Smith to create a more accurate and comprehensive vulnerability assessment. A thorough vulnerability assessment would allow the college to make fully informed decisions regarding what areas of campus are at the most risk. With this information, Smith can focus on specific areas of campus to improve and adapt to climate change.

Responsible Office(s): Environmental Science and Policy Department, related academic departments, the Spatial Analysis Lab, CEEDs.



Fig. 11 Damage caused by the “Snowtober” Storm, October 2013



Fig. 12 Dining at Smith

Developing a Food Systems Emergency Preparedness Plan

Policy Statement: A changing climate comes with lots of different negative impacts on food and food supply. In order to prevent having a food shortage or crisis due to extreme weather events or other cause related to climate change, we recommended that Smith College create centralized food refrigeration and storage that could hold more food than the current system.

Rationale: Currently, Smith College dining halls have a food supply of less than two weeks. Climate change in the future will cause larger fluctuations in weather, as well as more extreme weather events like drought and flooding. The current food system has food trucks delivering food to dining halls individually, and dining halls vary in their ability to hold goods (perishable or otherwise). By creating a centralized facility with increased space that can hold a surplus of goods for a longer amount of time, Smith will be better equipped to handle the impacts of climate change in the event of a localized or non-localized natural disaster that affects our food supply.

Providing a central location for food import, storage and distribution that takes charge of the ordering of goods and products can create a more fluid process than the decentralized process that occurs right now with each dining hall receiving goods and placing orders individually.

How it will help us adapt/mitigate to climate change: Maintaining conscientious of special dietary needs (every dining hall has specialized dietary accommodations) while also effectively supplying a surplus amount of food for the 2,663 undergraduates, 95% living on-campus, while also keeping in mind that emergency preparedness is not always a sustainable solution, often creating excess usage (of food, energy) in order to brace an unknown event.

Responsible Office(s): Dining Services, CEEDS, Facilities

The Smith College Green District

Policy Statement: We recommend that the Study Group on Climate Change looks into the possibility of creating a Green District on the campus. A Green District at Smith College could be situated in the area that consists of Scott Gym, Sage Hall, Mendenhall Center for Performing Arts, the Indoor Track and Field, and Schacht Wellness and Health Center because analysis suggests it is the most vulnerable area to climate change on the Smith College Campus (figure 10, figure 13).

Green Districts are areas that employ technologies and different design elements to reduce resource use. Several colleges such as Oberlin College and Hampshire College have implemented Green Districts on their campuses (Figures 14 and 15).

Rationale: Even though there are other areas of campus that are impacted by the same number of factors as the area highlighted in figure 13, this area is best suited for a Green District on Smith College's campus for several reasons. Firstly, the area is a heat island due to the amount of concrete in between several large brick and cement buildings. According to the Intergovernmental Panel on Climate Change, temperatures are predicted to rise between, 4.5°F to 10°F under the A2 scenario. This will lead to the area becoming even warmer over time because of the amount of heat that will be trapped. This could lead to maintenance as well as health related issues. Additionally, the area by Seelye Hall and the Neilson library gets much less traffic than our proposed Green District and will soon be undergoing renovation due to the new library project by Maya Lin.

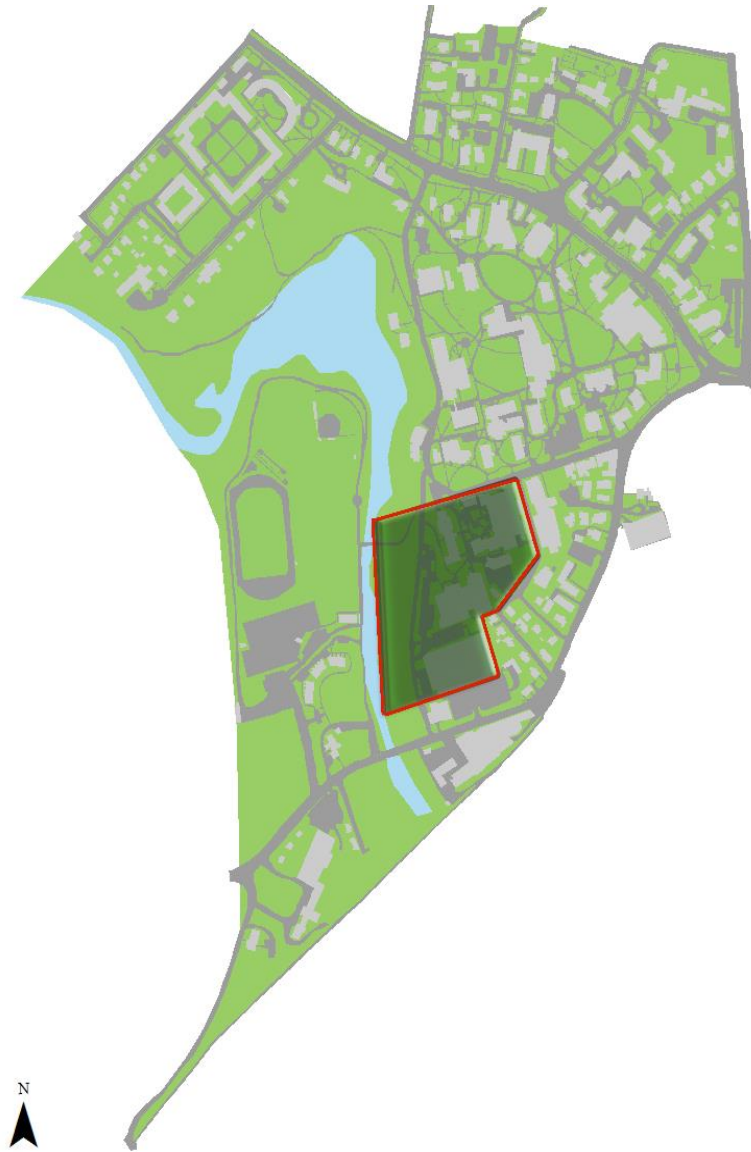


Fig. 13 The Smith College Green District



Fig. 14 Green District at Hampshire College

Hampshire College has recently transformed its lawns into meadows and recently opened The R.W. Kern Center, a “living” building, in the center of its campus (Sustainable Operations).



Fig. 15 Oberlin Green Arts District

The Green Arts District will be situated on 13-acres and include several LEED certified buildings.

Conversion of the area into a Green District for the safety of the students would be instrumental in of rising heat, and updating buildings instead of pouring funds into new building projects on-campus is an economically sound decision.

Adding a green district would make Smith a model for other educational institutions in their efforts to become more sustainable. Creating a hub of environmentally conscious buildings is step forward in relation to the environment but also attractive to prospective students and visiting alumnae.

Implementation:

Smith college could implement a Green District on campus in several ways. The college could add more vegetation in the area to decrease the heat island effect or convert buildings in this area, such as Sage Hall, to be more energy efficient by outfitting them with solar panels, energy-efficient lighting, and efficient windows. Additionally, the sloped land between the Mill River/ Paradise Pond, and Sage Hall/ the ITT, could be outfitted with infiltration trenches to prevent water and other types of runoff.

How it will help us adapt to and mitigate climate change: This policy would help us adapt to climate change by decreasing the area’s energy usage, promoting cleaner energy use, and reducing the heat island effect. This would reduce the area’s vulnerability to increasing temperatures and the stress these temperatures would put on infrastructure.

Responsible Office(s): CEEDS, Smith College Facilities Management, and Office of the President

VALUES AND GUIDING PRINCIPLES

“Smith College educates women of promises for lives of distinction. A college of and for the world, Smith links the power of the liberal arts to excellence in research scholarship, developing leaders for society’s challenges”

Smith College Mission Statement

Why Should we Discuss our Values and Guiding Principles?

As students of Smith College, we believe that it is important to **connect the values of Smith College to the climate change planning process** because they help to maintain the integrity of the college’s mission statement, ensure that the planning process is intentional and tailored to the unique characteristics of the Smith community, and ensure that the college’s priorities are reflected in the process.

Our Task

This report focuses on Smith College’s values and guiding principles in response to climate change. Members of the Smith community participated in a workshop to help formulate ideas and paths for future. The outcomes of the workshop are described in detail below.

Preliminary guiding principles

Our work has built on the preliminary guiding principles defined by the Study Group on Climate Change (SGCC).

According to the SGCC:

- Smith has a **unique role, location, and history** as an undergraduate institution devoted to the education of women and non-gender conforming individuals.
- Smith’s recommendations seek to **capitalize on its abundant heritage and legacies**.
- Smith’s goals are to **build essential capacities** for knowledge, create outstanding opportunities for students, and to establish sustainable communities at Smith and beyond.
- The impact and influence that Smith has as an institution can **transcend campus boundaries** and we aim to operate in ways that benefit both the campus and the larger world.
- Smith strives for **resilience** by looking for and investing in local products and solutions.
- Given that the dominant paradigm is one in which a better quality of life requires greater use of resources, Smith attempts to **promote innovation** that breaks this trend.
- Smith should adopt practices that **use fewer resources**, while **improving educational programming and quality of life**.



Fig. 1 Participatory Workshop, April 2016

Summary of the Participatory Workshop

Day 1

On Day One we facilitated roundtable discussions to address the collective preliminary thoughts on Smith's values and what they mean in the context of climate change. The following themes and questions emerged:

- How can Smith's values transcend the campus and reach the global community?
- How can Smith's student body, faculty, and staff advocate for those values and live them out?
- How does Smith represent itself as a community?
- How can Smith provide its campus and other communities with truthful and accurate knowledge regarding climate change?
- How can Smith utilize the classroom as a lab?
- How can Smith influence consumer behavior to live both seasonally and intentionally as a community?

First, we discussed the different ways in which **Smith has, upholds, and promotes its mission statement and core values.**

We emphasized why **intentional communication and community priorities** are examples of values that are important to connect to the climate change planning process. By translating values into actions, the SGCC can ensure the combination of values to influence and enhance Smith's adaptation to climate change, especially **with student-led experimentation and research initiatives.**

Inspired by the presentation of the theme, participants emphasized that **climate change speaks to the future. Smith's intersectional values and principles can help assist the formation of action and policy.** We had two very prolific conversations on how to redefine Smith's existing values and principles for the modern world.

Throughout the first discussion, the workshop participants acknowledged that all practices at Smith have inherent **tradeoffs. Smith has to compare social goods across all dimensions and consider the pros and cons.**

Smith shapes **women and non-gender conforming individuals into leaders** to engage the world and helps us to engage in moving forward- exactly the kind of action needed to fight climate change.

The second part of the discussion revolved around strategies to make the local and global communities aware of how Smith allocates and uses resources, as well as how global societal customs are unhealthy for the planet. Participant suggested that we could use **Smith's campus as a classroom in order to launch new initiatives for a "greener," more sustainable culture.**

Some suggestions for a sustainable future included constructing **an edible landscape or transitioning away from the perfectly groomed lawn.**

Participants wanted to ensure that **students live out Smith's values throughout their four years and carry those values with them after they graduate.** Can we encourage all Smith students, faculty, and staff to **live seasonally and intentionally?** How can we ensure that our community commits to living by an **environmental ethic?**

Last, but not least, discussion arose around the fact that "women are disproportionately affected by climate change." While Smith is not disproportionately affected, global communities are. **Smith is far from separate from the global community so how can we reflect Smith's values as we fit into the larger world?**

Part of our group suggested **outreach to other communities to support women in the climate change planning process** as a potential solution.

As a privileged institution Smith must become a **leader in helping more vulnerable communities plan for climate change.** Smith must act as a model for the Northampton community and others to live a sustainable life. Smith must encourage students to move these values forward.

Day 2

On Day 2 of the SGCC workshop we led an exercise of ranking the most important and essential values to translate into the climate change planning process and discussing how we could turn these values into policies. Building on the discussions that took place on Day 1, we came up with ten value statements to conceptualize how Smith's values and principles connect to policy action:

- History and legacy as a community
- Sharing knowledge globally
- Sustainability in both education, facilities, and operations
- Innovation
- Community engagement
- Supporting women and gender nonconforming individuals to become leaders
- Diversity of students, faculty, and staff
- Leadership on campus, for other campuses, and the world
- Social justice
- Utilizing the campus as a lab

Box 1 and 2 summarize discussions that occurred on Day 2 around our values and principles.

History: Smith values its history and legacy as a community. Smith holds an important place in the history of education for women and inspires and supports women to do their best. We are a forward looking community and we do well with adapting with time. Our history and past define us and influences everything that we do. Our past helps to shape our future as a community.

Global: Smith values sharing knowledge globally. It is important that we spread truthful knowledge and information so that we don't contradict our mission statement. We need to let people know that fossil fuel industries do not spread accurate information. It is important to engage the global community on truthful and accurate information regarding environmental issues.

Sustainability: Smith values sustainability in both education, facilities, and operations. This includes not just environmental sustainability, but educational sustainability, community sustainability, and thoughtful sustainability. Our community has meaningful values that we can implement on campus. We must safeguard our mission and the future of our college. Our goal should be to invest in sustainable practices that maintain who we are as a community.

Innovation: Smith values innovation. This is the hallmark of the work that goes on at Smith. Innovation refers to not just technological innovation, but imaginative innovation. We must translate imaginative innovation into behaviors and actions. It is our consumption that drives climate change and it is our responsibility to be innovators, actors, and doers.

Community: Smith values community engagement. Smith is a unique and special community. We cannot have a climate change plan without first connecting with and acknowledging the needs of our community.

Support: Smith values giving support to women and gender nonconforming individuals to become leaders. We need to integrate our values of education for women with support for women of the global world outside of Smith.

Diversity: Smith values the diversity of its students, faculty, and staff. We need to foster a culturally, ethnically, academically, and socially diverse community. We acknowledge the opinions of people of all different backgrounds.

Role-Model: Smith students, faculty, and staff should use their knowledge and experience to be role-models for other institutions and for the larger world. Smith creates leaders no matter what field they are in. As leaders, Smith should be at the forefront of social movements. We need to take initiative and not let caution hinder our progress. We have tremendous political credibility and must lead on the greatest social justice and political issues of our time.

Social Justice: Smith values social justice. We have an obligation to steward the world around us and our resources. Environmental and social justice are an important discourse in regards to climate change.

Lab: Smith values utilizing the campus as a lab. Using our campus as a lab will allow us to serve as a role model through innovation.

Participants then ranked the valued and principles from the most important (ranked as 1) to the least important (ranked as 3) (Figure 2).



Fig. 2 Participant's ranking of values and guiding principles

As figure 2 shows, participants ranked history, global, leadership, and support as the most important (1). They chose role model, innovation, and social justice as of secondary importance (2). They chose lab, sustainability, community, and diversity as the least important of the values (3).

From Values and Guiding Principles to Climate Action

Participants identified policies and actions based off of Smith's values and principles. Each policy or action recommendation connects to one of Smith's values and principles.

History

Actions and policies need to look forward and decisions for the campus must sustain our history and legacy

Global

Smith should show and teach other campuses how to globally engage other communities regarding climate change issues

Sustainability

- Renovate campus buildings
- Make buildings a carbon net zero space

Innovation

- Fund a program to endorse new innovative sources of energy
- Establish an innovation fund to fund cogeneration plant

Community

- Create work study sustainability training programs for organizations on campus
- Integrate community-based learning
- Establish budget priority for sustainability organizations
- Integrate a sustainability climate plan

Support

Organize programs and workshops to educate marginalized groups on climate change issues

Diversity

- Include, hire, and prioritize people of color
- Relate environmental issues to multiple people and departments on campus

Role-Model

- Maintain Smith's status as a model citizen
- Organize waste-free recycling programs
- Educate employees on how to live sustainably in their everyday lives

Social Justice

- Change our consumption habits
- Educate people about the damaging effects of capitalism
- Give access to a Smith education for women from around the world
- Learn from our curriculum how to solve problems

Lab

- Try new innovative approaches to campus operations: students can collaborate and contribute
- Create a support fund for CEEDS to sponsor interdisciplinary research projects

Some of the most important recommendations included creating an innovation fund to fund a cogeneration plant on campus, include, hire, and prioritize people of color, creating work study sustainability training programs for students, organizing more waste free events and programs, renovating campus buildings to be more sustainable, and funding programs to educate administrative members on how to be sustainable in their everyday lives.



Fig. 3 Smith College

Guidelines for Future Actions

After Smith students, faculty, and staff generated policy recommendations during the workshop, we organized and developed several code words to summarize the data. These code words form guidelines for future actions at Smith.

Maintain: Maintain the principle of keeping Sophia Smith’s dream alive with the value of moving forward. Smith must do everything in its power to maintain and sustain its history and legacy.

Fund: Create an innovation fund to budget a hydrogen plant to power the Cogeneration plant with a net zero carbon footprint. The project would involve the whole campus and would help lead towards a future of renovated buildings with net zero carbon footprints.

Work Study: Create a work study stipend for students who want to work with local climate initiatives. Smith should offer sustainability training for the entire student, staff, and faculty body. Student organizations should also be given priority. This would help Smith integrate a sustainable climate change plan into the community.

Prioritize: We must introduce more “green” development projects. This would include prioritizing LEED certification whenever Smith renovates, having more waste-free events, and establishing projects for employee support to allow them to be sustainable in their own lives.

Change: Educating the community about how to combat consumption habits as a society and how to teach people about those implications to create a more equitable system. Smith has a right and a responsibility to create change within its community and beyond. By the time a student leaves they must be completely and holistically educated in climate change and environmental issues.

Individual: Individual action must take precedence over community action. Individuals must take the initiative to live their lives sustainably and it is up to them to transcend these values to the larger community. Individual values and actions must be sustained beyond the standard four-year career at Smith so that individuals can live out their education and more importantly live Smith’s values.

Policy Recommendations

The following policy proposals build on the expertise of our knowledge of the data accumulated from the workshop. These policies translate Smith's values and principles into relevant and feasible climate change planning protocols. Following the Day 2 discussion, two policy recommendations stood out and should certainly be implemented by the college.

Stipend for Work Study Opportunity on Campus Sustainability and Climate Change Initiatives

Policy Statement: This policy would involve creating a work study stipend for students who want to work with local climate initiatives. Smith should offer sustainability training for the entire student, staff, and faculty body. Student organizations should also be given priority. This would help Smith integrate a sustainable climate change plan into the community.

Scope: The parties affected in this policy include all Smith College undergraduates and Ada Comstock Scholars students, all faculty (specifically stewarded by Environmental Science and Policy, Landscape Studies, and Engineering faculty), Valerie Schumacher (Student Employment Coordinator), the Payroll Office, the Budget Office, the Office of Campus Sustainability, CEEDS (Center for Environment and Ecological Design), potential

employers, Vice President for Finance and Administration, Vice President for Development, Dean of the College, and President Kathleen McCartney.

Rationale: The policy responds to those who want to reach out and use their education to help create and spread awareness of climate change issues. It resolves issues of climate change negligence and offers an opportunity for students to use their education to steward the world around them.

Definitions (to enhance clarity of meaning and accurate interpretation):

Work study: Part of the financial aid award where students can earn funding through some form of employment either on-campus or off-campus.

Organizations: Students who share environmental interests are involved in several different student clubs, such as the Green Team, Eco-Reps, and Divest, at Smith.

Employers: These are faculty, companies, or offices that the students would either be working with or for.

Stipend: The amount of money or salary that students would earn from participating in this work opportunity.

Sustainability: Stewardship, maintenance, and protection of the world's resources with the goal of mitigating and adapting to climate change.



Fig. 4 Smith College



Fig. 5 Participatory Workshop, April 2016

How it is a translation of values and procedures: The main values and principles of Smith College targeted in this policy recommendation are social justice, community, sustainability, and leadership. Students who sign up to participate in the work study program at Smith College will have the option of working with local climate initiatives and gaining educational experience in sustainability practices. Faculty and staff in the Environmental Science and Policy department will act as advisors to the students for this work.

Implementation:

Specific kinds of projects would involve collaborating with the Smith College Office of Sustainability, (which would require the work study students to work alongside the Office of Sustainability interns), organizing climate action workshops in town for the Northampton community, working in the botanical garden, and collaborating and sharing their information with Environmental Science organizations on campus. For this work, students will receive a normal work study stipend (for entering students it would be \$2,400 and for returning students it would be \$2,900).

After participating in the work study, students would be required to share and present their

experience to the community, which would increase accurate global knowledge.

How it will help us adapt to and mitigate climate change: The Stipend for Work Study Opportunity on Campus Sustainability and Climate Change Initiatives would create awareness of climate change in a global picture in a concentrated and meaningful way. Smith values using the past to engage in successful sustainable practices to move forward. Students will benefit from community-based work, which will enhance how they think about combating climate change. The Work Study Stipend will help the Smith and extended Northampton community adapt to thinking and acting for the future of the world.

Responsible Office(s):

Some offices that would hold responsibility for the facilitation of this policy would include the Office of Campus Sustainability, CEEDS, Environmental organizations (i.e. Divest, Green Team, etc.), the Payroll Office, the Budget Office, the Financial Aid Office, and Environmental Science and Policy faculty and staff.

Inter House Eco-Olympics

Rationale: This policy responds to individual environmental action. Environmental activism on campus begins with individuals taking the initiative to find ways to live their lives sustainably. It helps those who are not environmentally active or conscious become more aware of their energy use and overall lifestyle habits.

Scope: The parties affected in this policy would involve students in their respective houses, the Eco-Reps, the Office of Campus Sustainability, Emma Kerr, CEEDS, head house facilitators such as House President, Vice President, Treasurer, Head Resident, and House Community Advisor.

Policy Statement: This policy recommendation would involve hosting more house competitions (in addition to April Showers) related to environmental and sustainability consciousness and raising awareness of sustainable resource management.

Specifically, the projects would involve multiple kinds of energy-saving practices that would take place a few times a year. These competitions would take place in houses and would be facilitated by both house leaders and Eco-Reps. The competitions would also be between houses of similar size. For instance, houses on Upper Elm Street would compete against each other, houses on Lower Elm Street would compete against each other, houses in the Quad would compete against each other, etc.

Many schools including Oberlin College, Lewis and Clark College, Duke University, and Chapman University have organized eco-olympics competitions on their campuses.

The Chapman University eco-olympics is organized between dorm floors and the competitions are monitored over one month. The change in energy use is calculated by percentage so that no floor is disadvantaged or advantaged because of its size. In addition, Chapman University has a facebook page and pledges for students to sign to reduce their energy consumption. Oberlin College has been holding their eco-olympics for quite some time now. Their eco-olympics last only three weeks of the school year, during which time they monitor water and electricity consumption and hold events for residents to learn about multiple sustainability topics.

Oberlin College also has a college dashboard where students can track their progress online. In addition to the dashboard, students can also obtain feedback on water and energy use through Oberlin's "energy orbs" which are circular bulbs fitted in selected dorms and campus buildings that change color in response to the extent of energy and water use in a building. The Oberlin College eco-olympics should be used as a model for Smith to build up to.

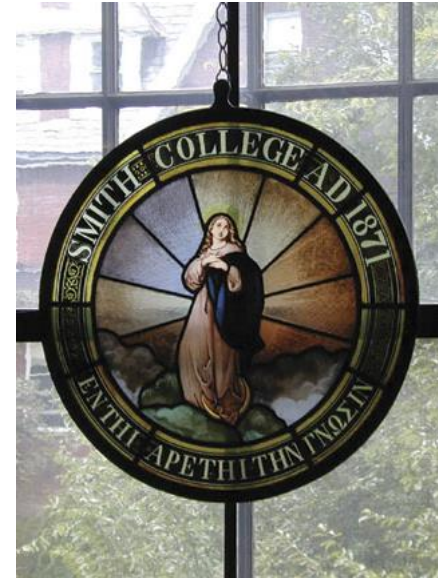


Fig. 6 Smith College



Fig. 7 Smith College

Definitions (to enhance clarity of meaning and accurate interpretation):

- **House President:** Act as a leader of the house and are responsible for making all housemates feel comfortable and welcome. They are also responsible for running house council meetings.
- **Vice President:** Act as second in command to the House President. They are responsible for helping the House President with any house activities.
- **Head Resident:** They are a member of the administrative staff of the College via the Office of Residence Life and report to the Area Coordinator of her assigned area. Responsible for developing a house environment in which individual responsibility and respect for differences are fostered and valued.
- **House Community Advisor:** Hold a similar job position as the Head Resident.
- **Eco Reps:** A specific house job that two or three people per house obtain that involves educating and engaging their house communities about environmental practices.
- **Treasurer:** Responsible for all the house finances.

How it is a Translation of Values:

The Inter House Eco-Olympics translates to the values of sustainability, social justice, and leadership and will engage students to step into leadership positions within Smith's

housing niches. House governance positions would help facilitate house competitions related to environmental and sustainability consciousness and raising awareness of sustainable resource management. Projects may include a turn-off-the-lights energy saving contest, a water saving contest, no food waste day, no trash day, eating vegetarian or vegan for a month, no computer or laptop use in house from 11:30pm-7:00am, and unplug all cords from outlets when not in use.

Implementation:

These different competitions would be facilitated mainly by the house Eco-Reps and other house leaders. There will be meters and check lists in hallways to show energy use trends and to see which residents have been complying. Residents who perform the specific energy saving task will make a check mark next to the days and times that they did that. Record sheets will be posted on each floor of the house. The competition of these energy saving practices would take place between houses in separate sections of campus. It is important that the houses have around the same number of people to make the competitions fair. Whichever house in each group saves the most energy for the specific practice will win a prize, which could include a local ice cream treat for the entire house community, a local and sustainable dinner cooked special by the chefs, or a trip to the MacLeish Field Station.

Responsible Office(s):

Specific offices involved in these projects would include the Office of Campus Sustainability, CEEDS, students in their respective houses, House President, Vice President, Head Resident, House Community Advisor, Eco Reps, Treasurer, kitchen staff, and facilities.

How will it help us adapt to and mitigate climate change:

By organizing fun activities in houses that use less energy, we will lessen the harmful impacts of climate change. Individual energy use is a major reason for why climate change has escalated so significantly over the years. The more energy we use, the more fossil fuels we are burning. Most of the energy that the campus consumes comes from the houses. By the end of these competitions, students should still follow through with these energy saving practices even after they leave Smith.



Fig. 7 Word-cloud of the participatory workshop

MITIGATION

What is Mitigation?

Climate mitigation is the process of reducing our carbon footprint and emissions by using new technologies, renewable energy, increasing energy efficiency, and changing our behavior as consumers and individuals.

At Smith, this takes the form of the Smith Sustainability & Climate Action Management Plan (SCAMP). Published in 2009, this plan is a commitment made by the college's former president, Carol T. Christ to making Smith carbon Neutral by 2030. The plan outlines the

steps necessary to reduce our carbon emissions, including gaining energy independence, switching fuel sources, increasing energy and water use efficiency, and committing to sustainable design in future construction. While this plan serves as a general guideline for campus policy, the college's emissions are not currently aligned with the SCAMP's projected timeline (Figure 1). Currently Smith college looks to form a new plan for mitigation on campus, which takes into consideration the issues outlined in this report.

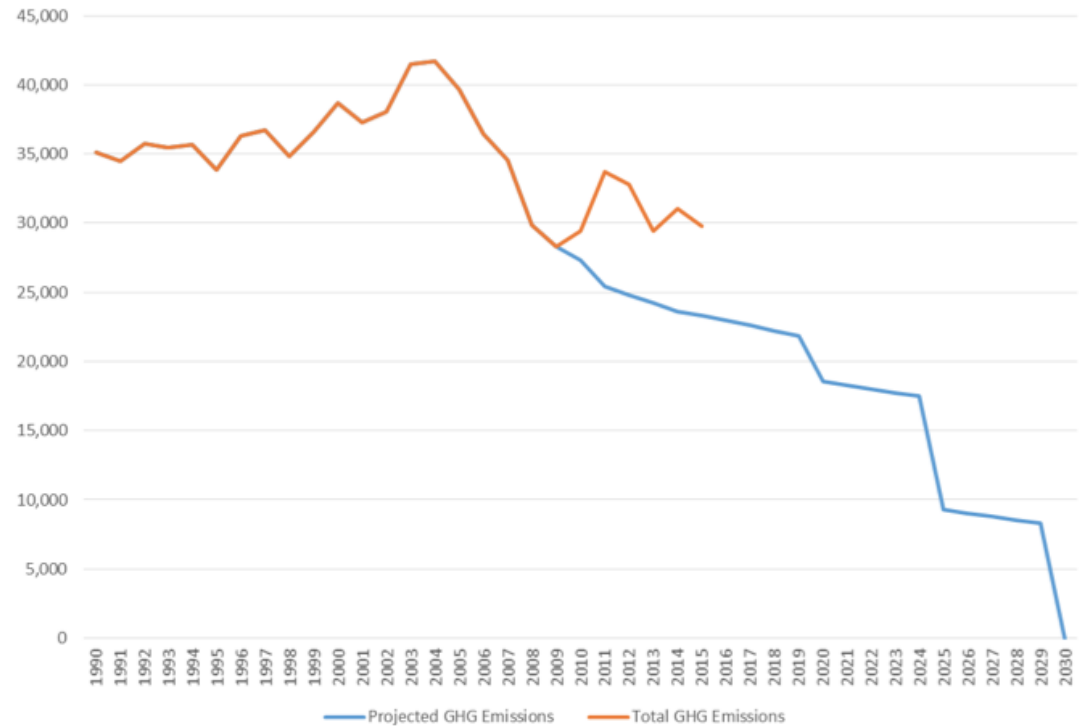


Fig. 1 Greenhouse gas emissions in metric tons over time.

Smith's Current Mitigation Efforts

Since the SCAMP was published, Smith College has taken a number of steps to reduce its carbon emissions:

- Starting in 2007, the college switched its energy over to localized production at the **Smith Cogeneration Plant**, which simultaneously provides the college energy independence, and allows the college to produce both energy and heating at a high rate of efficiency. Consequently, switching over to the Co-gen led to a steep decrease in emissions (Figure 1)
- Additional reductions have come from the addition of over 537 kWh of **solar energy** since 2009.
- The **construction of Ford Hall**, a LEED certified wet lab corresponded with an increase in Smith's emissions as a result of the new energy demand. Other construction projects on campus, like the LEED certified paradise roads apartments, have resulted in smaller changes in energy demand, because they replace outdated infrastructure and rely on newer, greener technologies.

- To manage and track these kinds of changes, the college submits an annual **STARS report**, and has hired an energy manager to oversee future improvements.

These efforts represent a substantial effort on the part of the college to mitigate its climate emissions, but as we look towards the **2030 carbon neutral target**, more work needs to be done.

Our Task

Mitigation section of the participatory climate change workshop hopes to provide policymakers with information about **how the campus community thinks Smith can move forward by making changes to buildings, energy and fuel sources and community behaviors.**

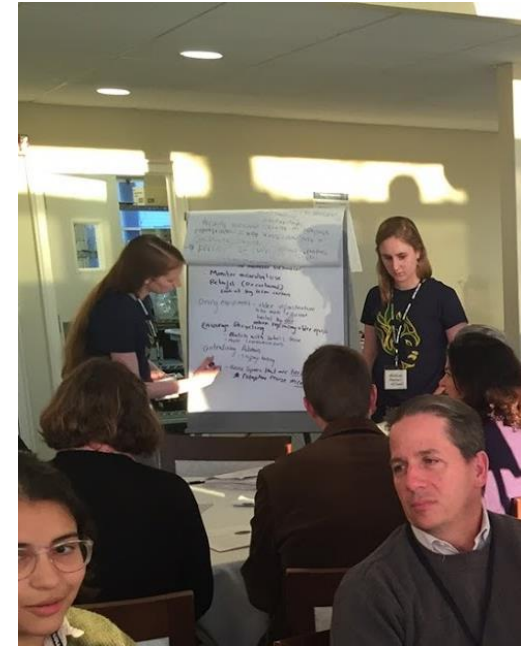


Fig. 2 Participatory Workshop, April 2016

Summary of the Participatory Workshop

Day 1: Background and Buildings

The first day of the participatory exercise focused primarily on creating a shared knowledge of Smith's current mitigation efforts among participants and brainstorming possible actions around known areas of interest, namely building infrastructure and energy sources.

The topic was first introduced via a 5 minute PowerPoint presentation and then discussed in a small group setting during a world cafe exercise. During the world cafe, two separate groups comprised of around eight students, faculty and staff were asked to brainstorm ways in which Smith College could reach its goal of carbon neutrality.

Although the initial intention of the facilitators was to structure the conversation around three main topics (fuel source, buildings and community), other themes in the participants conversation quickly emerged. This included the lack of clear feedback avenues and concern about commitments to 2030 carbon neutrality not being reflected in policy decisions.

Buildings

Much frustration was expressed over the efficiency of the campus' current infrastructure. Concerns included:

Heating

- Much of the College's current heating infrastructure is outdated
- The college needs to move away from a steam

radiator system

- Behaviorally, We could create a more responsive system by putting in work orders, but there's some doubt if they actually create change
- Allowing for Individual thermostats - more responsive control of heating
- Increasing the quality of insulation could reduce heat loss
- Removing the need for supplementary heating/cooling would save energy and expenses for the college and allow the co-generator to operate at full capacity

Retrofitting

- While it's been an ongoing process since 2011, progress has been slow
- Going house by house to solve problems is a slow, but necessary process
- Standards for renovation need to be accessible and consistent. They need to be unique to Smith as opposed to a national standard. The should also be unique to buildings and their use as well
- When deciding on projects, long term carbon reductions need to be prioritized. ie: choosing to replace outdated dining equipment with lower energy using counterparts, even if it means going a bit over budget

New Construction

- Keep it few & small
- Reuse spaces we already have -- concentrate their use
- Rewards system for reuse of spaces
- New buildings built with the 2030 goal in mind

“Building-related projects need to prioritize long term carbon reductions”

Energy and Systems

While many Smith faculty staff and students had a lot of information to share in discussions about the relative advantages of different energy sources, one of the largest challenges facing participants was a sense of confusion about what behaviors and infrastructure contributed to Smith's greenhouse gas emissions. While in recent years the colleges has installed energy and water use trackers in various buildings on campus (Ford, Campus center, Cutter-Ziskind houses, etc.) Participants felt that these did not necessarily represent the campus use as a whole. They identified several issues surrounding the current energy use tracking systems at Smith.

Monitoring Systems

- Current lack of information available to public
- Reported results are Inconsistent with what's happening
- Not enough data is being tracked
- Not being used to generate standards that are obtainable for the campus

Energy Sources

Participants in the World cafe identified and discussed potential paths for energy generation on campus. Initial conversation favored a model which embraced a bunch of small scale systems to produce energy, which would create a diverse energy profile for Smith. This model places a greater emphasis

on student lead research and education because the campus would become what a participant termed a "Living Laboratory" and serve as an example of options for the broader community.

Energy sources discussed included:

Geothermal

Shallow pumps

Used maybe for one building at a time

Offset with solar panels

Technical challenges

Hydrogen Fuel Cell

Not amazing, but it would send a positive message

Students could lead and learn

Biomass:

Closed loop carbon

Could use our generated compost

Educational tool

RISKS: may not be truly carbon neutral

Wind & Hydropower

Storage issues

Connecting to the grid

Other concerns

In addition to broader concerns about the administration's role in guiding carbon neutral policy decisions, participants raised questions about the role of individuals in climate mitigation. In the words of one of our participants, "I believe that it's critical that we build awareness of our concerns and engage and energize the campus community to take personal initiatives to reduce electricity."

"I believe that it's critical that we build awareness of our concerns and engage and energize the campus community to take personal initiatives to reduce electricity."

Day Two: Behaviors and Fuel Sources

The second day of the climate change workshop was focused on **analyzing behavioral changes and fuel source options** in depth.

Because the discussion on carbon emissions related to buildings on day one generated lots of ideas about desired infrastructure and use changes and at the request of the Study Group on Climate Change, we decided to focus our efforts on **student behaviors and fuel sources**.

Behavioral changes at Smith were not a main focus on day one, so we used a low hanging fruit exercise to brainstorm and analyze ideas at the same time. We had the participants write ideas for behavioral changes at Smith that would help mitigate climate change on post-it notes, and then as a group we assessed their feasibility. The most feasible changes were placed at the bottom of the tree, and the most difficult adjustments went at the top (Figure 3).

The low-hanging fruit exercise proved to be a great way to get people brainstorming and discussing

behavioral changes as a mitigation effort. We discussed the feasibility of each behavior was in relation to the other behaviors.

The coding of the data required looking through the notes we had taken about the discussion, as well as some input from us as facilitators.

We decided to code each behavior on both their **feasibility and impact** on a scale from one to three. A score of three was awarded to behaviors that had the highest impact and were the easiest to accomplish. The feasibility and impact of each behavior was generated through discussion, and quantified and coded later in the analysis of the data.

Figure 4 shows the matrix of behaviors, ranked from easiest to most difficult, and then again from highest to lowest impact. The color gradient and numbering system demonstrates the ranking of each behavior from easiest and most impactful to hardest and least impactful. In our color gradient, we prioritized the impact score over the feasibility score in showing the numbering, or timeline, of the behavioral changes.

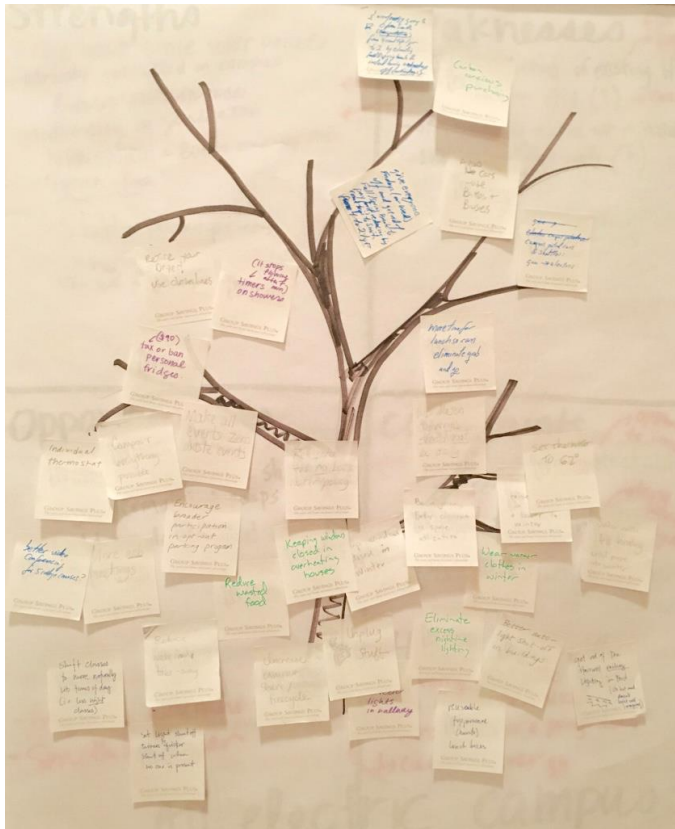


Fig. 3 Photograph of the low-hanging fruit exercise

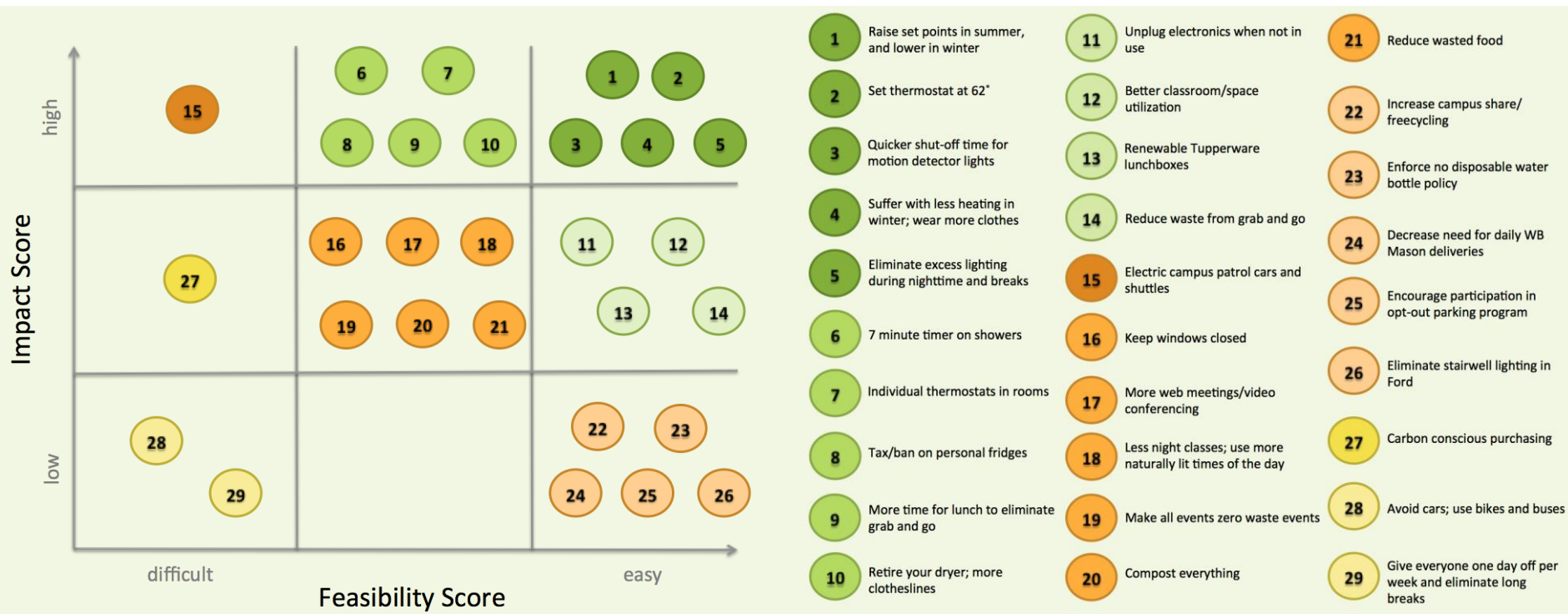


Fig. 4 Matrix and legend of combined impact and feasibility scores for all of the behaviors discussed at the climate change workshop on mitigation

To analyze the fuel source options at Smith, we used a Strengths, Weaknesses, Opportunities and Constraints (SWOC) exercise to facilitate critical thinking and analysis of the relative advantages and drawbacks of various fuel sources and assess the feasibility of their implementation here at Smith. Our groups had great discussions about fuel sources on day one, so we combined the workshop data with the study group’s ideas to create four main fuel source options: keep the natural gas cogeneration plant, use biomass or biofuels, switch to hydrogen combustion, or convert to an all-electric campus. Each option had its own SWOC table, in which the participants assess the strengths, weaknesses, opportunities, and constraints of each fuel source. We then further analyzed the tables by asking the participants how we could turn the constraints or weaknesses of each fuel source into opportunities or strengths.

Natural Gas

Participants performed a SWOC analysis on the strengths and weaknesses of remaining on Smith’s currently operating natural gas energy production system (Figure 5). While the cogeneration plant has only been working for less than 10 years, many of the participants felt that remaining attached to a natural gas based power supply system was incompatible with the college’s 2030 goal of carbon neutrality. The group identified the stability of natural gas prices, Smith’s energy independence from the

grid, and the ability to use currently existing infrastructure as benefits. The majority of the identified weaknesses centered less on the college, and more on the environmental justice issues that surround fracking and natural gas extraction, like environmental damage from pollution leakage and emission rates. Participants identified the low cost of natural gas and local employment as opportunities. However, the efficiency of current infrastructure, the lost opportunity to invest in renewable research and production, as well as the college’s support of pipeline companies are all constraints of sticking to natural gas.

<p>Strengths</p> <ul style="list-style-type: none"> ○ Infrastructure efficient and already in place ○ Less polluting than Coal ○ Relatively “clean” during burning ○ Keeps Smith partially off the grid 	<p>Weaknesses</p> <ul style="list-style-type: none"> ○ Hydrofracking causes a lot of environmental justice issues ○ Fuel extraction is problematic (pollution via leakage) ○ Relatively “dirty” in delivery ○ Not consistent with our 2030 commitment ○ Burns ancient carbon
<p>Opportunities</p> <ul style="list-style-type: none"> ○ Cheap (currently) ○ Keeps Halibuton employed ○ No new investment required 	<p>Constraints</p> <ul style="list-style-type: none"> ○ Infrastructure in place (efficient) ○ Inhibits use of renewables ○ College’s support of pipeline companies

Fig. 5 Transcription of a SWOC Diagram of the benefits and drawbacks of natural gas

Biomass/Biofuels

Converting to biomass and biofuel would be more feasible than an all-electric fuel source or hydrogen combustion because we already have the space and infrastructure necessary (figure 6). Using biomass or biofuels would give Smith base load power, and would allow it to recycle food waste, which makes it naturally renewable. Biomass and biofuels are considered a better option than fossil fuels because it is a more closed loop carbon cycle. While it would burn recent carbon as opposed to ancient carbon, it still burns carbon. This raises questions of whether it would actually help Smith reach the goal of carbon neutrality by 2030. Biomass and Bio fuel could provide an opportunity for Smith to engage the community in reducing food waste by partnering with local businesses to purchase food scraps or grease to use in the co-generator.

Smith could also support local suppliers of biomass and biofuel, as well as support sustainable land management of the suppliers. However, there are concerns with public opposition to biomass and biofuels, as well as the

risk that using biomass from local areas can change the landscape in unsustainable ways. In addition, the fuel efficiency can be lower than other fuel options. In order to claim that biomass and biofuels are carbon neutral, Smith would need land that we don't have to balance the output of carbon.

<p>Strengths</p> <ul style="list-style-type: none"> ○ Base load power ○ Closed loop carbon cycle (not burning ancient carbon) ○ Can recycle waste stream to produce ○ Naturally renewable 	<p>Weaknesses</p> <ul style="list-style-type: none"> ○ Need reliable feedstock ○ Potential increased emissions by putting pressure on land use ○ Can degrade land if not properly managed ○ Involves burning carbon ○ Air pollution?
<p>Opportunities</p> <ul style="list-style-type: none"> ○ Food waste reduction ○ Potentially support sustainable land management (community education program for suppliers) ○ Transition strategy (mix with natural gas) ○ Support local suppliers (Northeast Biodiesel, foresters) ○ Grow algae in Paradise pond to use ○ Support local businesses ○ Partner with local groups to use usual food waste (oil from local restaurants) 	<p>Constraints</p> <ul style="list-style-type: none"> ○ Need a large supply for campus (problems with storage and sourcing) ○ Biomass from local area changes local environments ○ Efficiency of fuel can be lower than others ○ Public opposition ○ Requires land the campus doesn't have for production and balancing carbon

Fig. 6 Transcription of a SWOC Diagram of the benefits and drawbacks of biomass/biofuel

Combustion of Hydrogen

Participants discussed the relative advantages and disadvantages of the college switching to the combustion of hydrogen as a primary source of energy generation (figure 7).

They identified the clean burning nature and high level of efficiency of hydrogen combustion as strengths. They identified the weaknesses of hydrogen combustion as the slow rate of technological development in energy production, the need to use an external energy source to split the water molecules, and the problems surrounding storing the materials. The group turned to the opportunity to be become leaders in the development of technology as potential benefit to exploring hydrogen combustion.

They also suggested continuing use of the cogenerator, the inexpensive price of water, rising groundwater levels in New England, eligibility of the process for funding, and the ability to sell resulting oxygen byproduct as further opportunities hydrogen combustion could bring to

campus. Some constraints identified during the workshop included the expenses surrounding retrofitting the cogeneration plant, the lack of functioning combustion technology, negative public perception, high storage demand, and the need for supplementary energy source as potential constraints.

Part of the challenge in converting to hydrogen combustion is that Smith doesn't have enough information as to how much space and resources we need to put into a hydrogen combustion plant.

<p>Strengths</p> <ul style="list-style-type: none"> ○ Clean burning - no emissions ○ Efficient ○ Smith could make its own ○ Energy independence 	<p>Weaknesses</p> <ul style="list-style-type: none"> ○ Technology isn't ready ○ Expensive ○ Requires energy to split the hydrogen, so it would need to be supplemented, which is less efficient than directly using the electricity ○ Storage of gas requires facility space ○ Initial energy cost
<p>Opportunities</p> <ul style="list-style-type: none"> ○ Smith could lead the way in technology use ○ Able to continue using the Cogen ○ Use the research and development process in education ○ Access to Water is easy and cheap ○ Sell oxygen byproduct ○ Eligibility for grants and rebates ○ New England is getting wetter (no shortage of water) 	<p>Constraints</p> <ul style="list-style-type: none"> ○ Expensive ○ Technology isn't ready ○ Fuel availability ○ Public perceives it as dangerous ○ Need a large amount of storage space (2-5x more) ○ Need a renewable energy source to make production carbon neutral

Fig. 7 Transcription of a SWOC Diagram of the benefits and drawbacks of hydrogen combustion

All electric campus

The discussion on the possibility of switching to an all-electric campus garnered a lot of discussion among the participants (Figure 8). The main strengths of converting to an all-electric energy system is that it is completely carbon free, we could increase diversity in our energy generation, and there would be stable power prices because we would be drawing from renewable resources as opposed to dwindling resources. Some weaknesses and constraints we discussed included the fact that we would have to completely tear up all of the historic infrastructure in order to put in electric systems. In addition, we would be dependent on the grid, and we would need a backup power source for emergencies. Since Smith is currently maxed out on solar energy, and we would need to ensure that our energy source is renewable in order to be carbon free, we would either need to invest in renewables off campus, or buy land elsewhere to build renewable technologies. Another major constraint is that it is difficult to update historic buildings without destroying parts of the building that make it historic, but a potential solution could be to place the value of historic buildings on features other than the foundation to allow for renovations to occur. The conversion to and electric system would also have a high initial cost, but it would have a payoff in

the long run because we would be able to fix other problems as we renovate, and it would be an educational opportunity for students and faculty to be involved in

studying and improving various renewable technologies. Smith could fit a custom energy plan to our specific needs, and engage recent alumni.

Strengths

- Some buildings are already electric
- Increase diversity in energy generation
- New system would allow for increased energy monitoring and update old infrastructure
- Carbon free
- Stable power prices
- Can run heat pumps

Weaknesses

- Require major retro-fitting of existing HVAC
- Dependency on grid
- Currently maxed out for solar energy on campus
- Would need backup power source for emergencies

Opportunities

- Fix basic HVAC problems as we renovate
- Complement other fuel sources like fuel cells
- Support local renewable energy jobs
- Increased energy from renewables
- Engage recent alumni
- Smith as a leader in environmental issues
- Place historic values on other features besides the foundation of the building
- Architecture students could help design changes
- Fit a custom energy plan to Smith
- Long term payoff

Constraints

- Need to ensure electricity is renewable
- High initial cost
- Need a 3rd party to take advantage of tax credits
- Difficult to update/change historic buildings

Fig. 8 Transcription of a SWOC Diagram of the benefits and drawbacks of biomass/biofuel 39

Summary of the Participatory Workshop

Analysis

Buildings

Currently, 91% of the college's current carbon emissions stem from building use. Classroom lab space and housing's heating and electricity demands comprise the majority of Smith College's energy use, and changes in infrastructure and individual behavior play a large role in determining the efficiency. As a historical campus, the buildings at Smith present a challenge in developing retrofitting and construction policy. The college consists of more than 100 maintenance, residential and classroom buildings constructed with architecture dating from the 1870's to the present day. As a result, **a cohesive standard for building sustainability or energy use is difficult to maintain.** Each building presents a unique set of problems with retrofitting, and many need to work with historical infrastructure and preserve iconic building facades. As a result, retrofitting rarely occurs on a large scale on Smith's campus. This has not gone unnoticed by students and staff, who have expressed frustration at the lack of visible infrastructure improvements that promote responsible resource and energy use.

During the round table discussion, workshop participants identified building heating, renovation, and system monitoring and

feedback as issues important to campus. One of the most common concerns expressed was **a lack of clear avenues for communication and feedback about energy use and heating.** Currently, the majority of communication about heating and energy use takes place through work order submitted by students experiencing overheating in their dorm rooms. Since changes in these two areas directly impact student and faculty lifestyle, policy changes should include more attempts to engage the broader campus as a whole. Information about energy and water use is not accessible either. Although the college does track its use in key buildings on campus, the data is not presented in a way that facilitates conversation or research. Moving forward, the college should prioritize communicating this information as clearly as possible.

Behaviors

Behavioral changes are an important component of climate change mitigation. Decreases in carbon emissions that result from infrastructure improvements are most effective when supplemented with corresponding commitments from the community. At Smith, student behaviors have a huge impact on our carbon footprint, given that many of them live on campus. In our discussions, the participants acknowledged that behavioral changes should stem from two main sources: policy shifts and peer activism.

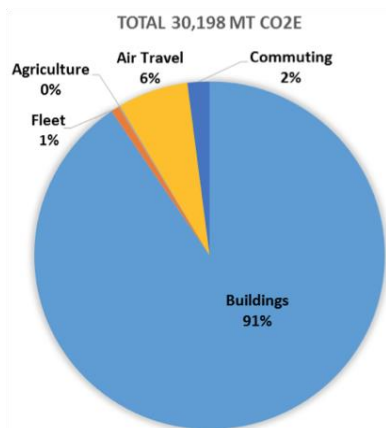


Fig. 9 Breakdown of carbon emissions at Smith College

The group suggested more administration based policy changes, such as implementing fines or bans on electrically demanding personal fridges, or lower temperature thresholds across Smith may encourage behavioral change more than just student motivation. In our discussion of the suggested student behavioral changes, almost all of the participants ranked them at the bottom of the tree, indicating that they are highly feasible. This bias towards a high commitment to mitigation could come from both the group's knowledge and expertise of climate change, as well as a low representation of students in the discussion group.

The goal of the discussion on behaviors was to generate ideas for student behavioral changes, so many of the faculty and staff in the group were making assumptions about the feasibility of behavioral changes that many students may not agree with.

In the data analysis of the feasibility tree, we took into account the relative feasibility and impact of each behavior. As facilitators, used the discussions around each behavior, as well as our student perspectives to rank and code each behavior on feasibility and impact separately. The scores were then combined to create a matrix (Figure 4).

Moving forward, the changes which would have the largest impact (colored in deep green) are mostly dealing with changes to heating regulation and changes in building temperature. Among students and faculty, heating is widely considered the largest issue of both personal comfort and energy waste.

Figure 4 can be used to form a kind of timeline for future behavioral changes. The numbering system, as well as the color of each of the behaviors is our suggested timeline for the behaviors. We started with the behaviors that are the most feasible and have the most impact, and prioritized impact over feasibility in our subsequent rankings.

Our rankings, however, focus on mitigation of carbon emissions currently defined by the SCAMP plan. **Smith's GHG inventory does not calculate or report emissions from student travel to and from the college throughout the year or emissions produced by the shipment and delivery of goods in our supply chain.**

Consequently, there are some behavioral shifts which would have large impacts on the greenhouse gas emissions produced by the college which would have no impact on its mitigation plan.

Moving forward, the changes which would have the largest impact are mostly dealing with changes to heating regulation and changes in building temperature.

Fuel source

Natural Gas

Since 2007, the campus has been running on a natural gas fueled cogeneration plant. The plant is highly energy efficient in production as the resulting heat from the burning of the natural gas is captured and used to heat steam for a centralized heating system. The co-gen is relatively new, and represents a substantial fiscal commitment by the university. Its lifetime extends past the 2030 carbon emission deadline, so consequently Smith College has some hesitations about abandoning this viable infrastructure to pursue alternate forms of energy.

Many participants, however, felt that continuing to adhere to a natural gas centered energy plan was essentially a passive acceptance of fossil fuel dominance and inconsistent with our 2030 carbon neutrality deadline, as well as the values the college places on being a socially just and responsible institution. In addition, there are contamination concerns in the catchment and transport of natural gas, and environmental justice issues that accompany fracking.

In its initial climate mitigation plan, the college viewed the change from a coal powered energy system to natural gas as a temporary transition which would ultimately be adapted to a more renewable energy source, like biofuel. Our discussion group recommended that Smith

should transition away from natural gas, and come up with a better plan that aligns with the 2030 deadline and focuses on providing an alternate fuel source to run Smith's campus.

Biomass/Biofuel

Biomass and biofuels were originally the proposed main fuel source from the Smith Sustainability & Climate Action Management Plan in 2009. However, the technology has not progressed quite as effectively as expected.

There are many incentives to switching to a biomass or biofuel source. For instance, Smith could burn biofuels in the current cogeneration infrastructure, with minimal infrastructure changes. In addition, switching to more biofuels could be an opportunity to use more recent carbon deposits, and transition away from ancient carbon and natural gas. The biofuels themselves could come from local restaurants, or even the Campus Center Cafe, which would encourage community engagement among small businesses, and ensure not as much wasted food or fuel.

However, biofuels have some apparent weaknesses. **It is unclear how much impact switching to biofuels or biomass will have because Smith would still be burning carbon, it just would be more recent deposits as opposed to ancient sequestrations.**

Many participants felt that continuing to adhere to a natural gas centered energy plan was essentially a passive acceptance of fossil fuel dominance and inconsistent with our 2030 carbon neutrality deadline, as well as the values the college places on being a socially just and responsible institution.

Therefore, it might be hard to classify using biofuels or biomass as carbon neutral. Middlebury College in Vermont recently built a biomass power plant that runs on wood chips. They rationalize declaring biomass as carbon neutral by arguing that the forests owned by Middlebury are taking in the same amount of carbon that the power plant burns.

Smith, on the other hand, does not own enough forests to make the claim that burning biomass or biofuels would be balanced out with vegetation intake. In addition, if Smith switched to a completely biomass or biofuel system, it would be a challenge to produce enough volume needed to supply energy for the whole campus.

Biomass or biofuel could be a good transition fuel or an added component to our current system, but it wouldn't be carbon neutral or sustainable as a long-term fuel source. One suggestion that came out of our discussion was "Fry Friday," in which one day of the week Smith burns solely biofuels, such as leftover restaurant grease.

Hydrogen Combustion

As a technology, hydrogen combustion is a developing field for clean energy that offers many exciting opportunities. **For Smith, it provides an unique opportunity for the**

college to continue using the infrastructure it has in place, like the cogeneration power plant and its centralized steam heating system, while eliminating carbon emissions.

While great in theory, the technology has not yet reached the point where it can be implemented on a large scale operation like Smith.

Until the technology advances, implementing this technology would be difficult. However, investing in it would provide Smith an opportunity to lead at the forefront of technology which paves a new path to carbon free emissions. More research needs to take place in order to assess the feasibility of Smith converting to hydrogen combustion.

There are **many unknown** factors involved in deciding the feasibility of a hydrogen combustion plan. Many participants looked at this as an opportunity for the research and lab work at Smith to engage students in work with a tangible impact on the world. In addition, groundwater levels are rising in New England, so water as a resource would not necessarily be a concern.

Hydrogen combustion provides an unique opportunity for the college to continue using the infrastructure it has in place, like the cogeneration power plant and its centralized steam heating system, while eliminating carbon emissions.

Converting Smith College to an all-electric campus would be a major step in terms of commitment, but it would have a significant impact on Smith's carbon emissions.

All-electric campus

Converting Smith College to an all-electric campus would be a **major step in terms of commitment, but it would have a significant impact on Smith's carbon emissions.** An all-electric campus would allow for more flexibility in fuel source; Smith would have the option of using only renewable resources, which would cut carbon emissions dramatically, and make the 2030 goal of carbon neutrality feasible.

In addition, an electric heating system could remain as a **centralized system**, where the entire campus gets their energy from one generation point on campus, or it could break off into a **decentralized model**, where maybe individual buildings have different energy sources. For example, one building would have a smaller geothermal energy system that would only provide enough energy for the single building.

This model, though less resilient, could provide some valuable research and educational opportunities for students to take the lead and take advantage of the living laboratory of Smith College.

An all-electric campus is an important option to consider because it would dramatically decrease carbon emissions. However, there are some **practical barriers** that prevent an electric campus from being

the ideal option.

Many of the buildings at Smith are historic, and are built on outdated steam heating. Replacing all of the heating systems in every building would require a huge investment and willingness to restructure historic buildings.

However, it would allow Smith to fix other infrastructure problems as they update, and with potentially changing the regulations on what makes a building historic.

Overall, electric heating would essentially cut our building carbon emissions, provide important educational opportunities, and pay off the costly upfront investment in the long run.

Policy Recommendations

Buildings

Moving forward, Smith college needs to improve its **tracking of energy and building use on campus**. It can accomplish this by making a commitment to have energy and water usage tracking meters placed in all of the main academic and residential buildings within four years. This change would encourage students, staff and faculty to look at their buildings energy consumption and make a commitment to conserving resources and make lasting change.

Smith college needs to commit to installing working meters in all of its buildings within the next four years and making the data captured by them available to the community in a clear, accessible manner. Currently, Smith College is working to install tracking meters in largest buildings on campus. While this project has placed meters in over 24 buildings on campus, it needs to be implemented on a broader scope, with more intentional implementation. This would help aid students and faculty to better understand the way their individual behaviors impact water use, and promote conversation about energy systems on campus and the relative efficiency of our current infrastructure. Moreover, this data should be made available to students in a more accessible fashion. This data would be extremely beneficial to student environmental activist groups on campus and serve as a powerful resource for student research projects. The college's current energy tracking site, **"Building Dashboard"** relies on visual

representation of information and has no clear way for students to compare data over a longer range of time or perform analysis independent from the site. Smith could accomplish this project through a collaboration between facilities management, CEEDS and the newly hired energy director. Together they could create a plan for retrofitting which is compatible with a stricter timeline.

Additionally, the college could develop, publish and implement **new retrofitting standards and make a commitment to prioritizing sustainability in future construction projects**. Currently, renovation policy and goals on Smith's campus remain **poorly publicized to the community**. While it makes sense to retain a certain degree of flexibility in renovations standards to meet specific building's needs for repair, it is equally important to make a visible commitment to environmentally sound retrofitting and renovation practices if the college hopes to reach its goal of carbon neutrality by 2030. In terms of new construction, the college has made a commitment to maintaining a standard of LEED silver or better.

While fantastic, the college needs to give more thought given to whether or not new construction is necessary and in line with the 2030 goal. The college could potentially accomplish this by encouraging all **future building projects to be electrically heated**. This would allow greater flexibility to for the college as electricity can be purchased from a wide variety of sources and have more easily take advantage of technology as it develops.

Smith college needs to commit to installing working meters in all of its buildings within the next four years

The involvement of the Eco Reps should be increased in order to encourage behavioral change through student-led activism.

Behaviors

In terms of behavioral changes, our workshop came up with a number of different ideas about what behaviors could help mitigate climate change at Smith.

Most of these behavioral changes were directed towards student lives, but many of them also involved **administrative or infrastructure changes that could influence and encourage changes in student behaviors**. We recommend following the numbering and gradient of the behaviors in the matrix (Figure 4). The numbering system represents the progression of behavioral changes that begins with those that have the most impact and are the most feasible.

Each behavioral change is different in how it can be carried out. However, to cover all of the behavioral changes that are recommended, multiple different sectors of campus will need to take responsibility.

Firstly, the involvement of the **Eco Reps** should be increased in order to encourage behavioral change through student-led activism. The Eco Reps could be responsible for introducing and encouraging behavioral changes that come from intrinsic motivation by students.

Along those lines, the **SGA Sustainability Committee** could also participate in the encouragement and education of students. In addition, the administration should also participate in promoting behavioral change through college policies.

The **sustainability office** in conjunction with facilities should be in charge of such policy changes such as lowering and keeping temperatures constant in buildings throughout the year.

A policy change such as **banning personal fridges** could be taken up with the sustainability office in terms of issue, but Residence Life could be responsible for implementation.

These combinations of policy and student-led changes will hopefully lead to drastic changes in how much energy and resources the student body uses.

This reduction in usage will help contribute to the mitigation of climate change by reducing how much energy the college needs to produce, which will be important if we switch fuel sources or energy systems. In addition, the direct reduction of energy and resource usage translates to a reduction in carbon emissions for Smith.

Fuel Source

The discussions surrounding potential fuel sources at Smith garnered great points about how best to address mitigation at Smith. The fuel source at Smith is one of the largest contributors to climate change, and choosing the best option for Smith is an extremely important decision. From the discussions at the workshops, we as facilitators have come up with a couple different options for fuel source moving forward.

In the short term, we recommend that Smith transition to using **more biofuels** in the power plant. One of our participants had the idea of creating “**Fry Friday**,” in which the cogeneration plant would burn biofuels, or filtered restaurant grease, on Fridays.

This new measure could decrease the use of ancient carbon, and close the carbon loop in the short term. The power plant can only burn biofuels from grease in the winter, but we recommend that Smith take advantage of that in the winter months, and consider any feasible pathways to increase biofuel use year round by expanding the capacity of the co-generator to burn biofuels. In terms of biofuel source, it would need to be filtered, and Smith would be able to obtain it from a filtering station.

Although this might add an extra step in the fuel process, it would exemplify to the Smith

community that we are committed to reaching the **2030 neutrality goal**, as well as stepping away from fossil fuels and ancient carbon. We could also have the opportunity to involve students in “Fry Friday,” which could be food concentrators or student organizations that could educate and publicize Smith’s biofuels initiative.

In the long term, **an all-electric campus** would be more in line with Smith’s goal of carbon neutrality. An all-electric campus would allow for Smith to become carbon neutral by getting energy from solely renewable resources. It would also allow us some resiliency, because in the case of an emergency, Smith could revert back to the grid or burn natural gas again.

Converting to an all-electric campus comes with a number of challenges, but it would ultimately have a long term payoff that would help us get to our carbon neutrality goal. In addition, updating and renovating the heating systems of each building would also allow us to fix other HVAC problems along the way, which need to take place to increase building efficiency.

In addition, an all-electric campus and a commitment to renewable energy would support Smith’s educational values and principles. Students and faculty could conduct smaller-scale projects on renewable energy resources, such as geothermal energy, and apply their findings to Smith.

Fry Friday!

How can we involve students, faculty and staff in the mitigation process?

Moving forward: Lingerin Questions

While there workshop and small group discussions generated a wide variety of information about the broader perception of mitigation on campus and what kind of steps Smith faculty, staff and students would be willing to take to reduce their impact on the climate. While the project lead to some policy solutions, it also highlighted some sources of confusion. Compiled here are a couple of the key questions that emerged from our discussion. Moving forward, carefully considering each of the issues will be an important to developing a mitigation plan that fits the college.

How do we define mitigation?

Currently the administration defines mitigation through the lense provided by the SCAMP and measures carbon emissions from energy production, use, and faculty transportation. This approach places most of its policy emphasis on the college's directly produced emissions and places less emphasis on third tier emissions produced by supply chains for food and other materials.

Currently, the college's mitigation plan doesn't track the majority of these emissions. This raises some of the following questions:

- What should we be tracking for carbon emissions?
- Are there commitments we as an institution should make that have impact that isn't measured by greenhouse gas emissions?
- Are our currently measured sources enough, accurate, and give a clear picture?
- What are we doing with that data?

How can we involve students, faculty and staff in the mitigation process?

Since the creation of the office of sustainability, the role of mitigation at Smith has been largely decided and directed by faculty with student and staff advising. While this demonstrates a substantial commitment to continuity within sustainability initiatives on campus, it also presents a potential problem with maintaining broader campus engagement. In order to encourage participation and a sense of ownership of greenhouse gas emissions, it's important to create avenues for for students and staff to be held accountable and made aware of the impact of their options. This could be accomplished through a variety of methods, including creating a green certification program for office and student living spaces through the eco rep program.

How can we, as an institution, promote the development and use of sustainable energy sources?

As previously outlined in the report, a major part of Smith's future climate mitigation is moving away from a fossil fuel dominated energy system. In addition to contributed to rising levels of greenhouse gas emissions, reliance fossil fuels limit our ability to adapt to climate change. The initial mitigation plan involved a huge shift in energy supply from natural gas to biofuel or other renewable energy source. Such a shift would make a clear statement about Smith's values. However, in many cases, the more sustainable fuel sources have not developed to the point that they could easily be used with the college's current infrastructure. While participants identified this as an opportunity for Smith College to act as a leader in a developing technology field, this could make reaching the college's goal of 2030 carbon neutrality difficult to achieve.

Moving forward, the college needs to ask itself the following question:

In light of the slow development of biofuel and hydrogen combustion technology, is making smith carbon neutral by 2030 feasible?



Fig. X Participatory Workshop, April 2016

ADAPTATION

What is Adaptation and Why Does it Matter?

The Intergovernmental Panel on Climate Change defines adaptation as an “adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities” (IPCC, 2007). In the context of Smith College, adaptive measures should be a response to the potential impacts of climate change. Another aspect of adaptation, adaptive capacity, is “the degree to which people, places, institutions and sectors are able to adapt to climate change impacts” (UN-Habitat, 2014).

Worldwide, most initiatives working to combat climate change tend to center on mitigation (Jacoby and Janetos, 2014). For example, the divestment movement (including the campaign at Smith) aims to push colleges to stop investing in the fossil fuel industry because fossil fuel use (and all greenhouse gas emissions) causes climate change.

Mitigation is vital, but it is also extremely important to address adaptation when discussing how Smith can best take action to deal with climate change.

Even if the college reduces its greenhouse gas emissions, the effects of climate change will continue to be felt for years to come (350.org. 2015).

Our Task:

This section of the report outlines the issues, opportunities and potential avenues of action for Smith College will encounter as it adapts to a changing climate.

Implementing adaptation plans at various scales of governance (regional, municipal, institutional) is an important step towards adjusting to an altered climate. Boston University is the first college campus to have designed a climate change adaptation plan (Figure 1).



Fig. 1 **Boston University Center for Integrated Life Sciences and Engineering** (Source: BU Facilities Management and Planning, 2016)

Boston's low lying coastal location makes it especially vulnerable to flooding caused by sea level rise and extreme weather events. Consequently, public and private organizations in Boston have been actively working on adaptation planning. Boston University built its newest academic building, the Center for Integrated Life Sciences and Engineering, with adaptation in mind. All of the mechanical and electrical equipment is located on the second floor of the building or higher so that the building can function in the increasingly-likely event of a flood

What is Being Done Now at Smith?

Recently, Smith College initiated many activities that could be considered adaptive measures; however, no activity has been explicitly labeled as an adaptation strategy. In addition, the college does not currently have a cohesive adaptation plan to coordinate these initiatives.

Some examples of current projects on campus include permeable pavement initiatives (figure 2), invasive species remediation (figure 3), a strategic dining plan (figure 4), and the power islanding of the campus' power plant (figure 5).



Fig. 2 **Mandelle Road parking lot** (Source: Courtesy of Andrea Shmid)

In order to adapt to the increased precipitation and flooding events that accompany climate change in New England, the college needs better storm water management techniques. Smith had started to test the effectiveness of permeable pavement as a way to reduce runoff and increase infiltration by using porous pavement at the MacLeish Field Station and in the Mandelle Road parking lot in the Quad.



Fig. 3 **Students removing invasive Species near Paradise Pond** (Source: Courtesy of Smith College)

In a changing climate, invasive species have an advantage because they are highly adaptable, and react more quickly to unusual environmental conditions than native species. In the context of the increased presence of invasive species on Smith's campus, some remediation work has been done around Paradise Pond. Coordinated through Facilities Management and the Botanical Garden, students and staff have worked to identify and map invasive species (using GIS/GPS).



Fig. 4 Local Delivery from Outlook Farm

Creating a more resilient and adaptive food supply chain is an important adaptation strategy in the context of decreased food security because of extreme weather events, potential climate conflicts, and the difficulty of transporting food because of these trends related to climate change. Dining Services is working on a Strategic Dining Plan “to analyze the current [dining] program with an eye toward understanding current patterns of use, enhancing sustainability performance, emphasizing health and wellness, and improving operational efficiencies”.



Fig. 5 New “Black Start” Generator (installed 2013)

In the context of increased extreme weather events in New England, such as the 2011 “Snowtober,” Facilities Management has worked to make the campus’ cogeneration power plant able to run independently from the regional electrical grid and provide heat and power to campus. The purchase of a new “Black Start” generator also gives the power plant the ability to restart even if the surrounding regional grid fails.

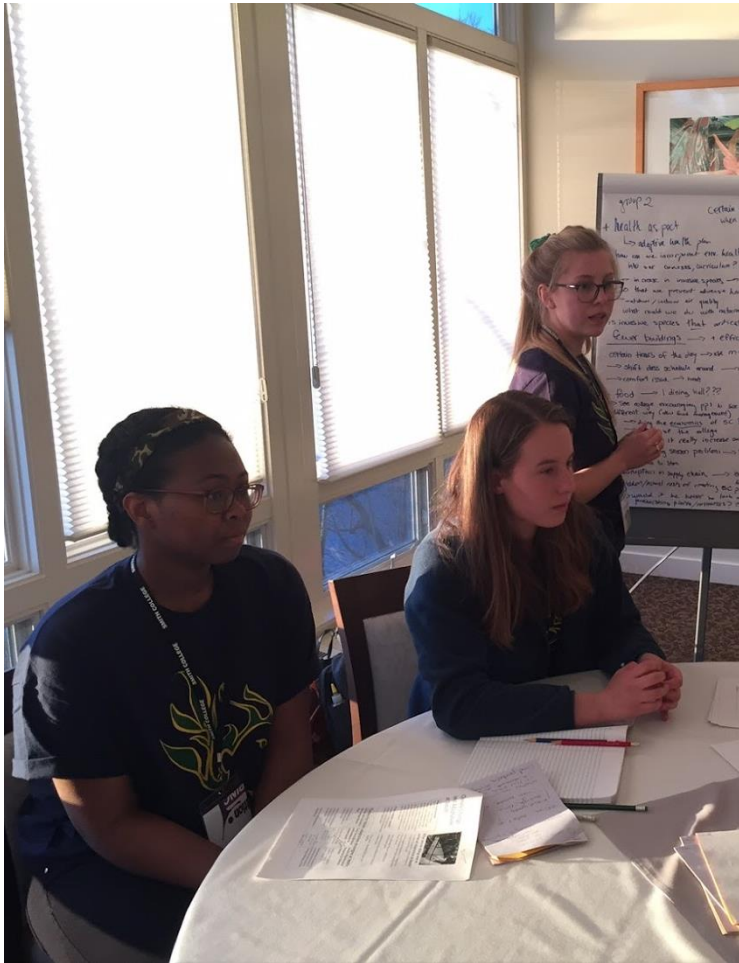


Fig. 6 Participatory Workshop, April 2016

Summary of the Participatory Workshop

An Introduction to our Adaptive Themes

With the help of the Study Group on Climate Change Adaptation Task Force, we have come up with three broad themes for campus adaptation: **Buildings and Grounds**, **Food**, and **Health** (see table 1).

Buildings and Grounds refers to suggestions made regarding the college's physical landscape such as the buildings, vegetative cover, and water management.

Food refers to ways in which Smith can adjust its procurement, usage, storage, and mentality of or about food to effectively adjust to effects on the food system associated with climate change.

Health refers to how we can research and better understand how a changing climate affects the wellbeing of the Smith community.

Methods

On **day 1**, our group conducted a World Cafe with two groups of workshop participants. These groups were mostly composed of faculty and staff, but a few students were present as well.

Day 2 began with a broad brainstorm discussion of adaptation and potential strategies for Smith. We then split up the group into three subgroups to discuss our three themes (Buildings and Grounds, Food, and Health). Afterwards, these subgroups reported their findings back to the group. This time our group was composed solely of faculty and staff members.

Health

As average temperatures begin to increase, heat in buildings without systematic conditioning becomes more concentrated and pollen production will begin to proliferate within the atmosphere. Thus, affecting the air quality of the area.

Our group discussions on health revolved around three main issues: creating collaborative approaches designed to lessen the impacts of climate change on the well-being of the community, conducting further research into vector borne diseases, and finding a way to re-design the campus landscape as to minimize pollen distribution. **Participants brainstormed and proposed potential changes and adjustments that could help the college adapt to the threats climate change pose to human health within the Smith and Northampton communities.**

Participants discussed the **well-being of those on campus**. A few participants came up with the idea of **integrating Health Services, Facilities Management, and Dining Services** in order to assess the health challenges brought on by climate change. The integration of these departments would function as a continuously **working team to promote and secure the health and wellbeing of the students**, ultimately satisfying a vital mission of the college.

Another related suggestion was **implementing systematic conditioning or HVAC system filters in the rooms**. These systems would not only improve sleep quality but also provide

better air quality for those with allergies and respiratory illnesses.

Participants also highlighted the need to address **vector borne diseases**. Another idea that was proposed was to **hire a new faculty** (full-time equivalent) **member** with an MPhD specializing in Environmental Science and Policy or Biology. This person **could lead a course focused on conducting research about how climate change affects the health of those within the Smith and Northampton communities** in terms of asthma, allergies, and vector borne diseases.

These studies and results could then be compiled and published into an adaptive health plan. The course would be primarily focused on studying the impact vector borne diseases. Thus promoting the integration of environmental health into the curriculum.

Participants highlighted the connections between **health and landscape design**. Participants also discussed **finding a way to re-design or alter the natural landscape with careful consideration of the types of plants that get planted on campus**. Since warmer temperatures will increase the amount of pollen in the air and create a longer pollen season, largely affecting those with allergies, asthma, and other respiratory illnesses, one thought was to purchase **genetically engineered sterile plants** that provide the same aesthetic value but do not produce pollen (“Warming Temperatures”).

Participants highlighted the connections between health and landscape design.

Food

Several ideas about food came up during the two days of the participatory workshop. These ideas can be grouped into three categories: **procurement, production, and menus and offerings**. A common theme was the goal of striking a **balance between financial sustainability, environmental sustainability, and community ethics**.

Procurement

During the participatory workshop, several participants expressed a strong interest in examining the **sourcing, packaging and transport of the food** that ends up in the dining halls. The college could accomplish this through including a **food-specific supply chain analysis**, developing a sustainable food purchasing guide with goals and guiding principles, such as that of **Hampshire College** (figure 7), exploring local food options through the lens of adaptation, and looking into the idea of a Five College Food Processing Plant.

Hampshire College has taken on the 100 Percent Local Food Challenge. The college aims to source the highest percent of its food possible locally. The college hopes to obtain all of its food from within a 150-mile radius except for products like coffee that cannot be

grown locally and fish, which must be from within a 500-mile radius.

In order to guide the school's purchasing practices and work towards the 100 Percent Local Food Challenge, Hampshire students created a Sustainable Food Purchasing Guide, which includes general purchasing priorities as well as priorities by type of food. The general priorities are: sourcing food directly from Hampshire's farm, buying local food, supporting sustainable farming practices (certified organic and food from the Hampshire farm is preferred, conventional farming is the last choice), supporting small-to-medium farms and rural economic viability, and requiring just labor conditions and humane treatment of animals.

While many of Hampshire's ascribed practices include adaptive aspects, the plan was not created with adaptation to climate change in mind. **If food purchasing principles are to be developed at Smith, it is imperative that they are created considering adaptation along with general environmental sustainability.**

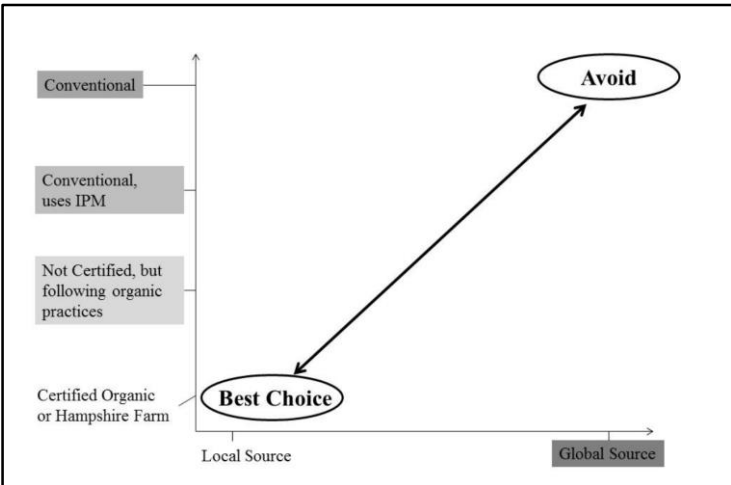


Fig. 7 Hampshire College Sustainable Food Purchasing Guide: Food Sourcing Priorities Chart

The ENV 201/202 class completed a **network analysis of food supply at Smith** lab using a social network software called Unicet (figures 8, 9, and 10). The figures show several example of models of the food supply at Smith. In the models, each food vendor that Smith buys from is categorized as “100% local or sustainable,” “local but not necessarily selling sustainable products,” and “other” (not locally or sustainably sourced).

Figure 8 represents the entirety of Smith’s dining system. It displays the strength of connections between each vendor and dining hall. 100% local vendors are shown as pink squares, vendors that use some sustainable practices are yellow, and vendors that follow conventional, less sustainable practices are shown in pink.

This diagram highlights the fact that Smith currently orders a very large percentage of its food from U.S. Foods. This is concerning from a sustainability standpoint as well as a resilience standpoint: the more “weblike” and interconnected a system looks, the more resilient it is. The fact that Smith relies so heavily on a single food source makes the food system vulnerable. However, it is important to note that U.S. Foods

does obtain food from diverse sources.

Figure 9 shows the relationships between food vendors and various dining halls. The dining halls are broken into four distinct geographic areas on campus; Elm Street, Green Street, the Quad, and Central Campus (which includes the Campus Café and catering). The width of each black line shows how strong the monetary connections are between each vendor and dining hall. While these four diagrams show that there is distinct variance in sourcing in different regions of campus, it is clear that all four dining regions buy large amounts of food from U.S. Foods, a source that is not local or sustainable.

Finally, **figure 10** shows the connections between each vendor and dining hall, separated by vendor sustainability categories. The three vendors that Smith buys the most food from are U.S. Foods, Black River Produce, and Outlook Farm.

Smith currently orders a very large percentage of its food from U.S. Foods. This is concerning from a sustainability standpoint as well as a resilience standpoint: the more “weblike” and interconnected a system looks, the more resilient it is. The fact that Smith relies so heavily on a single food source makes the food system vulnerable.

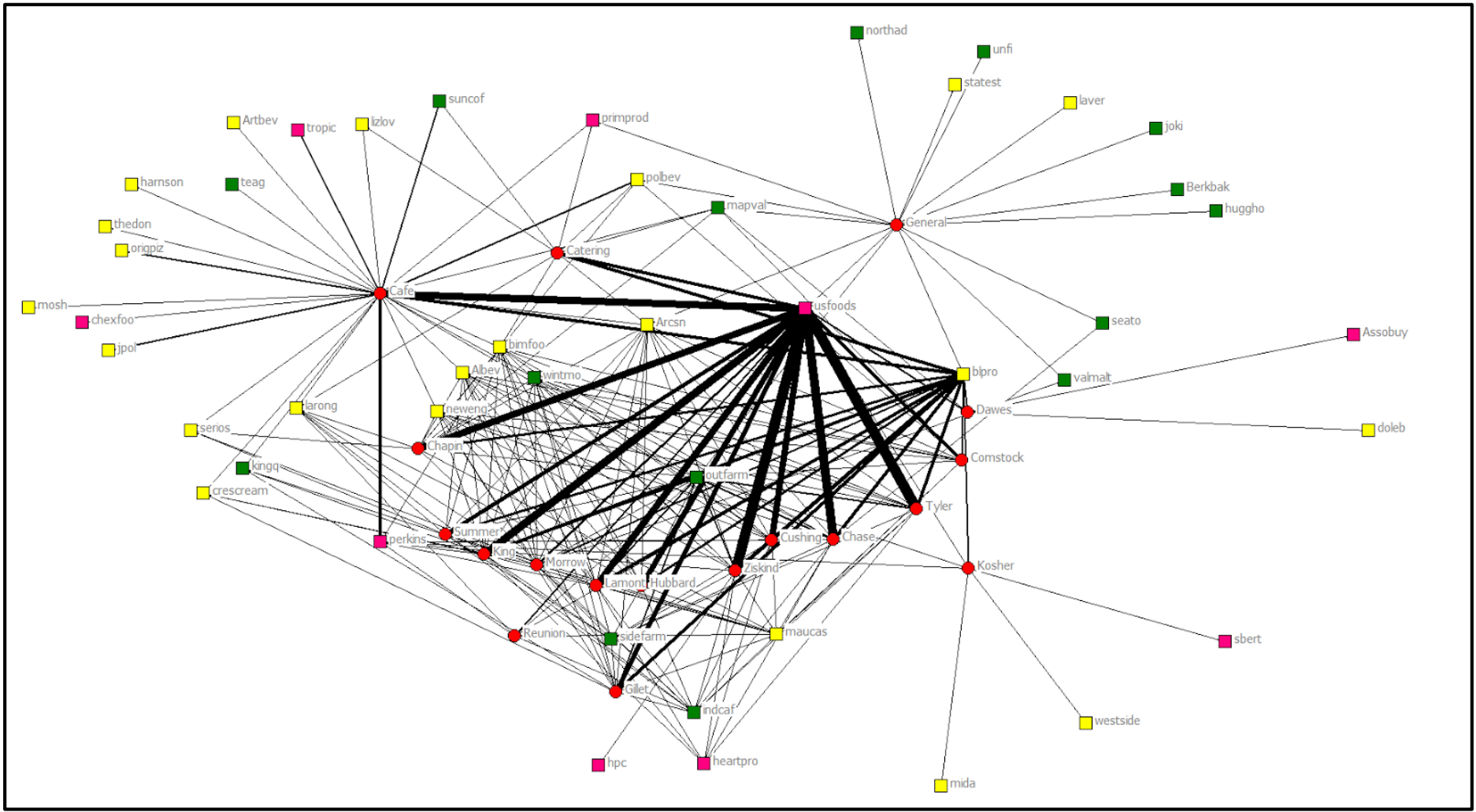
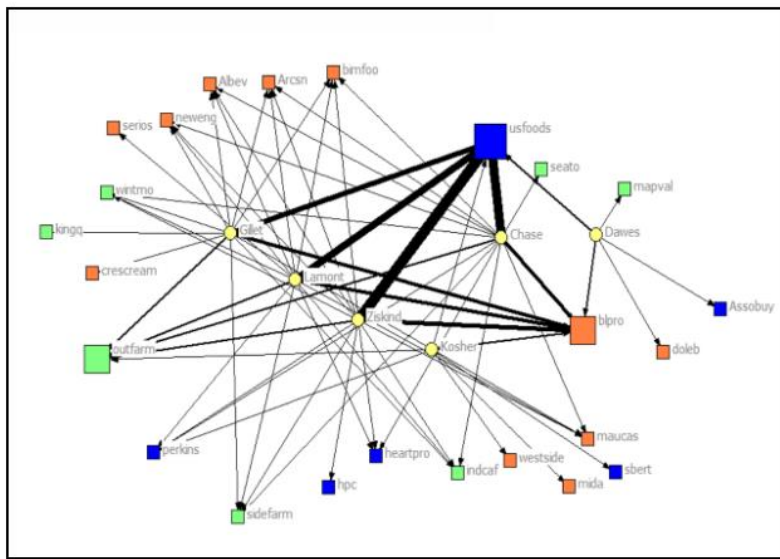
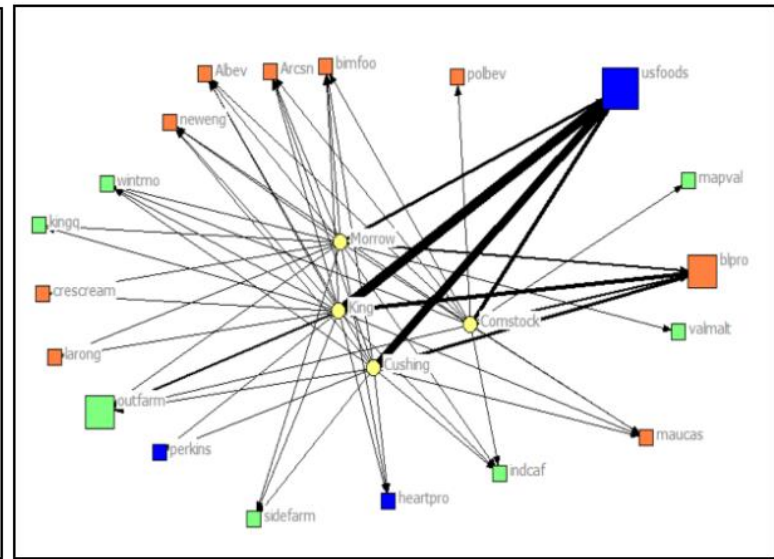


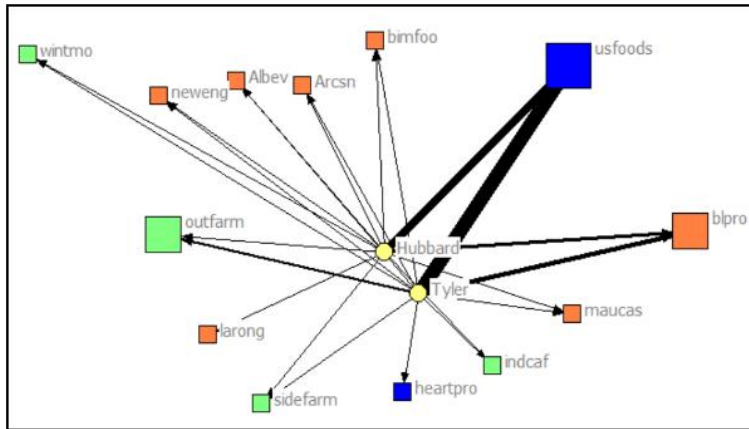
Fig. 8 Smith Campus Food Vendors and Dining Locations Network (Source: Hazel Edwards)



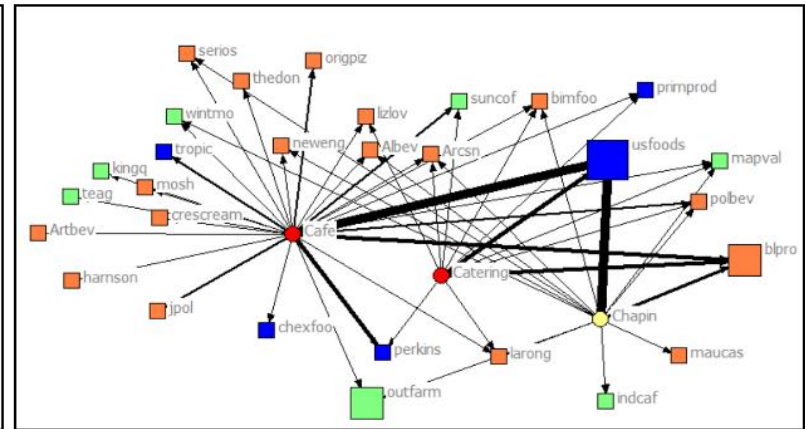
Elm Street Dining Halls



Quad Dining Halls



Green Street Dining Halls



Central Campus Dining



Fig. 9 Food Supply by Dining Region at Smith College (Source: Ella Martin-Gachot)

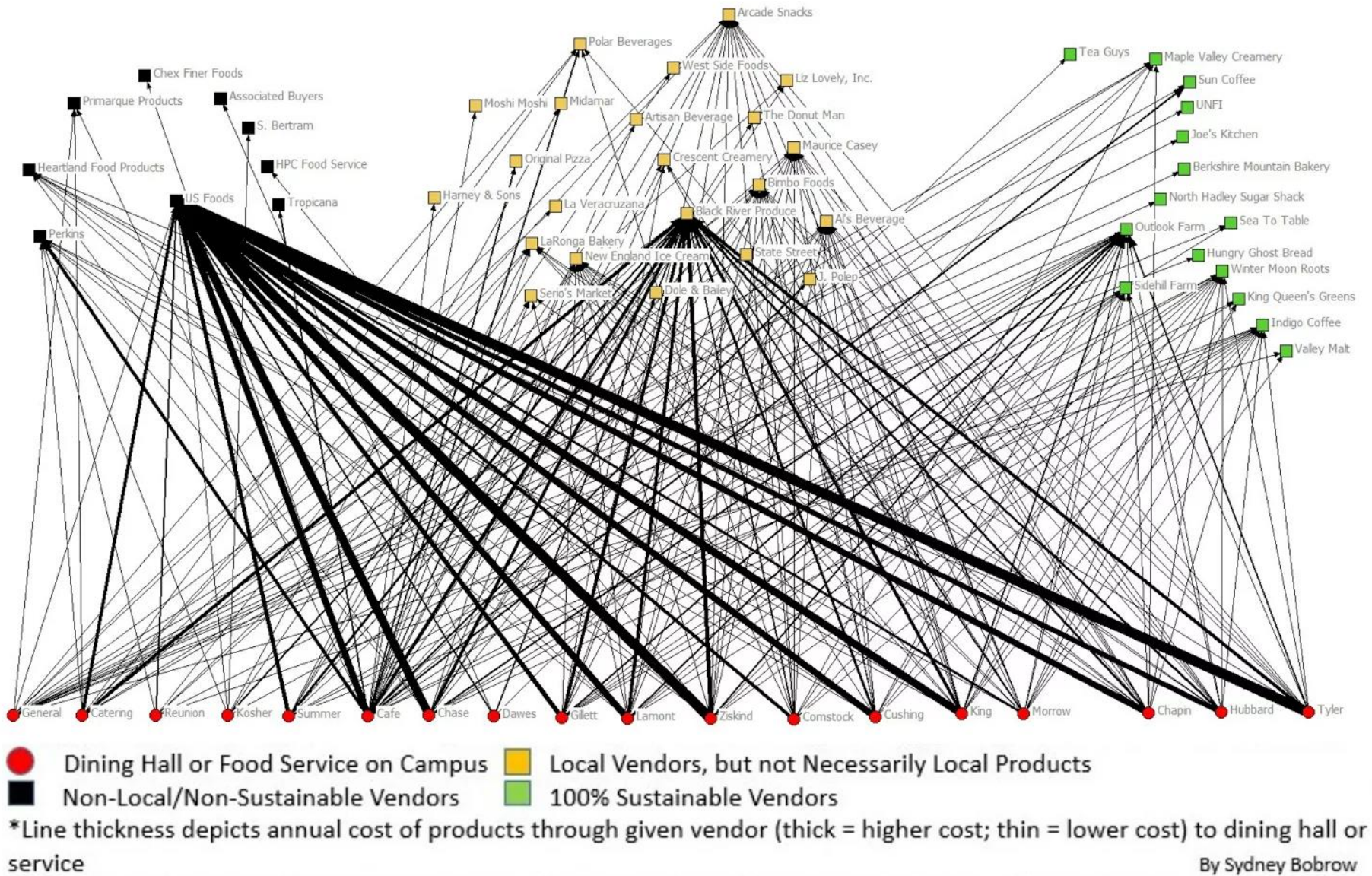


Fig. 10 Vendors by Sustainability Category (Source: Sydney Bobrow)

The single most impactful action concerning food would be to modify the dining hall menus in order to offer less carbon-intensive dining choices

Production/ Food Awareness

Participants discussed the idea of making local food production visible on campus as well as generally fostering a culture of food awareness at Smith. Some possible manifestations of this include edible gardens/landscapes and increased funding for the community garden. While the idea of creating a farm at Smith similar to Hampshire College's was discussed, according to representatives from Smith dining services, this is probably not economically feasible. Student internships at local farms or with regional organizations/committees could help build a **culture of sustainable food** at Smith and **connect the college with the wider foodscape and community**.

Menus and Offerings

A participant stated that the single most impactful action concerning food would be to **'evolve' the dining hall menus** to less carbon-intensive options such as serving less meat and dairy products and providing **more sustainable and local foods** that have not been transported very far.

According to Dining Services, the highest amount of food waste associated with Smith's dining system is excess food that students take on their plates but do not eat, which is possibly a response to the dining halls running out of food in the past. **Food waste can be reduced** by studying how much food should be offered in each dining hall to reduce the dining 'boom and bust' cycle.

A combination of more consistent food amounts and encouraging students to take only what they are planning to eat could significantly cut compost amounts.

Other measures to reduce waste include supporting the **Smith Food Recovery Network**, a student run group that recovers perishable food from destined for the waste stream and deliver it to shelters in the area, and minimizing the use of disposable and individually-packaged items. Choice engineering such as intentionally placing meat last in the buffet line can yield positive environmental and health-related results.

The measures described above all contribute to the mitigation of waste and of greenhouse gas emissions associated with the dining system, but they are not all overtly adaptive. Participants also mentioned that, when discussing streamlining Smith's food supply and increasing local food purchases, it is important to consider the impacts these choices will have on the **resilience** of the food system. For example, while buying local food strengthens the local economy and reduces the carbon footprint of food transport, relying wholly on local produce would leave Smith vulnerable to food shortages in the case of a climate change-related weather event destroying crops in the Pioneer Valley.

Buildings/Grounds

Participants brought up many ideas about the future of Smith's buildings and ground in discussions during both days of the Participatory Workshop. One theme that arose included **letting nature do more work** and **being aware of natural processes** that have an effect on our campus when installing and renovating infrastructure. An example of the latter would be to pay attention to hydrological processes when working with stormwater management at Smith. **The campus as a "living museum"** also emerged as a concern. Participants remained unsure of how Smith can adapt its landscape and buildings to climate change when it should also be preserving historical markers, such as Frederick Law Olmsted's landscape design for the campus. The values of **historical preservation versus adaptive capacity and response to climate change** were at stake. No clear consensus was formed on which values were most important. However, participants expressed interest in focusing adaptive measures on parts of campus that are not "quintessentially Smith," in order to avoid conflict over this dilemma.

Relating to adaptation and grounds, invasive species, breaching the dam, stormwater management, plants, permeable surfaces, and the replacement of lawns were the topics addressed the most.

Multiple viewpoints emerged concerning invasive species and their impact at Smith. Some participants weren't sure whether their removal was worth the colleges time and effort, while

others asserted their potential for harm. One participant wondered whether we should adapt to invasive species, or whether we should force them to adapt to us (e.g. eradicate or heavily control them). In short, there was no clear consensus about what Smith should do about invasive species in terms of adaptation.

Participants also voiced interest in breaching the dam and restoring the Mill River's natural ecosystem. In order to move forward, participants encouraged the college to conduct an analysis of the feasibility and impact of breaching the dam and consider how this action could provide opportunities on this land in terms of restoration and revival.

Additionally, participants brought up plants as both a potential resource and problem for adaptation at Smith that intersected with health concerns. As global temperatures and CO2 levels rise, plant pollination cycles will become lengthier and more intense, thus increasing the rates of allergies. To counter this negative side of plants, ideas emerged to incorporate in the campus' landscape plants that are less allergy-intensive, possibly even sterile breeds. Participants also discussed the impacts of plants on water retention and air quality. More research into vegetation that can both improve air quality and water retention on campus seems to be necessary at this time.

Historical preservation vs. adaptive capacity and response to climate change

Participants insisted on the fact that Smith needs to be able to infiltrate, retain, and direct stormwater on site.

Techniques for water infiltration and storage that were mentioned such: cisterns, catch basins, rooftop gardens, rain gardens and wetlands.

Greening stormwater management infrastructure was one of the most talked about topics. Participants insisted that Smith needs to infiltrate, retain, and direct stormwater on site. Techniques for water infiltration and storage mentioned included cisterns, catch basins, rooftop gardens, rain gardens and wetlands. In installing rain gardens, participants expressed that we need to be conscious of their siting and the ways in which they could affect or interrupt the natural hydrological processes.

Throughout the workshops, buildings were identified as potential hotspots for adaptive measures at Smith. Participants expressed interest in seeing collaboration between mitigation and adaptation strategies in order to ensure that Smith has the most efficient and adaptive buildings possible.

One theme regarding buildings at Smith was that we need to think about our buildings more holistically- from their construction and functioning to their siting and use. Participants mentioned the need to make sure buildings are sited in proper areas multiple times. They also saw improving insulation and ventilation as a key step to creating more resilient and robust buildings.

Participants also considered buildings as a potential resource for stormwater management. Further research must be performed on how green stormwater infrastructure can be incorporated into new and retrofitted buildings at Smith. An idea that emerged during conversations about buildings was adding green roofs to buildings at Smith. Not only would they help infiltrate water during heavy precipitation events, but they would also help cool the building, which might lessen the need for AC. The college would also strengthen the building so it could support the roof would improve its structure.

Table 1 Key Ideas from Summary of the Data

Health	Food	Buildings/Grounds
<p>Ensuring/maintaining mental health and wellbeing</p> <ul style="list-style-type: none"> Dining Services, Facilities Management, and Health Services collaboration Implementing systematic conditioning or (HVAC) system filters in the rooms <p>Research into local vector borne diseases</p> <ul style="list-style-type: none"> Creating a course focused on conducting research into how climate change affects the health of those within the Smith and Northampton communities <p>Landscape re-design</p> <ul style="list-style-type: none"> Careful consideration of the types of vegetation being planted and their placement around campus Looking at the effect an increase in pollen producing species could have on those with asthma and respiratory illnesses 	<p>Procurement</p> <ul style="list-style-type: none"> Record and analyze sourcing, packaging, and transport of food used at Smith; network analyses? Develop purchasing principles (e.g. “How can Smith purchase more of its food from sustainable sources while maintaining the system’s resilience?”) <p>Production/Food Awareness</p> <ul style="list-style-type: none"> Increase visibility of community garden and other food production in campus Engagement with community (e.g. student internships with local food-related organizations) <p>Menus and Offerings</p> <ul style="list-style-type: none"> Continue to collect data (Smith Dining 2016 Strategic Planning has collected some data) How can Smith dining mitigate waste? How can menus/ offerings be altered to better adhere to Smith’s environmental and social values (e.g. reduce carbon-intensive foods served)? 	<p>Adapting campus grounds</p> <ul style="list-style-type: none"> How do we address invasives? Possibility of breaching the dam How can plants be used to improve air quality and water retention? How can we continue to “green” stormwater management infrastructure? <p>Adapting campus buildings</p> <ul style="list-style-type: none"> How can we make sure buildings are properly sited? How can we improve insulation and ventilation? How can we incorporate green stormwater management infrastructure into buildings?

Analysis of the Data

At this time, we'd like to reflect upon the ways in which the data was collected and our groups were composed. **The participants were not necessarily reflective of the diversity of opinions and beliefs on Smith's campus.** Because of this, the topics that were addressed do not necessarily span all of the possibilities for adaptation strategies at Smith. In order to gather more comprehensive information, we recommend that the college open up the conversation about adaptation to a broader portion of the community.

Among the participants, **issues pertaining to Smith's food purchasing, production, and processing, were the most discussed.** Food acts as a vital factor in nourishment, promotes conversation, and serves as an important aspect of many cultures. Its persistence in the group discussions strongly reflects this. The other main topic discussed involved Frederick Law Olmsted's historic campus landscape design and figuring out a way to balance preserving these essential characteristics while improving the adaptive capacity of the landscape. This commitment some of the participants felt toward preserving the 'quintessential' aspects of the campus represents a shared connection between the community and the land.

Although the topic of health was not discussed in depth as the other themes, one issue that emerged was related to an increase in pollen production as a result of warmer temperatures. We discovered that participants viewed finding a way to minimize the amount of pollen in the air, whether through placing plants in certain locations or using species that produce less pollen, as a pressing issue. The college as a whole has a duty to protect the wellbeing of those on campus. An increase in pollen count would be harmful to those with allergies and respiratory illnesses and greatly affect the quality of their time spent on campus.

In our opinion, the topics raised during these participatory workshop discussions reflect merely a fraction of the community's views on adaptation. Other issues may not have been brought up or considered likely as a result of the differing group compositions and values they deemed important. During several of our group discussions, one or two participants took up a large amount of conversation space and steered the conversation toward their specific viewpoint. For example, during the first round of World Cafe, one participant suggested that we allow invasive species to thrive and instead focus on more pressing issues in response to climate change. As a result, there was very little discussion regarding invasives and adaptation.

In order to gather more comprehensive information, we recommend that the college open up the conversation about adaptation to a broader portion of the community.

Although a wide range of participants were invited to the event (the goal was to have as many viewpoints as possible represented), the majority of workshop attendees were people who are already somehow invested in environmental issues at Smith. This factor could definitely skew the data that was gathered.

Compared to the second day of the conference, **many more student participants joined the adaptation discussion on Day 1** (each discussion group contained a relatively balanced mix of faculty, staff, and students). On Day 2 of the participatory workshop, the adaptation discussion group was composed entirely of prominent administrators and faculty. This resulted in our discussions taking a broad, systemic approach to adaptation rather than ranking specific policy options. Several members of the discussion were experts on certain aspects of issues relating to climate change (such as food/dining systems) and were very vocal about their subjects of expertise, which resulted in a heavy focus on those topics.

Furthermore, even if there had been students present during the second discussion about adaptation, the group's views still would not have necessarily been congruent with those of the Smith community in general. **Although a wide range of participants were invited to the event (the goal was to have as many viewpoints as possible represented), the majority of workshop attendees were people who are already somehow invested in environmental issues at Smith.** This factor could definitely skew the data we gathered.

Although we gathered valuable and in-depth information during our two days of participatory workshops, in order to get a comprehensive understanding of the Smith

community's position on adaptation, **the college should continue to reach out to more community members.** Being in small groups **gave us the opportunity to hear everyone's voices at the table and to engage in lively and meaningful discussion.** However, the **tradeoff** of spending such long amounts of time in discussion with small groups of individuals was that the workshops only engaged a small part of the community. Because of this, we cannot state that our findings necessarily reflect what the whole campus thinks. Certain topics were prioritized because of the individuals in our groups and their personal biases and some of our groups did not accurately reflect the diversity of beliefs on Smith's campus.

In order to get a broader understanding of the community's thoughts on adaptation to climate change, **we recommend that the Study Group on Climate Change continue to reach out to the community, through a survey perhaps.** We believe this is the only way the multitude of voices and opinions on campus will be heard and considered. As adaptation to climate change will affect the community as a whole, we think it is crucial to incorporate the entire community throughout the stages of planning, decision-making, and action.

Policy Recommendations

After having discussed our findings from the participatory workshops, we will now consider how this information, coupled with our knowledge from a semester of research, can be used to construct policy recommendations.

Stemming out of the three adaptation themes mentioned above, we would like to propose four systemic adaptive plans, which will hopefully help Smith improve its interaction with an increasingly uncertain climate.

The following outlines of these plans include the issues they should consider, concrete policy ideas, and proposed timelines for their implementation—as well as deeper questions the Study Group on Climate Change should contemplate.

The proposed timelines and specific recommendations do not necessarily form final drafts. Each timeline is a vision of possible changes within each topic (such as health). It is important to note that one of the first recommendations listed under each category is for continued research and/or hiring an expert to look into possibilities for that adaptive plan. Most likely more in-depth analysis will yield changes in the recommended adaptive steps and measures.



Fig. 11 Participatory Workshop, April 2016

Smith should develop an Adaptive Health Plan to examine the adaptive measures that should be taken in order to assess and improve health in response to climate change.

Health

We recommend that Smith create an Adaptive Health Plan to examine the adaptive measures that should be taken in order to assess and improve health in response to climate change. Outlined below are issues that pose a risk to the general health of the community that the plan will consider as well as concrete actions that could be taken to adapt to these vulnerabilities. We have also included a proposed timeline of steps for enacting these measures.

Issues that the Adaptive Health Plan would consider:

- Increased heat and asthma
- Increased pollen count
- Longer pollen season
- Vector borne diseases
- Lack of communication between services and departments

Concrete Ideas for the Adaptive Health Plan:

- Creation of an Environmental Science and Policy or Biology course that focuses on vector borne diseases
- Implementation of collaborative interdepartmental workshops

Health Timeline & Recommended Steps for the future (figure 11)

Year 0: In the beginning stages of the process toward creating an adaptive health plan, one of the first things Smith should do is work on integrating Health Services, Dining Services, and Facilities Management through a series of trainings. The purpose of the training would be to develop a more efficient system of communication in order to meet the health needs of the community.

Year 1: The college should begin to assess the pollen production of various types of vegetation on campus and note their location in order to better understand the kinds of plants that are on campus and their pollen distribution when redesigning the landscape.

Year 2: During this time, a new or a current faculty member who specializes in Environmental Science and Policy or Biological Sciences should be hired to lead research on local vector borne diseases.

Year 3: A course would be launched to contribute to the research on the impact of vector borne diseases.

Year 5: The students in the class would compile their findings and results into a report that would be included in the adaptive health plan.

Food

Our group would like to propose that the college formulate a master food plan that focuses on adaptation to climate change as well as sustainability and waste reduction. The text below lists several issues that the plan should address as well as detailing concrete ideas for adaptive measures that can be taken. A timeline for the step-by-step implementation of an adaptive food plan is also included (figure 11).

Adaptive Food Plan would consider:

- Changes in food supply availability and pricing, both in the Pioneer Valley and worldwide, due to crop failures and difficulties caused by the increasingly erratic weather due to climate change (droughts, floods, etc.).
- Changes in the cost of imported food due to changes in fossil fuel use
- Changing the food network to be more adaptive (e.g. buying from multiple sources rather than relying heavily on a few, in order to increase resilience)
- Sourcing more food locally and sustainably
- Reducing waste associated with the dining system
- Increasing awareness about food on campus

Concrete Ideas for the Adaptive Food Master Plan:

- Make food production more visible on campus by emphasizing the community garden and adding edible plants into the landscape plan. Smith could integrate this into the curriculum and or include student internships with community organizations
- Reduce waste and the carbon footprint associated with meals: serve less meat and dairy; source more food locally in order to cut fuel usage from transportation, and continue to collect data about food consumption in each dining hall in order to reduce
- Create a sustainable and adaptive food purchasing guide
- Look into the possibility of a 5-college food processing plant or other improved food storage system and engagement on a regional level
- Conduct research on how to make our food system more sustainable and adaptive. This could include hiring an expert
- Consider student health and wellbeing when making changes in dining

We should make food production more visible on campus by emphasizing the community garden and/or adding edible plants into the landscape plan.

It is important to gather perspectives from varied sources before creating a definitive adaptation plan

Food-Timeline/ Recommended Steps for the Future (figure 12)

Year 0- Smith College Dining Services is already involved in a strategic dining planning operation which, which works to, among other things, streamline the food system to reduce waste and source more food locally. We recommend that the strategic dining plan incorporate adaptation as a tenet of their planning. We also recommend that the Study Group on Climate Change or its affiliates continue to engage with the Smith community at large to insure that decisions made by the committee reflect the views of the college as a whole

Year 1- We believe that it is important to gather perspectives from varied sources before creating a definitive adaptation plan. At this stage in the process, we recommend hiring an expert to analyze Smith's food system in terms of adaptation. Alternatively, the college to allocate funds toward extending the strategic dining planning. We also recommend that Smith students begin to draft sustainable and adaptive purchasing guidelines.

Year 2- At this stage, we recommend that students (such as those in the sustainable food concentration) become wholly

incorporated into research, projects, and planning involving Smith's food system. Purchasing principles should be finalized and should be subjected to a cost-benefit analysis.

Year 3- Collectively, all of the data collected and ideas formed should be streamlined into an campus food plan that focuses on sustainability and adaptation. Based on the assessment, modifications in food procurement, production, and offerings should be put into practice

Lingering Questions about Food and Adaptation to Climate Change

When thinking about how Smith's food system can be altered in order to adjust to climate change, we need to keep several important questions in mind. **Firstly, what will an adaptive plan look like?** While there is a precedent for adaptive planning in other areas on college campuses (such as building practices; note the Center for Integrated Life Sciences and Engineering at Boston University, figure 1), **Smith would be pioneering a new adaptation strategy by creating an adaptive food plan.** Many colleges have been increasingly focused on sourcing sustainable food, but not on adapting to climate change.

A major theme that appeared during discussions in the participatory workshops was the potential **tensions between mitigation efforts and adaptation.** In terms of mitigation, the main goal is to reduce waste and fossil fuel usage associated with the food system. This would likely involve sourcing nearly 100% of Smith's food locally.

However, a 100% local food plan may not be the most adaptive option due to the possibility of crop failure in the Pioneer Valley, which is increasingly likely because climate change is predicted to cause more and more extreme weather events.

Can adaptation and mitigation be effectively combined into a single plan?

One more idea to consider is that **the benefits of buying local food may make the community more resilient in other ways, even if it makes food supplies slightly more vulnerable.** Studies have shown that social capital, which would be augmented by supporting the local food economy, greatly affects communities' abilities to bounce back after (climate-related) disasters (Aldrich). Is transitioning to a local food-based system worth the potential vulnerabilities that it brings?

Smith would be pioneering a new adaptation strategy by creating an adaptive food plan.

An Adaptive Landscape Master Plan

Buildings/ Grounds

As a group, we'd like to recommend that the college formulate an adaptive landscape master plan and new adaptive building standards. Below you will find a list of issues that these plans should address, as well as concrete ideas for potential adaptation strategies. Furthermore, we understand that these recommendations will take time to implement and should be formulated carefully and meticulously. Accordingly, we have laid out a brief timeline (figure 11) of recommended steps which would culminate in the establishment of these proposals.

The Adaptive Landscape Master Plan would consider:

- Increasing presence of invasive species
- Increasing precipitation and flooding events
- Pollen control
- Increasing overall success of pests
- Decreasing influence of pollinators

The Adaptive Building Standards would consider:

- Increasing heating needs
- Increasing cooling needs
- Increasing precipitation
- Urban heat effect

Concrete Ideas for the Adaptive Landscape Master Plan and Adaptive Building Standards

- Adaptive Landscape Master Plan: installing permeable pavement every time an existing

parking lot gets renovated; placing rain gardens in sites on campus that accrue standing water during storm events; transitioning to allergy-sensitive/ low-pollen plants; placing an emphasis on native plants and turf.

- Adaptive Building Standards: criteria for proper siting of buildings (e.g. not in a floodplain); criteria for insulation and ventilation; adding green roofs to every new construction; adding air conditioning or other ventilation techniques to all residential houses

Grounds Timeline and Recommended Steps for the Future

Year 0- Since changing the campus' landscape is an important topic for many members of the community, we recommend that the Study Group, or another such group, engage more broadly with the Smith community to understand their opinions and receive their advice on how Smith's grounds should adapt to climate change. This campaign aims to engage the community might also necessitate educational efforts so community members understand adaptation and its repercussions on Smith's grounds. The Office of Campus Sustainability or CEEDS could promote awareness about adaptation to get the campus excited about adaptation.

Year 1- We believe garnering outside opinions about adaptation and college campuses is crucial to the creation of an adaptive landscape master plan for Smith. Therefore we recommend that the college hire an expert in adaptive landscapes. An alternative would be promoting a current staff or faculty member who has comprehensive knowledge of climate change and its effects on landscapes to be a point person for the master plan.

Year 2- Since we'd like to continue to include diverse members of the community in this process, we recommend that students from various disciplines relating to landscape (e.g. from Landscape Studies, Horticulture, or Biology) be incorporated into the development of research surrounding the topic at Smith.

Year 3- By this time, we'd like the point person for adaptation and the student researchers (and other faculty and staff researchers if needed) to have produced an assessment of Smith's grounds focusing on adaptation. This assessment would examine the hotspots of vulnerability on campus and begin to propose adaptive strategies.

Year 4- Based on the four year data collection and research process and the campus-wide assessment, an adaptive master plan would

be formulated.

Buildings Timeline/ Recommended Steps for the Future

Year 0- To continue to reflect on climate change and its effects on buildings at Smith, we recommend the establishment of a Building Task Force for the campus as the first step towards the creation of adaptive building standards. This group would hopefully incorporate individuals representing campus institutions such as Facilities Management, the Office of Campus Sustainability, and CEEDS. At this time, we would also encourage conversation and collaboration between adaptation and mitigation point people surrounding buildings, as we believe both of these dimensions of climate change need to be addressed in new constructions and retrofits of buildings.

Year 1- Similar to our recommendation for grounds, we propose that the college hire an expert in buildings and their adaptation to climate change. Smith could reach out to other schools that have begun to incorporate adaptation strategies into their building plans, such as Boston University.

A Building Task Force for the campus

Year 2- We'd like to incorporate students from different disciplines (e.g. Architecture, Engineering) in researching the campus' buildings and ways in which we could prepare them for climate change.

Year 3- By now, we would hope that collaboration between the Building Task Force, the adaptive building expert, and students could result in the production of a comprehensive assessment of campus buildings focusing on their adaptive capacity and ideas for future adaptive strategies.

Year 4- The four years of research would culminate in adaptive building standards for new constructions and retrofits. These standards would hopefully be implemented immediately.

Lingering questions to be considered by the Study Group on Climate Change and future groups concerned with the adaptation of Smith's buildings and grounds include:

- ***How can we improve the campus' adaptive capacity without undermining Olmsted's historic plan for the campus' landscape?***
- ***In what ways can we address the increasing temperatures in buildings without being too carbon intensive?***
- ***How can we best use the campus' environment, built and natural, to manage stormwater more effectively?***

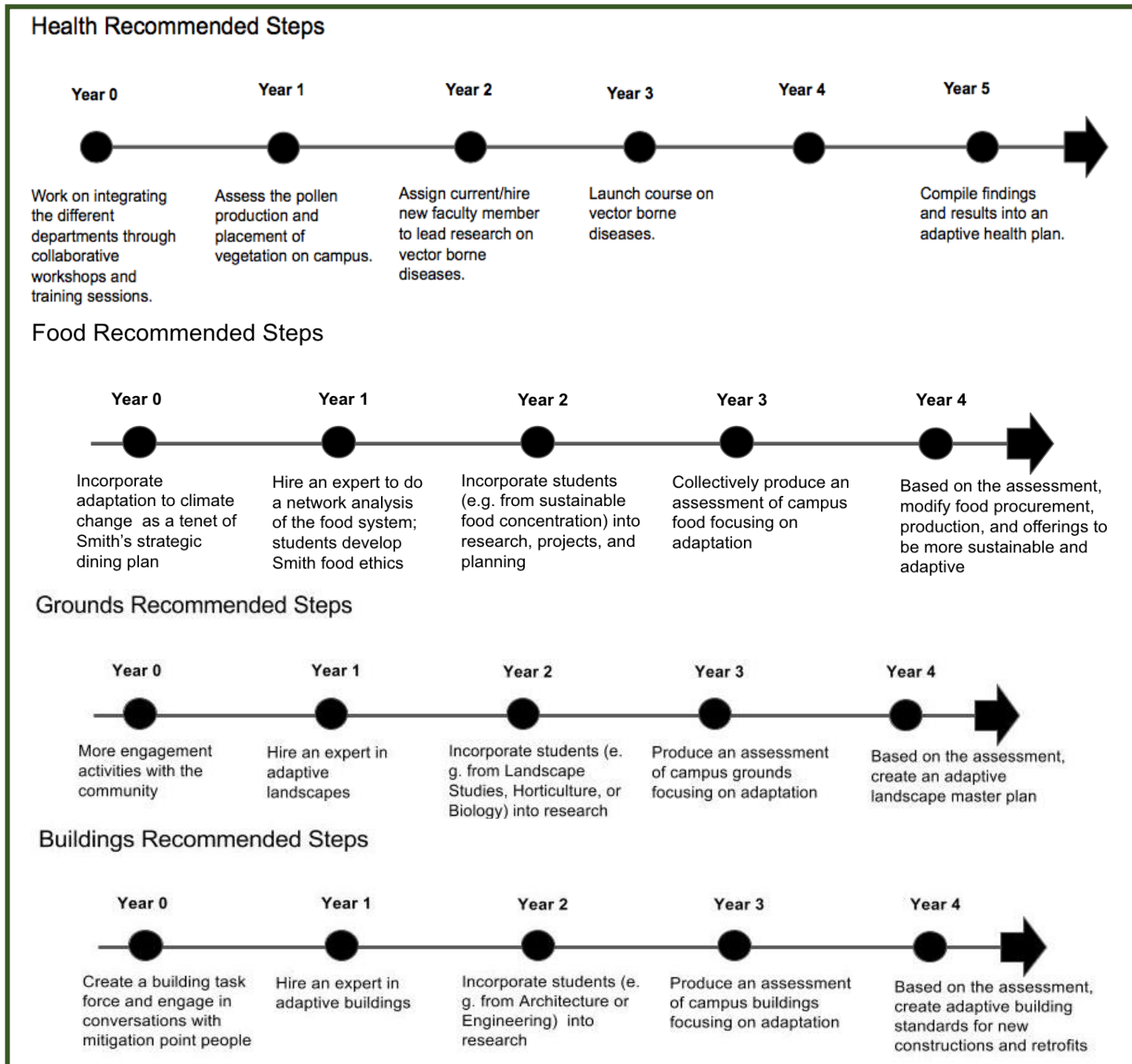


Fig. 11 Timeline for Adaptation

INVESTMENT

What is Investment and How does it Relate to Climate Change?

The goal of the Investment group during the Participatory Workshop was to present participants with an introduction to how Smith's \$1.7 billion endowment works and how it might be used as a tool to respond to climate change. If there were zero chances of divestment negatively affecting our endowment, we are confident that Smith would choose to divest. However, the actual process of divestment is very complex and the outcomes are uncertain. The decision to invest, divest, or a combination of the two is at the crux of examining our values, financial obligations, and the actual how to, or administrative side, of restructuring our endowment. Figure 1 illustrates the overlap of components that come into play as we assess potential options for our endowment.



Fig. 1 Venn Diagram depicting the intersection of factors that influence the decision to invest and/or divest.

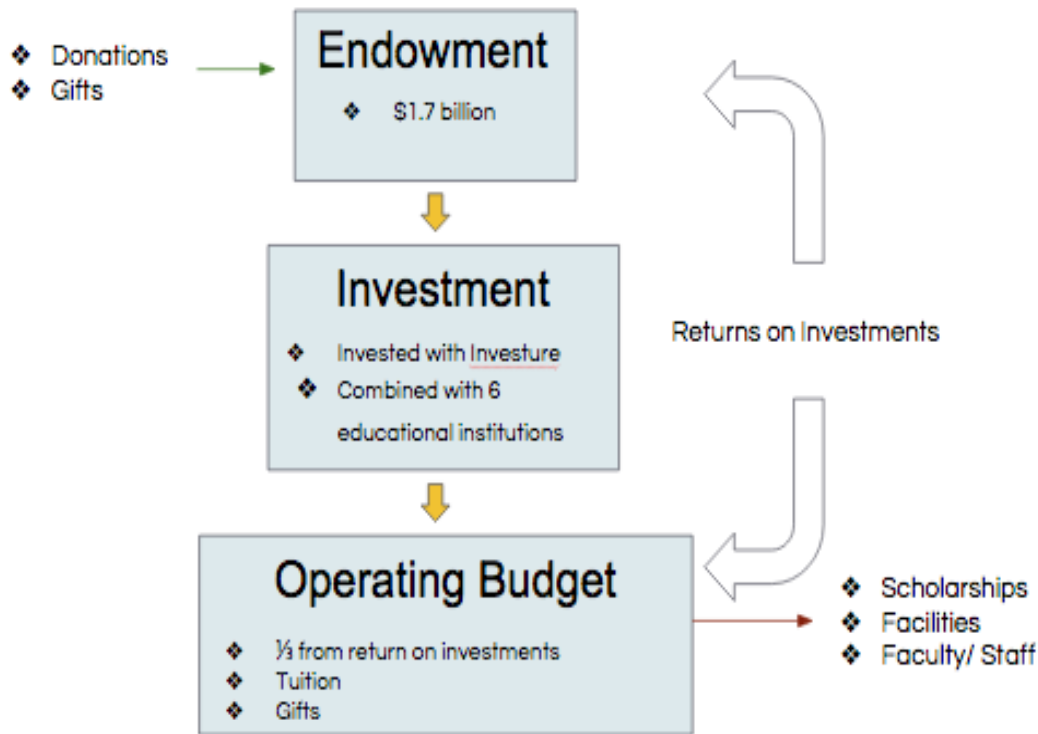


Fig. 2 Smith's endowment

The way in which Smith's endowment works can be thought of as a flowchart (Figure 2), that begins with our \$1.7 billion endowment which is comprised of donations and gifts. Smith invests its endowment with an outside company, **Investure** who pools our endowment with that of 6 educational institutions and other private funds, including Barnard, Dickinson, and Middlebury. The returns received on our investments go both back into our endowment and towards funding our operating budget. One third of our operating budget comes from our return on investments and the rest comes from tuition and gifts. This operating budget goes towards funding scholarships, facilities (like renovations), and the salaries and of faculty and staff.

Smith's endowment is co-mingled with Investure's other clients and makes up their pool of funds.

Fund managers at Investure pick mutual funds, like Fidelity Magellan or Vanguard to invest in, which already of thousands of other investors.

These mutual funds might be invested in a few fossil fuel companies, as indicated by the red dots in Figure 3.

Our current fossil fuel exposure hovers between 6-7%, and divestment from fossil fuel companies would require abandoning the whole mutual fund.

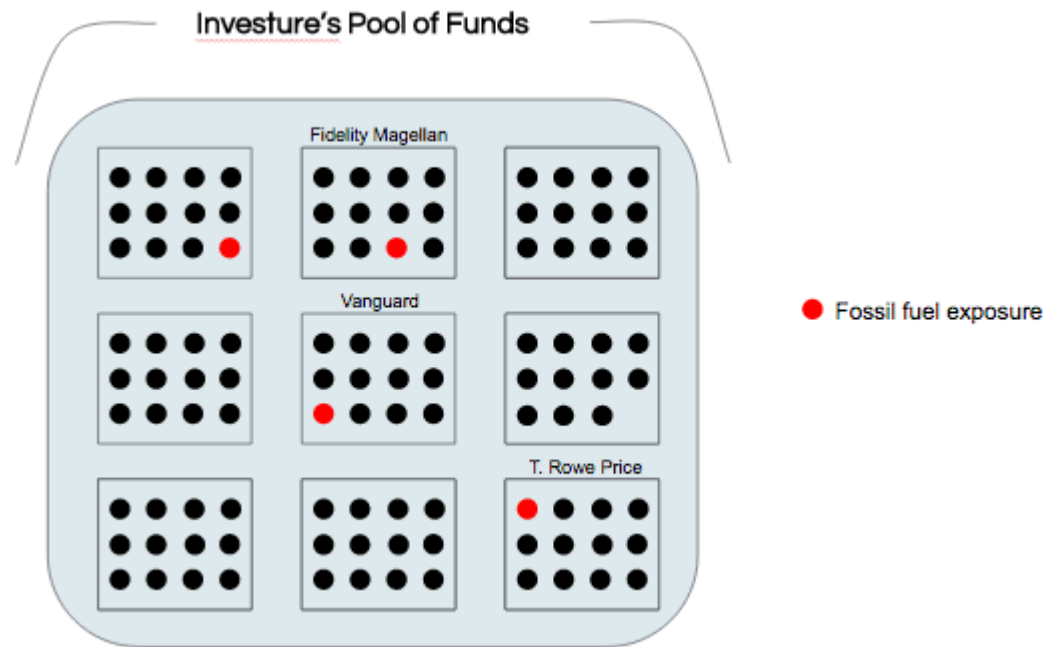


Fig. 3 Investure's pool of funds

Past divestment initiatives set a precedent for using our endowment to uphold our values as an educational institution.

Divestment at Smith

Discussions surrounding divestment are not new to the Smith College community, and it is worth acknowledging the College's previous divestment movements. These movements indicate that Smith, as an institution, does not want to be invested in companies that degrade the social good.

Smith's past divestment movements include:

- Apartheid in South Africa- In 1986, two hundred Smith students, faculty, and others barricaded College Hall for several days after the Board of Trustees voted against total divestment from all holdings in South Africa. The board ultimately agreed to divest from companies that did not sign anti-discrimination principles. A number of other colleges in the area also divested (Divestment, 1987).
- Tobacco companies- In 1997, the Smith Investment Committee recommended to the Board that the college divest the approximately \$1.9 million invested in the tobacco industry because of the negative health effects associated with tobacco (AcaMedia, 1997).

- Talisman Energy (ACIR, 2006) and companies operating in Sudan- In 2006, the Board voted to divest from companies, directly or indirectly, in support of the Sudanese government's regime. The vote occurred after the Committee on Investor Responsibility recommended divestment from Darfur. This was seen as an affirmation that Smith's values should be upheld in our investments (College Relations, 2006).

These past divestment initiatives set a precedent for using our endowment to uphold our values as an educational institution.

A lot of action has been taken in the past few years regarding Smith's endowment. **Divest Smith College** has successfully lobbied Smith's administration to move **\$1 million of our endowment to Investure's Sustainability Series**, they have worked with the **SGA to pass a resolution** supporting divestment, and created a petition for faculty to sign endorsing divestment. In terms of administrative action, the **Advisory Committee on Investor Responsibility (ACIR)** was relaunched in 2015 and an independent consultant has been hired to analyze the financial impacts of different divestment scenarios this coming summer.



Fig. 4 Participatory Workshop, April 2016

Our Task

With these initiatives serving as a backdrop for the Participatory Workshops, our goal is to determine the pros, cons, and tradeoffs of divestment, partial divestment, or an emphasis on impactful investment.

The critical questions the Investment group aimed to ask participants centered around the three themes of social good, financial and administrative, which influence the decision to invest and/or divest. These include:

Social Good

- What are Smith's moral implications to divest or not?
- How do we use our capital to respond to climate change?

Financial

- What are the financial implications of divestment? Direct/partial? Coal? Top 50? Top 200? All fossil fuels?
- Can the endowment be utilized effectively to respond to climate change/reduce CO2 emissions?

Administrative

- How do we define what constitutes a fossil fuel company?
- What does the timeline of investment/divestment look like?

Summary of the Participatory Workshop

Workshop participants considered the intersection of the college's values, financial obligations, and administrative process of investing and/or divesting in the decision making process of how to most effectively utilize our endowment. The following sections summarize the participants comments from Day 1.

Day 1

Social Good

As an institution, Smith has values (see Values and Principles portion of this report), which show through various fundraising campaigns, like Women for the World. In the past, Smith has used the endowment to uphold the college's values. The justification for action came from an understanding that by divesting from certain companies, the college upheld the social good. Concerning the theme of social good, we must ask two questions in regards to different avenues for action regarding climate change:

What are Smith's moral implications of divesting or not?

How do we use our capital to respond to climate change?

Intergenerational equity, our responsibility to provide the same access to resources for future generations of Smith students, was a major topic brought up by participants, when considering how to invest or divest our endowment. Smith's Women for the World fundraising campaign currently ties the college's endowment to companies who do not uphold its values. Fossil fuel industries promote the misinforming of society, a direct contradiction to its values as an educational institution.

Therefore, the companies Smith invests in should be held **financially responsible** for their actions, especially those which profit solely from the extraction of natural resources. Given this, it is important for the college to consider **investing in solutions that move it away from a fossil fuel dependent society**, as well as push investment firms, like Investure, to invest in more **socially responsible companies**.

Smith faculty and staff have retirement funds that provide limited options for responsible investments and there is interest in taking action with these funds, for the purpose of aligning with the values of the college. Although Smith's divestment will not put the fossil fuel industry out of business, divestment can be used as a monetary tool to focus attention on and **stigmatize the fossil fuel industry**.

It is our responsibility to provide the same access to resources for future generations of Smith students.

“The potential positive impact of divesting our endowment, which could extend to the millions of women living in countries being disproportionately impacted by climate change, might be worth the loss of a couple of scholarships to Smith.”

Financial

The financial risk associated with moving away from our current investment structure, has likely prevented Smith from taking greater action. During the workshop, Participants discussed and assessed the tradeoffs between divesting and continuing with the status quo, along with whether an idealistic approach to divesting from fossil fuels or a pragmatic one would be in the college’s best interest. The two questions posed were:

- **What are the financial implications of divestment? Direct vs partial divestment? Just coal companies? Top 50 fossil fuel companies? Top 200? All fossil fuels?**
- **Can the endowment be utilized effectively to respond to climate change/reduce CO2 emissions?**

The worst case scenario associated with divesting the endowment from our 6-7% fossil fuel exposure, is the loss of these returns on investment, something that Smith can recover from and adapt to in the long run.

Numerous studies have been done on the **financial impact of divestment** and it would be worth the resource expenditure to look at the reported findings, as another source of

information.

There is a chance that divesting our less than 7% fossil fuel exposure will have a minimal impact on the size of our endowment.

However, if it does, the college has **flexibility in how we allocate resources**, including reducing overall cost to operate and cutting operating inefficiencies.

“The **potential positive impact of divesting** our endowment, which could extend to the millions of women living in countries being disproportionately impacted by climate change, might be worth the loss of a couple of scholarships to Smith.”

Because **divestment does not directly prevent the burning of fossil fuels and the release of CO2** into the atmosphere, we need to consider if divestment is really the most significant statement Smith can make. If the end goal of divestment is to stigmatize fossil fuel companies and their harmful practices, we need to **consider whether divesting is the most effective political movement against them.**

These definitions of divestment lead to a crucial discussion about aligning Smith's investments with our values

Day 2

Defining Divestment

If Smith is to divest from fossil fuels in the future we must define what divestment looks like for faculty, students, staff and alumni. This includes what we should be divesting from, whether it is the Top 50 or Top 200 fossil fuel companies, coal companies or all fossil fuels, and in what time span do we wish to achieve these goals. Definitions of divestment were formulated by alumni, staff and students as indicated by parentheses, and fell under the three themes of Financial, Social Good, and Administrative.

Financial:

- Divestment should be executed over time to adjust investments in fossil fuel companies consistent with preserving returns on the endowment (Alumna).

Social Good:

- Divestment should include making an intentional choice to reallocate investment funds away from ethically compromised activities (Staff).
- Divestment should be focused on companies whose primary business is fossil fuel development or distribution and therefore are not transitioning to a non-fossil fuel business model (Staff).
- Removing or reducing financial investment in companies, activities, etc that do not reflect the college's values or practices should be the primary goal of divestment (Alumna).

Administrative:

- Divestment should constitute withdrawing an individual's or organization's funds from a particular set or group of industries (Staff).
- Fossil fuel divestment is selling all of the assets in the top 200 fossil fuel companies for an explicit social, political, and environmental reason (Student).

These definitions of divestment lead to a crucial discussion about **aligning Smith's investments with our values**, selling its assets to withdraw funds from a particular industry, and considering implementation of a **policy to freeze all future investments in the fossil fuel industry**.

There will, of course, be **tradeoffs on returns** and so Smith should also consider that there are other polluters besides fossil fuels, meaning that the companies it chooses to divest from must be easily identifiable.

In addition to this, Smith must decide how it will **measure the negative impact of these fossil fuel companies**, how it will account for their negative effects along the supply chain and what targeted approach it will take for investing our endowment.

If the college is to divest from the top 50 or top 200 fossil fuel companies, Smith needs to examine what the makeup of its exposure will be over time and whether divesting from the top 50 will have almost the same effect as divesting from the top 200 companies.

Analysis of the data

To gather data on the possible scenarios Smith can take regarding its endowment, we used SWOC (Strengths, Weaknesses, Opportunities, and Constraints) diagrams to engage participants in discussion. SWOCs are a helpful way to compare tradeoffs of different policy options because they encourage participants to consider the pros and cons of each option, leaving less room for previous bias to sway the outcome of the analysis.

Using SWOCs, Day 2 participants evaluated the following scenarios: Status Quo/No Action, Enhanced Reporting and Communication, Impactful Investment, and Divestment. Figures 5-8 are summarized versions of the SWOCs filled out by participants on Day 2.

The SWOC diagrams proved very useful in revealing the policy trade-offs of the four scenarios, including acknowledging the fact that all have strengths even though the option of maintaining the status quo is generally not seen as a favorable course of action. Listing the strengths and weaknesses of each policy option helped to reconcile the differing opinions people had on the topic of how to use our endowment to best respond to climate change. It illustrated how polarized the issue of divestment can be between those that want to divest and those that prioritize securing the future growth of our endowment.

<p>Strengths</p> <ul style="list-style-type: none"> ● Current return on investments is known and understood ● Saves time/resources ● Maintains the greatest flexibility by not limiting any investment options ● No new risk 	<p>Weaknesses</p> <ul style="list-style-type: none"> ● Current investments inconsistent with our actions, values and operations; put money where our mouth is ● Threatens our media reputation ● Does not address climate change ● Setting ourselves up for failure when carbon bubble bursts
<p>Opportunities</p> <ul style="list-style-type: none"> ● No impact to endowment 	<p>Constraints</p> <ul style="list-style-type: none"> ● Means operating within the fixed Investure model (non-disclosure)

Fig. 5 Status Quo/No Action SWOC Diagram

<p>Strengths</p> <ul style="list-style-type: none"> ● Potential to change Investure’s model ● Easier for Smith to ask questions ● Not too difficult to implement 	<p>Weaknesses</p> <ul style="list-style-type: none"> ● Smith would potentially have to provide a basis for analysis ● Smith resources needed to implement (time, money) ● May require a coordinated effort
<p>Opportunities</p> <ul style="list-style-type: none"> ● Greater transparency into our investments ● Enhanced analytics ● Determines impact from divesting from top 200 vs. top 50 ● Prompts further action ● Guides principles for future reporting ● Increases Smith’s leadership and brings other colleges on board 	<p>Constraints</p> <ul style="list-style-type: none"> ● More data does not necessarily translate to action ● Other schools may be hesitant to take part ● Analytics just coming on to the market

Fig. 6 Enhanced Reporting and Communication SWOC Diagram

<p>Strengths</p> <ul style="list-style-type: none"> ● Easy to implement; we do not have to change much with Investure ● Better publicity for Smith ● More impact per dollar ● Demonstrates that our capital is committed to the solution 	<p>Weaknesses</p> <ul style="list-style-type: none"> ● Up and coming, socially responsible companies may be riskier investments
<p>Opportunities</p> <ul style="list-style-type: none"> ● Greater ownership of our investment office ● Increased Smith leadership ● Could spur co-curriculum/corporate partnerships with companies ● Greater engagement with students/faculty 	<p>Constraints</p> <ul style="list-style-type: none"> ● Few viable socially responsible funds exist and could be hard to find ● Greater resources needed to switch (higher administrative costs) ● Muddles how we measure returns on investment and Investure's responsibility to yield us a certain return rate

Fig. 7 Impactful Investment SWOC Diagram

<p>Strengths</p> <ul style="list-style-type: none"> ● Generates cash to reinvest elsewhere ● Consistent with 2030 carbon neutral goal and Smith's ethos ● Highlights Smith's leadership both academically and institutionally 	<p>Weaknesses</p> <ul style="list-style-type: none"> ● Risky investment (degree of risk/impact depends on definition of divestment i.e. start with coal) ● Pulling out the 6-7% exposed to fossil fuels is not possible and would mean losing other profitable funds
<p>Opportunities</p> <ul style="list-style-type: none"> ● Smith is minimally invested in coal so divesting makes a statement without hurting our endowment ● Reinvest the money taken out of fossil fuels funds ● Good publicity (example: Stanford) ● Create a timeline that phases divestment in ● Test different divestment scenarios and respond accordingly using a scientific approach 	<p>Constraints</p> <ul style="list-style-type: none"> ● Hit to the endowment ● Smith's investments are outsourced and co-mingled with other schools; we are unable to operate independently

Fig. 8 Divestment SWOC Diagram

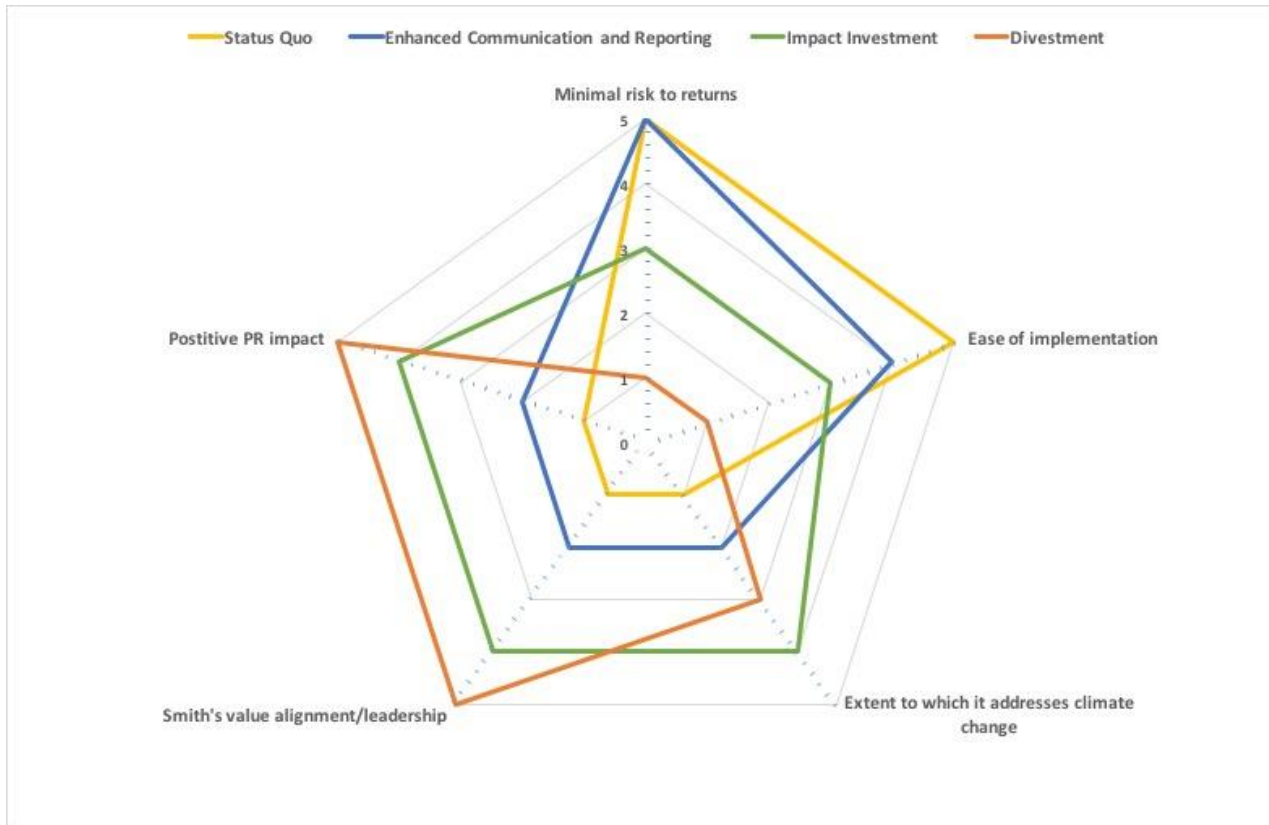


Fig. 9 Spider diagram illustrating how the four scenarios compare to each other based on their risk to returns, ease of implementation, extent to which it addresses climate change, extent to which it promotes Smith leadership and values, and PR impact.

Once participants completed the SWOC diagrams, they brainstormed the criteria to evaluate and quantify the strengths and weaknesses of each scenario.

The criteria the participants came up with to gauge the Status Quo/No Action, Enhanced Reporting and Communication, Impactful Investment, and Divestment scenarios were:

- Risk to the returns on investments associated with each scenario
- Ease of implementation for each scenario
- Extent to which each scenario addresses climate change
- How well the scenario aligns with Smith's values and opportunities for leadership
- How strong of a positive PR impact each scenario would have

Following the establishment of criteria, the participants gave each scenario a score of 1-5 in terms of how well it met each benchmark.

A score of 1 means the scenario does not meet the criteria. The best scenario would have a high score in all 5 spokes of the spider diagram (Figure 9).

For example, a score of 1 on Minimal Risk to Returns means the scenario would threaten the returns on investment, while a 5 indicates there is very little risk associated with adopting the scenario.

Figure 10 separates out the spider diagrams for each scenario, allowing a closer look at how the participants rated each scenario. It is important to keep in mind that these spider diagrams reflect the views and opinions of Day 2 participants and not those of Day 1.

Had Day 1 participants done this same exercise, based on the world café discussions, we have reason to believe that they would have rated divestment higher and not considered PR value as critical a factor in our decision making.

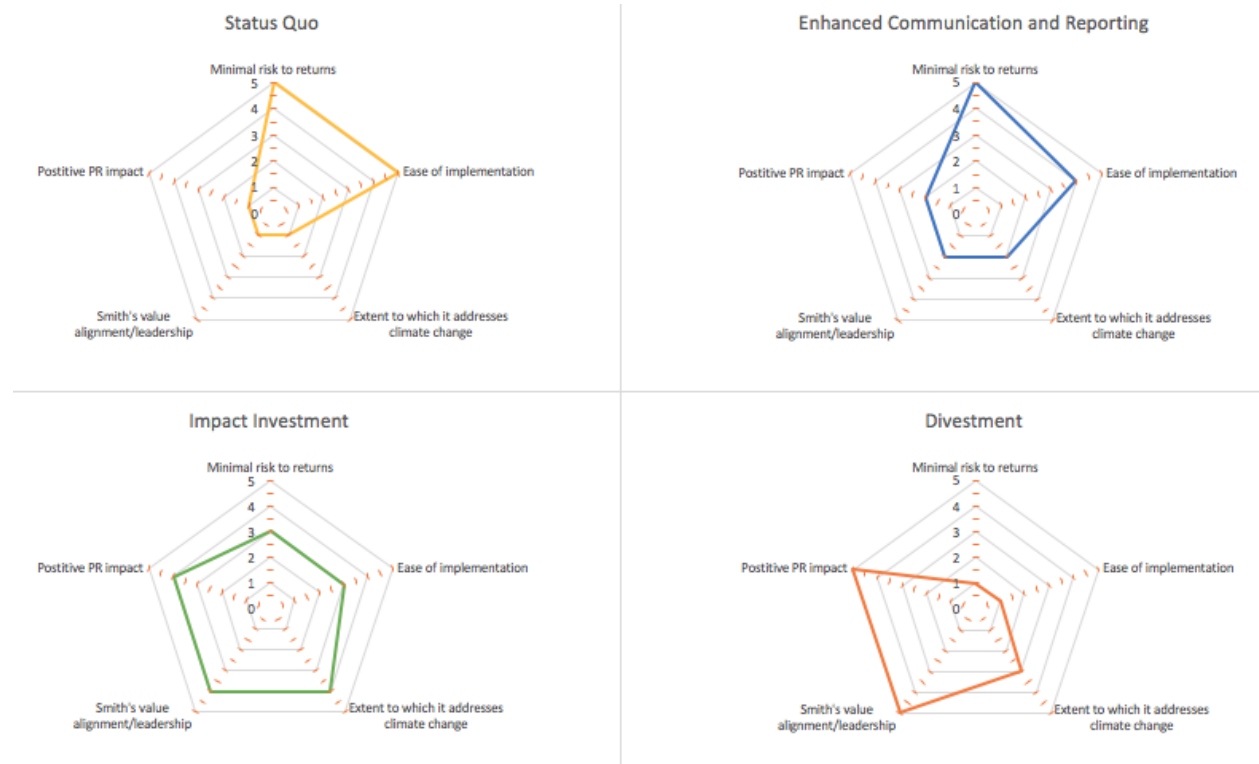


Fig. 10 Individual Spider Diagrams for each Scenarios



Fig. 11 Participatory Workshop, April 2016

Policy Recommendations

The data collected over the course of the two days of the participatory workshop served to influence our policy recommendations for the Study Group on Climate Change (SGCC). We suggest four areas for continued research by the SGCC, to better align our endowment with Smith's values, while also ensuring that our endowment continues to grow.

We recommend:

- Instituting impactful investment of our endowment would allow us to act in a socially responsible way that is in alignment with our values as an educational institution and gives us the greatest choice in securing investments with high returns.
- Divesting from coal companies, the most toxic of the fossil fuel industry, would serve as a catalyst for further action that addresses climate change without threatening our return on investments given our current low exposure to coal. It is the least complex divestment scenario but it would remove the most damaging companies from our portfolio.
- Differentiating between fossil fuel companies that work towards converting to a more sustainable business model and focus on the development of renewables, like Statoil and others

- Continuing investments in these firms to promote a shift to sustainable energy technologies.
- Factoring in the results from the independent consultant's study on the financial impacts of various divestment scenarios, to further guide decision making regarding the three other policy recommendations- instituting impactful investment, divesting from coal companies, and differentiating between fossil fuel companies working to provide fossil fuel free energy solutions and those that are not.

Remaining Questions for the Study Group on Climate Change

- How can these policies be operationalized in a timeline?
- How long would it take to phase out investments in coal? And what would that process entail?
- What would be the criteria used to evaluate the viability of firms we choose to impactfully invest in?
- What standards would we use to determine if a fossil fuel company is genuinely working towards converting their business model to one that is not fossil fuel dependent?

CURRICULUM AND CO-CURRICULUM

Curriculum, Co-Curriculum and Climate Change

Smith College aims to create “Women for the World.” These women, including transgender and gender nonconforming people, will have the confidence and perspective to tackle humanity’s greatest challenges. Among the most pressing of these challenges is climate change.

Smith can address climate change through the development of curriculum and co-curriculum. Smith has many courses, initiatives, and organizations that address climate change, including over 70 environmentally-themed courses. The Smith Center for Environmental, Ecological Design and Sustainability (CEEDS) hosts several co-curricular events such as Open Climate Cafes where students can inquire and engage in discussion on recent climate change news. Smith Students are also able to practice and learn sustainable living practices through house competitions through the house Ecology Representatives.

Our Task

This section of the report develops themes, analyzes data and makes suggestions for ways that Smith college can use its courses, organizations and unique campus life to

create climate literacy throughout its campus.

Working with the initial presentation of the Study Group on Climate Change (SGCC), we identified three broad themes or areas of improvement for Smith’s curriculum and co-curriculum. The first theme is the greening of Smith’s culture. The second theme involves acknowledging environmental issues as being transdisciplinary and “wicked” problems. The third and final theme is viewing the campus community as a living lab.

Greening Smith’s culture focuses on how we can engage the Smith community in becoming more environmentally conscious. Climate change has a disproportionate impact on women (Alam, Bhatia, and Mawby). As a women’s college, it follows that the Smith student body should be well-informed on environmental issues and sustainable practices. Greening Smith’s culture requires campus-wide environmental education. In other words, there must be programs to engage the Smith community as a whole rather than just those already engaged in environmentally-themed work.

The second theme involves viewing **environmental issues as transdisciplinary and “wicked” problems**. Transdisciplinary issues reach across and stretch beyond individual disciplines. They require collaboration of a broad section of stakeholders to generate new knowledge and identify solutions. All disciplines, not just the natural sciences, should have an opportunity to contribute to collective learning on climate change other environmental issues.

A “wicked” problem is a social or cultural problem that is difficult or impossible to solve (Kolko). Climate change is a wicked problem because there are many ways to frame the problem and solutions. For example, climate change has effects ranging from personal health issues to macroeconomic changes. Environmental issues can be addressed in conjunction with race, class, gender, ability and other social identities. These issues call for more collaborative research, courses and events across all aspects of the Smith community. Such transdisciplinary initiatives can also provide a space for environmental justice conversations. They also create

a conduit for creative opportunities that connect the natural sciences with humanities and the social sciences in environmental work.

The third theme is **making the campus function as a living lab**. A living lab is an experiential environment that immerses users in a space for designing and experiencing their own future. In a living lab, the Smith community serves not only as the observed subjects but as the source of ideation and creation. The concept of a creative campus generally refers to a collaborative environment between students, faculty, and the community (“What Is Creative Campus?, About, Creative Campus - Wesleyan University”). The community includes businesses, local government, schools, and civic organizations. The creative campus approach may be perceived as being more inclusive of the humanities and arts. The focus of this theme is a broad stakeholder group that designs programs and practices and then experiences the results of those initiatives. It is an iterative and dynamic process of learning through living.



Fig. 1 **Participatory Workshop**, April 2016



Fig. 2 Participatory Workshop, April 2016

Methods

Day 1

On the first day of the participatory workshop, we presented three topics as conversation starters: *greening the culture at Smith; environmental issues as interdisciplinary and “wicked” problems; and viewing the campus as a living lab.* We gave the participants a fact sheet which contained information about what Smith has already done with the three themes presented.

We asked the group which of the three theme was the most interesting and allowed the group to discuss from there. One of us facilitated the conversation while the other transcribed the points from the conversation. At the end of each group discussion, we quickly reviewed what they had said to avoid misstating the group. When the new group arrived we informed them of the previous group’s discussion to continue the discussion with the new group.

Day 2

On day two we presented the following questions as initial discussion starters:

Greening Smith’s Culture:

What are the best ways to create a culture?
What would success look like?

#1: What are the best ways to modify behavior on campus?

#2: What are the best ways to reach out to the entire Smith community?

#3: What are the best ways we could join social justice and environmental issues on campus?

#4: What are the best and most efficient ways we could use our campus as a lab?

#5: What are the gaps in our curriculum as regard to climate change?

Using these questions generated from the Day 1, we elaborated and expand on our previous discussion. We felt that presenting these questions would help guide the participants as they generated policy and initiative ideas. We presented these questions on our PowerPoint presentation as well as on a sheet of paper for the participants to reference and write notes.

The first hour the participants discussed the proposed questions. From the group’s discussion, we generated a sustainability matrix of policies or initiatives described by the group. The group then ranked each idea on a scale of 1-5 with 1 as the least feasible or impactful and 5 as the most feasible or impactful. An highly feasible and impactful idea would receive a total score of 10. We also transcribed the conversation that occurred as the group discussed the ranking of policies and initiatives.

Summary of the Participatory Workshop

Participants highlighted three following principles that should guide the future development of curriculum and co-curriculum initiatives: culture; and transectional and transdisciplinary approaches.

Culture

Much of the conversation for both days related to culture. For example, participants talked about how the **Smith community participates in sustainability practices to a greater extent than most community members are aware.**

Additionally, participants **emphasized increasing the promotion and awareness of environmental events.** Conversation about how culture shifts also overlapped with conversation about **how to engage students, regardless of their major, in environmental issues.** One suggestion was for a Latin Honors requirement to social justice and/or environmental justice. However in light of previous faculty resistance to adding academic requirements, this suggestion was not deemed feasible.

Other ideas included **offering more environmentally-themed first year seminars, offering an environment-based international studies program, and encouraging more students to study the environment when**

abroad. Additionally, participants mentioned that Smith should increase its partnership with the other colleges in the Five College Consortium and with businesses and organizations in the Pioneer Valley community.

The main way to change Smith's student behavior regarding sustainable practices is within the **residential houses.** Smith's residential houses form the social home base for most students. In many ways, the residential houses function in a co-curricular role and provide an opportunity for environmental communication and engagement. Consistent with this concept, participants brought up the need to increase **recycling** in the houses. Students brought up the fact that not all houses had accessible recycling.

One student reported the bins were often full and, therefore, were not accessible. Also, the need the scope of recyclable items/materials was discussed. In general, the participants desired a more structured and user-friendly recycling system. One participant stated that while many students already understand how recycling works, they were confused about what could be recycled in Smith houses. Currently, students either do not know much about recycling or are dissatisfied and confused about how the system works.

Students brought up the fact that not all houses had accessible recycling.



Fig. 3 Participatory Workshop, April 2016

In such an unclear situation, the student “Eco-Reps” organization could take a proactive role in educating the student population about recycling and many other environmental issues. Participants noted the desire to make house Eco-Reps more active. Currently, many houses do not have elected Eco-Reps or their Eco-Reps are not actively engaging the house residents. One solution participants suggested was to give Eco-Reps college credits for their services.

Participants also cited the need to **make information on sustainability more accessible and easier to disseminate.** Environmental and sustainability information should be developed in a manner that addresses cultural and socioeconomic differences within the Smith student body. Participants stated that communications regarding sustainable practices as well as co-curricular events contemplate the diverse backgrounds of Smith students.

Another topic discussed was **changing behavior and creating a more supportive culture at Smith.** Participants brought up three main

topics: behavioral economics, visibility, and environmental talk. In order to green Smith’s culture, there should be social pressure and participatory elements. Several upperclass students noted that they sensed significantly more attention focused on environmental issues this academic year than during their first and sophomore years. These students could not point to any one explanation example for this culture shift. Despite this positive shift, participants noted that Smith has much room for improvement.

Additional opportunities identified include better advertising/communication, **more participatory events and outreach like this workshop,** and a more radicalized culture and “world.” Specific policy initiatives mentioned included adding an environmental pause day similar to Mountain Day. Having a pause day on Earth Day was mentioned but the participants were doubtful that many students would attend because Earth Day occurs too close to finals. A Smith sustainability tour was also mentioned as a possible recurring event.

Transectional and Transdisciplinary Approaches

The **transdisciplinary nature of climate change** was one of the two themes articulated in our initial presentation to the workshop participants. Later, these participants mentioned the **need to have everyone graduate with an understanding of how socio-ecological systems work on local and global scales**. This understanding must be lasting, not just stored in people's short-term memories. All Smith community members should have an appreciation and understanding of the threats to natural systems.

Additionally, the college needs to make a more active attempt at reaching out to students who are not already choosing to be involved. The college could engage students by simultaneously engaging faculty, encouraging them to not only educate themselves but to include it in their lesson plans and research.

Most faculty are not conscious enough about these issues. **One way to increase faculty environmental awareness would be to make climate change a topic of focus during a January faculty retreat**. In this retreat, or during another form of engagement, faculty could make lesson plans to connect the course material to climate change. One of the workshop participants was a humanities professor and mentioned a lesson she taught on coal in Victorian literature. This professor

mentioned that during the Victorian period, literature and science were not so divided as they are today. This anecdote prompted others participants to question how interdisciplinary environmental discourses are on campus.

Participants **identified making the campus more of a teaching tool** as another area of improvement. **Instead of calling the campus a "living lab," the participants preferred the term "creative campus" since it is broader and more inclusive of other disciplines**. The creative campus concept involves establishing a collaborative environment between students, faculty, and the community. This ties in well with idea of a living lab where the stakeholders affected by the environment have a role in creating the environment. Therefore, a creative campus can be viewed as a variation of a living lab in which a broader collaborative group serves as the creative source.

A participant brought up retrofitting the dam with a turbine to produce electricity. They noted that although it would not be cost-effective, it could be an excellent way to model applied learning. Another participant mentioned that the indoor track and tennis facility already has solar panels on their roofs. However, these panels are out of view and therefore not in the consciousness of most Smith community members.

Instead of calling the campus a "living lab," the participants preferred the term "creative campus" since it is broader and more inclusive of other disciplines.

The central challenge relating to environmental justice is being inclusive of all voices.

Additionally, Smith could apply theoretical knowledge by using trash in creative ways. A humanities professor cited the teaching of a Victorian novel which had a moral of being resourceful and using items rather than letting them become waste.

One central issue of environmental justice is being inclusive of all voices. Participant's comments confirmed the challenge of including the diverse viewpoints of people from all cultures and socioeconomic backgrounds. They also identified the difficulty of engaging members of underrepresented groups in a topic on which they have traditionally lacked a voice. For example, one student participant of minority identity said that they had been discouraged from participating in environmental discourses by another person of the same identity because they felt conversations were just for white people.

Participants mentioned the Department of French Studies' recent lecture series on the environment in response to the COP21 climate conference in Paris as a model for interdisciplinary engagement. This was an example of a humanities department acknowledging the transdisciplinary nature of environmental issues and, in particular, climate change.

On the second day, the group of participants brainstormed ideas around the following question: "What are the best ways to reach out to the entire

Smith community?" Participants thought that Smith should bring humanities and social sciences into climate change issues. Climate change issues are broader than the natural sciences alone. To make this happen, participant's identified the need to connect ongoing collaborations between departments to work related to climate change. An online repository of materials, projects, and initiatives was proposed. This repository would be interdisciplinary, covering all academic departments and programs. In addition, there was the desire to take other measures to prompt humanities into climate change discourse. The synergies of this approach could produce results transferrable to the broader community as well as other institutions.

Workshop participants also discussed Sightlines, a private firm specializing in benchmarking educational facilities operations as well as campus sustainability. The company collects information to develop best practices and measures progress relative to peer institutions. When discussing Sightlines, participants also discussed how Smith can better communicate with other similar institutions. Since many other campuses around the country engage in some degree of sustainability work, it could be valuable to seek inspiration from their practices and learnings.

Additional communication at Smith needs to happen in several different ways. Firstly, faculty and facilities management need to have better communication about class projects. The group members understood that students and faculty, using course projects and research, have the power to make changes to campus sustainability where the Facility Management staff may not have the same ability.

Inter-departmental communication is a key part of the movement towards cross-campus environmental literacy. At Smith, the Economics Department could involve students by having them make a budget for implementing green infrastructure on campus. Because green infrastructure will be expensive initially, these economics students can research how to ensure that money will be saved in the long-term due to the overall efficiency of the green infrastructure. CEEDS already has curriculum enhancement grants to aid faculty in increasing environmental literacy in their classes. However, this incentive is only attracting faculty who are already engaged in this type of work. A next step would be for CEEDS to reach out and engage other professors and departments.



Fig. 4 Smith College

Table 1 A Sustainability Analysis of Policy Options

	Feasibility (out of 5)	Impact (out of 5)	Combined Total (out of 10)
Increased communication between Faculty and Facilities on what needs to be changed or investigated on campus	•••••	•••••	••••••••••
More opportunities for cross-curricular interactions between faculty and staff (i.e. participatory workshops)	•••••	•••••	••••••••••
Mandatory Environmental Training for Faculty	••••	•••••	••••••••••
Climate Change Reflection Day as a component of Mountain Day	••••	••••	••••••••
Social & Environmental Justice Lecture Series or Courses		•••••	
Debrief after sustainability events to implement and encourage action	••••	•••	••••••••
Creative Campus (living lab inclusive of humanities)			
Climate Change J-Term classes	••••		
Climate Reflection Day	•	•••••	••••••••
Build Hydro-Power on Mill River Dam	•••		
Environmental Sustainability course requirement			

In order to better categorize the policy ideas generated from the prior group discussion, we created a **sustainability matrix and asked the participants to rank the ideas generated from the aforementioned discussion** (table 1). In total, the group came up with eleven concepts total for us to use as policy recommendations.

The table organizes these ideals organized from highest to lowest according to their total score. Each concept could score a maximum of five points in feasibility and impact. A score of five is a high score while a score of one is a low score.

On table 1, the white circles represent when the participatory group from Day 2 gave a range of numbers or could not decide between the two numbers. Instead of choosing the higher or lower of the scores, we have chosen to preserve the initial rankings of the participatory group by representing the lower range with black circles and the higher, potential range with white circles if the idea was not scored a single number.

An example of a high ranking initiative is **increased communication between faculty and facilities on what needs to be changed or investigated on campus**. This scored initiative was scored a five on feasibility because increasing communication through meetings and emails is something easily achievable. The initiated also was scored a five on impact as the participants felt that increased communication and coordination would cause substantial change.

An example of a medium ranking initiative is defining and **using our campus as a creative campus**. A Creative Campus is an alternative phrase to living lab that is more inclusive of the humanities. The participants ranked this initiative's feasibility a 2-3 because, while it changing the way Smith views using the campus as part of classes could be relatively easily achieved, some aspects of climate change and conservation on campus would be difficult to incorporate into non-science classes, such as solar panels on the roof of the campus center ("What Is Creative Campus?, About, Creative Campus - Wesleyan University").

The group scored this initiative a 4-5 on impact because involving the humanities is vital to broadening the narrative of climate change on smith campus to include a broader general audience. Incorporating humanities in the climate change learning process on campus will

help Smith better tell the story of its current actions and the actions of students moving forward.

An example of a low ranking initiative is **creating an environmental sustainability course requirement**. This initiative hopes to improve the student's environmental literacy and understanding of biological systems so they will be informed when tackling climate change on and off campus. While this initiative received an impact score of 4-5 because a course requirement would increase student's strength in discussing the impact of climate change, the participants scored this initiative a one on feasibility. Participants on both days noted that both administration, faculty, and students are resistant to adding requirements to Smith's open curriculum. Some faculty, commented one of the participants, argue against this notion asking why environmental studies, in the interest of climate change education, should be valued higher than other fields of study such as economics.

Creating an environmental sustainability course requirement?

Policy Recommendation

A Climate Justice Lecture Series and Fund

Scope: This initiative will aim to engage all Smith community members and will aim to ensure and invite diverse perspectives on campus to conversations regarding climate justice.

Policy Statement: In order to create a greater awareness about environmental issues and how they affect different populations, we recommend The college create a lecture series and fund to address and educate Smith students on climate justice.

Rationale: Climate change disproportionately affects women, people of color and people of lower socioeconomic statuses. As climate change worsens, it is vital to educate Smith students in environmental justice and bring more awareness of how they will be impacted by future climate change.

Currently, there are many initiatives that already climate justice lectures, such as CEEDS' Climate Café and Divest Smith College's Intersection Series. However, this proposed lecture series would increase visibility, institutionalize these initiatives and ensure consistent funding of such endeavors.

Implementation:

The lectures in this series will be coordinated between Departments of Environmental Science and Policy Department, Africana Studies, and

Study of Women and Gender and CEEDS along with relevant student groups – such as Divest Smith College and SCOPES (collective of students of color in STEM & environmental justice) – with each lecture ideally targeting a certain aspect of climate change and how climate change will impact certain aspects of the Smith student population.

Funds for the lecture series will be through requested funding through the Endowed Lecture Funds application submitted to the Lecture Committee. The Lecture Committee funds both departmental and interdisciplinary seminar series which this policy seeks to create (“Smith College: Provost/Dean of the Faculty”).

How it will help us adapt to and mitigate climate change:

While climate change affects everyone, it will disproportionately affect the population represented by Smith students. Smith has the opportunity to initiate the discussion through these lecture series so that future Smith alumnae will be knowledgeable and prepared to tackle environmental justice.

Responsible Parties:

Student organizations such as SCOPES and Divest Smith College, CEEDS, Environmental Science and Policy Program, Department of Africana Studies, and Department of Study of Women and Gender.

A Climate Justice Lecture Series and Fund

Fall Semester Environmental Reflection Event

Fall Semester Environmental Reflection Event

Scope: This policy will encourage students and faculty to begin and share a conversation about the climate change on campus.

Policy Statement: In order to engage all Smith College students of regardless of class years and fields of study, we recommend that Smith hold an Environmental Reflection Event in the fall semester of the academic year.

Rationale: Since Earth Day and Earth Week occur too close to spring semester finals, students may be more engaged in conversations about sustainability at an event held at another time of the academic year. While it is important to raise awareness of environmental issues on an ongoing basis, the Smith community would benefit from an event focused specifically on these issues. Smith students should graduate with an understanding of how biological systems on our Earth work and how climate change will impact all of us.

Definitions (to enhance clarity of meaning and accurate interpretation):

Environmental Reflection Event is an event occurring in the fall semester designed to call attention to environmental issues affecting the Smith community. The event will seek to engage all members of the Smith community in reflecting on both progress and opportunities.

Sustainable Practices, as discussed in this policy, refers to the methods in which students and faculty can conserve resources. Examples on Smith Campus include recycling paper, turning off lights when rooms are not in use, and disposing food in the dining halls' compost bins.

Open Forum is a discourse based event where ideas can be expressed and discussed between students, faculty, and facilities. The goal of this event is to not only bring attention to environmental issues affect the Smith community but also discuss projects and solutions across the whole Smith community.

How it is a Translation of Values/Procedures (how exactly will it be implemented):

There are three general approaches to implementing this policy. Sustainability can be incorporated into Mountain Day; a new pause day can be created; or a multi-hour evening event can be created. The options all have the potential for significant reach with the student body and broader Smith community as annual events.

The participatory group thought using Mountain Day to promote environmental discourse would be more feasible than creating a new pause day as Mountain Day has an inherent environmental aspect (i.e., spending time away from campus surrounded by nature).

However when this idea was brought up before a class of students the idea was quickly refuted as many students do not wish to change Mountain Day in any way. They recognized that many students use Mountain Day to work on class assignments. If a more formal environmental aspect was added to Mountain Day, the recommendation would be for the residential houses to collaborate with their Ecology Representatives to have an environmental discourse sometime during the day. Students who do not have plans for the day or a house community could attend environmental and sustainability events on campus.

A proposed solution to the conflicts resulting from having an environmental reflection event as part of Mountain Day would be to have a single day of classes off for events, open forums with faculty, and panels. Coordination between the house Ecology Representatives and CEEDS would help engage house residents. The concern with this approach is that Smith already has pause days in the fall semester and introducing another pause day would excessively interfere with academic studies.

An alternative to introducing another pause day

would be to have a multi-hour environmental event in one evening arranged as an open forum between faculty and students. The main concern with this is that students may not take the time to attend. This would be contrary to our initial goal have having a long, campus-wide conversation on sustainability and climate change.

How it will help us adapt to/mitigate climate change:

Earth Day cannot be the only time of the year for campus wide sustainability discourse. This policy proposal seeks to start conversation on sustainability in the fall semester to educate and remind students the importance of sustainable practices. The more students that are aware, knowledgeable, and active in the conversation on campus, the more likely they are to begin sustainable habits now and continue them into their professional life.

Responsible Parties:

CEEDS, Student Affairs

Earth Day cannot be the only time of the year for campus wide sustainability event.

CONCLUSION AND KEY FINDINGS

This report summarizes the outcome of the Study Group on Climate Change Participatory Workshops that took place in April 2016. It also lays out policy recommendations to the SGCC.

Key findings regarding the priorities and concerns of the Smith Community relative to climate change include:

- Smith College should lead by implementing innovative responses to climate change
- Our responses to climate change should align with our values and our mission
- The Liberal Arts philosophy should be at the heart of our responses to climate change
- We need to adopt a transectional approach to climate change and fully consider issues of climate justice
- Responses to climate change are complex and tradeoffs between different policy options will need to be carefully evaluated
- Additional data and expert-based analyses are needed to carefully plan for climate change
- Future planning efforts should continue to regularly engage the Smith Community and create forums for diverse people to debate and exchange on these crucial issues

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Fig. 1 ENV 201/202 reporting to the SGCC, May 2016

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