Evaluating the Barriers for Solar Panels in Groningen

Spatial Planning Group Project

Final Report

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Abstract

This research report attempts to explain the current state of residential solar panel usage in the city of Groningen, with the goal being to assess the public perception of solar energy. With the issue of climate change becoming increasingly apparent and EU regulations looking to reduce greenhouse gas emissions to 20% by 2020, renewable energy sources must become widespread and accessible to the public. In order to investigate the barriers to development and the effectiveness of solar panels, a brief survey was drafted and administered to residents of the city of Groningen. Two different neighborhoods were selected for sampling to give a good representation of renter and owner perceptions, as well as current residents with and without solar panels. After the data collection was completed, the results were analyzed for present trends and used to answer specific research questions. A reflection of the findings was completed and limitations to the research and recommendations are discussed. It was concluded that there exists a positive overall perception of solar panels in the city, but a lack of information and initial cost are the key barriers preventing more widespread use.

1. Introduction

As world population and consumption continues to rise, the negative effects from relying on fossil fuels for energy has become increasingly apparent over the past century. Issues regarding the environment such as climate change are now one of the greatest threats to humanity. In order for there to be a viable future, alternative measures such as sustainable and renewable practices must be integrated into the existing energy structure. In recent decades, larger emphasis has been put on technologies, such as wind turbines and solar panels. These energy alternatives have rapidly improved over time, becoming more feasible in replacing fossil fuel use due to greater efficiency and decreases in pricing. However, public knowledge on the benefits of these technologies and urgency for implementing them at the neighborhood level are significantly lacking.

1.1 Data Gap

There exists a wealth of published data concerning renewable energy policy and useage for the EU, the Netherlands, and the Groningen province. However, there is a lack of information on the public perception of solar panels and their use in and around the city of Groningen. Therefore, our research design is formulated to fill data gaps in public perception on solar panels for the city of Groningen.

1.2 Research Goal Definition

Investigate the degree of public interest in solar panels, with the goal of the research being a survey of the *perceived* technical, social and financial barriers that prevent the use of solar renewables in homes in the city of Groningen.

1.3 Research Problem Definition

Climate change and EU commitments have pushed the Netherlands to source more of its energy needs from renewable sources. However, deployment of renewable energy in the Netherlands at the neighborhood level has been slowed due to complex discussions in some of the provinces (CBS, 2016). Problems with NIMBYism regarding wind power have increasingly made solar panels a more attractive option, and some solar projects are already underway in Groningen.

1.4 Research Question Definition

The main research question investigated with this assignment was “What is the public perception of residential solar panel usage in the city of Groningen?” The data gap missing from the current conversation on renewable energy is the public perception at the local level. Our main research question addresses this discontinuity. In order to answer it we must be able to target key demographic groups. This includes rental tenants and homeowners with or without solar panels. The sub-questions below further specify our areas of focus and target different aspects of perception:

- *BARRIERS TO ENTRY:* What is preventing residents from obtaining solar panels?

- *CATEGORIZING PERCEPTION:* Is there a difference in perception between rental homes and owner occupied homes on solar panel usage?
- *EXPECTATIONS VS EFFECTIVENESS*: For solar panel users, to what degree does solar energy fulfill their expectations for return on investment?

1.5 Hypothesis

The research hypothesis concerns the correlation between residential solar panel usage and the status of either renting or owning a home; we expect a lower number of renters who have solar panels due to the fact that those who rent are more restricted in modifications to their residence compared to those who own their homes. We also expect that the high level of rental housing in the city of Groningen is one of the main factors preventing more widespread implementation of residential solar panel use.

In addition, we predict that climate conditions in the city of Groningen will be a large influence on public perception of solar panel usage. Groningen is situated in Northern Europe, and as a result the city does not receive as many hours of usable sunlight when compared to other locations, such as the United States and Southern/Central Europe. Combined with a propensity for rainy, overcast weather, we hypothesize that the public views solar panels as an impractical investment and that the upfront costs for the technology are too high.

2. Theoretical Background

2.1 Europe

The European Union has committed itself to reducing greenhouse gas emissions by 20% before the year 2020. The energy sector accounts for 80% of all greenhouse emissions in Europe (European Commission, 2014). Thus, focus needs to be on transitioning to renewable energy sources. A shift must occur from the current centralized system with large scale plants, to a system of growing quantities of decentralized production units (European Commission, 2014).

2.2 The Netherlands

The Netherlands is a highly developed country within the European Union and is still heavily reliant on non-renewable sources to meet energy demands. The target for 2020 will likely not be met in the Netherlands (CBS, 2016). *In order to contribute to current emissions reduction goals, the country needs to make significant changes to its energy infrastructure.* However, the 2016 National Energy Outlook states that no major progress was made in expanding the sustainable energy supply (CBS, 2016).

As of 2016, the Netherlands annual energy consumption totaled 23,844 toe (tonnes of oil equivalent). Energy consumption in the country has continuously increased, rising 21% since 1990

(Deloitte, 2015). The 2015 breakdown of primary energy consumption is as follows:

- Petroleum Products 37.3%
- Natural Gas 37.9%
- Coal 16.4%
- Renewables 4.32%
- Miscellaneous 2.8%
- Net Electricity Imports 1.3%

Over 90% of consumed energy in the Netherlands is from fossil fuels (petroleum, gas, and solid fuel like coal). In May of 2016, 6.3% of energy consumed was sourced from renewables, a record high for the country. The Dutch government has its sights on attaining 16% renewable energy by 2023 (Netherlands Enterprise Agency, 2013). Wind and waste contribute the largest amount to renewables with each producing 20% of total renewable energy. Solar energy composes just under 10% of renewable energy produced, *which is only 0.6% of total energy* (CBS, 2016). In order to compensate for this deficit, the country has implemented tax subsidy programs and grants such as, the SDE+, the MIA and the Vamil. However, these initiatives target business and industry and seem to have only improved corporate consciousness. There are fewer programs creating greater incentives for individual level ownership of solar panels (Netherlands Enterprise Agency, 2017).

2.3 The Province and City of Groningen

The city of Groningen and its eponymous province are situated in the Northernmost area of The Netherlands, bordering both Germany and the North Sea. Other than the city of Groningen, the province is regarded as the rural periphery of the country, recently subjected to economic and population decline. Notably, the province of Groningen is home to the largest natural gas field in Europe. It has been capped at producing 24 billion cubic meters of gas annually as of 2017 and has been advised by the Dutch state supervision of mines SODM to be reduced further to 21.6 billion (NL Times, 2017). This is a drastic reduction that will require an immense shift to renewable energy. There are three main wind farms currently being built and operated in the province ; N33, Eemshaven, and Delfzijl. With a total projected output of approximately 450 MW, these wind farms make Groningen one of the highest producers of wind energy in the country. However, wind energy has been met with resistance, due to aesthetics and optimal location placements being non-favorable for local populations (colloquially known as NIMBYism, or “not in my backyard”).

Backlash against wind power and its footprint has drawn focus to other sources of renewables such as solar. The province of Groningen has a photovoltaic output potential of 963 kWh/kWp year (The World Bank, 2017), making it one of the least productive solar producers in the Netherlands. Despite this,

recent inroads have been made towards implementing solar in the region; as of 2014 there were 385 solar projects in the province of Groningen subsidized by the national government (CBS, 2016). A tax deduction of 7.5 euro cents per kilowatt hour (kWh) to individuals who generate solar electricity. This allows tax savings of up to 23 euro cents per kWh for households that sell the electricity they generate (Government of the Netherlands, 2017). Aside from the tax savings, there are no more grants available for the purchase of solar panels in the city of Groningen (Grunneger Power, 2017). In recent years, Groningen has held special information and instruction meetings on solar systems for its residents (Jager, 2006). These meetings were proven to be very helpful in spreading and clarifying information regarding the technology (Jager, 2006).

Major city projects include the fitting of over 500 solar panels on the FC Groningen stadium roof, as well as the new Energy Academy building which will produce more energy than it consumes using geothermal technology and 2000 solar panels (University of Groningen, 2016). The city has targets sets to achieve energy neutrality and produce as much energy as it consumes by 2035. This is a much more intensive goal than the rest of the Netherlands (The Smart Citizen, 2015). According to Grunneger Power, a Groningen energy cooperative, there are 40,718 solar panels in the city of Groningen, totaling 2.7 panels installed per 100 homes (Trouw, 2015). As of July 2016, 2,652 addresses in the city were equipped with solar systems (see Figure 1). There is some talk regarding municipal solar fields collectively invested by and for citizens without individual solar panels (The Smart Citizen, 2015).

75.7% of the Groninger city population is aged 15-64, with a high percentage of students by total population (CBS, 2017). Additionally, 61.4% of the city population lives in a highly urbanized setting characterized by high density housing and limited spatial arrangements. In the city's urban core, the proportion of rented homes is above 80% (see fig. 2). Residents of the inner city in rental housing have no independent incentives to install panels. Students are also low income earners and lack initial capital to invest in such opportunities. However, the housing stock changes as one moves towards periphery districts surrounding the city center. In these areas (such as Noordwest/Hoogkerk), the proportion of rental occupied homes decreases to less than 20% of total housing (CBS, 2008). This housing distribution is a potential barrier for the implementation of solar panels within the city of Groningen.

There exists additional theory regarding the barriers for homeowners moving to solar power. One of the biggest is that there is not an option for the trial of a system before purchasing it (Jager, 2006). Thus, a homeowner's final choice on solar panels must be made without the opportunity to test them. Many homes are also not suitable for installation. This is due to the certain construction of homes and/or their orientation to the sun (Jager, 2006). Expert consultation is therefore necessary for assessment. Theory suggests that the initial costs of residential solar panels are too expensive and the return on

investment is too delayed. Subsidies and grants offered by the government function insufficiently and require too much paperwork (Jager, 2006). Lack of innovators and early adopters in neighborhoods can also fail to produce a social network effect. General lack of information and awareness for the environment are also theorized barriers (Jager, 2006).

The city of Groningen's age structure combined with a highly urbanized setting can influence the propensity to invest in and install solar panels. A large, relatively poor student population limits the market for solar panels, and the dense urban environment restricts available space for solar installations. It is suspected that the high proportion of rental homes in the city and lack of government support may be hindering the ability of residents to modify their dwellings with solar installations.

3. Research Design

In order to investigate solar panel usage in the city of Groningen, the goal was to collect data through in-person surveys of a purposive sample population; neighbourhoods containing majority *owner occupied homes* with and without solar panels, and neighbourhoods containing majority *rental occupied homes* with and without solar panels. A survey was chosen as the best method of data collection due to its ease of use, ability to collect quantitative data and meet time constraints. Such data collection was meant to capture the perceptions of a categorized target population. It was not randomized or necessarily representative of the entire city of Groningen. In this respect, the careful selection of sample populations was meant to ensure the best possible evaluation of public perception regarding solar panels. The two neighborhoods selected for sampling were Selwerd, majority rental housing, and Eeelderwolde, largely owner occupied housing.

Image 1 - Eelderwolde Neighborhood

(Source - ikwilhuren.nu, 2017)

Image 2 - Selwerd Neighborhood

(Source - funda.nl, 2017)

Neighborhood Statistics	Eelderwolde	Selwerd
Housing Density	289 addresses/km2	3538 addresses/km2
Owner Occupied	91%	19%
Individuals with low income	16%	59%
Percentage of residents aged 25-65	55%	43%
WOZ house value	€446.000	€113.000

Table 1 - Neighborhood Statistical Comparison
(Source - CBS, 2014)

The final survey was comprised of statements/questions with a corresponding scale or selection boxes for responses. Such answers were designed to give easily quantifiable results to allow data to be more efficiently organized and analyzed. The survey was translated into Dutch by a for the ease of the patron completing the survey (See Appendix). Qualitative responses were translated back into English using Google Translate and were entered along with quantitative data were entered into a spreadsheet.

Public Perception:	Rental Homes	Owner Occupied
With Solar Panels	Selwerd (15)	Eelderwolde (15)
Without Solar Panels	Selwerd (15)	Eelderwolde (15)

Table 2 - Data Collection "Punnett Square"

In order to maximize the amount of thoughtful responses collected, data collection occurred during times when the target population was most likely to be at home and willing to participate. For this reason, Saturday afternoons, as well as Wednesday and Friday afternoons, were designated as the times to administer surveys. A total of 60 completed surveys were collected. Ideally, the survey breakdown was to include 15 completed by each of the four residences; rental homes with solar panels, rental homes without solar panels, owner occupied homes with solar panels, and lastly owner occupied homes without solar panels. One survey was allotted per residence. Surveys were printed out in advance and given to occupants to fill out at their residence. The survey was designed to not exceed 10 general questions for

better ease of completion. It is important in maintaining a neutral line of questioning. Each question aims to gather data on our previously selected research goal and subgoals (categorizing perception, barriers to entry, & effectiveness/satisfaction). Some questions included are adapted from previous studies with similar formats and research goals (Dunlap, Van Liere, 1978; Dunlap et al., 2000).

4. Analysis

4.1 General Findings

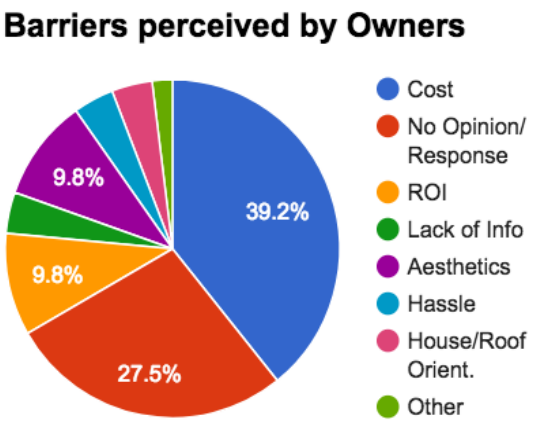
We found that a majority of homes we chose to survey in both neighborhoods were owner occupied, which counters our hypothesis regarding the proportion of rental homes in Groningen (see section 5 for research limitations, where sampling is mentioned). This difference may be because the neighborhoods selected are located farther from the city center. In addition, most solar panels installed were not existent prior to the participants moving into their homes. If a residence did have solar panels, they were typically installed because of personal reasons, such as environmental concerns or for economic reasons.

Over a third of homes with solar panels received either a grant or subsidy, and 31% of the same group also reported receiving some form of physical assistance in installation. In general, a majority of participants reported that the installation process was fairly easy. On a scale of 1 to 5, (1 being very difficult and 5 being very easy) the average rating given by solar panel users was a 4.8.

Half of residents without solar panels reported that they had no future plans to install solar systems. Similarly, about half of respondents said that they had been approached about installing solar panels. In addition, a majority of residents without panels said they would be very interested by the idea of a free trial and very few reported that neighbors influence personal decisions regarding the home.

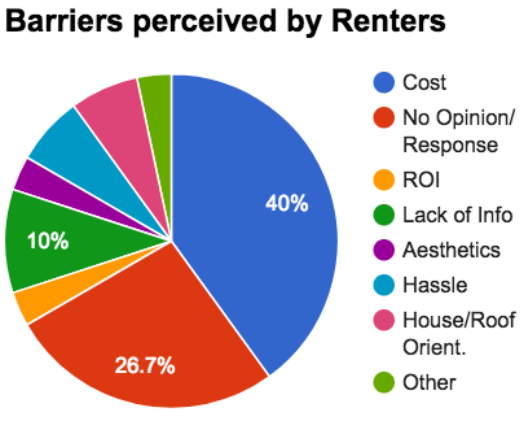
4.2 Renter vs. Owner Occupied

Research data showed a fifty-fifty split on homes with solar panels versus homes without for both owners and renter populations surveyed. During additional off-survery conversations with residents, we found that often renters did not have a choice on whether or not solar panels were to be installed on their homes. Rather, it was the decision of the building owner. If the landlord wanted to install panels, renters were only allowed to choose how many panels they preferred, corresponding with a proportional increase in rent. However, the renters ultimately saved money through direct energy savings. Out of 18 rental homes surveyed, only one household reported receiving any grants or subsidies, bringing into question the qualifications for financial assistance (addressed in section 5).



Graph 1

Barriers to solar panel installation for owner respondents



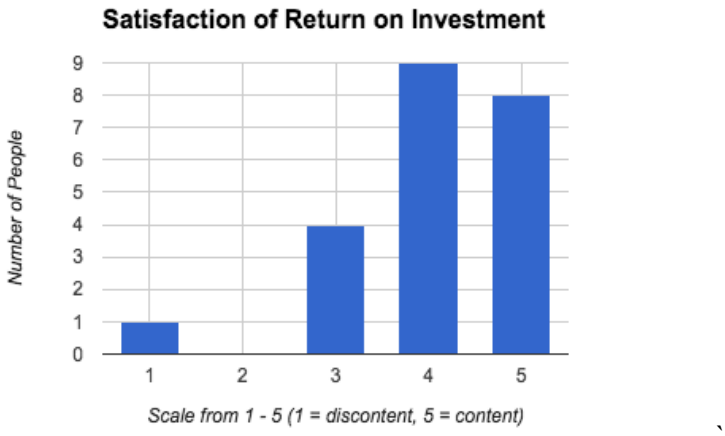
Graph 2

Barriers to solar panel installation for renter respondents

The perceived barriers to entry for renters and owners seems to differ in some aspects, but cost was still the largest single reason for both populations (disregarding no opinion/no response). For renters, other barriers focused on lack of information, hassle, and roof orientation. Barriers identified by owner-occupied respondents focused on aesthetics and return on investment (ROI) instead.

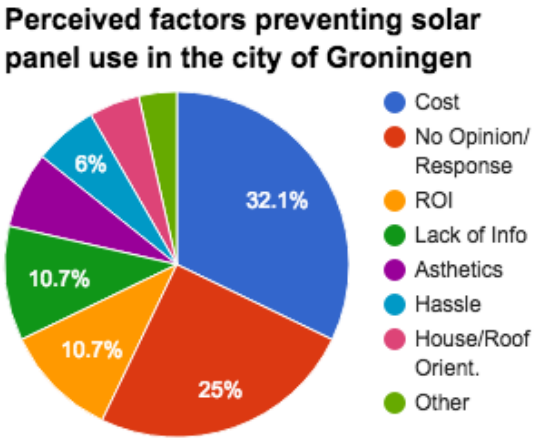
4.3 Perceived Cost v. Return on Investment

Current residents of the two neighborhoods who had solar panels installed were asked to rate their satisfaction regarding the technology's return on investment. The average contentment for solar panel users was very satisfactory. On the 1 to 5 scale, residents' average response was 4.8. Overall, the responses indicated that solar panels are worth the upfront costs. This shows that the initial payment required for residential solar panels is very well compensated by the experienced energy savings.



Graph 3 - Return on investment in solar installation

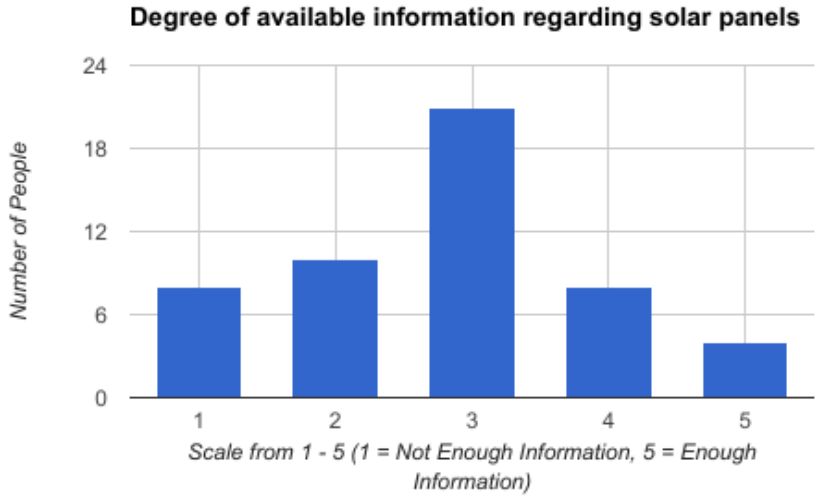
This observation resulting from the data was very interesting as one of the most commonly mentioned perceived barriers to entry was determined to be initial cost (33% of responses). This hints at a possible lack of information and/or a necessary threshold of financial security for solar panel purchase.



Graph 4 - Perceived factors preventing solar panel use in the city of Groningen

4.4 Lack of Information

The perceived knowledge gap between the supposed cost barrier and the excellent return on investment implies that many residents are unaware of the long term financial benefits of solar panels. A potential reason for this misalignment is a general lack of information.

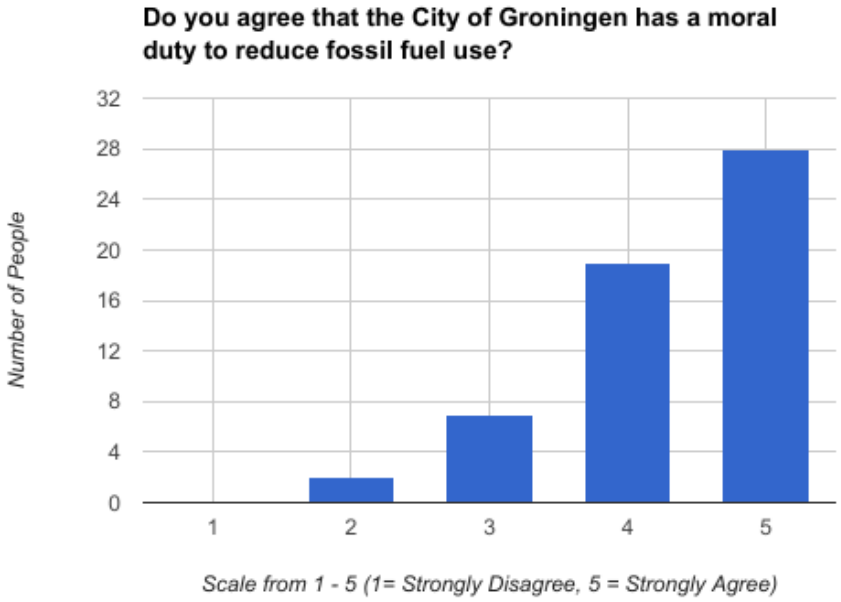


Graph 5 - Degree of available information regarding solar panels

Lack of education was a previously predicted barrier to entry. Thus, all residents sampled were

asked about the availability of information regarding solar panels. The results are displayed in the graph above. The opinion of available information evenly distributed. However, it is clear that the majority of patrons felt there was not quite enough information (with 5 representing adequate information). This shows that there is still vast improvement that can be made in spreading awareness regarding this energy alternative.

Additionally, when asked if they had ever been approached about solar panels, only about half of respondents reported having been in the past. This minimal exposure for many residents further portrays the lack and circulation of such information. That being said, it is clear that many residents have an awareness about the importance of renewable energy sources and believe that the city of Groningen should be making sustainable energy decisions. When asked whether or not the city is responsible for reducing its environmental footprint, there was a clear agreement that it should strive to do so.



Graph 6 - Moral responsibility of the city of Groningen

In Summary, our results were able to answer our research subquestions. We found that the main perceived barrier preventing residents from installing solar panels was cost. Additionally, owner-occupied homes reported aesthetics and return on investment as further barriers to installation. Renter-occupied homes listed lack of information and the challenge of installation as barriers. Both rental and owner homes widely remarked that they felt in favor of solar panel usage in the city. Lastly, solar panel users reported a high degree of satisfaction regarding their expectations and return on investment for solar panels.

5. Research Limitations/Recommendations

One of the main limitations in our research was the language barrier as none of the group members display any Dutch language skills. Therefore, our survey had to be translated into Dutch by a university colleague. Small discrepancies with English-Dutch translation made it more difficult to convey what we truly wanted to communicate (for example, the word "rent" in Dutch carries the context of government subsidized housing). In addition, many of the residents we attempted to survey were not comfortable speaking English or did not speak English at all. This made them more weary of our intentions, and increased our rejection rate. Even though our survey was translated into Dutch, it was difficult to clarify questions and directions with participants, which may have resulted in data collection errors. For example, our survey instructs participants to skip to question 2.g if they do not have solar panels on their house. Despite this, some participants were confused, instead filling out the section of the survey directed towards persons who had solar panels (these errors were corrected during analysis of the surveys). Another limitation to our research was that many participants chose not to fill in the write-in sections of the survey, for whatever reason (lack of time, confusion, etc.). This limited our insight into critical reflections on solar panel usage, possibly inflating the number of persons who reported having "no opinion".

An interesting detail that may have limited our initial response rate was the physical format of the survey. Initially, the six-question survey was printed on three pages. We observed that people were less likely to agree to fill out the survey due to the perceived long length. However, when we fixed the formatting to fit on one double-sided sheet of paper, we observed that people were more willing to fill out the survey.

Time constraints and the nature of door-to-door surveying further limited our research by capping the sample size of the participants. We estimate that on average, it took about one hour to collect 5 surveys (we always worked in pairs or as a group of three). This meant that it took 12 hours of canvassing door to door in order to collect 60 surveys. In addition, we only conducted research on Wednesday, Friday, and Saturday afternoons, as these were the times when people were at home and it was acceptable to knock on their door. There was also surveyor bias in terms of which homes were targeted by the individual or group active in the field. As a result, the length of time to collect data was longer than expected. A larger sample size and more accurate results may be possible given a longer timeframe, more data collectors, and a greater proficiency in the Dutch language.

Lastly, it would have been beneficial to find out which homes were rented or owned prior to surveying. This way, it would better represent the population and improve precision in answering one of our research goals, which was to find any differences in solar panel usage and perception between renter

and owner occupied homes. However, such a database is either a) non-existent, or b) in Dutch.

Recommended further research includes a more in-depth analysis of the process of grants and subsidies for renewables (ex. can renters even receive grants/subs?), as well as more specific research into market barriers between owners and renters.

6. Conclusion

After analysis of our survey data, we can conclude that the general public perception of solar panel usage in the city of Groningen is positive. The public interest would appreciate greater initiative and further implementation of this technology. This consensus is shared amongst people with and without solar panels, as well as in both of the neighborhoods surveyed. However, on an individual scale of solar panel usage by home, there are differing levels of interests to self implement these technologies. These findings answer our main research question, "what is the public perception of residential solar panel usage in the city of Groningen?".

Several factors were identified as barriers to entry, preventing residents from obtaining solar panels. Initial cost was the single biggest reason reported as preventing solar use. Return on investment and lack of information tied for the second most significant barrier. This result is interesting because the average level of investment satisfaction among people who had solar panels was very high. A more minor barrier included timing. Some residents either just moved in, were moving out soon, or were uncertain of the duration of their residency. These patrons had difficulty committing to solar panels as they weren't aware of how long they planned to live in the same space. Short term tenants wouldn't experience the benefits of a long term investment. Another barrier involved the direction of roofs facing away from the sun and the absence of available surface area to provide sufficient space for solar panels. A lack of an aesthetic appeal of solar panels was also mentioned as a deterrent to the technology.

There were a few observed differences between perception of solar panel usage between rental homes and owner occupied homes. The most significant difference was the level of control to choose whether a resident wanted solar panels or not. This is because a renter has little to say on the matter. The decision to install solar panels is almost entirely up to the landlord who owns the building. Owner occupied residents more regularly highlight the issues of appearance and the effectiveness of the return on investment. Residents who own their homes are likely at a level of financial security where they can overlook the upfront costs and seek long term benefits of this investment. However, both demographics still listed cost as the most apparent barrier to entry.

In conclusion, an increase in education and information on solar panels would contribute to greater solar panel usage in the city. Better distribution of general information on this technology (such as the return on investment, the installation process, and financial assistance) could stimulate the diffusion of solar panels in the city of Groningen. If such information was more widely distributed at the neighbourhood level, the Netherlands and the city of Groningen would be better situated to fulfill the EU energy goals and help Europe and the world combat climate change.

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Appendix

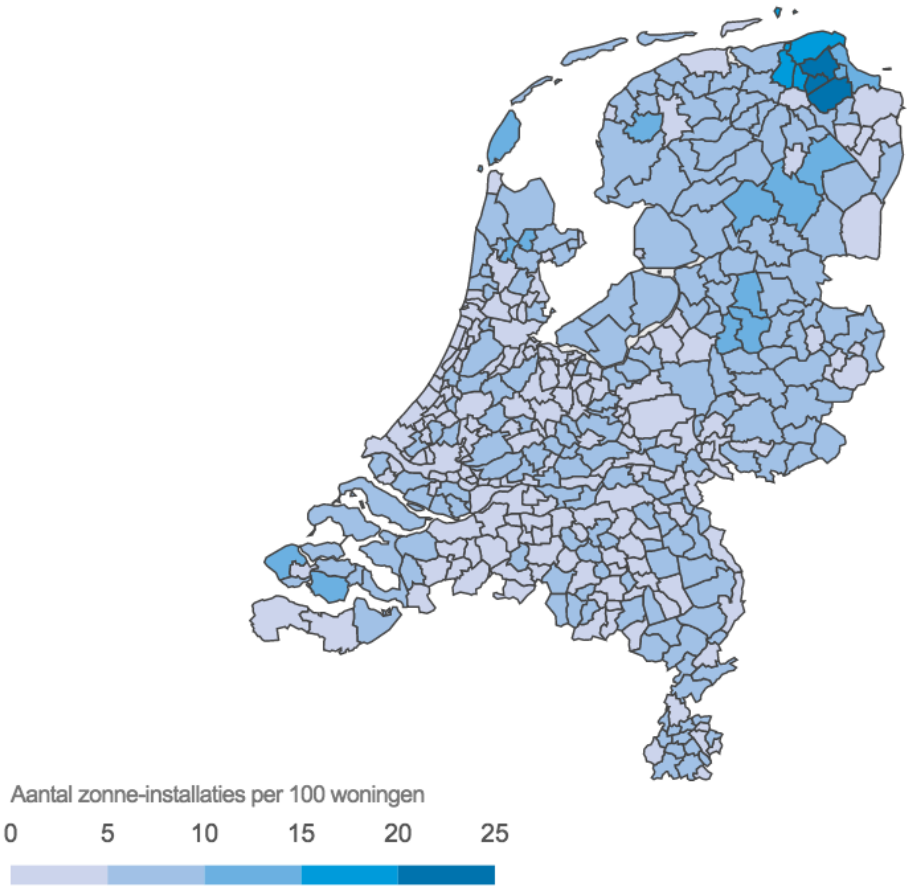


Figure 1 - Number of solar panels per 100 homes

(Source - Trouw, 2016)

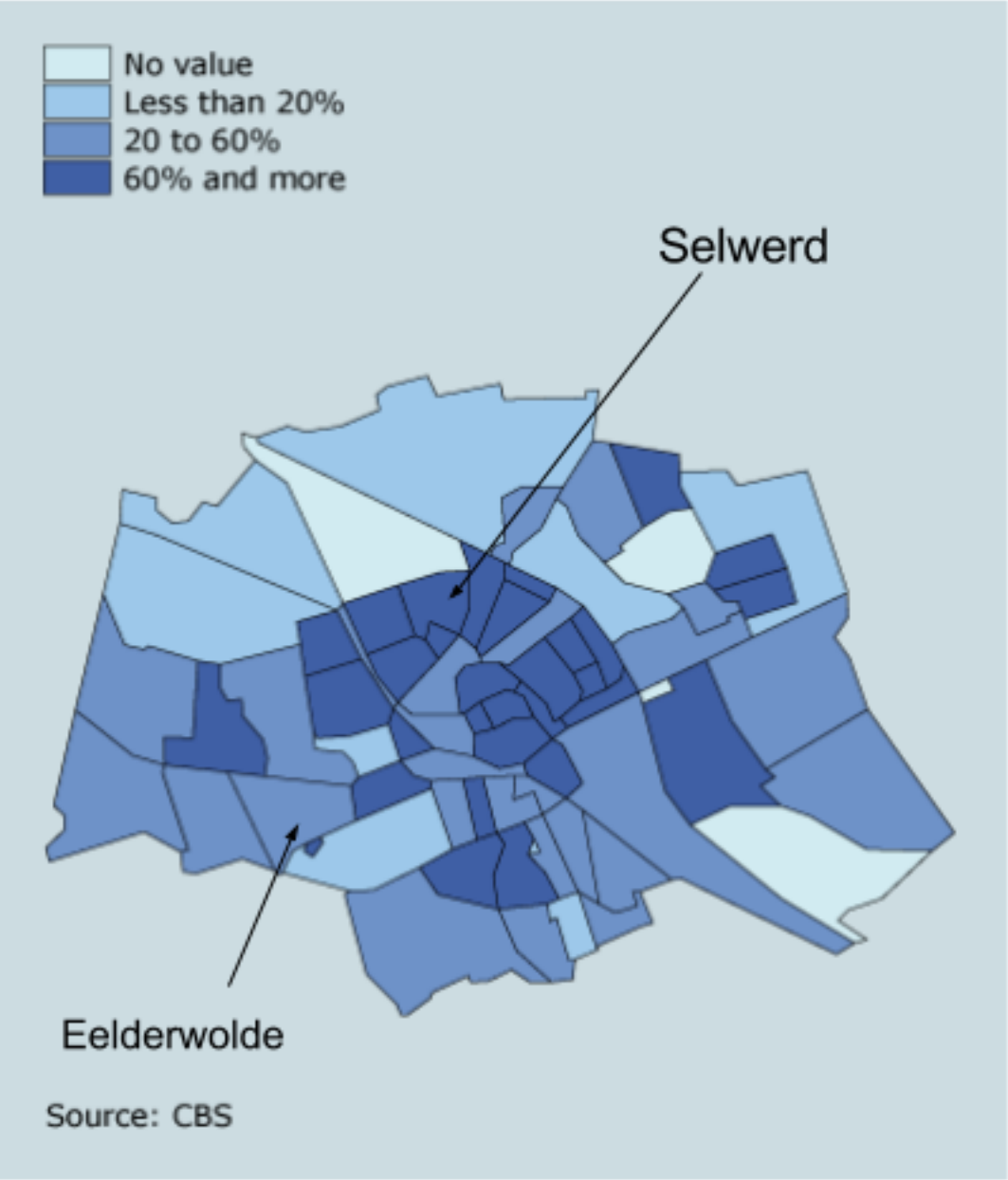


Figure 2 - Proportion of rented houses in districts in the municipality of Groningen, September 2005 (Source - CBS, 2008)

Final Questionnaire (English Version)

Good day! We are students at the University of Groningen in the Faculty of Spatial Sciences. We are investigating the current state of solar panel usage in the city of Groningen. This survey is meant to gather information about solar panel use at the neighborhood level. All responses will be viewed solely by the three students conducting the research and the two advising professors. We thank you in advance for your assistance with our data collection.

Please briefly answer the following questions by checking the most appropriate box(es) and/or writing a brief response when necessary. For questions with a 1-5 scale, please circle the number you feel best answers the question.

1. Do you rent or own your current home?
   - ❑ Rent
   - ❑ Own
   - ❑ Other

2. Is your residence fitted with solar panels? (If **no**, skip to question 2.g.) (Next Page)
   a. If **yes**, were solar panels installed before you moved into your current home?
      - ❑ Yes
      - ❑ No
   b. If **yes**, how did you decide to install solar panels?
      - ❑ Solicited
      - ❑ Personal
      - ❑ Came with house
      - ❑ Other
   c. If **yes**, what are the main uses for your solar panels?
      - ❑ General electricity
      - ❑ Heating/Air conditioning
      - ❑ Hot water heating
      - ❑ Private energy storage
      - ❑ Other
   d. If **yes**, what assistance (if any) did you receive in the installation process
      - ❑ Grants/Subsidies
      - ❑ Loans
      - ❑ Installation assistance
      - ❑ None
      - ❑ Other
   e. If **yes**, how "easy" was the installation process?
      1 2 3 4 5 (1=very difficult, 5=very easy)
   f. If **yes**, how content are you with the return on investment?
      1 2 3 4 5 (1=very discontent, 5=very content)

g. If **no**, what reasons are preventing solar panel installation?

h. If **no**, are you aware of/do you have future plans to install solar panels?
   - ❑ No
   - ❑ Yes
     - ❑ Within 12 months
     - ❑ Within 5 years
   - ❑ I don't know
   - ❑ Other

i. If **no**, have you ever been approached about installing solar panels on your home?
   - ❑ Yes
   - ❑ No

j. If **no**, how likely would you install solar panels if free trials were available?
   1 2 3 4 5 (1=not likely, 5=very likely)

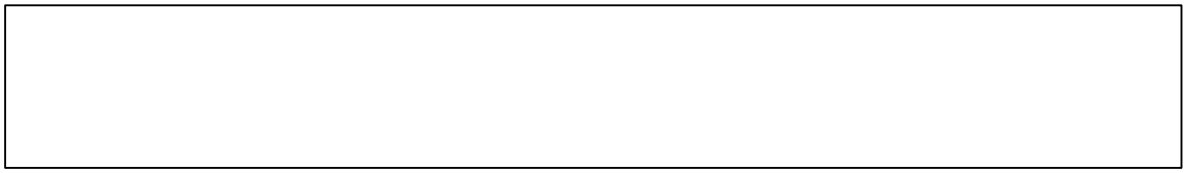
3. To what degree is there available/are you aware of information regarding solar panel installation in the city of Groningen?
   1 2 3 4 5 (1=No Information, 5=Plentiful information)

4. To what degree do the actions of your neighbors influence your decisions regarding your home?
   1 2 3 4 5 (1=No Influence, 5=Strong Influence)

5. Do you agree that the Netherlands and the City of Groningen have a moral duty to reduce fossil fuel (coal, gas, petroleum) use?
   1 2 3 4 5 (1=Strongly Disagree, 5=Strongly Agree)

6. What opinions do you have, if any, regarding solar panel usage in the city of Groningen?

7. What factors do you think prevent people from using solar panels in the city of Groningen?



Final Questionnaire (Dutch Version)

Goedendag! Wij zijn studenten van de Universiteit van Groningen van de faculteit Ruimtelijke Wetenschappen. Wij doen onderzoek naar het gebruik van zonnepanelen in de stad Groningen. Deze enquête is bedoeld om informatie over het gebruik van zonnepanelen in deze buurt te verzamelen. Alle data die verzameld is wordt alleen door de drie studenten, die dit onderzoek uitvoeren, bekeken en twee begeleidende professoren. Alvast bedankt voor het meewerken aan het verzamelen van onze informatie.

U kunt de volgende vragen beantwoorden door het meest geschikte hokje aan te vinken en/of een kort antwoord op te schrijven. Voor de vragen die een 1-5 schaal betreffen: omcirkel het antwoord dat het beste past.

1. Huurt of koopt u uw huidige huis?
    - ❑ Huur
    - ❑ Koop
    - ❑ Anders
2. Bevat uw huis zonnepanelen? (Zo nee, dan kunt u bij vraag 2.g. verder gaan) (volgende pagina)
    a. Zo ja, waren deze zonnepanelen al aanwezig voordat u in uw huidige huis kwam te wonen?
        - ❑ Ja
        - ❑ Nee
    b. Zo ja, waarom heeft u besloten om zonnepanelen te laten installeren?
        - ❑ Op verzoek (van anderen)
        - ❑ Persoonlijk
        - ❑ Het huis bevatte al zonnepanelen
        - ❑ Anders
    c. Zo ja, wat is het belangrijkste doel van uw zonnepanelen?
        - ❑ Elektriciteit (algemeen)
        - ❑ Verwarming/airconditioning
        - ❑ Verwarming van water
        - ❑ Privé energie opslag
        - ❑ Anders
    d. Zo ja, wat voor soort hulp (indien nodig) heeft u ontvangen tijdens het installeren van de zonnepanelen?
        - ❑ Subsidie
        - ❑ Lening
        - ❑ Installateur
        - ❑ Geen
        - ❑ Anders
    e. Zo ja, hoe soepel verliep dit proces?
        1 2 3 4 5 (1=helemaal niet soepel, 5=heel soepel)
    f. Zo ja, hoe tevreden bent u met wat u ervoor terug krijgt?

1 2 3 4 5 (1=zeer ontevreden, 5=zeer tevreden)

g. Zo nee, wat voor redenen heeft u om geen zonnepanelen te laten installeren?

h. Zo nee, heeft u plannen om in de toekomst zonnepanelen te laten installeren?
   - ❑ Nee
   - ❑ Ja
     - ❑ Binnen 12 maand
     - ❑ Binnen 5 jaar
   - ❑ Geen idee
   - ❑ Anders

i. Zo nee, bent u ooit geconfronteerd met het installeren van zonnepanelen?
   - ❑ Ja
   - ❑ Nee

j. Zo nee, als het installeren van zonnepanelen gratis zou zijn, hoe groot is dan de kans dat u hier gebruik van gaat maken?
   1 2 3 4 5 (1=kleine kans, 5=grote kans)

3. Vindt u dat Groningen genoeg informatie biedt over het installeren van zonnepanelen in de stad zelf?
   1 2 3 4 5 (1=Geen informatie, 5=Veel informatie)

4. Hoeveel invloed hebben de keuzes van uw buren op uw beslissingen met betrekking tot uw huis?
   1 2 3 4 5 (1=Geen invloed, 5=Sterke invloed)

5. Bent u het er mee eens dat Nederland en de stad Groningen een morele plicht heeft om het gebruik van fossiele brandstoffen (kolen, gas, aardolie) te verminderen?
   1 2 3 4 5 (1=Helemaal oneens, 5=Helemaal eens)

6. Wat is uw mening, als u deze heeft, over het gebruik van zonnepanelen in de stad Groningen?

7. Welke factoren spelen volgens u een rol bij de keuze van mensen om geen zonnepanelen te laten installeren in de stad van Groningen?