# **Brighten Up Caroline Pilot Study**

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### **INTRODUCTION**

#### Importance of the Study

Through the "Brighten Up Caroline" program, every household in Caroline will be receiving 12 LED light bulbs to replace all of their older bulbs. However, this is a large undertaking that needs to be tested out first. This project is a smaller pilot study to determine if it is feasible to distribute this many lightbulbs to approximately 1500 homes in the town. The main questions and goals are to determine how the residents will react, if these bulbs are something they want, the optimal method of distribution, and how much of the science of energy efficiency the researchers need to explain to the residents. This was accomplished through a pilot experiment with a series of surveys of residences, when the researchers will talk with the families, ask questions, and indirectly raise awareness of this program. The data from this pilot study will be used to extrapolate to the entire Caroline population, before running the full-scale program in 2019.

The Brighten Up Caroline project is important because it is the intersection of academics, politics, and reality. With the degradation of the environment and the rapid increase in global climate change, sustainability on a global scale is of paramount importance. This unique project is the town of Caroline's way to not only improve sustainability in the world, but also affect policy decisions for years to come. This longterm change can occur through the changing of environmental attitudes by addressing both cognition and affect (Pooley & O'Connor 2000). In this project, Caroline residents will receive more information on the importance of environmental preservation, which addresses cognition, as well as six LEDs, which may influence their feelings on the issue, due to the benefits of switching to newer, sustainable technologies, which addresses affect. Through this program, the town of Caroline will also be able to use academic resources and scientific data to reduce their carbon footprint and help preserve the environment. LEDs are up to 80% more efficient than incandescent bulbs ("How Energy-Efficient Light Bulbs"), so this is Caroline's way of making a difference in the world, while other governments, companies, and individuals are constantly polluting and destroying our planet. In the end, the goal of this project is to help Caroline become more sustainable, use less energy, and produce less material waste. In particular, the usage of LEDs over incandescent lights is important because many LEDs use only 1/10 the power of incandescent light bulbs (Schubert & Kim 2005). This could help individuals consume considerably less energy, reducing our dependence on fossil fuels and natural gas. Furthermore, this experiment is important to help individuals move past the initial high cost of LEDs. This high cost may dissuade families from changing their light bulbs, but it causes them to forget what they may save in the long run. As of 2012, LEDs result in an ownership cost of \$0.77/Mlmh (dollars per mega

lumen hour) while incandescents result in a cost of \$5.63/Mlmh (Tsao 2004). Calculated over the course of one's life, the cost of an incandescent far exceed that of an LED, but it is important for families to fully grasp that information. The pilot experiment being conducted is also important because it allows for testing before jumping into the large project. Caroline is trying to recreate this on a much larger scale, but a small experiment is necessary to iron out any issues and ensure that this project is feasible, before running a full-scale program.

To conduct this experiment, it is important to consider a number of different environmental attitudes, as different individuals will feel differently about their responsibility towards the environment. In fact, both cognition/beliefs and affect/emotions predict individual attitudes towards the environment (Pooley & O'Connor 2000). For example, an individual's "connectedness" to the environment may primarily affect his/her attitudes towards the environment. This connectedness refers to how closely he feels his life is to the environment as a whole, and whether or not the state of the environment affects him. Building off of this, selfishness and selflessness also affect environmental attitudes, as a selfish individual may not accept small personal hardships for the benefit of the environment. Furthermore, LEDs specifically emit a very harsh, bright light that some feel detracts from the HER process of homeyness. This reduction in homeyness may result in the lack of use of LEDs. Other factors include universalism, power, tradition, benevolence, and security, each of which further affect how one views and responds to the environment (Schultz & Zelezny 1999).

#### Caroline Background

Caroline, NY is a relatively small, rural town in upstate New York with a population of over 3,000 residents as of 2010 ("Caroline, New York"). Extending for 55 square miles, Caroline has a relatively low population density of about 60 people per square mile. On average, there are 2.3 people per household with a median age of 40.3 years old. The most common source of energy is oil/kerosene at 26% of Caroline, closely followed by natural gas at 25% ("Caroline, New York"). With over 50% of household energy coming from non-renewable sources, the residents of Caroline and the environment would benefit from switching to a clean, renewable source of energy. In 2006, a group of public officials and town residents came together to form "Energy Independent Caroline," an organization that promoted energy conservation and renewable energy. Their largest event, Lighten Up Caroline! occurred in 2008, when the organization and its volunteers travelled to every household in Caroline to distribute a free compact fluorescent light bulb (CFL). This was a significant achievement, as it was a step towards reduced expenditure on energy, less energy usage, and less hazardous wastes. With an overall cost of less than \$5,000 and a combined saving of about \$74,000 over the course of the lifetime of the CFLs, the Lighten Up Caroline! project was quite a

success (Blair, 2011). However, the goal of elimination of dependence on non-renewable energy sources in Caroline still exists, prompting the EIC to begin planning for *Brighten Up Caroline!*, a new project with the goal of providing 12 light-emitting diodes (LEDs) to each Caroline household. This project is so important because of the major benefits from LEDs.

In 2019, the Town of Caroline is planning to distribute the 12 LED bulbs to the approximately 1,500 households in the town. After the 2008 Lighten Up Project, the town board is trying to determine how interested people are in the new plan and how receptive they will be. In this pilot program, groups left flyer notices on the doors of Caroline residences a week before going to the homes and asking the residents to complete a short survey in exchange for six LED bulbs. The 2019 Brighten Up Caroline Project will be different from the 2008 Lighten Up Caroline Project because it will not be an option to leave a dozen bulbs on the porch of houses when residents are not home. During this pilot project, the researchers asked residents for the best way to give the lightbulbs to them in the hopes of gaining some insight to where residents generally go or when they are usually home.

Before conducting the survey, information about the reasoning behind the Brighten Up Project was provided to residents. The Town Board of Caroline has been trying to introduce more sustainable energy sources into the town, such as LED light bulbs, wind energy, solar energy, and heat pumps. With LED bulbs having five times the lifespan of CFLs, they are going to produce less material waste because they do not need to be changed so often (Lim et. al., 2012). While LED bulbs are still considered hazardous due to their composition and material content (Lim et. al., 2012), they are a better alternative for energy usage because they use 75-80% less electricity than incandescents and 15-20% less energy than CFLs (US Department of Energy).

#### **Proposed Research Plan**

As a pilot for the 2019 Brighten Up Caroline Initiative, a group of Cornell students went door to door on a few streets in Caroline and putting up flyers explaining the project on everyone's doors. This was only for a small group of houses, as it is a small pilot to prepare for the large-scale future project. The next week, the students went back to the houses and asked residents to complete surveys. These surveys provided a better idea of how to reach out to residents, the opinions that they have, and the demographics of the town. After conducting these surveys, the students handed out the six lightbulbs. Ideally, the students would have onducted follow-up interviews with the residents after another week. It should be noted that the Cornell students were not able to fulfill this part of the proposal, but there may be measures taken by the leaders of the Brighten Up project to complete the follow up interviews.

# LITERATURE REVIEW

#### Environmental Attitudes Toward LED Lighting: A Literature Review

In 2008, the Town of Caroline in Tompkins County gave each of its resident's households one CFL lightbulb in a project called "Lighten Up Caroline". This project was one to promote decreasing energy consumption and increase the sustainable living in their community. Now, ten years later, the town is trying to find a way to distribute 12 LEDs to each of the 1,550 households in the town. In order to create a distribution plan, research must be done about general environmental attitudes of Americans and smaller demographics within America, best marketing strategies to encourage sustainable choices, and the benefits that LEDs have (and the potential benefit they pose to Caroline). The following is important background information about the process of designing a way to distribute the LED bulbs and what effect the bulbs will have on the Caroline community.

#### Factors That Affect Environmental Attitudes and Opinions

Environmental psychologists from the California State University, San Marlos, published an article in 1999 about the kinds of attitudes that individuals can have toward environmental protection and sustainability. Their research delved into 14 different countries and compared environmental attitudes of each. They measured how much people cared about themselves, other humans, and the planet. It was found that by testing 15 personal values (such as being traditional, powerful, self-directed, benevolent, etc.) they could determine what type of environmental attitude people were most closely associated with. The three attitudes they were testing for were the New Environmental Paradigm (humans are dependent on the earth for survival), ecocentric (the earth and its beings should all be valued, regardless of humans' need to use natural resources), and anthropocentric (humans are the most important part of the earth and their needs should be met at all costs). These are three extremely severe attitude types, but each country had some percentage mix of those attitudes among their test subjects. In the U.S., the test subjects' values were those most closely aligned with ecocentrism, but there was still a distribution of values across the NEP and anthropocentrism. This study shows how a population may have a general environmental attitude, but there are many factors which affect individuals' attitudes (Schultz & Zelenzy, 1999).

Similar to the above findings, psychologists Julie Ann Pooley and Moira O'Connor of Edith Cowan University in Perth, Australia did research about how to go about changing environmental attitudes. They discovered that in order to change people's minds about environmental protection and preservation, it is not a matter of education but examining their emotions and moral values and trying to change those. If emotions and values can be altered, the environmental opinions of an individual will be altered, more than just providing them with knowledge about environmental protection (O'Connor & Pooley, 2000).

#### How to Change Peoples Environmental Behaviors to Be More Sustainable

A study done by the UK Department of the Environment, Food, and Rural Affairs looked into how to best influence citizens to adopt sustainable lifestyles. Their research found that "marginal improvements" were more widely received than plans to make significant lifestyle changes right away. An article about developing more sustainable lifestyles in the UK that discusses this research also found that social marketing is a great tool to help influence sustainable lifestyles. Social marketing is exactly what Caroline is doing; getting a group of people invested in a proposal and having individuals be part of the marketing for that proposal. The UK research determined that individuals are more likely to respond positively to change when local government and consumers are already supporting and marketing it personally (Barr, et. al., 2011).

In an article published by MIT Sloan Management Review that is targeted toward large firms trying to adopt green initiatives, the struggle to get people on board is acknowledged. Authors Jill Ginsberg and Paul Bloom say that "consumers are unlikely to compromise on product attributes such as convenience, availability, price, quality and performance to buy green products", which is as true as it is for large firms as it is for the small Town of Caroline (Ginsberg & Bloom, 2004). Convenience in this case is key to having support of environmentally sustainable initiatives, and the Town of Caroline is on the right track with their initiatives to deliver these (free) bulbs and make it as easy as they can for residents to get them.

There will be challenges faced in the task to implement more sustainable lighting sources into Caroline homes, which Per Espen Stoknes addresses in his book about climate change and sustainable living. His research shows that the more people are bombarded with fearful or guilt-inducing stories of environmental destruction caused by the human race, the less receptive they are to change their way of living. In order to get people to listen to why conserving energy and resources matters, creative questions should be posed. If you give someone the facts about climate change and then ask them, "how can we change this?", you are more likely to get a creative or enthusiastic answer that will excited someone than you would have if told "you need to change your ways of living". Stoknes also says that hopeful stories about how the planet has bounced back from damage before (and will again) help people to feel more empowered to change their lifestyles and not simply give up on sustainability because "the earth is doomed" (Stoknes, 2015).

#### How LED Bulbs Can Benefit Caroline Residents

LED bulbs may seem like an expensive jump for a small payoff to some people, but research done by Finish scientists shows that implementing LEDs into large sums of

households will cut energy usage and carbon dioxide emissions significantly. The Caroline Town Council has expressed interest in other green initiatives such as solar power and heat pumps, so the idea that LEDs could be a significant source of energy consumption would be a positive to the town council and the residents. The study of energy consumption estimates from over two million households in Finland compares energy usage of LEDs to other types of light bulbs, with LEDs being the best choice for lowering energy consumption (Tetri, et. al., 2008).

In an experiment performed by the Institute of Solar Energy at the Polytechnic University of Madrid in Spain, LEDs were piloted in a program that was testing solar energy with different types of lightbulbs. The solar energy was best utilized and controlled with the LED bulbs; this is something for Caroline residents to think of when they are trying to determine the future benefits that LED bulbs have. If Caroline ever decides to use solar power, LED bulbs will be the best compliment to that solar energy (Calderón et. al., 2015).

As with any form of technology, there are downfalls to using LED light bulbs. A report published by Californian and South Korean scientists in the Environmental Science and Technology Journal weights the benefits of LEDs with the disadvantages. Like any other type of artificial light source, LEDs will not last forever and will need to be replaced. However, they have longer lives than incandescent bulbs and CFLs. The LED bulbs are also considered hazardous material, but so are CFLs (Lim, et. al., 2013). No light bulb is perfect because almost no technology is perfect; this kind of bulb is just the best option for trying to conserve energy and reduce environmental harm.

#### Conclusions

The Town of Caroline and the Town Council should take into consideration the research that has been done about environmental attitudes, marketing strategies for environmental initiatives, and the factors that affect how individuals will respond to sustainable initiatives. There has been research done about LEDs in general, but Caroline will be creating a one-of-a-kind lightbulb distribution program so there are no precedents set for their procedure of distribution, only background knowledge to help them determine a procedure.

## **METHODS**

In the final implementation of the pilot study, the students began by hanging up flyers (Appendix A) on the doors of 30 houses on 3 streets of Caroline. This provided residents with information of the project and a time for when the students would be returning. The 30 flyers were spread out and placed in about an hour. The next week on Saturday between 12:30 and 1:05 pm, the students returned in a small group on and spoke with four households. The interactions began with an explanation of the project

and the reasoning for conducting it. The residents were then asked to fill out a fiveminute survey before they each received 6 LED light bulbs in a "soft white" color. Finally, the residents were thanked before being informed that they would receive a follow up call/email in the next few weeks about the installation of the bulbs. Each interaction took about 5-10 minutes. The follow up interview was not conducted, but will be scheduled in the near future. Although these methods reflect how the pilot was conducted, they are different from the initial proposed method, which can be found in Appendix C.

# **FINDINGS**

### Results

The pilot study showed that Fuller Lane mainly consisted of duplexes, where two families live in a house split in two halves. The demographics were mainly younger individuals who were renting out the houses. The researchers spoke to two white males, one white female, one African American male, and were rejected by one white female. Every household involved in the pilot had pets and three of the four had children (the fourth was not clear). They all provided contact information for a follow up. Also, these families were relatively new to the area and had only lived in Caroline for a few years max. They all indicated on their survey that they were pursuing greater energy efficiency, but they each were at different stages of having energy efficient houses. For example, some were still using incandescent light bulbs, while others had double or triple window paned glass. About half of the households reported that they use mainly LEDs already. None of the households hired a qualified contractor to do an energy audit, but all reported that they turn off the lights and water when they're not in use. One interesting comment that came from the surveys was that some of the households were waiting for their incandescent light bulbs to go out before buying or installing LEDs. Consequently, they still used incandescents, even though they had the means and ability to use LEDs.

#### Discussion

Based on the results of the study, there were many flaws discovered that affect the conclusions being drawn. The pilot had a very small sample size that was not an accurate representation of the Caroline population. The street where all the surveys were given, Fuller Lane, is comprised of renting tenants who are newer to the area, and those surveyed were not representative of Caroline's diversity. Furthermore, because they do not own the homes, it is possible that they are less invested in installing energy-efficient process and appliances in their residences. This may also be the reason why none had an energy audit previously performed on their houses. Consequently, a larger study is required to get a better understanding of the diversity of families in Caroline, as well as to conduct a project that would be more successful.

The four people surveyed were all at different stages of energy efficiency, some already using LEDs, while some never turned the thermostat down when leaving the house. They all stated opinions of environmental concern and were understanding of the fact that their actions have a larger impact on the environment. One subject surveyed admitted that Caroline is "diverse in personal and political views" and recognized that not everyone is incredibly invested in pursuing energy efficient practices. The fact that all of the sample showed care in some ways, like turning off faucets and lights when not in use, shows that at least a portion of the Caroline population will be receptive to the distribution of 12 LED bulbs and interviews conducted in 2019. However, it may be important to adjust the program in a way to accommodate the different stages of energy efficiency. It would not help much to give a family 12 new LED light bulbs if they already use only LEDs. The money spent on those 12 light bulbs (which may not be used for years if the family already has working LEDs) would be better spent on alternative sources of energy efficiency, such as a free reduced-water-flow shower head. This new facet to the program would help accommodate more households.

Those surveyed who already were using LED lights also showed greater care for energy efficiency. Others understood the benefits of LEDs but were waiting for their CFLs and/or incandescents to go out before installing LEDs. This will be an issue when it is time to check the installation status of the bulbs. Although it is understandable that residents would want to wait until the useful life of their current bulbs is over before making the switch to LEDs, there needs to be a larger effort from the researchers to sway the households to make the switch immediately. If the purpose of the program is to improve energy efficiency right now, there should be an addition to the program where the residents might receive more information or motivation to make the change immediately rather than wait. Fortunately for the researchers, all those surveyed provided contact information (phone numbers or emails), should the Brighten Up project choose to contact them following this pilot program. This demonstrates not only interest, but willingness to become further involved with the Brighten Up project from 100% of those surveyed. Additionally, due to the small sample size, there were no conclusions able to be drawn about race or age demographics. The one person contacted who chose not to be surveyed is not a surprise; in a voluntary study there are likely going to be people asked who will decline to participate.

#### RECOMMENDATIONS

#### Full-Scale Brighten Up Caroline

For the distribution of LED bulbs to every household in Caroline, going door-todoor with 1 week of advanced notice will be an efficient and feasible way to get the bulbs to residents. For the pilot, the placement of poster notices on houses a week before distribution provided enough time for people to be home and ready to be surveyed. However, advanced notice is key. If people are aware what time bulbs will be handed out, it is likely that they will make sure to be home during that time. It is recommended to complete this stage (hanging up flyers) in one day. If the Brighten Up Project could create a position for a social media promoter, that is recommended as well. Having frequent posts on Facebook, Instagram, or Twitter will keep the project in social media user's view. With the amount of time before the full-scale project in 2019, a promoter for the program has the opportunity to get the word out about the project in ways that will appeal to Caroline's residents which use social media. It is likely that the project leaders in Caroline could find a student willing to run their social media campaign for little to no charge, however it may be a better way to reach out to the Caroline residents if someone from Caroline would run those accounts. This way they would be present in Caroline to take photos for the accounts, interact with the public, and share stories of residents who have already started using the LED bulbs.

Although this pilot study was too small to make large conclusions, extrapolation of the timeline for the pilot can provide a rough estimate of hours and manpower required. The researchers posted flyers on 30 houses on three separate streets in about 1 hour. To flyer all of the approximate 1500 households in Caroline, it would take 50 hours. With 15 teams of two people each, each team would have to spend a little less than 3.5 hours flyering.

Suggestions for the distribution day of the project include ensuring that all of the volunteers are knowledgeable and prepared to prime the residents before giving out the surveys. For example, volunteers can explain that "changing light bulbs in a house is a concrete way to help the environment. LED light bulbs perform better and are more energy efficient than CFL light bulbs. Along with this, LEDs leave less of an environmental impact when properly disposed than CFL light bulbs because of the materials used. The materials - aluminum, copper, gold, lead, silver and zinc - used can have impacts on health (Lim et al 2012)." These priming statements may help the residents be more receptive to the survey and promote the quick installation of the LEDs. Another recommendation is to use technology to conduct surveys. It may be advisable to create a Google Form with all of the survey questions (rather than a paper survey) to conserve paper and align with the project's cause. This would also make it easier on the volunteers, as they would be able to bring their own laptop/tablet rather than carrying around large stacks of paper surveys. Furthermore, it is advisable is to compile and bring paper reading materials to be left with the residents about the impacts the LEDs can have on a single household. Many times words can be fleeting and easily forgotten after a few minutes, but information on paper will probably stay with the family for longer and have a better chance of resulting in concrete change. It may also be beneficial to suggest ideas of alternate smaller steps (like line-drying

laundry) and larger steps (like installing a heat pump) to create more energy efficiency in the home. In many cases, if a household is willing to make one change (to LEDs), they will be willing to implement other changes as well. It is imperative the program managers of Brighten Up Caroline use this to their benefit and make the most of their time with the residents! Furthermore, alternate free items may be beneficial. As mentioned earlier, the families surveyed were at different stages of energy efficient houses. Some were already using all LEDs, so providing them with more LEDs will not have much of an effect. Instead, consider providing low-water-flow shower heads or water-conserving sink faucets to further lower the residence's environmental impact. Again, a rough timeline for the distribution can be estimated from an extrapolation of the pilot study. A single team of researchers surveyed 4 households in about 30 minutes. This means it would take 187.5 hours to survey each of the approximately 1500 households in Caroline. With 25 teams of 2 people each, it would take each team 7.5 hours to complete the distribution. This could also be split up over the course of Saturday and Sunday so that each day requires less than 4 hours of surveying per team. Again, it is important to note that this timeline is based off of the pilot study data, which had a small sample size and may not be from a representative sample.

Following the distribution, it is recommended that the Brighten Up Caroline leaders contact the residents one month after they have received their bulbs to ask for confirmation of installation. They can call or email the residents (depending on the preference noted in the initial survey) and request verbal confirmation for installation. If they have already been installed, pictures could be sent to a contact email that Mark or another Brighten Up Caroline representative can answer. If they have not yet been installed, representatives can ask why not. If they are waiting for the incandescents or CFLs to die out, the team may provide contact information for a Brighten Up Caroline representative and ask them to contact them when they finally do install the LEDs. If they have just been too busy to install, let them know that they will be contacted again in two weeks to check on the installation status again. This follow up also provides a time for the program managers to ask further interview questions, based on the results of the preliminary survey. The initial findings will provide a starting point and will also allow researchers to assess behavioral attitudes of the participants to best format the follow up interviews.

#### Improvements to the Pilot Program

In this research study, the pilot program was supposed to reflect the opinions of the town's population and get an idea of what the environmental attitudes of Caroline residents are. Unfortunately, the small sample size prevented the gathering of data across demographics. There was a non-diverse group of residents interviewed: adults early 20's to late 40's, 75% Caucasian and 25% African American, and all of whom were renting tenants. In order to get a better idea of the attitudes of Caroline residents as a

whole, this study could have included different neighborhoods to be interviewed, where there will likely be more diversity in age, race, income, and environmental outlook. A larger period of time for the pilot would also have been beneficial, as the follow up interviews were not included in the pilot due to time restraints. A test run of the follow up interviews would have provided more information about the feasibility of this part of the program.

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# **TEAM BIOGRAPHIES**

Sophie is a freshman in the S.C. Johnson College of Business's School of Hotel Administration. Her background in hospitality and customer service will allow her to interact with Caroline residents, while focusing on their needs and comfort during the surveys. Sophie grew up not far from Caroline, so if locals have issues with the project, Sophie will be able to relate and empathize with them while showing her connection to them as a Tompkins County resident, not just a Cornell student.

Ankit is a junior studying biology in the College of Arts and Sciences. He does cell and molecular biology research in the Smolka Lab and is very involved in Cornell Habitat for Humanity and the Cornell Undergraduate Research Board. With experience speaking in front of large groups of people through CURB, Ankit plans to be a strong contributor to the interviewing aspect of the project.

## **APPENDIXES**

Appendix A – Flyer

# ATTENTION CAROLINE RESIDENTS

# ARE YOU INTERESTED IN SAVING MONEY and SAVING ENERGY?

#### What's Happening:

**Brighten Up Caroline** is a 2 part, grant-funded program to offer every Caroline household enough energy efficient LED lightbulbs to replace all or most of their current lightbulbs & replace all of Caroline's municipal streetlights with LED street light bulbs. They have partnered with **Cornell University** to find out how to make Caroline more energy efficient

When is this Happening: SATURDAY, APRIL 21, 10AM-2PM, students will be going house to house to talk with residents about their energy consumption and environmental attitudes.

Why you should Participate: Participants will receive up to six LED lightbulbs per household! Help you save money and reduce your environmental impact.



#### Appendix B - Surveys



Pilot Survey - Spring 2018

**Brighten-up Caroline** is a two-part, grant-funded program proposal to offer every Caroline household enough energy efficient LED lightbulbs to replace all or most of their current lightbulbs, and replace all of Caroline's municipal streetlights with energy efficient LED street light bulbs. These two projects will save lots of energy (estimated at 840 Mwh) resulting in lower electricity costs for Caroline residents and reducing the taxpayer dollars spent on streetlighting for the Town. This pilot for the program is through a partnership with Cornell University's Introduction to Environmental Psychology class. After you fill out this survey, you will be awarded six LED lightbulbs curtesy of the Town of Caroline

Start time:

For each of the following actions in your home, do			
you(check appropriate box)	Often	Sometimes	Never
1. Turn off lights and water when not in use			
2. Unplug appliances when not in use			
3. Turn down thermostat when leaving home			
4. Use fans instead of the air conditioner			
5. Raise the temperature setting a few degrees on the air conditioner			
6. Replace old windows with double or triple paned glass			
7. Buy one or more high efficiency appliance(s)			
8. Hire a qualified contractor to do an energy audit			

9. Do you pursue greater energy efficiency in your home?

No

10. If no, please circle the most important reason that prevents you from pursuing greater

energy efficiency in your home?

Lack of time

Lack of money

Yes

It is difficult to change energy habits

Energy efficiency is not a major concern for my family

Other

11. How many of the various types of lightbulbs do you currently use in your home? (Circle your best estimate for each type)

Bulb Type	None	1-2	Several	Most	All
Incandescent bulbs					
CFL bulbs					
LED bulbs					
Other					

12. If you use incandescent bulbs, what single factor is most preventing you from changing your lighting to newer, more efficient light bulbs such as LEDs? Cost of LEDs/alternatives Not willing to change energy habits Energy efficiency is not a concern for our household Other 13. If LEDs or other new lighting products are used in the home, what was the reason for adopting this product? Environmental concern Energy efficiency Social trends, influence from peers Other 14. When thinking of my household energy use, saving money on my utility bills is more important to me than environmental concerns. Agree Neutral Disagree 15. I am concerned that energy efficiency measures will reduce the comfort that I currently feel in my home. Neutral Disagree Agree 16. Do you use any other energy efficient measures in your home? Yes No

17. If yes, what other energy efficiency measures do you use in your home?

- 18. How do you rate your <u>concern</u> for the environment on a scale from 1 to 5? Please circle your response:
  Least Concerned 1 2 3 4 5 Most Concerned
- 19. How do you rate how much impact <u>your actions</u> have on the environment? Please circle your response:
  Least Impact 1 2 3 4 5 Most Impact
- 20. How do you rate your interest in your home being energy efficient? Please circle your response:
  Least Impact 1 2 3 4 5 Most Impact
- 21. Did you take part in Lighten Up Caroline, a town-wide project in 2007 that gave a fluorescent lightbulb to every household in Caroline and asked residents about their efforts on saving energy?
   Yes No
- 22. What were your feelings towards that event?
- 23. How do you think town residents will respond to the Brighten Up Caroline program mentioned at the beginning of the survey?

24. Are you willing to provide a telephone number or email address for us to contact you to confirm that you installed the LED lightbulbs? Yes No If yes, please provide the best way to contact you here: 25. How old are you? Under 12 years old 12-17 years old 18-24 years old 25-34 years old 35-44 years old 45-54 years old 55-64 years old 65-74 years old 75 years or older 26. What ethnicity do you identify with? White Hispanic or Latino Black or African American Native American or American Indian Asian / Pacific Islander Other I do not wish to provide this information 27. What religion do you identify with? Buddhism Christianity; specify denomination \_ Hinduism Islam Judaism Other I do not follow a religion I do not wish to provide this information

28. Which best describes your level of education?

Some high school Technical or vocational high school training Some college 2-year college graduate 4-year college graduate Graduate school

29. Which best describes your households annual gross income?

Less than 25,000 25,000 to 49,999 50,000 to 74,999 75,000 to 99,999 100,000 to 124,999 125,000 to 150,000 More than 150,000

Thank you for participating in our survey!

End Time: \_\_\_\_\_

#### Appendix C - Original Proposed Methodology

#### Proposed Research Plan

This proposal for the new Brighten Up Project is to conduct surveys over the phone with members of the community so that there is an active involvement and no dependence on the residents to mail in their answers. There will be an option for an additional, more in-depth interview that will (if the resident chooses to participate) provide even more information about the reasoning behind the resident's opinion of LED bulbs and sustainability. There will be two options for the follow-up interview: one being another phone interview, and the other would be to meet in personal at, for example, the town hall. In our short phone interview, the participants will be informed of the impact of LED light bulbs, and how they can influence their life. After that, they will be asked a series of questions about their energy usage, their level of environmental concern, and the demographics to which they belong.

The research plan is multifaceted. In this, the students hope to gain an understanding of the environmental attitudes of the Caroline population. As of 2010 data, Caroline has a population of 3,282 with an average household size being 2.3 people per house (Caroline, New York 2018). Caroline census will be used in a computer program that will randomly choose 50 households to be called to be part of the participant pool. This will take away any fear of bias towards who is to be interviewed and will provide the best possible data to give to the Brighten Up Caroline project.

The phone survey questions are listed here:

- Have you ever heard of Brighten Up Caroline? If yes, were you part of the first initiative, Lighten Up Caroline?
- What type of light bulbs do you use right now?
- When did you last change your lightbulbs?
- Approximately how long do you leave your lights on during an average day?
- Did you know that an LED light bulb has approximately twenty-five times the lifespan of an incandescent lightbulb, while using less energy, thereby saving you money?
- How many people live in your home and what are their ages?
- How would you best describe the home you live in? Would it be an apartment, a one-story home, a two-story home, a duplex, a cottage, or something else?
- What are your feelings towards environmental sustainability (on a scale of 1 to 10, 1 being little to no concern and 10 being extremely concerned)?
- When the time comes, what would be the best way for you to receive your new LED light bulbs, and realistically would you consider changing them yourself?

• Is it better for you to meet at the Town Hall, local grocery store, or for us to bring them to your house?

Following the phone survey, they will be thanked for their time and be reminded to come to the Town Hall at the specific time for the 12 free LEDs (if this is approved by Brighten Up Caroline). This process would target a subgroup of households in Caroline owned by individuals at the time of 2010, because this data is originally from the 2010 census. Therefore, the individuals called would be those who have lived in Caroline for at least 8 years. The individuals interviewed to would be an even smaller subset of this group of 50 called, as it is projected to be less than 50 who are interested in speaking with researchers on the phone.

#### Proposed Interviews

After the phone surveys occur, the optional follow-up interviews will be scheduled will participants who expressed interest in the project. These interviews will be conducted informally and for an undesignated period of time when the participants come to pick up the lightbulbs at the Town Hall. The interviewers will be prepped with knowledge about the Lighten Up Project, the proposed Brighten Up Project, and other initiatives that Caroline may be trying to adopt in the future (i.e. solar power and heat pumps). The interviewer should also have background knowledge about climate change and be in support of the idea that using LED bulbs will help to conserve energy, therefore reducing carbon emissions and being more sustainable.

As psychologist Per Espen Stoknes (2015) recommends, researchers will not badger the interviewees about the fearful situations that are to come if environmentally sustainable initiatives are not put into place. Creating a comfortable environment for the interview is ideal for getting the most honest and not "canned" or "should be" answers. If facts are given to the interviewees, then they can comment their opinions and researchers can try to gain knowledge and ideas from them. In this interview, it may be able to determine if there is a demographic trend in environmental attitudes (i.e. NEP, ecocentric, anthropocentric).

One of the researchers in the Cornell student group is a Tompkins County native, so that element of locality and relatability can be used as an advantage. Sophie understands that small towns' priorities may not be sustainable initiatives, but along with Ankit's help, the group will be to explain to interviewees why sustainable light sources are a big step for a town even as smaller as Caroline.

#### **Observations**

Beyond the explicit answers to the survey and interview questions, we can also collect data from the individuals' demeanor through observation. For example, data is immediately apparent when we call the households, regardless of if they respond or not. Simply by determining how many households pick up the phone call (and how many do not), we will have data on how likely we are to be well-received by the residents of Caroline. This will give us an initial group to work with, while showing us if we need to make a major change to our approach (if we are largely not well-received) or if we can continue with the current proposal.

Observations will continue while on the phone with the residents, as we will be able to listen to their tone of voice to determine how they feel about our questions and about the environment

as a whole, regardless of their individual answers. Participants' interest in an in-person interview also reveals more information about their involvement and willingness to be a part of this project, further telling us if our approach is acceptable or if we need a change.

We can only hope to get a diverse set of interviewees, but in all likelihood, it is probably that those who want to be interviewed will be those who are environmentally conscious and/or already in support of the Brighten Up Project. By asking our interview questions, it will be obvious who is knowledgeable about this subject matter, who is not, and who does not care to be knowledgeable about sustainable initiatives. All of the data and information we receive will be recorded through notes we take on paper. Finally, we will be able to observe nonverbal cues from the participants during interviews, such as facial expressions and body movement, as these can be by-products of mental thoughts and provide further methods to analyze individual environmental attitudes (Zeisel 1981). However, it can be difficult for interviewers to objectively score a participant's nonverbal cues. For example, Zeisel (1981) explains that empathy may amplify an observer's recorded thoughts on a participant, resulting in descriptions with improper emotions. Thus, it is important for the interviewer to either be trained or score participants on their environmental concern, relative to the other participants.

#### Appendix D - Follow-Up Interview Questions

- What is your background knowledge, if any, on environmental protection and/or sustainable initiatives?
- What are some of your ideas to help Caroline become more eco-friendly?
- How do you currently play a role in reducing your energy/natural resource consumption? (Examples: short showers, hanging laundry out to dry, etc.)
- If given the LED bulbs, how soon after receiving them would you conceivably be able to install them yourself? Do you anticipate needing assistance in the installation?
- Do you think this initiative will cause a substantial change in the energy consumption and sustainability of the Caroline population?

After they answer, we can provide more information about how much of an impact these bulbs will have for individual households and the town as a whole