

Challenging institutional constraints in emerging contexts: Towards a typology of actor strategies for overcoming barriers to energy transitions in India

Draft paper for the International Sustainability Transitions Conference 2018, Manchester

Suyash Jolly ¹, R.P.J.M. Raven ²

¹ Department of Human Geography, Lund University

Email: suyash.jolly@keg.lu.se, suyashjolly611@yahoo.co.in

² Copernicus Institute of Sustainable Development, Utrecht University, Utrecht, The Netherlands

Email: R.P.J.M.Raven@uu.nl

Abstract

The sustainability transitions literature has discussed the notion of institutionalization of promising niches, but there is a limited understanding of the heterogeneity involved in the process regarding opposing coalitions of different actors supporting a niche and contested power relationships between them. In the context of emerging economies, the contested power relationships between heterogeneous coalitions of actors shaping transition pathways are crucial for the understanding institutionalization of promising niches. There are limited insights on the institutionalization of promising niches and the different forms of experimental institutional strategies which are successful or even less successful in mainstreaming promising niches. In order to address these issues in the literature, the paper develops a typology of three institutional strategies namely: (1) Institutional adaptation focusing on experimenting within institutional constraints and outside institutional constraints in protective spaces; (2) Institutional capacity building focusing on building new indigenous capabilities by drawing on transnational linkages; and (3) Institutional transformation focusing on deliberate attempt at transforming institutional arrangements through discursive battles between heterogeneous actors in forums. Empirically the paper focuses on sustainable energy transition in India and focuses on the development of wind and solar PV energy sector in India. The paper utilizes a qualitative case study approach and draws insights from several archival data sources, 42 semi-structured interviews and participant observations in forums, regulatory hearings and industry conferences collected during field research in India. The paper points to ways of purposefully steering and maneuvering sustainability transitions by using insights from the typology and presents implications for future research in the field of sustainability transitions.

Keywords: Institutional strategies, typology, transitions, sustainable energy, India

1. Introduction

Earlier empirical research in the sustainability transitions literature based on the MLP (Multi-Level Perspective) model provided a good analytical lens for the analysis of long-term socio-technical change (Geels, 2002). However, the MLP model was also criticized for suggesting a simplistic account of socio-technical change, without placing much focus on the role of agency in steering socio-technical change (see Smith et al., 2005; Genus & Coles, 2008; Grin, Rotmans & Schot, 2011; Fünfschilling & Truffer, 2014).

The role of actor strategies and embedded agency has received adequate attention in the sustainability transitions literature with a number of studies suggesting that the emergence and development of novel sociotechnical innovations is a more complex, multi-faceted process that involves strategic action by heterogeneous actors and that is shaped by institutional structures which constrain and enable their actions (Musiolik & Markard, 2011; Farla et al., 2012; Brown et al., 2013). Using a relational perspective, few scholars have highlighted the need for shifting attention away from the notion of proponents and opponents of sustainability transitions as incumbents and challengers. Instead, the need is to move towards a more in-depth understanding of different actors, their strategies and their interests at stake (Garud & Gehman, 2012; Jorgensen, 2012; Bakker, 2014).

Existing conceptualization of sociotechnical transitions using the MLP (Multi-Level perspective) have gradually improved by focusing on the role of agency, power, and politics, the role of incumbents, users, and grassroots movements as well as contested nature of transitions. The conceptualization additions to the MLP have provided new insights about struggles between actors within niches as well as struggles between niche and regime and highly contested nature of socio-technical transitions (STRN, 2017).

Previous studies using the MLP perspective were also heavily focused on historical transitions in developed countries (Schot & Kanger, 2018). In the recent years, the focus has

shifted to contemporary sustainability challenges in developed economies, and a global and transnational understanding of sustainability transitions are thereby highlighting challenges in both developed and developing economies and aggregating lessons from transitions in different regions and countries across the world. A number of studies have explored the role of multi-scalar networks and international linkages and moving towards a better understanding of global innovation systems in supporting and hindering the development of promising niche innovations (Sengers & Raven, 2015; Hansen & Coenen, 2015; Binz & Truffer, 2017).

For instance, according to the MLP, the relative stability of the regime in developing countries is likely to be less stable and in greater flux than developed economies. Resistance by incumbent actors creates lock-in and obstacles in the socio-technical regime (Verbong et al., 2010). Unstable regimes in developing economies create barriers for niche development and often suffer from elite capture, rent seeking, access to limited sources, lack of democratic decision making and patronage from political elites.

Niche development in emerging contexts is more likely to be dependent on support from transnational linkages originating from developed economies. Developing economies rely on developed economies for access to relevant know-how, technologies, financial resources and access to relevant experts for steering sustainability transitions. Further, external and international donor interventions have a lot of power and influence over local development programs in many developing countries (Wieczorek, 2018; Hansen et al., 2018).

Given the fundamental cultural, institutional arrangements and structural differences between developing and developed countries, sustainability transitions are likely to be very different than developed economies (Romijn & Caniels, 2011; Wieczorek, 2018). For instance, there are a lot of concerns about social inequalities, power, and justice issues related to contested nature of development interventions in developing countries resulting due to the

marginalization of weaker and poorer actors in innovation process (Pansera & Owen, 2018). Building upon these debates, the aim of this paper is to develop a more comprehensive perspective on sustainability transitions in emerging economies by developing a more detailed understanding of institutionalization process and emphasize the role of embedded agency, international linkages as well as conflicts and contestations between actors during sustainability transitions (Binz & Truffer, 2017; Binz & Fünfschilling, 2018; Svensson & Nikoleris, 2018).

Empirically, this paper focuses on energy transitions in developing economies as there is an urgent need to understand the unique nature of energy transitions in developing economies as it is different from developed economies. Energy transitions in developing economies are challenging due to contested issues of meeting rapid economic growth targets using fossil fuels along with meeting sustainable development goals.

Energy transitions in developing countries are closely related to issues of sustaining livelihoods, poverty alleviation and challenging established social norms which are responsible for social injustice (Mohr, 2018). India presents fascinating research setting to investigate the role of multiple actors collectively challenging institutional constraints for overcoming barriers to energy transitions. The main research question of the paper is as follows:

Research question: How do actors collectively challenge institutional arrangements in the context of energy transitions in India?

This paper conducts a meta-analysis of five different types of studies conducted earlier by the authors on two technologies, i.e., wind and solar PV energy to develop a more detailed understanding of energy transitions (see Jolly, Romijn & Raven, 2012; Jolly & Raven, 2015; Jolly, Spodniak & Raven, 2016; Jolly & Raven, 2015; Jolly, 2017). The paper is an extension of the first author's doctoral dissertation on energy transitions in India and aims to provide a

more comprehensive perspective on energy transitions (Jolly, 2016) by moving beyond insights gained from individual case studies.

Furthermore, there are limited studies which have attempted synthesis across individual case studies to provide a more robust understanding of overcoming barriers to sociotechnical transitions by looking at the role of distinct strategies such as shielding, nurturing and empowerment (Raven et al., 2016).

Our study employs an exploratory approach and carries out a theoretically grounded reexamination of existing case studies to develop a more comprehensive perspective on sustainable energy transitions. The paper develops a novel typology of institutional strategies in the context of emerging economies. We aim to showcase the usefulness of the typology by illustrating it with suitable empirical examples and the extent to which it complements existing debates and discussions in sustainability transitions literature (see Etzion et al., 2017). Here, we aim to showcase the usefulness of the typology for steering sustainability transitions and for investigating its application in different types of case studies.

The paper contributes to the sustainability transitions literature by developing a typology of collective strategies that actors mobilize to challenge institutional arrangements (Battilana et al., 2009). We highlight a typology of collective institutional strategies: (1) institutional adaptation, focusing on coping with a difficult and highly complex institutional setting through tinkering with institutional constraints and experimenting within such constraints, rather than focusing on radically changing the institutional arrangements; (2) institutional capacity building, focusing on developing indigenous capabilities; and (3) institutional transformation which focuses on institutional transformation, particularly through interactions and discursive battles between heterogeneous actors in forums.

The paper is structured as follows. The paper introduces the key research question in section 1. Section 2 begins with a discussion of institutional approaches in the sustainability transitions literature and outlines the key theoretical argument of the paper. After outlining and discussing the research method in section 3, the paper continues in section 4 by discussing the typology of institutional strategies. Sections 5 and 6 discuss the implications of the typology for steering sustainability transitions, and section 7 concludes the paper. The paper concludes with a discussion of different measures for steering sustainability transitions.

2. Theoretical Background

2.1 Sustainability transitions literature

This paper primarily engages with the growing research community of ‘sustainability transitions’ interested in long-term structural changes in socio-technical systems for a transition to sustainability which offers a more systematic perspective on radical socio-technical change (Geels & Schot, 2010; Markard et al., 2012). The field of sustainability transitions aims to explain both stability and change in rigid and path dependent sociotechnical systems which are due to the presence of highly institutionalized formal and informal rules, routines and practices (Geels & Schot, 2008; Geels, 2010).

Previous studies within this growing body of literature have shown that the transformation of incumbent socio-technical regimes depends on processes beyond the control of novel niches and involves the linkages between niches and regimes for a wider socio-technical transformation (Geels & Raven, 2006; Smith, 2007; Markard & Truffer, 2008). Earlier criticism of the MLP (Multi-Level Perspective) (e.g., Genus & Coles, 2008) stressed the need to move beyond using MLP as a heuristic device to discuss case studies based on secondary data sources (Genus & Coles, 2008). As the MLP (Multi-Level Perspective) received more criticism regarding insufficient attention to a number of issues

such as the simplified representation of niche, regime, and landscape; the role of embedded agency, insufficient attention to practices, power and politics and lack of geographical sensitivity. A number of clarifications and conceptual additions have been made to address the previous criticisms (Geels, 2011; STRN, 2017).

A more specific conceptualization of power and agency in sociotechnical transitions is widely recognized as an important conceptual challenge as a deeper understanding of shifting power relations between actors is considered important for developing a systematic understanding of transitions (Smith et al., 2010; Avelino & Wittmayer, 2016; Kern, 2015). In this respect understanding, the role of incumbents with vested interests is critical. The role of incumbents in defending themselves by using various strategies such as adjusting to pressure from innovative niches by improving performance of incumbent regimes, influencing public policy by lobbying to governments, using advertising and media campaigns and educational programs to defend their interests has been discussed in a number of previous accounts (Geels, 2014a; Smink et al, 2015a; Hess, 2016; Heiskanen et al, 2018).

Scholars have even advocated the need for understanding the interaction between niches and regimes, as well as on contestations within the niche and the role of heterogeneous actors in shaping transitions. Understanding the strategies and interests of different actors involved in transitions, along with the contested power relationships between them is essential for a deeper understanding of sustainability transitions (Elzen et al., 2012; Farla et al., 2012; Diaz et al., 2013). For example, studies have discussed the role of boundary spanning activities in linking niches and regimes and create pressure on socio-technical regimes to open up for change (Smink, 2015b).

Previous studies have argued for moving beyond existing depiction in the Multi-Level Perspective which focused on proponents and opponents of sustainability transitions, i.e., promising niches acting as David against the incumbent regime as Goliath. Transition

scholars have advocated looking at divergent interests and expectations of different actors in conflict with each other within promising niches (Bakker, 2014; Hess, 2014). Therefore, understanding the role of multiple actors such as government, incumbent firms, industry associations, foundations, think tanks, political action committees, government offices, public relation firms, advisory committees, ordinary citizens and NGOs and their different strategies for shaping sustainability transitions is considered an important avenue for future research (Farla et al., 2012; Geels, 2014b).

Fischer & Newig (2016) reviewed the sustainability transitions literature regarding the role of actors in transition process and conceptualization of agency and suggested that actors supporting transitions can be part of multiple categories than just niches and regimes performing different types of roles. Building on these insights other scholars have even developed a typology of four different types of actors namely frontrunners, connectors, topplers and supporters to develop a more refined model of transformative change from earlier conceptualization based on niche and regime (De Haan & Rotmans, 2018).

A key ongoing debate within the literature relates to the significant conceptual overlap between sustainability transitions literature and institutional theory, as the transformation of socio-technical regimes requires the transformation of dominant institutional arrangements, as depicted in institutional theory (Geels & Schot, 2010; Geels, 2011; Geels, 2014b). Multiple discussions have centered around the centrality of institutions (regulative, normative and cognitive) in sustainability transition processes (Geels, 2004; Geels, 2010; Geels, 2014b). The role of agency in socio-technical transitions is considered essential as socio-technical change focuses on deinstitutionalization of incumbent socio-technical regimes (Fünfschilling & Truffer, 2014; Svensson & Nikoleris, 2018).

A number of accounts in transition studies have bridged the gap between concepts in institutional theory such as embedded agency, structure-agency paradox, institutional

entrepreneurship and institutional work and key concepts in sociotechnical transitions literature such as niche and regime (Fünfschilling & Truffer, 2014; Fünfschilling & Truffer, 2016; Binz et al., 2016b). Different scholars have also investigated the role of purposive action of actors in transforming the deeply structured rules associated with sociotechnical regime through different activities such as framing new agenda, lobbying for new regulations, persuasion to public authorities, modifying public perception and creating alternative spaces for institutional change (Fünfschilling & Truffer, 2016; Binz et al., 2016a; Binz et al., 2016b).

More specifically, few accounts have contributed in this direction by discussing the role of incumbent firms in sustainability transitions and provide new insights into niche-regime interactions. Incumbent firms influence public policy through distinct strategies such as engaging with policymakers, conveying messages through lobbying, presenting research reports and position papers and developing new technical standards. Incumbent firms influence their institutional environment to promote their interests and countering regulatory change which might harm their long-term interest (Smink et al., 2015a; Smink et al., 2015b).

In recent years, theory development in the field of transition studies has shown some interesting trends regarding improving the explanatory capacity of the MLP by focusing more on some key issues. One of the important trends relates to the role of actors in maintaining and challenging regimes and understand conditions under which actors can break away from rigid institutional structures instead of just reproducing and creatively interpreting existing rules (Fünfschilling & Binz, 2018; Svensson & Nikoleris, 2018).

Despite some promising studies, there is still a need for more research on the relationship between the transformation of dominant institutional structures and the strategic actions of actors to better understand sustainability transitions (Fünfschilling & Truffer, 2016). To better address, the issue of institutional change in sociotechnical transitions, the

next section focuses on discussing insights from institutional theory and organization studies to enrich sustainability transitions (Fünfschilling & Binz, 2018).

2.2 Institutional strategies for steering sociotechnical transitions

Institutions comprise of formal institutions such as laws and regulations, informal institutions such as norms and value systems and cultural cognitive institutions such as shared binding expectations and common beliefs which together provide stability to the social system. The new institutional theory has put forward the idea that organizations are not passive recipients of institutional environment as actors are always challenging the institutional environment than merely adapting to the constraints imposed by the institutional environment (Garud et al., 2007; Abdelnour & Hasselblad, 2017).

The collective institutional entrepreneurship literature focuses on overcoming collective inaction by developing collaborations between heterogeneous actors for transforming institutional arrangements. Institutional change emerges as a result of distributed and collective action between multiple actors including firms, government, social movement organizations. These actors induce institutional change by engaging in political activities, influence policymakers, campaigning, lobbying, developing position papers and influencing the general public (Hargrave & Van de Ven, 2006; Walker, 2014).

The notion of collective institutional entrepreneurship helps to shift the focus away from existing conceptualization focused on hyper-muscular, heroic efforts of institutional entrepreneurs who challenge established institutional arrangements, as well as passive actors who feel constrained by dominant institutional arrangements with no hope of challenging them (Wijen & Ansari, 2007; Aldrich, 2010; Greenwood et al., 2015). Using a path creation perspective, few studies have emphasized the role of distributed agency in the emergence of novel innovations as dominant institutional arrangements are not always constraining but allow actors to challenge them as well (Karnøe & Buchhorn, 2008; Garud, Kumaraswamy &

Karnøe, 2010; Karnøe & Garud, 2012).

A significant turn in institutional theory is with respect to its relevance for understanding grand societal challenges such as climate change, poverty alleviation, energy transition and reduction in income inequality as institutional change is far more complex and challenging for finding solutions to grand challenges (Ferraro et al., 2015; Purtik & Arenas, 2017). Recent developments in institutional theory have also focused on institutional strategies in the context of emerging markets which face challenges such weak regulatory environment, corruption and rent-seeking practices and weak infrastructure. In such conditions, actors are likely to adopt different kinds of strategies for challenging the institutional environment than in developed economies (Marquis & Raynard, 2015).

In the context of developing economies, it can be difficult to transform deeply entrenched patterns of inequality and institutionalize alternative institutional arrangements through purposive action due to powerful elites who may be against social change (Khan et al., 2007). Developing economies are characterized by institutional voids which refer to the absence of formal institutional arrangements which impede the proper functioning of markets and raise transaction cost for business (Marquis & Raynard, 2015). Often efforts aimed at social change might provide limited opportunities for excluded groups. Excluded actors create suitable spaces where transforming rigid institutional arrangements can be pursued alongside pursuing their day to day agendas for more facilitating more long-term social impact (Mair et al., 2016).

Furthermore, scholars have focussed on understanding how actors mobilize resources through bricolage to manage formal and informal institutional constraints in the context of emerging economies. To cope with such difficult conditions, actors rely on informal institutions, norms, and customs to create new opportunities and offset the presence of institutional voids. They develop solutions by a careful consideration of the local

institutional context and look at the challenges using a frugal mindset (Jain & Koch, 2016). By adopting new practices, actors engage in organizational ingenuity which refers to the ability to develop innovative solutions using limited resources and creative problem solving within the constraints imposed by the institutional environment. For example, actors develop multi-stakeholder partnerships, develop specialized products and services to develop new niche markets, reject existing institutionalized norms and values and mobilize new resources to initiate institutional change (Lampel et al., 2014; Walker et al., 2014).

Marquis & Raynard (2015) developed a typology of institutional strategies in the context of emerging economies. The strategies include relational strategies involve networking efforts for maintaining relationships with different actors. Infrastructure-building strategies focus on developing missing infrastructure, and socio-cultural bridging strategies focus on socio-cultural issues. By developing a typology of institutional strategies in emerging contexts, the study moves away from a top-down passive conceptualization of institutions to a more empirically grounded bottom-up driven conceptualization where actors are influencing their institutional environment (Marquis & Raynard, 2015).

Based on these conceptual insights, the overall goal of this paper is to contribute to a better understanding of institutional strategies in the context of emerging economies and the manner in which actors engage in collective action to influence transformative change. The paper considers a microanalytic focus to understand better how actors improvise new solutions to cope up with dominant institutional arrangements in the context of developing economies. By doing so, the paper develops a better understanding of institutional strategies; actors utilize to navigate the institutional environment which constrains them reflexively. The next section discusses the research method utilized in the paper.

3. Research method

Given the explorative nature of the study, this paper involves a qualitative case study approach as it is helpful for studying long-term innovation process and carrying out an in-depth investigation of a phenomenon. A case study approach is also useful for flexible data collection and analysis while being open about unanticipated developments during the research process (Eisenhardt & Graebner, 2007; Yin, 2009).

The research question addressed in this paper demanded qualitative case study approach which is helpful in understanding the strategies of different actors in a rapidly changing institutional environment (Greenwood & Suddaby 2006). Case study approach is also useful for immersing through data collection through field research which often leads to research in new and unpredictable directions based on insights gained from field observations (Gehman et al., 2017).

3.1 Case study

We draw insights from five prior studies on energy transitions in India conducted before by the author as a part of his doctoral research (Jolly, 2016). The first study among the five studies includes analysis of five social enterprises providing off-grid solar PV solutions to disadvantaged people without energy access in India. This study develops a broad classification of different upscaling dimensions of promising business model experiments in India and emphasizes the importance of institutional innovation for sustainability transitions (Jolly, Romijn & Raven, 2012). The next study focuses on the role of collective institutional entrepreneurship in the development of wind energy in India (Jolly & Raven, 2015).

The third study focuses on comparing wind energy development in India and Finland by highlighting the role of multiple actors shaping wind energy development in the two nations. The next study focuses on comparing differences in implementation of

grid-connected solar PV energy in two Indian states (Gujarat and West Bengal) by discussing the role of three key actors: government officials within regional government, regional regulatory agencies and regional industry associations (Jolly, 2017). Finally, the last study analyses two important points of debates associated with solar PV energy during the National Solar Mission in India related to stimulating domestic capabilities and efficiently using public financing mechanisms by following narratives of different actors in conferences and forums (Jolly & Raven, 2016). Together insights from these individual case studies.

3.2 Data collection

For data collection, we used multiple data sources such as archival data, semi-structured interviews with 42 wind and solar PV energy experts in India and participant observations in industry conferences and forums. The empirical data used in the paper was collected during two research visits to India in the year 2012 and 2013 for a total period of 9 months. An adequate amount of desk-based research was carried out before the fieldwork in India which was useful in identifying expert interviewees for the research. The data collected in this paper covers important developments in the Indian solar PV energy and wind energy sector up to the year 2015 and does not cover new developments and initiatives in the solar PV and wind energy sector in the recent years.

Archival data sources

This paper utilizes a variety of archival data sources such as existing policy and regulatory documents, reports from industry associations, academic books, reports from research institutes and universities, journal articles, doctoral thesis, minutes of meetings, presentations (e.g. discussions by experts during conferences and workshops), newspaper articles, media reports, publications by consulting organizations and trade magazines. The availability of publically available data sources made it possible to gather a large quantity of high-quality

data for carrying out the data analysis (Yin, 2009). We regularly maintained the archival data sources in digital folders and prepared a summary of the insights gained from the different archival documents. We regularly maintained the archival data sources collected in specific digital folders and prepared summaries of relevant insights for the case studies from the vast amount of data collected.

Semi-structured interviews

We utilized semi-structured interviews for data collection in this paper, as they are useful for obtaining retrospective as well as real-time information about strategies of different actors while emphasizing their lived experiences. Semi-structured interviews are also useful for obtaining information about the key decision-making process of actors through their personalized experiences and the manner in which they overcome social and institutional barriers for bringing out change (Langley & Abdallah, 2011).

The paper is based on insights from 42 semi-structured interviews with a range of representatives from wind and solar PV energy firms, consultants, manufacturers and project developers, professors in universities, scientists in research institutes, industry associations, government organizations, energy utilities, industry associations, regulatory commissions, advocacy organizations, civil society groups, NGOs, lobbying organizations and social enterprises.

The interviews were conducted over a period of 2 years, i.e., four months in 2012 and five months in 2013 as a part of author's doctoral dissertation. The selection of interview experts was based on criteria such as long-term experience in the solar PV and wind industry, professional expertise, mentions in media debates and newspaper articles and recommendations by other experts. In cases where personalized face-to-face interviews were not possible or the interviewees were not comfortable in recording the interviews, different arrangements were made such as carrying out telephonic interviews and writing down the

important points during the interviews. The recorded interviews were not formally transcribed but were documented carefully for important insights mentioned in the interview.

Participant observations in forums

Events such as regulatory hearings, industry conferences were also used as data sources as they are used for rich data collection to capture lived experiences of multiple actors discussing, debating and negotiating during the events (Schüßler et al., 2015; Zilber, 2014). Participant observations were carried out in a few industry conferences, regulatory hearings, and workshops for data collection for this paper. During the field research in India, we visited industry conferences such as SOLARCON India, Future of Solar Energy in India, regulatory hearings by state electricity regulatory commissions such as TNERC (Tamil Nadu Electricity Regulatory Commission) and APERC (Andhra Pradesh Electricity Regulatory Commission) and a workshop on the formulation and implementation of low-carbon policies in the electricity sector.

While attending the events, field notes were prepared by listening to the main discussions during the events. In addition to the field notes, photographs, audio and video recordings of the presentations made by experts and discussions between them during the plenary and discussion sessions. After the events, we also tracked down media coverage of the events in industry magazines, online sources and newspapers to prepare a summary report of the events.

3.3 Data analysis

Qualitative research approaches often result in unstructured and a large amount of data during the collection phase which needs to be analyzed to find meaningful patterns in the data. In this paper, raw data from the archival sources, semi-structured interviews, and observations in forums was first summarized by reading it in detail and picking out relevant theoretically informed patterns in the data and then making broader interpretations of the data (Reay,

2014). In practice, data analysis involved a highly iterative process moving back and forth between summarized data and theoretical perspectives to develop a rich case narrative (Gehman et al., 2017). During this iterative process, the analysis focuses on making sense of the emergent data by developing a theoretical framing of the empirical findings and constantly seeks better explanations of the data (Klag & Langley, 2013).

Efforts were made to rule out alternative interpretations, revise the insights gained from ongoing data analysis and develop a theoretically informed case narrative. Based on the data analysis, we propose a simple typology of three overarching collective institutional strategies used by actors in attempting to shape the development of wind and solar PV energy in India. These strategies include (1) Institutional adaptation; (2) Institutional capacity building; and (3) Institutional transformation.

The three strategies are as follows: (1) Institutional adaptation focusing on experimenting within and outside institutional constraints in protective spaces; (2) Institutional capacity building focusing on building new indigenous capabilities by drawing on transnational linkages; and (3) Institutional transformation that focuses on deliberate attempts to transform institutional arrangements through discursive battles between heterogeneous actors in forums. In the next section, we discuss these strategies in more detail.

4. Typology of institutional strategies

The first institutional strategy (Institutional adaptation) focuses on coping with a highly complex institutional setting through tinkering and experimenting within institutional constraints to develop novel solutions within a protective space, rather than focusing on radically changing the institutional context. Institutional adaptation focuses on balancing tinkering within institutional constraints and gradually changing institutional context. The strategy, therefore, involves working in protective spaces outside the mainstream institutional arrangements to avoid institutional constraints.

The second strategy (Institutional capacity building) focuses on building new indigenous capabilities, by drawing on support from transnational linkages but reducing the need for excessive dependence on such linkages to avoid elite capture and rent-seeking practices. The third strategy (Institutional transformation) focuses on institutional transformation by challenging dominant institutional arrangements by facilitating interactions and discursive battles between heterogeneous actors in forums. The table below describes the three strategies

Table 4.1: Typology of institutional strategies (Source: Jolly, 2016)

Institutional strategy	Description
Institutional adaptation	Tinkering within institutional constraints to develop workable solutions by conforming to institutional constraints and experimenting within a protective space; coping with institutional constraints through pragmatic thinking and deliberate practical strategies for initiating small and gradual changes
Institutional capacity building	Developing indigenous institutional capacity; by drawing upon from transnational and cross-border linkages such as actor networks, knowledge networks, finance, relevant professional expertise and capabilities developed in different institutional contexts; developing long-term indigenous innovation capabilities by relying on transnational linkages in the short term
Institutional transformation	Deliberately challenging and changing dominant institutional arrangements through discursive struggles and power plays between multiple actors; for example, through negotiations and contestations in concrete social settings; creating participatory avenues for the involvement of all concerned stakeholders with different access to power and expertise; developing avenues for participatory decision making in the short term but ensuring that too much focus on participatory approaches should now slow down decision making

The typology allows us to identify similarities and differences between different strategies actors utilize to overcome barriers to energy transitions. Now we present illustrative examples of the three different institutional strategies.

4.1 Institutional adaptation

The first strategy, institutional adaptation focuses on ways in which actors practically cope and tinker with dominant institutional constraints to meet specific goals without the ambitions of purposefully challenging dominant institutional arrangements. Institutional adaptation is also about actors trying to develop workable solutions while being aware of the limits of their influence in steering institutional change. Furthermore, actors manage to adapt to and co-evolve with partially reconfigured institutional arrangements, or in protective spaces away from dominant institutional arrangements, rather than radically transforming them.

For example, the social enterprise SELCO took into account the local institutional and power structures in rural India while developing solar PV energy solutions. SELCO devised appropriate solutions for providing affordable and high-quality solutions energy solutions to the rural and urban poor who were primarily dependent on kerosene for meeting their energy needs (Jolly, Romijn & Raven, 2012). The team of SELCO spent considerable time learning in the field from farmers, urban vegetable vendors, women workers and rural off-grid households about their day to day energy usage practices, daily practices, their income level and cash flows for determining the appropriate payback mechanism.

SELCO spend considerable time tinkering with the business model on the ground, selecting and training local energy entrepreneurs, maintaining installed energy systems at client's residence or business as well as developing a network of relationships with rural banks for financing the micro-enterprises and for providing energy services to customers. Providing financing to poor customers required small tweaks in banking rules so that the banks could provide loans to poor customers. In particular, SELCO devised financing solutions for poor customers by taking their income into account and devised an appropriate payback mechanism for them. SELCO acted as bank guarantor for many loans taken by rural poor. In doing so, SELCO managed to tinker with local institutional norms and rural

financing rules, designing affordable solutions for poor customers. By carefully tweaking with the institutional norms, SELCO managed to provide energy services to excluded and disenfranchised people through creative problem solving and institutional adaptation (Jolly, Romijn & Raven, 2012; Prabhu & Jain, 2015).

Another empirical illustration of the strategy institutional adaptation is the development of grid-connected solar PV energy in Gujarat where the head of the State Energy Department along with other solar PV stakeholders in Gujarat managed to tinker within institutional constraints (Jolly, 2017). The principal energy secretary in Gujarat, D. J. Pandian, coordinated the actions of different actors in the state for mobilizing political support for solar PV, brokering information between state-level political elites and creating legitimacy for solar PV in Gujarat.

Despite the constraints associated with financing solar PV in India and the reluctance of the Indian financial institutions in financing projects, he was instrumental in reducing the negative perception of financial risk among financial institutions and banks by explaining them about the long-term benefits, convincing them to fund solar projects in the state and to trust the project developers who were implementing the projects. The principal secretary played a pioneering role in reducing ongoing bureaucratic constraints for solar PV project developers by facilitating access to land to set up solar PV projects, mobilize financing for their projects by setting up linkages with international financial institutions such as ADB and World Bank and resolving project developers' problems through several meetings, while implementing their projects.

Similarly, the Solar Association of Gujarat utilized institutional adaptation to mobilize finance for solar PV project developers by facilitating linkages between the banking and financial institutions and project developers, in spite of the financial risks and uncertainties associated with financing solar PV projects. The solar association collectively mobilized

project developers and investors in Gujarat and helped them to resolve ongoing policy and regulatory issues, negotiate benefits for them from the government agencies and reduce bureaucratic constraints for facilitating project implementation (Jolly, 2017). In sum, institutional adaptation, which involves the tinkering of and within institutional constraints.

4.2 Institutional capacity building

The second institutional strategy focuses on building new indigenous institutions and capabilities, in particular by drawing on transnational linkages. The strategy institutional capacity building is illustrated by the fact that in the 1980s and 1990s, Indian wind energy firms were dependent on Danish and German governments and led firms for access to technologies and relevant know-how to gain indigenous capabilities for developing an Indian wind energy sector. A key strategy of the Indian government in this period was to encourage joint ventures and financial and technical collaborations with foreign firms and international organizations (e.g., DANIDA: Danish International Development Agency) for developing demonstration programs to stimulate the development of wind energy.

In the recent years, a number of international networks and organizations such as the Global Wind Energy Council (GWEC), EU India Wind Energy Network (EIWIN), International Renewable Energy Agency (IRENA) and World Wind Energy Association (WWEA) helped in creating advocacy for wind energy development in India, by translating learning experiences in the form of best practice guidelines from other developed as well as developing economies (Jolly & Raven, 2015).

The Indian wind energy firm Suzlon also utilized institutional capacity building to develop indigenous innovation capabilities and become the first Indian firm to achieve global competitiveness, in a relatively short period. However, over the year's other Indian wind turbine manufacturers have been highly dependent on gaining access to relevant knowledge from foreign wind firms. Indian firms have relied on global wind energy firms for access to

high-value wind turbine components, and have struggled to develop capabilities for indigenous research and development for low wind speed conditions in India (Jolly & Raven, 2015; Jolly, Spodniak & Raven, 2016).

Another illustration of the institutional capacity building is the actions taken by the Gujarat government in drawing support from transnational linkages to obtain access to low-cost finance for solar PV projects in the state from international organizations such as IFC (International Finance Corporation) and ADB (Asian Development Bank). These linkages were crucial in developing an emerging ecosystem of solar PV energy in Gujarat. On the other hand, such linkages were limited in West Bengal, which limited the deployment of grid-connected solar PV energy. The fact that Gujarat mobilized support from transnational linkages and was successful, along with West Bengal's limited mobilization, suggests that such linkages are crucial for the successful deployment of innovations in a specific region and are an essential institutional strategy (Jolly, 2017). Summarizing, institutional capacity building

4.3 Institutional transformation

The third strategy institutional transformation focuses on the role of events such as conferences, meetings, and forums in acting as arenas for collective learning and for facilitating consensus between actors engaged in power plays and discursive struggles.

Wind energy firms and associations have used public hearings organized by regulatory agencies and ministries and engaged in discursive struggles for introducing supportive policies and regulations and resisting the efforts of the incumbent utilities. For example, different wind energy associations in India such as the Global Wind Energy Council, Indian wind turbine manufacturers association have worked collectively to disseminate information about needs and demands of the industry in different wind industry forums (such as WE2020), with the purpose of creating legitimacy for wind energy among

policymakers and attempting to transform critical policy and regulatory bottlenecks (Jolly & Raven, 2015; Jolly, Spodniak & Raven, 2016).

For instance, forums have played an important role in facilitating discursive struggles between different actors for the development of wind energy in India related to use of specific policy incentives such as AD (accelerated depreciation) throughout the development of wind energy in India. There were significant tensions between one set of stakeholders (wind energy associations, medium- and small-scale industries, wind turbine manufacturers) supporting the re-introduction of AD (accelerated depreciation tax) benefits, while another set of actors (Indian government, Ministry of New and Renewable Energy, Ministry of Finance, independent wind power producers, civil society organizations) considered the re-introduction of AD benefits as harmful for the long-term development of wind energy in India.

The Accelerated Depreciation (AD) incentive for wind energy was introduced by the MNES (Ministry of Non-conventional energy sources) in the 1980's as a tax incentive for supporting wind energy. The AD incentive attracted small-scale investors such as cement, steel, automotive, smelting, and textile industries for investing in wind energy as it substantially provided captive energy for meeting their energy needs and also gaining tax benefits. Despite the benefits of the AD tax benefit for supporting wind energy in India, investors misused the incentive often resulting in the installation of poor quality wind turbines. The investors mostly cared about getting tax benefits rather than focusing on improving the operational efficiency of wind turbines. MNES was worried that provision of the accelerated depreciation (AD) benefit could lead to a gold rush situation creating speculative investors in the longer run.

In the subsequent years, the government of India particularly the Ministry of Finance and MNRE (Ministry of New and Renewable Energy) started viewing the AD incentive as problematic due to lower efficiency in tax collection, excessive profits to small-scale investors, and lower efficiency of wind turbine installations. The Ministry of Finance refocused its effort on introducing the Generation Based Incentive (GBI) scheme in 2009 to support independent wind power producers and shift the focus of the industry from captive generation to IPP (Independent Power Producer) business model.

A set back to the Indian wind industry occurred when the AD and GBI schemes were discontinued in April 2012 which resulted in significant reduction in installed capacity for wind energy in India. Removal of these incentives led to repeated requests, petitions, advocacy, and lobbying efforts from the wind industry associations and wind energy turbine manufacturers as the wind industry started facing considerable financial losses and limited growth opportunities. The Wind Independent Power Producers' Association in India lobbied against the reintroduction of the AD tax benefit as the association supported the IPP business model which would focus more on actual wind energy generation to avoid speculative investors in future (Jolly & Raven, 2015).

The Indian Wind Power Association, Indian Wind Turbine Manufacturers Association, the Federation of Indian Micro, Small and Medium Enterprises (FISME) and the Indian Wind Energy Association worked together to support the re-introduction of the AD tax incentive through agenda setting and lobbying the government to consider their requests. They collectively demanded the reintroduction of the tax benefit by highlighting the benefits of the incentive such as employment opportunities, financial benefits to small-scale investors and long-term development of wind energy in India. The concerns made by them were highlighted in some industry forums, regulatory hearings, and meetings with the policymakers. After significant lobbying efforts by the different organizations supporting the

AD tax incentive, the interest's groups were able to reinstate the AD and GBI incentives (Jolly & Raven, 2015; Jolly, 2016).

Another empirical illustration of the strategy institutional transformation is the role of industry forums in stimulating collective learning between actors, raising critical issues in media and resolving ongoing policy concerns of industry actors engaged in wind energy development in India. Such forums have played an essential role in resolving critical problems related to land issues, and project developments in remote areas in forests, villages and agricultural lands.

However, these forums have also not been instrumental in resolving all the concerns of all the stakeholders. For example, the wind energy developers have often not paid adequate attention to consultation processes for project development with the local population, local panchayats and village-level bodies. Lack of consultation mechanisms resulted in local institutional conflicts such as land grabbing, false, unmet promises of local development by wind energy firms and negative environmental impacts resulting from wind energy projects.

Despite the advocacy efforts, civil society groups and advocacy organizations in India have found difficulties regarding transforming wind energy policies and regulations. Civil society groups that are invited for commenting and deliberating in public forums have faced the challenge of moving beyond mere consultation and participation in public forums organized by government and regulatory agencies to have an actual impact on the decision-making process (Jolly & Raven, 2015; Jolly, Spodniak & Raven, 2016).

An empirical illustration of the strategy institutional transformation seen in the solar PV industry is the role of events (e.g., SOLARCON India and Future of Solar Energy in India) which were deliberately organized to try to transform the institutional context for solar PV in India. The events were aimed at discussing key issues such as the development of an indigenous solar PV manufacturing ecosystem in India to improve international

competitiveness and using mechanisms such as domestic content requirement and anti-dumping duties for supporting Indian solar PV manufacturers. The domestic content requirement was introduced as a result of lobbying by domestic solar PV manufacturers in India as they were facing considerable problems due to a weak level of productivity, low levels of capabilities and competition from international manufacturers (Jolly & Raven, 2016).

The government agency, MNRE (Ministry of New and Renewable Energy) was in favor of introducing domestic content requirements to promote interests of domestic solar PV manufacturers and for creating an emerging ecosystem in India. Subsequently, problems occurred when, one group of actors (domestic solar PV manufacturers, Indian Solar Manufacturers Association, solar industry associations, government agency MNRE) supported the introduction of domestic content requirement (DCR) and anti-dumping duties to protect creation of vibrant solar PV manufacturing ecosystem in India, while the other group of actors (solar PV project developers, National Solar Energy Federation of India, civil society organizations, WTO, US government) was not in favour of these measures.

The latter group was of the opinion that the measures such as domestic content requirement and anti-dumping duties might not result in the development of long-term indigenous capabilities for domestic manufacturing and that they might even result in rent-seeking activities. Introducing domestic content requirement was considered problematic by the latter group of actors in terms of restrictive trade practices, denying Indian solar PV project developers in accessing high quality modules from global sources, provide bulk of the benefits to few large domestic PV solar manufacturers and also increase electricity costs for Indian consumers (Jolly & Raven, 2016).

5. Discussion

Taken together, the empirical case studies discussed in the paper highlight three institutional strategies useful for steering sustainability transitions. These collective institutional strategies include: (1) Institutional adaptation focusing on experimenting for novel solutions within institutional constraints in protective spaces; (2) Institutional capacity building focusing on building new indigenous capabilities by drawing on transnational linkages; and (3) Institutional transformation focusing on deliberate attempt at transforming institutional arrangements through discursive battles between heterogeneous actors in forums. Now we highlight the extent to which the institutional strategies contribute to relevant debates in the sustainability transitions literature.

5.1 Institutional adaptation

Institutional adaptation resonates with the previous approaches in the transitions literature, which argued for the importance of gradually developing and removing partial and temporal protection against mainstream regime-selection pressures (Kemp et al., 1998; Smith & Raven, 2012; Raven et al., 2016). This strategy links to existing debates in the sustainability transitions literature for nurturing promising solutions in protective spaces and removing the protective spaces appropriately through strategies such as shielding, nurturing and empowering and using outward-oriented strategies for challenging the dominant socio-technical regimes (Raven et al., 2016).

Institutional adaptation is also linked to the recent discussions in the sustainability transitions literature on the focus on grassroots and inclusive innovation approaches which emphasize creative problem solving by paying attention to local power and institutional structures and meeting needs of the excluded rural and urban poor (Wieczorek, 2018).

Institutional adaptation points to creating more open, revisable, experimental and learning spaces for articulating new agendas, multiple pathways and constantly learning from failures

(Schot & Steinmuller, 2016; Kuhlmann & Rip, 2018).

The strategy institutional adaptation also resonates with the debates on creative problem solving by entrepreneurs in resource-constrained environments through trial and error learning with the aim of challenging the established rules and constraints for serving the poor (Shepherd et al., 2017). Institutional adaptation links to the role of creative, ingenious and inclusive approaches for providing people with access to innovative products and services living outside the formal economy. These ingenious approaches are important as they utilize pragmatic action and flexible mindset to find solutions to social problems, minimum use of resources and focus on inclusive solutions by including excluded groups and meeting actual needs of the users (Prabhu & Jain, 2015).

5.2 Institutional capacity building

Theoretically, institutional capacity building relates to existing debates in the transitions literature on the development of local and global niches (Geels & Raven, 2006; Smith & Raven, 2012) and to the numerous discussions on the role of transnational linkages and the manner in which the development of niches is dependent on wider global and international technology, markets and resources networks (Raven et al., 2012; Wieczorek, 2015a; Wieczorek et al., 2015b; Sengers & Raven, 2015).

According to these debates, promising sustainability experiments and niches are embedded in global flows of knowledge, financial resources, expertise in which promising local niches not only draw help from national linkages but international networks to a large extent as well (Hansen et al., 2018; Wieczorek, 2018). The transnational linkages are crucial for the development of promising niches as they complement technological know-how, finance, expert knowledge and relevant capabilities for the development of sustainable technologies in developing countries (Gosens et al., 2014; Hansen & Ockwell, 2014; Binz et al., 2016a).

The proposed second institutional strategy resonates with the recent insights on the development of new industrial paths in emerging economies by transplanting necessary knowledge, markets, skill set, legitimization dynamics and financial resources from international sources to develop a fully-fledged local innovation system (Gosens et al., 2015; Binz et al., 2016a). Firms in developing economies are often at the forefront of creating new industries and new technological capabilities with the help of national government which is unrelated to the existing knowledge base and skills, technological capabilities of the region or nation by utilizing transnational linkages. They creatively combine existing skills and capabilities already present in the nation with globally available resources to develop new industries (Hansen & Ockwell, 2014; Binz & Anadon, 2018).

Furthermore, institutional capacity building links to recent discussions on the development of new industries in emerging economies. In prominent emerging economies like China, studies have shown that entrepreneurs and firms shaped the development of solar PV industry in China by developing their capabilities and establishing their legitimacy by drawing support from international linkages. The domestic solar PV entrepreneurs build their legitimacy by aligning their actions with established norms and values and gradually modified the existing institutional norms by drawing support from transitional linkages (Zhang & White, 2016).

Institutional capacity building also resonates with recent debates on new path development in a global context. According to these debates, new path development in developing countries is shaped by strategic activities such as building of stable knowledge pipelines through mergers and acquisitions, long-term technological licensing activities between firms as well as the role of supportive initiatives by a range of actors (national governments, transnational corporations and entrepreneurs, international NGO's, consultancy

firms, technology technocrats, professional associations and international donors) (Binz et al., 2016b; Binz & Truffer, 2017; Fünfschilling & Binz, 2018).

5.3 Institutional transformation

The strategy institutional transformation contributes to the sustainability transitions literature by highlighting the heterogeneity of actors within niches specially the opposing coalitions of actors collaborating and contesting with each other on specific issues, and the contested power relationships between them. The third institutional strategy considers taking a more balanced perspective by not emphasizing a simple dichotomy between niches and regimes which has been stressed a lot in earlier sustainability transition studies.

Theoretically, the third institutional strategy in the typology relates to existing debates in the sustainability transitions literature on the negotiations and coalition building between actors in forums for the development of shared cognitive rules (Garud & Gehman, 2012; Geels, 2014b), and linkages between niches and regimes and the work carried out by hybrid and intermediary actors in developing and maintaining such linkages (Elzen et al., 2012; Diaz et al., 2013; Kivimaa, 2014).

The third institutional strategy thus provides insights into niche-regime interaction, which has repeatedly been coined as an important element in the sustainability transitions literature (Smith et al., 2010; Geels, 2011; Diaz et al., 2013), along with the transformation of stable institutional arrangements associated with sociotechnical regimes (Geels, 2004; Fünfschilling & Truffer, 2014). Another important area which institutional transformation relates to is the politics of sustainability transitions regarding the concrete discursive arguments mobilized by heterogeneous actors including weaker actors such as ordinary citizens and users for securing their interests and shaping sustainability transitions. (Raven et al., 2016; Chilvers & Longhurst, 2016).

In addition to the debates in the sustainability transitions literature, the third institutional strategy also resonates with the discussions on the role of settlements between multiple actors in conflict with each other which address grievances and disputes between conflicting actors for conflict resolution and to seek a solution which is acceptable to the conflicting actors (Garud, 2008; Helms & Oliver, 2016; Garud et al, 2018).

Institutional transformation is also linked to the notion of encouraging robust action strategies such as participatory architecture, multivocal inscription, and distributive experimentation. The robust action strategies allow diverse and varied actors to interact together for keeping future options open and resolve ongoing conflicts between heterogeneous actors by constantly learning from failures (Ferraro et al., 2015; Etzion et al., 2017; Gehman et al., 2018).

6. Implications of the typology for steering sustainability transitions

In sum, the three strategies identified here are (1) institutional adaptation; (2) institutional capacity building; and (3) institutional transformation. The typology, which is based on empirical insights from different case studies is useful for policymakers and practitioners to look at different ways of collectively maneuvering complex transition processes. These strategies represent how Indian actors collectively engaged in institutional dynamics in the fields of wind energy and solar PV energy. However, the research also suggested that the three collective strategies found mixed success.

The three institutional strategies discussed in this paper complement each other and require adequate coordination between one another, and successful outcomes might not be achieved by only focusing on one of the institutional strategies alone. While this research was not explicitly concerned with determining the contextual conditions for explaining success and failure, we propose an explorative and simplified representation of the conditions and the

ongoing dilemmas and failures for stimulating transitions through the strategies identified in the paper. The table (6.1) below highlights these issues

Table 6.1: Institutional strategies, ongoing dilemmas, and means of steering sustainability transitions (Source: Jolly, 2016)

Institutional strategy	Contextual conditions	Ongoing dilemmas and failures related to the institutional strategy	Means of facilitating sustainability transitions
Institutional adaptation	Tinkering, muddling with institutional constraints for developing workable solutions with focus on attaining achievable goals	Reduced focus on radical institutional transformation and create incentives for rent-seeking activities	Deploying institutional adaptation strategies in the short term with institutional transformation strategies in the long-term
Institutional capacity building	Development of indigenous innovation capabilities by drawing inputs from transnational linkages	Too much reliance on transnational linkages can result in a reduced focus on indigenous learning; indigenous capacity building measures might go against international free trade regulations ; continuous political support for innovations could result in lack of national competitiveness in the long run	Carefully balancing the need for developing institutional capacity in the short term by drawing upon transnational linkages and developing indigenous capabilities in the long-term
Institutional transformation	Transforming institutions through negotiations in concrete social settings	Risks involved due to the exclusion of less powerful actors in the decision-making process; risks of redundant learning due to too many deliberations and	Deliberative decision making process needs to balance the interests of all concerned actors but also, enable quick decision-making

		discussions; too much focus on participatory learning may slow down the decision-making process, create uncertainty and reduce commitment towards collective goals	without being captured by vested and powerful interests
--	--	--	---

Based on the typology and the explorative, simplified representation of such conditions, along with the ongoing dilemmas summarized in the table above, I discuss three essential lessons for policymakers and practitioners. The summary presented in the table informs three important lessons for policymakers and practitioners based on the empirical evidence presented for the three institutional strategies.

6.1 Lesson 1: Policymakers should focus on creating conditions for supporting institutional adaptation in the short term and institutional transformation in the long-term

The first essential lesson from the strategy institutional adaptation is that policymakers need to focus on creating conditions which support institutional adaptation in the short term and institutional transformation in the long term. Policymakers can stimulate protected spaces which allow heterogeneous actors to experiment with alternative solutions away from the scrutiny of the wider public, media controversy and vested interests from incumbents against the novel institutional solution in the short term.

These protected spaces can even include specialized working groups, experimental and collective platforms and specialized forums where powerful actors can work in collaboration with less powerful actors to temporarily develop novel solutions, later

implementing them in the real world by being open to failures. However, in complex institutional settings in emerging economies, actors can become used to institutional adaptation which could reduce motivation for developing stronger institutional arrangements and institutional transformation in the longer run.

6.2 Lesson 2: Policymakers can rely on institutional capacity measures in the short term, but overreliance in the long term is problematic

The second important lesson from the strategy institutional capacity building is that policymakers need to be highly receptive towards global networks of innovation, and frame national policies and regulations for supporting promising innovations by taking them into account. Policy makers need to be sensitive about encouraging transnational linkages for stimulating indigenous capacity building by carefully following selective measures.

Few measures include reducing restrictions on foreign investment such as low-cost finance from international financial institutions, facilitating technology transfer from developed economies, setting suitable tax duties on import of equipment. Other measures include encouraging and cross-border R&D linkages, facilitating knowledge exchange through trade shows, encouraging licensing arrangements between firms and facilitating knowledge-sharing mechanisms through bi-lateral initiatives.

Since building domestic indigenous capabilities is a complex and time engaging process, policy interventions for building them must focus on facilitating transnational linkages in the short term, but the long-term focus should be on stimulating indigenous capabilities. The long-term focus should be on the development of indigenous capabilities through specialized interventions. Policymakers should acknowledge the fact that overreliance on transnational linkages can lead to reliance on foreign agents for access to relevant technological know-how, finance and legitimacy thereby reducing the chances of development of long-term indigenous capabilities.

6.3 Lesson 3: Policymakers should focus on including concerns of excluding voices through institutional transformation, but overreliance could slow down the decision-making process

The third essential lesson from the strategy institutional transformation is while discursive struggles in forums and conferences have been useful in promoting collective learning, they have also had unintended impacts regarding excluding weaker actors and marginalizing their interests. During the drafting, designing and implementation stage of different policy initiatives, the viewpoints of weaker actors such as ordinary citizens, civil society groups, advocacy groups, and users need to be considered adequately.

Policy makers have to ensure that no voices are left unheard in the decision-making process, and even make sure to keep a system of maintaining checks and balances to counteract rent-seeking behavior and vested interests. However, it must be realized that too much focus on the participatory action through institutional transformation might result in a far more complex and slower decision-making process resulting in the implementation of desired policy measures.

7. Conclusion

The paper provides a better understanding of socio-technical transitions by contributing to the recent debates on the micro-foundations of sustainability transitions, which relate to a closer focus on the role of actors and their strategies in shaping transitions in socio-technical systems (Farla et al., 2012; Raven et al., 2016), as well as to increasing the attention given to institutional approaches in sustainability transitions (Füfnichilling, 2014; Füfnichilling & Truffer, 2014; Füfnichilling & Binz, 2018). The typology contributes to recent discussions related to adapting the existing theoretical models in the sustainability transitions literature to unique socio-economic, historical and political contexts of different developing countries (Wieczorek, 2018).

The typology is useful for helping researchers and practitioners in providing evidence-based knowledge and opportunities for experimental intervention for steering sustainability transitions. Further, the typology developed in the paper provide inputs for developing more specific policy mixes for steering transitions by aimed at niche innovation and simultaneously destabilizing incumbent regime and to design a range of policy instruments for transformative change (Weber & Rohracher, 2012, Kivimaa & Kern, 2016).

Our findings also provide inputs for initiating long-term transformative change through open-ended experimentation which involves some actors collaborating as well as in conflict with each other (see Coenen, Hansen & Rekers, 2015; Schot & Steinmuller, 2017). Findings from this paper are also relevant for designing strategic innovation programs for system innovation and for developing new ideas such as innovation races which can be useful for identifying new policy ideas for decision makers (Coenen et al., 2017).

The typology presented in the paper needs further work and refinement, as at the moment it is explorative at the moment. It can be useful to test the typology of the institutional strategies developed in the paper and investigate industries other than wind and solar PV energy in institutional settings other than India. We strongly suggest testing the generalizability and application of the typology in other institutional contexts to validate its effectiveness. The typology can also be further refined by conducting more number of focussed interviews with experts and collecting additional archival data.

Future research also need to focus on developing more specific insights on identifying conditions under which the proposed institutional strategies are successful or less successful, along with identifying institutional strategies that are successful in the long term for stimulating sustainability transitions. Such a conceptualization of successful institutional strategies in emerging contexts will be useful in developing novel theoretical and practical insights for enabling sustainability transitions.

8. References

- Abdelnour, S., Hasselbladh, H., Kallinikos, J., 2017. Agency and institutions in organization studies. *Organization Studies*, 38(12), 1775–1792.
- Aldrich, H.E., 2010. Beam me up, Scott (ie)! Institutional theorists' struggles with the emergent nature of entrepreneurship. *Research in the Sociology of Work*, 21, 329–364.
- Avelino, F., Wittmayer, J.M., 2016. Shifting power relations in sustainability transitions: a multi-actor perspective. *Journal of Environmental Policy and Planning*, 18 (5), 628–649.
- Brown, R.R., Farelly, M.A., Loorbach, D., 2013. Actors working the institutions in sustainability transitions: the case of Melbourne's stormwater management. *Global Environmental Change*, 23 (4), 701–718.
- Battilana, J., Leca, B., Boxenbaum, E., 2009, How actors change institutions: Towards a theory of institutional entrepreneurship. *The Academy of Management Annals*, 3(1), 65-107
- Binz, C., Truffer, B., Coenen, L., 2016a. Path creation as a process of resource alignment and anchoring – Industry formation for on-site water recycling in Beijing. *Economic Geography*, 92 (2), 172-200.
- Binz, C., Sedlak, D., Harris-Lovett, S., Kiparsky, M., Truffer, B., 2016b. The thorny road to technology legitimation –Institutional work for potable water reuse in California. *Technological Forecasting and Social Change*, 103, 249–263.
- Binz, C., Anadon, L.D., 2018. Unrelated diversification in latecomer contexts-The emergence of the Chinese solar photovoltaics industry. *Environmental Innovation and Societal Transitions*. DOI: <https://doi.org/10.1016/j.eist.2018.03.005>
- Coenen, L., Grillitsch, M., Hansen, T., Moodysson, J., 2017. An innovation system framework for system innovation: the case of Strategic Innovation Programs (SIPs) in Sweden. *Papers in Innovation Studies 2017/8*, Lund University, CIRCLE - Center for

Innovation, Research and Competences in the Learning Economy. CIRCLE working papers. Available <http://wp.circle.lu.se/upload/CIRCLE/workingpapers/201708_coenen_et_al.pdf>

Chilvers, J., Longhurst, N., 2016. Participation in transition(s): Reconceiving public engagements in energy transitions as co-produced, emergent, and diverse. *Journal of Environmental Policy and Planning*, 18(5), 585-607

De Haan, F.J., Rotmans, F.J., 2018. A proposed theoretical framework for actors in transformative change. *Technological Forecasting and Social Change*, 128, 275-286

Diaz, M., Darnhofer, I., Darrot, C., Beuret, J.E., 2013. Green tides in Brittany: What can we learn about niche–regime interactions? *Environmental Innovation and Societal Transitions*, 8, 62-75

Eisenhardt K. M., Graebner M. E., 2007. Theory building from cases: opportunities and challenges. *Academy of Management Journal*, 50(1), 25-32.

Etzion, D., Gehman, J., Ferraro, F., Avidan, M., 2017. Unleashing sustainability transformations through robust action. *Journal of Cleaner Production*, 140, 167-178. DOI:10.1016/j.jclepro.2015.06.064

Farla, J., Markard, J., Raven, R., Coenen, L., 2012. Sustainability transitions in the making: a closer look at actors, strategies, and resources. *Technological Forecasting and Social Change*, 79, 991–998

Ferraro, F., Etzion, D., Gehman, J., 2015. Tackling grand challenges pragmatically: Robust action revisited. *Organization Studies*, 36, 363-390. DOI:10.1177/0170840614563742

Fischer, L.B., Newig, J., 2016. Importance of actors and agency in sustainability transitions: a systematic exploration of the literature. *Sustainability*, 8, 476.

Fünfschilling, L., 2014. A dynamic model of socio-technical change: institutions, actors, and technologies in interaction. Ph.D. Thesis. The University of Basel, Faculty of Humanities and Social Sciences

- Fünfschilling, L., Truffer, B., 2014. The structuration of socio-technical regimes-Conceptual foundations from institutional theory. *Research Policy*, 43 (4), 772-791.
- Fünfschilling, L., Truffer, B., 2016. The interplay of institutions, actors and technologies in sociotechnical systems - An analysis of transformations in the Australian urban water sector. *Technological Forecasting and Social Change*, (103), 298-312.
- Fünfschilling, L., Binz, C., 2018. Global socio-technical regimes. *Research Policy*. In press. DOI :10.1016/j.respol.2018.02.003.
- Garud, R., Hardy, C., Maguire, S., 2007. Institutional entrepreneurship as embedded agency. *Organization Studies*, 28, 957–969.
- Garud, R., 2008. Conferences as venues for the configuration of emerging organizational fields: The case of cochlear implants. *Journal of Management Studies*, 45, 1061-1088.
- Garud, R., Kumaraswamy, A., Karnøe, P., 2010. Path dependence or path creation? *Journal of Management Studies*, 47, 760–774.
- Garud, R., Gehman, J., 2012. Metatheoretical perspectives on sustainability journeys: Evolutionary, Relational and Durational. *Research Policy*, 41, 980-995.
- Garud, R., Gehman, J., Karunakaran, A., 2014. Boundaries, breaches, and bridges: The case of climate gate. *Research Policy*, 43, 60–73.
- Garud, R., Gehman, J., Giuliani, A., 2018. Serendipity arrangements for exapting science-based innovations. *Academy of Management Perspectives*. DOI:10.5465/amp.2016.0138.
- Geels, F.W., 2002. Technological transitions as evolutionary reconfiguration processes: a multi-level perspective and a case-study. *Research Policy*, 31 (8/9), 1257–1274
- Geels, F.W., 2004. From sectoral systems of innovation to socio-technical systems: insights about dynamics and change from sociology and institutional theory. *Research Policy*, 33 (6–7), 897–920.
- Geels, F.W., Raven, R.P.J.M., 2006. Non-linearity and expectations in niche-development

trajectories: Ups and downs in Dutch biogas development (1973-2003). *Technology Analysis & Strategic Management*, 18(3/4), 375-392

Geels, F.W., Schot, J.W., 2010. The dynamics of transitions: a socio-technical perspective. In: Grin, J., Rotmans, J., Schot, J.W., Loorbach, i.c.w.D., Geels, F.W.(Eds.), *Transitions to Sustainable Development; New Directions in the Study of Long Term Transformative Change*. Routledge, New York, pp. 11–104

Geels, F.W., 2010. Ontologies, socio-technical transitions (to sustainability), and the multi-level perspective. *Research Policy*, 39 (4), 495-510.

Geels, F.W., 2011. The multi-level perspective on sustainability transitions: responses to seven criticisms. *Environmental Innovation and Societal Transitions*, 1(1), 24–40.

Geels, F.W., 2014a. Regime resistance against low-carbon transitions: introducing politics and power into the multi-Level perspective. *Theory Culture and Society*, 31(5), 21–40.

Geels, F.W., 2014b. Reconceptualising the co-evolution of firms-in-industries and their environments: Developing an inter-disciplinary Triple Embeddedness Framework. *Research Policy*, 43(2), 261-277

Gehman, J., Glaser, V.L., Eisenhardt, K.M., Gioia, D.A., Langley, A., Corley, K.G., 2017. Finding theory-method fit: A comparison of three qualitative approaches to theory building. *Journal of Management Inquiry*. DOI:10.1177/1056492617706029.

Gehman, J., Ferraro, F., Etzion, D., 2018. Robust action strategies for tackling the world's grand challenges. In book: *Resilient Systems, Resilient Communities*. Chapter: 8, Publisher: *Intersections of Sustainability*, Editors: Jordan B. Kinder, Makere Stewart-Harawira, pp.180-204, Forthcoming

Genus., A., Coles, A.M., 2008. Rethinking the multi-level perspective of technological transitions. *Research Policy*, 37(9), 1436-1445.

- Greenwood, R., Suddaby, R., 2006. Institutional entrepreneurship in mature fields: The big five accounting firms. *Academy of Management Journal*, 49(1), 27–48.
- Greenwood, R., Jennings, P.D., Hinings, C. R., 2015. Sustainability and organizational change: an institutional perspective, in Henderson, R., Gulati, R., and Tushman, M. (eds.), *Leading Sustainable Change: An Organizational Perspective*: 323–55. Oxford University Press
- Grin, J., Rotmans, J., Schot, J., 2011. On patterns and agency in transition dynamics: some key insights from the KSI programme. *Environmental Innovation and Societal Transitions*, 1(1), 76–81.
- Gosens, J., Lu, Y., Coenen, L., 2015. The role of transnational dimensions in emerging economy ‘Technological Innovation Systems’ for clean-tech. *Journal of Cleaner Production*, 86, 378–388.
- Hansen, U.E., Ockwell, D., 2014. Learning and technological capability building in emerging economies: The case of the biomass power equipment industry in Malaysia. *Technovation*, 34(10), 617–630
- Hansen, U.E., Nygaard, I., Romijn, H., Wieczorek, A., Kamp, L. M., Klerkx, L., 2018. Sustainability transitions in developing countries: Stocktaking, new contributions, and a research agenda. *Environmental Science and Policy*, 84, 198-203.
DOI: 10.1016/j.envsci.2017.11.009
- Hansen, T., Coenen, L., 2015. The geography of sustainability transitions: review, synthesis, and reflections on an emergent research field. *Environmental Innovation and Societal Transitions*, 17, 92-109
- Hargrave, T. J., Van De Ven, A. H., 2006. A collective action model of institutional innovation. *Academy of Management Review*, 31(4), 864-888.
- Heiskanen, E., Apajalahti, E. L., Matschoss, K., Lovio, R., 2018. Incumbent energy

companies navigating the energy transitions: Strategic action or bricolage? *Environmental Innovation and Societal Transitions*. Available <<https://doi.org/10.1016/j.eist.2018.03.001>>

Helms, W. S., Oliver, C., 2015. Radical settlements to conflict: Conflict management and its implications for institutional change. *Journal of Management & Organization*, 21, 471-494.

Hess, D.J., 2014. Sustainability transitions: A political coalition perspective. *Research Policy*, 43(2), 278– 283.

Jain, S., Koch, J., 2016. Conceptualizing markets for underserved communities. in A.Guerber & G.Markman (Eds.) *Sustainability, Society, Business Ethics, and Entrepreneurship*. Singapore: World Scientific Publishing.

Jolly, S., Raven, R.P.J.M., Romijn, H.A., 2012. Upscaling of business model experiments in off-grid PV solar energy in India. *Sustainability Science*, 7(2), 199-212.

Jolly, S., Raven, R.P.J.M., 2015. Collective institutional entrepreneurship and contestations in wind energy in India. *Renewable and Sustainable Energy Reviews*, 42, 999-1011.

Jolly, S., Spodniak, P., Raven, R.P.J.M., 2016. Institutional entrepreneurship in transforming energy systems towards sustainability: Wind energy development in Finland and India. *Energy Research and Social Science*, 17, 102-118.

Jolly, S., Raven, R.P.J.M., 2016. Field configuring events in sustainability transitions: The case of solar energy in India. *Technological Forecasting and Social Change*, 103, 324- 333.

Jolly, S. 2016. Collective institutional entrepreneurship for fostering sustainable energy transitions in India. Doctoral degree, Department of Industrial Engineering & Innovation Sciences. Eindhoven University of Technology, Eindhoven, The Netherlands. ISBN: 978-90-386-4023-5

Jolly, S., 2017. Role of institutional entrepreneurship in the creation of regional solarPV energy markets: Contrasting developments in Gujarat and West Bengal. *Energy for*

Sustainable Development, 38, 77-92.

Jorgensen, U., 2012. Mapping and navigating transitions- the multi-level perspective compared with arenas of development. *Research Policy*, 41 (6), 996–1010.

Karnøe, P., Buchhorn, A., 2008. Denmark: Path-creation dynamics and winds of change.

WM Lafferty & A Ruud (red), Promoting Sustainable Electricity in Europe: Challenging the Path Dependence of Dominant Energy Systems. Edward Elgar Publishing, Incorporated, Cheltenham, s.73-101.

Karnøe, P., Garud, R., 2012. Path creation: co-creation of heterogeneous resources in the emergence of the Danish wind turbine cluster. *European Planning Studies*, 20 (5), 733–752.

Kemp, R., Schot, J., Hoogma, R., 1998. Regime shifts to sustainability through processes of niche formation: the approach of strategic niche management. *Technology Analysis & Strategic Management*, 10 (2), 175–195.

Kern, F., 2015. Engaging with the politics, agency, and structures in the technological innovation systems approach. *Environmental Innovation and Societal Transitions*, 16, 67-69

Khan, F.R., Munir, K.A., Willmott, H., 2007. A dark side of institutional entrepreneurship: Soccer Balls, child labor, and postcolonial impoverishment. *Organization Studies*, 28, 1055–1077.

Khoury, T.A., Prasad, A., 2016. Entrepreneurship amidst concurrent institutional constraints in less developed countries. *Business and Society*, 55(7), 934–969

Kivimaa, P., 2014. Government-affiliated intermediary organizations as actors in system-level transitions. *Research Policy*, 43 (8), 1370-1380.

Kivimaa, P., Kern, F., 2016. Creative destruction or mere niche creation? Innovation policy mixes for sustainability transitions. *Research Policy*, 45(1), 205-217.

Klag, M., Langley, A., 2013. Approaching the conceptual leap in qualitative research. *International Journal of Management Review*, 15 (2), 149-166

- Kuhlman, S., Rip, A., 2018. Next generation innovation policy and grand challenges. *Science and Public Policy*. DOI: 10.1093/scipol/scy011.
- Lampel, J., Honig, B., Drori, I., 2014. Organizational ingenuity: Concept, processes and strategies. *Organization Studies*, 35 (4), 465-482.
- Langley, A., Abdallah, C., 2011. Templates and turns in qualitative studies of strategy and management. *Research methodology in strategy and management*, 6, 201-235.
- Mair, J., Wolf, M., Seelos, C., 2016. Scaffolding: A process of transforming patterns of inequality in small-scale societies. *Academy of Management Journal*, 59(6), 2021–2044.
- Markard, J., Truffer, B., 2008. Technological innovation systems and the multi-level perspective: towards an integrated framework. *Research Policy*, 37, 596–615.
- Markard, J., Raven, R., Truffer, B., 2012. Sustainability transitions: An emerging field of research and its prospects. *Research Policy*, 41 (6), 955-967.
- Marquis, C., Raynard, M., 2015. Institutional strategies in emerging markets. *The Academy of Management Annals*, 9(1), 291-335.
- Meadowcroft, J., 2011. Engaging with the politics of sustainability transitions. *Environmental Innovation and Societal Transitions*, 1(1), 70–75.
- Mohr, A., 2018. Opening up' energy transitions research for development. In: B. Nerlich, S. Hartley, S. Raman, A. Smith eds., *Science and the Politics of Openness: Here be Monsters*. Manchester University Press (In Press).
- Musiolik, J., Markard, J., 2011. Creating and shaping innovation systems: Formal networks in the innovation system for stationary fuel cells in Germany. *Energy Policy*, 39, 1909-1922.
- Pansera, M., Owen, R., 2018. Framing inclusive innovation within the discourse of development: Insights from case studies in India. *Research Policy*, 47(1), 23–34. DOI: <https://doi.org/10.1016/j.respol.2017.09.007>
- Prabhu, J., Jain, S., 2015. Innovation and entrepreneurship in India: understanding jugaad.

Asia Pacific Journal of Management, 32 (4), 843-868.

Purtik, H., Arenas, V. D., 2017. Embedding social innovation: Shaping societal norms and behaviors throughout the innovation process. *Business & Society*. DOI:

10.1177/0007650317726523

Raven, R., Schot, J., Berkhout, F., 2012. Space and scale in socio-technical transitions.

Environmental Innovation and Societal Transitions, 10(4), 63-78

Raven, R., Kern, F., Verhees, B., Smith, A., 2016. Niche construction and empowerment through socio-political work. A meta-analysis of six low-carbon technology cases.

Environmental Innovation and Societal Transitions, 18, 164–180.

Reay, T., 2014. Publishing qualitative research. *Family Business Review*, 27, 95-102.

Romijn, H.A., Caniëls, M.C., 2011., Pathways of technological change in developing countries: Review and new Agenda. *Development Policy Review*, 29, 359-80

Schüßler, E., Grabher, G., Müller-Seitz, G., 2015. Field-Configuring events: Arenas for innovation and learning. *Industry & Innovation*, 22 (3), 165-172.

Schot, J.W., Geels, F.W., 2008. Strategic niche management and sustainable innovation journeys: theory, findings, research agenda, and policy. *Technology Analysis and Strategic Management*, 20 (5), 537- 554.

Schot, J., Steinmueller, E.W., 2016. Framing innovation policy for transformative change:

Innovation Policy 3.0 [Online]. Working paper. Available at:

<http://www.johanschot.com/wordpress/wpcontent/uploads/2016/09/SchotSteinmueller_FramingsWorkingPaperVersionUpdated2018.10.16-Newcopy.pdf.>

Schot, J., Kanger, L., 2018. Deep transitions: emergence, acceleration, stabilization, and directionality. *Research Policy*, 47(6), 1045-1059

Shepherd, D., Parida, V., Wincent, J., 2017. The surprising duality of Jugaad: Low firm growth and high inclusive growth. *Journal of Management Studies*. DOI:

<https://doi.org/10.1111/joms.12309>

Sengers, F., Raven, R., 2015. Toward a spatial perspective on niche development: the case of Bus Rapid Transit. *Environmental Innovation and Societal Transitions*, 17, 166–182.

Smink, M.M., Hekkert, M.P., Negro, S.O., 2015a. Keeping sustainable innovation on a leash? Exploring incumbents' institutional strategies. *Business Strategy and the Environment*, 24 (2), 86- 101.

Smink, M., Negro, S., Niesten, E., Hekkert, M., 2015 b. How mismatching institutional logics hinder niche-regime interaction and how boundary spanners intervene. *Technological Forecasting and Social Change*, 100, 225-237

Smith, A., Stirling, A., Berkhout, F., 2005. The governance of sustainable socio-technical transitions. *Research Policy*, 34, 1491–1510.

Smith, A., 2007. Translating sustainabilities between green niches and socio-technical regimes. *Technology Analysis and Strategic Management*, 19 (4), 427–450.

Smith, A., Voss, J., Grin, J., 2010. Innovation studies and sustainability transitions: the allure of the multi-level perspective, and its challenges. *Research Policy*, 39 (4), 435-448.

Smith, A., Raven, R., 2012. What is protective space? Reconsidering niches in transitions to sustainability. *Research Policy*, 41 (6), 1025-1036.

STRN., 2017. A research agenda for the Sustainability Transitions Research Network.

Available <https://transitionsnetwork.org/wp-content/uploads/2018/01/STRN_Research_Agenda_2017.pdf>

Svensson, O., Nikoleris, A., 2018. Structure reconsidered: Towards new foundations of explanatory transitions theory. *Research Policy*, 47(2), 462–473.

Verbong, G.P.J., Christiaens, W., Raven, R.P.J.M., Balkema, A., 2010. Strategic niche management in an unstable regime. Biomass gasification in India. *Environmental Science and Policy*, 13, 272–291.

- Walker, K., Schlosser, F., Deephouse, D. L., 2014. Organizational ingenuity and the paradox of embedded agency: The case of the embryonic Ontario solar energy industry. *Organization Studies*, 35, 613-634.
- Wieczorek, A.J., Hekkert, M.P., Coenen, L., Harmsen, R., 2015a. Broadening the national focus in technological innovation system analysis: the case of offshore wind. *Environmental Innovation and Societal Transitions*, 14, 128–148.
- Wieczorek, A.J., Raven, R., Berkhout, F., 2015b. Transnational linkages in sustainability experiments: a typology and the case of solar photovoltaic energy in India. *Environmental Innovation and Societal Transitions*, 17, 149–165.
- Wieczorek, A. J., 2018. Sustainability transitions in developing countries: Major insights and their implications for research and policy. *Environmental Science and Policy*, 84, 204-216.
- Weber, K.M., Rohrer, H., 2012. Legitimizing research, technology and innovation policies for transformative change: Combining insights from innovation systems and multi-level perspective in a comprehensive failures framework. *Research Policy* 41, 1037–1047.
- Wijen, F., Ansari, S., 2007. Overcoming inaction through collective institutional entrepreneurship: Insights from regime theory. *Organization Studies*, 28, 1079 –1100.
- Yin, R., 2009. Case study research design and methods, *Applied Social Research Methods Series*, 4th ed., Vol. 5. Sage Publications, USA.
- Zhang, W., White, S., 2016. Overcoming the liability of newness: entrepreneurial action and the emergence of China's private solar photovoltaic firms. *Research Policy*, 45 (3), 604–617.
- Zilber, T. B., 2014. Beyond a single organization: Challenges and opportunities in doing field level ethnography. *Journal of Organizational Ethnography*, 3(1), 96-113.