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Energimyndighetens titel på projektet – svenska Betydelsen av lokalt engagemang för ökad produktion av småskalig hushållsnära solel	
Energimyndighetens titel på projektet – engelska Solar Districts – a bottom-up approach to steer the energy transition	
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Förord

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Innehållsförteckning

Sammanfattning

Utgångspunkten för projektet var att förstå prosumers och intressenters behov av att implementera/investera i småskalig PV i stadsområden. Vi var särskilt intresserade av de kreativa och värderelaterade aspekterna av PV i städer. Vårt antagande var att människor, även om de inte är experter, har idéer och något att säga om hur PV skulle kunna integreras i framtida städer. För att besvara den här typen av frågor använder vi konventionella och mindre konventionella forskningsmetoder. För konventionella metoder använde vi skrivbordsforskning, intervjuer och fokusgrupper med kommuner och andra nyckelintressenter. Okonventionella, kreativa metoder användes istället för att arbeta med invånare,

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tillsammans med ett traditionellt undersökningssätt. I synnerhet satte vi ut deltagande workshops där deltagarna stimulerades att tänka på framtiden för sitt boende (deras lägenhet/hus, offentliga rum, tec.) i energiomställningen. Sedan arbetade vi med dem med kartor för att lokalisera deras tankar och gå igenom deras levda erfarenheter när de flyttade i deras distrikt. En annan uppgift var att modellera med hjälp av enkla material som träskivor, papper, färger, lim, polystyren etc. Genom att använda modelleringstekniker ställde och utforskade vi frågor som rör de olika aspekterna av att forma sitt boende tillsammans med energi. Tillsammans med teknik, tillstånd och kostnadsfrågor undersökte vi också hur energi kan vara relevant för urban attraktionskraft, säkerhet och lekfullhet. Som resultat fick vi en stor mängd kvalitativ data som vi använde för att tolka i fokusgrupper med nyckelintressenter. Huvudresultatet är att även om enskilda investeringar PV verkar motiveras av t.ex. teknikintresse och förväntningar på framtida kostnadsbesparingar, det påverkas också av inkomst och husinnehav, och individer hade mycket att bidra med och säga om framtidens energi i stadsrummet. Speciellt lekfulla och energiaestetiska aspekter av urban energiintegration framkom från våra deltagande workshops med medborgare. Vi spred dessa resultat på ett antal sätt (uppsatser, populära artiklar, seminarier för arkitekturbiennalen i Venedig, etc).

Summary

The starting point of the project was to understand the needs of prosumers and stakeholders to implement/invest in small scale PV in urban areas. In particular we were interested in the creative and value related aspects of PV in cities. Our assumption was that people, even if no expert, have ideas and something to say to the way PV could be integrated in future cities. To answer these type of questions we deploy conventional and less conventional research methods. For conventional methods we used desktop research, interviews and focus groups with municipalities and other key stakeholders. Unconventional, creative methods were instead used to work with inhabitants, together with a traditional survey approach. In particular we deployed participatory workshops were participants were stimulated to think about the future of their living space (their apartment/house, public space, tec.) in the energy transition. Then we worked with them with maps to help localize their thoughts and go through their lived experience when moving in their district. Another task was to model by using simple materials such as wood boards, paper, colors, glue, polystyrene, etc. By using modeling techniques we asked and explore questions related to the different aspects of shaping their living space together with energy. Together with technology, permits and costs issues we also explored how energy could be relevant for urban attractiveness, safety, and playfulness. As results we got a large amount of qualitative data that we used to interpret in focus groups with key stakeholders. The main result is that even though individual investments n PV seem to be motivated by e.g. technology interest and expectations of future cost savings, it is also affected by and income and house tenure (rent V. own unit), and individuals had a lot to contribute and say about the future of energy in urban space. In particular, playful and energy ahesticts aspects of urban energy integration emerged from our

participatory workshops with citizens. We disseminated these results in a number of ways (papers, popular articles, seminars for the Venice Architecture Biennale, etc).

Inledning/Bakgrund

Housing, facilities and services make up 40 percent of energy consumption and 50 percent of electricity use in Sweden (SEA, 2015). This has made sustainable building, property management and energy efficiency high on the political agenda, both nationally and globally. In politics, there is a clear commitment to sustainable development, but for the policy to be successful this endeavor is highly dependent on whether people's attitudes and behaviors are in consistence with these political ambitions. Research has suggested that people are not necessarily motivated primarily by quite abstract arguments such as sustainability and climate change: in order to be engaged people may seek to gain also a more tangible benefit (Bergström, 2007). Research in Sweden show that institutional factors such as ownership or possibilities to participate and affect how Renewable Energy (RE) is implemented in the local community may also be important (Ek and Matti, 2015; Ek and Persson, 2014). Moreover, research in Germany (Li et al, 2013) have shown that beside economic benefits, communities are motivated by their direct involvement as “prosumers” in making RE possible - as the opposite of solely commercial RE development. Therefore, the implementation of RE is increasingly linked to the claim of legitimacy to be democratically viable. It also calls for a more holistic understanding of energy and built environment whereby people and their surrounding environment are understood as a unity rather than an arithmetic sum of people, infrastructures, and so forth (Torrekulla, 2005).

Genomförande

Step 1: “Need-finding” (Agatino, Björn, Kristina, Alessandra)

This first step consists of need-finding sessions that include the research group, the reference group, and other relevant stakeholders. We started with a kick off meeting (2018). We then performed a literature review about energy questions and participatory design in Europe. We then organized focus group (2018-9) with key stakeholders to find out strengths, weaknesses, opportunities and potentials about building integrated PV.

Step 2: “Participatory Design workshops followed by Survey” (Agatino, Kristina, PhD student)

We carried out two separate pilot workshops to develop our methods. The first was with students at LTU (2018). Students are overwhelmingly represented in the rental market in Porsön. A second pilot workshop (2019) was held with mainly people working and studying in the study area. The purpose of both workshops

was to investigate people's needs, ambitions and creativity when integrating PV in their urban environment. We structured the workshop in three sub-phases: "Inspiration" (participants are introduced to the project and are asked to what extent are they interested in investing in PV); "Ideation and Experimentation" (generate, select and develop ideas through quick prototyping); "Qualitative Assessment" (open discussion to assess the results of prototyping and compare with the early discussion). Based on this first pilot a survey was developed and rolled out to a sample of inhabitants living in our case study area. A final workshop (2021) was held with another sample of inhabitants to dig deeper on the results of the survey and validate results from previous workshop.

Step 3: "Synthesis and dissemination" (Agatino, Kristina, PhD student)

This step reconvened the stakeholders (2021) to discuss the results of the workshops and identify the enablers and barriers to urban-integrated PV. During this phase final article dissemination and project reporting will be finalizated.

Resultat

-Q1: What are the needs and aspirations of potential "prosumers" and stakeholders and to what degree they converge/diverge?

Stakeholders (municipality, energy providers, developers) have all different missions which partly overlap with the main topic of energy transition. In our case study, the municipality main goal was to refurbish of the town (Porsön, Luleå) that for too long wasn't maintained. While energy concerns were not on top of the agenda, democracy and participation concerns were particularly important for the planners. On the other hand, Luleå Energi's interest in facilitating PV ownership and installation is high while the quality of public space is less important for them. From the inhabitants side, the situation is more fragmented as the results of the survey show (see Q2).

-Q2: How are "prosumers'" values related to the integration of PV affected by PV characteristics (design, ownership, etc.) and perceptions about neighborhood identity, and are these values sensitive to participatory design?

Survey results indicate that inhabitants, not least those living in rented flats, are positive towards increased PV electricity production, in general as well as in their own residential area. There were no statistically significant differences in attitudes depending on whether the (hypothetical) PV scheme were owned by a private company or by a cooperative. Survey respondents engaged in environmental and climate issues were more positive than those less engaged in these issues. Responses further indicate that people living in the area think it is important that local citizens have influence, in particular over the location but also over issues related to aesthetics. One, quite serious, limitation with the survey results is however the high proportion of non-respondents. Although this is likely a result of the characteristics of the area with large proportions of students and people with

limited knowledge about the Swedish language, this limits the possibility to generalize survey results to other contexts.

-Q3: What factors (e.g. institutional, physical and forms of participation) enable or hinder “prosumers” and stakeholders in the integration of PV establishments in urban districts?

Both survey and workshops (with inhabitants and stakeholder) point to technology interest and expectations of future cost savings as important drivers for PV investments, but also coordination between actors, and knowledge are main enabling/hindering factors. Our participatory workshop demonstrated that participants had a lot to say about different design configurations of PV in urban space. Participants related energy questions to the degree of maintenance of the public space (e.g., deploying PV in abandoned municipal sports areas), night safety (e.g, road underpasses), urban attractiveness (e.g., redesign of streets and facades), and mobility (e.g., parking lots). However, this requires a high level of coordination between public and private actors compared to the current one.

Diskussion

With its focus on the nexus energy-space, our project was positioned well to deal with the fragmented interests in society for the integration of renewable energy and public space. Our results show that there is great interest from companies and citizens to take an active role in the development of public space. The participatory approach helps to democratize this development as well as to create a shared interest among companies and citizens. In addition, the participatory approach is beneficial for the design process itself since it opens up to less conventional outcomes. We found that involving people with a different set of skills and knowledge was more enriching than leaving all of the design work to architects alone. The effects of the proposed installations are most likely to create daily based impacts such as sound, visual moving elements, and solar reflections. However, in this case these attributes are all part of the installations and hence not addressed as problematic or disturbing by the participants, all of whom are a sort of “developers/designers” in this case. This indicates that the aesthetic values of renewables might undergo a similar transformation as, for instance, sound in general. For instance, the sound of water running might be experienced as positive, while the sounds of cars might not. From a political point of view, the development of sustainable energy systems is dependent on people’s experience of their implementation. Through the perception of the built environment, norms based on the experience of past examples are created, which facilitate or, conversely, obstruct their continuous development. These norms usually depend on economic, ecological and social descriptions of energy. To a certain extent the meaning of energy in this study is focused on the aesthetic and artistic expression as a way of questioning the validity of given norms, many of have shown that questioning the given norms of aesthetic values of renewable energy can greatly contribute to enhance the popularity and uptake of renewable energy systems.

However, although the Luleå case study, unlike Piteå, included a large residential area (rental housing), our approach needs to be tested in urban contexts different from that of a university campus, contexts with a different socio-economic setting in which it could perhaps be more difficult for design-based methods to yield results. These possible limitations should be further explored in future studies.

Publikationslista

(2019) Brief/Report step 1
This deliverable reports on the work of step 1 (internal report). It was used to inform the discussion during the inhabitants workshops in step 2 and key stakeholder discussion in step 3.

(2019) Solar Conference in Gothenburg
This event was organized by STEM. We presented the first step of our project and enlarged our network for similar projects.

(2019) ECLAS conference in Ås
In this conference we presented the draft of journal article #2 and got feedback.

(2019) Conference poster Circular City European Network Conference in Austria
In this event we presented the research questions and aims of our project to an audience of researchers that are part of the circular city EU Cost network.

(2020) Journal Article #1 (published): "Transformation tools enabling the implementation of nature-based solutions for creating a resourceful circular city"
This paper was a follow up of the conference poster in Austria. We participated to a co-authored publication in which we discussion the definition of circular and resilient cities and performed a literature review on this matter. The paper contribute to our project to insert energy questions within the larger topic of circularity. https://iwaponline.com/bgs/article/2/1/188/72534/Transformation-tools-enabling-the-implementation

(2020) Journal Article #2 (published): "Participatory design as a tool to create resourceful communities in Sweden"
In this paper we developed our methodology of participatory design. We also defined our theoretical scope that is to rethink architecture aesthetics in terms of energy aesthetics in continuity with past projects developed in the architecture group at LTU. https://recil.ensinolusofona.pt/handle/10437/11654

(2020) Webinar "The role of renewable energy in post COVID-19 public spaces", Journal of Public Space
In this event, we discussed how integrated urban design with renewable energy systems can contribute to re-imaging the future public space. The evnt was participated from researchers in Sweden, Germany, USA, Japan, Italy, Hong Kong (China), and Spain. https://www.ltu.se/ltu/calendar/Forelasningar-seminarier/Webbinarium-Den-fornybara-energins-roll-i-stader-efter-COVID-19-1.200653?l=en

(2021) Popular Article: “Rethinking resilience: towards resourceful communities”
In this article we contributed to the Architecture Biennale in Venice by discussing resilience from a critical point of view. In many ways this article is the popular version of journal article #2 although the scope of this article includes other research strands developed in the architecture group at LTU.
https://www.researchgate.net/publication/357222342_Rethinking_resilience_towards_resourceful_communities

(2021) Workshop on Building Integrated Photovoltaic at the Venice Biennale
This workshop was organized and held by Alessandra Scognamiglio and included dissemination and discussion of the project results at the Biennale.

(2021) Journal Article #3 (draft): “Analysing attitudes towards small-scale solar power in urban neighbourhoods: A mixed methods approach”.
In this paper, we conveyed the results of both survey and participatory workshops. The paper is due to be submitted in January 2022.

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