



Role of institutional entrepreneurship in the creation of regional solar PV energy markets: Contrasting developments in Gujarat and West Bengal



Suyash Jolly

Department of Industrial Engineering and Innovation Sciences, Eindhoven University of Technology, Eindhoven, The Netherlands

ARTICLE INFO

Article history:

Received 9 December 2015

Revised 10 July 2016

Accepted 12 October 2016

Available online xxxx

Keywords:

Regional

Institutional entrepreneurship

Implementation

Solar PV

Gujarat

West Bengal

ABSTRACT

With political initiatives, such as the National Solar Mission by Government of India, rapid development of grid connected solar PV energy in India has occurred in the recent times. However, an interesting puzzle is with respect to significant regional differences in Indian states despite similar levels of solar radiation, government support and regional level policy and regulatory initiatives in the states. The paper discusses the implementation of grid-connected solar PV energy in two Indian states – Gujarat and West Bengal – under the national-level program Jawaharlal Nehru National Solar Mission by the government of India. The paper offers empirical insights into implementation barriers involved in regional sustainable energy initiatives by using insights from the institutional entrepreneurship literature. The study concludes by describing the reasons for successful implementation in Gujarat and less successful implementation in West Bengal by discussing regional similarities and differences of institutional entrepreneurship of three key actors: government officials within regional government, regional regulatory agencies and regional industry associations.

© 2016 International Energy Initiative. Published by Elsevier Inc. All rights reserved.

Introduction

The purpose of this study is to shed light on regional differences in sustainable energy initiatives at the sub-national level in India. In particular, the paper focuses on differences in implementation of grid connected PV solar in Indian states under the Jawaharlal Lal Nehru National Solar Mission launched in 2010. In a large country like India, with diverse economic and political dynamics, the central government has a limited role in affecting the decisions of sub-national governments in influencing sustainability initiatives. Historically, Indian states have had significant differences in economic and industrial growth patterns due to different political, economic and social pre-conditions, pressure from national government and influence of regional political parties and leaders (Sinha, 2003, 2004; Beale and Noronhora, 2014).

Indian states have competed with one another in order to attract national and international investment through several measures, such as lobbying to the national government for resources, becoming business- and investment-friendly, reducing bureaucracy and providing incentives in order to embark on rapid growth trajectories. While some Indian states have had the ability to develop their own policy mandates by being autonomous and not following the mandates from the central government, other Indian states have relied on the central government for policy direction and political support for their initiatives. Furthermore, Indian states have also engaged in using a variety of instruments and policy measures for shaping the business environment such as

improving access to various incentives, infrastructure, legal frameworks for setting up industry, facilitating enforcement of regulations, providing access to natural resources and human capital in order to attract investors (Kennedy et al., 2013; Sud, 2014a). Previous studies have also shown that in a large country like India, with diverse economic and political dynamics, the central government has a limited role in affecting the decisions of sub-national governments in influencing climate change and sustainability initiatives. Indian states have a crucial role in implementing national-level initiatives related to mitigating climate change impacts and transforming the incumbent energy system based on fossil fuels (Jørgensen, 2011).

In the case of grid connected solar PV energy, after the launch of the Jawaharlal Nehru National Solar Mission (JNNSM) [under the National Action Plan on Climate Change], the Government of India gradually started framing solar PV energy as a solution to chronic energy shortages, increasing import dependence on oil, concerns of energy security, energy access and industrialization through the creation of a domestic industry (Shrimali and Rohra, 2012; Ganesan et al., 2014). Before the National Solar Mission, the development of solar PV energy in India was limited to demonstration projects supported by the government, social enterprise models and initiatives by various international organizations (Chaudhary et al., 2014; Quitzow, 2015). Several regional initiatives operating within the framework of the National Solar Mission appeared in Indian states such as Gujarat, Karnataka, Maharashtra, Kerala, Rajasthan, Tamil Nadu and Andhra Pradesh. Due to the concurrent nature of India's energy system, Indian states were also free to devise their own policy and regulatory initiatives, taking into account regional socio-political concerns, availability of adequate solar

E-mail addresses: suyashjolly611@yahoo.co.in, suyash.jolly@abe.kth.se.

resources, energy situation in the state and other relevant concerns (CEEW and NRDC, 2012; Bhushan and Hamberg, 2012).

Indian states came out with their own policies, regulatory mechanisms and incentives for promoting solar energy apart from the initiatives by the central government in the National Solar Mission. Gujarat continued to be the leading Indian state, with 860.4 MW out of the total installed capacity of 2753 MW in India in 2014. West Bengal was once the leading Indian state with respect to the deployment of solar PV energy. In fact, India's first grid-connected solar PV project was developed and installed in 2009 in Jamuria, Asansol, West Bengal by West Bengal Green Energy Development Corporation Limited, and financed by Power Finance Corporation of India Ltd. After the announcement of the National Solar Mission in 2010 and the change in the state government (from CPI (M) to All India Trinamool Congress), the growth of grid-connected solar PV energy nearly stagnated in West Bengal between 2009 and 2013, when other Indian states were rapidly deploying solar energy. In 2013, West Bengal only had 7.05 MW of grid-connected solar PV installed, and Gujarat went far ahead in terms of deploying grid-connected solar PV energy (Bhushan and Hamberg, 2012). This leads to the main research question of the paper: *How and why was implementation of grid connected solar PV energy different in Gujarat than in West Bengal?*

The research question is answered by using a qualitative case study approach and utilizing the concept of institutional entrepreneurship to understand the differences in implementation of grid connected solar PV energy in Gujarat and West Bengal. Particularly, in this paper I am interested in examining the strategies of regional actors in stimulating regional sustainable energy initiatives while experiencing setbacks and failures and at the same time challenging dominant institutional arrangements. The paper highlights the fact that although a range of factors are important for understanding regional implementation of sustainable energy initiatives, the role of institutional entrepreneurship is crucial. This is due to the fact that even good regional conditions such as good natural conditions, attractive policies and incentives can lead to unsuccessful implementation due to lack of concrete efforts by regional actors in transforming institutional arrangements. The research question in this paper is therefore answered using insights from institutional entrepreneurship literature in regional context which focuses on strategic action of multiple actors in shaping regional institutional environment (Walker et al., 2014; Sotarauta and Mustikkamäki, 2015; Sotarauta, 2016). In answering the key research question, I try to offer insights into institutional entrepreneurship in regional context and reflect on its usefulness for explaining differences in the two Indian states.

This paper is organized as follows. First, I discuss the relevant literature on institutional entrepreneurship in regional context in the section **Theoretical background: institutional entrepreneurship in regional context**. This is followed by describing the research methods used for the study in the section **Research method**. I then discuss the role of institutional entrepreneurship in the implementation of grid-connected solar PV energy in Gujarat and West Bengal in the section **Findings**. Finally, in the section **Discussion**, I compare developments in Gujarat and West Bengal followed by conclusion in the section **Conclusion**. The paper concludes by answering the research question, discussing relevant empirical insights from the study and relevance for institutional entrepreneurship literature.

Theoretical background: institutional entrepreneurship in regional context

Regional differences in implementation of sustainable energy initiatives

Several studies have looked into the role of a large number of factors influencing regional sustainable energy transitions, such as natural resource endowments in the region, regional income level, structure of electricity markets and consumer profile, political discourses around

renewable energy, presence of ideologically motivated citizens and regional economic growth. Other factors include mismatch between consumer demand and available technical potential, access to transmission and grid infrastructure, availability of land, and regulatory and policy instruments initiated by the government (such as renewable purchase obligations, power purchase agreements, feed in tariffs, financial incentives, tax benefits, and regional permitting and planning procedures) to encourage the development of sustainable energy technologies (e.g., Fischlein et al., 2010; Delmas and Montes-Sancho, 2011; Ferguson-Martin and Hill, 2011; Holburn, 2012; Sawhney and Rahul, 2014; Feurty et al., 2016). Recent accounts have also suggested the need to look beyond examining the effectiveness of different policy and regulatory instruments and explore the actions of various actors and the different strategies along with the broader institutional context that trigger the implementation of policies and regulations. For instance, few studies have emphasized the role of collective actors – such as regional champions such as entrepreneurs, regional associations and entrepreneurial associations – in strategically shaping regional development paths while being shaped by the regional institutional context (Feldman, 2014; Lippmann and Aldrich, 2015).

Studies considering a public policy perspective have suggested that while indeed a number of broader environmental, social, economic, political and technical factors can lead to significant regional differences in the implementation of sustainable energy programs, public policy plays a crucial role in attracting investment into the regions (Holburn, 2012). Moreover, the success of regional initiatives depends, to a large extent, on the collective action between various regional stakeholders during the implementation of policies and requires coordinated efforts from multiple stakeholders, despite the presence of legal mandates for implementing them. Furthermore, implementation of regional policies and regulations often leads to resistance from opposing regional political coalitions and requires continuously adapting policies and regulations as a result of ongoing rapid technological changes (Marcus and Fremeth, 2011; Stokes, 2013).

In this respect, the innovation system perspective has been used by few scholars to study regional differences in implementation of novel innovations as it is useful for mapping the role of relevant actors, networks and institutions (e.g. Goess et al., 2015). Recent studies have even used insights from innovation system perspective to study regional energy transitions for analyzing spatial aspects of energy transitions and understand how change is brought by different organizational actors and supportive regional institutional arrangements (Mattes et al., 2015). Studies have also utilized the Technological Innovation System (TIS) perspective to study differences in implementation of solar PV energy in Germany. This particular study highlights that new regional markets for solar PV energy in Germany emerged as a result of supportive local institutional context and presence of local supportive consumer user groups i.e. solar civic initiatives. The presence of local supportive user and civic initiatives contributed to more successful implementation of solar PV energy in few German federal states such as Bavaria and Baden Württemberg that other states (Dewald and Truffer, 2012).

However, the innovation system perspective has also been criticized for not paying adequate attention to agency in endogenously driving institutional change despite its merits in emphasizing the role of actors, networks and institutions for mapping emerging innovations (Hung and Whittington, 2011; Sotarauta and Mustikkamäki, 2015). Furthermore, the Innovation Systems (IS) and Technological Innovation System (TIS) perspectives have also been criticized for not emphasizing the role of micro level activities such as role of different activities of actors in development of the innovation system. Recent studies in this respect have even indicated the need for more focus on understanding the role of key actors and system builders in creating novel sociotechnical system for emerging innovations (Markard et al., 2015; Kuk, 2016; Kuk et al., 2016).

While the Innovation Systems perspective has been criticized to some extent for lacking attention to micro level dynamics and the role of actors, the path creation perspective is useful in this direction. This is due to the focus of the path creation perspective on the role of multiple and distributed actors in creating new regulations, creating new standards, developing new market segments and lobbying for supportive conditions for developing novel innovations. This perspective emphasizes that new regional paths emerge from strategic work by heterogeneous actors who collectively challenge dominant institutional arrangements (Karnøe and Garud, 2012). Building upon this perspective, recent studies have also shown that few regions are more successful in implementing innovation successfully due to the fact that regional actors in these regions engage in the process of anchoring external knowledge, resources, legitimacy, skills and expertise through transnational and extra regional linkages for transforming regional institutional structures (Binz et al., 2016).

A number of studies have also examined the role of regional institutional context and the actions of bottom-up driven change agents (such as ideologically motivated social and environmental movements) in creating legitimacy for sustainable energy technologies and encouraging incumbent utilities to adopt them (Doblinger and Soppe, 2013). Previous research examining the role of bottom-up driven action by activists and environmental social movements has also discussed a range of tactics such as advocacy and lobbying, use of pressure tactics, awareness creation, mobilizing resources and enrolling new consumers (e.g., Lee and Sine, 2007; Sine and Lee, 2009; Pacheco et al., 2014; York et al., 2016). While the role of social movements is essential for understanding bottom up driven change, there is also a need for better understanding the role of broad range of other regional actors other than ideologically motivated social movements in reducing institutional bottlenecks and transforming institutional arrangements.

Another stream of literature i.e. the neo-institutional economics perspective has emphasized the role of entrepreneurs as agents of change in promoting institutional change. However, the focus of this perspective is restricted to focus on economic self-interest of actors promoting change. On the other hand, the institutional entrepreneurship literature provides a broader perspective for better understanding of transformation of institutional arrangements by looking at social, cultural and regulative aspects and not just economic self-interest (Pacheco et al., 2010a). The institutional entrepreneurship literature therefore provides better insights into strategic role of multiple actors and their strategies for transformation of institutional arrangements (Aldrich, 2011). Summarizing, while there are several competing strands of literature which can be used to explain regional differences in implementation. However, this paper instead focuses on using the concept of institutional entrepreneurship due to its emphasis on actor's agency and their different strategies in transforming dominant institutional arrangements.

Role of institutional entrepreneurship in regional context

According to institutional theory, actors are constrained by interplay of regulative, normative and cognitive-cultural dimensions of institutions and the development and diffusion of novel technologies is strongly influenced by regional institutional context. For instance, formal institutional arrangements such as laws and regulations and informal institutional arrangements such as cultural values, behavior, attitudes and perceptions related to novel innovations enable emergence of regional markets for novel innovations (Wirth et al., 2013).

The institutional entrepreneurship literature has essentially focused on the manner in which actors can create new institutional arrangements or transform existing ones. Institutional entrepreneurs can be individuals, groups of individuals, organizations and a range of different actors such as commercial entrepreneurs, scientists, regulatory agencies, governments and others who are involved in shaping the development of a new field (Battilana et al., 2009; Kaplan and Murray,

2010). In attempting to change the institutional environment, actors act collectively in order to gain socio-political legitimacy and to drive the institutional transformation process (Wijen and Ansari, 2007; Aldrich, 2011).

Few studies have also shown that institutional entrepreneurship is experimental and iterative in nature and involves considerable time, commitment, imagination and risk-taking behavior from actors, as they need to make continuous decisions about confirming and challenging the institutional environment (Jain and George, 2007). Institutional entrepreneurship has unintended consequences, and that institutional entrepreneurs who begin challenging institutional structures may not reap the benefits of their efforts, eventually failing in creating institutional changes (Etzion and Ferraro, 2010; Tracey et al., 2011). Institutional entrepreneurship involves challenging the institutional environment by improvising solutions through creative efforts and probing the future without having a clear idea of the successes and failures of the initiatives taken (Henfridsson and Yoo, 2013; George et al., 2014; Gurses and Ozcan, 2014). Institutional entrepreneurship involves actively experimenting and learning while tackling unexpected and unanticipated changes created due to the dominant institutional environment. Institutional entrepreneurship therefore involves an iterative process of learning while confronting ongoing bottlenecks, experiencing uncertainties and simultaneously challenging dominant institutional arrangements (Alvarez et al., 2015; Suddaby et al., 2015).

A recent stream of literature has looked into role of institutional entrepreneurship in the regional context. This literature has focused on examining the manner in which different regional actors influence the course of events and challenge institutional arrangements and illustrate the different strategies used by them (Sotarauta, 2009; Sotarauta and Pulkkinen, 2011). For instance, studies have emphasized the role of regional development officers in influencing regional development trajectories by networking and mobilizing political support for regional initiatives (Sotarauta, 2010). A range of studies has even shown that multiple actors (e.g. regional governments, government officials, research institutions, scientists, regulatory agencies, industry associations etc.) use a range of strategies, such as articulating new visions and logics, awareness building, creating new alliances, lobbying, combining new institutional elements with existing local elements, mobilization of resources and creating legitimacy for shaping regional institutional arrangements (e.g., Robinson et al., 2007; Ritvala and Kleymann, 2012; Schneiberg, 2013). Other strategies include creating novel opportunities by developing good relationships with local government officials, nominating in political parties, becoming rooted in local contexts and developing harmonious relationships with local people (Cao et al., 2014). Building upon these discussions in the literature, recent studies have indicated that challenging the regional institutional context involves resolving bottlenecks, muddling through a series of decision-making processes about the emergent future, making continuous adjustment in institutional strategies due to surprises caused by changes in the institutional environment and learning through ongoing failures (Sotarauta and Mustikkamäki, 2015; Sotarauta, 2016). Scholars have also found significant differences in regional development patterns by examining the role of heterogeneous actors (that is, the many actors involved in design, regulation, production, evaluation, use, advocacy, etc.), and have shown that the actions of multiple actors have a significant impact on shaping regional institutional arrangements (Andersen and Drejer, 2008; Garud et al., 2014; Autio et al., 2014).

In this section, I outlined the theoretical background of the paper and the need for utilizing the concept of institutional entrepreneurship for analyzing regional differences in implementation between the two states. Based on these insights from the existing literature, I focus on examining the strategies of different regional actors in stimulating regional sustainable energy initiatives while experiencing setbacks, failures from the institutional environment and challenging institutional

constraints. The next section describes the research method utilized for the study.

Research method

Case analysis

The cases for in-depth investigation in this paper Gujarat and West Bengal were chosen as a successful and less successful case of implementation of grid connected solar PV energy. In the introduction section, I highlighted that while West Bengal was a pioneer in implementing grid connected solar PV energy for the first time in India, it lost momentum while Gujarat became the leading Indian state for implementation of grid connected solar PV energy. This section describes the research setting – highlighting the historical and political context of the chosen case studies (Gujarat and West Bengal) – and the data collection and data analysis procedures used to answer the research question. I examine the development of solar PV energy in Gujarat and West Bengal, up to recent developments in 2014. The chosen cases help to answer the key research question as they were pioneer cases in initiating grid-connected solar PV energy in India. Whereas West Bengal was successful in establishing the first grid-connected solar plant in India, it was Gujarat that was responsible for implementing it on a large scale.

This paper uses a qualitative case study approach, as it has advantages regarding collecting rich data on the phenomenon under investigation; additionally, it better captures the experiences of practitioners, in a manner that is also sensitive to contextual details (Langley and Abdallah, 2011; Gioia et al., 2013). A qualitative case study approach was also considered useful as it is useful to capture actions of institutional entrepreneurs over a period of time and the manner in which they challenge institutional arrangements (Pacheco et al., 2010b). Qualitative case studies are useful for the collection of variety of data sources such as archival records, official policy documents, reports from consultants, committee papers, media reports, newspaper articles and expert interviews all of which provide data for rich description and analytic generalization (Yin, 2009). By combining insights from multiple data sources, it is easy to understand the contextual nature of the regional adaptation of national-level mandates and the barriers faced by regional actors in implementing them (Vogel and Henstra, 2015).

In order to collect data for this study, a comprehensive search was carried out by focusing on prior academic articles, policy documents by state governments, position papers by the regulatory agencies, regulatory orders, policy documents, expert studies, newspaper articles and proceedings of public hearings conducted by regulatory agencies (GERC & WBERC – Gujarat Electricity Regulatory Commission and West Bengal Electricity Regulatory Commission). Thus, I gathered all kinds of empirical data through publically available sources on solar PV developments in the states and also gained access to scholarly

publications on similar issues. In addition to these data sources, industry publications (such as Bridge to India), reports from solar PV industry associations, documents by Indian solar PV experts, report and blogs by consultants and websites of different stakeholders in the states were also consulted.

To find additional data sources, I used a snowball procedure, in which news articles, new industry reports and blogs were regularly tracked for looking at new developments. For example, I used insights from popular newspapers and media outlets such as Hindu Business Line, Times of India, Economic Times, Business standard and Energy Next to develop an understanding of ongoing debates in the states for solar PV energy. The process of data collection was carried out until no new additional data sources were found that helped in obtaining a rich understanding of the dynamics that unfolded in the states. Additional efforts were made towards looking at distributed action by different actors such as government, regulators, activists, industry associations, firms and users, and the negotiations and contestations between them (Garud and Gehman, 2012). In addition to the archival data sources, semi-structured interviews were also conducted for data collection. For the selection of experts, field research was carried out in Gujarat and West Bengal between July and November of 2013. The experts were chosen in a way that ensured that they covered different positions in the industry and that they provided both an insider and an outsider perspective on policy and regulatory implementation processes. Among the experts interviewed, a few were directly involved in the policy and regulatory process while others had experience in directly observing the developments in different capacities (see Table 1 for interviewees' details).

The semi-structured interviews were conducted with expert interviewees and lasted between 30 min and 2 h. The interview questions were based on literature review as well as initial analysis of solar PV energy implementation in the two states based on a desk study. The interviews were customized to fit the background and expertise of the concerned stakeholder; nonetheless, they also followed a general guideline in many instances. The interviews focused on understanding the policy and regulatory processes from the interviewees' perspective, important barriers faced by them, their role in the implementation of grid-connected solar PV energy and the key learning points from their experiences so far. I focused on mapping the key institutional barriers faced by them and the different strategies used by interviewees to overcome them, as well as the successes and failures of their initiatives. The interviewees were also asked to reflect on how they dealt with multiple and conflicting interests with other stakeholders. All interviewees were given ample space to express their own experiences and assessments of ongoing developments based on their personal experiences. In a few instances, interviews were not recorded if the interviewees were not comfortable with it due to reasons of confidentiality. In these particular cases, interview accounts were summarized by preparing notes of the interview instead of tape-recording

Table 1
Details of interviewees in Gujarat and West Bengal.

Number	Interviewee	Stakeholder category
1	Principal secretary, Energy Department, Government of Gujarat, Gandhinagar	Policy maker/Government
2	Member, Finance, Gujarat State Electricity Regulatory Commission, Gandhinagar	Regulatory agency
3	Research Scientist, Gujarat Energy Research Management Institute, Gandhinagar	Academic scientist
4	President, Solar Association of Gujarat, Ahmedabad	Industry association
5	Head, Consumer Education and Research Society, Ahmedabad	Civil society
6	Director, Solar energy Consultancy, Ahmedabad	Consultancy organization
7	Senior Executive Projects, Gujarat Petrochemical Corporation Limited, Gandhinagar	State energy utility
8	Past Principal Secretary, Energy Department, Government of West Bengal, Kolkatta	Policy maker/Government
9	Past Director, West Bengal Renewable Energy Development Agency, Kolkatta	Policy maker/Government/Independent renewable energy expert
10	Director, West Bengal Renewable Energy Development Agency and West Bengal Green Energy Development Corporation Limited, Kolkatta	Policy maker/Government
11	Adviser Engineering, West Bengal Electricity Regulatory Commission, Kolkatta	Regulatory agency
12	Regional Manager, East India, European Business Technology Center, Kolkatta	Knowledge transfer organization
13	Center head, CUTS Kolkatta resource center, Kolkatta	Civil society

them. As it was not possible to record all interviews, I could only rely on a few interviews for rich quotes from the interviewees.

In addition to the semi-structured interviews, observations were also made at two stakeholder forums organized by the Centre for Science and Environment in Gandhinagar and by the CUTS resource center in Kolkata. The combination of multiple data sources such as interviews, secondary data and observations offered different perspectives on key actors and events, and helped in obtaining a rich understanding of the developments in the two Indian states. While conducting the interviews, an elite bias was present as most of the stakeholders interviewed for the research were either government officials, members of regulatory agencies, consultant or business elite. One common bias of elite interviews is that such informants have a position of authority and interviewers tend to give lot of importance to their views and perceptions than other kind of non-elite stakeholders thereby resulting in bias. Elite interviews also have restriction in terms of not allowing capturing of controversial information such as criticism of the Government or information not in favor of business interests of elite firms. This often results in situations where elites provide diplomatic answers resulting in potential bias. However, for this research interviewing such elites was very essential to know in detail about the implementation of solar energy in the two states and the process of policy enactment and implementation. Interviewing elites for this research was essential to get firsthand knowledge and experiences of actors implementing policies and regulations which might be possible by interviewing other actors. However, care was also taken to ensure that the retrospective accounts of elite interviewees were accurate by verifying insights by conducting multiple interviews and enhancing the credibility of the data by combining it with insights from multiple archival data sources. As additional interviews with other elite and non-elite stakeholders were not possible due to time constraints as well as difficulties in accessing them, adequate care was taken to learn more about their views and perceptions from accounts published by other researchers on similar subjects i.e. solar PV energy in Gujarat (e.g. Yenneti, 2014b).

The initial analysis of the summarized data was mainly descriptive, involving selective quotes from the interviewees as well as secondary documents capturing the actions of different regional actors. For the data analysis, a qualitative content analysis of the summarized data was carried out for describing a theoretically informed account sensitive to the regional institutional context. Initial data analysis was performed manually, by reading the summarized data and then identifying relevant differences in strategies of regional actors in implementation of grid connected solar PV energy. While analyzing the action of different regional actors, care was taken to focus on role of different actors and strategies used by them for resolving locally specific institutional bottlenecks (Rodríguez-Pose, 2013). The focus was on understanding the distributed actions of different actors such as regional government agencies, regulatory agencies, industry associations in shaping regional institutional arrangements by paying equal attention to successful as well as less successful efforts (Karnøe and Garud, 2012). To analyze the data further, a multi-step approach was considered which involved getting an overview of the data collected by understanding the regional historical, economic and political conditions in the two regions. The second stage involved generating insights about the power sector in the two states and the developments happening in the region with respect to solar PV energy. The third stage involved analyzing the role of different actors and their strategies for challenging institutional constraints and influencing the course of events for shaping implementation of solar PV energy. The actor analysis was carried out by reading the summarized data and manually coding the actions of the different actors. The fourth stage involved developing narratives of actors in shaping implementation of solar PV energy and developing a more theoretical account of their strategies by iterating between the theoretical concepts from the literature on institutional entrepreneurship and the summarized data. Through an iterative process by moving between

theoretical concepts and data, I identified the institutional entrepreneurs who initiated and led implementation of solar PV energy in Gujarat and West Bengal. I returned back to the data from the interviews again to reconfirm if the regional institutional entrepreneurs identified were significantly responsible for challenging institutional arrangements. The data analysis revealed the crucial role of few prominent actors within the regions which shaped the implementation of solar PV energy in the states. In this paper, I particularly highlight the role of three key regional actors which shaped differences in implementation of grid connected solar PV energy in steering regional sustainable energy initiatives in the two case studies: (1) government officials within regional government; (2) regional regulatory agencies and (3) regional industry associations.

In the next section, I compare the contrasting developments in the two states and emphasize the role of these actors acting as institutional entrepreneurs and shaping the implementation of solar PV energy. I also highlight the presence of conducive conditions for grid connected solar PV energy in Gujarat and West Bengal by emphasizing the role of several regional factors such as historical political and economic conditions, business and investment environment, the status of the power sector and conditions favorable for implementation of solar PV energy. This is helpful in knowing the extent to which the impact of pre-existing regional conditions was more prominent than the role of institutional entrepreneurship in contributing to differences in implementation of solar PV energy in the two states. The next section discusses solar PV energy deployment in the two Indian states of Gujarat and West Bengal focusing on similarities and differences in the institutional work of these three actors.

Findings

Existing regional conditions for solar PV energy implementation in Gujarat and West Bengal

In this section, I try to highlight if the presence of supportive regional conditions in Gujarat and West Bengal contributed to differences in implementation of grid connected solar PV energy. The aim is to also explore the extent to which pre-existing regional conditions also contributed to significant differences in implementation. I particularly highlight the following pre-existing regional conditions namely: (1) Historical political and economic conditions; (2) Business and investment climate; (3) Performance of the power sector; (4) Presence of supportive natural conditions; and (5) Support from central government and autonomy to develop specific programs.

Historical political and economic conditions

Gujarat over the years emerged as an attractive destination for private investment by creating a business-friendly image, creating a supportive policy environment and administrative bureaucracy. Gujarat also had historical advantages such as presence of entrepreneurially driven business class, technical and non-technical manpower, supportive knowledge infrastructure, financial resources and physical infrastructure (Government of Gujarat, 2013). The Gujarat model of development has focused on decentralized planning, targeted public spending, empowering bureaucrats and improving efficiency in delivery of public goods. Measures taken under the leadership of past Gujarat chief ministers and Narendra Modi have helped to reduce bureaucratic bottlenecks for private investment, also simplifying procedures for setting up industries, creating single-window mechanisms for investors, facilitating faster allocation of land for projects and creating new infrastructure (Dholakia, 2002; Ray, 2011; Debroy, 2012). The business friendly political environment in Gujarat has not been easily replicated in other states in India as government bureaucrats in Gujarat have had limited political interference in implementing policies and regulations, allocating land for projects, getting licensees and investment from

central government, developing international linkages and facilitating private investment in the state (Sud, 2009, 2013, 2014a). A significant reason for the business-friendly environment in Gujarat has been related to limited political interference in government bureaucrats attracting private investments and facilitating projects in the state (Sud, 2014a, 2014b). However, the Gujarat model of neoliberal development and rapid industrialization has also been criticized over the years for increasing wealth inequality, generating low performance in social indicators and putting financial burden on common people (Jaffrelot, 2015).

On the other hand, West Bengal was ruled by the Communist Party of India (Marxist) from 1977 till 2011 which won consecutive assembly elections due to its pro-poor regulations and political priorities for rural masses in the state. Communist Party of India (Marxist) (CPM) maintains its hegemonic dominance almost all over the state and almost controlled all social affairs in the state till the mid 1990's. CPI (M) feared that it had to change its focus on industrial growth and development and create conditions conducive for private investment. The party included a new emphasis on involving the private and foreign sector in the state's industrial development but was not very successful in gaining confidence of potential investors (Ray, 2011; Chakravarty and Bose, 2009; Das, 2013). The government of West Bengal took initiatives such as setting up government-industry co-ordination committees and organizing partnership summits to facilitate private investment in the state. This was facilitated through organizations such as West Bengal Industrial Development Corporation (WBIDC); Shilpa Bandhu or the State Investment Facilitation Centre (SIFC) and West Bengal Industrial Infrastructure Development Corporation (WBIIDC) (Sinha, 2004). In the last few years, West Bengal started marketing itself as emerging and investment friendly by initiating investment summits, projecting the state as welcoming for investors and industrial growth and large scale manufacturing under the leadership of Mamta Banerjee (Sud, 2014a, 2014b).

Summarizing, while the states had different political and historical conditions and conducive environment towards industrial growth, the differences have reduced gradually over the years. West Bengal also became pro-active towards industrial growth during the time period when National Solar Mission was launched. Therefore, it might be difficult to argue that West Bengal had fewer advantages than Gujarat due to historical political and economic conditions. Although West Bengal was not very successful than Gujarat in terms of industry friendly measures, the differences over the years have reduced gradually. Hence, West Bengal had more or less equal opportunities as Gujarat.

Business and investment climate

The investment and business climate in Gujarat and West Bengal has been quite favorable for investment and they have stood above many Indian states in rankings related to business environment and investment climate. However, Gujarat has been more successful than West Bengal in few dimensions but the general investment climate and business environment in the two states did not vary significantly unlike the difference between Gujarat and Bihar (D'Souza, 2011; NCAER, 2016). Based on recent studies it is suggested that the differences in business environment and investment climate in the states is not very high with investors preferring Gujarat slightly above West Bengal.

Performance of the power sector

With respect to the performance of the power sector in the two states, majority of the power generation in Gujarat has relied on as coal based thermal power generation followed by natural gas and renewable energy sources such as wind, solar and biomass. In Gujarat, energy generation from coal has increased substantially along with rapid increase in renewable energy technologies. In terms of performance of the power sector, Gujarat became a power surplus state by

reducing the transmission and distribution losses gradually and facilitating private sector power producers. After facing significant losses in 2000–2001, the power sector in Gujarat grew exponentially between 2004 and 2013 due to power sector reforms and the state saw significant increase in capacity addition by the private sector with the share of the public sector gradually decreasing. The power sector reforms reduced the Aggregate Technical and Commercial (AT&C) losses significantly and increased profitability of the power sector in Gujarat. The Jyoti Gram Yojna in Gujarat also helped to improve the operational efficiency of the power sector by managing the rural load and supplying cheaper power to rural consumers by bifurcating transmission lines to rural areas Gujarat became a power surplus state and has been exporting electricity to other Indian states and industries at higher prices (Madhavan, 2012; TERI, 2013). Furthermore, the decreasing AT&C losses by the state distribution utilities in Gujarat also helped in improving the financial position of the power sector and also reduced the dependence on funds from the state government (AF-MERCADOS, 2014).

The power sector in West Bengal has mostly relied on coal based generation followed by hydroelectricity but limited amount of gas based generation and renewable energy. However per capita consumption of power is low in the state with a large number of households are still yet to be electrified. The share of agricultural consumers is quite low when compared to other Indian states. Efforts have been made by the state government to segregate feeders and improve supply to poor rural consumers. West Bengal's power sector has gradually improved its operational efficiency and also has been successful in providing unrestricted power supply to consumer's in the state (Forum of Regulators, 2014). One crucial issue in West Bengal is related to the high aggregated technical and commercial losses for the energy utilities when compared to other Indian states. The energy utilities in West Bengal have been profitable over the years and have also not relied on subsidies from the state government to sustain their operations (AF-MERCADOS, 2014).

Summarizing, there are some obvious contrasting differences between the power sector in West Bengal and Gujarat, with respect to generation mix as West Bengal has relied more on coal based power generation while Gujarat has focused more on diversifying its energy portfolio and increasing share of renewable energy over the years. Another significant difference is related to the low share of agriculture power in West Bengal, low per capita consumption and limited electrification. Gujarat has achieved more success in terms of higher installed capacity, increasing share of renewable energy and reducing aggregate technical and distribution losses. However, both the states have been successful in improving financial position of the energy utilities, improving the operational efficiency and reduced the need for reliance on the state government for funds. The power sectors in Gujarat and West Bengal have also been performing quite efficiently overall when compared to other Indian states (TERI, 2013; AF-MERCADOS, 2014). Therefore, it might be difficult to say that there were very significant and contrasting differences between the overall performance of the power sector in Gujarat and West Bengal which would have made it difficult for West Bengal to implement solar PV energy.

Presence of supportive natural conditions

Gujarat had advantages in terms of good natural conditions such as availability of high solar radiation and large tracts of waste land which could be utilized for solar energy generation. However, despite these favorable conditions in Gujarat, the process of implementing grid connected solar PV energy has still been challenging as implementing projects still requires proactive role of regional government in facilitating project developers. With access to waste land, the Government of Gujarat also had to ensure that weaker actors and non-elites such as local farmers, tribal and poor communities living near waste land were not marginalized during implementation of solar PV projects

(Yenneti, 2014b; Yenneti and Day, 2016). On the other hand, West Bengal also had favorable conditions in terms of adequate level of solar radiation, high technical potential for implementation of solar PV energy and access to land but not as better as the conditions in Gujarat. The focus on coal based low cost thermal power generation resulted in neglect of tapping vast potential of solar energy in the state (Comptroller and Auditor General of India, 2015). Therefore, it might be difficult to say that West Bengal did not had good natural conditions as Gujarat for implementing solar PV energy or there were significant differences in terms of natural conditions which would have made it difficult for West Bengal to implement solar PV energy.

Support from central government and autonomy to develop specific programs

The overall policy and regulatory incentives offered by the central government to promote solar PV energy in different Indian states were quite similar under the National Solar Mission. However, the differences in implementation of grid connected solar PV depended to a large extent on a range of state specific factors such as state specific policies and regulations, plant load factor generated, enforcement of Renewable Purchase Obligations, tariffs fixed by the State Electricity Regulatory Commission and overall commitment of the state government to promote solar energy by attracting project developers. Both Gujarat as well as West Bengal were free to devise their own policies and regulations for attracting project developers and even came up with supportive policy and regulatory instruments (Comptroller and Auditor General of India, 2015).

Summarizing, a comparison of factors such as historical economic and political conditions, investment and business climate, performance of the power sector, presence of natural conditions as well as political support from the National Government to develop specific policies and regulations highlights that both the states had more or less equal opportunity to implement solar PV energy. Gujarat had better pre-existing regional conditions than West Bengal to some extent. However, such pre-existing regional conditions cannot entirely account for significant differences between Gujarat and West Bengal. In the subsequent section, I try to show the significant differences in implementation by emphasizing the role of institutional entrepreneurship and looking at the role of (1) government officials within regional government; (2) regional regulatory agencies and (3) regional industry associations in shaping the implementation of solar PV energy in the two states. The next section will highlight the extent to which regional institutional entrepreneurship contributed to differences in implementation as the two regions had quite comparable pre-existing regional conditions with no significant differences.

Role of regional government officials

The case of Gujarat

The chief minister of Gujarat, Narendra Modi, became interested in solar energy due to the tremendous potential of solar PV energy and available natural resource conditions in Gujarat. His intent to promote solar PV energy was also due to his commitment towards climate change as well as to resolve energy crises in the state. Through his strong social and political skills, Narendra Modi used his public speeches to highlight Gujarat's achievements as an Indian state committed to addressing climate change issues; additionally, he dedicated significant budgets for the deployment of renewable energy in the state. These public speeches and stories helped to legitimize the potential of solar PV in Gujarat and attempted to mobilize stakeholder support, create credibility and develop a regional investment-friendly identity in order to attract investors. In one of his public speeches he remarked.

"When we started the price per unit was 15 rupees, today it came down to 8.5 rupees. This is the greatest contribution to India also. Now even other states will be able to take risk and initiative because they will count that now slowly how cheap the solar power can be. This is the greatest contribution of Gujarat to our great country [...]. Today Gujarat will show the rest of the world in solar energy [...]. Still the Gujarat government is spending huge amount on renewable energy, more than 2000 crores rupees per year. We are doing this mainly to contribute against the war against global warming and global climate change. We have a long-term vision and want to leave green footprint in whatever we do [...]"

[(Modi, 2013)]

In order to implement his vision, Narendra Modi – along with Minister of Energy and Petrochemical Department Saurabh, Bhai Patel, and Principal Secretary, Energy Department D.J. Pandian – collectively showed visionary leadership and execution capabilities for implementing grid-connected solar PV energy in Gujarat (Interview 1; Interview 6). This vision was translated into the Gujarat Solar Power Policy, which came out in January of 2009, before the announcement of the National Solar Mission by the Government of India. Gujarat Energy Development Agency (GEDA) and Gujarat Petrochemical Energy Limited (GPCL) were designated as relevant nodal agencies for the Gujarat solar policy (GEDA, 2009). The policy was aimed at large-scale deployment of grid-connected solar PV, promoting R&D and local manufacturing, reducing the negative impact of climate change and creating local employment opportunities (Interview 1). The Gujarat policy had several features of a lucrative policy for investors in terms of assured high returns (preferential fixed tariff), instead of the reverse bidding process used in the National Solar Mission and other Indian states for determining price for solar PV energy (Interview 4; Interview 6; PWC and Shakti Sustainable Energy Foundation, 2012). An important aspect of the Gujarat solar policy was that it did not mandate the use of crystal-line solar PV modules as suggested in the guidelines of the National Solar mission. The policy was technologically neutral, which enabled project developers to access low-cost solar PV modules internationally and complete projects faster. Most developers preferred thin film technology supplied from First Solar (US) due to its performance and the cheap availability of low-cost finance from the US Exim Bank (Bridge to India, 2012; RESolve Energy Consultants, 2013).

The Gujarat government received tremendous responses to its solar policy from various project developers and investors due to the attractive feed in tariffs, higher return on investment, good financial position of the utilities and availability of transmission and evacuation infrastructure through GETCO (Gujarat Energy Transmission Corporation) and Gujarat State Load Dispatch Centre (SLDC) (Bhushan and Hamberg, 2012; Kasture et al., 2013; RESolve Energy Consultants, 2013). In order to attract potential investors, the guidelines for the completion of solar PV projects were not strict in the beginning of the policy implementation. However, depending on the progress and real-time experiences, the conditions for project completion were made stricter gradually, including, for instance, penalties for delays in project execution (Interview 1; Interview 6; Yenneti, 2014b). As remarked by one of the interviewees.

"The government of Gujarat did not stop at making the policy. They further went to take proactive action. The government of Gujarat agencies like GEDA, GUVNL, GPCL, GETCO all of them gave excellent cooperation to the developers unlike what people face elsewhere in the country."

[(Interview 4)]

The Vibrant Gujarat (VGGIS: Vibrant Gujarat Global Investors Summit), organized by the Government of Gujarat, promoted the state as an investment-friendly destination among national and international investors, leading to greater investment for solar PV projects. The

Vibrant summits conducted by the Government of Gujarat provided opportunities for developing a future roadmap for sustainable energy development in the state.

These events were useful in promoting solar PV energy through workshops and networking sessions between various industry members, providing platforms for the latest technological trends and sharing knowledge about best practices. In addition to the Vibrant Gujarat summit, the India Solar Investment and Technology Summit held in Gandhinagar helped to stimulate linkages between different PV manufacturers, solar PV project developers, equipment suppliers, government officials, consultancies, investors and policy makers, also highlighting emerging opportunities and critical challenges the industry would face (Vibrant Gujarat, 2013). Networking sessions in the summit played an important role in facilitating joint ventures, mergers and acquisitions, as well as providing access to relevant finance knowledge due to the presence of several international firms and investors (Indian Solar, 2013). These events played a critical role in stimulating interactive learning between heterogeneous actors and even provided platforms for policy initiatives. In addition, such events provided opportunities for actors to gain specific tacit knowledge, learn about new technological trends, build trust and develop new relationships. These multiple events, organized by multiple bodies and involving heterogeneous stakeholders, stimulated regional collective action in Gujarat. Moreover, the summit created opportunities for government officials from other Indian states to learn from Gujarat's experiences and apply some lessons to their respective states.

A state-level selection committee was created to scrutinize project proposals from developers, based on their financial and technical capabilities and past track record in developing solar PV projects (GEDA, 2014). The Energy and Petrochemical Department also demanded financial guarantees from project developers for the allotment of projects (Interview 1; Interview 6). Government bureaucrats such as D.J. Pandian, the Principal Secretary of the Energy and Petrochemical Department, Government of Gujarat, played an instrumental part in implementing the Gujarat Solar Policy through his personal commitment and motivation. He remarks on the initiatives taken by him for mobilizing finance for implementation of grid connected solar PV in Gujarat despite facing several constraints.

"I was fully personally involved, committed. Because I worked in the World Bank, so I knew some officials there. I knew IFC. I used all my diplomatic skills [...]. It is talking, convincing them [...]. I understand the language of international bankers [...]. It took more than a year [...]. It is an individual officer's commitment supported by government policies and government support. If the government is not supportive, we do not want solar, it is very costly, and then my skills are of no use. Or if the government is ready to support and if the officers do not take it forward, then also it is a failure. It is both administrative skills and political will both together [...]. I created the solar park in record time, I took the land, I developed the land, I put up the evacuation system. Then I called review meetings with developers and I understood their problems [...]. Then I talk to collectors, I wrote to all the collectors. I personally monitored everything."

[(Interview 1)]

He also remarks on the initiatives taken by him for mobilizing finance by drawing on international linkages and support from global financial institutions.

"The developers after getting the LOI (Letter of intention) were reluctant to sign power purchase agreements (PPA). I called a meeting of all the bankers. They said no one body is financing. Solar was not financeable. It is a risky item [...]. I arranged two three round table conferences of various bankers [...]. I went to Washington, I talked to World Bank, I talked to US Exim Bank, I talked to IFC, I went to Philippines, I went to ADB. I met all these international bankers. It is a dialogue process. Then they are also convinced. They see our commitment that the Government

of Gujarat is committed to buy this power and to go ahead in solar. They prepared some PPA. Then some international legal experts came. They wanted to change certain clauses. We amended. So, we made a robust bankable PPA (Power Purchase agreement) [...]."

[(Interview 1)]

The actions of the head of the energy department were also supported by the Gujarat state government. This was possible because government bureaucrats in Gujarat faced limited political interference in allocating land for projects, issuing licenses and facilitating corporate investment, developing international linkages and facilitating private investment in the state (Sud, 2014a, 2014b). Over the years, Gujarat became popular for its business-friendly nature. As remarked by one of the interviewees.

"People are efficient here [...]. See what happens in other states, the Minister is not ready to take any decision, because if he takes a decision, he might go against his popularity, so people are afraid to take a decision. Here whoever is the minister is not afraid for taking a decision because they are not doing anything illegal. See in other states doing even legitimate things, they have to wait, they don't take decisions [...]. Here it does not happen like that [...]. They have a cabinet meeting [...]. C.M. meets with all the ministers and all the principal secretaries are always there. So, all the questions are raised there [...]. The bureaucracy is very fast here, very fast."

[(Interview 6)]

Through the efforts of principal energy secretary, the Government of Gujarat was able to mobilize international linkages for accessing external knowledge, expertise and financial resources through organizations such as IFC (International Finance Corporation) and ADB (Asian Development Bank). The principal energy secretary played an instrumental role in resolving ongoing problems and bottlenecks for the implementation of the policy by organizing several forums (for example, forums including bankers and entrepreneurs) and committee meetings, monitoring progress and finding solutions to ongoing issues and challenges faced by project developers (Interview 1).

The case of West Bengal

In comparison to Gujarat which was ruled by the BJP (Bhartiya Janta Party), West Bengal had a different socio-political background: between 1977 and 2011, West Bengal was ruled by CPI (M) (i.e. Communist Party of India (Marxist)), which won consecutive assembly elections due to its pro-poor regulations and political priorities for rural masses in the state. The Communist Party of India (Marxist) (CPM) maintained its dominance over the state and controlled all social affairs until the mid-90's. By being concerned about reducing investments in the state, CPI (M) feared that it had to change its focus on industrial growth and development and create conditions conducive to private investment (Ray, 2011; Chakravarty and Bose, 2009; Das, 2013). The government of West Bengal took initiatives for improving its investment-friendly identity by setting up government-industry coordination committees and organizing partnership summits to facilitate private investment in the state. After the rule of CPI (M) leaders such as Jyoti Basu and Bhuddhadev Bhattacharyya, the new government shifted to the hands of Mamta Banerjee, from the Trinamool Congress, in 2011. The new government tried to change its image from the older CPI (M) regime, in which slow industrial growth was quite common; it started reforms with setting single-window clearance mechanisms for attracting industry and reducing inefficiencies in administrative procedures (Sud, 2014b).

During the 1980s and 1990s, Chief Minister Jyoti Basu politically supported Dr. Gon Chaudhari in developing solar energy in West Bengal. Since the late 1980s, Dr. S.P. Gon Chaudhari was at the forefront

of promoting solar PV energy in West Bengal. In fact, he was among the first in India to develop solar energy solutions, conducting work in the Indian state of Tripura. He was also instrumental in developing knowledge about technical specifications and regulations regarding solar energy in India, by developing small-scale solar solutions such as solar pumps, solar lanterns and solar mini-grids. Dr. S.P. Gon Chaudhari advocated the use of solar energy to various ministries and planning commission in India. Based on his field experiences, the government of India started remote village electrification programs. Dr. Gon Chaudhari then took charge of the West Bengal Renewable Energy Development Agency (WBREDA) and became the face of renewable energy in West Bengal through his dynamic leadership (Interview 9). Dr. Gon Chaudhari became an instrumental advocate for solar PV energy in West Bengal, influencing government policies and regulations in the state (Harrison and Kostka, 2012). He also remarks on the initiatives taken by him.

"In 2009 I commissioned the first 2 MW plant. 2 MW plant commissioning grid-connected means regulation, rules. It is 2 MW, 11000 V supply system, nobody thought. It was so difficult for me to make the first tender of the country for a grid-connected system [...]. Now everything is common. Nobody knows how I struggled for developing the main tender document for the grid-connected system, regulations, the safety, security."

[(Interview 9)]

Under his leadership, WBREDA gained considerable experience in setting up solar mini-grids and solar hybrid mini-grid projects in different villages in Sunderbans between 1996 and 2010. The West Bengal Renewable Energy Development Agency took care of negotiating with local leaders and villagers, setting the tariffs with mutual consultation with local villagers, holding information meetings, channeling subsidies and carrying out surveys, maintenance and inspection of the systems. These initiatives also resulted in the installation of India's first solar mini-grid system (Ulsrud et al., 2011). Over the years, WBREDA was successful in implementing the largest number of off-grid solar programs in India (Interview 10). The idea of setting up the first MW grid-connected solar PV project was formulated by Dr. S.P. Gon Chaudhari, who was also instrumental in setting up the first grid-connected solar PV project in India (Chaudhari, 2012). As remarked by Dr. S.P. Gon Chaudhary,

"West Bengal was the only state where you know really I was doing this photovoltaic program in a serious manner, and I realized that this was a potential area. That was the reason that West Bengal became a model in the country in the 1990s (1993 onwards) and it continued up to 2009–2010, almost for 15 years. By the time other states, also seen, learn [...]. The main point is Gujarat was lagging at that time [...]. Gujarat is leading in grid-connected, off-grid is still West Bengal is highest in the country [...]. West Bengal was really giving the ideas, the concepts everything. During that period, maybe all the other states were learning how West Bengal is doing that."

[(Interview 9)]

Dr. S.P. Gon Chaudhary also remarks on other initiatives taken by him for promoting grid connected solar PV in the West Bengal.

"As managing director of the corporation, I executed India's first MW-level solar PV project and connected the same with DVC grid in September, 2009. I also solarized the first Rajbhavan of the country in Kolkata with a grid-connected solar PV power plant which was inaugurated by President Pratibha Patil in 2010. A solar farm (40 MW) in the Purulia district of West Bengal was also initiated by me. WBGEDCL prepared the Solar Energy Vision Plan of ONGC under my leadership. The Energy Infrastructure Plan of Sundarbans was also prepared under my leadership with funding from the World Bank."

During my tenure in the Ministry of Power, the Indian government sanctioned a major DDG project for Sundarbans with a new concept, which is currently under execution."

[(S.P. Gon Chaudhari, Energy Next)]

This project was difficult to execute due to lack of awareness of solar energy during that time in India, in addition to a lack of past experiences in setting tariffs and power purchase agreements, financing, operation and maintenance. The project was successful in demonstrating that large-scale grid-connected solar PV projects were possible in India (Interview 9; Chaudhuri, 2008; Chaudhari, 2012). Although Dr. S.P. Gon Chaudhary took several measures to promote grid-connected solar PV energy in West Bengal, the momentum was lost after his retirement in 2010, which led to a void in terms of creating political space for solar PV energy in the state. These issues are even highlighted in a newspaper.

"According to experts, what is unfortunate is the fact that other states followed the model that was first introduced in Bengal and went ahead to promote solar power. But due to the lack of a policy and proper initiative, West Bengal gradually fell behind. The picture, however, could have been different if the government had carried forward the initiatives that were taken a long time back. It was in Bankura way back in 1992 that the country's first off-grid solar power plant was installed. The country launched a national program based on the concept."

[(Chakraborti, 2015)]

Administrative problems occurred in WBREDA and the organization lost its innovative capabilities to further develop solar initiatives in West Bengal (Interview 9). After the first grid-connected project in Asansol, several project proposals came out in places such as Durgapur and Purulia, but none of the proposals materialized. The state lost investment opportunities from firms such as Astonfield Renewable Resources, Videocon and Reliance Power for grid-connected solar energy projects, which resulted in a further decline in investment plans for grid-connected solar PV projects in the state; subsequent efforts to improve the situation were not well received by the state government or by the MNRE (Ministry of New and Renewable Energy) (Bhushan and Hamberg, 2012).

Differences between Gujarat and West Bengal

These differences between Gujarat and West Bengal suggest that regional government officers working in regional governments are crucial, as they mobilize support for legitimizing the sustainable energy transition due to their personal interest and motivations or due to a consideration for larger public interest and regional benefits. Motivated individuals within the state government – such as D.J. Pandian and Dr. S.P. Gon Chaudhary – worked towards implementing solar PV despite institutional constraints and ongoing uncertainties; they did so because of their high level of personal motivation and commitment towards mainstreaming solar PV energy. In the case of Gujarat, D.J. Pandian occupied a key social position in terms of formal authority and political resources, and employed several tactics to act on emergent opportunities. His position in the state government enabled him to coordinate the actions of different actors, broker information and mobilize political support with the state's chief minister and other bureaucrats for implementing solar PV in Gujarat. His efforts were adequately supported by the state government, which gave him ample political support for his initiatives without creating bureaucratic constraints.

In West Bengal, however, despite the motivated efforts and vast experience of Dr. S.P. Gon Chaudhary, the state lost momentum after his retirement, as his efforts were not collectively supported by the state government or by related government agencies, resulting in limited implementation of grid-connected solar PV energy in the state. While the efforts of D.J. Pandian were adequately supported by the

state government and other agencies, it was difficult for this kind of collective action to take place in West Bengal. It is important to realize that motivated government officers within a regional government engaging in institutional entrepreneurship and the role of regional government are equally important and both are necessary for successful implementation and complement each other.

Role of regional regulatory agencies

The case of Gujarat

The Gujarat Electricity Regulatory Commission (GERC) took initiatives in becoming the first regulatory commission in India to develop a regulatory tariff order specific to solar PV energy through its regulatory orders (GERC, 2009). The commission used several measures for making the process of determining the feed in tariffs transparent, such as producing a discussion paper and inviting comments from different stakeholders, posting position papers on websites, conducting public hearings and carrying out brainstorming sessions with experts. Through a new regulatory order based on the latest technological trends, GERC updated the tariffs (GERC, 2010, 2012); moreover, it took a different approach while setting tariffs for solar PV energy and did not follow the competitive bidding approach or the reverse auction approach that was used in the National Solar Mission and followed by other Indian states (Shukla, 2012). This different approach focused on a generic, leveled tariff based on the cost-plus approach of tariff determination (Interview 2; Altenburg and Engelmeier, 2013). The different approach taken by the regulatory agency in Gujarat proved to be successful. As remarked by one of the interviewees.

"There was no bidding in Gujarat [...]. If they would have done bidding nobody would have come at all [...]. Nobody was interested [...]. See you are adding complexity. There is no market place, there is no industry, you are trying to put up the industry, now you put competitiveness, it is not possible. Any industry or technology to speed up has to come up without regulations. It should come simple like what happened in Gujarat [...]. In the first place, you cannot do regulation you have to open up [...]."

[(Interview 6)]

Unlike the National Solar Mission where a reverse bidding process was followed, GERC used a fixed, leveled feed in tariff (that is, the average of a fixed amount for the first 12 years and a lower amount for the last 13 years). As mentioned in the commission's regulatory order.

"The Commission unveiled attractive tariffs leveled at 12.54 and 9.29 per kWh for solar photovoltaic and solar thermal projects, respectively, for 25 years. GERC further divided these tariffs for two sub-periods for the first 12 and the subsequent 13 years as follows: 15 per kWh for the first 12 years and 5 per kWh for the next 13 years for solar photovoltaic projects. This tariff is a single-part, generic leveled tariff determined on a cost-plus basis."

[(as directly quoted in GERC tariff order, 2012)]

This approach was created in order to bring more clarity for investors and reduce risks due to excessive bidding from inexperienced project developers that would result in poor-quality projects (Interview 6; Bridge to India, 2012). The Gujarat Electricity Regulatory Commission (GERC) instituted mechanisms for regular interaction and learning and strong information sharing by conducting regular regulatory hearings and meetings with the state advisory committee, along with coordinating forums with different stakeholders in the state. This was carried out by consultation with a variety of stakeholders in order to obtain a multitude of views during public hearings. These forums provided opportunities for various stakeholders to meet and interact on

critical issues such as the setting of feed in tariffs through a consultative process by considering the views of different stakeholders, monitoring renewable purchase obligations (RPO's) and discussing guidelines for power purchase agreements. Discussions in these forums also helped to resolve ongoing regulatory issues, assess the impact of changing technological developments and modify regulations based on ongoing technological developments (Interview 2).

The Gujarat Electricity Regulatory Commission was adequately supported by research and academic institutions – such as Pandit Deen Dayal Petroleum University (PDPU) and Gujarat Energy Management Institute (GERMI) – in reducing problems associated with inadequate and asymmetric information while determining the feed in tariffs (Interview 3). The commission re-determined the feed in tariffs in subsequent years; the new tariffs were lower than the previous ones, based on ongoing technological developments in solar PV (GERC, 2010, 2012). The tariffs were re-determined by carefully balancing the tension between investor stability concerns and the impact of tariffs on consumers based both on practical experience and regular consultations with different stakeholders (Interview 2). The Gujarat Electricity Regulatory Commission took strict measures for commissioning projects, such as imposing strict financial penalties on projects for missing the deadlines and even rejecting petitions for deadline extensions (Bhushan and Hamberg, 2012; Altenburg and Engelmeier, 2013).

Civil society organizations in Gujarat – such as Consumer Education Research Society (CERS) – were critical about the impact of solar energy prices on consumers in the state and about the windfall benefits being given to project developers without much scrutiny (Interview 5). Subsequently, a controversy emerged in the state when Gujarat Urja Vikas Nigam Ltd. (GUVNL) filed a petition for a reduction in the leveled tariff set by the Gujarat Electricity Regulatory Commission (GERC); GUVNL had an opinion that the feed in tariff set by GERC did not account for actual project development costs, and that it was giving unnecessary profits to project developers. It also claimed that the developers supplied the high capital costs of solar PV plants while submitting their comments during the public hearing by GERC, but ultimately carried out the projects at much lower costs. Because the extra costs would ultimately burden the consumers in the state as well as its limited budget support for a costly solar PV energy, GUVNL requested GERC to reduce the tariffs (GERC, 2013).

In response to the claim by GUVNL, the project developers claimed that the project costs assumed by GERC during the tariff determination process was based on past installations in India, and the decrease in the cost of solar PV equipment was taken into account during the process. Moreover, the tariff set was lower than the tariffs determined by the reverse bidding mechanism used in the National Solar Mission in 2010. The project developers responded that the Government of Gujarat should have allocated enough budget for solar PV energy in Gujarat to fulfill obligations, as laid out in power purchase agreement. They felt that a retrospective cut in feed in tariffs would affect future solar investments in the state and lead to a loss of investor confidence (Interview 2; Interview 6). Accordingly, GERC dismissed GUVNL's petition on several reasons. The main argument used by GERC for dismissing the petition was that the petition had been filed three years after the release of GERC's regulatory order, and that according to regulation 72(3) of the GERC (Conduct of Business) Regulations, 2004, the time allowed for such petitions was generally 60 days from the release of the order. GERC felt that the petition was based on financial and technical data from only a few project developers, and therefore did not represent project development concerns from all project developers (Interview 2).

In its argument, GERC also suggested that the power purchase agreements were signed by GUVNL, which implicates considering the impact of the tariffs on consumers in the state. In other words, GUVNL must have thought about the necessary impact on its finances while signing the power purchase agreements. GERC felt that, renegotiating the agreements might hamper investors' trust in the government of

Gujarat. The commission suggested that a retrospective cut in tariffs would adversely affect future investments and create a negative perception about the rights of investors in the state. Instead, GERC suggested that it did not have the regulatory and legal power to reopen the terms of the power purchase agreement and re-determine the feed in tariff (GERC, 2013). GERC dismissed the petition, but suggested that GUVNL appeal to the Appellate Tribunal for Electricity (APTEL) for reconsideration of the case, which indeed it did.

This issue brought considerable uncertainty about the future of solar investors in Gujarat. Consequently, GUVNL resisted future solar policy initiatives, fearing becoming unprofitable and further burdening the consumers in Gujarat. The state energy utilities felt that they had little incentive in buying costly solar energy beyond the Renewable Purchase Obligations as stipulated by GERC (Bridge to India, 2013; Interview 6). Due to limited mechanisms for selling excess grid-connected solar PV energy outside Gujarat and legal limitations for selling bundled solar energy with thermal energy, as done in JNSM, the Government of Gujarat started exploring new business models apart from earlier initiatives such as grid-connected solar plants, solar parks, canal-top PV, and others (Interview 1; Interview 7). Despite this change of pace due to the conflict over retrospective cuts, Gujarat was still successful in seizing emerging opportunities and transforming itself into an international hub for the large-scale deployment of grid-connected solar PV energy in a relatively short period of time.

The case of West Bengal

The West Bengal Electricity Regulatory Commission (WBERC) was careful about the impact of solar PV energy on the finances of distribution utilities as well as about the eventual impact on consumers in the state. Therefore, it ordered that the procurement of solar energy should not increase the average cost to consumers in the state by a certain margin (Interview 11). The tariff order of WBERC clearly showed the regulatory commission's intention to protect the interests of the state energy utilities and to reduce the impact of purchasing solar energy on consumer prices, rather than supporting the interests of solar energy investors (WBERC, 2008, 2010; Interview 11). The regulatory commission's order stated.

"The price for the purchase of electricity from cogeneration and/or renewable sources shall be agreed mutually by the licensees and the suppliers at a level not above the price cap indicated by the Commission in these regulations [...]. The PPA will become effective only after getting the approval. However, the licensee shall not decline to purchase energy from such sources within the specified capped price as per these regulations from the existing units which have already covered the validity period of the capped price as was indicated in the earlier Regulations of the Commission until the minimum target RPO is achieved each year provided that connectivity and all other conditions are consistent with these regulations. Notwithstanding anything contained contrary to any other regulations, the solar power shall be purchased through competitive bidding only."

[(as directly quoted in WBERC Tariff order, 2013)]

Due to the low interest from project developers in West Bengal for grid-connected solar PV projects, WBERC set moderate solar purchase obligations, as it felt that setting excessively high obligations would result in a limited number of prospective project developers selling solar PV energy to the distribution utilities in the state (Interview 11; WBERC, 2013). Lack of regulatory enforcement in West Bengal was a major concern. As remarked by one of the interviewees.

"The role of a regulator is enforcing, that they are not doing [...]. Nothing will happen. CESC knows nothing will happen. DVC knows nothing will happen. WBSEB knows nothing will happen. Those people who want to invest in solar, they sit outside the room of the directors,

and they beg but they don't get any good positive response. They go away, there is no investment."

[(Interview 9)]

The commission did not adequately enforce regulations, and did not create an investment-friendly regulatory environment conducive for project developers to sell their power to distribution licensees in the state. As remarked by one of the interviewees, WBERC was conservative in its measures, as it followed guidelines from the central government under JNSM in order to reduce rent-seeking activities and financial burdens on state-distribution utilities. However, the commission ignored the interests of investors, which reduced the interest of project developers in setting up grid-connected PV projects in West Bengal. Only a few public hearings were organized by WBERC in order to consider the views of different stakeholders regarding tariff determination, thereby limiting stakeholder interaction (Interview 11). The Department of Power and Non-Conventional Energy Resources in West Bengal felt that an urgent approach to deploy large-scale grid-connected solar PV might bankrupt the energy utilities in the state, as the cost of setting up solar PV plants was continuously decreasing over the years due to grid parity. The Department felt that a slow and steady approach would be better in the long run (Interview 8).

Differences between Gujarat and West Bengal

Despite political pressures, GERC (Gujarat Electricity Regulatory Commission) supported solar PV in Gujarat by acting autonomously from the regional state government, without being influenced by their political decisions, acting on windows of opportunity and creating an ambitious tariff design to attract investors. The commission used adequate strategies that included designing tariffs that offered higher remuneration in the early years for ensuring predictable cash flow, setting tariffs that took into account rapid technological changes and obtaining input from a regional university in this regard, helping investors repay their loans at an early stage and reducing investment risks. GERC was also successful in following administrative procedures such as conducting public hearings for setting tariffs and drafting regulations, allowing different stakeholders to present their comments on draft regulatory documents, listening to the concerns of stakeholders and providing stable regulatory guidelines despite the high cost of solar PV energy. GERC did not succumb to pressure when a petition was filed by the state energy utility GUVNL for reducing the feed in tariffs due to the high cost for consumers. Instead, GERC maintained regulatory support and looked at the long-term interests of project developers and investors. On the other hand, WBERC did not successfully manage to balance multiple trade-offs and did not reduce risks for solar PV investors, as it took a wait-and-see approach for solar PV costs to further decrease before implementing solar PV on a large scale. While the regulatory agency and the state energy department were confident about the potential of solar PV in meeting future energy needs, they created uncertainty by suggesting that they were not ready for a large-scale investment due to its significant financial impact.

Contrary to the approach taken by GERC, WBERC was conservative, as it followed guidelines from the central government under JNSM for promoting solar PV energy and devising complex procedures for incentivizing project developers and investors. The regulatory agency in West Bengal issued regulatory orders for grid-connected solar PV energy in West Bengal; however, it failed to devise processes for implementing them. It also continued to support the incumbent energy utilities, by mobilizing arguments such as uncertainty about the rapidly decreasing solar PV prices and the cost pressure on utilities and its eventual impact on consumer prices. These insights suggest that the role of regulatory agencies is complex and can vary considerably. Regulatory agencies like GERC played a critical role in facilitating investors by working around political and economic constraints imposed by the state energy utilities while WBERC was less successful in doing so.

Role of regional industry association

The case of Gujarat

The government of Gujarat was aware of the possibility of inexperienced investors – with no prior expertise and motivated by profits – rushing in and misusing the government subsidies. The government took proactive measures by designing adequate mechanisms for monitoring projects and assisting the developers with constraints, along with setting strict measures regarding failure to finish projects on time (Interview 1; Interview 6). In spite of these measures by the state government and nodal agencies, project developers still faced several constraints.

The financing of projects was a major challenge, as banking and financial institutions did not have adequate data and expertise to verify the claims made by project developers. The distribution utilities were also considered risky due to their poor financial performance (Dasgupta and Syiem, 2012; Bridge to India, 2012). Although the nodal agency GEDA was responsible for obtaining clearances for developers, project developers still had to negotiate with many government departments for obtaining all the necessary clearances for their projects. For example, project developers in Gujarat faced several problems, such as approvals and clearances from multiple agencies, lack of access to project sites, infrastructure problems and floods on project sites. Another important reason for delays was that many project developers delayed their projects to benefit from rapidly reducing prices of solar PV equipment. This did not prove to be a good strategy, as it resulted in delays in the completion of projects (Bhushan and Hamberg, 2012; Mehta, 2013b; Interview 6).

These bottlenecks concerning the implementation of projects were resolved by the Solar Association of Gujarat, who helped in creating a collective action between disorganized solar PV project developers, manufacturers, EPC contractors, service providers in Gujarat and both small- and large-scale companies. The association organized several group meetings between project developers and financing institutions, sponsored multiple educational seminars and carried out many studies and surveys on behalf of project developers; additionally, through arranging group meetings, preparing reports, setting up forums and offering expert advice, the association collectively mobilized project developers and investors in the state and helped them resolve ongoing policy and regulatory issues, obtaining clearances from government agencies and helping project implementation. As remarked by one of the interviewees who was instrumental in starting the regional industry association.

"I created a new platform where people can come together [...]. Main problems were expected in the area of land and finance. So, our first seminar was on availability of land in Gujarat so that people can really get help as to how to go about acquiring land. Next immediate thing was arranging a seminar for finance [...]. We decided to hold one seminar in which we invited the state bank of India, we invited IDBI, we invited IREDA [...]. Fortunately, we received fantastic response not only from the solar developers but also from bankers [...]. I have brought bankers to your doorstep [...]. That dialogue ultimately helped in breaking the ice [...]. That greatly helped [...]. Banks were not ready to finance [...]. We could give them comfort and helped elsewhere how banks have financed [...]. I have believed in dreams coming true but you have to work for your dreams [...]. Our objective was very clear: making Gujarat number one in the country in the field of solar energy."

[(Interview 4)]

The association was instrumental in resolving ongoing concerns related to financing and land allocation, as well as reducing bottlenecks while practically implementing projects. Facilitating linkages between the banking and financial institutions and project developers, in spite of the risks and uncertainties associated with financing solar PV

projects. Without such assistance, projects would not have been financed in Gujarat. The solar association of Gujarat created the National Solar Federation of India – which was similar to EUROSOLAR – for creating an enabling environment for solar energy in India and for collectively advocating it to the Government of India (Mehta, 2012, 2013a, 2013b; Interview 4).

The solar association in Gujarat also played an important role in mobilizing collective action among solar PV project developers and investors. Networking events organized by the association were useful for funding projects in Gujarat, as they facilitated linkages between solar PV project developers and financial institutions. The association also represented project developers in Gujarat in industry forums such as SolarCon India, Inter Solar and even public hearings conducted by GERC, the regulatory agency. Particularly, the association helped the project developers in preparing their petitions and claims during regulatory hearings conducted by the regulatory commission GERC. The Solar Association of Gujarat asked the different investor members to set aside their personal differences and work collectively for promoting grid-connected solar PV in Gujarat (Interview 4).

The case of West Bengal

In 2012, after rounds of deliberation and discussions between different stakeholders, the West Bengal Government announced a renewable energy policy to improve the situation in the state. While the government displayed its intentions of promoting solar PV in the state, it lacked measures for implementing projects, with little coordination between the different implementing agencies (Department of Power, and Nonconventional Energy Sources, Govt. of West Bengal, 2012). To increase the investment in grid-connected renewable energy in the state, the West Bengal Green Energy Development Corporation Limited (WBGEDCL) was created. The role of WBGEDCL was focused on assisting project developers in obtaining incentives and clearances for projects, signing power purchase agreements (PPA) with energy utilities, setting the arrangement of power evacuation, executing demonstration projects, monitoring and reviewing projects and obtaining single-window clearances for project developers in coordination with different state agencies (WBGEDCL, 2010; West Bengal Green Energy Development Corporation Ltd, 2012; Department Of Power, and Nonconventional Energy Sources, Govt. of West Bengal, 2012). The state nodal agency for renewable energy did not play an essential role in facilitating projects. As remarked by one of the interviewees.

"The initiative of the state nodal agency should be at least being much more aggressive; otherwise also nothing will come here [...]. The corporation when you form that should have some initial capital, they should have a vision [...], this is the initial infrastructure we will develop, then we will call the investors, then we give them assurance about selling of their power or signing of PPAs but that corporation, nobody listens to the corporation. The corporation unfortunately has not taken any initiative also and nobody listens [...]. The corporation can do some work if there is a demand [...]. If they pursue also they know the corporation can't do anything as they do not have power."

[(Interview 9)]

West Bengal also faced problems in implementation of grid connected solar PV projects due to limited capabilities of the implementing agencies WBREDA and WBGEDCL in facilitating the required infrastructure for project developers. WBGEDCL took an approach that focused on screening project developers on having strong technical and financial capabilities, setting rigorous project deadlines and proposal assessment, along with a two-round evaluation process (WBGEDCL, 2012). The project development responsibilities – such as land allocation, financing, setting power purchase agreements and obtaining clearances for projects – were given to the project developers, without the instrumental facilitation from WBGEDCL (Interview 9). These measures increased

the complexity of projects and for investors in the state. West Bengal had no counterpart – such as the Solar Association in Gujarat – that could mobilize collective action and address the concerns of project developers.

In contrast to Gujarat, forums for collective action, discussions on policy options and the reduction of implementation barriers were limited, with only a few networking events being organized by the Bengal Chamber of Commerce and the civil society group (CUTS resource center, Kolkata). For instance, events organized by the Bengal Chamber of Commerce and Industry deliberated on the relatively low deployment of grid-connected solar PV energy in West Bengal despite its good solar potential, with inputs from different stakeholders in the state (Interview 12; Interview 13). Civil society groups such as CUTS Calcutta resource center organized meetings and discussion forums on capacity building so that consumer groups could engage in advocating for renewable energy, along with developing the capabilities of government institutions and identifying challenges with the implementation of suitable policies and regulations in the state (Interview 13; CUTS, 2011, 2013).

Differences between Gujarat and West Bengal

In the case of Gujarat, the industry association complemented the function of the state nodal agency GEDA (Gujarat Energy Development Agency) and other government agencies for implementing solar PV energy projects. This is not to suggest that grid-connected solar PV would not have developed without the collective action from the industry association, but it certainly helped shape ongoing developments by acting as a key institutional agent in connecting different stakeholders and complementing the functions of government organizations involved in the implementation process. On the other hand, a limited number of organizations were present in West Bengal for reducing implementation barriers. However, future research is still necessary to understand the presence of such organizations in different regions and the differences of their impact in different regions, as well as the extent to which they are successful.

Discussion

The paper describes failed efforts in West Bengal with respect to implementation of grid connected PV solar compared to successful efforts in Gujarat. The study looked to answer the following research question: *How and why was implementation of grid connected solar PV energy different in Gujarat than in West Bengal?* The paper answers the research question by uncovering the role of various regional actors and the collective strategies used by them to address the institutional challenges associated with implementing grid-connected solar PV energy.

The paper discussed that the National Solar Mission provided a broader policy and regulatory environment for promoting solar PV energy in India. Gujarat had certain advantages in terms of high solar radiation, availability of large amount of waste land, financially sound energy utilities as well as a well-developed industrial infrastructure. The Government of Gujarat was also interested in addressing issues of climate change and energy security as well as developing local industry and generating revenue by selling excess power at higher stages by promoting solar PV energy. The solar PV project developers also had confidence in Gujarat as a favorable investment destination due to better financial position of the energy utilities, proactive role of regional government in facilitating projects by providing necessary infrastructure and use of fixed feed in tariffs. Factors such as use of reverse bidding mechanism for setting solar tariffs in the National Solar Mission also prompted project developers to choose Gujarat due to the presence of fixed feed in tariff incentive which offered more stable return on their investment (Yenneti, 2014a, 2016). However, the Gujarat solar policy and enthusiasm for solar energy also resulted in financial strains on

the state energy utility and financial burden on consumers in the state as the Government of Gujarat awarded projects to inexperienced bidders with limited project management capabilities resulting in high costs of solar energy (Nair, 2014; Comptroller and Auditor General of India, 2015).

On the other hand, West Bengal was a pioneer in implementation of first grid connected solar PV plant in India and had equal opportunity in taking a lead in becoming a hub for solar PV energy but lacked in implementation due to lack of commitment of the state government as well as regional actors. In the case of West Bengal, although the state government developed a policy document for installation of grid connected solar PV energy as well as devised a State Action Climate Change Programme for supporting solar energy, the state suffered from implementation measures. Crucial implementing actors in West Bengal such as WBGEDCL, WBREDA and WBERC did not play essential role of supporting project developers by facilitating access to waste as well as private land, carrying out grid feasibility and other tasks for them. This resulted in delay in implementation of projects in West Bengal. Even after receiving proposals for implementing projects in West Bengal, the crucial actors namely WBREDA and WBGEDCL did not facilitate the projects thereby creating a situation where solar project developers did not find it attractive to implement projects (Comptroller and Auditor General of India, 2015).

While pre-existing regional conditions were quite favorable in both Gujarat and West Bengal, the differences in implementation were due to lack of supportive regional institutional entrepreneurship in West Bengal. In the next section, I summarize the main findings of the study and offer some insights for the institutional entrepreneurship literature.

Conclusion

The following conclusions can now be drawn from the study. First, the findings highlight the importance of regional government officials and state government actively engaging in institutional entrepreneurship for stimulating regional sustainability transitions. Existing studies have also pointed at the critical role of state governments in engaging in institutional entrepreneurship by creating opportunities for economic development, attracting international entrepreneurial linkages, creating infrastructure and implementing reforms for the removal of bureaucratic constraints (Nasra and Dacin, 2010). Past accounts have also indicated that many policy and regulatory initiatives are delayed due to resistance from vested interests within the state machinery, lack of political power and assertiveness to drive implementation of initiatives, and presence of actors with competing ideologies and logics (Jain and Sharma, 2013). This paper confirms the role of regional state government in creating necessary political conditions for implementation of desired initiatives while also creating resistance in some cases. In this paper, I demonstrate the work of motivated and engaged efforts of the principal energy secretary of Gujarat, D.J. Pandian as he played an essential role in mainstreaming solar PV in the state despite facing resource and political constraints. In West Bengal, in spite of motivated efforts and vast experience of Dr. S.P. Gon Chaudhary the state lost momentum as his efforts were not collectively supported by regional government in West Bengal. While the efforts of D.J. Pandian were adequately supported by the Gujarat state government and other agencies in, it was difficult for this kind of collective action to take place in West Bengal. This specific finding suggests the need for developing an integrated perspective on regional institutional entrepreneurship, by focusing on the role of motivated individuals within the government and the extent to which their actions are supported by the regional government.

Second, the analysis offers deeper insights into the work of regional regulatory agencies in stimulating entrepreneurial action. Previous research has discussed a number of roles of regulatory actors – such as exercising coercive pressure on entrepreneurs by mandating strict regulations, resisting change by maintaining strong connection with incumbent actors and preserving their status quo, and creating

investment opportunities by devising regulatory orders which guarantee regulatory support and reduce investment risk in the long term (Holburn, 2012; Gurses and Ozcan, 2014; Weigelt and Shittu, 2015). Regulatory agencies face legitimacy risks, as they have to protect the interests of diverse stakeholders as well as their autonomy, along with playing an essential role in the implementation of regulations (Hiatt and Park, 2013).

In this study, I showed that it was difficult – in both states – for regulatory agencies to counteract the arguments of incumbent utilities regarding the cost pressure and impacts on consumer tariffs due to the high costs of solar PV energy. The analysis finds that regulatory agencies have a critical role in facilitating investors and implementation of regulations by working around economic and political constraints. Regulatory agencies such as GERC played an important role in balancing multiple and contradictory interests such as protection of consumers from high prices, ensuring profitability and long term predictability for investors and minimizing negative impact on financial position of energy utilities. GERC facilitated investment in Gujarat as it worked around cost and political constraints and managed to support solar PV investors despite resistance from the state energy utility GUVNL. WBERC on the other hand focused more on supporting the incumbent energy utilities in the state, by mobilizing arguments such as uncertainty about the rapidly decreasing solar PV prices, cost pressure on utilities and its eventual impact on consumer prices.

Third, the analysis offers insights in the role of industry associations in stimulating collective action in regional context. Literature has emphasized the role of professional and trade associations as powerful institutional actors influencing entrepreneurial choices and promoting new agendas, enacting and enforcing laws, lobbying for specific policies and regulations, providing inputs to the government and advocating for modifying draft policy documents, seeking political support for their members while balancing collective and individual interests (see Gertler and Vinodrai, 2009; Pacheco et al., 2010b; Kshetri and Dholakia, 2009; Hiatt, 2010; Pinkse and Groot, 2015). These studies suggest the need to look at a range of other activities such as local capacity building, encouraging collective learning, fulfilling functions of other organizations and resolving critical institutional bottlenecks.

Finally, this study contributes to the institutional entrepreneurship literature in regional context by empirically illustrating regional differences in implementation of national political mandates and developing an overview of the institutional entrepreneurial work of three key actors as highlighted before. The study contributes to recent discussions on the manner in which actors challenge institutional arrangements in a regional context (Ritvala and Kleymann, 2012; Sotarauta and Mustikkamäki, 2015; Sotarauta, 2016) by empirically investigating the strategies they use and the manner in which they exercise their influence. By building upon insights in this paper, future studies can focus on studying the development of solar PV energy in other Indian states or in different institutional contexts.

Limitations and scope for future research

This study has few number of limitations as well. The first limitation is related to research design of the study and focus on limited number of elite interviews even field work for a significant amount of time in India. The interviews focused more on capturing the experience of individuals who were personally developed in implementing solar PV energy in the two states or observed the developments closely. However, it was not possible to interview all concerned stakeholders and I had to rely on second hand accounts such as reports, research papers and archival data sources to know more about experience of these stakeholders. The limited number of elite interviews served the purpose of answering the key research question using the concept of institutional entrepreneurship. The research also recognizes the need for interviewing more stakeholders such as non-elites and powerless actors such as local communities for reducing potential bias and enhancing the validity of

the findings. There is a need for studying voice and concerns of local affected groups (e.g. local workers, pastoralists, nomads, tribal, small farmers) and communities in solar energy implementation as they are often marginalized in decision making process related to implementation of projects, land acquisition and compensation for their work as temporary workers (Yenneti and Day, 2015, 2016).

Second, the findings are very specific to the cases of Gujarat and West Bengal and it might be difficult to generalize to other such cases. More studies exploring differences between other Indian states are needed in order to draw broader implications for governance of regional sustainability initiatives in emerging economies such as India. Furthermore, as other Indian states Tamil Nadu and Rajasthan have deployed more solar PV energy than Gujarat in the recent years, more research is needed to explore the reasons for rapid deployment in these states.

Finally, the paper relied mostly on using a qualitative descriptive methodology to capture the differences in implementation of solar PV energy in the two states. The motivation of this research was not to provide a definitive answer for explaining differences in regional implementation between the two states by accounting for all possible factors which could have been useful in explaining the differences in implementation. Quantifying the impact of all such possible variables and to measure their impact on regional differences in installation was beyond the scope of this paper. Instead the focus of the paper was to highlight the role of institutional entrepreneurship for explaining the regional differences in implementation. Future studies can focus on using more quantitative regression based models to quantify the impact of a range of factors as used in few studies before (e.g. Schmid, 2012; Panse and Kathuria, 2015; Shrimali et al., 2015; Goetzke and Rave, 2016) for accurately estimating the impact of multiple variables for explaining regional differences. Future research can also focus on utilizing a mixed method approach to understand regional differences in implementation by quantifying the impact of different variables and supporting the insights gained from a qualitative analysis as carried out in this paper.

Acknowledgement

I would like to thank the Netherlands Organization for Scientific Research NWO-WOTRO (Project number: W 01.65.330.00) program for their kind financial support for this research.

References

- AF Mercados EMI. Power sector operations and impact on state finances. All India power sector operations and impact on state finances. All India summary of key aspects of power sector. The fourteenth finance commission. AF-Mercados Energy Markets India Pvt. Ltd; 2014.
- Aldrich HE. Heroes, villains, and fools: institutional entrepreneurship, NOT institutional entrepreneurs. *Entrep Res J* 2011;1(2): 2.
- Altenburg T, Engelmeier T. Boosting solar investment with limited subsidies: rent management and policy learning in India. *Energy Policy* 2013;59(8):866–74.
- Alvarez SA, Young SL, Wooley JL. Opportunities and institution: a co-creation story of the king crab industry. *J Bus Ventur* 2015;30(1):95–112.
- Andersen PH, Drejer I. Systemic innovation in a distributed network: the case of Danish wind turbines, 1972–2007. *Strateg Organ* 2008;6(1):13–46.
- Autio E, Kenney M, Mustar P, Siegel M, Wright M. Entrepreneurial innovation: the importance of context. *Res Policy* 2014;43(7):1097–108.
- Battilana J, Leca B, Boxenbaum E. How actors change institutions: towards a theory of institutional entrepreneurship. *Acad Manag Ann* 2009;3(1):65–107.
- Beale D, Noronhora E. Indian public-sector trade unionism in an autocratic political climate: the distinctive case of Gujarat. *Cap Class* 2014;38(3):517–39.
- Bhushan C, Hamberg J. Facing the sun: policy for sustainable grid connected solar energy. New Delhi: Centre for Science and Environment; 2012.
- Binz C, Truffer B, Coenen L. Path creation as a process of resource alignment and anchoring – industry formation for on-site water recycling in Beijing. *Econ Geogr* 2016;92:172–200.
- Bridge to India. India solar handbook. Available at: <http://www.indiaenvironmentportal.org.in/files/file/The-India-Solar-Handbook.pdf>, 2012.
- Bridge to India. Project development handbook. Available at: http://www.solarify.eu/wp-content/uploads/2013/05/BRIDGE-TO-INDIA_Project-Development-Handbook.pdf, 2013.
- Cao X, Liu Y, Cao C. Institutional entrepreneurs on opportunity formation and exploitation in strategic new industry. *Int J Emerg Mark* 2014;9(3):439–58.

- Chakraborti S. West Bengal lags in solar power promotion. Available at: <http://timesofindia.indiatimes.com/city/kolkata/West-Bengal-lags-in-solar-power-promotion/articleshow/48138012.cms>, 2015.
- Chakravarty D, Bose I. Industrialising West Bengal: the case of institutional stickiness. IPPG discussion papers series 32. School of Environment & Development, University of Manchester; 2009.
- Chaudhari SPG. In conversation: Dr S P Gon Chaudhuri. Energy next. Available at: <http://www.energynext.in/dr-s-p-gon-chaudhuri/>, 2012.
- Chaudhary A, Narain A, Krishna A, Sagar A. Who shapes climate action in India? Insights from the wind and solar energy sectors. Evidence report no 56. Rising powers in international development. AG level 2 output ID: 183. Available at: <http://opendocs.ids.ac.uk/opendocs/bitstream/handle/123456789/3537/ER56.pdf?sequence=1>, 2014.
- Chaudhuri SPG. India's first solar housing complex Rabi Rashmi Abasan. Available at: <http://www.indiaenvironmentportal.org.in/files/India's%20first%20solar.pdf>, 2008.
- Comptroller and Auditor General of India. Report of the comptroller and auditor general of India on renewable energy sector in India. Union government Ministry of New and Renewable Energy. Report no. 34 of 2015; 2015.
- Council on Energy, Environment and Water & Natural Resources Defense Council (CEEW & NRD). Laying the foundation for a bright future assessing progress under phase 1 of India's National Solar Mission. Available at: <http://www.nrdc.org/international/india/files/layingthefoundation.pdf>, 2012.
- CUTS Resource Kolkatta. Raising stakeholders' demand for renewable energy in India. Available at: http://www.cuts-international.org/crc/pdf/CRC_Activity_Report_Apr-Jun-2011.pdf, 2011.
- CUTS Resource Kolkatta. Workshop on formulation & implementation of low carbon policies in electricity sector - an inclusive approach towards good governance. Available at: http://www.cuts-international.org/crc/pdf/Report-Workshop_on_Formulation_and_Implementation_of_Low_Carbon_Policies_in_Electricity_Sector.pdf, 2013.
- D'Souza E. What constrains business? The role of the 'single window' in Gujarat, India. London, UK: The International Growth Center; 2011.
- Das R. History, ideology and negotiation: the politics of policy transition in West Bengal, India; 2013 [Thesis submitted to the Department of International Development of the London School of Economics for the degree of Doctor of Philosophy. Available at: http://etheses.lse.ac.uk/614/1/Das_History_Ideology_Negotiation.pdf].
- Dasgupta A, Syiem N. Don't bank on the sun. Hemant Sahai associate. Asia law India annual review; 2012.
- Debroy B. Gujarat: governance for growth and development. New Delhi: Academic Foundation; 2012.
- Delmas M, Montes-Sancho MJ. U.S. state policies for renewable energy: context and effectiveness. Energy Policy 2011;39:2273–88.
- Department of Power & Non-conventional Energy Sources, Govt. of West Bengal. Policy on co-generation and generation of electricity from renewable sources of energy. Available at: <http://www.wbreds.org/wp-content/uploads/2012/06/policy-renewable-wb.pdf>, 2012.
- Dewald U, Truffer B. The local sources of market formation: explaining regional growth differentials in German photovoltaic markets. Eur Plan Stud 2012; 20(3):397–420.
- Dholakia RH. Economic reforms and development strategy in Gujarat. Available at: <http://www.iiimhd.ernet.in/publications/data/2002-12-02RavindraHDholakia.pdf>, 2002.
- Doblinger C, Soppe S. Change-actors in the U.S. electric energy system: the role of environmental groups in utility adoption and diffusion of wind power. Energy Policy 2013;61:274–84.
- Etzion D, Ferraro F. The role of analogy in the institutionalization of sustainability reporting. Organ Sci 2010;21(5):1092–107.
- Feldman MP. The character of innovative places: entrepreneurial strategy, economic development, and prosperity. Small Bus Econ 2014;43(1):9–20.
- Ferguson-Martin CJ, Hill SD. Accounting for variation in wind deployment between Canadian provinces. Energy Policy 2011;39(3):1647–58.
- Feurty E, Ilina S, Sakout S, Saucier C. Institutional factors influencing strategic decision-making in energy policy: a case study of wind energy in France and Quebec (Canada). Renew Sustain Energy Rev 2016;59:1455–70.
- Fischlein M, Larson J, Hall DM, Chaudhry R, Peterson TR, Stephens JC, et al. Policy stakeholders and deployment of wind power in the sub-national context: a comparison of four U.S. states. Energy Policy 2010;38:4429–39.
- Forum of Regulators. Strategy for providing 24 × 7 power supply. Available at: <http://www.forumofregulators.gov.in/Data/WhatsNew/24x7.pdf>, 2014.
- Ganesan K, Choudhary P, Palakshappa R, Jain R, Raj S. Assessing green industrial policy: the India experience. The International Institute for Sustainable Development and Council on Energy, Environment and Water; 2014 [Available at: http://www.iisd.org/gsi/sites/default/files/rens_gip_india.pdf].
- Garud R, Gehman J. Metatheoretical perspectives on sustainability journeys: evolutionary, relational and durational. Res Policy 2012;41:980–95.
- Garud R, Gehman J, Giuliani AP. Contextualizing entrepreneurial innovation: a narrative perspective. Res Policy 2014;43(7):1177–88.
- GEDA. Solar power policy. Available at: http://geda.gujarat.gov.in/policy_files/Solar%20Power%20policy%202009.pdf, 2009.
- George G, Rao NR, Corbishley C, Bansal R. Institutional entrepreneurship, governance, and poverty: insights from emergency medical response services in India. Asia Pac J Manag 2014;32(1):39–65.
- Gertler M, Vinodrai T. Life sciences and regional innovation: one path or many? Eur Plan Stud 2009;17(2):235–61.
- Gioia DA, Corley KG, Hamilton AL. Seeking qualitative rigor in inductive research: notes on the Gioia methodology. Organ Res Methods 2013;16(1):15–31.
- Goess S, De Jong M, Ravesteijn W. What makes renewable energy successful in China? The case of the Shandong province solar water heater innovation system. Energy Policy 2015;86:684–96.
- Goetzke F, Rave T. Explaining the heterogeneity of wind energy capacity across German regions. Util Policy 2016. <http://dx.doi.org/10.1016/j.jup.2016.02.010>.
- Government of Gujarat. Directorate of Economics and statistics. Socio-economic review 2012–2013. Available at: <http://gujceostat.gujarat.gov.in/wp-content/uploads/Publication/34%20-%20Socio%20Economic%20Review%20English.pdf>, 2013.
- Gujarat Electricity Regulatory Commission (GERC). Order no. 1 of 2009. Available at: http://www.gercin.org/renewablepdf/en_1303212067.pdf, 2009.
- Gujarat Electricity Regulatory Commission (GERC). Order no. 2 of 2010. Available at: http://www.gercin.org/renewablepdf/en_1303211935.pdf, 2010.
- Gujarat Electricity Regulatory Commission (GERC). Order no. 1 of 2012. Available at: <http://www.gercin.org/renewablepdf/Solar%20Tariff%20Order%201%20of%202012.pdf>, 2012.
- Gujarat Electricity Regulatory Commission (GERC). Petition no. 1320 of 2013. In the matter of: tariff for procurement of power by the distribution licensees and others from solar energy projects. Available at: http://www.gercin.org/myorderarchivepdf/en_1376895899.pdf, 2013.
- Gujarat Energy Development Agency (GEDA). Background information. Available at: <http://geda.gujarat.gov.in/background.php>, 2014.
- Gurses K, Ozcan P. Entrepreneurship in regulated markets: framing contests and collective action to introduce pay TV in the U.S. Acad Manage J 2014;58(6):1709–39.
- Harrison TW, Kostka G. Manoeuvres for a low carbon state: the local politics of climate change in China and India. Developmental leadership program research paper no. 22; 2012. [Available at: <http://www.dlprog.org/ftp/info/Public%20Folder/Manoeuvres%20for%20a%20Low%20Carbon%20State.pdf.html>].
- Henfridsson O, Yoo Y. The liminality of trajectory shifts in institutional entrepreneurship. Organ Sci 2013;25(3):932–50.
- Hiatt SR. Institutional actors and entrepreneurial choices: new ventures in the biodiesel fuel industry. Unpublished dissertation ILR School, Cornell University; 2010. Available at: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1658425.
- Hiatt SR, Park S. Lords of the harvest: third-party influence and regulatory approval of genetically modified organisms. Acad Manage J 2013;56:923–44.
- Holburn G. Assessing and managing regulatory risk in renewable energy: contrasts between Canada and the United States. Energy Policy 2012;45:654–65.
- Hung SC, Whittington R. Agency in national innovation systems: institutional entrepreneurship and the professionalization of Taiwanese IT. Res Policy 2011; 40(4):526–38.
- Indian Solar Summit. Indian solar. Making India's solar mission a reality. Available at: http://www.solarsummitindia.com/images/uploads/general/ISIT_Mediapack_june2012_lowres.pdf, 2013.
- Jaffrelot C. What 'Gujarat model'? —growth without development—and with socio-political polarization. South Asia: J South Asian Stud 2015;38(4):820–38.
- Jain S, George G. Technology transfer offices as institutional entrepreneurs: the case of Wisconsin alumni research foundation and human embryonic stem cells. Ind Corp Chang 2007;16(4):535–67.
- Jain S, Sharma D. Institutional logic migration and industry evolution in emerging economies: the case of telephony in India. Strateg Entrep J 2013;7(3):252–71.
- Jørgensen K. Climate initiatives at the subnational level of the Indian states and their interplay with federal policies. Montreal: paper presented at the 2011 ISA annual convention, 16–19 march 2011; 2011.
- Kaplan S, Murray F. Entrepreneurship and the creation of value. Res Sociol Organ 2010; 29:107–47.
- Karnøe P, Garud R. Path creation: Co-creation of heterogeneous resources in the emergence of the Danish wind turbine cluster. Eur Plan Stud 2012;20(5):733–52.
- Kasture R, Bhalerao S, Nimgaonka P, Dodhia D. Grid solar success hinges on policy implementation. Energetica India; 2013 [Available at: <http://www.energetica-india.net/download.php?seccion=articles&archivo=17ANPIHzkX1fhi93DqzmJGbf4Kc5MWtHW8XeDMEaBj9jhnMoOWvp2.pdf>].
- Kennedy L, Robin K, Zamuner D. Comparing state-level policy responses to economic reforms in India: a sub national political economy perspective. La confrontation des réponses politiques des Économie politique de l'Asie, Vol. 1.; 2013.
- Kshetri N, Dholakia N. Professional and trade associations in a nascent and formative sector of a developing economy: a case study of the NASSCOM effect on the Indian off shoring industry. J Int Manag 2009;15(2):225–39.
- Kukk P. Complexities in building innovation systems. The case of radical medical technologies [Doctoral thesis] Utrecht University; 2016 [ISBN: 978-90-6464-997-4].
- Kukk P, Moors EHM, Hekkert MP. Institutional power play in innovation systems—the case of Herceptin. Res Policy 2016;45(8):1558–69.
- Langley A, Abdallah C. Templates and turns in qualitative studies of strategy and management. Res Methodol Strateg Manag 2011;6:201–35.
- Lee B, Sine W. Constructing entrepreneurial opportunity: environmental movements and the transformation of regional regulatory regimes. In: Frenken K, editor. Applied evolutionary economics and economic geography. Cheltenham and Northampton, MA: Edward Elgar; 2007. p. 93–120.
- Lippmann S, Aldrich HE. A rolling stone gathers momentum: generational units, collective memory and entrepreneurship. Acad Manage Rev 2015. <http://dx.doi.org/10.5465/amr.2014.0139>.
- Madhavan N. Gujarat's power sector turnaround story. Business Today; 2012 [Available at: <http://businessday.intoday.in/story/gujarats-power-sector-turnaround-story/1/21750.html>].
- Marcus A, Fremeth A. In: Burger J, editor. Institutional void and stakeholder leadership, chapter for science and stakeholders: solutions to energy and environment issues. Heidelberg: Springer; 2011.
- Markard J, Hekkert M, Jacobsson S. The technological innovation systems framework: response to six criticisms. Environ Innov Soc Trans 2015;16:76–86.
- Mattes J, Huber A, Koehrsen J. Energy transitions in small-scale regions – what we can learn from a regional innovation systems perspective. Energy Policy 2015; 78:255–64.

- Mehta P. Converting solar dreams into reality in Gujarat state, India. Sharing the experience. Global solar EPC summit. 16–17 May, 2012. New Delhi; 2012.
- Mehta P. Presentation before the jury panel for renewable awards. Solar power man of the year. The metropolitan hotel. 23rd March, 2013, New Delhi, India; 2013a.
- Mehta P. Financing of solar power: Developer's perspective. Available at: http://www.cseindia.org/userfiles/Financing%20solar%20power_Developers%20perspective.pdf, 2013.
- Modi N. Public speech by Narendra Modi. Available at: <https://www.youtube.com/watch?v=rEDxG2QFDoY>, 2013.
- Nair A. CAG flays state for creating rs 473 cr burden on power consumers in Gujarat. Available at: <http://indianexpress.com/article/business/economy/cag-flays-state-for-creating-rs-473-cr-burden-on-power-consumers-in-gujarat/>, 2014.
- Nasra R, Dacin MT. Institutional arrangements and international entrepreneurship: the state as institutional entrepreneur. *Entrep Theory Pract* 2010;34(3):583–609.
- NCAER. The NCAER state investment potential index: N-SIPI 2016. National Council of Applied Economic Research; 2016 [Available at: <http://www.ncaer.org/uploads/photo-gallery/files/1459754012NCAER-SIPI-Report%202016.pdf>].
- Pacheco D, York J, Dean TJ, Sarasvathy S. The coevolution of institutional entrepreneurship: a tale of two theories. *J Manag* 2010a;36:974–1010.
- Pacheco D, Dean T, Payne D. Escaping the green prison: entrepreneurship and the creation of opportunities for sustainable development. *J Bus Ventur* 2010b;25(5):464–80.
- Pacheco D, York J, Hargrave T. The co-evolution of industries, social movements, and institutions: wind power in the United States. *Organ Sci* 2014;25:1609–32.
- Panse R, Kathuria V. Role of policy in deployment of wind energy: evidence across states of India. *Renew Sustain Energy Rev* 2015;53:422–32.
- Pinkse J, Groot K. Sustainable entrepreneurship and corporate political strategy: overcoming market barriers in the clean energy sector. *Entrep Theory Pract* 2015;39(3):633–54.
- PWC and Shakti Sustainable Energy Foundation. Financial engineering as a means to support Jawaharlal Nehru National Solar Mission. Available at: http://www.shaktifoundation.in/cms/uploadedImages/final%20report_pwc.pdf, 2012.
- Quitow R. Assessing policy strategies for the promotion of environmental technologies: a review of India's National Solar Mission. *Res Policy* 2015;44(1):233–43.
- Ray SC. The political economy of decline of industry in West Bengal: experiences of a Marxist state within a mixed economy. Working Paper. Connecticut: University of Connecticut; 2011.
- Resolve Energy Consultants. Sunrise in Gujarat. Available at: <http://www.re-solve.in/wp-content/uploads/2013/10/Resolve-Gujarat-White-paper-2.2.pdf>, 2013.
- Ritvala T, Kleymann B. Scientists as midwives to cluster emergence: an institutional work framework. *Ind Innov* 2012;19(6):477–97.
- Robinson D, Rip A, Mangematin V. Technological agglomeration and the emergence of clusters and networks in nanotechnology. *Res Policy* 2007;36(6):871–9.
- Rodríguez-Pose A. Do institutions matter for regional development? *Reg Stud* 2013;47(7):1034–47.
- Sawhney A, Rahul M. Examining the regional pattern of renewable energy CDM power projects in India. *Energy Econ* 2014;42:240–7.
- Schmid G. The development of renewable energy power in India: which policies have been effective? *Energy Policy* 2012;45:317–26.
- Schneiberg M. In: Lounsbury M, Boxenbaum E, editors. *Lost in transposition? (a cautionary tale): the Bank of North Dakota and prospects for reform in American banking*. Research in the sociology of organizations Emerald Press; 2013. p. 277–310.
- Shrimali G, Rohra S. India's solar mission: a review. *Renew Sustain Energy Rev* 2012;16:6317–32.
- Shrimali G, Lynes M, Indvik J. Wind energy deployment in the U.S.: an empirical analysis of the role of federal and state policies. *Renew Sustain Energy Rev* 2015;43:796–806.
- Shukla A. State regulators perspective on development of renewable energy. Accelerating renewable energy development in India. Gujarat Electricity Regulatory Commission; 2012 [6th September, 2012. New Delhi. Available at: <http://mnre.gov.in/file-manager/UserFiles/presentations-pwc-workshop-06092012/GERC.pdf>].
- Sine WD, Lee BH. Tilting at windmills? The environmental movement and the emergence of the U.S. wind energy sector. *Adm Sci Q* 2009;54(1):123–55.
- Sinha A. Rethinking the developmental state model: divided leviathan and sub-national comparisons in India. *Comp Polit* 2003;35(4):459–76.
- Sinha A. Ideas, interests and institutions in policy change in India: a comparison of West Bengal and Gujarat. In: Jenkins Rob, editor. *Regional reflections: case studies of democracy in practice*. Oxford University Press; 2004.
- Sotara M. Institutional entrepreneurship in regional innovation systems. Framing the emerging research agenda. Paper presented in Stavanger innovation summit June 15–16, 2009 Stavanger, Norway; 2009.
- Sotara M. Regional development and regional networks: the role of regional development officers in Finland. *Eur Urban Reg Stud* 2010;17(4):387–400.
- Sotara M. An actor-centric bottom-up view of institutions: combinatorial knowledge dynamics through the eyes of institutional entrepreneurs and institutional navigators. *Environ Plann C Gov Policy* 2016. <http://dx.doi.org/10.1177/0263774X16664906>.
- Sotara M, Mustikkamäki N. Institutional entrepreneurship, power, and knowledge in innovation systems: institutionalization of regenerative medicine in Tampere, Finland. *Environ Plann C Gov Policy* 2015;33(2):342–57.
- Sotara M, Pulkkinen R. Institutional entrepreneurship for knowledge regions: in search of a fresh set of questions for regional innovation studies. *Environ Plann C Gov Policy* 2011;29(1):96–112.
- Stokes LC. The politics of renewable energy policies: the case of feed-in tariffs in Ontario, Canada. *Energy Policy* 2013;56:490–500.
- Sud N. The Indian state in a liberalizing landscape. *Dev Chang* 2009;40(4):645–65.
- Sud N. The state in the era of India's sub-national regions: liberalisation and land in Gujarat. *Geoforum* 2013;51:233–42.
- Sud N. The state in the era of India's sub-national regions: liberalization and land in Gujarat. *Geoforum* 2014a;51:233–42.
- Sud N. Governing India's land. *World Dev* 2014b;60:43–56.
- Suddaby R, Bruton GD, Si SX. Entrepreneurship through a qualitative lens: insights on the construction and/or discovery of entrepreneurial opportunity. *J Bus Ventur* 2015;30(1):1–10.
- TERI. Policy and regulatory issues in the context of large scale grid integration of renewable energy in Gujarat. New Delhi: the energy and resources institute project report no 2011R; 2013.
- Tracey P, Phillips N, Jarvis O. Bridging institutional entrepreneurship and the creation of new organizational forms: a multilevel model. *Organ Sci* 2011;22(1):60–80.
- Ulsrud K, Winther T, Debajit P, Rohrer H, Sandgren J. The solar transitions research on solar mini-grids in India: learning from local cases of innovative socio-technical systems. *Energy Sustain Dev* 2011;15:293–303.
- Vibrant Gujarat. Available at: <http://vibrantgujarat.com/images/pdf/vg-newswire-nov-dec-13.pdf>, 2013.
- Vogel B, Henstra D. Studying local climate adaptation: a heuristic research framework for comparative policy analysis. *Glob Environ Chang* 2015;31:110–20.
- Walker K, Schlosser F, Deephouse DL. Organizational ingenuity and the paradox of embedded agency: the case of the embryonic Ontario solar energy industry. *Organ Stud* 2014;35(4):613–34.
- Weigelt C, Shittu E. Competition, regulatory policy, and firms' resource investments: the case of renewable energy technologies. *Acad Manage J* 2015. <http://dx.doi.org/10.5465/amj.2013.0661>.
- West Bengal Electricity Regulatory Commission (WBERC). WB (Part 1)/2007/SAR-91. Available at: http://ireda.gov.in/writereaddata/Manual/WEST_BENGAL/NCE_regulation_dt_25.08.pdf, 2008.
- West Bengal Electricity Regulatory Commission (WBERC). WB (part-I)/2010/SAR-460. Available at: http://www.wberc.net/wberc/regulation/under_2003_Act/regulation47/PDF_Regulation_Cogeneration.pdf, 2010.
- West Bengal Electricity Regulatory Commission (WBERC). WB (Part 1)/2013/SAR-104. Available at: http://mnre.gov.in/file-manager/UserFiles/Grid-Connected-Solar-Rooftop-policy/West_Bengal_ERC_Notification_2013.pdf, 2013.
- West Bengal Green Energy Development Corporation Ltd (WBGEDCL). Expression of interest. Available at: <http://www.wbgedcl.in/wp-content/themes/wbgedcl/images/pdf/eoi-rpsgp.pdf>, 2010.
- West Bengal Green Energy Development Corporation Ltd (WBGEDCL). Expression of interest. Phase 1 and 2. Available at: <http://www.wbgedcl.in/wp-content/themes/wbgedcl/images/pdf/eoi-phase2.pdf>, 2012 <http://www.wbgedcl.in/wp-content/themes/wbgedcl/images/pdf/eoi-phase1.pdf>.
- Wijen F, Ansari S. Overcoming inaction through collective institutional entrepreneurship: insights from regime theory. *Organ Stud* 2007;28(7):1079–100.
- Wirth S, Markard J, Truffer B. Informal institutions matter: professional culture and the development of biogas technology. *Environ Innov Societal Chang* 2013;8:20–41.
- Yenneti K. What makes Gujarat a hotspot for solar energy investments? *Curr Sci* 2014a;106(5):10.
- Yenneti K. Social justice and solar energy implementation: a case study of Charanaka Solar Park, Gujarat, India. University of Birmingham; 2014b [Available at: <http://ethos.bl.uk/OrderDetails.do?uin=uk.bl.ethos.619347>].
- Yenneti K. Industry perceptions on feed in tariff (FIT) based solar power policies – a case of Gujarat, India. *Renew Sustain Energy Rev* 2016;57:988–98.
- Yenneti K, Day R. Procedural (in)justice in the implementation of solar energy: the case of Charanaka solar park, Gujarat, India. *Energy Policy* 2015;86:664–73.
- Yenneti K, Day R. Distributional justice in solar energy implementation in India: the case of Charanka solar park. *J Rural Stud* 2016;46:35–46.
- Yin RK. Case study research: design and methods. London: Sage; 2009.
- York J, Hargrave T, Pacheco D. Converging winds: logic hybridization in Colorado wind energy field. *Acad Manage J* 2016;59(2):579–610.