

Pathways to a Zero Carbon New York:
Understanding Solar Resistance and Overcoming Barriers to Renewable
Deployment

Emmy Goodwin, Carson Halabi, Maddie Hurtgen, Lillian Norton-Brainerd
Prof. Aaron Strong

Levitt Center for Public Affairs
Hamilton College
Summer 2021

Abstract

The mounting climate crisis, brought on by fossil fuel burning, requires ambitious climate solutions. By enacting the CLCPA (Climate Leadership and Protection Act) in 2019, New York has led the U.S. in its movement to cut greenhouse gas emissions and deploy renewable energy on a large scale. Acres of photovoltaic solar panels have been installed throughout the state in recent years. The rapid development of large scale solar has faced local opposition. The rationale behind community opposition reveals more complexity than the typical “Not In My Backyard” (NIMBY) argument. Residents of Kirkland, NY voiced their opinions of a proposed 60 acre solar farm near their homes. Through a series of interviews, we observed reasons for support and opposition of the project. While every individual supported renewable energy as a general concept for its movement away from fossil fuel reliance, there were varying degrees to which community members supported solar, as well as this specific project. Opponents were concerned by aesthetics, the siting on a floodplain, construction noise, impact on the landscape, and limited financial benefits. Many of these concerns followed typical NIMBYist patterns, as respondents discussed solar as a way of the future and an important climate solution. We conducted a demographic analysis which demonstrated that solar is implemented in primarily rural communities with white, low-income populations. Over time, likely influenced by the CLCPA, solar development has spread to increasingly politically conservative areas. The Kirkland case provided a foundation to consider and draw conclusions about the barriers to renewable deployment in rural communities.

Introduction

To mitigate climate change, many countries and policies are working to reduce greenhouse gas (GHG) emissions. According to the EPA, 25% of the United States’ emissions are caused by electricity production (2019). Thus, renewable energy resources are on the rise at the center of mitigating climate change. Solar power, specifically photovoltaic panels, has increased in recent years and has the potential to significantly decrease GHG emissions.

As the climate crisis continues to impact communities around the planet, New York is one of several U.S. states that has enacted ambitious climate policy in recent years. In 2019 the state passed the CLCPA (Climate Leadership and Community Protection Act) which proposed the following targets: 85% Reduction in GHG Emissions by 2050; 100% Zero-emission Electricity by 2040; 70% Renewable Energy by 2030; 9,000 MW of Offshore Wind by 2035; 3,000 MW of Energy Storage by 2030; 6,000 MW of Solar by 2025; 22 Million Tons of Carbon Reduction through Energy Efficiency and Electrification (New York State, 2020).

Globally, New York’s ‘net-zero’ proposition aligns with the targets of more than 60 countries around the world, along with President Biden’s goal to reach net-zero emissions economy-wide no later than 2050 (The White House, 2021). The CLCPA created a Climate Action Council, a 22 member committee made up of state agency leaders as well as selected appointees. This council must draft its first Scoping Plan by January 1st, 2022, which will make recommendations as to how the state will achieve its climate goals. The Act also created a Climate Justice Working Group to ensure that disadvantaged communities receive at least 35% of resources invested in clean energy and efficient programs as well as projects in various areas of development (NY State, 2021-a). Since the CLCPA was enacted in July 2019, the Climate Justice Working Group has met 16 times, while the Climate Action Council has met 13 times,

with the majority of those meetings being held in late 2020 and early 2021. With recent rapid development of renewable energy in New York State due to new CLCPA targets, the Climate Action Council has been working to ensure that such renewable energy is developed in an equitable fashion.

New York strives to deliver affordable and reliable electricity to its residents over the next decade, and has proposed renewable energy targets that serve as benchmarks for doing so. One of the CLCPA's targets is 6,000 MW of solar power installations by 2025; as of April 30, 2021, there are 3,036 MW (NYSERDA, 2021-b) of installed solar in the state. To reach its target, the state has created financial incentives for increased deployment of commercial solar power, offsetting the cost of development for solar developers and operators, and thereby utility bills for those on community solar plans. NY-Sun is New York's public solar program which encourages development in the state through monetary support mechanisms. The program's On-Bill Recovery loans and Participation loans make it easier for small businesses to manage solar costs and for lenders to financially support these businesses, respectively (NYSERDA, 2020). The EIC (Energy Improvement Cooperation) is a "non-profit, local development corporation that operates EIC OPEN C-PACE for the benefit of its member municipalities;" municipalities have access to capital that helps pay for upgrades and repairs to their personal solar grids (EIC NY PACE). The state's numerous incentives (which stretch beyond the three described) have created a "solar boom" of sorts over the last two years, as many businesses and individuals see it as an economic opportunity that also contributes to the state's climate targets.

With this boom, it is critical to understand people's perceptions of solar energy, including both concerns and interests regarding its development. Renewable energy is generally accepted and supported by the majority of people, but the actual planning and implementation of renewable energy projects can create opposition from neighboring residents depending on the circumstances under which they're built. (Hoberg, 2019). Understanding the dynamics of opposition to solar energy can help offer insight as to better pathways towards solar development in New York, which is ultimately imperative to reaching the state's climate goals. With rapid development, it is critical to evaluate the land suitability/feasibility for solar farms in NY state as well as human debate over how this land should be used. This data helps to highlight the barriers to development, including NY's terrain and residents' opinions.

Land Suitability/Feasibility and Land Use Conflict

The question of land suitability as related to utility scale solar energy (USSE) is important as New York continues to push towards its renewable energy goals in accordance with local communities and governments. Using a multi-faceted analysis process, Katkar et al. (2020) estimate that 84% of identified land suitable for USSE in New York is agricultural, and 40% of preexisting USSE is on agricultural land. The USSE capacity for non-agricultural land is 22.5 GW, which barely accommodates 21.6 GW or the amount necessary to reach the goal of 70% renewable energy in NY by 2030 (Katar et al.). When creating criteria for suitable land, Katkar et al. used four measures: slope, land cover, quality of farmland, and distance from electric infrastructure. "Suitable" differs from "feasible" in measuring what land has potential to be developed versus what land can actually be developed (respectively). To create the figure below, which highlights feasible land across New York State, the study included physical conditions (land use and slope) and protected areas (PADUS, wetlands, state parks, places of recreational

and historical importance, and environmentally critical areas). When these conditions were applied to all areas in NY state, Katkar et. al produced the following:

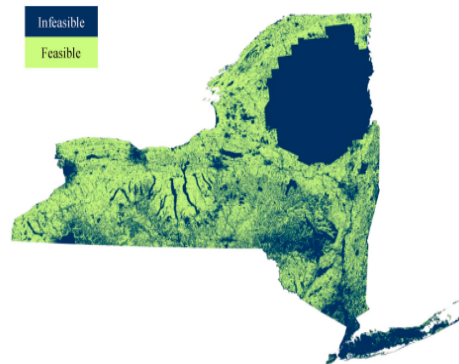


Fig. 4. Feasibility map of New York State.

Given the high potential for solar development on agricultural farm land, New York State has created incentives for developers and contractors to establish solar farms in NY that can contribute economically to communities. Many farmers have been selling their land to solar developers, which is expected to continue as New York moves towards its CLCPA goals. Many residents living near what was once sprawling green and farmland take issue with development of solar energy on this land instead.

While the figure above shows all suitable land for potential USSE development, it does not factor in human opposition to development, as well as proximity to electric substation (calculated using tree canopy and contiguity criteria) which can significantly alter the distribution of the above map. Varying levels of opposition and advancement of electric infrastructure create varying distributions of suitable land, as seen in the figure below:

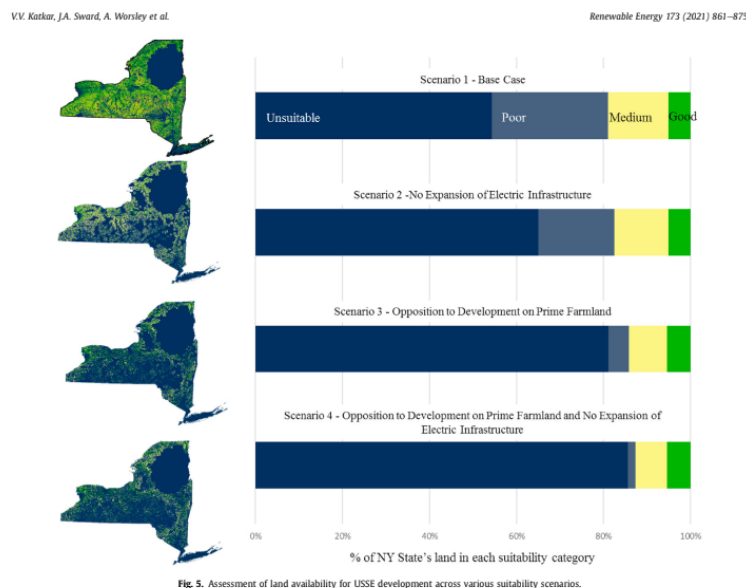


Fig. 5. Assessment of land availability for USSE development across various suitability scenarios.

Though Katkar et al.'s figures show development scenarios which include opposition related to

USSE development on suitable land, they do not highlight the nuances related to opposition and/or support by local communities. The reasons for opposition or support are numbered, and none can be defined as objective nor even subjective truth. In our interviews, we found that while most participants were supportive of the concept of solar energy, many opposed the development within their community. Ultimately, people's personal relationship to the land in Kirkland highly influenced their reasoning.

One term often used to describe local opposition is Not in My Backyard (NIMBY). NIMBYism typically refers to local, place-based opposition to a development, often waste disposal facilities, low income housing, and social service shelters (Gerrard 1994). People consider NIMBYism as a selfish desire for the development to be located somewhere else; however, determining if the cause of opposition is selfish versus political is challenging (Esaiasson 2014). Although NIMBYism is closely related with environmental justice issues as it can push developments onto those with less political power, it is also a tool of activism to fight environmental justice problems and can benefit the environment (McGurty 1997, Gerrard 1994). More recently, discussion over NIMBYism has changed with increasing protests against renewable energy, placing NIMBYism in a more negative light.

In a study on perceptions of landscapes changed by solar power in Slovenia (Bevk and Golobik, 2020), researchers found that solar farms “are perceived as sustainable energy producers but, when developed without the landscape and people in mind, also spoil the scene.” The study allowed participants a camera and freedom to take photos of whatever landscapes they desired, including those with solar infrastructure. Of the 25 participants who took photos of solar infrastructure, 42% of photos had a negative association, 27% had a positive association, and 23% were divided. Interestingly, those who saw the landscape in utilitarian terms were more likely to accept the solar infrastructure than those who saw the landscape in more rural, idyllic terms. While land ethic is seemingly important to participants in the Slovenian study, there is less personal connection to the land than those interviewed in our study with relation to the Kirkland case. Ultimately, this personal relationship to the land (including its effect on participants' livelihoods and businesses) is what draws the most opposition to the Kirkland development.

Our interviews produced certain trends that included negative and positive comments about the proposed solar development in Kirkland, however, the line between the participant's support and opposition to the project participants was not always clear. With this, our research aims not to find a “correct” or “best” response, but to shed light on varying perspectives of solar development, specifically at a local NY community scale. In our paper, we will address the most prominent topics of conversation within the interviews, those being: aesthetics and landscape, solution to the climate crisis, communication, alternatives and climate action, NIMBYism and environmental justice, economy, flooding, and a few other concerns. Rapid solar development and climate initiatives make it important to understand the dynamics surrounding these processes, including their effects on individuals' livelihoods and businesses. The resistance to necessary clean energy infrastructure offers insights to the problems that exist within planning and implementation of these projects. Identifying these concerns while offering innovative solutions will be imperative to meet New York State's ambitious climate goals.

Kirkland, New York Solar Resistance Case

In the spring of 2020, a solar developer – SMT Energy LLC, based in Boulder, Colorado approached the owner of a 62 acre plot on Kirkland Avenue in Clinton, New York. The developer proposed a plan for a photovoltaic solar farm which would generate 4.2 Megawatts (MW) of AC electricity from about 16,000 panels, contributing to the 6000 MW of solar which New York aims to reach by 2025.

The proposed solar farm is located less than one mile from the Clinton village green, on the west side of Kirkland Avenue, as seen in Figure 1. Agricultural fields previously occupied a portion of the Kirkland Avenue plot; grasses and low shrubbery now cover the site. As shown in Figure 2, the plot is four-sided. The property is zoned as “Rural Residential” and is in a resource conservation overlay district. Two edges of the property are adjacent to areas zoned as “Rural Town Center;” the other two border “Rural Residential” areas. The land is partly in the agricultural conservation overlay district and partly in the resource conservation overlay district, both of which serve to conserve natural resources in these areas.

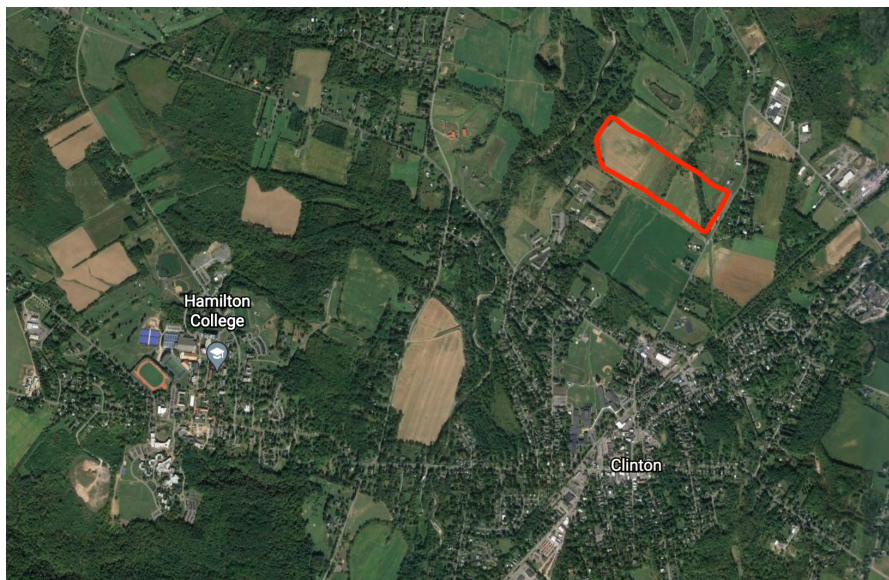


Figure 1. The location of the planned solar development on Kirkland Ave.



Figure 2. The developer’s plan for the location of solar panels on the plot.

A water treatment plant and seven privately owned properties border the plot, excluding properties across the street from the proposed project. Four residential properties are directly adjacent to the property, including one family business, and several more houses are in the

possible viewshed. One house directly across the street from the property and several houses on Old Kirkland Ave are in the viewshed.

The plot is on a 100-year floodplain, which, according to the Department of Environmental Conservation, is “the area that would be inundated by the 100-year flood” or “an area that has a one percent or greater chance of experiencing a flood in any single year.” A regulatory floodway also crosses the plot, which Federal Emergency Management Agency (FEMA) defines as “the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height.” Oriskany Creek borders the west side of the plot, and two smaller streams, Sherman Brook and St. Mary’s Brook, traverse the plot. Kirkland Avenue has been affected by flooding in recent years, due to increased severe weather in the area and the naturally low-lying lands adjacent to the Oriskany Creek. The proposed solar panels will not be placed on the floodway and SMT Energy has stated that all electrical equipment will be at least 3 feet above the base flood elevation. The solar farm will be enclosed by a chain link fence, and about 16,000 panels will be installed.

Because the plot is zoned as Rural Residential, the plan requires a Special Use Permit to install solar infrastructure, which Kirkland’s town planning board must issue. In May 2020, SMT Energy LLC created a subsidiary called SSC Kirkland LLC to move forward with their project.

Beginning in the spring of 2021, local opposition to the proposed solar development grew. Abutters of the land and other community members voiced concerns about increased flooding in the area, changes in the aesthetic character of the land, disturbance from construction, impact on local businesses, and other negative quality of life impacts. Local support for the project also arose, especially among community members focused on local climate action and environmental efforts.

Residents and community members expressed their concerns in two signed letters, written in February 2021 and June 2021. Both were submitted to the Kirkland planning board, and later became the basis for a Change.org petition. Another group of community members expressed their support for this project. They verbalized excitement for a solar farm in Clinton. The development could set a precedent for renewable energy initiatives, help New York reach its climate goals, and educate people about local climate action and responsibility. Members of the Climate Smart Task Force signed a letter demonstrating their support for the project.

On June 28, 2021 at 7:30 pm, the Kirkland Town Planning Board and two representatives from SMT Energy LLC held a public hearing at the Town of Kirkland Municipal Building. The meeting was an open forum for comments and questions regarding the Kirkland Ave project. About 75 people attended the meeting, and many voiced their opinions. At the meeting, the Planning Board announced they would make their decision on approval of the development in the coming months. If the Planning Board approves the Special Use Permit, the company could move forward with construction on their project. As of July 2021, SSC Kirkland LLC has not yet purchased the 62 acre plot, and it remains in the hands of the original owner.

Because of the opposition and discussion of the Kirkland Ave solar development in the Clinton community, we wanted to deeper understand the nuances of local opposition to solar energy. This case study served to demonstrate specific concerns and reasons for support in order to understand how climate solutions can be successfully implemented.

Methods

Part 1: Interviews

To understand why people oppose and support solar energy, we conducted seventeen semi-structured interviews with supporters, opponents, and stakeholders with a variety of connections to the proposed solar project on Kirkland Ave. Some interviewees were neighbors of the property, many lived in Clinton, and all gave us insight into how individuals view solar power as a renewable energy source. We use the terms “supporters” and “opponents” as shorthand for clarity purposes, but there are complexities in the opinions and responses of every individual that we interviewed. Opposition and support of this project is more nuanced than what might appear from an outside perspective.

The objective of the interviews was to understand who live in a small Central New York town with a recently proposed solar development to gauge individual perspectives and opinions on solar energy. First, we aimed to get a sense of how each person felt about solar energy and renewable energy in general, which helped us set a tone for the rest of the interview. We then asked questions which led us to understand individuals’ specific views and concerns about the solar project in Kirkland. Concern or support for the Kirkland development often differed from general feelings towards solar energy. We also gained an understanding of the dialogue within the community surrounding the solar development. It was interesting to see the flow of information and knowledge and how each person had developed their opinions about this project through community engagement.

We then asked questions about governance and communication surrounding the proposed project to determine what the communication between residents, the local government, and the solar company was like. The interview ended with questions about the individual’s conception of a sustainable future on a large scale as well as in their own community. These responses provided us with personal land ethics, and insight into how community members regard the land they occupy and that which exists around them.

After conducting about half of our interviews, we developed a code book which organized the interview transcripts by deconstructing each one, isolating quotations which fit into the code book categories. To develop the code book, we used an inductive analysis following a modified grounded theory approach where we read over the transcripts to create categories for the code book. Our code book disconnects the person’s name from their interview, which creates a common pool of information which highlights the main reasons for concern and support of the solar project. The code book allows us to quantify certain qualitative data, and gives us a clear framework to analyze our interviews.

Part 2: Demographics

We conducted a demographic analysis of where solar is built in New York. Using census data we created a map of the spread of solar development throughout New York by zip code from 2017 and earlier through 2021. We used a dataset from NYSERDA that included all planned solar developments and built solar developments that are two megawatts or larger in our analysis. We labelled each zip code in New York state as solar or not for each year based on the application date, then were able to create maps that display which zip codes in New York state have planned solar developments.

We collected different data points for each “solar” zip code in New York: median income; percentage of the population in each income bracket; percentage of the population of different races or ethnicities; percentage of population in each age bracket; percentage age 25 and higher

with a high school diploma; percentage age 25 and higher with a bachelor's degree; unemployment rate; and 2020 election results. Our question was: What kind of communities are hosting solar energy developments? This data demonstrates where solar is built and the trends over the last five years. We compared the mean of each of these variables for zip codes with planned solar developments and zip codes without any solar, as well as the trends over time in zip codes with solar.

Results

Part 1: Interviews

To display the prominent themes we uncovered in our interviews, we grouped together categories from our codebooks and added quotes that portray these themes. Our results are divided into eight categories 1) aesthetics and landscape, 2) solution to the climate crisis, 3) communication, 4) alternatives and climate action, 5) NIMBYism and environmental justice, 6) economy, 7) flooding, and 8) other concerns.

Aesthetics and Landscape

Respondents discussed several themes relating to the aesthetic aspect of solar panels. When asked about how already built solar farms make them feel, respondents' answers ranged from positive and excited to negative and disgusted. One response, mostly from people in support of the project, displayed a sense of excitement about solar energy. This sense of excitement that solar was something good for the environment became many people's sense of the aesthetics of solar. Although no one said solar was beautiful, people's excitement about the technology made them seem to enjoy looking at it. As one respondent said:

Wow, look at that. It's cool

Several respondents highlight the nuances between the view of solar as a positive futuristic technology as well as an eyesore. These people responded with mixed feelings that acknowledge how solar is beneficial to the environment, which is exciting, but also recognizes the unattractiveness of solar panels. As one respondent indicated:

I don't really have, I don't really have a strong feeling when I see them. I see them and, you know, I have the feeling of, you know, oh, uh, that's, that's good for the environment, but also, you know, uh, I don't want to live next to it.

Some respondents mentioned only the unattractiveness of solar when speaking about how solar farms make them feel. One respondent considered solar panels to be “visual pollution”:

It's interesting that, um, they're wanting to be in these nice rural communities that you think of as green space. And, um, I feel like this is, you know, a visual pollution with solar panels.

The previous quote also highlighted concerns over aesthetics disrupting green space and the aesthetic character of the landscape. This concern was highlighted by many respondents in the

interview, particularly when mentioning the Kirkland Ave case. One person specifically mentioned Kirkland's land use plan and how the solar panels would fail to follow this plan.

The very first line of that plan on page one is the highest goal in managing kind of lands is to quote, preserve rural character sensitive, environmental resources, agricultural uses, and open spaces.

Respondents additionally mentioned the character of the landscape in more subtle ways. By discussing how they appreciate the green spaces and beautiful land, people pointed out how solar panels would harm the landscape. As one respondent observed:

Because when we take our hay wagons back there, we parked right in the pasture. That's directly open to the solar farms. And it is, um, everybody that goes out there says how peaceful and how beautiful it is.

Respondents in support of the Kirkland Ave solar farm responded to these concerns in multiple ways. One respondent pointed out what the company was doing to hide the solar farm from view using trees.

But it seems like they're going to have a few...they're supposed to have shrubbery and trees around it. It won't be that visible.

Respondents also compared solar to other changes in the area that people had accepted, including wind turbines. One participant provided a historic perspective to the aesthetic character of the landscape:

I wish I had time to go back into the Clinton courier from a century ago and find the articles that I'm sure are there about how automobiles and streetlights will destroy the bucolic splendor

Another respondent compared the aesthetics of solar to fossil fuel plants, noting that solar is considerably more attractive, even if it's not aesthetically pleasing, in addition to lacking many of the negative effects from fossil fuels. As the respondent stated:

I mean, I know we don't have fossil fuel electricity, um, generating plants around here, but I've driven through Louisiana. Whew, man, they're awful. They're really ugly. And the communities around them are just, you know, there's so many negative impacts of those that I don't see with solar

Thus, although people had a range of views on the aesthetics of solar, solar was often recognized as somewhat unattractive, but potentially necessary. We understand a tension between solar as a futuristic, exciting technology and an unattractive disruption to the landscape.

Solution to the Climate Crisis

The concerns over solar were contrasted with some respondent's general support for solar. Although the degree to which respondents supported the use of solar energy in general differed greatly, all participants we interviewed supported solar in some sense. Solar is perceived as necessary and important for the future. Most respondents discussed solar using language that pointed towards solar as a futuristic technology. One participant explained:

to me it seems like solar farms are the wave of the future

Another participant described solar as progress toward a sustainable future. This quote also delves into the nuances of people's complex attitudes towards solar energy, where they struggle with disliking aspects of solar panels, yet believing they are necessary for the future. The respondent stated:

I mean, and, and I truly believe that we won't have to live with solar panels forever because technology will always be making it better. That's the way it has been in the past. So I'd like to believe that that's what will happen is that the solar panels are just a step in the right direction.

When asked about the benefits to solar, almost all participants brought up the advantage of not using fossil fuels in order to mitigate climate change. Similar toward the general attitude of solar as a technology of the future, participants discussed the essential nature of solar energy for the future. When asked about the benefit of solar energy, participants were quick to mention the importance of not using fossil fuels. This emphasis also led to a few participants mentioning the carbon footprint of the production of solar panels, as the following participant explained:

A sustainable future looks like one in which we're not burning any more fossil fuels than absolutely necessary

The general support for solar energy and view of solar as futuristic makes any opposition to solar much more complex than it initially seems. Many participants' aesthetic and place based concerns are complexified by the view of solar as necessary and important for the future.

Communication

Another large section of our results indicated that the communication between the town, solar company, and the residents of Kirkland was poor. This seemed to be the one thing that most people could agree upon. Many people felt as though in the initial planning of this project there was little communication because the solar company and the town wanted to have the project approved quickly and with little opposition, which initially felt wrong to many of the people opposing the project. As one respondent observed:

I think, um, the town has been hush hush about this. They're trying to push it through without, um, a lot of people finding out, [...] people are amazed that it's progressed this far and they hadn't heard anything about it.

Many people also felt like even when there were spaces to ask questions about the project and gain clarification, the town planning board conducted poorly organized meetings that got out of hand and ended in more frustration than they had started with. A participant indicated:

Whose name is on the deed to this property, who is responsible for maintaining this property, who is responsible for the insurance associated with this property, who is responsible for the dismantling and restoration of the land after this property? None of those questions were answered at the meeting. In fact, they were intentionally, um, deflected, they would say, 'it's not me' and uh, that was, that was one of the responses. So, you can imagine how there's a general sense of mistrust in this project.

While some people we interviewed felt that the planning board and representatives of the solar company were doing the best that they could, many other interviewees thought that the solar company would intentionally deflect responsibility when questions were asked about property maintenance and restoration of the land when the solar panels had run their course, leaving many people with a general sense of mistrust in the town planning board and this outside solar company. Overall, people felt as if the lack of communication signified a lack of care for the land as well as a low sense of obligation on the solar developer's side to care for the land and make sure that it is maintained properly. As one respondent stated:

We go to great lengths to take care of the land here and to be good stewards and not to ruin things, um, not to make it worse for our neighbors. [...] After spending so much time and energy on the land and this area, I hate to see somebody else come in. And it seems like because there is no communication, they just plan to, you know, come in, collect their money and be gone.

Alternatives and Climate Action

When asked about climate action and what that should look like in the town of Clinton, every single interview participant agreed that climate action was important. The people who opposed the solar development were careful to give us a list of climate actions that they thought would benefit their community without causing the harm that they believed this solar development would cause. Some participants cited individual action as important to mitigating climate change, while others highlighted the importance of policy. All participants emphasized the importance of being good stewards of the land.

I mean sustainability, but not just, you know, not, not sort of minimum sustainability, but, but flourishing, having, having, um, uh, a whole ecosystem that thrives, um, and that includes us because, you know, people won't can't survive long term or thrive long-term without the ecosystem that sustains all life.

Many people discussed alternative siting locations. Most participants discussed rooftops as ideal, but for larger scale solar developments gave a range of locations away from residential areas, whether that was rural or industrial.

Industrial locations, um, commercial locations, rooftops, uh, brownfields, uh, former landfills

In addition to comparing solar to fossil fuels, participants also discussed other forms of energy as alternatives to solar energy. Most participants had a positive perception of wind energy and hydroelectric power, but there was a sharp divide between participants who supported nuclear power and those who were against it. There was a general perception among a few participants that solar was positive because it provides self sufficiency for communities or even individual houses. As one participant reflected:

Um, so, um, and you know, you can envision things like micro grids where, you know, each town is, can be self-sufficient

Although some literature on solar development mentions concern over using agricultural land, many participants we talked to did not bring up this concern, besides to say that the farmland meant that the site was flat and already cleared.

And, uh, you know, if, if it's, so if it's on flat land, I mean, it, it would be good if it could use some otherwise unproductive land. So using, you know, prime farmland to build a solar farm doesn't seem like the greatest use. It seems like that also is counterproductive. But if, if some, if somebody has a relatively flat field near an electric grid that isn't being, uh, productively used as farmland, that would be an ideal location for solar.

Those in support of the project sometimes mentioned that they had heard the argument about agricultural land in opposition to this project, and responded with the counter argument that this site is not ideal for farming and that farming is not very economically viable.

another constant refrain you hear about this stuff is it's taking land away from food production. We need food production while simultaneously farmers are all telling us they can't make any money. So I'm not sure why they were so concerned about farming production if farmers can't make any money

Several participants in support of the project also discussed options for dual use on solar farms, where agriculture or livestock exists on the land underneath the solar panels.

So, um, yeah, places where it can, can be, um, uh, you know, not taking up valuable arable land, you know, where it is better to grow crops, but, but places where, you know, where there's livestock, why not, you know, put them together.

Participants' opposition to the project was thus overlaid with their ideas for climate action, many of which included solar. This furthers the idea of NIMBYism; however, it becomes more complex as participants want solar done differently, not simply in a different location.

NIMBYism and Environmental Justice

Participants responded positively to solar in general and were careful to show their support of solar energy, even if they opposed the project. They questioned this specific project for a variety of reasons, whether it was the proximity to residences or the location on the floodplain. The criticism of the specific location and project as opposed to their views on solar energy in general display a form of NIMBYism, where participants desire the project to be located somewhere else. Many interviews displayed the contrast between their support of solar and opposition to this specific project.

Even the folks that are on Kirkland Ave, everyone, one of them was in favor of solar generally. They're just like, is this really a good spot for it?

if they're, if they're very well located, it's a hundred percent positive.

This is also seen in the divide between those opposed to and those in support of the project. All neighbors we talked to opposed the project to some degree, while none of the people who didn't live near the project opposed it. This neighbor expresses the opposite of NIMBYism; however, they change their mind when they learn more about how this project affects them.

I said, if they want to put them in my backyard, they should go ahead and put them, put them back there because, you know, I was all for, um, solar, renewable, renewable energy... Um, my issue came as we learned more about what a solar farm entails

People in support of the project also critiqued the neighbors for being NIMBYist. They seemed to say that the neighbors only had all these arguments because the solar development was located near them.

I just want it to happen and I rely on the experts in the fields and determine where the best place is. And I just, I do see a lot of, not in my backyard, um, and I get tired of it.

A few participants specifically mentioned "Environmental justice". One participant discussed how living near this project feels like living environmental justice because of the outside company not listening to local concerns and neighbors not having the means to fight the company.

So I'm really, you hear about like environmental justice and while it was a buzzword, kind of to me in the past, um, I have never lived it and I feel like now I'm living it. Cause I

don't have the means to fight the solar company that I'm not, I, I don't have the capital that they have.

The other environmental justice perspective we heard from participants emphasized the relative wealth and whiteness of the Clinton community and emphasized that Clinon has a responsibility to make a small sacrifice for the good of the climate. People in support of the project said that the development should go through regardless of concerns because of the duty that the town has to contribute to climate action in a meaningful and powerful way.

And, um, and it frankly makes me, um, not just upset, but it makes me, um, close to angry, um, with people who say Clinton is, I love solar power, as long as we put it where it belongs, but it doesn't really belong in Clinton because Clinton, uh, you know, it's a certain kind of community. And, and so it doesn't really belong here.

These interviews show a close relationship between environmental justice and NIMBYism, where to some participants they were bearing a disproportionate amount of the negative effects from this solar project, whereas to others, those in opposition were using their privilege to push the solar project onto someone else. Our demographic analysis later in the paper shows that solar development does not follow the typical identity categories of environmental justice; nevertheless, people are still being affected by this project and do have less power than the solar company.

Economy

In an effort to reach the CLCPA's proposed targets, NY State invites residents to access clean energy produced by solar farms by subscribing to community solar plans. In doing so, residents receive a credit towards their regular utility bill; as NYSERDA reminds us, "the amount credited each month will depend on the amount of solar energy generated by your selected project." Those who rent or are co-op/condo owners can also participate in community plans. The level of knowledge which respondents in our research have regarding these community plans differs. Many have displayed a base level of understanding as to how they may benefit from the proposed solar development, however, there seems to be an information barrier between residents and community plans potentially beneficial to them.

There's financing that, that supports us. And certainly, um, the, the green credits that, that, that, uh, are, uh, generated by solar panel farms are, uh, uh, are a big driver of, uh, uh, of instituting this.

There is little information yet as to whether there will be a subscriber model connected to this proposed development. This unknowing has led to unsatisfied individuals, who speculate that it serves the solar developer and operator more so than the local Kirkland community (especially considering that most of the business developer is coming from out of state, so that furthers this notion and divide). One interviewee states:

Other than long-term, there's not much local benefit, which is what makes it a hard sell, honestly

Other respondents relay this same message:

They claim that they're not getting any benefits, like we've specifically requested what is the town of Kirkland going to get from this? And they're saying nothing. So, I mean, I guess we have to, um, believe them, but I, it seems like there has to be some benefit that we're getting from and we're getting from this. Why would they keep it going?

Others continue to speculate if residents have potential to receive any actual benefits, and if their distance to the solar farm affects this. Given what we know about the state's community solar plans, distance should not impact whether a resident can receive any significant amount of credits towards their utility bill. If credits are to be received, residents are asking for more transparency from the town in regards to this.

Like, is that worth it to us? Because our tax bills will come down because our energy costs will be lower. Um, there are tangible benefits to the abutters whose property values will be impacted. There's a study out of the University of Rhode Island that there's a minimal 5% impact within a mile and a half radius of the [development], as according to the ones they've researched. So, okay. If we have no choice, but to swallow that, uh, are you going to give us a \$200 a month energy credit with the national grid? You know, something like that. So they've got to, they've got to show what the benefits are.

Some believe that utility scale solar deployment can actually be detrimental to local business. One interviewee who operates a business built on farm tours, birthday parties, and summer camps adjacent to the projected solar site, notes that her business will be affected by the construction.

So we are starting to look at it now through a business lens rather than a, um, solar, you know, a good thing for the environment. Now we start looking at it as, oh my gosh, this is going to hurt. This is going to hurt us. This is going to hurt our business. Um, cause we can't do the tours out back, and we're not going to be able to do summer camp. And that's how we pay the taxes. So we need that land and we need to not have the commercial construction.

Those who do not live adjacent to the solar farm nor have any personal relationship to the development may have less concerns and instead, more optimism regarding the development. Solar farms can create the appeal of a greener community, which some feel can be a driving force for business.

Two decades ago when I was wishing that our town would take some steps to being in greener, um, community, I thought that would hold some economic benefit for the town by attracting people who really wanted to live in a community like that and businesses.

How the local economy--including businesses, individuals' utility bills, tax benefit to the town, and more--will be affected cannot be predicted at this point in time. With that said, residents continue to make predictions as to how it will be and prepare themselves in certain ways.

Flooding

The proposed project is in a 100 year flood zone and adjacent to floodway, which has generated conversation and concerns from community members. In regards to the solar infrastructure itself, solar panels are typically raised above ground, which some respondents predict may protect them from flooding that is likely to occur given its position in the flood zone.

Um, this area is near Oriskany Creek, which is on the flood plain. So, um, when it floods, obviously the crops don't grow unless you're growing rice. So, um, seems to me that solar has an advantage because it's up off the ground.

Many interviewees believe the development may exacerbate flooding, which has proven to be hurtful to the town of Kirkland in the past. Recent floods have created more than six feet of water on residential properties.

Then they have all these panels on top where in a torrential rain, like the kind that generate these floods, you're going to have water just sheeting off of these things like it does off of a roof without a gutter; you know, extrapolate that over 60 acres with, uh, a different opportunity for ground absorption because instead of natural rain, which falls consistently over a whole area, it's going to be focused in these sheets of water coming down.

Those who live close to the proposed solar farm may be more personally affected by potential flooding. Respondents noted that the flooding may front load onto surrounding properties, posing risks of damage to homes and other personal assets. Respondents conveyed to us the direness of this situation, and the emotion that concurs with damage to property.

It's very obviously emotional for the people who live there because it's their homes that our biggest assets for most of them... so there's fear that it's going to exacerbate a real problem that exists.

What is of chief concern to many respondents is the proposed chain link fence to surround the solar farm. The chain link fence may potentially make existing flooding in Clinton worse if flora surrounding the fence creates a dam of sorts and prevents water from evenly permeating through it.

Um, the, the one major flooding issue that was raised that I don't think that they had an adequate response to, was that the fencing that would be going up around the project, um, to stop water from flowing into that property. Uh, the fencing in question is chain link, so it won't do that if it doesn't become overgrown, but because of the area and the

prevalence of grapevines and things that, that get on the fences, it is likely to become overgrown.

At this point in time, no one can predict whether flora will become overgrown surrounding this fence nor if that would exacerbate flooding. The town planning board and solar developer have agreed to address this issue in some capacity, though it is unclear at this point what that means.

Other Concerns

While the concerns discussed so far, namely aesthetics, flooding, economic benefits, and communication, were the major concerns we identified in our interviews, we also discovered many other concerns that participants brought up.

Many participants were very concerned about the potential lost property value of their houses from having a solar development right next to them.

Participants also brought up concerns about the maintenance of the property and who was responsible for the upkeep. The vegetation surrounding the solar development was another point of contention, with those in opposition arguing that it wouldn't be maintained, and those in support using the vegetation screening as an argument for why people should not be concerned about the aesthetics.

They're telling us they'll put up trees, but I visited. So our projects, the trees are dying. They don't replace them. They have burlap up on them like months after the winter is over. It's not well-maintained

Construction noise and its impact on local businesses was another prominent concern. Neighbors were worried about the increased traffic, loud noises, and view during the construction period. While a few people were worried about noise from the solar panels, those in support of the project argued that the construction would be the only noisy aspect of the project.

There's going to be the construction period. It's going to be done. And after that, it's going to be peaceful and quiet. And all you are going to hear is birds chirping

Many people were extremely concerned about the decommissioning impacts on the environment, as well as what would happen to the solar panels, and in terms of maintenance of the site. Participants also brought up concerns over lost historic value of the area, the impacts on wildlife, toxic chemicals leaching, and the emissions from the production of the panels.

PART 2: Demographics

We found that from 2014 to 2017, solar was concentrated in the Hudson Valley and Capital Region and lightly dispersed throughout the rest of the state (Fig.1). In 2019 and 2020, when solar progress accelerated, developments began to spread further upstate into Central New York and the Finger Lakes region. By 2020-21, solar was in all regions of the state, excluding the

Adirondack State Park, New York City, and Long Island. In 2019, the CLCPA was passed, so we hypothesized that the solar spread upstate was because of the solar development goals written into this law.

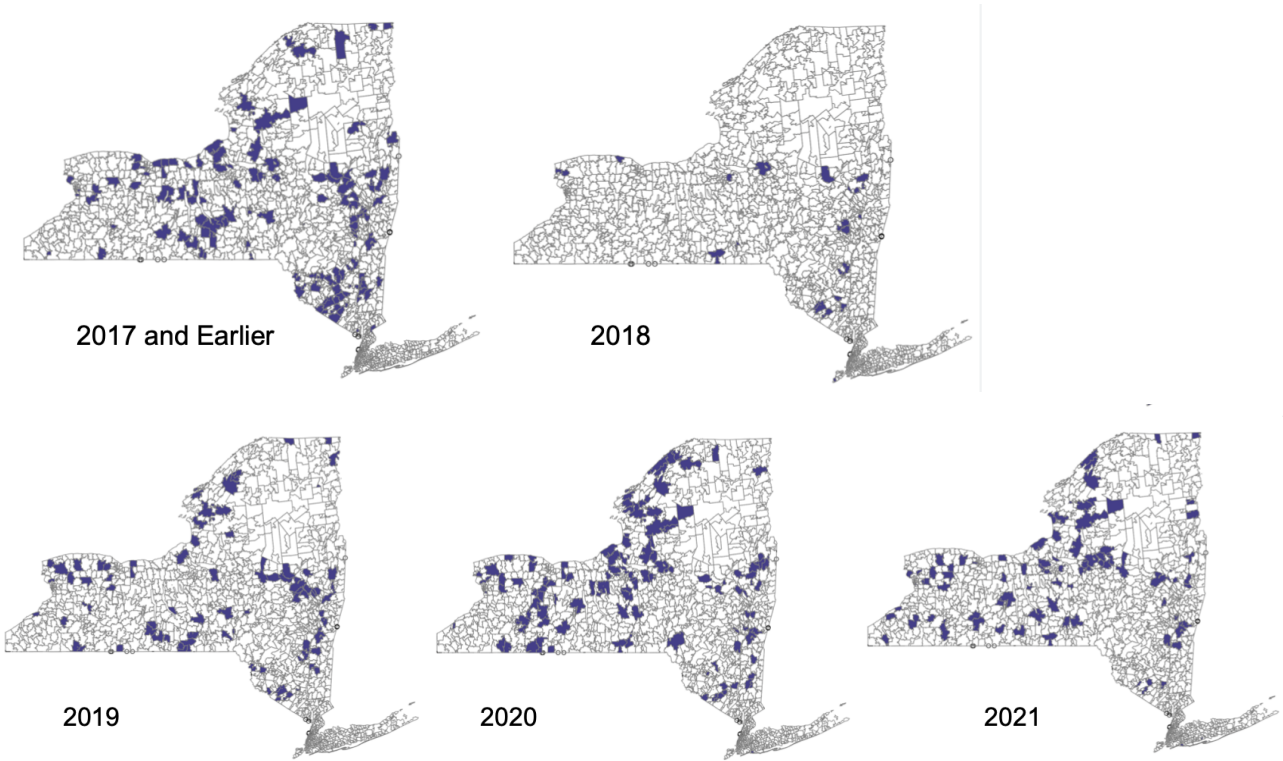


Figure 1. Spread of solar development in New York beginning in 2014. Purple regions are zip codes with at least one development of two Megawatts (MW) or larger.

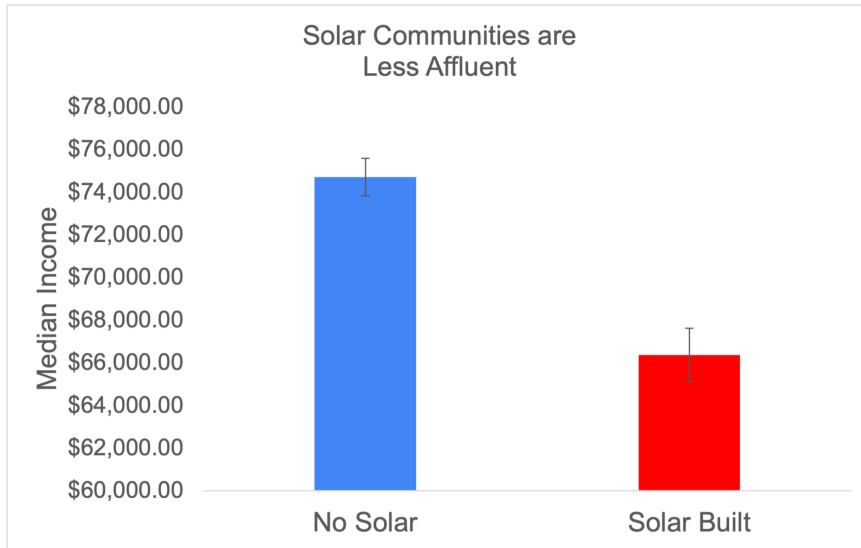


Figure 2. Communities where solar is built have a lower median income than communities with no solar.

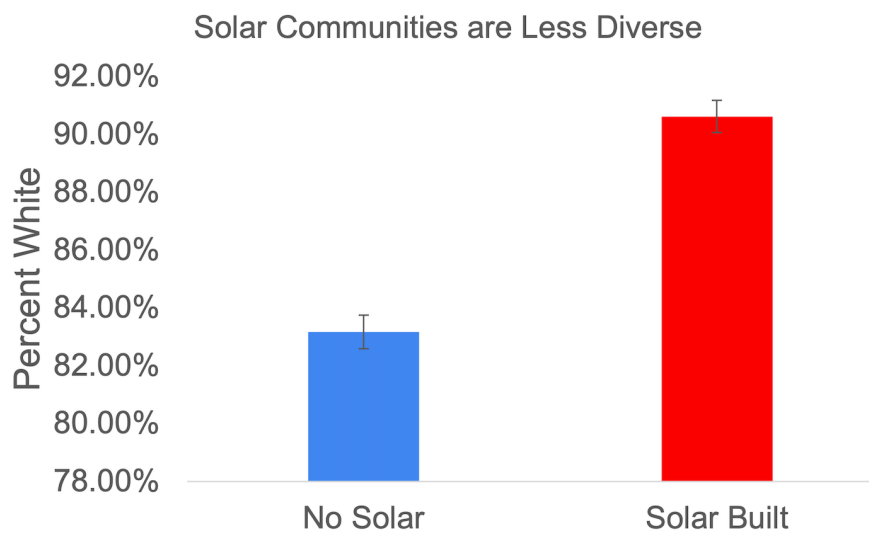


Figure 3. Solar communities have a higher percentage of white people than communities without solar.

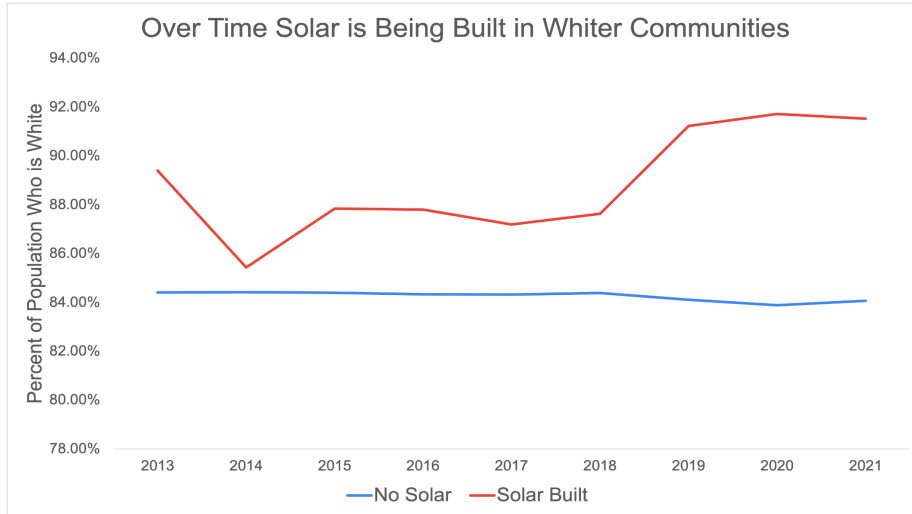


Figure 4. Since 2013, solar energy has been implemented in increasingly white areas.

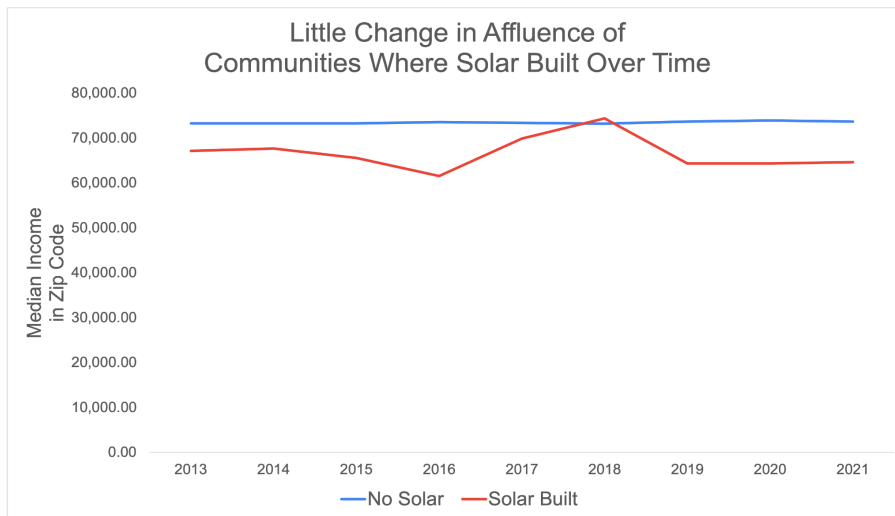


Figure 5. Solar is continuing to be built in middle class communities. **(Change the title of this graph to clarify its meaning).**

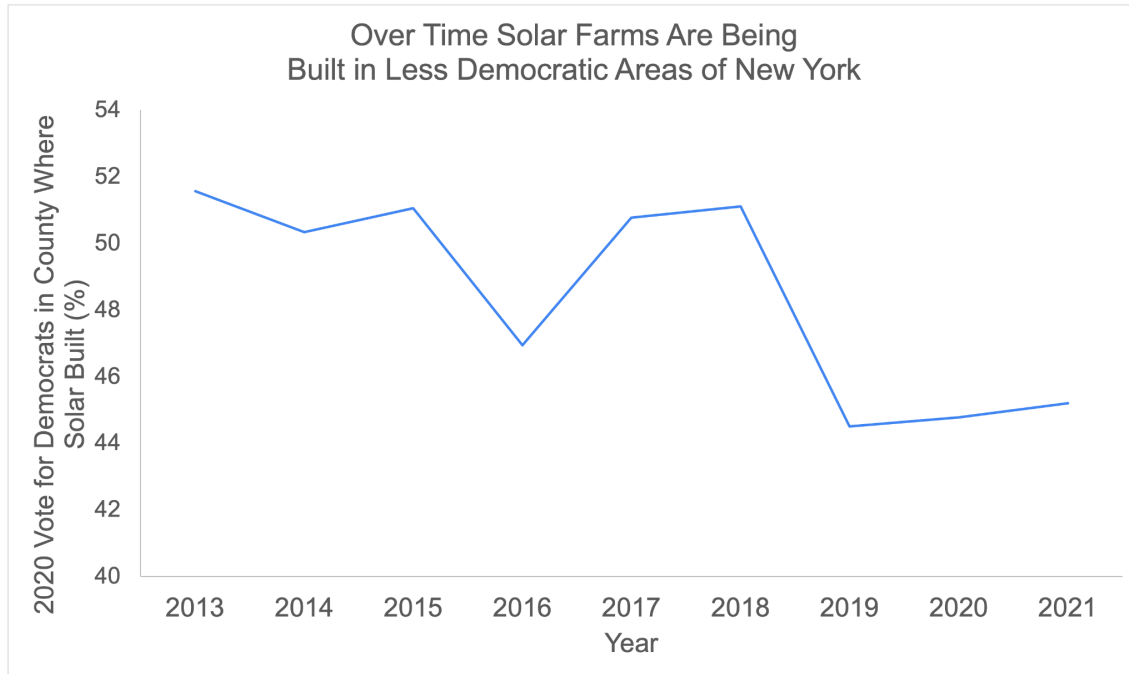


Figure 6. Using 2020 presidential election results as a measure, this figure shows how solar communities are increasingly less Democratic over time.

When assessing socioeconomic status and race in the zip codes that have solar development, we found that solar is a largely rural phenomenon, with more solar in lower income, white communities. Because cities are typically more diverse and wealthier, we attributed the trends in wealth and whiteness to the difference between cities and more rural areas.

Communities where solar is built have a lower median income than communities without solar, with a mean of the median income of each zip code with solar development of \$66,357 compared to \$74,712 in communities without solar [Figure 2]. When we observed the median income in communities with and without solar by year, from 2013 to 2021, little change in the affluence was found, and any observed change is unlikely to be statistically significant [Figure 5]. Solar development instead seems to be staying consistently within lower to middle income communities.

The mean percentage of people who identify as white in zip code areas with solar development is 90.6%, while in zip code areas without solar development, the mean percentage is 83.17% [Figure 3]. This means that in general, solar is built in whiter communities, relating to the rural phenomenon. When comparing the percentage of the population that identifies as white by year, overtime, solar is being developed in whiter communities. In communities without solar, the percentage remained the same with the lowest year at 83.9% in 2020 and the highest year at 84.4% in 2013 and 2014. In zip code areas with solar, the trend was generally increasing, with 85.4% of the population identifying as white in 2014, and 91.7% of the population identifying as white in 2020 [Figure 4].

When comparing the data for 2020 election results, used as a measure of conservatism, with trends in solar development, we were able to show that from 2013 to 2021, solar is moving away from more liberal areas. In communities with solar, the mean of the percentage of votes for Biden/Harris in each zip code was at its highest in 2015, with 51.1%, and at its lowest in 2019, with 44.5% [Figure 6]. This trend relates to our observation of whiteness in communities and can again be attributed to the CLCPA and push for solar in whiter, more conservative communities.

It is important to note that the data used to create this analysis was at the zip code level and did not uncover any information about who within each zip code is being affected by the solar developments.

Discussion

Looking at the results, we can see how, in many ways, people expressed NIMBYism in their desire for the solar development to be located somewhere else. Additionally, the primary concerns were focused on aesthetics and flooding, both of which are location specific and affect the people living adjacent more than others. However, it is challenging to differentiate between people's selfish reasons and rationalization of their opposition and concerns that would have occurred no matter the location (Esaiasson 2014). The divide between the neighbors' opposition and other community members' support reinforces the presence of NIMBYism; however, it is clear that some people are more affected by this specific solar development than others. The social gap between general support for solar and specific opposition occurred in Kirkland, and, as Mulvaney explains, cannot only be explained by NIMBYism (2017).

The concerns of the solar development project in Kirkland have gone well beyond the typical aesthetic concerns and NIMBYism arguments. It has become a discussion of responsibility for climate action, a concern over who benefits from the project, and the poor communication and lack of transparency from the town and the solar company.

Ultimately, we found a very wide range of opposition and support across the people we interviewed with different and nuanced reasoning for their opinions. The main concerns for the Kirkland Ave solar development were the location on a floodplain and the aesthetics of the panels, but these concerns were mixed with a desire to reduce our dependence on fossil fuels. This contrast between the disruption of the landscape and the practical nature of solar reflects Bevk and Golobic's discussion of the aesthetics of care versus scene narratives, with the former emphasizing utility and the latter beauty (2020). One of our big takeaways is that this is centered around responsibility for climate action and who bears that responsibility, with supporters arguing that Clinton has a responsibility to do their part, and those in opposition questioning why their views were not considered in this process. Throughout the interviews, people have been very careful to emphasize that they are not anti solar, just against this specific location. While the character of the landscape carries importance for many people, others argued that climate action should be prioritized over the preservation of rural character. We uncovered a very interesting dynamic between what stewards of the land and ethics of care really are, and we have been able to see that people's values are kind of pushing up against this feeling of responsibility for climate action. Another significant issue was the lack of transparency, feelings of being unheard, and the fear of and divide between the outside company and community. This issue is present in a lot of

literature on opposition to renewable energy, including Mulvaney's studies of public land in the Southwest (2017). Below, we make a series of recommendations that address the problems that we observed throughout the interviews conducted.

Conclusions/Recommendations

One aspect both those in opposition and those in support of the project agreed upon was the lack of communication and distance between the community and solar company. As both Mulvaney (2017) and Hoberg (2019) observed, actions to improve communication and trust are necessary to gain community's support for solar developments.

- Earlier and clearer communication from the company to the neighbors about the planned solar development and why this location was chosen and closer interactions between the company and neighbors
- Open forum for people to voice their concerns and have them addressed
- Have solar developers and community work together to find an ideal location for a solar development
- Have a community member who is knowledgeable about solar who can help answer questions and communicate with the company and community
- More comprehensive planning and widespread knowledge of these plans
- Bring in professional help when needed to figure out how to make each solar development work and be unique to the area in which it is being built (i.e. a different style fence around the development that responds to flooding concerns)

Another common issue we heard surrounded the community not receiving direct benefits from the solar panels.

- Town/solar company should provide assistance (financial or other) to the surrounding property owners that will be affected by the construction period as well as the businesses that they may own.
- Neighbors should automatically be signed onto the community solar agreement or receive other financial benefits

Finally, to address concerns over general placement, destruction of wildlife, and aesthetic concerns, there are several potential actions that may alleviate community members' concerns and mitigate issues associated with solar development.

- Agricultural expertise needs to be included in the planning for the flora surrounding the solar development with thought given to including native plant species and possible incorporation of other wildlife.
- Dual use options should be incentivized at the state level
- Focus on developing solar in industrial places, landfills, parking lots, etc to prioritize spaces that people seem to support more
- Incorporate the solar panels into the landscape and consider options that make them more aesthetically pleasing, such as incorporating solar panels into architecture or creating sculptures.

REFERENCES

- Bevk, T., & Golobič, M. (2020). Contentious eye-catchers: Perceptions of landscapes changed by solar power plants in Slovenia. *Renewable Energy*, 152, 999-1010.
- EIC NY PACE. Municipalities: NY: EIC. *Energy Improvement Corporation*, www.eicpace.org/municipalities.
- Environmental Protection Agency. (2019) Sources of Greenhouse Gas Emissions. <https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions>.
- Esaiasson, P. (2014). NIMBYism—A re-examination of the phenomenon. *Social science research*, 48, 185-195.
- Gerrard, M. B. (1994). The victims of nimby. *Fordham Urban Law Journal*, 21(3),
- Hoberg, G. (2019). The Resistance Dilemma: How Resistance to Renewable Energy Infrastructure is Frustrating Climate Solutions. *School of Public Policy and Global Affairs, University of British Columbia*.
- Katkar, V. V., Sward, J. A., Worsley, A., & Zhang, K. M. (2021). Strategic land use analysis for solar energy development in New York State. *Renewable Energy*, 173, 861-875.
- McGurty, E. M. (1997). From NIMBY to Civil Rights: The Origins of the Environmental Justice Movement. *Environmental History*, 2(3), 301-323. doi:10.2307/3985352.
- Mulvaney, D. (2017). Identifying the roots of Green Civil War over utility-scale solar energy projects on public lands across the American Southwest. *Journal of Land Use Science*, 12(6), 493-515.
- New York State. (2020). Climate Act. <https://climate.ny.gov/>.
- NYSERDA. (2021-a). Climate Justice Working Group. *NYSERDA*. climate.ny.gov/Climate-Justice-Working-Group.
- NYSERDA. (2021-b). Statewide Solar Projects. *NYSERDA*. <https://www.nyserda.ny.gov/All-Programs/Programs/NY-Sun/Solar-Data-Maps/Statewide-Projects>.
- NYSERDA. (2020). Commercial Solar Incentives and Financing. *NYSERDA*. <https://www.nyserda.ny.gov/All-Programs/Programs/NY-Sun/Solar-for-Your-Business/Financial-Support/Incentives-and-Financing>
- The White House. (2021). FACT Sheet: President Biden Sets 2030 Greenhouse Gas Pollution Reduction TARGET Aimed at Creating GOOD-PAYING Union Jobs and Securing U.S. Leadership on Clean Energy Technologies. *The White House*. www.whitehouse.gov/briefing-room/statements-releases/2021/04/22/fact-sheet-president-biden-sets-2030-greenhouse-gas-pollution-reduction-target-aimed-at-creating-good-paying-union-jobs-and-securing-u-s-leadership-on-clean-energy-technologies/.

