

THE PUBLIC HONORS COLLEGE



St. Mary's College of Maryland
at Historic St. Mary's City

Climate Neutrality by **2020**



A Climate Action Plan by Christophe Bornand, Shane Hall,
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2010

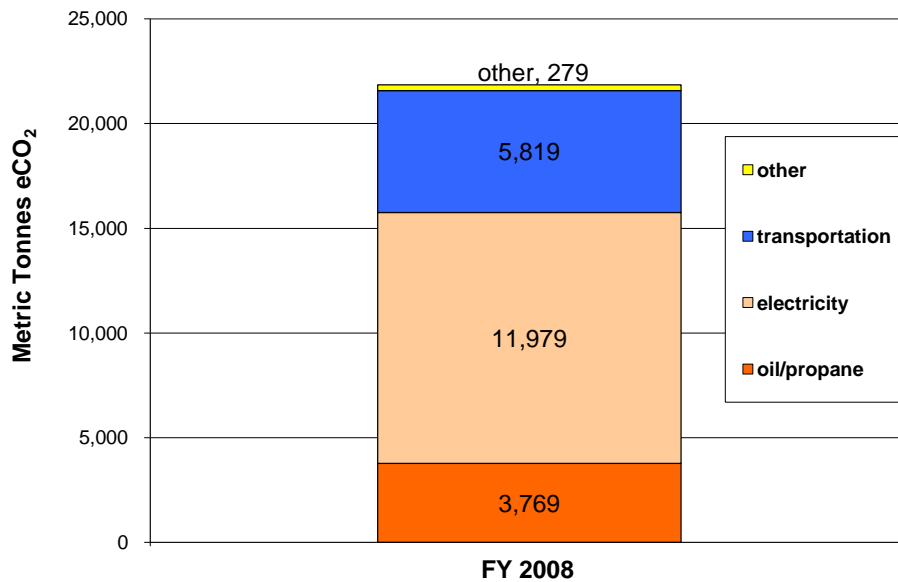
Contents

Executive Summary	3
I. Introduction	4
A. The College’s Commitment to Climate Change	4
Drafting and Public Outreach Process	5
Our Climate Action Plan Goals	6
B. Reaching Climate Neutrality	6
How the Plan Is Organized	6
II. Presentation of St. Mary’s GHG Footprint	7
A. Description of the School	7
B. Methodology	7
C. Summary of Emissions	7
Description of Emissions by Major Source	8
D. Historical and Future Emissions Trends	9
Future Growth of Emissions	10
Future Emissions Reductions	11
E. Measuring GHG Mitigation Strategies	11
III. St. Mary’s Greenhouse Gas Mitigation Strategies	12
A. Specific Targets for Mitigation Strategies	13
Energy Efficiency Upgrades	14
Renewable Energy Systems on Campus	16
Operational and Behavioral Change	17
Renewable Energy Credits and Carbon Offsets	18
B. Cost Modeling for Mitigation Strategies	18
IV. Education, Research, and Public Outreach	21
A. Curricular Offerings Related to Climate Change to Date	21
Sustainability in the Core Curriculum, First Year Experience	22
Co-Curricular Offerings to Date	22
B. Tactics to Enhance Curricular and Co-curricular Sustainability Offerings	23
C. Conclusions about Educational and Institutional Efforts	25
V. Conclusion	25

Executive Summary

Most of St. Mary's' emissions stem from three areas: transportation (25.4%), purchased electricity (52.4%), and oil and propane consumption (17%). During the 2008 fiscal year, St. Mary's' emissions totaled 21,846 metric tonnes of carbon dioxide equivalent (eCO₂). Of this, 100% percent of emissions from electricity consumption were offset through the purchase of renewable energy credits (RECs), effectively reducing the College's carbon footprint to 9,867 metric tonnes eCO₂.

FIGURE 1: St. Mary's Total Carbon Footprint, by source (FY 2008)



Calculating total greenhouse gas (GHG) emissions has enabled the College community to better understand where reductions are possible. To achieve climate neutrality as soon as feasible, as mandated under the American College and University Presidents' Climate Commitment (ACUPCC), it is the intention of the College to improve energy efficiency, promote behavioral and operational changes, invest in renewable energy systems, and to purchase RECs and offsets. Of the 100% net reduction, 30% of GHGs will be mitigated on campus as "gross" GHG reductions.

St. Mary's College appreciates its responsibility for both furthering intellectual progress and improving the state of the global community. By designing and committing to a climate action plan, as mandated under the ACUPCC, St. Mary's College joins its peer institutions at the forefront in the battle against climate change.

I. Introduction

St. Mary's College of Maryland is the state's public honors college and an independent institution in the liberal arts tradition. Founded in 1840, St. Mary's is a public coeducational institution offering undergraduate bachelor of arts degrees and a master of arts in teaching degree. The College promotes scholarship and creativity by challenging students to achieve academic excellence through classroom activities, experiential learning, and close relationships with faculty. Located on the St. Mary's River, the College's beautiful residential campus inspires the college community's work, play, and commitment to the environment.

St. Mary's College also appreciates the impacts local actions can have on the global commons. The College recognizes the scientific validity of climate change research and acknowledges the results of the Intergovernmental Panel on Climate Change (IPCC), noting that "Warming of the climate system is unequivocal."¹ Furthermore, the College agrees with United Nations' Secretary General Ban Ki-moon that anthropogenic climate change is a "defining issue of our time."² As such, the underlying justification of this document is the belief that if left unchecked, the impacts of climate change will harm not only the planet's natural ecosystems, but in turn will also impede future generations' abilities to maintain an acceptable quality of life.

In order to combat these changes, humankind must advance their efforts in guarding the integrity of natural resources. According to the latest consensus of the world's top climate change scientists, as laid out in the Fourth Assessment Report of the UN's Intergovernmental Panel on Climate Change, the global community must reduce GHG emissions anywhere from 50% to 85% from year 2000 levels by 2050 in order to avoid dangerous impacts from global climate disruption.³ Given the complex relationships between built and natural systems, the College appreciates that a combination of solutions will be required to create the most effective climate action plan. Appreciating that leadership falls especially on institutions of higher education, this document aims to further the institutionalization of climate change mitigation practices.

A. The College's Commitment to Mitigating Climate Change

Building on the institution's core values of intellectual exploration, civic and global engagement, diversity in all of its forms, environmental stewardship, and a spirited community centered on the

¹ Climate Change 2007: Synthesis Report. *Summary for Policy Makers*. Nov 2007. p22

² Investing in Carbon Offsets: Guidelines for ACUPCC Institutions. Accompanying document to The ACUPCC Voluntary Carbon Offsets Protocol. November 2008 v 1.0, p11

³ UN News Centre. 8.7.2007 <http://www.un.org/apps/news/story.asp?NewsID=22836&Cr=climate&Cr1=change>

students, St. Mary's recognizes that it is imperative to the mission of the College to offer leadership in confronting climate change. In the spring of 2008, former president Dr. Jane Margaret O'Brien signed the American College and University Presidents' Climate Commitment (ACUPCC). As a signatory, the College embraces its responsibility to lead by example in reducing emissions and educating the campus community.

St. Mary's College has a long history of environmentally-oriented campus improvements. Since 1984, the College has reduced its storm water runoff by 50%, steadily improving the local environment through reforestation and the creation of meadows, infiltration ponds, and plant buffer zones. In 2008, St. Mary's was rewarded for its efforts when it became the first college in Maryland to be awarded the Certification in Environmental Planning from the Audubon Cooperative Sanctuary Program (ACSP). The College is also the site of one of two pilot programs for green buildings funded by the state of Maryland.

In 2007, students voted to begin taxing themselves to provide funds for the campus to cover 100% of the College's electricity consumption with renewable energy credits (RECs). That same year the student body also provided half of the funding for the installation of a 37-well geothermal heat pump system under the James P. Muldoon River Center. Furthermore, under the first energy performance contract, which was completed in 2007, the College reduced its annual electrical consumption by 16.5%, #2 heating oil by 24%, and water consumption by 35%. These changes have reduced the College's carbon footprint by approximately 4,600 tonnes of eCO₂ per year.

Drafting and Public Outreach Process

This plan describes the framework by which St. Mary's will fulfill its commitments under the ACUPCC to pursue climate neutrality and incorporate climate change and sustainability into its educational endeavors. The plan also includes targets and strategies for meeting these commitments by 2020. Although the plan was constructed as a team effort between planning and facilities staff and the Sustainability Committee, the framework has been vetted in an open and inclusive process to allow for generous community input. Open meetings were held during the fall of 2009, spring of 2010, and fall of 2010 to present progress, discuss specific aspects of the framework, and receive feedback from community members.

Once a framework proposal was developed, the sustainability staff presented the committee's findings to the Student Government Association, the Student Environmental Action Coalition, the President's Cabinet, the Office of Student Affairs, the Office of Planning and Facilities, the Faculty Senate, the Business Office, and the Board of Trustees - Building and Grounds subcommittee. In addition several follow-up open house events were conducted with the campus community to ensure broad support

of the plan. During these presentations further feedback on the goals, structure, and implementation of the plan was provided to help ensure the context appropriateness and feasibility of the plan's separate initiatives. Nevertheless, the publication of this framework plan in no way constitutes the end of the process. This document is not intended to serve as an inflexible step-by-step manual to achieve climate neutrality. Instead, it is a statement of goals containing a framework which must be continually enhanced over the years as the College takes further steps toward climate neutrality and gains a better understanding of dilemmas that come along the way.

Our Climate Action Plan Goals

It is the aim of the St. Mary's College of Maryland Climate Action Plan to:

1. Achieve campus-wide climate neutrality by 2020
2. Enhance the academic mission of the college, teaching students and our community about climate change and sustainability to ensure we remain a monument school that adheres to our core values of academic exploration, global and civic engagement, freedom, inclusivity and environmental stewardship
3. Remain fiscally responsible
4. Achieve the maximum extent and amount of "co-benefits" the pursuit of climate neutrality may entail. These co-benefits include improvements to local ecosystem health, utility cost avoidance, improved profile of the College, the formation of new partnerships with public and private entities, etc.

B. Reaching Climate Neutrality

To fulfill the College's commitment under the ACUPCC, St. Mary's College plans to aggressively pursue climate neutrality through improvements in campus energy efficiency, on-site renewable energy generation, increased educational programming, and investments in remote reductions for the remaining immitigable emissions. In aggregate, our proposed actions will reduce the College's gross annual GHG emissions 30% by 2020, with the remaining 70% of emissions being offset through off campus programs including the purchase of carbon offsets and renewable energy credits.

How the Plan is Organized

The first section of the plan presents the institution's GHG inventory and projections for its future GHG inventory. In the second section, strategies are laid out on how to reduce the gross annual GHG emissions 30% and net emissions 100%. This portion will go into further detail on the preliminary cost modeling of the plan. The third section will describe future efforts to be made by the College to educate

its students about climate change and sustainability. Finally, this document concludes with a reflection on St. Mary's commitment to pursuing climate neutrality and the importance of our work to do so.

II. Presentation of St. Mary's GHG Footprint

A. Description of the College

Situated on the banks of the St. Mary's River, the 361-acre campus contains 47 academic, administrative, and residential buildings. Occupying this campus are 1,993 full-time students, 260 full-time staff, and a total of 225 full and part-time faculty members. Full-time enrollment in the fall of 2009, including those studying abroad, was 2,060 students, over 80% of whom lived on campus.

B. Methodology

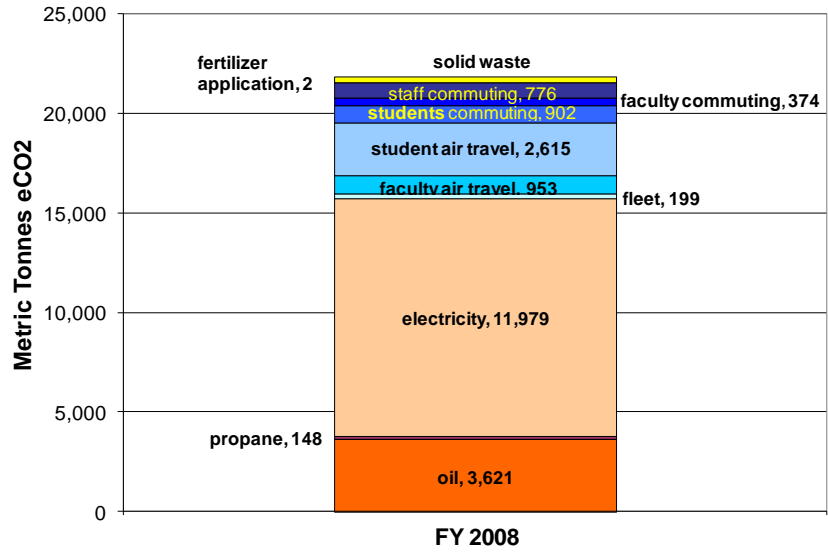
The first estimate of the institution's carbon footprint was conducted by a student as part of her senior St. Mary's Project in the spring of 2008. With the help of a wide array of campus community members, the Office of Planning and Facilities then developed its own calculations of the College's emissions for the 2007-2008 school year (Fiscal Year 2008), which has become our benchmark year. The total calculated emissions were then submitted to the ACUPCC reporting system on May 15, 2009.

To calculate gross and net emissions, as well as to make historical projections, the College used the Clean Air Cool Planet Campus Carbon Calculator v5.0. This particular campus calculator was chosen due to its acceptance by the ACUPCC and its widespread use among other institutions of higher education; over 1,000 colleges and universities across the country utilize the Clean Air Cool Planet Campus Carbon Calculator v5.0 as their standard metering tool for green house emissions.

C. Summary of Emissions

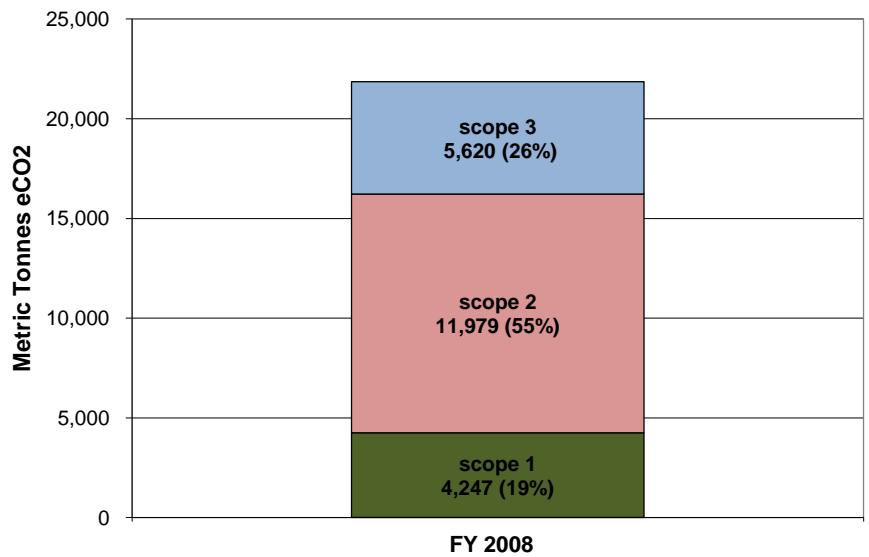
St. Mary's total gross GHG emissions for 2007-2008 (FY08) were reported to the ACUPCC as 21,846 metric tonnes of carbon dioxide equivalents (eCO₂). Beginning in 2007, students elected to fund the purchase of renewable energy credits (RECs) to offset 12,000 metric tonnes of eCO₂, reducing the College's net emissions to 9,846 tonnes (eCO₂). The sources of emissions are highlighted in Figure 2.

FIGURE 2: St. Mary’s Total Climate Footprint by Source – Detailed



Scope 1 emissions of the College, also known as “direct” emissions, are produced by fleet vehicle fuel consumption, on-site fossil fuel consumption (heating oil & propane) and solid waste generation. Scope 2 emissions, also known as “indirect” emissions, are produced by the fossil fuels used off-site to provide the purchased electricity of the College. Scope 3 emissions, also known as “optional” emissions, are harder to define, quantify, and mitigate. The optional emissions calculated in the first St. Mary’s climate footprint include student, faculty, and staff commuting, as well as all faculty and student air travel. The relative contributions of each source are demonstrated in Figure 3.

FIGURE 3: St. Mary’s Total Climate Footprint, by scope (FY 2008)



Description of Emissions by Major Sources

Purchased electricity: Annual purchased electricity is the single greatest source of carbon emissions in the College’s GHG inventory. In 2008, the College caused the emission of 11,979 metric tonnes eCO₂ by purchasing approximately 19,000 MWH of electricity from Southern Maryland Electricity Cooperative (SMECO). In all, purchased electricity accounted for 55% of the College’s net emissions.

On Campus Stationary: On campus stationary source emissions are produced by distillate #2 fuel oil consumed in College-owned boilers and propane consumed in certain building facilities. In 2008 St. Mary’s consumed 362,079 gallons of distillate fuel oil and 29,673 gallons of propane, emitting 3,808 metric tonnes eCO₂. This accounts for approximately 15% of the College’s total annual emissions.

Transportation: St. Mary’s calculated emissions for transportation account for both direct and optional scope sources. The total combined emissions of the College’s vehicle fleet (direct emissions), college-funded air travel (direct emissions), and student/faculty/staff commuting account for 5,819 metric tonnes eCO₂ annually. The relative impact from each source is demonstrated in Figure 4 below.

FIGURE 4: Transportation Emissions, by source (FY 2008)

Transportation Source	eCO ₂ Emitted (Metric Tonnes)	% of Trans. Emissions	% of Total Campus Footprint
Student Commuting	902	16%	4%
Faculty Commuting	374	6%	2%
Staff Commuting	776	13%	3%
Student Air Travel	2,615	46%	12%
Faculty/ Staff Air Travel	953	16%	4%
Fleet Vehicles	199	3%	1%
Total:	5,819	100%	26%

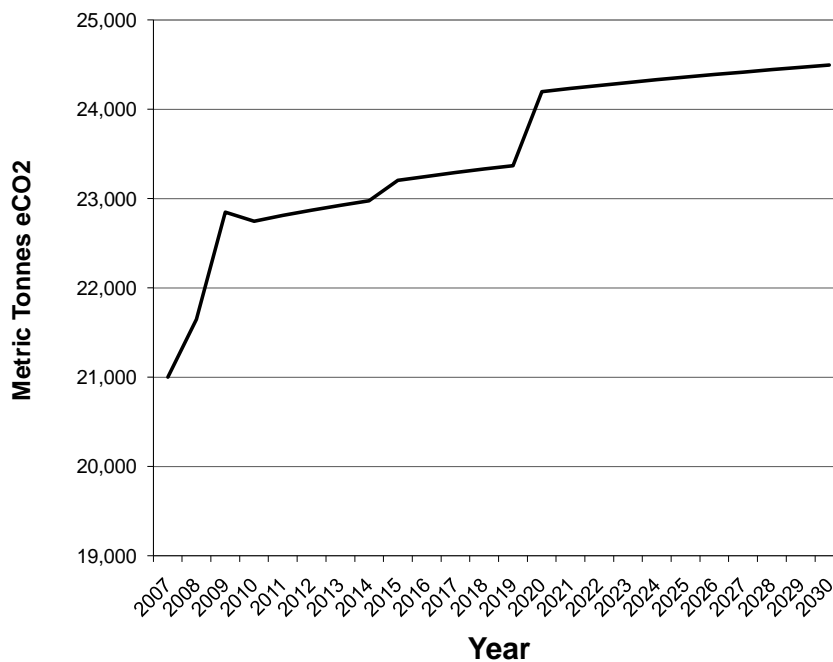
D. Historical and Future Emissions Trends

In the last two decades, the number of annual full-time students at St. Mary’s has increased by approximately 35%, while the campus infrastructure has expanded by more than 60%. The numerous capital projects include a new science building (Schaefer Hall, 1993), several residences (Townhouse Crescent, 1994; Lewis Quad, 2001; Waring Commons 2003 & 2007), a new campus center (2000), and the expansion of the Michael P. O’Brien Athletic and Recreation Center (2005). More recently, the

College has constructed a building for psychology, chemistry, and education studies (Goodpaster Hall, 2008), the James P. Muldoon River Center (2008), and an administrative center (Glendening Hall, 2009).

Each of the three recent construction projects reflects the College’s growing interest in sustainability. Goodpaster Hall was Maryland’s first LEED-certified public building, while both the River Center and Glendening Hall were built to meet LEED Silver criteria. Furthermore, a 37-well geothermal heat pump system was installed for the River Center, funded in large part by a student-led initiative. Nevertheless, the College’s growth has come with a corresponding rise in our annual greenhouse gas emissions. Due to the rapid development of the campus and the expanded international education programs, it is estimated that the College’s emissions have doubled over the past two decades. Using historical data, a forecasted “business-as-usual” emissions scenario through the year 2030 has been created to track the growth of emissions (see Figure 5).

FIGURE 5: “Business-as-Usual” GHG Projection



Future Growth of Emissions

While one more large-scale capital investment project, Anne Arundel Hall, is scheduled for the near future, scope 2 emissions for the campus were expected to have peaked in FY2008 for at least the next eight years. This was made possible due to the highly efficient design of the new facility; replacing the energy inefficient, ADA-inaccessible Anne Arundel Hall with a LEED Gold certified building of the same name. While this project will add a slight increase to net building square footage, the efficiency

improvements being made to the building will more than make up for the increase in size, reducing the gross emissions of the College. In the long term, only one more major building project is expected for the campus: a new 700 seat auditorium building with supplemental space for the arts.

In addition, taking a “business-as-usual” approach, we project that the amount of scope 1 emissions peaked in FY 2010; however, scope 3 emissions are expected to grow as a greater number of students study abroad in the future. Currently, the College’s Core Curriculum requires all students to participate in approved programs or internships that enable them to Experience the Liberal Arts in the World (ELAW). As a result, many students opt to satisfy this requirement through a study-abroad program.

Future Emissions Reductions

Emissions reductions in the coming years will derive from a variety of factors. Some of these positive influences are beyond the College’s control, but will nevertheless assist in reducing emissions. These reductions derive from the regulation of energy providers at the state level (Maryland’s escalating Renewable Portfolio Standard: 20% by 2022); improvement of scope 3 vehicle fuel efficiency as defined by CAFÉ standards over time;⁴ and a slight improvement in air travel efficiency. The rest of our emission reductions will derive from the actions of St. Mary’s College. We will achieve reductions through a combination of energy efficiency measures, on-site renewable energy generation, widespread behavioral changes, and the purchase of clean energy and carbon offsets for remaining inmitigable emissions.

E. Measuring GHG Mitigation Strategies

Emissions reductions will be measured in tonnes of eCO₂ decreased from the total eCO₂ inventory. Calculations of actual emissions will be done using the Clean Air Cool Planet Campus Carbon Calculator v5.0 on a semi-annual basis. While individual energy conservation measures (ECMs) will include calculated emissions reductions based on projected best estimates, a two-year review process will reconcile the actual combined value of ECMs compared to total GHG reductions. Utility invoices will be used to calculate scope 1 and 2 emissions, while practicable means such as surveys will be used to calculate most scope 3 emissions. These surveys and any other estimates of novel GHG sources not included in this document, such as food source emissions, will be developed over time based upon student interest.

⁴ We assume that students will largely lag behind in purchasing fuel efficient vehicles as defined by CAFÉ standards. For example, if in 2017 the CAFÉ standard is 36 mpg in all US cars, we assume students will be inheriting or purchasing 2012 models on average.

III. St. Mary’s Greenhouse Gas Mitigation Strategies

There is no single method for mitigating the College’s climate footprint that also achieves each of the four goals laid out by this Climate Action Plan (swift neutrality, enhanced education, fiscal responsibility, maximized co-benefits). St. Mary’s will instead simultaneously pursue a number of different mitigation strategies, including:

1. Improving campus infrastructural energy efficiency
2. Fostering operational and behavioral change
3. Installing renewable energy systems on campus
4. Investments in regional renewable energy systems and greenhouse gas reductions

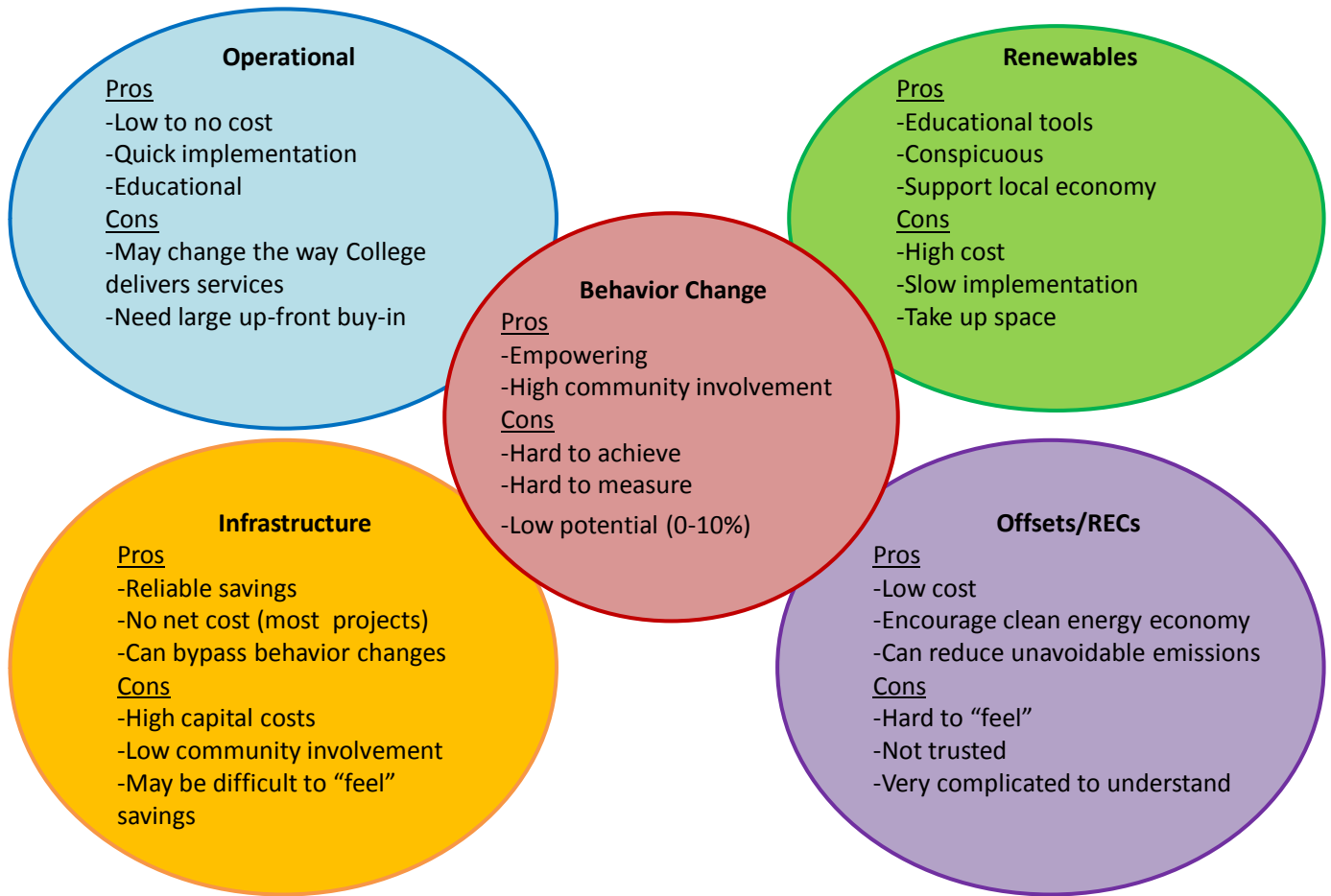
These distinct but crosscutting strategies will allow St. Mary’s to pursue climate neutrality in a way that best realizes the objectives of our plan. These strategies are shown in Figure 6 as four distinct “wedges,” which when combined equal the net offset needed to achieve climate neutrality.

Figure 6: Emission Reduction Targets by Tactic

Tactics (wedges)	Target reduction of total GHG emissions by 2020	
Automatic reductions	5%	5%
Energy efficiency	15%	25%
Behavioral & operational changes	5%	
Renewable energy systems	5%	
RECs & Carbon offsets	70%	70%
Total:	100%	100%

To determine the reduction targets for each wedge, the pros and cons were weighed carefully. A summary of each strategy’s pros and cons is seen on the next page in Figure 7.

Figure 7: Pros and Cons of Different Mitigation Strategies

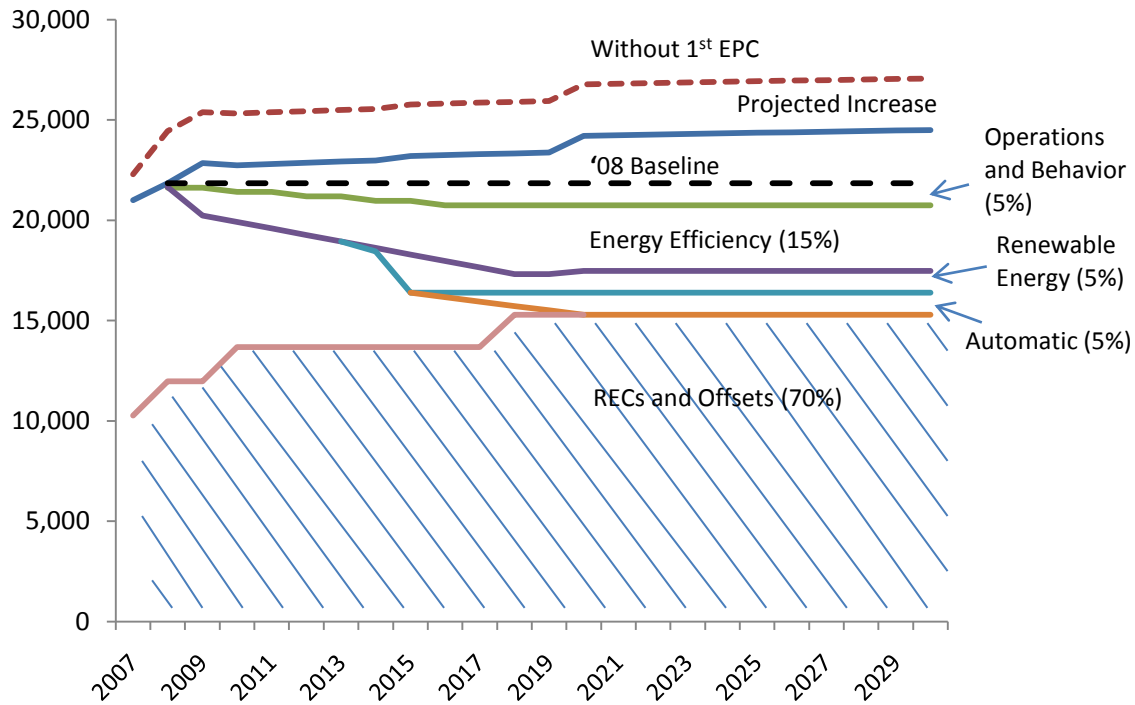


These pros and cons were weighed against the College’s resources to come up with the goals for each strategy as listed in Figure 6. As is shown, the College is supposing a heavy reliance on infrastructure improvements. This was set due to the student body’s high level of interest in advancing technology, the existing popularity of “green” culture, and the large potential for infrastructure upgrades.

A. Specific Targets for Mitigation Strategies

This subsection details what the College’s tactical approach will be for meeting the specific emissions reduction targets outlined by Figure 6. A summary of the tactics and their specific targets in terms of GHG emissions reduction is presented in the table below. These figures are compared against the baseline “Business-as-Usual” scenario.

Figure 8: The Impact of the “Wedge” Strategy over Time



Energy Efficiency Upgrades

Energy conservation is largely achieved through aggressive renovations and retrofitting of campus facilities, retro commissioning of buildings, and through a green building policy for new facilities. As shown in Figure 8, the aim of the College is to achieve a 15% overall eCO₂ reduction through energy efficiency improvements by 2020. Measures for achieving this goal are laid out below.

Implement a Second Energy Performance Contract (EPC):

An EPC is an arrangement by which an energy service company (ESCO) identifies and performs energy conservation measures (ECMs) to a campus or business and guarantees a certain amount of energy and cost savings to be accrued through those ECMs. While the initial studies, installation, monitoring, and maintenance of the ECMs are paid with a low interest loan from the Maryland State Treasury, the College will pay off the state treasury loan using funds that would have been used to pay expected utility bills without the EPC. In this way, the EPC is a cost neutral venture.

In 2004, St. Mary’s partnered with Maryland’s Department of General Services and contracted NORESKO to conduct its first EPC, which implemented ECMs between 2005 and 2007. This EPC saved the College in excess of 20% of its overall energy usage from a 2005 baseline. Projects such as retrofitting incandescent light bulbs with compact fluorescent bulbs, new boilers and fume hood retrofits

in laboratory buildings have eliminated more than 16.5% of annual electrical consumption, 24% of #2 heating oil, and 35% of water consumption. These changes have reduced the College's carbon footprint by approximately 4,600 tonnes of eCO₂ per year.

Most of the GHG emissions reductions achieved through energy efficiency improvements are expected through the completion of a second EPC. During the spring of 2010, the College began the preliminary phase of a new EPC. After completion of the survey phase, the College and the energy service company will evaluate the scope of potential energy efficiency projects. Types of projects likely to be completed during the second EPC include:

- Light retrofits
- Day lighting controls
- Weather stripping and insulation for buildings
- Lowered lumen count for over-lit areas
- Geothermal HVAC systems for townhouses
- Solar thermal installations
- Window replacements
- Improved building automation systems

Retrofit Facilities Periodically:

Retro commissioning is a systematic process that identifies low-cost operational and maintenance improvements in existing buildings. Oftentimes these improvements are made at the end of equipment service lives, requiring little or no additional funds other than those earmarked in the plant budget. These sorts of projects can help realize optimal performance and additional savings, while at the same time making buildings more pleasant for occupants.

In the past, replacements of boilers, chillers, a/c units, windows, doors, and fume hoods have all allowed the College to significantly reduce its energy consumption. As part of the College's effort to "go green," St. Mary's has more recently been a strong supporter of geothermal HVAC systems. Funded in large part by the Student Government Association, the College was able to install a 37-well geothermal HVAC system for the new James P. Muldoon River Center in 2008. This effort is expected to grow as the College makes plans to replace the residential townhouse HVAC systems with geothermal wells (size unknown) in 2011 and construct of a 90-well geothermal system for the new Anne Arundel Hall in 2014.

The Green St. Mary's Revolving Fund:

Reflecting heightened interest in sustainability and climate change, students have sought additional means to reduce the College's GHG emissions. In 2007, students voted for a fee increase of \$25 a year to purchase renewable energy credits, offsetting 100% of GHG emissions from electrical consumption. Earlier this spring, the students voted again, this time to increase their fees by \$10 with the purpose of creating a green energy fund to support campus energy efficiency and sustainable energy projects. The fund, entitled the Green St. Mary's Revolving Fund (GSMRF), expects to recapture the cost savings generated by the implementation of energy-saving projects, and to reinvest these funds in other projects that have similarly attractive returns on investment.

Green Building Policy:

As mentioned previously, three green buildings have been constructed on campus since 2007. Continuing with this practice, the new Anne Arundel Hall, designed by Smithgroup Inc., is intended to be the College's greenest to date, designed to achieve a LEED Gold rating. While only one additional building project is expected, the College is set to adopt a "Green Building Policy" into its strategic plan whereby all new buildings on campus must be LEED Silver certifiable or equivalent.

Renewable Energy Systems on Campus

Acknowledging both student preferences and the limited scope of other methods, on-site renewable energy facilities will be constructed to such a capacity that they account for a 10-15% reduction of the College's carbon footprint by 2020. By the fall of 2011, a complete feasibility study of renewable energy opportunities and costs for St. Mary's College will be completed. This study will include solar thermal, solar photovoltaic, wind, and biomass generation in the scope of research. As more detailed climate action plan cash flow scenarios are developed, funds for renewable energy systems might be sourced from the plant budget, outside grants, donations, the 2nd EPC, power purchasing agreements (PPAs), and GSMRF.

Currently, the College's renewable energy facilities are limited to a 2kW solar photovoltaic array on the library roof.⁵ Additional projects currently being reviewed include:

1. A 650kW photovoltaic array located on the roof of the Michael P. O'Brien Athletic and Recreation Center would generate approximately 820,000 kWh per year, about 5% of current electrical consumption and roughly 2.5% of overall GHG emissions.

⁵ Geothermal systems were considered an energy efficiency measure vs. renewable energy as the systems installed on campus still necessitated the regular usage of grid electricity.

2. A 1,200 gallon solar thermal water heating system for the showers and laundry facilities of the Michael P. O'Brien Athletic and Recreation Center- Reduce oil consumption by 32,000 gallons per year reducing campus GHG emissions by about 1.5%.

Operational and Behavioral Change

While state-of-the-art, highly efficient facilities and renewable energy systems help to save energy and reduce GHG emissions, some of the swiftest and most cost effective measures towards carbon neutrality are based on the operation of facilities and consumption habits of the College community. The operational and behavioral changes discussed in this section will account for a reduction of 5% of the College's carbon footprint by 2020.

Unlike infrastructural improvements, offsets or fuel purchasing, the rate of operational and behavioral reductions depend upon the sustained commitment of the entire campus community. While a certain degree of behavioral change can be expected as a consequence of the growing concerns over climate change and fiscal waste, optimal improvements will only be had through a ubiquitous appreciation of the consequence of existing inefficiencies. This goal requires the establishment of firm expectations, policies, and most importantly regular public outreach. Policies and programs will be constructed in an inclusive fashion that fosters community buy-in and encourages new and meaningful connections among different campus stakeholders. This will allow these issues to become catalysts for the College's overall efforts as they will foster greater buy-in and support for larger infrastructural projects.

To accomplish this task the College should promote less wasteful energy consumption through awareness building, positive reinforcement, deterrents, and corrective actions. Thus far, the College has been successful in a number of operational improvements including the new four-day, ten-hour summer workday schedule, wherein much of campus shuts down on Thursday evenings instead of Fridays. The College has also tightened operating hours during the academic year by synching energy systems closer with electronic event scheduling software. Furthermore, the switch to a co-mingled, single stream recycling service has allowed the College to steadily increase the campus recycling ratio by over 10% over the past four years. This large operational shift has been supported by numerous other recycling initiatives, including annual participation in Recyclemania and the hiring of student recycling and compost coordinators by the student government.

In the future, projects will focus heavily on awareness building and building operation policies. Specific projects could include the establishment of annual energy savings goals that are supported by monthly reports on energy consumption, as well as participation in the national "Phantom Slayer"

competition. Further incorporation of energy-conservation trainings and announcements both into orientation and the regular school year will also be pursued. The College would also benefit heavily from the establishment of firmer temperature set points and the increased integration of communications technology as an alternative to off-campus travel.

Renewable Energy Credits and Carbon Offsets

The majority of GHG mitigation (70%) will be achieved through the purchase of renewable energy credits and carbon offsets. As noted previously, a student referendum was held in 2007 to see whether students would raise their student fees by \$25 a year to purchase “green power.” The results of the referendum were overwhelming: 96% supported the increase in fees to purchase green power. The Board of Trustees approved the green fee later that year, and the College began purchasing renewable energy credits in FY 08 from Clean Currents, Native Energy, and SMECO.

The College will adhere to the ACUPCC Voluntary Carbon Offset Protocol when purchasing all RECs and offsets. This will ensure that RECs and offsets purchased by the College are of a high quality and meaningfully reduce the amount of GHGs in the atmosphere. By 2015, all emissions deemed “unavoidable” will be mitigated through the purchase of RECs and offsets. These will likely include emissions from student study abroad air travel, college-related business travel, all purchased electricity, fleet vehicle emissions, and all commuting. By 2020, the remaining emissions not mitigated by other strategies will also be annually offset.

B. Cost Modeling for Mitigation Strategies

In keeping with our framework goal to develop a fiscally responsible plan, we have tried to model the anticipated costs of the proposed strategies and compare it with the cost of a business-as-usual scenario. The cost model consists of the total energy expenditure over the next 20 years (2010-2030), including investments in energy efficiency improvements, the purchase and installation of renewable energy systems (and their depreciation), and the purchase of carbon emission offsets. The cost model does not include costs related to travel. All costs presented are at present value (2010).

Given the inherent difficulties associated with forecasting, several assumptions were made to produce the following models. Although these assumptions may appear reasonable today, they will certainly have to be adjusted over time to better reflect the evolution of the energy market. General assumptions are:

- The average annual inflation rate is 3%
- Utility (electricity, #2 oil, and propane) average annual cost increase is 3%

- RECs and carbon offsets average annual cost increase is 7%
- The cost of renewable energy systems decrease at an average annual rate of 3%
- Goals under Maryland's Renewable Portfolio Standard are achieved
- Goals under the Federal CAFÉ standards are achieved

The Business-as-Usual Scenario

This scenario establishes the benchmark upon which the cost of climate mitigation strategies can be compared. As such, this scenario envisions no efficiency upgrades to the college energy systems, no construction of renewable energy system on campus, and no particular effort from the campus community to adjust operations or individual behaviors to reduce energy consumption. Carbon neutrality is achieved by purchasing RECs and carbon offsets only.

Climate Action Plan Scenario

This climate action plan requires investments to be made in renewable energy systems. While the type, size, location, and construction date of renewable energy systems to be installed on campus have not been finalized, a number of projects have been assumed for the purpose of cost modeling only. These include:

1. Year 2012: 650 kW photovoltaic array to be installed on the roof of the Michael P. O'Brien Athletic and Recreation Center. Capital cost: \$4.0M
2. Year 2014: 1,200 gallon solar thermal water heating system for the showers and laundry facilities of the Michael P. O'Brien Athletic and Recreation Center. Capital cost: \$0.25M

This cost model assumes that these systems will be purchased solely by College funds and does not take into account possible grants or donations. The cost model also assumes the College will secure financing at a 6% interest rate over 12 years and that the output efficiency of photovoltaic panels will diminish over 25 years. Furthermore, a combination of energy efficiency upgrades, funded by various sources, has been included. For the purpose of cost modeling these upgrades are assumed to have an average payback of 10 years. The cost model provided herein represents a theoretical implementation strategy for the purpose of understanding the relative financial scale of the Plan's goals. Final implementation strategies will be developed upon the conclusion of the renewable energy feasibility study and the continued financial analysis of anticipated projects. Total anticipated capital costs for the cost model are presented in Figure 9 on the next page.

Figure 9: Estimated Capital Costs of Plan Implementation- CAP Scenario

Strategy (wedge)	Capital Cost	Simple Payback
Operations & Behavior	0	NA
Energy Efficiency	\$4,000,000	10 years
Renewable Energy	\$4,300,000	32 years
Automatic	0	NA
Total:	8,300,000	

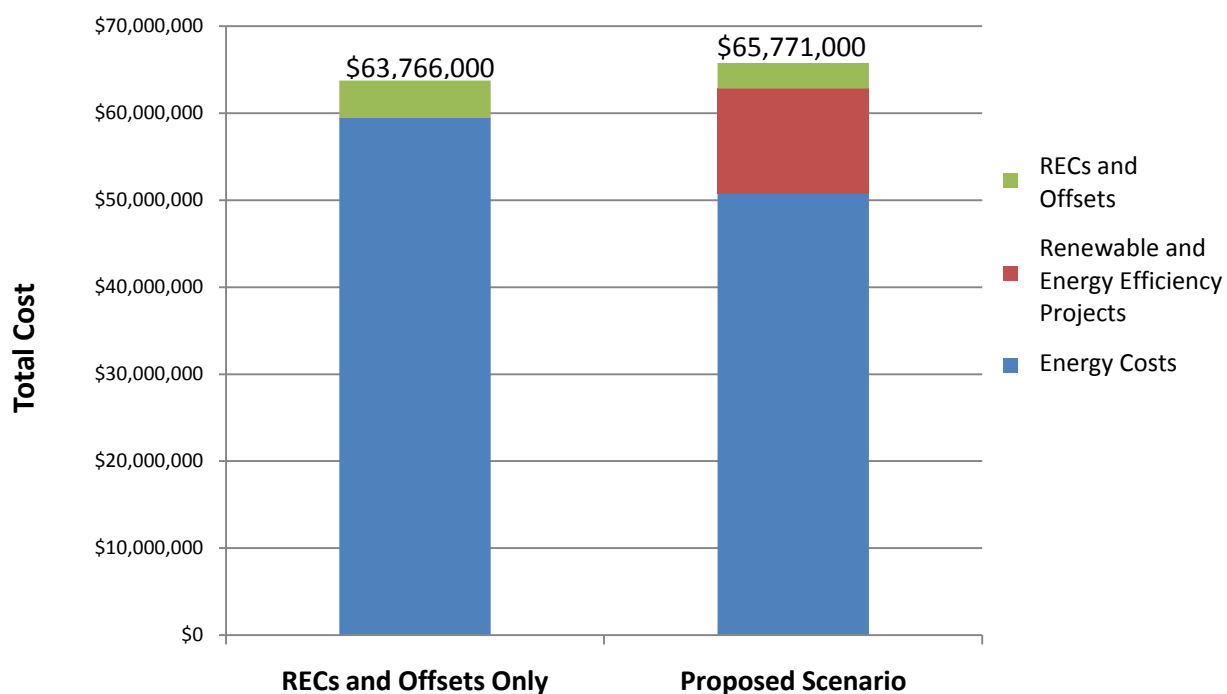
In order to ensure that the plan remained fiscally responsible, annual cost avoidance from each strategy was estimated. These figures are presented below in Figure 10.

Figure 10: Annual Cost Avoidance by Sector upon Plan Completion

Strategy (wedge)	% Reduction Goal	Gross Reduction (tonnes of eCO ₂)	Annual Cost Avoidance
Operations & Behavior	5%	1,092	\$134,000
Energy Efficiency	15%	3,277	\$400,566
Renewable Energy	5%	1,092	\$134,000
Automatic	5%	1,092	\$0
Total:	30%	8,738	\$669,000

Cost avoidance was then subtracted from a business-as-usual scenario in which no special effort was made to mitigate greenhouse gasses. Total project implementation costs were then added to this figure to give an estimate of all energy-related costs for the College. When compared to the business-as-usual scenario, plan implementation for the climate action plan scenario represented approximately a 3% increase in total costs. This demonstrates that the cost for a balanced approach, while not necessarily cheaper, is still an affordable venture for the College.

Figure 11: 2010-2030 Comparative Cost Scenarios



IV. Education, Research and Public Outreach

Perhaps the most important role of colleges and universities in the fight to curb climate change is to educate their students and community about the issue itself. This section provides an overview of our efforts to educate students about climate change and sustainability to date and describes some goals that the College will pursue in the coming years to expand on these efforts.

A. Curricular Offerings Related to Climate Change to Date

The Class of 2005 was the first to graduate students with an Environmental Studies cross-disciplinary minor (ENST). This program examines the relation between the natural world and human life, including scientific, aesthetic, cultural, and political perspectives. Approximately 15 courses with an ENST cross-listing are offered each semester. The diversity of the ENST offerings is such that many students, even those not seeking an ENST minor, take at least one of these courses before graduating from St. Mary's. In 2009, 6% of the student body graduated with an ENST minor, making it the most popular minor conferred by the College. Additionally, several students graduate each year with student-designed majors in environmental studies or a similar field.

In order to graduate with an ENST minor, students must take the "Environmental Perspectives" course, offered in multiple sections every semester. The course exposes students to guest lecturers from

the College and community, while field trips are taken to learn about local and global environmental issues. Climate change bears upon virtually every environmental issue discussed in this class. Other classes also have been offered that deal directly with the science, effects, or solutions to climate change.

In addition to courses offered in the Environmental Studies minor, there has been an increasing number of ENST cross-listed St. Mary's Projects (SMP) completed each year. The St. Mary's Project is an eight-credit senior capstone experience, an independent project consisting of independent research, analysis, or creative expression. Roughly one-third of students pursuing an ENST minor also complete an SMP with an ENST listing. Furthermore, many students completing SMPs in other academic departments also explore issues relating to climate change and sustainability without officially listing their SMP as such with the registrar's office (27 of 220 SMP projects presented by the Class of 2010 included sustainability themes).

ENST Regular Offerings:

ANTH 302: Food and Culture
ANTH 341: Economic and Ecological Anthropology
BIOL 316: Tropical Marine Biology
BIOL 327: Ecology and Diversity of Maryland Plants
BIOL 337: Population/Community Ecology
BIOL 432: Limnology
BIOL 463: Ecology of Coastal Systems
ECON 350: Environmental Economics
ECON 354: Natural Resource Economics
ENGL 102: English Composition, specific sections
ENGL 106: Introduction to Literature, specific sections
ENGL 230: Literary Topics, American Landscapes and/or American Environmental Literature
GEOL 130: Introduction to Geology
PHIL 304: Values Inquiry, Earth Ethics, specific sections
PHIL 321: Environmental Ethics
POSC 461: Studies in American Politics, Seminar on the Environment Section
SOCI 355: Population Problems

Sustainability in the Core Curriculum, First-Year Experience

Adopted in 2008, the Core Curriculum promotes the development of critical thinking, information literacy, and written and oral expression. The Core Curriculum requires all incoming first-years to read one work that is used in all Core 101 seminar courses. Approximately 30 Core 101 seminars are offered each fall semester. Of these seminars, between three and five Core 101 courses with an explicit focus on climate change or sustainability have been offered each year. In 2009, the first-year summer reading material was journalist Elizabeth Kolbert's *Field Notes from a Catastrophe: Man, Nature and Climate Change*. Kolbert also came to St. Mary's that October to speak to students about her work covering climate change.

Co-Curricular Offerings to Date

While the Environmental Studies cross-disciplinary minor is currently the framework by which climate change, sustainability, and environmental studies are offered within the curriculum at St. Mary's, numerous co- and extra-curricular offerings also engage with these topics. Each year the College offers programs in the form of film series, speakers, workshops or other

events that enrich the community's understanding of sustainability, and often, climate change. Specific examples of these programs include St. Mary's participation in Focus the Nation, Recyclemania, and the annual "Polar Bear Splash."

There are also a number of active student organizations through which students directly take control of their education on environmental issues. The two longest running organizations are the St. Mary's Student Environmental Action Coalition (SEAC) and the St. Mary's River Project (SMRP). SEAC is a student-run club that trains and organizes grassroots activists to push for policy changes at both the local and national level. SMRP is a club that teaches public and private elementary school classes in the county about the Chesapeake watershed and the environmental issues it is facing. In the past two years, new groups have added to the traditional offerings from SEAC and SMRP. These include the Chancellor's Point Project and the Campus Garden Club, both focused on local ecology and sustainable agriculture. The College also supports an Eco-Representative program, which focuses on creating a culture of conservation and sustainability amongst the student body. In addition, many clubs also coordinate with one another while acting as members of the College's Sustainability Committee. This organization acts as a coalition of representatives from various student groups, academic departments, and staff offices throughout the College to manage campus sustainability issues.

B. Tactics to Enhance Curricular and Co-curricular Sustainability Offerings

As a college that greatly values creative and intellectual exploration, we must strive to increase educational opportunities relating to environmental issues. While most of such exploration is ultimately in the hands of the individual student and community member, comprehensive resources should be available to benefit the entire community. Outlined below are tactics developed by the Strategic Planning Committee and a student focus group in the public climate action planning sessions. This list conveys some projects already in the works and some of those high on the priority lists of many campus groups.

Encourage students to satisfy their ELAW and "5th hour" requirements with a sustainability focus:

Another way sustainability can become part of the educational experience of all students is by enabling students to fulfill their "Experiencing Liberal Arts in the World" (ELAW) requirement with an environmentally themed endeavor. Students can participate in internships (paid or unpaid) or an independent study with a community focus. Any experience chosen to satisfy the ELAW requirements must carry the equivalent course load of at least four credit hours. More information on the ELAW requirement may be found at <http://www.smcm.edu/firstyear/curriculumoverview.html>. While some students have already opted to satisfy their ELAW requirement through sustainability-related internships or independent studies, the College should encourage more students to satisfy their ELAW requirement in

this way. To this end, representative examples and opportunities to satisfy a “greener ELAW” have been posted on the sustainability web page. (<http://www.smcm.edu/sustainability.html>) Sustainability-themed groups, staff and faculty have also begun encouraging students to satisfy their “5th hour” civic engagement requirement by participating in co-curricular sustainability programs at the College. For example, Dr. Crow’s Fall 2010 Core 101 class, “Fast Food Nation: Modern Agriculture” course will be working at the new Campus Community Farm every week to enhance their knowledge of sustainable agriculture.

Forge closer links between academic departments and facilities to increase project opportunities:

Students have consistently been the flag bearers for sustainable initiatives, including the improvement of our facilities and grounds. While there have been significant successes over the past four years, it has become clear that the ability of students, faculty, and staff to collaborate on projects involving the improvement of campus facilities and grounds could be enhanced. In the spring of 2010, a group of staff and faculty met to discuss how to create a closer bond amongst the campus community in order to provide students with ready opportunities for intellectual exploration while creatively engaging in campus decision making and implementation of more sustainable policies. The challenge this group faces is to find ways to openly and conveniently share information about institutional resources in a mutually beneficial manner.

Publish information about environmentally focused Student-Designed Majors (SDM):

Because the Environmental Studies program can only award a minor at this time, some students have opted to design their own majors for a degree in environmental studies. There will be five students graduating in 2011 with SDMs in environmental studies or similar fields, such as environmental science or environmental policy. Information and examples of successful SDMs with an environmental focus will be placed online for students and advisers’ use.

Maintain on-going support for the Campus Community Farm:

The Campus Community Farm was created in the spring of 2010 to promote sustainable agriculture while locally producing nutritious organic food. The farm is an educational, community-driven venture. The aim of the farm is to unite the College and community in learning about the ecological and historic value of the land and increase environmental stewardship through experiential learning. During the spring of 2010 the farm began with a ¼-acre plot. This size, while able to provide a substantial amount of produce, is small enough to be managed by primarily volunteer labor and the limited resources available at this time. In the next three years the farm can expand to up to five acres, but

will do so only when demand is high enough to support such a size. The College (namely the ENST program, sustainability staff, and Student Government Association,) will continue to support this project.

Develop and distribute sustainable living guides for students, faculty, and staff:

St. Mary's has already developed several "green guides" for students, faculty and staff. While the student guide is distributed electronically during orientation and all guides are posted on the sustainability website, outreach efforts to faculty and staff in particular will be increased in the coming semesters. Means to do so likely will include e-mails, workshops during the popular "brown bag lunch" series, and individual department meetings. Additionally, the current program to train Resident Assistants in ways to live sustainably and promote sustainable living in their residence halls needs to be improved and expanded.

C. Conclusions about Educational and Institutional Efforts

Both educational and institutional efforts have helped to create a sea change in how St. Mary's views itself in the local and global environment. Along with the rise in concern for climate change, the College has seen similar concern and action on other issues regarding the broader scope of environmental stewardship. Inspired in part from the students' actions and passion, the grounds crew now has taken it upon themselves to manage the campus lands as organically as possible. The housekeeping staff has also begun using natural cleaning products for their work. Furthermore the institution's recycling rate has steadily increased over the past three years as the campus has switched to a single stream recycling program. The food services have also improved, purchasing between 40-50% of its food from local or organic sources, a figure set to rise as the new Campus Community Farm expands. The cafeteria now also operates "trayless," a move made in 2008 that has since diminished food waste 23% and saved the College more than \$23,000 annually.

All of these actions to reduce the impact of our campus have earned the College well deserved attention and praise from the local and national media, as well as college reviewing agencies. As such, a "greener St. Mary's" has become one of the cornerstones of our public image. All of these sustainable initiatives reinforce one another and help create the cultural shift necessary to combat climate change, with education being the principle empowering agent behind each and every accomplishment.

V. Conclusion

It is vital that St. Mary's College act now to swiftly curb its greenhouse gas (GHG) emissions. Implementing the framework outlined in this Climate Action Plan will reduce gross GHG emissions 30% and net GHG emissions 100% by 2020. Reducing the College's emissions is the most effective

protection for the College against climate change. As our preliminary cost-modeling shows, when looked at over a 20-year period, the cost of plan implementation is similar to the College's otherwise expected costs. If the window of cost observation were increased, the benefits of investments in efficiency and renewable energy would become all the more compelling. Furthermore, the Climate Action Plan will allow the College to appreciate a number of co-benefits, including long-term cost savings and improved marketability.

Most importantly however, the St. Mary's framework Climate Action Plan ensures that the College shoulders its share of climate change mitigation. As the Intergovernmental Panel on Climate Change, and more locally the Maryland Commission on Climate Change have stated, some of negative effects associated with climate change are inevitable. Even if the government, private sector and individuals around the globe summon the necessary moral and political courage to meet this challenge head-on the planet may still see unprecedented changes. In Maryland this will mean wetter winters and hotter summers. It will exert added stress to an already imperiled Chesapeake Bay, and hasten ecological degradation in areas like St. Mary's County. However, by joining the American College and University Presidents' Climate Commitment, St. Mary's College of Maryland has committed to being a model for how schools and larger communities can address climate change. In pursuing climate neutrality, the College will help mitigate local threats to the environment as well as those affecting the global community.