Energiepolitik und Klimaschutz
Energy Policy and Climate Protection

RESEARCH

Angela Pohlmann

Situating Social Practices in Community Energy Projects

Three Case Studies about the Contextuality of Renewable Energy Production

Springer VS

Energiepolitik und Klimaschutz
Energy Policy and Climate Protection

Reihe herausgegeben von
L. Mez, Berlin, Deutschland
A. Brunnengräber, Berlin, Deutschland

Weltweite Verteilungskämpfe um knappe Energieressourcen und der Klimawandel mit seinen Auswirkungen führen zu globalen, nationalen, regionalen und auch lokalen Herausforderungen, die Gegenstand dieser Publikationsreihe sind. Die Beiträge der Reihe sollen Chancen und Hemmnisse einer präventiv orientierten Energie- und Klimapolitik vor dem Hintergrund komplexer energiepolitischer und wirtschaftlicher Interessenlagen und Machtverhältnisse ausloten. Themenschwerpunkte sind die Analyse der europäischen und internationalen Liberalisierung der Energiesektoren und -branchen, die internationale Politik zum Schutz des Klimas, Anpassungsmaßnahmen an den Klimawandel in den Entwicklungs-, Schwellen- und Industrieländern, die Produktion von biogenen Treibstoffen zur Substitution fossiler Energieträger oder die Probleme der Atomenergie und deren nuklearen Hinterlassenschaften.

Die Reihe bietet empirisch angeleiteten, quantitativen und international vergleichenden Arbeiten, Untersuchungen von grenzüberschreitenden Transformations- und Mehrebenenprozessen oder von nationalen „best practice"-Beispielen ebenso ein Forum wie theoriegeleiteten, qualitativen Untersuchungen, die sich mit den grundlegenden Fragen des gesellschaftlichen Wandels in der Energiepolitik und beim Klimaschutz beschäftigen.

Reihe herausgegeben von

PD Dr. Lutz Mez
Freie Universität Berlin

PD Dr. Achim Brunnengräber
Freie Universität Berlin

Weitere Bände in der Reihe http://www.springer.com/series/12516

Angela Pohlmann

Situating Social Practices in Community Energy Projects

Three Case Studies about the Contextuality of Renewable Energy Production

Springer VS

Angela Pohlmann
Faculty of Business, Economics
and Social Sciences
University of Hamburg
Hamburg, Germany

Dissertation at the University of Hamburg, Faculty of Business, Economics and Social Sciences, 2016

Funded with a full PhD scholarship by Hans-Böckler-Stiftung

Energiepolitik und Klimaschutz. Energy Policy and Climate Protection
ISBN 978-3-658-20634-5 ISBN 978-3-658-20635-2 (eBook)
https://doi.org/10.1007/978-3-658-20635-2

Library of Congress Control Number: 2017963538

Springer VS

Printed on acid-free paper

This Springer VS imprint is published by Springer Nature
The registered company is Springer Fachmedien Wiesbaden GmbH
The registered company address is: Abraham-Lincoln-Str. 46, 65189 Wiesbaden, Germany

Acknowledgements

This work could not have been written without intense help, inspiration and advice from many people. First of all I want to thank the project members of the CDT, KEBAP, and the staff members of the IBA Hamburg, who all let me take part in their daily routines and who spent their time to contribute their knowledge, information, and insights to my thesis. This work is based on your friendliness, your knowledge, and your engagement. I also want to thank all the other people who were willing to give me interviews and take part in my research. I am extremely grateful to my first supervisor, Anita Engels! She has not only been the first person to believe that I could indeed write a PhD-thesis, but throughout the process she has supported me with adequate critique, insightful advice, practical support, and trust in my competencies. Many thanks also go to my second supervisor, Jörg Knieling who has always been willing to meet me and debate my ideas. Besides his competent expert advice, I am grateful for the many pragmatic recommendations he has made. Janette Webb has not only welcomed me in her team for some month, but has given me the opportunity to take part in all discussions, meetings, and event which took place at the time of my stay. Throughout my stay at the University of Edinburgh she furthermore has taken the time to intensely debate my research, my ideas, and the relevance and value of theoretical concepts with me. I also want to thank Janette Webb, Mags Tingey, David McCrone, and David Hawkey for actually making me feel like being part of the team, for talking things over with me, sharing their tea, coffee, and milk with me, and generally making me feel at home in Chisholm House. Thank you: Kerstin Walz, Sarah Debor, and, Lena Borlinghaus who kindly have each read, commented upon, and corrected parts of my thesis. Who have contributed ideas, were willing to discuss things over and over again, and whose work and patience definitely has improved this work. Clearly, this thesis could not have been written without the material and immaterial support from the Heinrich-Böll Stiftung. Getting a scholarship from the Heinrich-Böll Stiftung has secured my livelihood, enabled my fieldwork in Scotland, and my stay at the University of Edinburgh. Furthermore, and maybe even more importantly: being part of the “Cluster Transformationsforschung” has put me in contact with many brilliant and likeminded people.

Table of Contents

List of Abbreviations

ANT	Actor-Network-Theory
BImA	Bundes Immobilien Agentur
BTTP	Block-Type Thermal Power Station
BSU	Behörde für Stadtentwicklung und Umwelt Friends
BUND	of the Earth Germany
KEBAP	Kultur-und-Energie-Bunker-Altona-Projekt
KW	Kilowatt
CCF	Climate Challenge Fund
CCS	Carbon Capture and Storage
CDT	Comrie Development Trust
CES	Community Energy Scotland
CHP	Combined Heat and Power
CO_2	Carbon Dioxide
DGRV	Deutscher Genossenschafts- und Raiffeisenverband
DTA	Development Trust Association
EEG	Erneuerbare-Energien Gesetz
FIT	Feed-in Tariff
IBA	International Building Exhibition
INES	International Nuclear Events Scale
IPCC	Intergovernmental Panel on Climate Change
kWh	kilo Watt per hour
KSB	Keep Scotland Beautiful
LTS	Large Technical Systems
MCA	Maximum Credible Accident
MoD	Ministry of Defence

PoW	Prisoner of War
RE	Renewable Energy
RHI	Renewable Heat Incentive
SCOT	Social Construction of Technology
SDHL	Scottish District Heating Loan Scheme
STS	Science and Technology Studies
UHUN	Unser-Hamburg-Unser-Netz Westray
WDT	Development Trust

Figures

Introduction

Bunkers and Prisoner-of-War (PoW) camps from the Second World War (WWII) are not typically associated with renewable energy production. During the war, bunkers and PoW camps were used to separate humans from their environment. Renewable energy production sites are usually approachable; they dissolve the geographical and social separation of people and energy production that characterizes conventional energy production (Walker et al. 2007: 68). WWII is associated with dictatorship and strict top-down power relations, while renewable energies are in many ways closely related to citizen initiatives and bottom-up processes (Rosenbaum/Mautz 2011: 411; likewise among others, Bergman et al. 2010; Mautz et al. 2008). Last but not least, WWII stands for a destructive past while renewable energy is equated with the future of low-carbon energy production. There is, however, an important similarity between bunkers and PoW camps and renewable energy production sites—both are associated with what were or are major threats to humankind. Bunkers and PoW camps sheltered people from the hazards of the World War—air raids as well as enemy combatants. Renewable energy sources derive from the aim to lessen the extent of anthropogenic climate change. Thus, both types of buildings are responses to major hazards for mankind, created by human conduct.

In the following, three buildings from the WWII which are transformed into renewable energy production sites serve as case studies for this thesis. The case studies are analysed with the research interest to gain insights into the contextuality of renewable energy and renewable energy production. This analysis of the case studies aims to contribute to an understanding of renewable energy and renewable energy production as complex, socially embedded phenomena. In Hamburg, a northern German city, two bunkers have been or are in the process of being refurbished to host renewable energy production technologies. In Comrie, a village in central Scotland, renewable energy production takes place in a former PoW camp. One of the two bunkers has been refurbished within the context of an international building exhibition (IBA). After restoration, the building now houses an energy production centre, a café, and an exhibition about the WWII and the history of the bunker. The energy production centre consists of a biomass boiler for burning woodchips, a gas biomethane-fired combined heat and power unit, a wood combustion system, and a solar thermal unit, as

well as waste heat from an industrial plant. The heat produced by these technologies is fed into a 2000m³ buffer storage facility. The heat is distributed via a newly installed micro-grid that connects the bunker to about 1600 households.

The second bunker is going to be transformed into a culture-and-energy bunker (KEBAP) by the combined efforts of a cooperative and a charity organisation. Both organisations have their origins in the same citizen initiative. One part of the bunker is meant to provide room for the installation of a modular system comprised of a biomass combustion system for burning woodchips, a gas block-typed thermal power station (BTTP), and a buffer storage facility. Installation of solar thermal panels on the rooftop is being considered. Within the second part, cultural and social activities are projected to take place. The produced heat will be fed into Hamburg's long-distance heat grid and (virtually) distributed to customers all over the city. The income generated by selling the heat will be used to subsidize cultural and social activities in the second part of the building. These include but are not limited to urban gardening, music exercise rooms, yoga, a social kitchen, and a multipurpose room for exhibitions, neighbourhood meetings, and parties. At the moment the project is negotiating with Hamburg's government and the district government about conditions for purchasing the building.

In Scotland, a former PoW camp called the Cultybraggan Camp has been purchased by a community organisation—the Comrie Development Trust (CDT). Besides a multitude of different activities taking place at the camp, the CDT has installed photovoltaic panels and a biomass woodchip-based boiler to produce heat and electricity for the camp users. For this purpose, a micro heat grid has to be installed as well in the Camp. The facilities offered at the camp include a community orchard, allotments, a heritage centre, history re-enactment groups, small-scale entrepreneurs, a gym, and a music exercise room. The financial income from selling electricity and heat is fed back into the local community.

Using bunkers and PoW camps for renewable energy production alters the way these sites are made sense of. Initially, all the buildings were sites of military activities, more specifically WWII. While they continue to be memorials of war, the buildings have now become associated with ideas like climate change and sustainability. As mentioned above, anthropogenic climate change is one of the biggest challenges for today's human societies. Being created through human activities, the '*warming effect of greenhouse gases has the potential to trigger abrupt, large-scale, and irreversible changes in the climate systems'* (Stern 2006: 19). These changes in the climate system have effects on most ecological systems in the world. They will cause changes in sea levels and temperatures, draughts and desertification, melting of ice caps and glaciers, and the desiccation

of swamps and marshes. The anticipated effects of these changes include the loss of biodiversity and an increase in natural hazards like storm-floods, tornados, and strong rains (Dunlap/Brulle 2015). Besides—and because of—the negative impacts on the flora and fauna, climate change and its effects will also affect human societies. Loss of arable and/or settled land and an increase in natural hazards will affect human lives and are likely to cause mass migrations and wars over resources (Smith 2007; Reuveny 2007). In particular, economically disadvantaged groups and individuals are going to suffer due to the effects of climate change (Adger 2006). Because of their lack of resources, they are more vulnerable and less resilient to the effects of climate change. Climate change thus '*presents perhaps the most profound challenge ever to have confronted human social, political, and economic systems*' (Dryzek et al. 2011: 3; likewise Weyer 2010: 385).

While the effects of climate change are related to human societies, climate change is also caused by human activities. As Working Group 1 states in its contribution to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC), there are '*multiple lines of evidence that the climate is changing across our planet, largely as a result of human activities*' (Cubasch et al. 2013: 121).[1] More specifically, climate change is caused by the emission of greenhouse gases, most significantly carbon dioxide (CO_2), into the atmosphere. Most greenhouse gases result from the burning of fossil fuels like coal, gas, and oil. Fossil fuels are burned to produce energy. Modern societies require energy in the forms of electricity and heat and also for mobility and transport. The utilization of energy is a 'by-product' of human activities. People want to use, not energy per se, but their computers, cars, and other technical devices. '*Energy demand is the outcome of what people are* doing*, of the interlinking of practices and energy-intensive material arrangements'* (Urry 2014: 4). Furthermore, people do not use these technical devices in social isolation. Humans drive their cars on a daily basis because they need to get to work or in order to fulfil diverse social demands. They use a hoover and shower in hot water because of social conventions of cleanliness (Shove 2003). They switch on their computer as part of their social interactions, for work, and for information gathering. Taken together, '*energy in a variety of guises is bound up technically, economically, and politically with our societies, communities, and livelihoods in very diverse ways*' (Rutherford/Coutard 2014: 1354).

The social sciences have for a long time been marginalized in the scientific debates about climate change (Urry 2011; Brulle/Dunlap 2015; Rosa et al.

1 This thesis does not elaborate upon the scientific discussions about the factual existence or social reality of climate change. But see Steffen 2011; Boykoff et al. 2010; Norgaard 2006; Olausson 2009; McCright/Dunlap 2003.

2015). Arguing against purely natural science and technocratic understandings of climate change, social scientists have started to argue against '*the neglect of "society" in analysing current and future climate and resource processes*' and instead to '*bring society centrally into the analysis of climate change*' (Urry 2011: 2). Within this realm, sociology has become increasingly engaged in understanding the human dimensions of climate change, especially its social, institutional and cultural dynamics (Brulle/Dunlap 2015: 2). Social scientists who take part in political and scientific debates about climate change and carbon reduction argue that

> '[s]trategies of mitigation and adaptation cannot be accomplished by technical means alone but require a fundamental change in society and culture because climate change puts the traditional concept of industrial societies in itself in question, its technologies based on carbon, its economics, its principles of growth, and its ways of life' (Leggewie/Welzer 2010: 031009-2).

Instead of working on purely technical and natural science-based solutions, societies need to engage in radical, encompassing, and deliberate transformations. In order to transform today's societies it does not suffice to develop energy-efficient devices. In fact, '*there is clear evidence that improvements in efficiency often have failed to have substantial effects on the overall scale of environmental problems*' (Rosa et al. 2015: 33). Increases in energy efficiency are often thwarted by rebound effects (ibid.: 33; Frondel 2012). In addition to energy-efficiency measures, people's energy consumption patterns need to change in order to achieve significant carbon reductions. As it will be possible to neither eliminate carbon consumption absolutely, nor increase carbon efficiency sufficiently, these strategies need to be accompanied by an energy production approach that does not offset CO_2 or utilize non-renewable resources. Transforming today's societies means to fundamentally change the system of energy production. A main question is if and how renewable energy production can be incorporated into the existing system, or if the low carbon society requires a radical break with the existing structures and institutional infrastructures (Weyer 2010: 385)?

Energy efficiency, reduction of energy consumption, and renewable energy production are the key mitigation strategies to decrease carbon emissions and transform present-day societies into low- or no-carbon societies (Diesendorf 2011: 561). Within social sciences, researchers so far have studied different aspects of energy efficiency (Kousky/Schneider 2003; Rutland/Aylett 2008; Slocum 2004), energy consumption (Shove/Pantzar 2005; Ehrhardt-Martinez et al. 2015; Urry 2010), and energy production and distribution (Webb 2015; Bolton 2011). Additionally, different scholars have developed approaches to theoretically explain transformation processes (among others Geels 2004, 2010;

Markard/Truffer 2008; Geels/Schot 2007; Berkhout et al. 2003). Last but not least, social scientists have analysed the existing barriers to transformations and developed ideas to overcome them (Foxon/Pearson 2008; Burch 2010). These scholars have identified path dependencies (Wise et al. 2014), lock-in effects (Unruh 2000), social power (Avelino/Rotmans 2009), and individuals' cognitive barriers to prevent or act upon climate change (Lorenzoni et al. 2007; Slocum 2004) as obstacles.

Social scientists have acknowledged and even emphasised the complexities of the causes and consequences of climate change (Dryzek et al. 2011: 4pp.; Rotmans/Loorbach 2009; Norberg/Cumming 2008). While recognising this complexity, many studies in the field of '*transformation research*' (WBGU 2011) are characterized by an underdeveloped estimation of complexity with regard to the transformation processes themselves. Many models and theoretical approaches, for example, draw on a linear concept of transformation processes (for example Westley et al. 2011; Moore et al. 2014) or transition pathways (Foxon/Pearson 2011; Geels/Schot 2007). This simplistic understanding can also be seen in terms like 'the great transformation'. Different scholars have repeatedly criticized the failure to integrate complexity within transformation research (Engels 2015; Fuchs/Hinderer 2014; Shove/Walker 2007). Instead of talking about 'the' transformation, it would be more advisable to use the plural form—thus acknowledging the complexity of actors, events, processes, and outcomes (Engels 2015).

This thesis will make visible some of the complexities that are part of transformative processes. More precisely, it studies the complexities and heterogeneities that occur among three rather similar local renewable energy projects. In fact, the projects have a lot of similarities. Besides being situated in buildings from the WWII, each project uses woodchip biomass boilers and solar and/or photovoltaic panels to produce renewable heat. Furthermore, no site is used exclusively for energy production. Instead, all three projects combine energy production with facilities for social and/or cultural activities. Last but not least, all three projects explicitly aim to contribute to the development of low-carbon, renewable, and decentralized energy systems. Using examples of only one type of actors—local renewable energy production projects—within transformations, the analysis of the case studies focuses on heterogeneities and complexities between the three projects. It is analysed how renewable energy and the production of renewable energy are made sense of in different ways, not only by the different projects, but also by different members of each project.

A number of studies have already shown the existence of a range of dissimilarities among local renewable energy projects. According to these studies, projects can be differentiated according to whether the owning, running, and/or

profiting organisations are private businesses, public institutions, or '*grassroots initiatives*' (Seyfang/Smith 2007). Grassroots initiatives, again, might vary, for example with regard to the organisational form chosen. Organisations as diverse as charities, cooperatives, and community development trusts have been identified (Seyfang et al. 2014). Community engagement is another differentiating factor. Projects vary with regard to the involvement of citizens in planning as well as profiting from local renewable energy projects (Walker/Devine-Wright 2008). Bauwens (2016) found very heterogeneous motivations among individuals participating in community renewable energy projects. Also, projects have attained very different levels of 'success' (Kunze 2011). While some projects are able to install even more energy production unities than had originally been anticipated, other projects die somewhere along the way. Studies have also analysed variances between renewable energy projects from different national backgrounds (Schreurs 2008; Breukers/Wolsink 2007). These studies have, for example, shown how national institutions and policies influence the realization of renewable energy projects. Most of the differentiating factors analysed for renewable energy projects are rather descriptive. Also, many studies are inspired by the aim to produce applicable results (for example, Seyfang et al. 2014; Schneidewind/Singer-Brodowski 2014).

In studying how energy and energy production are made sense of in these projects, this thesis has transferred one of the most basic sociological questions onto the issue of renewable energy. It aims to tackle two fallacies inherent to all existing studies on local renewable energy projects. First, this thesis addresses the inherent idea within all existing studies—the assumption that energy is 'somehow just there'. To counter this common idea, this thesis analyses how energy is produced through specific human activities. These activities take place in specific social situations. As such, energy is an outcome of particular social contexts. More precisely, as a specific type of human activity, renewable energy production is always embedded into the social contexts in which these activities are enacted. It is a meaningful part of the context in which it is enacted, and is both shaped by the context and shapes it.

Second, this thesis aims to challenge the lack of awareness that energy and the process of energy production are socially situated and thus have dissimilar meanings in different projects. By not acknowledging this difference, scholars tend to homogenize local renewable energy projects. Different ideas about energy and energy production within one project are overlooked. Challenging this inherent homogenization of renewable energy (production), this thesis is interested in the complex and dynamic understanding of energy and energy production within certain contexts.

By focusing on the contextuality of sense-making within local renewable energy projects, this thesis realises one of the main principles of qualitative social research (Hollstein/Ullrich 2003: 36). According to this principle, sense-making is always embedded in certain contexts and can only be understood in relation to these contexts. Studying energy and energy production as outcomes of contextualized, complex, and heterogeneous sense-making requires a theoretical approach that is able to not only uncover these complexities, but also explain how heterogeneous positions are negotiated within the projects. Taking serious insights from postmodern thinking, negotiation is understood as a dynamic, constantly contested process (Clarke 2003).

In order to analyse how energy and energy production are understood in the projects, this thesis uses a practice theoretical approach. Scholars have already applied practice theories to environmental, specifically low-carbon, issues. Studies have, for example, looked at social practices and how they change with regard to the environment (Hargreaves 2011) and energy consumption (Shove/Walker 2014; Strengers 2012; Røpke 2009; Shove/Pantzar 2005). The interplay of social practices and smart technologies such as smart homes (Wilson et al. 2015; Strengers 2012); various domestic technologies (Hargreaves et al. 2011), or smart grids (Naus et al. 2014; Nyborg/Røpke 2013) have also been analysed with practice theoretical approaches. Specifically, with regard to warmth, scholars have analysed the relationships between heat comfort and social practices (Gram-Hanssen 2010) as well as the social practices in the context of cooling (Strengers/Maller 2011).

Among the growing number of practice theories, I have adopted the approach developed by Theodore Schatzki. Analysing energy production with his concept of social sites '*directs attention to how practices and arrangements causally relate, how arrangements prefigure practices, how practices and arrangements constitute one another, and how the world is made intelligible through practices*' (Schatzki 2010: 146). His concept offers a way to analyse how energy and energy production are positioned in, related to and have meaning for other elements in a specific context. Though it takes complexity and dynamic developments into account, his approach, however, does not specifically enable researchers to focus on these. Furthermore, he does not offer any theoretical tool to study how sense-making practices of different actors are negotiated in a certain context. To create a theoretical approach which is able to grasp this research interest, his concept is combined with Adele Clarke's situational analysis.

Adele Clarke's situational analysis is a method/theory package based on grounded theory. It provides a methodology that focuses on negotiations of different actor groups. Members of different '*social worlds*' negotiate, bargain

with, or even coerce other social worlds in '*social arenas*' (Clarke 1991). Analysing these instances of negotiation with the tools of situational analysis draws attention to the complexities and instabilities that are part of every such situation. Combining practice theory with situational analysis offers a way to relocate the focus from the reproductive and routine aspects of embodied practices onto their negotiated and situated character in a specific situation or context.

Specifying the aforementioned research interests in accordance with the methodological premises and the theoretical framework, the first research question is:

How are energy production activities shaped by the specific context within which they are enacted? This question can be differentiated into two sub-questions: What specific motivations, ideas, knowledge, and intentions are underlying the production of energy? How do other elements of these contexts influence the production of renewable energy?

Energy production, however, is assumed to not only be shaped by but also shape the context within which it is produced. Consequently, the second research question is:

How does energy production shape the context within which it is enacted? This question can also be split into two sub-questions. How is energy production related to other activities within a certain context? How does it influence the human actors, material artefacts and local environments of the context?

These research questions are answered through a qualitative analysis of the three projects briefly described in the beginning of this introduction. Qualitative fieldwork in these projects was conducted between the beginning of 2012 and the end of 2013 and consisted of participant observation, interviews, and the collection of grey literature.

This thesis is structured as follows. Chapter 1 describes the state of the art of research on local renewable energy projects. It situates this thesis within the scholarly discussions of a certain scientific community and defines its thematic limits and boundaries. This chapter is followed by an explanation of the methodological premises, the research design, and the methods employed for the research. The description of the methodological premises is motivated by principles of qualitative social research and essentially aims to make transparent the why and how of this thesis. Deriving from the methodological premises, Chapter 3 develops the theoretical framework by first providing an introduction to practice theoretical ideas and concepts. Subsequent to the general overview, Section 3.5 details Theodore Schatzki's practice theory approach and provides an explanation as to why his approach best suits the research interests. As is elaborated, Schatzki's approach does not suffice to realise the specific research interest and

methodological premises of this thesis. It is combined with Adele Clarke's situational analysis, described in Section 3.6. The last section of this chapter (3.7) details how the two approaches are combined and operationalized in order to analyse the three case studies. In the second part of this thesis, these cases are individually described and analysed. The conclusion summarizes the results and refers back to the research interest and questions.

1 State of the art

Different theoretical and empirical strands of literature have contributed to the development of this thesis. This chapter introduces those studies and theoretical works that have influenced my thinking and contributed ideas to the analysis and interpretation of the three case studies. Subsequent to some introductory remarks about the scope and limits of the literature review, this chapter provides an overview to the socio-technical science publications that have contributed to the analysis of renewable energy production from a theoretical perspective. The largest part of this review presents those empirical works that have studied new actors and activities in the field of decentralized and renewable energy production. The chapter concludes with an identification of existing research gaps and an explanation of how this thesis fits into the existing body of research.

1.1 Scope and limits

On the most general level, this thesis contributes to the body of research on transformation to low-carbon societies. So far, social sciences have had a marginal role in research on the causes and consequences of climate change (Brulle/Dunlap 2015: 2; Welzer et al. 2010). One reason is that most social sciences only started to engage with climate change in the beginning of the 1990s, at a time when the natural sciences had already developed sophisticated climate models (Brulle/Dunlap 2015: 4). Scholars have pondered the reasons for sociology's missing interest in climate change. One explanation is seen in the division of nature and 'the social' which underlies sociology. In order to legitimate the new discipline, early theorists had to separate sociology from other disciplines, especially the dominant natural and physical sciences. The differentiation between nature and society was enabled by Enlightenment's understanding of nature as '*primordial, autonomous, and mechanistic*' (Goldman/Schurman 2000: 564). Since then sociologists have focused on what was perceived as 'social facts', while 'nature' was left to the natural sciences (Dunlap/Catton 1979: 244). Since the 1970s, however, environmental degradation increasingly forced sociologists to recognize that nature and society are inseparable (Dunlap/Catton

A. Pohlmann, *Situating Social Practices in Community Energy Projects*, Energiepolitik und Klimaschutz. Energy Policy and Climate Protection, https://doi.org/10.1007/978-3-658-20635-2_1

1979). Especially climate change '*makes a mockery of the premise that society and nature are separate and mutually exclusive*' (Beck 2010: 256).

As a result of these historical developments, sociologists since the 1990s have started to take part in debates about climate change (Shove 2010). By the time social scientists started to argue the social factor in climate change, both the causes of climate change and the strategies to tackle it, had already been framed as natural science or technological issues (Brulle/Dunlap 2015). Increasingly, however, recognition has set in that

> '[t]he phenomenon of global warming is also driven by processes that cannot be adequately analyzed by physicists, geologists, or meteorologists alone. The dynamics of anthropogenic climate change is not merely a question of natural processes but first and foremost a question of economy, society, and culture' (Leggewie/Welzer.: 31009-1).

Social scientists argue that '*the drivers of anthropogenic climate change are deeply rooted in the routines of everyday life and the social structure of modern societies*' (Brulle/Dunlap 2015: 4; likewise Rosa et al. 2015: 32). What needs to change is not only the energy efficiency of technological artefacts, but also the ways they are used by and within societies. Likewise, scholars argue that it does not suffice to provide information about the most sustainable options to individuals and expect them to change their behaviour. Instead,

> 'the "problem" of human behaviour which leads to emissions needs to be placed within the wider contexts where social practices are undertaken. Norms and values shape practices, and so do infrastructures, institutional arrangements and systems of governance' (Moloney et al. 2010: 7615).

Acknowledging the social background of climate change also means to understand transformations to low-carbon societies as socio-technical processes (among others Leggewie/Welzer 2010; WBGU 2011). This nearly paradigmatic change in the perception of climate change has had effects on the existing literature. While technical and business studies still make up the main part of publications—representing the often diagnosed '*technological bias*' in discourses on transition (among others Sovacool et al. 2014, 2015)—the number of studies focusing on or at least including insights from social sciences has increased.

An important aspect in the socio-technical transformations towards low-carbon societies are changes in the energy system. Social scientists have criticized the '*blind spot*' in '*conventional techno-economic thinking*' (Lutzenhiser/Shove 1999: 217; likewise Sovacool 2014; Sovacool et al. 2015) concerning necessary changes in the systems of energy production, distribution, and consumption. These scholars argue that energy research has so far in most

parts downplayed the role of human dimensions in energy production, distribution, and consumption. Sovacool and his colleagues state that '*energy advocates, the climate change community, and related policymakers need to recognize that energy production, consumption, and policy are both social and technical domains*' (Sovacool et al. 2015: 95). A greater degree of scholarly interest has to be generated for understanding the interplay of the technical and social components in the energy system (Sovacool 2014: 26).

Scholars from different disciplines within the social sciences have offered ideas about and insights into transformations to low-carbon societies. Geography, among others, has contributed with extensive debates about the change of land usage in the context of new infrastructure for renewable energy production in rural settings (among others Gailing/Röhring 2015) and the conflicts arising due to these transitions (Murphy 2010). Urban planners have provided insights into infrastructural changes that support mitigation and adaptation strategies in urban settings (Fröhlich 2011; Knieling et al. 2011; Condon et al. 2009). Apart from other important issues, an interest in the question of governance and formal participation instruments has originated from the political sciences (among others Stephan et al. 2015; Goldthau 2014; Kern/Bulkeley 2009; Betsill/Bulkeley 2006). International relations and treaties are another important topic that has been highlighted by political scientists with regard to low carbon transformations (Luterbacher/Sprinz 2001). Historians have offered insights into the progress of various transition processes (Geels 2011, 2010, Grin et al. 2010b; Markard/Truffer 2008).

Sociologists have worked on a broad range of topics in the realms of climate change and low-carbon transformations. Among many other issues, sociologists have studied the involvement of different social actors (Sommer/Schad 2014; Schaefer Caniglia et al. 2015; Dunlap/McCright 2015; Voss/Schildhauer 2016), the role of social institutions and how they (need to) change (Dunlap 2010; Buttel 2010), and the practices of energy consumption (Shove/Pantzar 2005; Nyborg/Røpke 2013; Shove/Walker 2014). Furthermore, sociologists have analysed discourses on climate change (Weingart et al. 2000; Reusswig 2010), aspects of environmental and/or climate justice (Harlan et al. 2015), and the influence of existing and emergence of new markets (Engels et al. 2008; Engels 2010; Perrow/Pulver 2015).

As this short overview illustrates, the existing wealth and diversity of literature cannot be captured in one chapter. Instead, this review focuses on those bodies of research that are directly relevant to the research question and interest. Only studies that centre on energy production activities at the local level are included. While acknowledging that transformations to low-carbon societies are multi-level governance processes (among others Betsill/Bulkeley 2006;

Kern/Bulkeley 2009), in which local, regional, national, and international levels are interconnected, neither the multitude of relevant social levels nor their interactions are included here. For the same reason, research publications dealing with global or international issues do not feature in this chapter. This overview concentrates on the topic of the thesis—the local production of renewable energy. Thus, despite being inextricably related to renewable energy production, the issues of conventional energy production, energy grids, energy efficiency, or energy consumption are not part of this chapter. To further limit the scope of this review, only publications that provide insights into the German and the British context are presented. Publications from other national contexts are included only if they are significant for the scientific discussion of energy transitions in Germany or the UK.

Important contributions on the other hand, not only originate from scientific institutions. Publications by political organisations like the report from the German Advisory Council on Global Change ('*Wissenschaftlicher Beirat der Bundesregierung Globale Umweltveränderungen*' or WBGU) or the Energy White Paper in the UK and publications from Federal Ministries or different federal state institutions are relevant to the political and scientific debates in both countries. Publications from civil society institutions have also contributed to the British and German transformation discourses. Among these are environmental organisations like Friends of the Earth or Greenpeace, funding organisations like the Heinrich-Böll Stiftung or Community Energy Scotland, and organisations as varied as the umbrella organisation for cooperatives in Germany ('*Genossenschaftsverband Deutschland*') and the German association for cooperatives ('*Deutscher Genossenschafts- und Raiffeisenverband*' or DGRV), as well as community organisations in Great Britain (Development Trust Association Scotland). Publications from these organisations feature in this literature review if they contribute to the process of finding, developing, and answering the research questions.

1.2 Theoretical approaches to renewable energy production

One subfield in the social sciences that has frequently been dealing with issues of energy production and distribution is science and technology studies (STS). Within STS, the socio-technical branch in particular is '*concerned with explaining how social processes, actions, and structures relate to technology*' (Mackay/Gillespie 1992: 658). While the socio-technical approach is not a unified set of theories but rather a research agenda (Bolton 2011: 37), a common concern of all socio-technical approaches is the rejection of technical determinisms

(Mackay/Gillespie 1992: 658pp.; Bolton 2011: 37). They are further united '*by an insistence that the "black box" of technology must be opened, to allow the socio-economic patterns embedded in both the content of technologies and the processes of innovation to be exposed and analysed*' (Williams/Edge 1996: 866). In essence, socio-technical approaches are interested not in the social impacts of certain technologies or innovations but in the range of social factors that form the basis of the design and implementation of technologies (ibid: 865).

When the '*new sociology of technology*' (Bijker/Pinch 1987: xiv) came into existence in the 1980s, three approaches constituted this new field of research: the social construction of technology (SCOT) approach, the systems concept, later renamed as large technical systems (LTS), and Bruno Latour's actor-network theory (ANT) (ibid. xiv pp.). Here, I focus on the concept of SCOT. While the concept of LTS implies

> 'that large-scale technologies—such as electricity networks, railroads, telecommunications grids, roads and automobiles, and sewage systems—weave together technical artefacts, organisations, institutional rule systems and structures, and cultural values' (Sovacool 2014: 24pp.).

and thus fits my research interests, the approach is—as the name suggests—dedicated to explaining large technical systems, while my focus is on small and medium-sized energy production systems. Ideas from ANT that are important for this thesis are included in both Adele Clarke's situational analysis and Theodore Schatzki's concept of social practice.

SCOT approaches derive from the motivation to combine social constructivist approaches from the study of science with the study of technology (Pinch/Bijker 1984). Adapting the idea '*that there is nothing epistemologically special about the nature of scientific knowledge: it is merely one in a whole series of knowledge cultures*' (ibid: 401) to the study of technology, the implication is to treat '*technological knowledge in the same symmetrical, impartial manner that scientific facts are treated within the sociology of scientific knowledge*' (ibid: 405). Technological artefacts are not understood to be outcomes of quasi-natural evolutionary processes, but as social constructs. When Michel Callon (1986) analysed the controversies and negotiation processes evolving around the development of electric vehicles in France, he showed that the technology was not the outcome of a selection process of the technologically best options, but that a controversy involving different actors' heterogeneous aims, ambitions, resources, ideas, and power access crucially shaped the technology. Analysing the changing patterns of renewable energy implementation in the UK, Walker and Cass argue that in order to understand the mutual construction of technologies and the society, studies should '*focus on the relationships between an object and surrounding actors*' (Walker/Cass 2007: 459).

This last quote describes one of my main research interests. Technologies do not exist in social isolation; they are related to the social contexts within which they are invented or used. Throughout the analysis of the three cases, readers constantly encounter the idea of SCOT approaches that energy production technologies, their meaning, and their usage are related to the social context within which they are created or used. However, while STS approaches have inspired and influenced this thesis, they focus on social aspects that are directly related to certain technologies. They start with a certain technology by identifying the social elements or aspects that have shaped or are shaped by it. STS concepts—like the ANT (Schatzki 2010: 135), however, do not provide any conceptual tools to analyse *how* technologies are related to the surrounding actors or contexts. This is the aim of this thesis. While STS has contributed the general idea of studying the social contextuality of renewable energy technologies and thus has significantly shaped the research interest, it is not used for the analysis of the three case studies.

1.3 Research on civil engagement in local energy production

The second field of transformation research relevant for this thesis are empirical studies, studying the activities of different actors in transformation processes. My research interest and case studies relate this thesis to those studies that deal with the engagement of civil society actors in energy production. The subfield of studies on public engagement in energy production constitutes the research community into which this thesis is most intensely embedded.

Research on civil engagement in local energy production can roughly be differentiated into two streams. The first (and older) of these is interested in studying civil protests against energy projects. A large part of this stream consists of acceptance and risk-perception studies. The second stream, which has recently emerged in the social sciences, is distinctly interested in new actors and activities related to the production of renewable energy. This second stream of research has been inspired by the increasing participation of actors from civil society in energy production (among others Seyfang/Smith 2007; Kunze 2011; Becker et al. 2012; Becker et al. 2013; Seyfang et al. 2013; Fuchs/Hinderer 2014; Schmid et al. 2016). These studies are interested in the different aspects of those projects, in which citizens become the producers of renewable energy. Before explaining the main issues in these two fields, I describe some fundamental aspects of the history and actual political processes related to (renewable)

energy production in Germany and the UK. Providing this background information is crucial to understanding the historical and social contexts within which conflicts against and engagement of citizens in energy production occur.

Different social processes have contributed to the growing number and diversity of actors engaged in energy production. Technological developments are an important aspect of this development. The technical and economic structures of the existing energy systems in Germany and the UK date back to the beginning of the 20th century and are still largely in existence today (Mautz et al. 2008: 11). Technical innovations from the end of the 19th century enabled the production and utilization of energy in large scales, which could also be transported over long distances (Urry 2014: 4). Conventional energy production utilizes resources like coal, gas, or uranium, which can only be extracted and processed in an economically viable manner when organised in centralized production units (Fuchs/Hinderer 2014: 354). The produced energy is transported via energy grids to distant consumers. Energy production thus takes place at those places that are economically most feasible for centralized energy production, at sites that are often geographically distant from the places of energy consumption (Mautz et al. 2008: 11pp.; Kocka 1990: 18). Furthermore, conventional energy systems are characterized by a high degree of market concentration. In both Germany and the UK, an oligopoly of few large energy providers dominates these nations' energy systems (Mautz et al. 2010: 11pp. for Germany; Winskel 2007 for the UK). While people consume energy on an everyday basis, they are not involved in the processes of energy production. These factors have contributed to the creation of a '*significant spatial and psychological distance between energy generation and use*' (Walker et al. 2007: 68).

By the middle of the 1970s, more and more people became frustrated with the ecological and social effects of the by then conventional energy system (Mautz et al. 2008: 33pp.). Inspired by ideas of '*soft energy*' (ibid: 33), members of the new ecological social movement started to puzzle over alternative ways to produce decentralized, inclusive, and environment-friendly energy (ibid: 34). Prototypes of wind turbines, biogas plants, and solar panels were developed in mostly non- or semi-professional settings (ibid: 44pp.). Within a short period, these technologies spread throughout society. While these new technologies were an important technical background for the decentralized production of energy, institutional factors have been found to be even more important than the technical features of energy production (Schmid et al. 2016: 272). Social scientists from both the UK and Germany have found that the processes of liberalization and privatization in the late 1980s and 1990s constituted a disruptive process (Winskel 2007: 184) that opened up opportunities for new market entrants (for the UK see for example Winskel 2007; Walker et al. 2007; for Germany see

Schmid et al. 2016). In Great Britain the Labour government throughout the 1990s despite liberalization still supported large scale private-sector led models of energy production. This changed in 2010 when the new coalition government was formed. One of the key policy aims of the new government was to reduce the influence of central government and devolve power to local communities (Eagle et al. 2017: 55). In 2011 the 'Localism Act' was passed, which—among other things—gave communities the right to protect and better control assets in their locality (ibid: 56).

At about that time, the increasing necessity to tackle climate change and other environmental issues induced a change in energy policy in both countries. Both countries have set more or less ambitious targets for carbon reduction and renewable energy production. The German targets envisage a 40% reduction of carbon emissions by 2020 and 80–95% by 2050, compared to emission from a 1990 baseline (www.bmub-bund.de, 27.08.2016). In order to achieve these targets, the German national government aims to increase the percentage of renewable energy to 40–45% by 2020 and 55–60% by 2035 (ibid.; Klemisch 2014: 154). Great Britain likewise has decided to reduce carbon emissions by 80% by 2050 (www.gov.uk, 27.08.2016.). According to the national renewable energy action plan, Great Britain aims to produce 20% of overall energy consumption from renewable sources by 2020.

Also contributing to changes in policy and practice of energy production, especially in Germany, is the active engagement of civil society actors against conventional energy production, particularly against nuclear- and coal-based energy production (Mautz et al. 2008). Activities of the large energy providers have increasingly become subject to local, regional, national, and (in the case of nuclear waste transports) even transnational criticism and conflicts. Most conflicts in the energy sector develop around infrastructural projects. The biggest conflicts, in terms of number of actors involved, concern activities like pithead mining, mine dumping, nuclear waste, and related issues like the evacuation of villages (Schumann et al. 2010; Moss et al. 2014; Becker et al. 2016). Additionally, new technologies, like fracking and carbon capture and storage (CCS) are heavily contested both generally and with regard to specific testing sites (Schumann et al. 2010: 54; Rost 2015).

While many studies have found high levels of public acceptance for renewable energy, the construction of renewable energy facilities has also caused numerous conflicts (among many others van der Horst 2007; Becker et al. 2012; Becker et al. 2016). Among renewable energy projects, wind farms are the most controversial technology (a conclusive review of the literature on protests against wind farms is given in Devine-Wright 2005). The level of civil society

protest against wind parks varies among different countries, with anti-wind organisations being more common in the UK than in Germany or Denmark (Toke 2007: 167). Solar parks and biomass projects have also given rise to local conflicts (Becker et al. 2012: 45; Otto/Leibenath 2013), albeit on a much smaller scale than wind farms. Technologies differ in terms of their environmental, social, and economic impact, depending on the natural source being used and the way it is being used. Protests against a wind-farm will be based on other arguments than protests against a biomass plant (Devine-Wright 2007: 8). Infrastructural projects related to energy supply have also been subject to protest. A number of conflicts grow around the construction of new overhead networks for the transport and distribution of renewable energy (Zimmer et al. 2012; Neukirch 2014). Lately, initiatives aiming for re-communalization of energy utilities, for example in Hamburg and Berlin, have aroused a lot of scientific interest in Germany (Blanchet 2015).

Protests against energy projects are a key obstacle facing renewable energy projects, whereby *'[l]ocal people have been identified as the chief influence on planning outcomes in places like the UK where population density is high and where landscape issues loom large'* (Toke 2007: 168; likewise Wüstenhagen et al. 2007). Protest against development plans were found to be particularly strong if communities had no or only limited opportunities to take part in the planning and realization of energy projects, and especially *'if major utility companies were seen as making money at the community's expense'* (Walker et al. 2007: 71; likewise Warren/McFadyen 2010). The phenomenon of citizens being supportive of renewable energy in principle while at the same time heavily opposing the construction of the necessary facilities in their own vicinity has come to be known as 'NIMBYism' (not in my backyard). The term, however, has often been found to be used as a strategy to de-legitimize local protest against energy projects (Devine-Wright 2005; Ek 2005; van der Horst 2007). It homogenizes the activities of very different groups that may be opposing particular energy projects or aspects thereof for very different reasons. Despite the differences between individual protest activities, citizen initiatives have been found to play a major role in all these conflicts (Schweizer-Ries et al. 2013: 24; Neukirch 2014: 20). They are able to mobilize the necessary resources as well as to organise and focus the different aims and interests of heterogeneous actor groups.

The recent developments in political thinking described above have led to the creation of certain policy instruments, the most prominent of which are feed-in tariffs (FITs), which have significantly influenced the production of renewable energy by individuals and small producer organisations in both countries. When the FIT in Germany was redesigned to conform to the Renewable Energies Act (EEG) in 2000, this led to *'an increase in the share of renewables in*