

# Sustainability Case Paper

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## Purpose

The sustainability field is relatively new and often requires interdisciplinary teams to tackle complex global challenges. These uniquely assembled teams might find difficulty working together, which could inadvertently cause ethical conflict. For example, an environmental scientist's thoughts or point of view might very well differ from an economist yet they both could be correct in their assumption or core belief. This rift is common in the sustainability field, and sustainable engineers can potentially alleviate, who could act as an intermediary. By mitigating the effect of polarized views, sustainable engineers can prevent significant conflict between stakeholders and risk of ethical dilemmas under the fundamental canon principles, specifically the fourth canon principle.

Our dynamic planet presents complex challenges – from human-induced to naturally occurring events, which require thoughtful, sustainable solutions from interdisciplinary teams. In some cases, the formidable challenge abides by the canon principle: engineers shall act in professional matters for each employer or client as faithful agents or trustees and shall avoid conflicts of interest (Canon 4). When examining Lafayette College's interdisciplinary team's effort to design and develop a biomass farm on their campus, we will expand on potential hazards and how they can be mitigated or resolved by any conflicts of interest.

Interdisciplinary teams are necessary for the field of sustainability. Without these teams of trained professionals in their respected fields, the individuals on the team will potentially be in breach of the second canon principle: engineers shall perform services only in the areas of their competence (Canon 2). Through the example of Lafayette College, we will delve deeper into how this principle can impact individuals and the team.

The term sustainability is somewhat new in a historical context. Throughout history, we face a moral dilemma, a difficult decision caused by two paths of action (Google, 2019). This paper will examine the moments in time that led to projects like Lafayette College's biomass farm. In doing so, we will outline and point out the moral dilemma society has faced for nearly two centuries.

## Case Overview

Assistant Professor Dwayne Breger, Civil and Environmental Engineer at Lafayette College, brought twelve students together to utilize farmland owned by the college to design a biomass farm. The group of students pursuing degrees in civil, environmental, mechanical, and chemical engineering with an additional five students majoring in biology, geology, and environmental geoscience. Many students also sought minors in other fields from economics and business to government and law. Together— these students with a vast knowledge in a wide range of disciplines contributed toward the design, development, and implementation of harvesting alternative sources of renewable energy through their biomass farm and on-campus steam plant.

Engineering is a broad term used to define a person's occupation generally recognized as a branch of science and technology. Dr. Breger understood he would need to assemble a diverse team of engineers to perform in their esteemed competencies upon the successful design and development of a biomass farm (Canon, 2). Two civil engineers would be bound to the farm's structure, but only a mechanical engineer can develop the machinery made to operate the biomass farm. This same competency principle exhibited when reviewing the individual abilities of the twelve-person team.

Sustainability does not define by a department, discipline, or field. Those practicing are found across industry not just relating to the sciences and technology as seen in Dr. Breger's team. From business to government backgrounds, the sustainability field applies. Being it Dr. Breger's diverse team brings forth several thought patterns, beliefs, principles, and views. Knowingly or unknowingly will present the probability for the team or team members to unavoidably breach conflict of interest (Canon, 4). The question is how to mitigate the likely event of a conflict of interest to transpire and use this team's novel situation as an advantage for a bright resolution.

Moral dilemmas appear in many forms. Closely related to canon's fourth principle, Dr. Breger's team is full of members who share separate obligations, duties, and ideals. Throughout history, we have observed individual published works in conflict with other profession's ideals that often provoke a moral dilemma between two or more parties. Fortunately, in Dr. Breger's case, these conflicting ideas evoking a moral predicament can be discussed and lessened throughout the stages of design and development.

## Scope Limitations

Inside or specific, detailed accounts and information about Lafayette Colleges biomass project are limited in scope. Understanding how the twelve students from Lafayette College cooperated and worked together will be absent from this paper. Outside sources will be utilized to examine how these twelve students might have encountered, experienced, and resolved any ethical moral dilemmas.

## Background

Sustainability examines the long-term ecological balance and management of Earth's natural resources to avoid depletion and ensure a healthy quality of life for future generations (Asheim, 1994). This field places a precedent on economic, environmental, and social aspects of all decisions otherwise known as the triple bottom line or sustainable triangle. For instance, a community who shares a pond stocked with fish must not take too little or much. An ecological imbalance will incur if a community does not catch enough fish from the stocked pond based on the fish reproduction rate and will eventually lead to lesser quality of that resource. However, the quality of life for the community will diminish if an individual catch too many fish and will lead to a proportion of community members becoming malnourished. Balancing a community's natural resources or commons like a stocked pond of fish face the moral dilemma of under or overfishing.

A brief historical timeline spanning two centuries defines a few key moments which led to the creation of projects as seen by Lafayette College Biomass Farm.

- *Walden, or Life in the Woods* first sparked public discussion, questioning the effects of Industrialization and Urbanization near the turn of the 19th century
  - (Thoreau, 1854).
- A Swedish chemist by the name of Svante Arrhenius secures a place in history through his publication released in 1896 that models the greenhouse gas effect caused by the burning of fossil fuels
  - (Crawford, 2019).
- Geophysicist and astronomer, Milutin Milankovitch, devise a theory in the 1920s detailing climatic cycles between the Earth and Solar orbit influenced the prehistoric ice age, which garnered support by renown scientist, Alfred Wegner

- (NASA, 2000).
- A team of four NASA scientist in the 1960s led by Dr. Andrew A. Lacis and member James Hansen controversially declare trapped CO<sub>2</sub> in our atmosphere will lead to global warming
  - (NASA, 2007).
- Garrett Hardin extended Thoreau's observations when publishing the *Tragedy of the Commons* in 1968, inferred that shared resources like water or air, humans tend to take more than their share and the commons becomes degraded
  - (Hardin, 1968).
- Dawn of climatic change and term of global warming popularized by Al Gore but based on Wallace Broecker's scientific study, *Climate Change: Are We on the Brink of a pronounced Global Warming*.
  - (Broecker, 1975)
- NASA's Goddard Institute of Space Studies report confirms Lacis' team and Broecker research of the global temperature increase caused by trapped CO<sub>2</sub> in our atmosphere
  - (Hansen, 1981).
- The concept of sustainability first appeared in a United Nations report defined as the avoidance of the depletion of natural resources in order to maintain an ecological balance
  - (Brundtland Commission, 1987).
- United Nations acknowledge Earth's climatic patterns as a potential threat and in 2000 191 UN member states set eight millennium development goals (MDGs)
  - (United Nations Development Program, 2019).

- Elinor Ostrom, who won the Nobel Prize in Economics in 2009 by publishing, *Governing the Commons*, showed that the only way to protect the commons is to have grass-roots and small scale stake-holders
  - (Ostrom, 2015).
- United Nations decide to replace the eight MDGs with seventeen Sustainable Development Goals (SDGs) in 2012
  - (United Nations Development Program, 2019).

A liberal arts school located in Easton, Pennsylvania is home to a relatively small Lafayette College. The campus nestles inland between two major east coast cities, New York City and Philadelphia no more than 100 miles apart. With a mission to nurture the inquiring mind and to integrate intellectual, social, and personal growth, Lafayette College maintains a strong engineering and computer science program (Lafayette College, 2019). These core values become quintessential for Dr. Dwayne Breger's team of twelve students.

Renewable energy is organic, naturally recurring sources of energy that do not deplete after use (EIA, 2018). Biomass like nuclear or solar power is a naturally replenishing renewable energy source that converts organic plant or animal matter into energy via a wide assortment of methods, most notably by the process of photosynthesis— plant absorbs the Sun's energy (EIA, 2018). From animal to human sewage to agriculture crops and wood all these sources and more can be processed to generate electricity, heat buildings, or convert into gas (EIA, 2018).

## Discussion

Canon 2 – Working to a professional's competency, Canon 4 – Avoiding conflicts of interest and moral dilemmas are three significant ethical considerations presented. Society has been fighting an ongoing ethical paradox for over two centuries. Only until recently has this environmental imbalance been deemed a credible threat by policymakers and mainstream media. It is important to note the initial warning proposed by an author competing against contemporaries whom some might consider a traditionalistic, peacenik bohemian. A point in time when society was getting a first taste of the benefits to urbanize and industrialize, a technological tipping point and much-needed advancement for civilization to be where it is today and foolish to not pursue.

The question society must ask is how it learns from this historical theme which came to be known as the birth of sustainability. Knowing it took nearly 200 years to open discussion involving the moral dilemma between industrializing and protecting our environment. Where following Canon's fourth principle, the historical theme could not be more pronounced and difficult to manage. Do we follow a democratic-based, social conscious value system and a capitalistic-based economy or turn to socialism. Will reverting to renewable energy from fossil fuels lead to the betterment of our environment or alter our dynamic planets natural, ever-evolving progressions. Do we solve one challenge and create two and maybe three more. Answers to these questions unfold as we continue to make history by each rotation on the Earth's axis and seemingly weightless revolution around our star, the Sun. All that is known is the complex nature of deciphering truth before the fact. Anything else is solely a matter of assumption, interpretation, and perspective.

Managing moral dilemmas is an obscurely, complex task that raises caution when mediating between different cultures or core beliefs. Canon four, avoiding conflict of



interest, share a comparable philosophy. Seen through Dr. Breger's team of twelve students one may only imagine the conflicting beliefs and values stirred by the individuals who share different educational backgrounds. An environmental engineer opposing opinions with the civil and mechanical engineer can be affected by multiple factors. Being the amount of energy, they want to transform into power or the type of material they want to convert chemical energy to kinetic, mechanical, and electrical power. The environmental engineer might believe waste is the better, more sustainable resource, whereas the mechanical engineer assumes algae or plants is an easier, more compatible option in respect to the on-campus steam plant producing a more sustainable power-loss ratio. Deciding which renewable resource to process is only the introductory factor to calculate and discuss amongst the team of twelve.

Assuming the team has agreed upon the initial plans to construct the biomass farm, Canon 2 – working to a professional's competency, becomes a vital principle to follow for Dr. Breger's team. With no shortcuts to follow, Dr. Breger's team is thoroughly necessary, as a biological engineer has absolutely no notion or expertise to wiring the facility to the local grid. By doing so, Dr. Breger and the biological engineer face the pressing threat of being balled from employment, following malpractice accusations, and potential legal ramifications if anything were to go wrong or be made public.

## Case Conclusion

Pennsylvania's, Lafayette College is home to biomass farm built in a joint collaborative effort by a group of students and faculty. Spearheading development, professor Dr. Dwayne Breger handpicks a select few of twelve students with a wide range of disciplines. Utilizing

an existing steam power plant found on-campus, the biomass farm provides clean, renewable energy for Lafayette College.

Biomass comes in different forms typically from the process of photosynthesis when a plant absorbs the Sun's energy. Energy (DC – Direct Current) converts into electricity (AC – Alternating Current), heat, or gas through waste, crops, and organic decay. An on-campus steam plant permits the ability to harness energy and convert it into power. By amassing a diverse team of qualified professionals in their respected fields, the biomass farm can be designed and developed without any infringement of the second canon principle. Bypassing the breach of Canon's second principle makes the team susceptible to moral dilemmas and Canon's fourth principle.

There is seemingly no escaping a conflict of interest or moral dilemma in Dr. Breger's team case. There is only one way to circumvent a conflict of interest or moral dilemma which is to face it head-on. This philosophy might not be advisable by someone following the canon principles. Based on the team's structure, by working together and coming to an ethical understanding might be the only alternative for the team throughout all the stages of development.

## Ethical Discussion Summary

Working to a professional's competency, avoiding conflicts of interest, and combating moral dilemmas are the three ethical issues put into consideration for Lafayette College's team of twelve students and lead professor, Dr. Dwayne Breger.

The term and profession of an engineer share a broad connotation. Reviewing the second canon principle, working to a professional's competency, it comes to show despite being an

engineer, an engineer does not exhibit the aptitude to complete all tasks that encompass a single project. Whether developing sustainable projects like a biomass farm or an office building, a team must have the appropriate personnel and expertise for all stages of development to complete the project successfully.

A team must exercise caution when approaching the fourth canon principle and avoid any potential conflicts of interest whether it be in the conceptual design or throughout the course of development. The sustainability field spans across various disciplines from engineering to political science. By placing precedence on patience, understanding, and mindfulness, interdisciplinary teams can avoid future conflicts of interests.

Throughout history, we have shown times of progression and regression. Progression when improving technologies like the cell phone. Regression while uncertainty leads to the deconstruction or negligence of traditional or contemporary technologies that share a subtle yet applicable and beneficial purpose. Whether if we properly adapt, accept, and address scientific findings like Arrhenius Greenhouse Gas Effect in 1896 or Thoreau's observational effects of urbanization and industrialization in 1854. Efficient communication techniques, advisement, and awareness of relevant past occurrences can be exercised to circumvent moral dilemmas.

Moral dilemma, conflict of interest, and professional competency are the three ethical paradox discovered in observation of Lafayette College's biomass farm. Thoughtfulness and inquisitiveness are two essential traits that dominate the sustainability field. Adopting efficiency and punctuality will bring fourth fluidity amongst future challenging objectives.

## Recommendations

Institutions around the nation should take notice to Lafayette College's effort in developing their own biomass farm. Regardless of the outcome, it provides a benefit for the university to exploit. Be it marketing toward future students to preparing current students for industry. Institutions aspiring to have competitive programs might strongly consider adopting and transitioning to project-based credited courses potentially spanning a student's four-year term.

The industrialized concept of memorizing and standardization does not provide students or faculty with the ability to open up development for skills such as critical thinking or emotional intelligence. Importantly to note, what was once memorized or answered correctly on multiple choice has been long forgotten upon the time of graduation and often not apply to a professional's daily duties. Leaving employers with the responsibility to retrain their newly hired employees with knowledge absent, and much-needed skills to perform their responsibilities. By combing short answer to multiple choice questions could be the rudimental step toward the transition to a project-based curriculum, allowing students to explain how they found this answer correct.

Higher education programs that do not plan to adopt these learning opportunities ultimately provide a disservice to their students, faculty, staff, and surrounding communities. Upon every project executed, delivers a new aid for the community or department improvement of an existing facility at a saving. If you were to take a poll, universities might find there is no proper incentive to match the heightened demand for mentees with an undersupply of available faculty mentors.

Canon two, performing tasks to one's competence. Maintaining an accurate sense of one's abilities, professionals must not have this principle limit their own personal or professional growth. A fundamental ethical tool that must not confine the natural cycle of improving upon current or future professional growth. Recognition of your limitations as a professional is crucial to achieving a sense of where you are and want to be.

Canon four, avoiding conflicting interest. On the surface, appears to be anticipated quite easily. Situational dependent, there can be subtle differences between what one can define as a conflict of interest. Practicing self-awareness and demonstrating a high level of character can be the main factors leading to the avoidance of any conflict of interest. Intuition and listening to your gut, instinct can potentially lead to a lesser tendency of breaching this principle.

Moral dilemma, a difficult decision caused by two paths of action. We witness the paradoxical dilemma throughout the course of history time and time again. Society cannot avoid nor ignore the issues that transpire. The only reasoning left is for civilization to take a step back and reflect upon similar occurrences and not be caught in the crossfire of both sides for a solution to present itself. No matter the chosen party, the truth will reveal itself upon the facts placed by all parties involved. Hostility will lead to aggressive conflict where goodwill leads to passive discord. Balanced reasoning will be the ultimate deciding voice.

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