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## The Case for a Green Economy

Achraf El Madnaoui, Sai Surya Cheedella, Kenechukwu Okolo, Kingfey Wang, Pranav Jatin,  
Aryan Agrawal

Principal Investigator: Sakshi Priya

Affiliation: International Socioeconomics Laboratory and Patna University.

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### Abstract

In recent years, it has become clear that how we produce energy determines the future of our economic and environmental prosperity; affordable, reliable, and decarbonized energy systems are critical to preserving this future. This has prompted many people, including us, to take a closer look at the broad concept of a "Green Economy," what it entails, and how we can best transition to it. This study investigated the viability and appeal of the green economy and analyzed homeowner response data to better understand which factors influenced the decision to switch to solar and why the homeowners made the switch. A sample of 159 homeowners from the United States and a few foreign countries completed a Google form with multiple choice, multiple selection, and open-ended questions. The questions were used to assess the relationship between our independent variables: income bracket, location, and solar panel ownership, and the dependent variables: attitude toward solar panels (motivation to switch, hesitations, willingness to spend and convictions). The results indicated that the main drawbacks of switching to solar are (a) the cost; solar energy is expensive/overpriced and out of reach for the average American, with nearly 90% of respondents saying they will not spend more than \$7500, despite the fact that the average initial cost runs up to \$13,320. (b) Lack of information; there is insufficient information about solar energy. (c) Excess regulations, which vary by town, make the process of installing solar panels tedious and confusing (d) Strict regulations make local electricians unable to install solar, causing prices to be high because installation companies charge a premium. Contrary to our initial hypothesis, income is not correlated to propensity of an individual to install solar panels, in fact the establishment of a correlation between these two variables is due to chance 9.7% of the time. Implications of this study can inspire policy change and reduce regulations to ease panel installation while also increasing pollution monitoring enforcement and implementing systems to incentivize corporations to go greener. This research will also provide a better understanding of solar energy and the importance of transitioning to a green economy.

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Categories: Environment, Economy

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## Introduction

In the United States and several other countries around the globe, fossil fuels are the most important sources of energy production. Today, the combustion of fossil fuels such as oil, coal, and gas provide approximately 80% of our energy needs and as the population and economy grow rapidly, we can easily predict that this percentage will increase. While this growth is beneficial economically, it has unavoidable negative externalities such as threats to the environment and our lives. The combustion of fossil fuels emits gases and chemicals into the atmosphere, and in an especially destructive feedback loop, air pollution not only contributes to but also exacerbates climate change. According to a 2014 EPA study, carbon dioxide accounted for 81% of total greenhouse gas emissions in the United States, with methane accounting for 11% (Mackenzie,2016), both of which are byproducts of the combustion of fossil fuels. This brings up a long-running debate: “Do you compromise the economy to save the environment, or do you compromise the environment to save the economy?” Such discussions, in particular, emphasize the significance of transitioning to a green economy.

A green economy is one that promotes both sustainability and economic growth. It is a viable alternative to today's dominant economic model, which exacerbates inequalities, promotes waste, causes resource scarcity, and poses widespread threats to the environment and human health.

The transition to a green economy can be accomplished in a variety of ways, but we have focused on one that is most critical: the power sector. Cleaner energy resources such as solar energy produce negligible or no greenhouse gas emissions, switching to them as our main source of energy, would reduce pollution and greenhouse gas emissions, which fossil fuels are primarily responsible for. Furthermore, solar panels have been widely available for mass consumption since 1963, and the benefits of this renewable energy on the environment, economy, and people's daily lives have been widely accepted by the majority of environmental scientists, green engineers, and economists.

Despite all of this data to support the transition to solar energy, only 6% of American homeowners claim to have installed solar panels on their properties as of 2019 (Kennedy & Thigpen, 2019). There is clearly a problem, and research in this area appears to be lacking. This provides an opportunity to conduct research and analyze response data from homeowners both nationally and overseas, to better understand the socioeconomic status of individuals purchasing solar panels and what factors influenced their decision to switch. This research aims to provide insight to the feasibility and appeal of a green economy and aid the local and state to put more effort into making this transition a reality.

## Background Information

### *Environmental Incentives:*

The contribution of solar energy to the global and United States electricity supply is moderate but

growing at a rapid pace—a consequence of steep reductions in the cost of solar energy, and in the United States, a host of policy measures at the state and federal level. At the federal level, the United States has invested in various programs that provide direct financial assistance to solar power projects, such as the investment tax credit. In addition, the federal government has designed a targeted research program called the SunShot Initiative in an ambitious attempt to bring in new and revamped solar technologies to market and to reduce the overall costs of deploying existing technologies. One of the central goals of this initiative is to reduce the total installation cost of utility solar photovoltaics to \$1 per Wdc by 2021, as well as other concomitant reductions in the cost of solar replacements and applications. In the long run, these initiatives aim to strengthen the role of solar as a low-cost source of energy and motivate higher levels of electricity supply through the use of solar.

Achieving the aforementioned cost reductions would drive profound and long-lasting implications for the solar industry, the electricity sector as a whole, end-use electricity consumer, and the environment. Considerable progress has already been made in meeting the intended cost goals, though success by 2021. The Department of Energy recently released the SunShot Vision Study to provide an in-depth assessment of the great potential of solar technologies and to evaluate the environmental implications of reaching the SunShot cost objectives. The study explicitly recommends that the overall solar electricity penetrations of annual U.S. electricity demand be at 14% by 2020 and 27% by 2030 (DOE, 2012). While these estimates are detailed and time-sensitive, they do not comprehensively quantify the significant environmental and health advantages associated with achieving such levels of solar penetration.

The environmental and public health benefits of solar energy stem from averting the harmful usage of combustion-based electricity generation. Depending on the fuel and technology type, combustion-based electricity generation emits greenhouse gases into the atmosphere and releases nitrogen oxides. These pollutants contribute to ozone air pollution. Breathing elevation concentrations of ozone can dramatically reduce lung function, making it more difficult to breathe deeply and vigorously.

#### *Global Energy Resources:*

Current global energy consumption is  $4.1 \times 10^{17}$  J annually. Projected population and economic growth are predicted to more than double this consumption rate by 2040 and more than triple it by 2100. Ergo, in order to adequately boost global primary energy supply, a prospective energy resource must be utilized that can provide a minimum of 1-10 TW of power for an extended period of time. Moreover, the existential threat of climate change creates an extra requirement on prospective energy resources: they must generate energy without emitting any form of greenhouse gases. Fortunately, solar energy meets both of these requirements.

It is important to note that solar energy is diffuse and intermittent, so it must be harnessed in a system of effective storage and distribution. This is imperative to matching supply with demand.

#### **Specific Aims and Objectives**

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Renewable energy sources play a vital role in securing sustainable energy with lower emissions<sup>1</sup>. Renewable energy technologies significantly cover electricity demand and most importantly, guarantee a sustainable path for the future. This research paper seeks to double down on the overall appeal of a Green Economy transition, as well as the unique benefits of using renewable energy sources like solar.

Most importantly, this investigation aims to discern whether or not the average American resident should make the switch to solar. “Do the benefits outweigh the concerns?” We believe so.

Additionally, we conducted several tests to evaluate and analyze our collected data. This includes ANOVA tests, frequency tables, and a descriptive diagram. These tests will allow us to turn our units of data into quantifiable information that can then be used to deduce the appeal of a Green Economy. Through this, we hope to provide insight into the feasibility of a Green Economy transition, and hopefully aid local and state politicians in putting more effort into making this transition a reality.

### **Materials & Methods**

Our research study was taken in the form of a google form and specifically qualitative data was used. The Google form had 4 sections and nearly 12 questions that the participants had to answer. The questions came in the form of multiple-choice, multiple selections, and open-ended. The initial target for the form was only residents living in New York, but through later research, it was found that a majority of residents living in New York do not have any control over the use of solar panels wherever they are living. That is our research group expanded the form to the United States as a whole, and a few foreign locations which gave our research a wider perspective and enhanced its reliability. The plan was to have more than 100 responses like that will be able to further our study and show the reason as to why the subjects are not using solar panels, and what can the government or private companies do to help in their own opinions. The total number of responses was 159, which exceeded our research group's expectations. The people who were answering the questions were targeted to be homeowners, as they have the say whether they are going to install the solar panels or not. The main aim for the google form was to determine what motivated people to switch to solar energy, and why the homeowners switched. Our research study wanted to look at the changing factors and variables. We wanted to see if that could be enhanced and do it country-wide to make solar energy accessible to further save the environment. They were many different categorical questions asked in the survey to further analyze the public opinion towards a green life.

The independent variables are the income brackets, and whether they have solar panels installed and their location. The dependent variables are their motivation to switch to solar, their hesitations to switch to solar, and what would convince them to solar, and if you were to switch to solar how much would the subjects spend. As stated early the questions were divided up into mainly 3 different sections. In the first section, the first question that was asked was the town that the subject lives in. This question is important because depending on where they live, it is questionable whether they can install solar panels or not. For example, in New York, it is highly unlikely that residents can set up their solar panels. While in Edison New Jersey it is easier to set

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up solar panels as many residents are homeowners. The next question would be the income bracket, and our research group made this optional even though the form was unanimous. The income bracket is significant because if the subject had a low income, that could be their reason as to why they do not want to switch to solar. If the subject fits into the high-income bracket, then, the reason as to why they have not switched to solar is different and evidently, that is what the entire research study is about. The third question was an opinionated question on whether the subjects care about the negative health effects that fossil fuel creates. The options were strongly disagree, disagree, neutral, agree, and strongly agree. Several questions were given the same options, and these options were used to show the audience real opinion and would be used for the main research aim. The fourth question is whether the subjects care about the negative environmental effects that fossil fuels produce. Again, they were given the same options: strongly disagree, disagree, neutral, agree, and strongly agree. This question showed whether the audience cared about the environment at all, and how did that correlate towards opinion on solar panels. The fifth question was a rating question, and it was how would you rate the use of solar panels in your town from 1-5. This question was asked to give our group an idea of how solar panels are used in their town in the first place. The 6th question is whether the subject already has solar panels. This question is crucial to the study, if the subject said yes then the rest of the questions would be aimed towards why the subject switched to solar, and if the subject said no the question would be why not? The second section is for mainly people who said yes. The 7th question was would you recommend getting solar based on your experience. The options were yes and no, and we were wondering what the answers from those who would be already have solar. The 8th question was a rating question from extremely diffusion to extremely easy and the question was how easy it is to maintain solar panels. Although solar panels do provide the same amount of electricity the normal fossil fuel provider does it does cost a lot to maintain.

The third and final section was aimed at the people who do not have solar panels and do not use solar energy. The 9th question was an open-ended question listing all the reasons as to why you are hesitating to switch solar. Our group used open-ended as a form of answering the question because we felt that the response would vary as the circumstances would vary. We decided to break it down into 2 sections so it would be easier for the data analysis. The 10th question was if any family or friends had any solar panels, and this was used to determine if the environment of the subject was solar and if it was how is that going to affect them. The 11th question is a select all apply question was it was what would motivate you to switch over to solar energy. The options were learning more about the benefits of solar energy, tax benefits, I would not like to switch, and others. Depending on the subject's responses we could enhance and scale into reality, by actually doing it. The final question of the form is how much you would be willing to speed on solar energy. This question is important because depending on the number of tax benefits, and incentives could help the increased use of solar energy.

## Results / Data Analysis

### Frequency Tables ▼

Frequencies for Which town do you live in? (If you live in a larger city, please state the specific neighborhood) ▼

Which town do you live in? (If you live in a larger city, please state the specific neighborhood)	Frequency	Percent	Valid Percent	Cumulative Percent
Austin, TX	1	0.629	0.741	0.741
Bedford Park, NJ	1	0.629	0.741	1.481
Bridgewater, NJ	1	0.629	0.741	2.222
Bronx, NY	6	3.774	4.444	6.667
Brooklyn, NY	5	3.145	3.704	10.370
Brooklyn, NY	3	1.887	2.222	12.593
Charlotte, NC	9	5.660	6.667	19.259
Dhaka, Bangladesh	1	0.629	0.741	20.000
East Windsor, NJ	1	0.629	0.741	20.741
Edison, NJ	19	11.950	14.074	34.815
Edison, NJ	1	0.629	0.741	35.556
Fort Lauderdale, FL	1	0.629	0.741	36.296
Franklin Park, NJ	1	0.629	0.741	37.037
Hagerstown, MD	1	0.629	0.741	37.778
Houston, TX	1	0.629	0.741	38.519
Hyderabad, Telengana	7	4.403	5.185	43.704
Iselin, NJ	1	0.629	0.741	44.444
Kendall Park, NJ	1	0.629	0.741	45.185
Lagos, Nigeria	1	0.629	0.741	45.926
Lake Hiawatha, NJ	1	0.629	0.741	46.667
Loma Linda, CA	1	0.629	0.741	47.407
Long Island, NY	2	1.258	1.481	48.889
Manhattan, NY	5	3.145	3.704	52.593
Maple Ridge, BC, Canada	1	0.629	0.741	53.333
Middlesex, NJ	1	0.629	0.741	54.074
Milpitas, CA	1	0.629	0.741	54.815
Monroe, NJ	6	3.774	4.444	59.259
Montgomery, NJ	1	0.629	0.741	60.000
Parsippany, NJ	1	0.629	0.741	60.741
Patna, Bihar	2	1.258	1.481	62.222
Piscataway, NJ	19	11.950	14.074	76.296
Plia2, TX	1	0.629	0.741	77.037
Queens, NY	2	1.258	1.481	78.519
Queens, NY	15	9.434	11.111	89.630
Richmond, VA	1	0.629	0.741	90.370
Staten Island, NY	6	3.774	4.444	94.815
Sugar Land, TX	1	0.629	0.741	95.556
Toronto, Canada	1	0.629	0.741	96.296
Vancouver, Canada	1	0.629	0.741	97.037
Virginia Beach, VA	2	1.258	1.481	98.519
West Windsor, NC	1	0.629	0.741	99.259
Woodbridge, NJ	1	0.629	0.741	100.000
Missing	24	15.094		
Total	159	100.000		

Due to the lack of current published work possessing a household-esque view towards solar energy / panels, our primary source of data collection came in the form of a survey distributed to over 150 people to gain insight regarding individual sentiments towards this form of green energy. As a precursor to the actual results and data analysis, it is important to consider the tables above which contain information regarding the location and income bracket of participants who filled out the survey. Clearly, most of the participants lived in the greater New Jersey / New York area, so while the results may be influenced by norms of the area, due to strong similarities between this region and the others from where participants resided, they can be applied on a larger scale. Also looking at income, a spread between all income brackets is depicted, highlighting this idea that results reflect all socioeconomic classes and are not skewed towards specific groups.

### Frequency Tables ▼

Frequencies for Which income bracket do you fall into?

Which income bracket do you fall into?	Frequency	Percent	Valid Percent	Cumulative Percent
500	1	0.629	0.730	0.730
5000	6	3.774	4.380	5.109
25000	22	13.836	16.058	21.168
60000	14	8.805	10.219	31.387
120000	67	42.138	48.905	80.292
205000	21	13.208	15.328	95.620
375000	5	3.145	3.650	99.270
500000	1	0.629	0.730	100.000
Missing	22	13.836		
Total	159	100.000		

### Frequency Tables

Frequencies for Do you currently have solar panels installed?

Do you currently have solar panels installed?	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	12	7.547	7.547	7.547
No	147	92.453	92.453	100.000
Missing	0	0.000		
Total	159	100.000		

Utilizing the results from the survey conducted, a frequency table was created to analyze how many of the candidates had solar panels installed or were in the process of installation. The results as seen in the table above display that of the 159 participants that filled out the survey, only 12, around 7.5%, reported having solar panels installed. This mirrors the findings from major research organizations, such as the Pew Research Center, which stated that 6% of American homeowners had solar panels installed, establishing the fact that findings are very similar throughout (Pew Research, 2020).

### ANOVA

ANOVA – Which income bracket do you fall into?

Cases	Sum of Squares	df	Mean Square	F	p
Do you currently have solar panels installed?	1.650e +10	1	1.650e +10	2.785	0.097
Residuals	7.996e +11	135	5.923e +9		

Note. Type III Sum of Squares

Initially, income was hypothesized to be a major determinant of an individual’s sentiments towards solar energy in the sense that higher income individuals would already have solar panels installed or would be more than willing to install them as they have the means to. After conducting several ANOVA tests (tests designed to determine if survey / experiment results are significant) on the data collected to test this theory, it has been proven false. Holding all other factors constant, the propensity for individuals to install solar panels was found to be unrelated to the independent variable of one’s wealth as seen from the table above, the p value of 0.097 establishes this idea that the correlation of the two factors is due to chance around 9.7% of the time. This value is higher than the accepted baseline of 5% proving this idea that income is not a predictor of solar panel installation.

**ANOVA**

ANOVA – Please list all the reasons why you are hesitating to switch to solar.

Cases	Sum of Squares	df	Mean Square	F	p
Which income bracket do you fall into?	24.293	5	4.859	0.812	0.544
Residuals	640.610	107	5.987		

Note. Type III Sum of Squares

A second ANOVA test was run to determine whether income had an impact on the major concern’s individuals had when it came to switching to solar panels. The major concerns individuals had been grouped into 9 different categories ranging from High Installation Costs to Weather Constraints, and much more. They can all individually be seen in the table below. In this ANOVA test, each of these categories were held constant and it was found that income was not a predictor of which hesitation / concern individuals had. As seen in the table above, the p-value of 0.544 reflects this idea that any correlation between income and determining these hesitations would be due to random chance 54.4% of the time. Since the likelihood of chance is much higher than the accepted value of 5%, these two factors are completely unrelated. As a whole, these past two ANOVA tests are significant as they reveal a greater truth in that the limited adoption of solar panels is not related to the economic wellbeing of an individual.

**Frequency Tables**

Frequencies for Please list all the reasons why you are hesitating to switch to solar.

Please list all the reasons why you are hesitating to switch to solar.	Frequency	Percent	Valid Percent	Cumulative Percent
High Initial Costs	64	40.252	47.761	47.761
Live in Rental / Townhome (No Choice to Switch)	23	14.465	17.164	64.925
Decision To Be Made By Parents	12	7.547	8.955	73.881
Not Available / Accessible in Area	9	5.660	6.716	80.597
Newly Moved / Installed New Roof	3	1.887	2.239	82.836
Weather Constraints / Exposure of Sun	3	1.887	2.239	85.075
Lack of Information / Want to Learn More	11	6.918	8.209	93.284
Concerns Over Installation	3	1.887	2.239	95.522
No Hesitation	6	3.774	4.478	100.000
Missing	25	15.723		
Total	159	100.000		



Rather, at all socio-economic standpoints, solar panels are avoided as they are intrinsically seen as being overpriced with almost 48% of all participants who don't have panels admitting to shying away due to high initial costs (as seen in the frequency table above).

**Frequency Tables ▼**

Frequencies for If you were to switch over to solar panels, how much would you be willing to spend? (Including tax and other benefits)

If you were to switch over to solar panels, how much would you be willing to spend? (Including tax and other benefits)	Frequency	Percent	Valid Percent	Cumulative Percent
2500	100	62.881	68.027	68.027
7500	33	20.755	22.449	90.476
12500	12	7.547	8.103	98.639
17500	2	1.258	1.361	100.000
Missing	12	7.547		
Total	159	100.000		

Rightfully so, solar panels are by no means cheap as average installation costs for a 6kW system with \$3 per watt gross cost averages \$13,320. As seen from the table above regarding data as to how much homeowners would be willing to spend on solar, almost 90% would not spend more than \$7500 on solar, proving that at its current average price point solar remains out of reach for almost all-American homeowners.

**Descriptive Statistics**

**Descriptive Statistics**

	Which income bracket do you fall into?	Please list all the reasons why you are hesitating to switch to solar.
Valid	137	134
Missing	22	25
Mean	117813.869	2.761
Std. Deviation	84155.646	2.432
Minimum	500.000	1.000
Maximum	500000.000	9.000

The average income is around \$118000, so an average \$13,320 investment in solar energy is about 11.2% of the total average income without taking taxes into account. This is a lot for a person to spend on solar energy as they have to spend on other things such as food, clothes, and entertainment. This again shows us that solar energy is extremely expensive to invest in. Furthermore, the table below shows that only 7.5% of people surveyed have solar panels, so there is still a long way to go to achieve complete solar penetration. The issue of pricing is not the only debacle mass solar energy installation faces. There is the issue regarding the lack of information individuals have regarding solar in terms of who can install, how can this progress be started, the benefits of solar and so forth. Potential buyers have limited knowledge of this technology and how they can harness it to its full potential to save on their electricity needs and for this reason, even those with the means to purchase solar are shying away. Despite this, individuals are open to learning more.

**Frequency Tables ▼**

Frequencies for What would motivate you to switch over to solar energy? (Select all that applies) ▼

What would motivate you to switch over to solar energy? (Select all that applies)	Frequency	Percent	Valid Percent	Cumulative Percent
Learning more about the benefits of solar	107	67.296	100.000	100.000
Missing	52	32.704		
Total	159	100.000		

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One of the questions on the survey created was to analyze what would motivate individuals to switch to solar. An overwhelming majority of 67% of participants would be motivated to switch to solar if they learned more about its benefits. This emphasizes the fact that the lack of awareness is discouraging potential buyers to make the switch over, diminishing an already reduced market and contributing to low adoption rates of solar panels.

### **Discussion**

The survey established two main points regarding the American solar energy resolved issues that America is currently

1. Solar energy is expensive / overpriced and out of budget for the average American
2. There is not enough information / accessibility of information regarding solar energy for individuals to make the switch.

While America struggles to overcome these barriers to widespread solar energy adoption, another nation, Australia, has pioneered efforts in the large-scale transition to renewable energy and has been battling. For some context, according to GreenTech media, Australia is deploying renewables 10 times faster than the global average and their rooftop solar industry is experiencing significant consistent growth throughout the past few years (Deign, 2020). As reported by Bloomberg Tech, about one in four Australian households has solar panels installed and prices are around \$1 per watt, meaning the same system in Australia costs one-third of the price of the same system in the US (\$3 per watt) on a gross cost per watt basis (Thornhill, 2019).

An EnergySage article discloses as to how Australia was able to cut solar panel costs massively, and it is all due to easing the permitting and inspection process for new solar homeowners. Australia has reduced soft costs by simplifying requirements and hiring dedicated solar inspectors whose sole responsibility is to inspect solar panel installation across various regions. This is different from the US solar energy model as regulations vary between jurisdictions and the inspection / permit process is usually long and tedious with excessive amounts of paperwork needing to be filled (Fields, 2021). Additionally, in the United States solar installation inspections are conducted by building inspectors who lack thorough knowledge of solar energy and its optimal installation as they are mainly focused on the structure / construction element of the project. The main takeaway is that on a higher level, the Australian model has called for the easing of regulations and dedicated solar inspectors to make the process to convert be as smooth as possible. America's solar energy model is decentralized, and this causes a lot of confusion and energy needing to be put into the switch to solar which raises costs and disincentivizes individuals from switching to solar.

Another area where Australia is thriving is pertaining to the accessibility to information homeowners have regarding how to make the switch to solar. [energymatters.com.au](http://energymatters.com.au) is a website for a solar installation company in Australia and one of the first results that appears when looking at solar energy. This website provides information regarding the benefits of solar and a quote in minutes. This is just one example, and many from competing companies exist and they provide valuable information that would convince many to make the transition over. Websites of such nature do exist in American societies, but each region

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would need a specific website as regulations vary per town and installation companies tend to operate in these regional sections, meaning it is harder to connect an individual to them.

Based on the discussion above, the most ideal solution for America would be for policies to be set in place easing the regulations, mirroring the Australian model. This would make the inspection / permit process less of a hassle for homeowners and would drive down costs as the lack of regulations would allow local electricians (who have the skills) to be able to install these panels. Reducing regulations would also expunge a lot of confusion that exists regarding the process to switch to solar and it would eliminate trivial laws established by local jurisdictions, which ultimately would allow installation services to expand their horizons and cater to a greater clientele. Alongside this, a wave of informational campaigns revealing these changes and spreading awareness about green energy would inspire a mass wave of converts as proven by the results from the survey. American cities like Las Vegas already have implemented policies easing the inspection / permit phase of solar panels for homeowners and it is vital that other American cities follow suit and work towards creating a greener society based on values of sustainability and renewable energy.

### **Conclusion**

A green economy serves to be a feasible option that will sustain and even advance our environmental, economic, and social prosperity. The transition to a greener economy is just a foot's step away, starting with the power sector. By switching over to more sustainable forms of energy such as solar energy, environmental pollution will reduce in the long run. Not only this, but solar energy costs will eventually fall below that of electricity. To top it off, acquiring solar power is much more readily available than people may believe. However, in 2019, only 6% of American homeowners claim to have installed solar panels. Armed with these facts, we wanted to uncover what stopped people from transitioning to a green economy.

Initially, we hypothesized that income was a central determinant of how likely someone was to install solar panels.

To test our theory, we conducted a survey that asked a series of questions about solar energy and economic status: geographical location, income brackets, opinions on fossil fuels, the environment, and solar panels, and ownership and knowledge of solar panels. At first, we aspired to aim our survey towards NYC residents, but it became apparent that solar panels were not popular in the metropolitan area. Because of this, we expanded our scope to American residents instead.

After this change, we received 159 responses. Of the 159 responses, only 12 people—about 7.5% of the responses—reported having or will have solar panels installed.

When running ANOVA tests on our data, we found that income is not a factor of whether an individual is likely to install solar panels. As a result of our extensive research and data collection, we concluded that income is not a determining factor for whether people are likely to install solar panels.

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What was more likely to impact an individual's choice of solar panel installation was the costly initial expense to install solar panels. Almost half of our responses, 48% of them, expressed their concern with high prices. With people knowing very little about solar energy, their downfall will ultimately stem from misconceptions of being overpriced and too much of a hassle.

Still, though a little under half of our responses were relevant about installing solar panels, over half of them responded that they would be more willing if they understood and learned more about the benefits of solar panels.

Because of varying laws and regulations in America that may be confusing to the public, some people may stray away from wanting to install solar energy like solar panels, which are a big investment and commitment. Many regulations may also limit their local electricians' ability to install solar and that, in turn, makes the prices higher because most installation companies also charge a premium fee. Having so many fees attached to the initial purchasing of solar panels are probably daunting to many, and it may take years for them to see the benefits, which turn people away even more. Still, no matter how long it takes, solar energy is proven to have more long-term benefits for the buyers and the environment.

A problem that frequently emerges is that some countries do not have adequate environmental plans. However, Sweden's approach to a greener economy is superior compared to other countries' environmental plans.

First off, Sweden was the first country in the world to implement an environmental protection act. Additionally, they further hosted the first UN conference about the green economy. Sweden is a prominent supporter of the green economy as they also imposed a climate tax that reduced the usage of fossil fuels. Through these methods, they have managed to reduce carbon emissions and pollution. More than half of all of their energy comes from renewables, such as hydropower and bioenergy. With these implementations, by 2018, Sweden's renewable share of energy was nearly 55% of their total energy consumption. They even hope to run entirely fossil-free by 2045. The majority of the world has almost 35 million CO<sub>2</sub> emissions, which is extensive compared to Sweden, which only has under 5 million CO<sub>2</sub> emissions. Their environmental protection acts their environmentally conscious imposed taxes as well help to make their country more sustainable.

Further, Sweden also has various techniques to make everyday life as sustainable as possible. Cities are constantly getting re-developed, and to counteract the environmental challenges that are emerging because of it, Sweden began making eco-friendly homes. They also use biogas, a biofuel produced from the decomposition of organic waste, as fuel for cooking and heating. Not only did they take into consideration housing, but they also thought about transportation. In the city of Stockholm, their entire public transport system runs on green electricity, along with all buses fueled by sustainable energy as of 2017.

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Lastly, Sweden also does not support using materials from other countries because they believe in using raw materials grown unsustainably. For example, cotton produced outside of Sweden is grown in countries where there are dire shortages of water. Also, because cotton from other countries is usually non-recyclable, they pollute the environment; because of this Sweden makes their own cotton using cellulose from trees that are not hazardous to the environment.

The world should take on Sweden's green economy plan because of how much effort they have put in, they have had massive and extensive accomplishments. More laws targeting polluters and higher taxes should be imposed (like Sweden's carbon tax) to reduce the usage of fossil fuels. Combining that with easing regulations to promote the installation of solar panels and spreading awareness while using Sweden and Australia as a guide will help encourage people, and to larger scale, nations reduce the reliance of unsustainable energy and resources, promoting a more sustainable and greener society.

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