Developing Solar, Transforming Land

The Role of Landowners in Sweden’s Energy Transition

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Developing Solar, Transforming Land: The Role of Landowners in Sweden's Energy Transition

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Abstract

As Sweden turns increasingly toward solar energy as a pathway for the renewable energy transition, ground-mounted solar parks are becoming a central feature in future energy projections. At the same time, the development of solar parks has sparked debate regarding the displacement of agricultural production, limitations in access to grid infrastructure, and disruptions to rural landscape aesthetics. At the heart of this transition are landowners, actors who decide whether to develop solar on their land, and shape how this is carried out in practice. This thesis explores how landowners in Sweden experience the development of ground-mounted solar parks on their land, while navigating the broader systemic constraints of ambiguity in policy and market conditions, and how these projects relate to agricultural practices and land-use management. Through semi-structured interviews with eight landowners and one key informant, this study identifies key motivations and opportunities for solar projects, such as financial viability and income generation, land-use optimization, and energy independence, while also uncovering challenges related to policy ambiguity, market volatility, and infrastructure constraints. A recurring theme is the different approaches to land management in the solar park. While some landowners use mowing for low-maintenance upkeep of vegetation in the solar park, others experiment with dual land-use models such as grazing or crop cultivation. This is creating a divergence between simplicity and innovation in such land maintenance strategies and reshaping the notion of land in solar parks as multifunctional. The findings suggest that landowner experiences with solar park development are shaped not only by national energy policy, market and land availability, but by context-specific factors such as when in time the solar park was built and under what conditions of the local land, experiences as farmers, coordination with their main operations, and the decision-making of landowners was impacted by their own characteristics and values. Drawing on frameworks from land system science, agricultural decision-making, and local energy transition theory, this thesis argues that understanding, including and drawing on landowner perspectives is crucial to creating a more resilient, long-term, multifunctional, and context-sensitive solar energy transition in Sweden.

Keywords: solar parks, landowners, land-use, agrivoltaics, rural energy transition, energy policy, agricultural decision-making.

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Abbreviations

Abbreviation	Description
EU	European Union
IEA	International Energy Agency
LET	Local Energy Transition
MW/kW	Megawatt/Kilowatt
MWh/kWh	Megawatt-hour/Kilowatt-hour
PPA	Power Purchase Agreement
RED III	Revised Renewable Energy Directive
USSE	Utility-Scale-Solar-Energy

Glossary

Concept	Description
Agrivoltaics/Dual land-use	An approach to land management in which solar energy production is combined with continued agricultural activity, through grazing or crop cultivation. In this thesis, the terms agrivoltaics and dual land-use are used interchangeably.
Battery storage	An energy storage technology using a battery system to store solar electricity for later use.
Crop cultivation	Crop cultivation is a less common approach, usually carried out between spaced rows of solar panels to allow sufficient light penetration. This method requires specific design considerations drawing the planning of the solar park.
Ecovoltaics	A solar park approach focused on enhancing biodiversity and ecological value in solar parks through measures such as pollinator habitats, wildflowers, or wetland zones.
Electricity grid	The national electricity infrastructure through which solar parks feed electricity for common use.
Energy independence/Off-grid	A goal to reduce reliance on the electricity grid by producing and storing one's own solar energy for self-consumption.
Grazing	Grazing is commonly implemented underneath and between solar panels, often using rotational methods where different sections of the solar park is grazed in sequence. Sheep are typically used, as their size and behaviours allow them to access the full area of the park with minimal risk of damaging the installation.
Ground-mounted solar park	A solar energy system installed on land, where panels are connected to a transformer.

Hydrogen storage	An energy storage technology using hydrogen gas to store excess solar electricity for later.
Joint-developed solar park	A collaborative solar park model where the landowner has developed a solar park on their own land in partnership with other actors.
Landowner	Individuals, organizations, or entities who own land where solar parks have been developed.
Landowner type	Refers to the different categories of landowners in the study, such as farmers, church associations, or businesses.
Large-scale centralized solar park	Large ground-mounted solar parks typically developed by solar developing companies commercially, feeding electricity directly into the grid.
Leased-out solar park	A solar park model where the landowner rents out land to an external developer who has developed a solar park on their land.
MW/kW	Units of capacity for solar parks, where 1 MW equals 1000 kW, and describes installed power output.
MWh/kWh	Unit of electricity production, where 1 MWh equals 1000 kWh, and describes energy generated or consumed annually.
Self-developed solar park	A solar park model where the landowner developed a solar park themselves on their land, only using a solar developer for installation of the system.
Solar park agreements	Contractual models for solar park development, such as land leases or Power Purchase Agreements (PPAs). Leases involve renting land to a developer, while PPAs are long-term contracts to sell electricity at a fixed price.
Small-scale decentralized solar park	Small ground-mounted solar parks developed and managed locally, often by a landowner, where

electricity can be both self-consumed and integrated with existing operations, or fed into the grid.

1. Introduction

The global transition from fossil fuels to more sustainable energy systems is a central challenge for governments, industries and societies alike. In recent years, the need to reduce greenhouse gas emissions in response to climate change has intersected with concerns around energy security, affordability, innovation and geopolitics, placing the development of renewable energy high on political agendas. Among renewable energy sources, solar energy is receiving growing attention due to its scalability across different contexts and levels, falling material costs, technological improvements, and increasingly flexible deployment options. According to the International Energy Agency (IEA) solar is projected to become the dominant global energy source by 2050 (IEA, 2021, p.116). In the European Union (EU), solar expansion is further reinforced by initiatives such as the EU Green Deal and the REPowerEU Plan, connecting the renewable energy transition to goals of energy independence and resilience (European Commission, 2023).

In Sweden, however, solar has so far played a minor role in an electricity system largely dominated by hydropower and nuclear energy. Still, the past decade has seen rapid growth in the sector. While installed solar capacity grew at an average annual rate of 60% between 2016 and 2023, partly driven by the higher electricity prices during the European energy crisis, growth slowed in 2024 to just 20% (Swedish Energy Agency, 2025; EurObserv'ER, 2024, p.9). This decline is largely attributed to reductions in household rooftop solar installations, which previously dominated the market as electricity prices fell, causing the initial incentives to have lost their appeal (Solar Power Europe, 2024; Svensksolenergi, 2024). In response, attention is currently shifting toward ground-mounted solar parks, larger systems where panels are installed directly on land and connect to a transformer that feeds electricity directly to the grid or a business operation. These parks are increasingly framed as a scalable long-term solution to meet future energy needs (Solar Power Europe, 2024). The Swedish Energy Agency even describes ground-mounted solar as having "nearly unlimited potential for future growth" (Swedish Energy Agency, 2023a, p.102).

However, such growth is raising questions about land siting and spatial trade-offs. Ground-mounted solar parks require large, flat land areas with good solar exposure and proximity to grid infrastructure (OX2, 2024). In Sweden, these conditions are often found on arable land, particularly in the southern parts of the country where solar irradiation levels are higher. Over half of the currently existing solar parks are located on arable land (Björnsson et al., 2022, p.3), which raises concern about land-use conflicts and the future of agricultural food production. A recent government commission has assigned the Department of

Agriculture to analyze whether the use of farmland for solar should be more tightly regulated in light of geopolitical tensions prompting questions of rearmament in relation to domestic food production (Government of Sweden, 2024). As a result, media, public and policy discussions often frame solar and agriculture as a trade-off between competing land-uses (County Administrative Board, 2025, p.5).

Whether this competition is inevitable, or is instead reflecting current policy frameworks and project designs in solar parks, is a question that warrants closer attention. Some actors in the Swedish solar sector have begun to explore dual land-use strategies such as grazing or crop cultivation under and between the panels as well as biodiversity measures such as pollinator habitats or wetlands, commonly referred to as agrivoltaics and ecovoltaics, as a way to integrate continued agricultural activity and land restoration with energy production (Råberg et al., 2021, p.2). While these practices remain novel in Sweden (Björnsson et al., 2022, p.1), their role in shaping the future of solar park development still remains uncertain. Most existing research has assessed agrivoltaics from a technical or ecological perspective (ibid.). This thesis is instead examining the perspective of those who shape these practices on the ground, the landowners.

Previous and ongoing research has examined the potential of incorporating agrivoltaic models into solar parks both practically and technologically (ibid.). The findings in this thesis also turn to the generally assumed trade-off between solar and agriculture, suggesting that the contrast may not be as clear-cut as it is often portrayed, i.e. as “a new way of managing land” as stated by one of the interviewees in the study.

The study is focusing on landowners in Sweden, actors whose decisions largely determine whether and how solar parks are implemented. Some are developing solar parks themselves, while others are leasing out land to external developers. In both cases, they are adapting to and navigating a complex and often uncertain energy system shaped by market volatility, ambiguous policies and unclear regulations. Although central to enabling solar expansion, landowners often carry substantial risk with limited structural support, and their perspectives remain underrepresented in literature that has mainly focused on issues such as grid integration, spatial siting, policy design, public acceptance and technological innovation.

This thesis addresses that gap by placing landowner experiences at the center of analysis. It is exploring how landowners navigate the development of ground-mounted solar parks, and how they are managing tensions between energy production and existing land-use. In doing so, the study is contributing to a broader understanding of how energy transitions are unfolding not only through infrastructure or policy, but through land-use decisions, rural livelihoods, and the agency of landowners shaping these outcomes.

1.1 Purpose and Research Questions

This thesis aims to understand how Swedish landowners are experiencing the development of ground-mounted solar parks on their land. It is focusing on landowners whose primary business operations lie outside the solar energy sector, such as farmers, businesses, or associations, who are pursuing solar energy as a complementary activity. Through a qualitative approach of semi-structured interviews with landowners, the study is seeking to identify key motivators, challenges, opportunities and land-use dynamics associated with solar parks. It is studying how landowners are navigating solar park development in relation to agricultural production and long-term land value.

Placing landowner perspectives and experiences at the center of analysis, this study is contributing to a broader understanding of how energy transitions intersect with land-use management, agricultural systems, and rural development. It is highlighting how landowners are influenced and constrained by broader structures of energy policy, land regulation and subsidies, and market conditions. Four overarching research questions are guiding the study:

What motivates landowners to engage in solar energy projects and develop solar parks?

What challenges do they face when integrating solar parks into their operations, and how do they manage these challenges?

What opportunities do they see in solar park development?

How do solar parks affect land-use? And what kinds of land-use management strategies are adopted?

1.2 Delimitations

This thesis is delimited landowners in Sweden who have developed ground-mounted solar parks on land that they own. These landowners have not previously been engaged in the solar energy sector, and therefore focuses on actors whose primary business lies outside the solar energy sector. This study places a particular focus on solar parks that have been developed on land that is current or former agricultural land, enabling a focus on how the solar park project affects land-use and management. The scope of the study is limited to solar parks developed in Sweden. The thesis does not aim to assess the availability or feasibility of siting solar parks, but instead aims to understand how landowners experience, perceive and engage in these projects.

2. Background

2.1 Solar Energy in the European and Swedish Energy Transition

2.1.1 European Solar Energy Policy

The European Union has played a central role in the development of solar energy. During the 2000s, EU countries such as Germany, Italy, and Spain drove early deployment through generous feed-in tariffs, a policy mechanism which guarantees renewable energy producers fixed prices for electricity fed into the grid (European Commission, 2022a). However, many of these support schemes have since been rolled back as deployment grew, driven by concerns over the financial burden on governments and challenges related to grid integration. Over time, technological advancements and economies of scale led to significant cost reductions, between 2010 and 2020 the cost of solar energy decreased by 82%, which in turn accelerated deployment of solar across the EU (European Commission, 2023). In recent years, China has become a global frontrunner for solar, while the EU has remained the second largest solar market globally (EUObserv'ER, 2024, p.4).

Solar development in the EU has been significantly impacted by the European energy crisis in 2021-2022, triggered by Russia's invasion of Ukraine. Soaring gas and electricity prices have required urgent action to reduce fossil fuel dependency and improve energy security. In response, the EU has launched the REPowerEU plan in 2022, placing solar as the central pillar in this strategy (European Commission, 2022b).

The EUs solar policy has in recent years focused on speeding up deployment and has reinforced supply chains through easier permitting for solar, mandatory rooftop solar on new buildings, and support for domestic manufacturing. The Revised Renewable Energy Directive (RED III) has introduced "renewable acceleration areas" to increase projects and has raised the renewable energy target to 42.5% by 2030 (European Commission, 2022a).

2.1.2 Swedish Solar Energy Policy

Sweden's energy mix has historically been dominated by hydro and nuclear power, leaving solar with a comparatively marginal role in the national energy mix. In 2023, solar energy was only 0.6% of Sweden's total electricity generation (Swedish Energy Agency, 2024a). Sweden's policy mechanisms for solar energy have shifted over the years, going from upfront government subsidies to a more restrained, market driven model. In the early 2000s, the government introduced investment subsidies that covered up to 70% of installation costs for solar installations. These subsidies have gradually decreased over time, to 60% in 2009, 45% in 2012, and eventually to 20% in 2019, before being entirely phased out in 2021 (Westerberg & Lindahl, 2022, p.13).

This previous investment subsidy has been replaced by a tax deduction system for green technology, which has provided a deduction on income tax for solar-related costs and profit. The deduction initially covered 15% of material and installation costs and 50% for energy storage solutions. The deduction rate was temporarily increased to 20% in 2023, and later reduced to 15% again in 2024 (Government of Sweden, 2024; Swedish Tax Agency, n.d.).

In 2003, Sweden introduced a Renewable Electricity Certificate system to promote renewable energy production. Under this scheme, producers received one certificate for every MWh of electricity they generated from renewable sources. Electricity providers were then required by law to buy a certain number of these certificates, known as the 'Quota obligation', to ensure that a portion of the electricity they sold came from renewable energy sources. While the system helped drive investment in renewables, it primarily benefited wind rather than solar. The scheme was closed to new installations in 2021, and will be fully phased out by 2035 (Swedish Energy Agency, 2023a; Westerberg & Lindahl, 2023, pp.33-34).

As of today, the 'Guarantees of Origin' system is certifying the renewable origin of electricity fed into the grid and can be sold to energy suppliers for use in consumer agreements or sustainability reporting (Swedish Energy Agency, 2024b). However, the market value of such guarantees has been limited and volatile, e.g. it fell from 8.6 to 1.25 Euros per MWh in 2023 (Westerberg & Lindahl, 2023, p.37). Another current policy incentive is the tax exemption on self-consumed electricity for solar installations below 500 kW, which was raised from 255 kW to 500 kW in 2021 (Swedish Tax Agency, 2024). Also, value-added tax is deductible for purchases and installation costs of solar installations (Swedish Tax Agency, 2020).

2.1.3 Swedish Solar Energy Legislation

The regulatory framework for solar park development in Sweden has remained fragmented and rather unclear, especially regarding land-use for solar parks and permitting. Unlike wind energy, solar installations have not been centrally regulated through national legislation, which has left regional County Administrative Boards with discretionary power. This has led to a lack of coordination, inconsistent rulings between regions, and lengthy or confusing permit processes (Region Stockholm, 2023, p.7; Ganhammar, 2021, p.38).

Over time the regulatory framework has evolved. A key legal requirement for solar parks in the Swedish Environmental Code is the consultation process by the County Administrative Board before establishing large-scale solar parks that alter the natural environment. For solar parks planned on agricultural land, the permitting process has been and is especially restrictive, where productive farmland may only be used for installations if it serves as an "essential societal interest" and no other suitable land is available, as arable land is protected as a matter of national interest under the Environmental Code. However, the interpretation of these criteria has varied across counties (Swedish Energy Agency, 2023b; County Administrative Board, 2025, pp.5-9).

The lack of clear guidance has meant that developers have often been unsure of how extensive their environmental assessments must be. In some cases, local authorities have required developers to examine alternatives across the entire electricity price zones, which has often been deemed unfeasible (Region Stockholm, 2023, p.7). These regulatory challenges persist, causing permit processes to be inconsistently applied across counties and outcomes have varied case-by-case (ibid.; Sweco, 2022). Compared with other countries, Sweden's legislative system regarding solar parks has been relatively complex and less developed. Denmark, for example, has simplified permitting processes (Agricultural Agency, 2024a, pp.43-44). The lack of national coordination regarding solar in Sweden has resulted in long and delayed permitting as well as unpredictability in these processes.

In addition to permitting, agricultural subsidies have been restricted in solar parks. Under current regulation, land-used for solar parks is not eligible for the EU's direct payment scheme for areal support, even if agricultural activities such as sheep grazing are being maintained in the solar park. The Swedish Board of Agriculture has determined that solar installations disqualify land from being classified as actively farmed, as the panels are considered to obstruct agricultural use. However, a change of this rule is expected in 2028, when land integrating grazing in solar parks will become eligible for subsidies under certain conditions. It remains unknown how this will be integrated in practice (Agricultural Agency, 2023b). Another requirement tied to grazing is the stalling requirement, which mandates access to shelter for grazing animals during months of no grazing possibilities, in other words in winter time (Agricultural Agency, 2023a, p.4).

2.2 The Solar Market

In recent years the Swedish solar market has expanded rapidly, with installed capacity growing at an average annual rate of 60% until 2023 (see Figure 1) (Swedish Energy Agency, 2025). Lower global installation costs, largely driven by increased Chinese production, have contributed to growing interest in solar parks. This shift has made solar energy more attractive due to lower installation costs (SolarPower Europe, 2024, p.26; EUObserv'ER, p.11). However, in 2024, this growth had slowed to just 20% (see Figure 1) (Swedish Energy Agency, 2025), largely due to a decline in household rooftop installations that had previously dominated the market, as falling electricity prices reduced the appeal of initial incentives. With the falling installation costs, along with the decreased appeal for rooftop solar installations, interest is instead growing toward ground-mounted solar parks (SolarPower Europe, 2024; Svensk Solenergi, 2024). By the end of 2024, Sweden had 293 000 grid-connected solar installations, totalling 4 808 MW (Swedish Energy Agency, 2025).

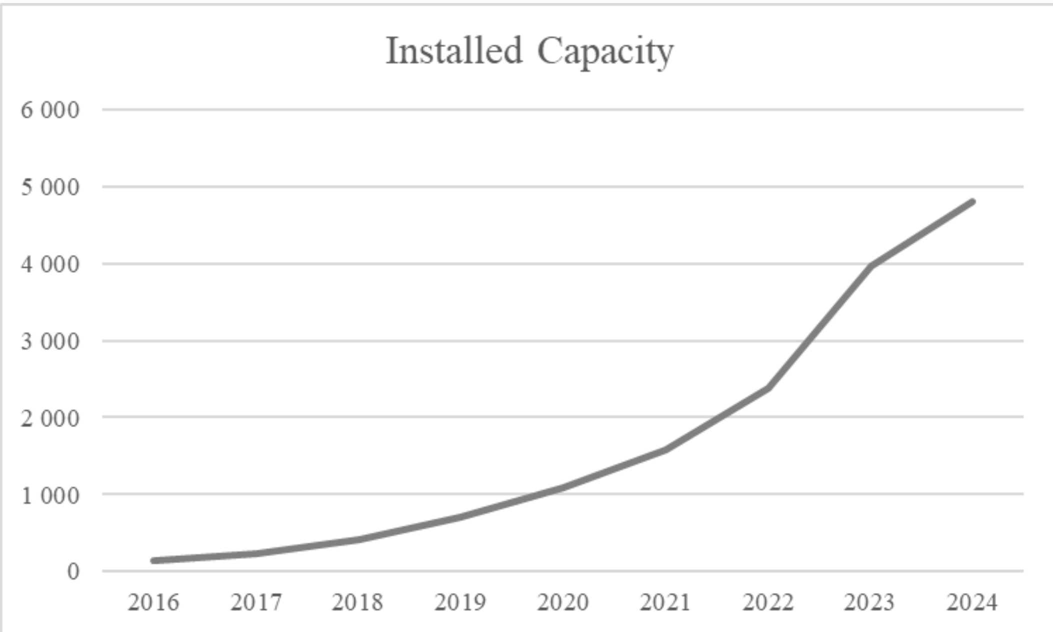

Figure 1. Installed Capacity of Solar Installations in Sweden between 2016 and 2024 (Swedish Energy Agency, 2025).

The European energy crisis has triggered a spike in electricity prices which in turn has contributed to an increase in solar installations, as it made both self-consumption of and selling electricity more profitable. However, since 2023, electricity prices have fallen. For example, the average spot price in a southern bidding zone fell from 248 EUR/MWh in December 2022 to 71 EUR/MWh in December 2023 (Swedish Energy Agency, 2024c, p.5). While this is benefiting consumers, it is reducing the profitability of solar parks for producers, especially since production is highest during summer time when prices typically are at their lowest in Sweden (Westerberg & Lindahl, 2023, p.37; Lundkvist, 2025).

The market has also been characterized by high prices in solar batteries, which has limited the ability to store electricity for resale or consumption during periods of higher demand. While battery prices have begun to decline, costs remain high (IEA PVPS, 2024, p.40). As a result, most solar producers have to sell directly to the grid at real-time market prices, which vary considerably throughout the year. Grid access is posing another challenge. Connecting to the grid has often required high upfront costs and has led to long delays due to limited grid capacity (SolarPower Europe, 2024, p.18). In addition, solar producers feeding electricity to the grid are typically being charged a fee by grid companies. While the structure of these varies depending on the grid operator, they have the potential to significantly lower compensation for electricity fed into the grid, especially for small-scale producers (Swedish Energy Markets Inspectorate, 2021; Garcia, 2024).

2.3 Land and Landowners in Sweden

Ground-mounted solar parks require specific land conditions for optimal productivity. Land should be relatively flat, unshaded and contiguous, with high solar irradiation exposure and proximity to existing grid infrastructure (OX2, 2024). In Sweden, such characteristics have been found primarily on arable land, particularly in the southern regions of the country, where a significant share of farmland is located, and solar exposure is higher than in the north. In the region of Skåne in the south of Sweden nearly 45% of the land area is being classified as agricultural, which makes it subject to potential land-use for solar parks (Statistics Sweden, 2023). Around 65% of solar parks in Sweden have been installed on arable land (Björnsson et al., 2022, p.7). However, Sweden is being considered to have large areas of other potentially suitable land, including peatlands, moorlands, landfills, and other types of ‘low-value’ or non-arable lands (ibid.). Typical land-use requirements for solar parks range from 0.7 to 1 MW per hectare, depending on panel efficiency, row spacing, and solar irradiation levels (LRF, 2023, p.10).

Sweden has a substantial total land area, approximately 41 million hectares, of which about 7% is classified as agricultural (Statistics Sweden, 2023). However, the share of arable land-used for food production has declined, largely due to increased food imports, structural changes in agriculture, and rising economic pressures on small-scale farmers (Agricultural Agency, 2024a, p.3; Agricultural Agency, 2024b). While this is raising concerns about long-term food security, it is also opening a window for alternative land-uses such as solar energy.

In terms of ownership, around 91% (3.2 million hectares) of agricultural land in Sweden is owned by private individuals, including individuals, estates and individual entrepreneurs. These landowners are usually operating small to mid-size holdings, often combining agricultural land ownership with productive forest land (Thorstensson, 2015, p.7). Institutional landowners, such as the Church of Sweden, also own land and are one of the country's largest non-state landowners. Through its properties designated to support clergy salaries, the Church owns around 54 000 hectares of agricultural land, of which 44 000 is arable, as well as significant amounts of forest land. These holdings are classified as legal entities and are often leased out by the Church, making them a central actor in Sweden's land-use landscape. Other landowners include private companies, foundations, municipalities, and the state (ibid.).

2.4 Solar Park Agreements

Landowners engaging in solar park projects in Sweden are typically doing so under one of two models, either by leasing land to a developer, or developing the project themselves with the help of an external installer. The most common model when leasing the land to a solar developer is through a long-term lease agreement, often over 30-40 years. This way, the developer is responsible for permits, financing, construction, and maintenance of the solar park, while the landowner is receiving fixed annual compensation (rent) per hectare, but can also be paid based on the performance in electricity output of the solar park. While this model is minimizing risk for the landowner, it is limiting their share of revenue, control over decisions, and the flexibility of using the land for other purposes over a long time period (EnergiEngagemang, 2024; Solgrid, 2024). Alternatively, some landowners are pursuing self-development, either independently or jointly with other actors. This approach is allowing greater control of and potentially higher returns from the solar park, but it is also coming with significant upfront investment costs, exposure to risk, time and effort, and the need for acquiring certain knowledge (OX2, 2024). In self-developed solar parks, electricity is either sold to the grid or self-consumed within the landowner's own operations.

There are generally three main types of contractual agreements for solar park development. Lease agreements between a landowner and a developer that includes established fixed-price annual payments and can include clauses on land restoration, liability, and revenue sharing from certificates. Power Purchase Agreements (PPAs) are long-term contracts where electricity is sold at a fixed price to an actor, they help reduce price volatility and secure project financing rather than selling electricity to the grid (LRF, 2023, pp.13-15). Contracts within self-development are often built on loans for investment costs, where banks typically require 50% equity, while the remaining costs are financed through loans based on expected electricity revenue over a 20-25 year period (Swedbank, n.d.).

2.5 Land-Use Trade-Off and Dual Land-Use Approaches in Solar Parks

The expansion of solar parks has sparked tensions in public and policy debates, primarily regarding the trade-off between using land for solar energy or food production. As solar parks are often developed on arable land, it raises concerns about reduced agricultural output, especially in the context of Sweden's declining food self-sufficiency (Region Stockholm, 2023). The legal protection of arable land as a national interest under the Environmental Code is adding further complexity to the debate. While the use of agricultural land for solar parks remains controversial, several County Administrative Boards have determined that such installations may be granted permits if they contribute to an overarching societal goal of climate change mitigation or energy security (Johansson, 2024). At the same time, solar parks have also raised ecological concerns. As they are involving a transformation of land-use, discussions around its impacts have addressed habitat loss, fragmentation, altered soil or hydrological conditions. Public opposition is often focused on disruptions to rural landscape aesthetics and worries about reduced access to recreational landscapes (Pettersson et al., 2022).

To mitigate these tensions, new approaches are emerging that combine solar energy production with other land-uses. Agrivoltaics refers to the simultaneous use of land for both agricultural production and solar energy generation. By integrating solar panels with either crop cultivation or grazing by planning the construction of panels in a way that allows access for agricultural machines, enabling animals to graze without destroying the construction, or minimizing shading for crops to grow (Pettersson et al., 2022, p.57). In Sweden, grazing animals such as sheep have become a more common agrivoltaic application, since they are able to manage vegetation growth even underneath panels (Björnsson et al., 2022, p.7; Råberg et al., 2021, p.16). These approaches generally require that dual land-use is planned for early in the project, as such options may be restricted in retrofit due to installation design constraints (Pettersson et al., 2022, p.70). The benefits of agrivoltaics include improved land-use efficiency, sustained agricultural production, healthier soils, and continued revenue for landowners (Dupraz et al., 2011, p.1; Råberg et al., 2021, p.18).

Ecovoltaics, by contrast, emphasizes the ecological value of the land in a solar park by aiming to restore or enhance biodiversity or ecosystems. As a complement to the solar park, this approach includes measures such as implementing pollinator habitats, flower-rich meadows, wetlands, and protective zones for insects, birds, and amphibians (van Noord et al., 2022, p.12; Råberg et al., 2021, pp.18-20). Similar to agrivoltaics, ecovoltaic measures are most effective if planned for at an early stage of the solar park project, but can be implemented afterwards depending on the context.

Whereas agrivoltaics focuses on optimizing land-use for agricultural production in solar parks, ecovoltaics focuses more on the ecological restoration and conservation of land where a solar park is developed. Both approaches provide alternatives for multifunctional land-use that can enable opportunities to reduce land-use conflicts, improve public acceptance, and contribute to more long-term land-use models in solar energy development (Pettersson et al., 2022, p.57; Björnsson et al., 2022, p.3). However, their adoption in Sweden remains limited and relatively novel.

3. Previous Research

3.1 Land Availability and Requirements for Solar Parks

Much of existing research has focused on assessing the land requirements and availability for ground-mounted solar parks, often using spatial modelling and quantitative assessments. Globally, such studies have mapped technical potentials and spatial constraints using for instance GIS or integrated assessment models. Capellán-Pérez et al. (2017), for example, have illustrated that meeting the entire global electricity demand with solar would require substantial land, posing potential land-use conflicts. Saunders (2020) similarly has highlighted that solar energy typically requires more land than fossil fuels per unit of electricity, and that indirect land requirements of this have often been overlooked in policy discussions. van de Ven et al. (2021) have underscored the risk of land-use change emissions and have called for coordinated planning and regulation to mitigate such effects. In the European context, Kiesecker et al. (2024) have identified low-conflict areas of renewable energy development and find that reaching the REPowerEU targets may have required land equal in size to Sweden, highlighting the land availability pressures of the renewable energy transition.

Swedish research, although more limited in quantity, has contributed through similar spatial mapping approaches. Lindberg et al. (2021) have used GIS and grid capacity analysis to identify suitable areas for solar parks in Sweden, emphasizing the importance of grid proximity in siting solar parks. Ketzer (2020) has complemented this by mapping land for solar parks in the EU that would implicate the least land-use conflicts, by also including agrivoltaics as a potential approach to decrease tensions between solar and agricultural land-use. Ketzer has introduced a participatory element, showing that land-use conflicts should be assessed in a regional context and as they are shaped by local conditions of acceptance. Adding a qualitative element to this field, a choice experiment in the U.S. by Gaur et al. (2023) has found that the public prefers solar to be installed on industrial land rather than forests or agricultural land.

Further qualitative perspectives in this research field have been provided by Biggs et al. (2022). Their study has focused on land availability in California through interviews with agricultural landowners, solar developers, and community stakeholders. They have found that while financial motivations have been important factors, land values such as water scarcity, farmland preservation, and ecological or visual landscape concerns have played a significant role for siting solar parks as a landowner. Their study has highlighted the importance of understanding how landowners, as key actors in the renewable energy transitions, are making decisions that shape where and how solar parks are developed. It has also provided a methodological and theoretical foundation for qualitative studies investigating landowner decisions for solar park siting, which is an approach this thesis is aiming to expand further in a Swedish context.

3.2 Drivers and Barriers of Solar Energy Adoption

In existing literature, financial factors have often been raised as crucial for enabling or hindering solar energy adoption. In Sweden Lindahl et al. (2022) have shown that while it has become cheaper to build solar parks, whether a project is financially viable still depends on factors such as electricity prices, access to financing, and grid-connection. These findings have emphasized that economic outcomes of solar park development are highly site-specific. Internationally, researchers have argued that high upfront costs limited financing, and policy instability has remained general barriers to solar energy adoption (Polzin et al., 2019; Bouich et al., 2023; Aparisi-Cerdá et al., 2024; Karakaya & Sriwannawit, 2015).

Governmental and policy instruments have been shown to play a central role in shaping solar market development. Rydehell et al. (2024) have found that while subsidies have stimulated early investments in solar in Sweden, their long-term effects may diminish, which calls for more adoptive policy frameworks. Globally, several studies have demonstrated that stable, long-term, and transparent policy frameworks are essential to reduce investment risk and attract private capital to solar (Polzin et al., 2019; Kihlström & Elbe, 2021). However, as Bouich et al. (2023) have argued, many policy schemes have remained short-term or inconsistently implemented, reducing their effectiveness. Broader benefits of solar adoption, such as job creation and local energy security, have often been overlooked in evaluations despite having motivational impact for both policy and investment (Noel, 2017).

Regulatory uncertainty has emerged as a recurring theme in the literature on barriers and drivers of solar energy adoption as well. In Sweden’s emerging market for ground-mounted solar, Bankel & Govik (2024) have found, through qualitative case studies, that a lack of regulatory clarity has hindered development. Similar conclusions have been drawn regarding green certificate systems (Ganhammar, 2021). Long-term reviews have further shown that solar technology remains dependent on governmental regulatory interventions to overcome infrastructural and financial barriers (Kihlström & Elbe, 2021). While some actors have adapted by using flexible, network-based business models, Bakel & Govik (2024) have concluded that these are often context-specific and difficult to scale up.

Environmental sustainability has appeared as both a driver and barrier in the literature. Several studies have emphasized the need for lifecycle assessments and circular design strategies of solar parks to manage emissions, waste, and land-use (Rabaia et al., 2021; Bosnjakovic et al., 2023). Although environmental motivations have often driven adoption of solar parks, practical limitations such as lack of recycling infrastructure have posed implementation challenges (Nyffenegger et al., 2024). In addition, environmental justice concerns have emerged around geographic disparities in how the benefits and burdens of solar adoption have been distributed, and raises the issue of equity in policy design for renewable energy transitions globally (Carley et al., 2018).

3.3 Attitudes and Land-Use Conflicts

Understanding how solar parks have been perceived and how they have shaped local landscapes is central to identifying the social dimensions of land-use conflicts. Ketzer (2020) has explored land-use tensions in Northwestern Europe through GIS spatial modelling, and has shown that dual land-use approaches, like agrivoltaics, may help reduce conflict. However, the study has emphasized that local conditions, agricultural practices and community attitudes must be considered case-by-case. According to Ketzer, the link between spatial planning and public perception will be important for evaluating solar park feasibility, especially in rural areas where competing land-use between agriculture and solar is a general debate.

Roddis et al. (2020) have identified a range of spatial and governance-based determinants that shape solar park acceptance of large-scale solar parks, and include perceived fairness, attachment to place, and visual or ecological concerns. Wüstenhagen et al. (2007) have developed a framework to assess acceptance across socio-political, community, and market levels. This model has defined factors that shape community acceptance interrelatedly, such as political support for renewable energy, public opinion, endorsement by policymakers, fairness in planning processes, trust in developers, distribution of benefits and impacts, and uptake of renewable energy technologies in the economic systems. Other studies have emphasized the importance of narratives, symbolism and public imagery. Research by Sütterlin & Siegrist (2017) and Scovell et al. (2024) has found that trust in developers, alignment with broader environmental values, and visual associations shape attitudes toward solar parks. These attitudes have also been shaped by symbolic meanings and experiences, which suggests that stakeholder engagement strategies must account for these dimensions. Karasmanaki & Tsantopoulos (2021) have shown that attitudes are shaped by perceptions of environmental benefit, financial cost, and personal values. Walker & Devine-

Wright (2008) have further highlighted the need to clarify what “community” means in renewable energy projects to ensure meaningful local participation.

3.4 Swedish Solar Parks and Land-Use

In recent years, the Eko-Sol project has contributed to Swedish research on solar parks in relation to land-use and biodiversity. Björnsson et al. (2022) have conducted a mapping of Swedish solar parks, and identified a lack of formalized ecological guidelines for solar parks in Sweden and advocate for early-stage biodiversity assessments and multifunctional designs of solar parks. Dupraz et al. (2011) have introduced agrivoltaics as a promising model for improving land-use efficiency while generating solar energy. Råberg et al. (2021) have expanded on these ideas, noting that while solar parks can impact farmland, they also have the potential for grazing, pollination and ecological enhancement if they are designed with these goals in mind. A practical handbook of how to design ecovoltaic and agrivoltaic systems has been developed within the same project, with strategies for site and technology selection, zoning, and multifunctional land-use (Pettersson et al., 2022). Van Noord et al. (2022) have provided a framework for integrating biodiversity and have drawn attention to the limited use of agrivoltaics in Swedish solar parks to date. To situate these insights within a broader context, international studies have reported similar findings. Lafitte et al. (2023) have mapped global evidence on biodiversity impacts of solar installations and have called for more nuanced evaluations that regard multiple species. These studies have highlighted the importance of integrating ecological and land-use perspectives in solar development, a trend that is emerging in Sweden but still evolving in terms of policy and practice.

3.5 Research Gap

Much of the existing literature on land availability and land-use in relation to solar parks has relied on spatial modelling, GIS, or mapping methodologies, with a focus on technical, financial, or environmental assessments. Although some studies have incorporated stakeholder perspectives in its research design, most qualitative research focused on either community attitudes (Roddis et al., 2020; Scovell et al., 2024) or expert insights (Biggs et al., 2022), and often in non-Swedish contexts. Biggs et al. (2022) have provided a valuable methodological, conceptual and theoretical framework by studying agricultural landowners’ decision-making to hosting solar parks in California, while including solar developers and community stakeholders in data collection.

In contrast, this study is focusing exclusively on landowners, a group that plays a central role in the energy transition but has rarely been explored in the literature beyond the work of Biggs et al. (2022). This study does not seek to assess land availability or siting feasibility for solar parks, but is rather aiming to understand how ground-mounted solar parks reshape land and land-use practices through the experiences and perspectives of those who host it, the landowners. Furthermore, while Biggs et al. have focused on agricultural landowners, this study is broadening that scope to landowners relevant in a Swedish context, such as the Swedish Church, businesses, associations, or farmers as landowning actors.

By examining the motivations, challenges, opportunities and land-use effects through qualitative interviews, this study is seeking to contribute with knowledge that could clarify how solar park development has unfolded in Sweden. Focusing on the experiences of solar park landowners, the thesis aims to show how involved landowners' land-use and landscape is impacted by solar parks. The thesis emphasizes that landowners are not just passive enablers of solar siting, but strategic decision-makers who are navigating risks, responsibilities, and land-use trade-offs in ways that are impacting their main operations. In doing so, the thesis is offering a new perspective that complements existing research, by addressing a gap in how solar energy and land-use transitions are understood and experienced in Sweden from a landowner perspective.

4. Theoretical Framework

This thesis draws on two theoretical frameworks to analyze how landowners in Sweden engage with, shape, and experience the development of ground-mounted solar parks on their land. Drewello’s (2022) ‘Three-Level-Model of Local Energy Transition (LET)’ and Biggs et al. 's (2022) framework of factors influencing landowners' decisions to host utility scale solar energy on their land. Together, these frameworks offer a multi-scale as well as an actor-centered approach to understanding how landowner experiences are shaped by and in turn shape contextual factors as well as the larger system of the solar energy transition.

The decision to apply these frameworks is grounded in the duality of landowner experiences of developing solar parks on their land. On one hand, solar energy development is influenced by systemic structures, connected to energy policy, grid access, and planning systems, which Drewello’s (2022) framework addresses through a holistic and multi-level approach to local energy transitions. On the other hand, landowners also act as strategic individual decision-makers that shape how we understand their experiences of developing solar parks, which is something Biggs et al. (2022) capture through their framework integrating land system science and agricultural decision-making theory. Together, these frameworks enable an analytical lens that connects landowner experiences through both individual agency as well as broader systemic dynamics.

4.1 The ‘Three-Levels-Model of Local Energy Transition’

Drewello’s (2022) model for understanding local energy transitions (LET) is rooted in the economic theory of regional competitiveness developed by Michael Porter. In his book “The Competitive Advantage of Nations” (1990), Porter argues that the ability of a region or nation to remain competitive depends not only on macroeconomic conditions, but also on local context and micro-level dynamics, such as the presence of strong local networks, institutions, and innovation systems. Drawing from this idea, Drewello (2022) develops the competitiveness concept into an analytical framework for energy transitions, and suggests that successful LET’s involves determinants across three interrelated levels: *the local context*, *the macro framework*, and *the micro framework*.

- *The local context* includes geographical, ecological, infrastructural, and demographic factors of a specific region, such as land characteristics, weather conditions, or population density, that shaped the feasibility or suitability of a particular energy project. In the case of solar parks, this means factors such as sunlight exposure, land availability, or existing land-uses.

- *The macro framework* encompasses national and international policies in terms of regulatory structures, market outlook, and energy infrastructure, such as grid connectivity or subsidies that can create either enabling or constraining conditions for energy transitions at the local level.

- *The micro framework* focuses on the actors involved in implementing energy transitions locally, such as municipalities, energy companies, businesses, civil society, and in this case landowners. It includes their willingness and ability to engage, organize, innovate, and collaborate within local governance networks and under national policy frameworks.

This framework is particularly useful for analyzing solar park development in Sweden, where local landowner (i.e. the *micro* level) decisions and experiences are shaped by both place-specific land-use contexts (i.e. the *local* context) as well as national energy market and policy structures (i.e. the *macro* level). By connecting drivers at a system level to local actor capacity, Drewello's (2022) framework helps explain both structural limitations and possibilities, and as such serves as a connection between the system of solar energy and on the ground implementation of solar parks.

4.2 Land System Science and Agricultural Decision-Making Theory

While Drewello (2022) provided a system level perspective to solar energy transitions, Biggs et al. (2022) applies an actor-centered approach using land system science and agricultural decision-making theory. Their framework provides insights into how landowners make decisions around adoption of utility-scale solar energy (USSE) on their land, through both external incentives as well as landowner specific motivations, values, and contexts.

Land system science as applied by Biggs et al. (2022) draws on land rent theory which states that land will be allocated to the use that generates the highest profit, or "rent", for the landowner, but expands the scope of the theory to include ecological and socio-cultural values. As such, the value of land can be shaped by its productivity and profitability, but also aesthetics, heritage, and identity. Landowners do not only aim to maximize profit, but assess the value of their land through multiple perspectives that often overlap, in turn making decisions that provides the highest "rent" when hosting solar parks on their land.

In this thesis, I draw on this idea but expand the concept to include volatility as a core factor influencing how land value, profitability and future land-use were assessed. Based on the literature studies and interviews, it has become clear that uncertainty with regards to market, policy conditions, and regulations, plays a large role in shaping how landowners thought about long-term profitability of developing solar parks. Volatility may increase interest in hosting solar as a potentially more profitable source of income, but it also increases perceived risk around allocating land for solar park projects over long periods of time. This addition is not included in Biggs et al. (2022) original framework but became important to include in this thesis to capture the highest perceived "rent" from the Swedish context. Integrating volatility into the concept of land system science allows this thesis to better reflect how landowners assess value of land in a changing energy system.

The agricultural decision-making part in Biggs et al.'s (2022) framework focuses more directly on the landowners themselves, their values, motivations, and the structural factors that shaped how they made decisions. Agricultural decision-making theory according to Biggs et al. standpoint originates from studies of how farmers and landowners inclination to respond to hosting solar facilities can be understood from a landowner perspective. It aims to understand how decisions are formed not only based on external incentives, such as profitability, trends, or policy incentives, but also in relation to the farming system, identity, and values of the landowner themselves. Biggs et al. use this approach to explore how landowners navigate solar park hosting within their broader strategies of land management and rural livelihoods.

Biggs et al. combine these theoretical perspectives into three factors that influence landowner decision-making for hosting USSE on their land:

- *Institutional, market, and program factors*, such as policies, market, regulations, or lease models.
- *Farm and farmer characteristics*, such as size, structure, income, or type of agricultural production.
- *Motivations, attitudes and perceptions*, such as a landowner's environmental ethics, personal values, perceptions of landscape or land.

In this thesis, I apply this framework to analyze not only why landowners chose to develop solar parks, but how their experiences reflect certain decision-making contexts or abilities. By focusing on how land-use strategies are shaped over time, and how landowner perceptions of financial viability, land optimization, or risk management evolve, this framework offers valuable insight into how future solar park development might be encouraged or constrained, shifting the focus from land availability to landowner agency. As the *farm and farmer characteristics* factor relies on the collection of extensive landowner data, the analysis within the scope of the study only applies this perspective to the extent to which such information was gathered and available from the interviews.

5. Methods

5.1 Research Design

The study was carried out using qualitative interviews with eight Swedish landowners who had developed solar parks on their land. The purpose was to understand their experiences and reflections, not to generalize results that apply to all landowners in Sweden, but to explore how a set of individuals thought and acted in this type of project, where the goal was to understand individual thoughts and decisions in detail, rather than to measure or compare them statistically.

The research design was guided by four key categories and related subcategories of interest, which were derived from the interview questions: motivations, challenges, opportunities and land-use effects. These categories assisted the process of making sure the research process followed a certain focus, but also helped the making of the interview guide (see Appendix 1 and 2), the coding of interview data, analysis and drawing conclusions that related back to the research questions.

Rather than following a fixed structure from start to finish, the research design was inductive, and the scope and process continued to evolve as new insights and data emerged. This approach allowed going back to earlier steps and revising them if needed, and it meant that the research design was shaped throughout the process. This allowed the study to stay close to the landowners' experiences, building the analysis from what they were actually saying rather than trying to fit their experiences into predefined ideas. Early assumptions or decisions were revisited and shaped as new patterns or information emerged during literature studies, desktop research on the topic, data collection and analysis (Flick, 2009, pp.92-95). Although the initial themes and categories of the research design were based on the four analytical categories that derived from the research questions, they were treated as provisional and somewhat adjusted throughout the process if needed to better reflect the data.

5.1.1 Delimitations

The scope of this study was delimited to Swedish landowners who had developed solar parks on their own land, either themselves or by leasing out land to an external developer, where their primary business operation was outside the energy sector. This included actors such as farmers, associations, or businesses. A particular focus was placed on solar parks developed on current or former agricultural land, to better understand the land-use and land management implications, as well as reflect the broader societal debate of food versus energy.

The scope generally excluded experts, solar developers, energy companies or authorities, except for one Key Informant who turned out not to be a landowner throughout conducting the interview. The decision was made to focus the study on landowners as a specific actor group whose decisions and experiences were central to the transformation of rural land through renewable energy. While other actors play a role, this thesis did not aim to provide a comprehensive mapping of the solar energy sector in Sweden, but to deepen the understanding of landowners' experiences and perspectives in that process.

As such, the study had an explorative purpose, and was not intended to provide statistically generalizable conclusions, but instead sought to understand patterns of thought and practice among a smaller group of different landowner types. The goal was to inform further research and policy discussions on the role of landowners and land in the solar energy transition.

5.2 Data Collection: Interviews and Sampling

The method used for data collection was semi-structured interviews. Interviews were chosen as the most appropriate method for this study, as they allowed for an in-depth exploration of landowners' experiences and perspectives, insights that would have been difficult to access through other forms of data collection. The semi-structured format was intended to allow landowners to speak freely about their experiences and deep-dive into interesting case specific subjects, while still covering the four central categories guiding this study, and an interview guide was developed based on them (motivations, challenges, opportunities and land-use), but the interview format had allowed room for follow-up questions or detours depending on the context and responses of each landowner (See Appendix 1 and 2). Background literature studies were used to build contextual understanding in preparation for conducting and interpreting the interviews (Flick, 2009, p.49).

Eight interviews were conducted with landowners across Sweden (although all were located in the southern parts of the country), alongside one interview with a Key Informant conducting and expanding sheep farming for solar park grazing. The interviewees were identified through desktop research on solar park projects and snowball sampling. While snowball sampling may create more generic landowner types, the snowball method proved particularly useful in reaching less visible landowners who were not as easily identified through public sources such as media or energy companies' websites. The sample included a variety of landowner types, from farms, to church parishes and rural businesses, which offered a range of perspectives within the Swedish landowner landscape (see Table 1 below). Sampling focused primarily on case relevance in terms of quality of content rather than reaching a fixed number of cases (Flick, 2009, p.31).

Land-owner	Landowner Type	Park Type	Electricity Use	Land-Use Strategy	Est.	Size (MWh/yr)	Size (ha)
1	Farmer	Leased-Out	Sell	Grazing	2022	3 000	3
2	Farmer	Self-Developed	Self-Consume	Cut grass	2018	500	0,7
3	Congregation	Self-Developed	Self-Consume	Cut grass	2021	230	0,17
4	Farmer	Joint-Developed	Self-Consume	Crop cultivation	2021	-	-
5	Parish	Self-Developed	Self-Consume	Cut grass	2018	244	0,65
6	Business	Leased-Out	Sell	Crop cultivation	2024	7 000	13
7	Business	Self-Developed	Self-Consume	Cut grass	2021	499	-
8	Business	Self-Developed	Self-Consume	Grazing	2023	500	1,1

Table 1. Landowners Interviewed with Landowner Data.

The interview guide was informed by literature and desktop research on the topic, as well as by background knowledge about the landowner's contexts, in order to increase the relevance of the questions and enable more informed and tailored conversations. Interviews were carried out in Swedish, as all landowners and myself were native Swedish speakers (see Appendix 1 and 2). During the interviews, I tried to stay neutral and open, but it is important to acknowledge that interviews always include a degree of interpretation and social interaction which could shape responses. I was careful not to steer the interviewees toward certain answers, but allowed landowners to describe experiences freely, based on the guiding questions from the interview guide, asking follow-up questions if something of particular relevance or importance arose throughout. At the same time, the goal of the study was not strict neutrality or unbias, but to understand how landowners themselves perceived and talked about their experiences. In this way, personal stories or reflections were treated as valuable insights rather than as sources of bias.

Interviews were carried out online using Teams, apart from one interview that was in person. The interviews lasted between 45 to 60 minutes. All but one interview was recorded and later transcribed. One landowner requested not to be recorded, so instead detailed notes were taken during and after that interview. While this brings a limitation in terms of data consistency and comparability, the core themes discussed aligned well with other interviews and were reflected in the findings.

5.3 Data Analysis: Thematic Content Analysis

Following the interviews, all of the transcribed and recorded material was organized into a comparative spreadsheet, with responses categorized under the four key categories that were deriving from my research questions: motivations, challenges, opportunities, and land-use effects, and their subcategories. Using thematic content analysis, this method allowed for systematic comparison across interviews and enabled the identification of both common patterns or differences between landowner's responses.

The analysis followed a thematic and interpretative approach, I did not use any formal coding software. Instead, I worked manually with the data by noting similarities, contradictions and recurring topics. The process was inductive, which meant the themes accounted for in the findings were not predetermined, but emerged from the data analysis process, beyond the four predetermined categories in which responses were coded. By using thematic content analysis, I was able to focus on what the landowners were saying in-depth, which was suited to the aim of providing an understanding of their experiences. The analysis aimed for transparency in how data was grouped, ensuring that all the categories used in the findings could be traced back to landowner responses in the spreadsheet. In the Results chapter (see from page 28), landowner responses and data was referred to using anonymized ID-codes (such as L1, L2, and KI) to maintain confidentiality while ensuring transparency of specific information origin.

The theoretical framework, drawing on Drewello (2022) and Biggs et al. (2022) was applied inductively after the empirical material had been collected, coded and analyzed. Rather than predefining the analysis at an early stage of the research process, the frameworks were selected to structure and deepen the interpretation of the findings in a way that aligned with the themes that emerged from the data. In this way, theory was used to support the thematic discussion of the findings and to situate landowner experiences within broader analytical perspectives.

5.4 Limitations and Considerations

Some limitations should be acknowledged. First, all landowners within the scope of the study had already developed solar parks. This group was assessed as the most relevant group to interview, as they had experience with the different stages of developing solar parks. This meant that the study did not capture the perspectives of landowners who chose not to proceed, were denied permits, or were still considering solar projects. As a result, their responses reflected to some degree successful development, particularly in relation to permitting. These excluded landowner groups may represent valuable perspectives for future research.

Second, since the study focused solely on landowners, it did not include perspectives of solar developers, municipalities, or energy companies, which could have added insight into the broader process of developing solar parks. However, this choice was made to keep the study grounded in landowner perspectives and to maintain a focused scope.

Third, while I aimed to capture as many landowner types as possible, the study was not able to reflect the full diversity of landowners across Sweden developing solar parks, such as private persons, larger corporations, or landowners in northern parts of the country. However, the material has captured the main landowner types and geographical scopes that are visible in solar park development in Sweden.

6. Results

This chapter presents the empirical findings from the eight semi-structured interviews with landowners who had developed ground-mounted solar parks on their land in Sweden, as well as one Key Informant (KI) with experience and knowledge of grazing sheep in solar parks. The findings are presented thematically and reflect the conditions under which solar parks have been planned, implemented and managed from a landowner perspective, and offer insight into how landowners navigate their solar park projects in relation to land-use, energy systems, and broader societal settings. This includes the motivations behind solar park development, the practical and institutional challenges faced, what opportunities come with solar parks, and the broader reflections landowners hold with regards to land-use strategies and management.

The findings are organized into four overarching themes that emerged from the analysis; ‘Land-Use Practices’, ‘Solar Investments: Costs, Timing, and Operational Barriers’, ‘Navigating the System: Institutional and Market Factors’, and ‘Landowner Motivations, Values, and Long-Term Visions’. Each theme was structured and broken into sub-themes that reflect recurring or contrasting patterns in the interview data. Further interpretive commentary on the interview data is included in the Discussion (see page 53) chapter that follows.

6.1 Land-Use Practices

6.1.1 Land Characteristics and Site Selection

The eight solar parks analyzed in this study were developed on agricultural land, either productive arable land or lower yield farmland, such as grass lands. In five cases (L1, L3, L4, L5, L6), productive farmland was used (either completely or in part) for the solar park. Landowners explained influencing factors of grid proximity, transformer access, and lesser agricultural value than surrounding land plots as reasons for this choice. In two cases (L1, L6), land was leased out to external developers, and for them it was the developers who identified the most suitable and productive land for the park. Among the four landowners (L1, L4, L6, L8) who integrated dual land-use models, the parks were either completely or partially situated on arable land.

Two landowners (L1, L6) emphasized that integrating dual land-use approaches was essential to securing permit approvals for placing solar parks on productive farmland. More generally, these landowners justified the use of high-yield land through the added agricultural or grazing functions they maintained within the park. In contrast, three landowners (L2, L7, L8) selected low-yield agricultural land for their solar parks, describing this as previously unused or otherwise marginal for farming or other purposes. In these cases, the solar park was seen as a way to develop land-use without competing with food production or other income generating activities.

Three landowners (L1, L7, L8) and the KI highlighted the need to prioritize lower-quality lands for future solar development in Sweden. Examples mentioned included land with high soil erosion, marginal grasslands, industrial land or forest impediments. L8 reflected that "although land is taken for a solar park for 40 years, it is still 40 years and we have no clue what the Swedish rural or agricultural environment looks like in 40 years, therefore it is important to beware of sustaining our food production and agricultural interests", adding that they are still positive toward solar expansion, only pushing for a strategic approach in terms of the land management aspects. The three landowners (L1, L7, L8) and the KI argued that in cases where productive farmland was used, dual land-use models such as grazing should be made obligatory to ensure continued agricultural production across Sweden, especially in large-scale commercial solar parks.

6.1.2 Land-Use Optimization

Land-use optimization emerged as a strong underlying motivation for solar parks across the interviews. Among the four landowners integrating dual land-use (L1, L4, L6, L8), the solar parks were seen as a way to maintain productive working land, while introducing a new income stream and "testing" an innovative approach. Grazing and crop cultivation were described by the four landowners as part of the land-use optimization that motivated the solar park, as complementary strategies that aligned with personal values of agricultural tradition on farmland.

Among five landowners (L2, L3, L5, L7, L8), particularly the businesses and landowners associated with the Church of Sweden, the solar parks were framed as an opportunity to utilize land, especially low-productive or unused land, and integrate it with existing business operations or put the land to "better use" than before (L2).

6.1.3 Land Maintenance Strategies and the Potential of Dual Land-Use

Among the eight landowners, four (L2, L3, L5, L7) used mowing or cutting grass for vegetation management in the solar park, either manually or through hired contractors. The landowners described this method as easy, reliable and requiring minimal effort, and was framed as the most viable strategy to incorporate into their current operations. One landowner (L2) explained that they lacked capacity in terms of time and resources to practically explore more complex strategies like grazing.

The other four landowners (L1, L4, L6, L8) had implemented agrivoltaic strategies for solar park maintenance. Two (L1, L8) used rotational grazing with sheep, while two (L4, L6) had developed crop cultivation between the panels. These landowners viewed dual land-use as a strategy to combine revenue generation with ecological benefits. Grazing was framed as particularly promising due to its lesser infrastructure demands, the benefits of minimizing vegetation management labour, and being a more easily implemented approach.

Among those who integrated grazing, benefits were also described in terms of supporting soil health and biodiversity on their land, as well as preventing rooting of growth that may damage the solar park long-term. L1 noted that the already existing solar park fencing made grazing more easily implemented, while L8 highlighted that sheep grazing was a lot less costly from a wider perspective, as cutting also required labour or that the sheep and sheep farmer could benefit from the grazing opportunity. L4 and L6, who incorporated crop cultivation, described benefits of decreased, or rather avoided, losses of food production. Notably, the three landowners (L1, L4, L6) who leased out land to external developers or carried out the project jointly, integrated dual land-use. Suggesting that such approaches may emerge not only from landowner initiative, but also from collaboration during project planning or the increased potential for landowners to focus more on land-use aspects when the solar park is developed by an external actor.

Landowners practicing dual land-use models often described more dynamic approaches to land management. One (L1) was experimenting with introducing chickens alongside the grazing sheep. Others (L4, L6) spoke about rotational crop cultivation and trying different approaches or methods over time. In common for these four landowners (L1, L4, L6, L8) was a motivation of dual land-use models "feeling right" to incorporate from a personal perspective. L8 highlighted that including sheep grazing in the solar park felt like a "pleasant" addition. According to the KI, grazing-based models could serve as a scalable business idea for sheep farmers (a sector in decline) to provide maintenance services for solar parks while regenerating soil and vegetation quality. Lessons from successful grazing models in Denmark, which the KI had drawn upon to develop their grazing strategies in Sweden, demonstrated the long-term viability of grazing when collaboration between solar developers and farmers was established early on. They also emphasized that grazing prevented issues of panel damage or need for removal of growth of thistles (*Cirisium arvense*), elderflower trees (*Sambucus nigra),* or blackberry bushes (*Rubus*). Such growth was reported as more likely in solar parks maintained only by mowing and would be difficult to remove, the KI stressed the importance of spreading this knowledge.

Three landowners (L1, L4, L8) reported that vegetation grew better underneath the panels, attributing it to reduced evaporation, moderated temperatures or less direct sunlight, and protection from night frost. L1 could even compare vegetation in the solar park to surrounding land areas, which had the same preconditions for growth apart from the solar panels, and had concluded that vegetation thrived much better in the solar park. These environmental benefits were seen as an increasingly important opportunity in light of climate change of more dry and hot conditions in the future. Landowners (L2, L3, L7) that incorporated strategies of mowing or cutting grass also described how growth had not been noticeably affected by the solar park or even better than before in one case (L2).

6.1.4 Barriers to Dual Land-Use Models

All four landowners who primarily used mowing or cutting of grass (L2, L3, L5, L7) expressed interest in integrating grazing into their solar parks but had met barriers towards such developments. Retrofitting parks for agricultural activities was described as complex, time-consuming and costly. Once panels were installed tightly to maximize energy production, there was little room for livestock access. Landowners (L2, L7) mentioned that alternative animal options beyond sheep that were more accessible in terms of their specific farming operations were impractical (such as horses or cows), as solar parks were not adapted for larger animals, and would require a lot of effort and risk to implement. As described by the KI, other animals could graze solar parks, such as cows, goats or hens, but these options were less tested, more complex, and might require a different approach to solar park construction than sheep grazing.

L6, who incorporated agrivoltaics, explained how the spacing between rows of panels had been negotiated with the solar developer, who wanted to maximize production on a small surface by placing panels tightly, while the landowner wanted space between them to access the land with agricultural machines. The KI emphasized that early-stage planning was crucial, without proactive involvement of land-use perspectives from landowners, parks were often designed solely for energy yield, neglecting land management possibilities. Consequently, this limited future potential for dual land-use integration.

Three landowners (L5, L6, L8) noted that certain crop cultivation practices, such as irrigation or fertilizer spraying, were difficult to implement due to the risk of interfering or destroying solar panel function. While this limited current cropping options, they saw future potential if technical solutions could be developed. In comparison, L8 described grazing as a more easily integrated dual land-use model than cropping.

Agriculture related regulatory obstacles were highlighted, L1 and the KI noted that grazing was not legally recognized as an agricultural activity when applied in solar parks, which limit eligibility for certain agricultural subsidies. Furthermore, the mandatory indoor housing requirements for sheep, despite being needed for only a short period of each year, would impose significant costs and logistical burdens on sheep farmers. For sheep grazing to be scaled up and meaningfully integrated into solar parks, a much larger number of sheep would be needed. This, in turn, would require substantial investments in indoor housing facilities that might sit unused for most of the year, making such expansion financially unviable. While sheep would be able to graze year-round if not shaved, they argued that the panels would provide additional protection for the sheep. Another point raised by the KI was the lack of economic incentives for integrating sheep grazing in solar parks, and that even if grazing were possible, the lack of financial support or subsidies for expanding sheep farming in Sweden for this purpose might discourage landowners from integrating such practices into their solar parks.

6.2 Solar Investments: Costs, Timing and Operational Barriers

6.2.1 Solar Development as Financially Viable

Across seven landowners (L1, L2, L3, L4, L6, L7, L8) financial viability stood out as a key motivating factor to develop solar parks. This finding aligns with trends discussed in the background, where self-consumption and cost savings have motivated solar investments. This was particularly clear among the five landowners (L2, L3, L4, L7, L8) who had developed solar parks themselves. For these landowners, the primary goal was not to generate income by selling electricity to the grid, but to achieve cost reductions through self-consumption, and ensuring predictable electricity supply.

Two landowners (L2, L4) described financial factors as the main driver for developing solar parks, while the other three (L3, L7, L8) acknowledged financial viability as a necessary precondition while other reasons were mainly cited as the drivers, such as personal or environmental motivators. For example, L2 explained that the decision was “mainly financially motivated”, while L3 said that “cost reductions and economic gains” contributed to the decision of developing a solar park. L8 emphasized that securing a long-term stable electricity source and price was a key driver, despite the high upfront costs, as they viewed the solar park as a buffer against future market price volatility.

Among the four (L1, L4, L6, L8) landowners with dual land-use models, two (L6, L8) emphasized the land-use integration made the projects financially feasible and motivated. L6 stated that without the additional income streams, or rather avoided lost income streams from crop cultivation on that piece of land, the solar park would not have been interesting for them to develop. Similarly, L8 highlighted that while sheep grazing did not increase profits substantially, it offset maintenance costs of mowing or cutting and contributed to a broader value in the solar park.

For the two landowners that leased out land to external developers (L1, L6), leasing was framed as a way to generate a stable low-risk income from the solar park project. L6 emphasized that financial viability was an underlying requirement, but highlighted that a prerequisite for motivating the project was the agrivoltaic approach “it felt right in my gut to do this project…but we would not have done it if it was not financially viable” (L6).

Subsidies and tax incentives were also important in motivating the solar parks especially among landowners developing solar parks themselves. Two landowners (L2, L7) stated that they would not have pursued their projects without the investment subsidies or tax conditions available at the time of investment. L7, limited the park's size to stay below the 500 kWh annual production threshold for tax reductions on self-consumed electricity.

In relation to solar park size and financial viability, the two leased-out solar parks (L1, L6) were larger and more commercially oriented in scale and energy output. In contrast, the two solar parks established by the two landowners (L3, L5) connected to the Church of Sweden were smaller in size and primarily designed for their own local energy needs and implemented a more contained approach to solar park development. As expressed by one of these landowners (L5): “as we are financed by tax-payers, we must be more careful and thoughtful in our approach to solar development”. The rest of the solar parks (L2, L4, L7, L8) were developed just below the energy tax threshold, as noted in earlier sections.

6.2.2 Solar as a Strategic Opportunity

Four landowners (L2, L4, L7, L8) framed their solar park development as a strategic move under the favourable conditions at the time of investment. Those who installed their parks just before or during the energy crisis (L4, L7, L8) explained how the high electricity prices and available subsidies just before the crisis presented a brief “window of opportunity” to act on favourable incentives and high electricity prices.

In contrast, L2, who was an early adopter, reflected how financial unpredictability had negatively impacted their outcome. In hindsight, they stated that they would have reconsidered the solar park had they known about the extent of market volatility ahead. L2 explained that at the time of investment a solar park seemed like a strategic opportunity with high the investment subsidies available at the time.

Motivations for solar park development were framed as highly context-sensitive and opportunistic, shaped by the rapidly changing policy and market conditions (see more on this in section 6.3.). L7, whose investment was repaid relatively quickly due to well-timed development, remarked that luck and timing played a crucial role, and that the solar park projects generally seemed strategic at the time of investment. Beyond case-based financial outcomes, four landowners (L2, L4, L6, L8) also reflected on broader sectoral trends of timing and external conditions shaping solar park development. They noted that the market for small-scale solar development had decreased significantly after the peak interest during the energy crisis, and that timing the project had been essential to have favourable conditions.

The responses around strategic opportunity were not limited to financial factors. The KI and L1 emphasized dual land-use strategies as ways to prompt broader societal change. By demonstrating the viability of integrating grazing into solar parks, they hoped to influence future land management opportunities through knowledge around solar and grazing as a strategic opportunity to improve land management as well as the financial sustainability of solar parks long-term.

6.2.3 Logistical Constraints and Infrastructure Barriers

Logistical and infrastructural challenges affected both the development and operational phases of solar parks. Three landowners (L1, L6, L8) described difficulties during the construction phase when integrating dual land-use models. For example, L6 described how delays in deliveries of the solar park caused seasons to shift to seasonal wet conditions which caused a "missed" planting window and crop planting delayed a whole year. Design and infrastructure also posed challenges to dual land-use approaches. L6 described, as explained previously in 6.1.4., how the layout of the solar park became a point of negotiation, with the developer aiming to maximize energy output or reduce lease costs through dense panel placement, while L6 pushed for wider spacing to ensure accessibility for farm equipment.

Practical challenges were noted around fencing. L1 and the KI highlighted the need for fences that protected grazing animals while also allowing other animals to pass through in accordance with the regulations, which posed risks for predators accessing the parks. The KI emphasized the lack of accessible water infrastructure in solar parks as a barrier to scaling up grazing operations, especially in large-scale solar parks.

Fertilization and irrigation practices were also constrained within the solar park. L6 pointed out that liquid spraying of fertilizer on their crops was not possible as it sprayed onto the panels which limited solar uptake. L5 described how they had started using irrigation systems for the vegetation but stopped due to the risks of destruction it posed on the panels. L8 highlighted the difficulties with dust from agricultural machines onto the panels in agrivoltaic solar parks.

Grid access and transformers were other themes that emerged. Three landowners (L5, L7, L8) mentioned issues related to connecting either their parks or batteries to the grid. L8, for instance, needed a custom transformer in order to integrate it into their business that contained high voltage levels, which caused significant delays in the project. The KI added that the greatest issue in solar park development today was that the grid was not built for large scale solar and cannot receive that amount of electricity. L5 noted that limitations in grid infrastructure had influenced their site selection decision, and the park was now located on land with very moist soil which had caused them to have a lot of difficulties with thunder attracted to the installation, which had been expensive to fix and there was no certainty that developers had a solution for the problem.

6.2.4 Desire for Energy Independence

Five landowners (L2, L3, L4, L7, L8) expressed ambitions to eventually become energy independent and go off-grid. This was primarily driven by frustrations with increasing grid fees, which were perceived by these landowners as the reason selling electricity to the grid was unprofitable. As L4 expressed: “going off-grid is the only way forward”. For two of these landowners (L3, L4) energy independence was seen not only as a financial opportunity but also as a contribution to local resilience and energy security. L3 envisioned their solar park to be a secure point for electricity for the municipality in the case of crises.

Although none of the five landowners (L2, L3, L4, L7, L8) had achieved off-grid systems yet, the aspiration was widespread. Current barriers, primarily the high cost of battery storage, were seen as a temporary rather than a permanent hinder. L8 had recently installed a smaller battery system when prices had gone down, but noted that it was too early to evaluate it. L4 had gone even further by initiating a hydrogen-based storage community project, aiming to develop an alternative model for energy independence in rural areas driven by farmers.

6.3 Navigating the System: Institutional and Market Factors

6.3.1 Policy: Permits, Land Classification and Ambiguity

Five landowners (L1, L2, L3, L5, L6) and the KI described the regulatory environment for solar parks as inconsistent and difficult to navigate. Four landowners (L1, L2, L5, L6) were required to apply for solar park permits, but they and L3 noted that permit outcomes varied significantly between counties, echoing concerns raised in policy discussions (see Background). L3 stated that their project had required no permit, but that their project would have required one in their neighbouring regions and most likely would not have approved their solar park. Among the four landowners (L1, L2, L5, L6) that did receive permits, approval was often attributed to idiosyncratic-type reasons such as municipal politician support (L2) or agrivoltaic approaches that strengthened the solar park's justification (L6). L1 added, in terms of land suitability for solar parks, that "it is local conditions that determine if solar parks are good or not, which the current legislation and authorities have difficulty implementing into the permitting system", and that local assessments should be made case by case and not as a general debate for all solar parks.

Two landowners (L1, L2) and the KI raised concern over how authorities classified land in dual land-use parks. Although the land in such parks remained actively used for grazing or crop cultivation, it was not officially recognized as agricultural land. This classification, according to them, excluded solar park land from eligibility to farming subsidies such as areal support, which limited both the economic viability of as well as incentives for integrating dual land-use strategies to solar parks. L1 stressed that failing to recognize grazing as agriculture "inhibits innovation and cultivation of land" and sends mixed messages about the value of multifunctional land-use in solar parks, saying that "driving through … one sees lots of solar parks that does not have any growth underneath the panels and that is sad".

As previously mentioned in 6.1.4., the KI and L1 pointed out that current rules regarding indoor housing for sheep in winter time were incompatible with the reality of grazing solar parks year-round. Both of them stated that their sheep could remain outdoors throughout the whole year, if their wool was not shaved off, due to the sheltering provided by the solar panels. Yet, current animal welfare regulations required them to provide covered structures in barns, which makes expansion of sheep farming for solar park grazing logistically and financially difficult, they argued. It was also highlighted that the lack of subsidies for scaling up sheep farming in Sweden, a sector in decline, was also a financial barrier for scaling or widespread realization of such opportunities.

Five landowners (L1, L2, L3, L4, L5) described the policy landscape for solar as unstable and difficult to interpret. One landowner (L3) noted that 70% of their installation costs were covered by subsidies at the time of construction, but similar subsidies were now unavailable, which would make their solar park an unrealistic investment for them had they developed under current conditions. Two landowners (L4, L5) described the national policy climate for solar as unsteady, with shifting attitudes toward solar energy creating uncertainty in these projects for small-scale actors. L5 said that "the politics are not very uplifting regarding solar, which also creates market shifts… which makes it difficult to navigate". L4 expressed that "this transition is not really a focus in global politics, Trump and Putin focuses on other things", and that they think "society should support these small-scale decentralized initiatives more". L1 reflected that although their own solar parks succeeded, it was not clear whether similar or neighbouring ones could be carried out today under current policy frameworks.

6.3.2 Market Conditions of Solar Parks

Six landowners (L2, L3, L4, L5, L7, L8) described financial unpredictability as a central challenge. Four of them (L2, L3, L4, L5) said their parks had not generated the expected income, especially when electricity was sold to the grid. L2 described their solar park as a "zero-sum game" pointing to the mismatch between solar output in summer time and their electricity consumption needs in winter time. The timing of investments was also described as critical. As previously mentioned in section 6.2.2., L7 who developed during the peak of the energy crisis, when electricity prices were relatively high while investment subsidies still remained, had already recouped their investment, which underscores how the market volatility of solar can affect landowner outcomes solely based on timing.

Business types also mattered in relation to the current market conditions. L2 who had high electricity needs during winter time when electricity production was at its the lowest, could not consume the electricity generated in the summer without battery storage. While L7 ran their main business during summer time, making self-consumption of all electricity generated from the solar park feasible.

The six landowners (L2, L3, L4, L5, L7, L8), where five had self-developed solar parks, expressed an interest in becoming energy independent to avoid selling electricity at low prices while facing high grid fees by energy companies, as the current market conditions made it unprofitable to sell electricity to the grid. However, all six landowners described limitations to achieving energy independence. The tax-free threshold for self-consumed electricity was stated as set too low to make full off-grid operation viable. The possibilities of battery storage were seen as too costly or not technically reliable enough to connect to the grid. One landowner (L4) had launched a hydrogen storage project to evade these limitations, while another (L8) had recently installed a small battery when prices had gone down a bit. While going off-grid was not seen as feasible at the time, all six landowners saw it as a long-term goal as technological developments of batteries proceeded.

6.3.3 Working with Developers and Energy Companies

Landowners shared challenges in collaborating with solar developers. Four landowners (L2, L6, L7, L8) described difficulties in finding good developers who were reliable and understood their specific needs. One landowner (L8) discovered a major installation error made by the installer that could have caused a fire if not detected beforehand, an oversight they connected to the developer having taken on too many solar park projects. Another (L5) mentioned the difficulty of reaching people at large solar developer companies when support was needed for certain solar park operative issues.

Four landowners (L2, L6, L7, L8) described how there had been a huge boom of companies during the energy crisis when the interest in solar was high, which made finding a professional and honest developer difficult. They also explained how many of these companies had disappeared now that interest in small-scale solar had decreased post energy crisis, and that some projects may have been timed badly in regard to this trend and attributed issues. L8 raised the potential of hiring an expert in the field of choosing the right developer if they were to develop a solar park again, as it was such a difficult landscape to navigate even though you were diligent in terms of taking references and being thorough in investigating different options.

Two landowners (L1, L6) described smoother collaborations, both of them leasing out land to developers, especially with smaller or local developers, according to L1. These landowners stated that purposeful communication helped align project goals and reduced risk, echoing what L8 highlighted as important and a lesson learned for the future from their solar park project. L6 emphasized the importance of clearly defined contracts in projects with a developer when leasing out land, by requiring that developers begin construction within a year of signing the contract. According to L6 it was arguably common for developers to commit to tie up land for speculative projects only to actually start developing parks on the land they assessed made for the most profitable and interesting solar park projects in the end.

In addition, four landowners (L2, L4, L7, L8) described frustration with the solar energy market. They stated that continuously rising grid fees and decreasing compensation for surplus electricity set by energy companies had made it nearly impossible to break even by selling electricity. L4 referred to energy companies as "kings of the grid", highlighting a perceived imbalance of power between the energy companies and the landowners developing solar parks.

6.3.4 Infrastructure and Grid Integration

Three landowners (L5, L7, L8) described issues related to integrating their parks with existing grid infrastructure. L8 said that their solar park required a custom transformer due to the high voltage used in their operations, which had delayed the project. Another landowner (L5) explained that grid access had significant influence over where and on what land the solar park was located, which limited flexibility for optimal land management. L7 said that the current scope and availability of flex-services, systems that help balance electricity supply and demand through smart grid engagement, made such an installation impossible due to the rural location of their solar park. These issues were echoed by the KI, who said that the Swedish grid was not designed for distributed solar and lacked capacity to handle large amounts of electricity from large-scale solar parks.

Also, L7 and L8 criticised the extent to which solar panels were developed on deprecated rooftops that would not live through the lifespan of solar panels, which made for short-term fixes rather than a long-term investment. According to them, current infrastructure was focused on small-scale rooftop solar or large-scale solar parks located on arable land, and that there were overlooked opportunities in decentralized small-scale solar on marginal land that was more optimal for solar parks.

6.4 Landowner Motivations, Values and Long-Term Visions

6.4.1 Autonomy and Energy Independence

As already discussed in relation to financial and infrastructural challenges (see section 6.2.4.), energy independence emerged as both a reactive strategy and a long-term goal. Particularly among the five of the six landowners (L2, L3, L4, L7, L8) who had developed solar parks themselves. Going off-grid was generally phrased as a vision that came after the project had started, when landowners realized selling electricity was not profitable. As L4 expressed "going off-grid is the only way forward". The motivation for energy independence was framed both as a financial strategy to secure more value or profit from the electricity produced, but also to strengthen autonomy and resilience for their business or at a community level. For example, L3 discussed their ambition to become a secure local energy point in their municipality, emphasizing the importance of such preparedness in times of societal instability. L4 had launched their hydrogen-based storage project, which in hindsight was not only a means to achieve energy independence, but also to contribute positively to the community and society at large, by doing this initiative without energy companies or the government. Going off-grid was generally framed as a long-term goal rather than for immediate outcomes, apart from L4, and was a common perception among the five landowners (L2, L3, L4, L7, L8) to shape rural energy transformations in the future.

6.4.2 Innovation and Experimentation

Seven landowners (L1, L3, L4, L5, L6, L7, L8) emphasized motivations connected to innovation and experimentation at different levels. Among those implementing agrivoltaic models (L1, L4, L6, L8), solar park development was framed as an opportunity to experiment with new ways of managing land, by combining agricultural practices with renewable energy production. L1 highlighted that one of the main opportunities that had come with the solar park was that it was “exciting and interesting with this project to constantly try new things”, such as rotational grazing of different farm animals and potentially integrating perennial or annual crops in the future as well.

Landowners from church (L3, L5) and business sectors (L6, L7, L8) often described the solar park as an innovative addition that aligned with broader sustainability ambitions. They explicitly described the project as an exciting or practical addition to integrate with their operations. For instance, L5 used the electricity produced from their solar park in their crematory, which was a highly energy demanding operation. Or L7, who could use the electricity directly to heat up the cabins for their rural hotel- and spa business.

6.4.3 Stewardship and Responsibility

An underlying factor throughout the interviews was the perception of solar park development as a form of land stewardship. Six landowners (L1, L3, L4, L5, L6, L8) emphasized values such as sustainability, resource conservation, and climate change responsibility as contributing factors that motivated their solar park decisions. All of these were either incorporating agrivoltaic approaches to their solar parks, or were associated with the Church of Sweden. L6, for instance, described the agrivoltaic approach not only as practical integration but according to them as the only acceptable use of productive agricultural land for solar energy. Similarly, L1 spoke about using the resources available responsibly, framing dual land-use as a personal value or perception of land and land-use rather than merely a business opportunity. L5, connected to the Swedish Church, also framed a value of “taking care of the earth with the resources we have and keeping them for as long as possible” as a motivation for the solar park.

Four landowners (L1, L3, L4, L5) expressed a desire to lead by example and contribute to positive societal change through their projects. L4 articulated a broader vision where local farmers could claim agency in the energy transition, becoming “the heroes with electricity” and providing local energy solutions for their community. At the same time, for four out of these six landowners (L3, L4, L5, L8), these drivers seemed secondary to the financial and operational aspects of the solar park project and had surfaced once the solar park was already established, making it an opportunity within these solar projects rather than the primary motivations.

6.4.4 Collective Engagement and Knowledge Sharing

Knowledge exchange and collaboration were perceived by four landowners (L1, L4, L6, L8) and the KI as important tools for advancing dual land-use strategies and improving solar park outcomes in the long-term. The KI described, as previously mentioned in section 6.1.3., that learnings from a Danish sheep farmer grazing solar parks had provided important insights to the advantage of incorporating grazing into solar parks, but also how to scale these approaches as a business idea for sheep farming and grazing in solar parks. Sharing experiences and knowledge in this way was seen as very useful and important to continue spreading it among the whole solar energy sector according to the KI. L3 highlighted how insights from an expert consultant had really gained their solar park project in terms of planning the solar park from their operations.

However, dissemination of such knowledge appeared not as widely spread among landowners. Landowners incorporating mowing based vegetation maintenance seemed unaware of the long-term effects of solely cutting the grass described by the KI. As explained by the KI, “many solar parks already have agreements with a landowner that wants to manage the land a certain way… and people do not realize you can produce agricultural value in solar parks”. Also explaining how time was needed for this knowledge to disseminate, as well as more sheep farmers engaging in these questions to spread the knowledge. The KI framed solar park development and dual land-use as “a new way of managing land, and people are generally afraid of the new”, emphasizing that adaptation gradually occurs as new practices prove their worth or old practices have revealed their downside, which is when people will listen, and knowledge spread.

L4’s hydrogen storage project was another example of fostering collective learning, involving landowners, researchers, engineers, and local stakeholders. This initiative was framed not only as a project of technical innovation but as a new model of decentralized energy transition driven by rural communities themselves. L1 explained how collaboration between them and the local Scouts, building an “ivy-wall” to cover reflections from the park onto neighbouring houses, fostered both engagement and development of land-use strategies in the park as well as knowledge building around solar parks and land-use for local youth.

6.4.5 Rural Landscape Impacts

Although few landowners expressed environmental concerns with their solar parks, three landowners (L1, L4, L8) discussed the visual impact of solar parks on the rural landscape, especially at the large-scale. L8 highlighted that “covering an entire village with large scale solar arrays understandably raises reactions and concerns in a local community”, calling for a more small-scale, decentralized and distributed approach to solar park development. This was also raised by L4 who stated that it was much better for the rural landscape if everyone deployed little rather than a few deploying lots on small areas. Although, L8 was understanding that such an approach would be more costly for developers, but that it was worth it for a better rural environment. L8 also raised the aspect of rural landscape assessments being integrated into the process of solar park planning and development, expressing that this should be part of the process in the same way such considerations are included in local development plans for housing in rural areas.

7. Discussion

The findings presented in this study reflect the varied experiences of eight landowners and one Key Informant involved in solar park development in Sweden. They show that rather than following a fixed blueprint, outcomes vary based on the specific contextual conditions of the solar park project. At the same time, these outcomes cannot be fully understood without considering the wider landscape of policy conditions, market opportunities, developer practices and landowner motivations. Through the lens of Biggs et al. (2022) and Drewello (2022), this chapter explores how these dynamics evolve, and how they relate to the broader energy transition. Rather than focusing solely on the barriers and critiques of existing system structures, this chapter aims to weigh in the opportunities that arise when landowners are included as both implementers and contributors shaping the solar energy transition.

7.1 Solar Park Project Success as Highly Contextual

The differences in outcomes among the landowners interviewed illustrates a key finding: that success in solar park development is highly contextual. Landowner experiences and decisions were shaped by infrastructure access, land availability, the timing of subsidy schemes and other policy conditions, whether the solar park was built by a developer or the landowner, what the landowners' primary operations are, and how easily solar could be integrated into existing land-use practices. These patterns align closely with Biggs et al.'s (2022, p.7) perspective that both landowner characteristics and perceptions of volatility influence solar park decisions, and that institutional and market conditions can either enable or discourage long-term outcomes.

However, this study's scope goes beyond confirming such decision-making dynamics, it also reveals how landowners operate within structural ambiguity. While the Swedish Energy Agency (2023, p.102) speaks of "nearly unlimited potential" for solar parks, landowners are in reality left to interpret vague regulations, shifting market conditions, and unclear system structures. In the words of Drewello's (2022, p.3), macro-level ambitions are not met with enabling systems and structures at the micro-level. Instead, landowners described a system where they were expected to fulfil such aims without the tools, clarity, or stability needed to do so.

Some landowners, particularly those who timed their solar park projects fortunately or could combine it with specific operational needs, such as grazing, found ways to integrate solar effectively. Others faced shifting conditions throughout the solar park project, or lacked access to knowledge and support. While this can promote innovation at a local level, it also creates an unstable system, where micro-level actors see different potentials without coordination. This can in turn lead to decisions driven by short-term opportunities rather than creating a collective long-term transition.

A system such as the one here laid out does not only disadvantage landowners. When landowners are left unsupported or excluded from shaping it, solar park projects risks overlooking beneficial land-use knowledge, optimal design opportunities, and broader sustainability gains beyond only solar park development, such as rural landscape and community integration or dual land-use potentials. In other words, a system that sets aside landowners experiences may seem efficient in the short-term, but ultimately undermines the potential to contribute meaningfully to the energy transition through climate, agricultural, and rural development goals. As expressed by Drewello (2022, p.3), the key to securing a long-term local energy transition is to align the macro-level determinants with the micro-level actors and local contextual conditions. This study finds that such alignment remains partial and uneven from the landowner perspective.

7.2 Integration of Land-Use Strategies: Potential and Barriers

A visible tension in the findings is how solar parks are generally framed in Swedish public and policy discussions as a land-use trade-off that often assume a zero-sum relationship between agriculture and solar parks. While several landowners saw solar as compatible with agriculture through dual land-use strategies such as grazing or crop-cultivation, these approaches were mostly seen as possible when considered from the beginning. Most landowners who had not planned for dual land-use from the outset experienced practical, technical, and financial barriers to retrofitting. From Biggs et al.’s (2022, p.6) perspective, timing in terms of what generates the most rent from the land, taking into account the perceived risk or volatility, is central to landowner decision-making. In this case, it becomes clear through the findings that the risk of retrofitting impacts whether experimenting with dual land-use models is assessed as viable by the landowner. As such, this study highlights that dual land-use must be planned for early on, not left as an option for later.

At the same time, such planning was largely absent unless initiated by the landowners themselves. While those who developed solar parks on their own generally lacked early awareness of the potential benefits of dual land-use approaches. In leased-out solar parks, developers were described as opting for dense layouts that maximized production rather than optimizing for potential land-use. Up until now, it seems like solar park development has been characterized as a model of untapped potential, where solar developers can be described as “grabbing candy out of a candy bowl”, while landowners are kept somewhat in the dark. This metaphor speaks to a system where developers are incentivized to prioritize short-term energy yield, often at the cost of long-term outcomes and impacts on other interests.

While not illogical from a business perspective, this practice narrows the value to solely energy output, which in turn overlooks how integrated land-use could strengthen biodiversity, reduce maintenance costs, and align with rural livelihoods and landscape aesthetics. As a result, authorities at the macro-level (Drewello, 2022, p.3) may halt or question the rapid expansion of solar parks on high-yield farmland at a micro-level, potentially contributing to the slow and inconsistent permitting processes observed today.

Still, the findings suggest that developers are not generally resistant to integrating dual land-use models. In some cases, early collaboration with the landowner allowed for flexibility and collaborative planning. This points to an opportunity, if developers had clearer incentives, regulatory guidance and support, as well as knowledge around the added value of dual land-use models which landowners can make a reality, they could shift their approach. Moreover, developers are in a position to influence the conditions for dual land-use adoption at the micro-level, for example through how they plan projects, collaborate with landowners, and share knowledge or best practices, all of which shape how transitions unfold on the ground. Although macro-level enablers through legislation and policy are additionally beneficial (Drewello, 2022, p.3).

For instance, by enabling dual land-use, offering opportunities and knowledge to landowners of increased revenue or value of the land through grazing or crop cultivation, developers could propose lower rent in return. This would create a more balanced and attractive deal for both parties, in line with the perspective of Biggs et al. (2022, p.6) that landowners make decisions based on what generates the highest rent. This would not only improve long-term project viability and promote interest in exploring the potential of dual land-use further, but also help spread the knowledge of dual land-use as a new business model to landowners and farmers.

There is also potential in ecovoltaic strategies. While none of the interviewed landowners had implemented such measures or designs, ecovoltaics may offer more accessible retrofit options than agrivoltiacs in cases where agrivoltaic approaches are deemed unfit or difficult to integrate. These potential integrations could be further explored.

These findings challenge the assumption that solar parks and agriculture must inherently be in conflict with one another. While trade-offs exist, especially when solar is built on high-yield farmland without other land-use potential, the findings show that such trade-offs are not inevitable. Where dual land-use models are supported, the solar park can become a tool to strengthen, not replace, agricultural use. It is not a matter of either or, but of how. I wish to highlight the quote from the Key Informant, that this could be “a new way of managing land”. With early-stage integration, adequate incentives, developing best practices and improved knowledge sharing, solar parks can complement farming, contribute to biodiversity, and help sustain land productivity. In the context of climate change, these dual land-use approaches also present an opportunity to make rural land and agricultural production more resilient and adaptive.

The trade-off narrative is therefore less of a practical truth, and more of a result of limited knowledge around the potential around dual land-use across the sector. But this does not only challenge the trade-off narrative, but also points to a general tendency in the energy transition discourse to frame decisions as binary: solar or agriculture, centralized or decentralized, permits or no permits. In practice, however, the experiences of landowners suggest that outcomes are shaped case-by-case. The push for universal models on one-size-fits-all approaches may therefore risk overlooking viable middle grounds and hybrid solutions that emerge through local adaptation.

The findings also highlight a blind spot in the sector and how the system is shaped. The lack of attention to “in-between” land. Rather than framing and conducting solar park siting between either rooftops or arable farmland, several landowners advocated for marginal, low-yield grassland, or infrastructural land as suitable for solar parks. These land areas could also be further explored as potential sites for future solar park development. But would require a shift in how solar park land is evaluated, beyond short-term productivity in energy yield.

Taken together, these insights suggest that no single actor at the local level can carry the responsibility of transforming solar park development alone. Landowners have shown both openness and initiative in integrating dual land-use strategies. But without enabling policy conditions and clearer incentives, these remain isolated cases of informed and invested landowners. Developers, as key actors shaping how solar parks are designed and managed, have the capacity to make dual land-use models financially attractive and technically viable, while also spreading the knowledge to landowners of its potential. Policymakers can also further reinforce this by recognizing dual land-use in legislation and subsidy schemes. It is between these actors that more resilient, socially beneficial, and long-term solar park development can be created.

7.3 Landowner Autonomy and Stewardship

Throughout the interviews, autonomy and land stewardship were a part of the motivations and values that guided landowner decision-making, in line with Biggs et al.'s (2022) approach. Several landowners saw the solar park as a motivating goal to gain independence from electricity markets to secure stable long-term planning, or to make use of the land in a way that aligned with their own values. This can also be perceived from Drewello's (2022, p.2) perspective that local actors interpret and enact transitions within their own local contexts and rationalities. At the same time, these logics were often constrained by structural factors. Landowners described feeling left to a system with little understanding for their needs or risks, and navigated planning the solar park project without reliable information at hand, due to the lack of clarity in the sector. Their autonomy was limited to reactive choices or plans, rather than proactive collaborative design of the system they were a part of.

This is a key misalignment, where the current system assumes that landowners can either self-develop solar parks by navigating a complex and volatile market, or lease-out land with less possibility of input to the solar park planning. In both cases, landowner knowledge of land management and its long-term value is often left untapped. But as this study also shows examples of, when landowners are engaged early and meaningfully, solar parks can become more than electricity generators but rather become part of broader rural sustainability strategies and transformations. To enable landowner autonomy would not be about decentralizing the responsibility of decision-making, but rather about recognizing that landowners hold both capacity and perspectives that can strengthen project design, resilience, and local anchoring of the solar park projects. As Drewello (2022, p.3) notes, transitions rely on actors being able to shape systemic shifts. This means fostering structures where landowners can participate not as passive hosts of solar parks, but as actors shaping the renewable energy landscape.

7.4 Towards Systemic Alignment in Sweden's Solar Landscape

All in all, the findings suggest that Sweden's solar energy landscape is still to be defined. While policy points toward rapid expansion, aspects of inclusion, knowledge spreading and collaboration remain underdeveloped. Landowners currently operate in a landscape of unclear rules, uneven developer practices, and context depended outcomes. In addition to the opportunities these solar parks bring, they also carry risks that fall on those who own and manage the land.

Developers can involve landowners early and gain access to their knowledge, align those insights with the solar park project, and improve long-term outcomes. Governance approaches that enable dual land-use models can align renewable energy targets with food production. Landowners who are provided access to knowledge, advice, support, and collaborative planning processes can make decisions that benefit not just their operations, but also rural communities. Exploring these dynamics further will be important for the solar energy transition in Sweden.

The findings of this study point to four key insights for those shaping solar park development in Sweden:

- *Support early-stage decision-making at the micro-level*. Landowners need trusted guidance on installers, design options, and integration of their main operations. Consultants, advisors, or extension services adapted to landowners' needs and concerns to lower risk, improve outcomes, and incentivize further solar park development.

- *Facilitate and create knowledge-exchange and collaboration within the sector*. Sweden's solar landscape is still evolving. Platforms that showcase good practice, connect actors, and share lessons learned, can spread capacity and improve outcomes for early adopters.

- *Align policies to enable dual land-use and improve rural landscapes*. Dual land-use offers a potential model to the trade-off between agricultural production and solar energy. Current rules and incentives do not reflect this potential, instead policy can be reformed to enable and shape this transition.

- *Invest in rural grid and energy storage infrastructure*. Solar park development from a landowner perspective relies on the potential of improved grid access and storing energy to go off-grid.

Finally, this study shows that it is not that the system fails landowners, but that it falls short in recognizing the potential of including landowners. As a result, the process is fast, but short-term and volatile. Instead, we can create a long-term process from the outset through a more participatory decentralized approach to solar park development, that includes landowner perspectives to promote a locally informed transformation of solar parks on rural land.

8. Conclusion

This thesis has set out to explore how Swedish landowners experience, navigate and shape the development of ground-mounted solar parks on their land. Through qualitative interviews and thematic content analysis, guided by frameworks using land system science, agricultural decision-making and local energy transitions (Biggs et al., 2022; Drewello, 2022), it has examined landowner motivations, challenges, opportunities and land-use practices of solar development. The findings have shown that solar park outcomes are contextual, shaped not only by the institutional and market system, but also by landowner type, business, and values.

Landowner motivations prove to be layered. While financial viability remains a consistent prerequisite for development, many landowners are also driven by values of innovation, sustainability, land-use, and energy independence. In some cases, these motivations emerge during the solar park project, suggesting that solar parks not only reflect intentions, but that landowners evolve with them. Challenges relate to volatility in electricity prices, rising grid fees, shifting policy, and infrastructural constraints of the grid. These conditions make planning and profitability difficult and reflect broader governance challenges where the system of policy, regulation, and infrastructure fails to offer stable, supportive, or coherent pathways of the transition it promotes.

Despite this, landowners identify several opportunities in their solar park projects. Going off-grid emerges as a strongly emphasized future opportunity, related to the systemic challenges. However, land management practices of dual land-use models, especially through grazing, are seen as a promising approach to balance energy production with continued agricultural activity. These strategies align with landowner values and perceptions of land and land-use. Although, adoption of these is still limited by lack of early-stage planning, knowledge, technical constraints, and lack of policy or market incentives. The findings suggest that through clearer support, early involvement, knowledge-sharing and appropriate incentives, dual land-use could become a more widespread model, also avoiding the trade-off between domestic food production and solar energy production.

In conclusion, this thesis argues that landowners are not passive in the solar transition. They are central decision-makers whose agency, values, and knowledge shape how, where, and why solar parks are developed. Recognizing their potential is key for scaling solar in a way that aligns with sustainable land-use, preserves rural landscapes, and protects domestic food production. Landowners have direct and long-term interest in managing land productively and profitably. Supporting their involvement requires stable policy, market structures that value innovation at smaller scales, incentives that reward dual land-use, and systems that spread knowledge more effectively. For Sweden's solar transition to be just and effective, landowners must be engaged in shaping this process. This includes the integration of landowner perspectives in planning solar parks to create a transition that values not only efficiency, but context, collaboration, and care for the land.

8.1 Suggestions for Future Research

This thesis focused on landowners who have already developed solar parks. Further research could explore those landowners who are considering, resisting or are in the process of developing solar parks, particularly in terms of the complex permitting processes that shape solar park project outcomes to a larger extent today than those studied in this thesis.

Another potentially relevant study would be a comparative study between Denmark and Sweden. Denmark has more streamlined permitting processes and clearer support for grazing in solar parks, in contrast to Sweden, which has a more unclear approach. A comparative study could examine how policy differences affect adoption of agrivoltaics and different land-use outcomes.

Research could also compare solar parks managed through grazing versus mowing, assessing its outcomes in biodiversity, soil health, vegetation growth, vegetation management costs, and long-term land productivity. Such research may support evidence-based recommendations for future solar park design and planning.

Given the key role of solar developers in shaping project success, further research could explore the developer landscape. How different firms operate, how they engage landowners, and what best practices exist. This could help professionalize the sector and improve decision-making among landowners in solar park development projects.

Finally, additional research is needed on the electricity market and grid infrastructure. How do current pricing mechanisms and grid fees shape solar development? What reforms could make decentralized solar and agrivoltaic approaches more viable? And how might rural landscape impacts be better integrated into solar policy and planning?

References

Books

Porter, M.E. (1990). “The Competitive Advantage of Nations”. Harvard Business Review, 68(2), 73-93. <https://www.hbs.edu/faculty/Pages/item.aspx?num=6105>

Flick, U. (2009). “An Introduction to Qualitative Research”. Sage, London. <https://elearning.shisu.edu.cn/pluginfile.php/35310/mod_resource/content/2/Research-Intro-Flick.pdf>

Academic articles

Aparisi-Cerdá, I., Ribó-Pérez, D., García-Melón, M., D’Este, P., Poveda-Bautista, R. (2024). “Drivers and Barriers to the Adoption of Decentralised Renewable Energy Technologies: A Multi-Criteria Decision Analysis”. *Energy*. 305:132264. doi: <https://doi.org/10.1016/j.energy.2024.132264> [2025-03-17]

Bankel, A., Govik, L. (2024). “Networked Business Models on a Nascent Market for Sustainable Innovation”. *Supply Chain Management*, 29:7. doi: <https://www.emerald.com/insight/content/doi/10.1108/scm-10-2023-0496/full/html> [2025-03-18]

Biggs, N.B., Shivaram, R., Lacarieri, E.A., Varkey, K., Hagan, D., Young, H., Lambin, E.F. (2022). “Landowner decisions regarding utility-scale solar energy on working lands: a qualitative case study in California”. Environmental Research Communications, 4(5). doi: <https://iopscience.iop.org/article/10.1088/2515-7620/ac6fbf> [2025-03-20]

Bosnjakovic, M., Santa, R., Crnac, Z., Bosnjakovic, T. (2023). “Environmental Impacts of PV Power Systems”. *Sustainability*. 15(15):11888. doi: <https://doi.org/10.3390/su151511888> [2025-03-17]

Bouich, A., Pradas, I.G., Khan, M.A., Khattak, Y.H. (2023). “Opportunities, Challenges, and Future Prospects of the Solar Cell Market”. *Sustainability*. 15(21):15445. doi: <https://doi.org/10.3390/su152115445> [2025-03-16]

Capellán-Peréz, I., de Castro, C., Arto, I. (2017). “Assessing vulnerabilities and limits in the transition to renewable energies: Land requirements under 100% solar energy scenarios”. Renewable and Sustainable Energy Reviews, 77:760-782. doi: <https://doi.org/10.1016/j.rser.2017.03.137>. [2025-03-20]

Carley, S., Evans, T.P., Graff, M., Konisky, D.M. (2018). “A Framework for Evaluating Geographic Disparities in Energy Transition Vulnerability”. *Nature Energy*. 3(2018):621-627. doi: <https://www.nature.com/articles/s41560-018-0142-z> [2025-03-15]

Dupraz, C., Marrou, H., Talbot, G., Dufour, L., Nogier, A., Ferard, Y. (2011). “Combining solar photovoltaic panels and food crops for optimising land use: Towards new agrivoltaic schemes”. Renewable Energy, 36(10):2725-2732. doi: <https://doi.org/10.1016/j.renene.2011.03.005> [2025-03-20]

Drewello, H. (2022). “Towards a Theory of Local Energy Transition”. *Environmental Governance for Sustainable Development*. 14(18):11119. doi: <https://doi.org/10.3390/su141811119> [2025-05-06]

Ganhammar, K. (2021). “The effect of regulatory uncertainty in green certificate markets: Evidence from the Swedish-Norwegian market”. Energy Policy, vol.158. doi: <https://doi.org/10.1016/j.enpol.2021.112583> [2025-03-18]

Gaur, V., Lang, C., Howard, G., Quainoo, R. (2023). “When Energy Issues Are Land Use Issues: Estimating Preferences for Utility-Scale Solar Energy Siting”. Land Economics, 99(3):343-363. doi: <https://doi.org/10.3368/le.99.3.111221-0130R1> [2025-03-20]

Ketzer, D. (2020). “Land Use Conflicts between Agriculture and Energy Production Systems: Approaches to Allocate Potentials for Bioenergy and Agrophotovoltaics”. <http://dx.doi.org/10.13140/RG.2.2.11926.78408> [2025-03-17]

Karakaya, E., Sriwannawit, P. (2015). “Barriers to the Adoption of Photovoltaic Systems: The State of the Art”. *Renewable and Sustainable Energy Reviews*. 45(2015):60-61. doi: <http://dx.doi.org/10.1016/j.rser.2015.04.058> [2025-03-17]

Karasmanaki, E., Tsantopoulus, G. (2021). “Public Attitudes Toward the Major Renewable Energy Types in the Last 5 Years: A Scoping Review of the Literature”. *Low Carbon Energy Technologies in Sustainable Energy Systems*. doi: <https://doi.org/10.1016/B978-0-12-822897-5.00004-3> [2025-03-18]

Kiesecker, J.M., Evans, J.S., Oakleaf, J.R., Dropuljic, K.Z., Vejnovic, I., Rosslowe, C., Cremona, E., Bhattacharje, A.L., Nagaraju, S.K., Ortiz, A., Robinson, C., Ferres, J.L., Zec, M., Soci, K. (2024). “Land Use and Europe’s Renewable Energy Transition: Identifying Low-Conflict Areas for Wind and Solar Development”. *Environmental Science*, 12:2024. doi:<https://doi.org/10.3389/fenvs.2024.1355508> [2025-03-16]

Kihlström, V., Elbe, J. (2021). “Constructing Markets for Solar Energy - A Review of Literature about Market Barriers and Government Responses”. *Sustainability*. 13(6):3273. doi: <http://dx.doi.org/10.3390/su13063273> [2025-03-14]

Lindahl, J., Lingfors, D., Elmqvist, Å., Mignon, I. (2022). “Economic analysis of the early market of centralized photovoltaic parks in Sweden”. *Renewable Energy*, 185:1192-1208. doi: <https://doi.org/10.1016/j.renene.2021.12.081> [Accessed 2025-03-19]

Lindberg, O., Birging, A., Widén, J., Lingfors, D. (2021). “PV park site selection for utility-scale solar guides combining GIS and power flow analysis: A case study on a Swedish municipality”. *Applied Energy*, 282. doi: <https://doi.org/10.1016/j.apenergy.2020.116086> [2025-03-18]

Noel, L. (2017). “The Hidden Economic Benefits of Large-Scale Renewable Energy Deployment: Integrating Heat, Electricity, and Vehicle Systems”. *Energy Research & Social Science*. 26:54-59. doi<https://doi.org/10.1016/j.erss.2017.01.019> [2025-03-17]

Nyffenegger, R., Boukhatmi, Ä., Radavicius, T., Tvaronavicene, M. (2024). “How Circular is the European Photovoltaic Industry? Practical Insights on Current Circular Economy Barriers”. *Journal of Cleaner Production*. 448:141376. doi: <https://doi.org/10.1016/j.jclepro.2024.141376> [2025-03-15]

Polzin, F., Egli, F., Steffen, B., Schmidt, T.S. (2019). “How do Policies Mobilize Private Finance for Renewable Energy? - A Systematic Review with an Investor Perspective”. *Applied Energy*. 236:1249-1268. doi: <https://doi.org/10.1016/j.apenergy.2018.11.098> [2025-03-16]

Rabaia, M.K.H., Abdelkareem, M.A., Sayed, E.T., Elsaid, K., Chae, K.J., Wilberforce, T., Olabi, A.G. (2021). “Environmental Impacts of Solar Energy Systems: A Review”. *Science of The Total Environment*. 754:141989. doi: <https://doi.org/10.1016/j.scitotenv.2020.141989> [2025-03-16]

Roddis, P., Roelich, K., Tran, K., Carver, S., Dallimer, M., Ziv, G. (2020). “What shapes community acceptance of large-scale solar farms? A case study of the UK’s first ‘nationally significant’ solar farm”. *Solar Energy*, 209:235-244. doi: <https://doi.org/10.1016/j.solener.2020.08.065> [2025-03-17]

Rydehell, H., Lantz, B., Mignon, I., Lindahl, J. (2024). “The Impact of Solar PV Subsidies on Investment Over Time - The Case of Sweden”. *Energy Economics*, 133. doi: <https://doi.org/10.1016/j.eneco.2024.107552> [2025-03-12]

Saunders, P. (2020). “Land Use Requirements of Solar and Wind Power Generation: Understanding a Decade of Academic Research”. *Energy Innovation Reform Project*. doi: <https://www.researchgate.net/publication/345638945_Land_Use_Requirements_of_Solar_and_Wind_Power_Generation_Understanding_a_Decade_of_Academic_Research> [2025-03-06]

Scovell, M., McCrea, R., Walton, A., Poruschi, L. (2024). “Local Acceptance of Solar Farms: The Impact of Energy Narratives”. 189(B):114029. doi: <https://doi.org/10.1016/j.rser.2023.114029> [2025-03-16]

Sütterlin, B., Siegrist, M. (2017). “Public Acceptance of Renewable Energy Technologies from an Abstract versus Concrete Perspective and the Positive Imagery of Solar Power”. *Energy Policy*. 106:356-366. doi: <https://doi.org/10.1016/j.enpol.2017.03.061> [2025-03-15]

Walker, G., Devine-Wright, P. (2008). “Community Renewable Energy: What Should it Mean?”. *Energy Policy*. 36(2):497-500. doi: <https://doi.org/10.1016/j.enpol.2007.10.019> [2025-03-15]

Wüsterhagen, Rlf, Wolsink, M., Bürer, M.J. (2007). “Social Acceptance of Renewable Energy Innovation: An Introduction to the Concept”. *Energy Policy*. 35(5):2683-2691. doi: <https://doi.org/10.1016/j.enpol.2006.12.001> [2025-03-16]

van der Ven, D., Capellan-Peréz, I., Arto, I., Cazcarro, I., de Castro, C., Patel, P., Gonzalez-Eguino, M. (2021). “The Potential Land Requirements and Related Land Use Change Emissions of Solar Energy”. *Scientific Reports*, 11:2907. doi: <https://www.nature.com/articles/s41598-021-82042-5> [2025-03-16]

Reports

Agricultural Agency (Jordbruksverket) (2023a). “Djurhållning i ligghallar”. Available at: <https://jordbruksverket.se/download/18.31aed35e17657849041bad47/1701879594282/Djurhallning-i-ligghallar-tga.pdf> [2025-04-10]

Agricultural Agency (Jordbruksverket) (2024a). “Jordbruksverkets redovisning av regeringsuppdrag - stärkt stöd a ordbruksmark och solelsproduktion”. Available at: <https://jordbruksverket.se/download/18.1b29a1dd194b2e05896aaf6b/1740733653152/Jordbruksverkets-redovisning-av-regeringsuppdrag-starkt-skydd-av-jordbruksmark-och-solelsproduktion-tga.pdf> [2025-04-06]

Björnsson, L.H., Morell, K., van Noord, M., Pettersson, I. (2022). “En kartläggning av Solcellsparker i Sverige 2021”. RISE. 2022:64. Available at: <https://www.ri.se/sites/default/files/2022-05/Solcellsparker%20i%20Sverige%202021%20-%20en%20kartl%C3%A4ggning.pdf> [2025-02-19]

County Administrative Board (Länsstyrelsen Västra Götaland) (2025). “Länsstyrelsens vägledning om solceller på jordbruksmark 2025”. Available at: <https://www.lansstyrelsen.se/vastra-gotaland/om-oss/vara-tjanster/publikationer/2025/lansstyrelsens-vagledning-om-solceller-pa-jordbruksmark-2025.html> [2025-04-05]

EurObserv’ER (2024). “Photovoltaic Barometer 2024”. Available at: <https://www.eurobserv-er.org/photovoltaic-barometer-2024/> [2025-02-19]

European Commission (2022a). “EU Solar Energy Strategy”. Available at: <https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52022DC0221> [2025-02-02]

International Energy Agency (IEA) (2021). “Net Zero by 2050 A Roadmap for the Global Energy Sector” Available at: <https://iea.blob.core.windows.net/assets/deebef5d-0c34-4539-9d0c-10b13d840027/NetZeroby2050-ARoadmapfortheGlobalEnergySector_CORR.pdf> [2025-01-29]

International Energy Agency (IEA) (2023). “Trends in PV applications 2023” Available at: <https://iea-pvps.org/trends_reports/trends-2023/> [2025-02-25]

International Energy Agency Photovoltaic Power System Program (IEA PVPS) (2024). “Trends in PV Applications 2023”. Available at: <https://iea-pvps.org/trends_reports/trends-2023/> [2025-01-29]

Thorstensson, F. (2015). “Ägande och arrende av jordbruksmark”. *Agricultural Agency (Jordbruksverket)*. Available at: <https://jordbruksverket.se/download/18.514d3694172cce07237d7f1d/1592782253936/201503..pdf> [2025-04-26]

Lantbrukarnas Riksförbund (LRF) (2022). “Solel för lantbruk - praktiska råd och exempel”. Available at: <https://www.lrf.se/media/bhnprsfy/solel-for-lantbruk-juni-2022-1.pdf> [2025-04-05]

Lantbrukarnas Riksförbund (LRF) (2023). “Solel för lantbruk - information om småskaliga solparker” Available at: <https://www.lrf.se/media/eblmuf1m/sm%C3%A5skaliga-solcellsparker.pdf> [2025-04-05]

Pettersson, I., Morell, K., Råberg, T., van Noord, M., Zinko, U., Ghaem Sigarchian, S., Sandström, A., Unger, M. (2022). “Ecovoltaics och Agrivoltaics - en Handbok om Solcennsparker som Gynnar Biologisk Mångfald och Ekosystemtjänster. *RISE*. Available at: <https://www.ri.se/sites/default/files/2022-10/RISE_Ecogain_Eko-Sol_Handbok_2022-10-17_rev.pdf> [2025-02-08]

Region Stockholm (2023). “Samexistens mellan solparker och annan markanvändning”. Available at: <https://www.regionstockholm.se/regional-utveckling/rapporter-och-analys/klimat/samexistens-mellan-solparker-och-annan-markanvandning/> [2025-04-25]

Råberg, T., van Noord, M., Björnsson, L.H., Pettersson, I., Zinko, U. (2021). “Solcellsparker, Biologisk Mångfald och Ekosystemtjänster - Påverkan och Möjligheter för Multifunktioner”. *RISE Rapport*. 2021:52. Available at: <https://www.ri.se/sites/default/files/2022-01/Solcellsparker%2C%20biologisk%20m%C3%A5ngfald%20och%20ekosystemtja%CC%88nster%20%E2%80%93%20P%C3%A5verkan%20och%20m%C3%B6jligheter%20f%C3%B6r%20multifunktioner%20%28Eko-Sol%29%20v220111.pdf> [2025-02-08]

Solar Power Europe (2024). “EU Market Outlook for Solar Power 2024-2028”. Available at: <https://www.solarpowereurope.org/insights/outlooks/eu-market-outlook-for-solar-power-2024-2028/detail> [2025-02-18]

Swedish Energy Agency (2023a). “Scenarier över Sveriges Energisystem 2023”. Available at: <https://energimyndigheten.a-w2m.se/System/TemplateView.aspx?p=Arkitektkopia&id=fc6fe5f6d1914bca8176e64b0bb04b44&q=scenarier&lstqty=1> [2025-02-20]

Swedish Energy Agency (2024c). “Nuläget på elmarknaden”. Available at: <https://www.energimyndigheten.se/48dd50/globalassets/om-oss/lagesrapporter/elmarknaden/2024/nulaget-pa-elmarknaden-december-2023.pdf> [2025-05-08]

Westerberg, A.O., Lindahl, J. (2022). “National Survey Report of PV Power Applications in Sweden 2022”. *Swedish Energy Agency*. Available at: <https://iea-pvps.org/wp-content/uploads/2023/11/National-Survey-Report-of-PV-Power-Applications-in-Sweden%E2%80%93-2022.pdf> [2025-01-28]

Westerberg, A.O., Lindahl, J. (2023). National Survey Report of PV Power Applications in Sweden 2023”. *IEA PVPS*. Available at: <https://iea-pvps.org/wp-content/uploads/2024/09/National-Survey-Report-of-PV-Power-Applications-in-Sweden-2023.pdf> [2025-01-28]

van Noord, M., Ghaem Sigarchian, S., Unger, M., Råberg, T., Morell, K., Pettersson, I., Zinko, U., Sandström, A. (2022). “Solcellsparker som Gynnar Biologisk Mångfald och Ekosystemtjänster - Fallstudier”. *RISE*. Available at: <https://www.ri.se/sites/default/files/2022-10/RISE_Ecogain_Eko-Sol_Bilaga_2_Fallstudier_2022-10-17.pdf> [2025-02-15]

Media & Websites

Agricultural Agency (Jordbruksverket) (2023b). “Gårdsstöd”. Available at: <https://jordbruksverket.se/stod/jordbruk-tradgard-och-rennaring/jordbruksmark/gardsstod> [2025-04-27]

Agricultural Agency (Jordbruksverket) (2024b). “Jordbruksmarkens användning 2024”. Available at: <https://jordbruksverket.se/om-jordbruksverket/jordbruksverkets-officiella-statistik/jordbruksverkets-statistikrapporter/statistik/2024-10-22-jordbruksmarkens-anvandning-2024.-slutlig-statistik> [2025-04-27]

Lundkvist, E. (2025). “Negativa elpriset - sol- och vindkraft faller på eget grepp”. *Dagens PS*. Available at: <https://www.dagensps.se/teknik/energi/negativa-elpriset-sol-och-vindkraft-faller-pa-eget-grepp/> [2025-04-28]

European Commission (2022b). “REPowerEU”. Available at: <https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal/repowereu-affordable-secure-and-sustainable-energy-europe_en> [2025-02-10]

European Commission (2023). “Solar Energy”. Available at: <https://energy.ec.europa.eu/topics/renewable-energy/solar-energy_en?prefLang=nl> [2025-01-30]

Swedish Energy Markets Inspectorate (EI) (2021). “Nätavgifter - elnät”. Available at: <https://ei.se/om-oss/statistik-och-oppna-data/natavgifter---elnat> [2025-04-27]

EnergiEngagemang (2024). “Markarrende för solceller”. Available at: <https://www.energiengagemang.se/markarrende/> [2025-04-14]

Government of Sweden (2024). “Förändrade skattesubventioner för solceller”. Available at: <https://www.regeringen.se/pressmeddelanden/2024/09/forandrade-skattesubventioner-for-solceller/> [2025-03-17]

OX2 (2024). “Frågor och svar om solkraft i Sverige”. Available at: <https://www.ox2.com/sv/pressrum/nyheter/2024/fragor-och-svar-om-solkraft-i-sverige/> [2025-03-15]

Statistics Sweden (SCB) (2023). “Marken i Sverige”. Available at: <https://www.scb.se/hitta-statistik/sverige-i-siffror/miljo/marken-i-sverige/> [2025-04-15]

Swedish Tax Agency (Skatteverket) (2020). “Avdragsrätt vid inköp och installation m.m. av en solcellsanläggning för mikroproduktion av el; mervärdesskatt”. Available at: <https://www4.skatteverket.se/rattsligvagledning/386073.html?date=2020-11-09> [2025-04-26]

Swedish Tax Agency (Skatteverket) (2024). “Grön teknik - skattereduktion”. Available at:

<https://www.skatteverket.se/privat/fastigheterochbostad/gronteknik.4.676f4884175c97df4192860.html> [2025-04-26]

Solgrid (2024). “Solpark för markägare”. Available at: <https://solgrid.no/se/solpark-for-markagare/> [2025-02-14]

Svensksolenergi (2024). “Prognos för antal installationer 2024. Available at: <https://svensksolenergi.se/prognos-for-antal-installationer-2024/> [2025-02-15]

Johansson, L. (2024). “Länsstyrelsen: Därför är solceller på åkermark möjligt”. *SVT*. Available at: <https://www.svt.se/nyheter/lokalt/vast/lansstyrelsen-darfor-ar-solceller-pa-akermark-mojligt> [2025-04-26]

Garcia, R. (2024). “Kan bli hårt slag mot de som investerat i solceller: “Det känns som ett bedrägeri”. *SVT*. Available at: <https://www.svt.se/nyheter/lokalt/smaland/kan-bli-hart-slag-mot-de-som-investerat-i-solceller-det-kanns-som-ett-bedrageri> [2025-04-26]

Swedbank (n.d.). “Leasing och avbetalning”. Available at: <https://www.swedbank.se/foretag/foretagslan-och-finansiera/leasing-och-avbetalning/avbetalning.html> [2025-04-10]

Sweco (2022). “Miljötillstånd för solcellsparker”. Available at: <https://www.sweco.se/projekt/sweco-bidrar-i-utveckling-av-tillstandspraxis-for-solcellsparker/> [2025-02-27]

Swedish Energy Agency (2023b). “Tillstånd för solcellspark”. Available at: <https://www.energimyndigheten.se/energisystem-och-analys/styrmedel-for-elproduktion/ursprungsgarantier/> [2025-02-28]

Swedish Energy Agency (2024a). “Tillförsel”. Available at: <https://www.energimyndigheten.se/energisystemet/tillforsel/> [2025-01-28]

Swedish Energy Agency (2024b). “Ursprungsgarantier”. Available at: <https://www.energimyndigheten.se/energisystem-och-analys/styrmedel-for-elproduktion/ursprungsgarantier/> [2025-03-17]

Swedish Energy Agency (2025). “Nätanslutna solcellsanläggningar”. Available at: <https://pxexternal.energimyndigheten.se/pxweb/sv/Energimyndighetens_statistikdatabas/Energimyndighetens_statistikdatabas__Officiell_energistatistik__Natanslutna_solcellsanlaggningar/EN0123_1.px/> [2025-05-13]

Popular science summary

In recent years, solar parks have become a growing part of Sweden's transition to renewable energy. These parks are generally placed on farmland, which has raised concerns about how this affects domestic food production and the rural landscape. Behind each solar park is a landowner who has decided to develop the solar park on their land and also taken responsibility for decisions on how to manage the land once the park has been built. This thesis has explored how landowners in Sweden experience solar park development on their land, and what their solar parks mean for land-use and the broader energy transition.

The study is based on interviews with eight landowners across southern Sweden who had developed solar parks on their land, as well as one key informant who worked with grazing in solar parks. The study has focused on the motivations, challenges, opportunities, and land-use effects that landowners have experienced and perceived from developing solar parks. The aim has been to contribute to a better understanding of how the energy transition, in terms of solar parks, plays out on the ground and how it could be improved.

The results from the study have shown that most landowners are motivated by financial reasons, such as lowering electricity costs or gaining a stable income from leasing out land for a solar park, alongside motivations of contributing to the renewable transition by producing solar energy. But solar park projects have also shown not to be as straightforward as that. Landowners have described challenges with unclear policy and regulations, unpredictable electricity prices, and difficulties connecting to the grid or storing electricity through batteries. These obstacles made it harder for landowners to plan long-term, and could limit the appeal for landowners to develop solar parks in the future.

A key finding was that landowners use their land in different ways once the solar park is in place. Some chose simple methods like mowing the grass in the solar park to keep vegetation down. Others went further by combining the solar park with agriculture, such as sheep grazing or crop cultivation, known as dual land-use or agrivoltaics. This allowed the land to remain productive, but could also improve soil health and reduce maintenance costs in the solar park. This ensured that the landowner could continue using the land. But such land-use approaches could be an approach to the problem of lost domestic food production and rural landscape effects of developing solar parks. However, these approaches were not always easy to implement, especially not after the solar park had already been built. Landowners said that they required early planning, cooperation with solar park developers, and better support from authorities.

The study has highlighted that landowners are not just passive participants in the renewable energy transition. Their decisions could shape what kind of solar development takes place, and how it fits into rural landscapes and farming practices. If Sweden wants to expand solar in a way that supports both climate goals and sustainable land-use, then landowners need better tools, clearer policy, and more flexible planning processes.

Appendix 1

Intervjuguide (svenska)

Inledande frågor (övergripande/bakgrund):

- Kan du berätta lite om din huvudsakliga verksamhet utöver solcellsanläggningen?
- Hur länge har solcellsanläggningen varit i drift?
- Hur mycket energi utvinner solcellsparken? (gärna i kWh eller MWh årligen)
- Hur stor markyta upptar anläggningen? Vad användes den marken till tidigare?
- Vad används den producerade elen huvudsakligen till (egen förbrukning eller försäljning)?
- Vilka externa aktörer (energibolag, investerare?) har varit involverade i utvecklingen och driften?
- Hur många, från din verksamhet, är det som arbetar med /är involverade i denna solcellspark?

1. Motivationer för att utveckla en solpark

- Hur uppkom idén att utveckla en solcellspark? Var det eget initiativ eller något du blev kontaktad om?
- Vad var de främsta drivkrafterna och motiveringen bakom beslutet att satsa på solenergi?
- Exempelvis ekonomiska faktorer (lönsamhet, kostnadsbesparingar, statliga stöd), miljöhänsyn (hållbarhet, minskad klimatpåverkan), teknisk innovation (utveckling), sociala möjligheter (synlighet, varumärkesbyggande eller att skapa lokalt engagemang), personliga intressen och värderingar?

<u>Uppföljningsfrågor:</u>

- Var det något personligt intresse eller värdering som gjorde att du satsade på just en solcellsanläggning?

- Hur påverkade ekonomiska incitament, såsom lönsamhet, kostnadsbesparingar, statliga stöd beslutet?
- Spelade miljöaspekter eller förnybar energiomställning en roll i beslutet? (energiomställning, använda mark, hållbarhet)
- Fanns det sociala eller affärsmässiga skäl, som ökad synlighet, varumärkesbyggande eller att skapa lokalt engagemang?
- 2. Utmaningar i att utveckla och driva solparken
- Vilka har varit de största utmaningarna i att utveckla och driva solcellsparken?
- <u>Uppföljningsfrågor:</u>
- Har det funnits praktiska utmaningar med att anlägga och driva solcellsparken (exempelvis val av mark, få tag i material, etc.)?
- Har det varit en utmaning att kombinera solcellsparken med din övriga verksamhet eller att samverka med andra aktörer i projektet?
- Hur har de ekonomiska aspekterna, såsom investeringskostnader, lönsamhet, marknadsutvecklingen för solenergi, påverkat projektet?
- Har krav i lagar och regler, som till exempel tillståndsprocesser eller lagändringar inneburit några utmaningar?
- Har det funnits utmaningar med tekniska problem, Exempelvis kring anläggningens funktion, underhåll eller behov av extern expertis, att något gått sönder, behov av att byta ut delar i anläggningen etc?
- Ser du några säkerhetsutmaningar med din anläggning, som exempelvis inbrott, brandrisker eller elolyckor?
- Har du mött några utmaningar i lokalsamhället, som exempelvis motstånd från grannar eller kommunen?
- Har energipolitiken eller förändringar i statliga stöd varit en utmaning för solcellsparken?
- Har det uppstått miljörelaterade utmaningar, såsom påverkan på marken, biodiversiteten eller andra miljöeffekter?

3. Möjligheter med solparksutveckling

- Vilka positiva effekter har solcellsparken haft för dig? Vilka möjligheter finns i att investera i solenergi på detta sätt?

Uppföljningsfrågor:

- Har investeringen varit lönsam eller resulterat i kostnadsbesparingar på el?
- Har solcellsparken minskat energiberoendet för din verksamhet?
- Ser du några möjligheter med att utveckla solcellsparken i takt med att det uppkommer nya tekniska innovationer?
- Har du märkt ett ökat intresse från andra markägare eller aktörer att göra liknande satsningar som du?
- Finns det positiva effekter i lokalsamhället till följd av solcellsparken? (ex. energitillgång, samarbeten, arbete, inspiration)
- Har investeringen bidragit till lärande och utveckling, både på ett personligt plan men även på ett större samhälleligt plan?
- Upplever du att det finns möjligheter för solcellsparken att påverka miljön och marken positivt? Både i ett större sammanhang men även anläggningens närmiljö?

4. Påverkan på markanvändning

- Hur fattades beslutet att anlägga solcellsparken på just den marken?
- Vad har varit fördelarna med det?
- Hur har solparken påverkat din markanvändning och skötseln av marken? (Tillgänglighet, möjlighet till skötsel och underhåll eller möjligheter för annan markanvändning, såsom jordbruk eller bete?)
- Har du fortsatt att använda marken för andra ändamål parallellt med solcellsanläggningen?
- Har beslutet att etablera en solcellspark skapat några intressekonflikter i markanvändningen, och i så fall hur har dessa hanterats?
- Har solparken påverkat dina långsiktiga planer för markanvändning?
- Har anläggningen påverkat markvärdet ekonomiskt?

Om ej agrivoltaisk:

- Hur ser du på möjligheterna för kombinerat markanvändande, som exempelvis agrovoltaiska system?

Om agrivoltaisk:

- Varför började du med agrivoltaik?
- Hur funkar det? Hur påverkar det markanvändningen?
- Vad har varit fördelarna och nackdelarna med denna approach?

5. Avslutande frågor

- Är det något du önskar att du visste mer om innan du tog beslutet att utveckla en solcellspark?
- Har du några råd till andra markägare som överväger att anlägga en solcellspark?
- Finns det något annat du vill lyfta om din erfarenhet av att investera i solenergi och att anlägga och driva en solcellspark?
- Känner du till andra markägare som har anlagt solcellsparker på sin mark på liknande sätt som jag skulle kunna kontakta?
- Kan jag återkomma om jag har fler frågor i framtiden?

Appendix 2

Interview Guide (English)

Introductory Questions (General/Background):

- Can you tell me a bit about your main business activities beyond the solar installation?
- How long has the solar installation been in operation?
- How much energy does the solar park produce? (Preferably in KWh or MWh annually)
- How much land area does the installation occupy? What was the land used for previously/what type of land is it?
- What is the main use of the produced electricity? (Self-consumption or sale?)
- What external actors (energy companies, developers, etc) have been involved in the development and operation?
- How many people from your own organization are involved in or work with the solar park?

1. Motivations for Developing a Solar Park

- How did the idea to develop a solar park come about? Was it your own initiative or were you approached?
- What were the main drivers and motivations behind the decision to invest in solar energy?
- For example: economic factors (profitability, cost savings, government support), environmental concerns (sustainability, reduced climate impact), technical innovation (development), social opportunities (visibility, branding, local engagement), personal interests or values?

Follow-up questions:

- Was there a personal interest or value that influenced your decision to develop a solar installation?

- Did financial incentives, such as profitability, cost savings, or subsidies, affect the decision? If so, how?

- Did environmental aspects or the renewable energy transition play a role in your decision? (e.g. energy transition, land-use, sustainability)

- Were there social or business reasons, like increased visibility, brand building, or creating local engagement?

2. Challenges in Developing and Operating the Solar Park

- What have been the biggest challenges in developing and operating the solar park?

Follow-up questions:

- Have there been practical challenges related to establishing and managing the park (e.g. site selection, sourcing materials)?

- Has it been difficult to combine the solar park with your other operations?

- Has it been difficult to collaborate with other actors in the project?

- How have economic aspects such as investment costs, profitability, and market development for solar energy affected the project?

- Have legal and regulatory requirements (e.g. permit processes or legislative changes) posed any challenges?

- Have you faced technical problems (function, maintenance, need for expertise, equipment failures, replacement needs)?

- Do you perceive any safety challenges in the local community, such as burglary, fire risks, or electrical hazards?

- Have you encountered challenges in the local community, such as resistance from neighbours or the municipality?

- Has energy policy or changes in government support posed a challenge for the solar park?

- Have any environmental challenges arisen, such as impacts on the land, biodiversity, or other ecological effects?

3. Opportunities in Solar Park Development

- What positive effects has the solar park had for you?
- What opportunities do you see in investing in solar this way?
- Has there been any unexpected opportunities?

Follow-up questions:

- Has the investment been profitable or resulted in electricity cost savings?
- Has the solar park reduced energy dependency for your business?
- Do you see opportunities to expand or adapt the solar park as new innovative solutions emerge?
- Have you noticed increased interest from other landowners or actors to make similar investments?
- Are there any positive effects in the local community resulting from the solar park? (e.g. energy access, collaboration, employment, inspiration)
- Has the investment contributed to learning and development, both on a personal level and more broadly?
- Do you perceive that the solar park can have positive environmental or land-related effects? Both in a broader context and locally?

4. Impact on Land-Use

- How was the decision made to place the solar park on that particular land? What have been the advantages of that choice?
- How has the solar park affected your land-use and land management? (In terms of accessibility, possibility for maintenance and upkeep, or opportunities for other land-uses such as farming or grazing)
- Have you continued to use the land for other purposes alongside the solar installation?
- Has the decision to establish a solar park caused any land-use conflicts, and if so, how have they been managed?
- Has the solar park affected your long-term plans for land-use?
- Has the installation affected the economic value of the land?

If not agrivoltaic:

- What is your view on the possibilities for combined or dual land-use, such as crop cultivation or grazing?

If agrivoltaic:

- Why did you incorporate agrivoltaics?
- How does it work? How does it affect land-use?
- What have been the advantages or disadvantages of this approach?

5. Closing Questions

- Is there anything you wish you had known more about before deciding to develop a solar park?
- Do you have any advice for other landowners considering a solar park?
- Is there anything else you would like to share about your experience investing in solar energy and developing a solar park?
- Do you know of any other landowners who have developed solar park in a similar way as you that I could contact?
- May I follow up if I have more questions in the future?

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