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WHO IS THE GREEN LEADER IN SOLAR ENERGY MATTERS?

A theorization of political leadership in domestic solar energy development in the cases of the EU, the USA and the People's Republic of China

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I. Abstract

The objective of this exploratory study is to develop a theorization of how political leadership could have an impact on domestic solar energy development. Theorization means in this case the identification of empirical ideal types of solar energy leadership as manifested in six dimensions of policy strategies and analyzed by theoretical, ideal-typical modes of leadership. Based on previous research, three cases, the EU, USA and China, are selected and their policy strategies in terms of domestic solar energy development are analyzed in the following six operative dimensions: policies, research and development (R&D), institutionalization, international agreements, support for less-developed countries, and customs. For the analysis, leadership itself is decomposed in four scholarly modes of international political leadership, which will serve as the coding frame of the qualitative content analysis of material illustrating the policy strategies of the cases in the respective dimensions covering a period from 2009 to early 2016. The analysis reveals three distinct approaches to solar energy development leading to the identification of three empirical ideal types and a suggestion how they might affect solar energy development. By opening room for discourse on employed practices, this exploratory and inductive study will not only set up a typology for empirical ideal-types of solar energy leadership, but also provide implications for political action for fostering development and positioning in the global comparison. Thereby, it is explored whether a specified leadership analysis could contribute to explain variations in domestic solar energy development.

Keywords: solar energy, renewable energy sources, leadership theory, EU, USA, China, qualitative content analysis, empirical ideal types, inductive, exploratory study.

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III. Contents

IV. Abbreviations

AD	Anti-dumping
BASIC countries	Brazil, South Africa, India and The People's Republic of China
BRICS	Brazil, Russian Federation, India, The People's Republic of China, South Africa
CELA	Climate Change Technology Transfer Centres in Europe and Latin America
China	The People's Republic of China
CoFR	The Charter of Fundamental Rights
COP	Conferences of Parties of the UNFCCCC
CORDIS	Community Research and Development Information Service
Council	Council of the European Union, also: Council of Ministers
CVD	Countervailing duties
C02	Carbon dioxide
DG	Directorate General
DG Climate	Directorate General for Climate Action
DG R&I	Directorate General for Research & Innovation
DG DEVCO	Directorate General for International Development and Cooperation
DOE	U.S. Department of Energy
DOS	U.S. Department of State
DSIRE	Database of State Incentives for Renewables & Efficiency
EC	European Commission
EIA	U.S. Energy Information Administration
eNGOs	environmental non-governmental organizations
EU	European Union, before: European Community
Eurostat	Statistical Office of the European Union
EP	European Parliament
ETS	Emission Trading System
FP	Framework Programme
GDP	Gross Domestic Product
GEEREF	Global Energy Efficiency & Renewable Energy Fund

GW	Gigawatt
IEA PVPS	International Energy Agency Photovoltaic Power Systems Programme
INDC	Intended Nationally Determined Contribution
IPCC	UN's Intergovernmental Panel on Climate Change
KP	Kyoto Protocol
KW	Kilowatt
MEAs	Multilateral Environmental Agreements
MOFCOM	The People's Republic of China's Ministry of Commerce
MS	Member state/s
MW	Megawatt
NPCA	China's National Program on Climate Action (Period 2014-2020)
NCCETC	North Carolina Clean Energy Technology Center
OECD	Organization for Economic Co-operation and Development
OEERE	Office of Energy Efficiency & Renewable Energy, Department of Energy, USA
OPS	U.S. Office of the Press Secretary
RES	Renewable energy sources
RPSPs	Renewable Portfolio Standard policies
R&D	Research and development
SEIA	Solar Energy Industries Association in the USA
SPV	Solar photovoltaic
SPPAs	Solar Power Purchase Agreements
UNFCCC	United Nations Framework Convention on Climate Change
UN	United Nations
UNDP	United Nations Development Program
USA	United States of America
U.S.	United States
USAID	U.S. Agency for International Development
2020 CEP	2020 Climate and Energy Package of the European Union
2030 CEF	2030 Climate and Energy Framework of the European Union

1. Introduction

The objective of this exploratory study is to develop a theorization of how political leadership could have an impact on domestic solar energy development. Theorization means in this case the identification of empirical ideal types of solar energy leadership as manifested in six dimensions of policy strategies and analyzed by theoretical, ideal-typical modes of leadership.

From the point of view of the mid 2010s, it might be difficult to imagine the European Union (EU) as a proper laggard in environmental matters, however, that was the starting point in the 1980s, when the USA were clearly frontrunner in environmental protection measures (Oberthür, 1999). Historically, there were major differences between the global major powers in which path they followed in environmental politics. Who was leading changed with succession and changes in governments that entailed developments in policies. According to previous research, the USA were a key actor and showed "determined leadership" (Wurzel & Connelly, 2011, p.3) at the Vienna Convention for the Protection of the Ozone layer (1985) and during the establishment of the following Montreal Protocol on Substances that Deplete the Ozone Layer (1987) (Oberthür as cited in Kilian & Elgström, 2010). Back then, the EU's climate policy was in its cradle and the Union posed itself as a laggard protecting its own industry (Wurzel & Connelly, 2011; Gupta & Grubb, 2000). Still in 1992, the George H. W. Bush administration was among the first governments to ratify the United Nations Framework Convention on Climate Change (UNFCCC); however, during the Clinton-Gore era, climate protection and the ratification of the Kyoto Protocol (KP) lacked the support of the Senate (Parker & Karlsson, 2010). When George W. Bush took into office in 2001, the USA abdicated its leadership role in the area of climate change and disengaged from international environmental governance, because the U.S. American discourse questioned the science behind and the seriousness of the posed threat (Harris, 2007; Parker & Karlsson, 2010, p.928; Bang & Schreurs, 2010, p.235; Karlsson et al., 2011, p.94). The "no regrets strategy" (Bang & Schreurs, 2010, p.235) was the dominant principle in the guiding norms of climate policy focusing the attention on the cost of climate action and, consequently, action was only taken if the result would be beneficial to the economy in the end, for instance by energy efficiency improvements (Bang & Schreurs, 2010).

When the USA turned its back on climate change leadership, the EU filled the vacuum that unfolded and it was the first major economic power in the world to begin seriously tackling climate change (Paterson, 2009; Parker & Karlsson, 2010, p.928). Wurzel and Connelly (2010) can identify four phases the EU has gone through: the formation and formulation phase from the 1980s to 1992, the KP negotiation until 2001, the KP rescue phase lasting until 2005, and implementation of the KP and the follow-up agreement negotiations afterwards. Particularly, the first phase is of interest for the shift towards a climate change policy. Initially, the European Parliament (EP) favored the decision (1986) and the European Commission's (EC) communication in 1988 for the established United Nation's (UN) Intergovernmental Panel on Climate Change (IPCC) supported the idea. Third, in Dublin in 1990, the European Council expressed the "enormous capacity to provide leadership" (European Council, 1990, p.11) in global environmental politics. This acknowledgement by three of the major EU institutions was followed by the final proposal of the EC in 1991 and has to be seen in the context of the preparation for the UN Rio summit (Pallemaerts & Williams, 2006; Wurzel & Connelly, 2010). Ever since, the officials of the EU have frequently confirmed the pursuit of environmental leadership in climate change matters and the actions followed these words over the years. The rescue of the KP, the establishment of the Directorate-General (DG) Climate Action, the 2020 Climate and Energy Package (2020 CEP), the introduction of the Emission Trading System (ETS) and the updated 2030 Climate and Energy Framework (2030 CEF) are striking steps on the EU's ladder towards leading the international environmental governance. Thereby, environmental and energy policies have been central to the EU integration process by advancing the common stance towards climate change, fostering a common approach to renewable energies and strengthening the EU's position on the global stage (cf. Oberthür & Kelly, 2008).

When the Obama administration came into office, the USA started embracing the international scientific community's warnings more diligently and, hence, employed a distinct approach to climate change mitigation (Bang & Schreurs, 2010, p.235). In particular, the engagement on the global stage can be seen as stepping forward with leadership aspirations again. Despite the necessity for the U.S. government to consult Congress and get its support in regard of international agreements, the Obama administration achieved to create the eventually signed

Copenhagen Accord at the Conference of Parties (COP) 15 in co-operation with The People's Republic of China[1] and the other BASIC countries[2] (Bang & Schreurs, 2010). Since then, the USA have attempted to further their leadership ambitions and reinstate their leadership position. President Obama stated at the COP 21 that "the U.S.A. not only recognizes our role in creating this problem, we embrace our responsibility to do something about it" (Frizell, 2015) and, in an interview, he added, "America is now a global leader when it comes to taking serious action to fight climate change. Approving the project [the Keystone XL oil pipeline] would have undercut that global leadership" (Aguirre, 2015).

During the COP 14 and at the COP 15, when the world looked to the USA and China to secure a resolution, it was one of the first times, China presented itself as willing to establish itself as a cooperating and leading partner in environmental protection (Karlsson et al., 2011). Although China positions itself as a developing country, it has been rewarded for its efforts in forging the Copenhagen Accord and supporting less-developed countries, in particular in Africa, with roughly the same recognition as a leader as the EU on the global stage (e.g. China, 2015; Karlsson et al., 2012; Parker et al., 2012). Scholars agree that international environmental leadership "will depend not only on [EU's] actions but also on other actors such as the US and major developing countries" (Oberthür & Kelly, 2008, p.48) (Kilian & Elgström, 2010; Karlsson et al., 2011; Karlsson et al., 2012). This is confirmed by the look at the data from the International Energy Agency Photovoltaic Power Systems Programme (IEA PVPS) that verifies China's leading role in terms of annually installed capacity in 2015 and total installed capacity of solar energy (IEA PVPS, 2016; Table 1 in the Appendix).

This still does not give an answer to what exactly environmental leadership is or what makes for leaders. An international environmental leader would have to employ modes of leadership in regard of climate change mitigation, internationally shaping preferences by creating costs and benefits, leading by example, raising global consciousness aiming for joint solutions, and fighting for passing actual deals. Not only scholars agree on the importance of ambitious and effective leadership in complex international challenges such as tackling the potentially catastrophic consequences of

[1] Henceforth, 'China'.
[2] The BASIC countries include Brazil, South Africa, India and China.

climate change, but also political actors (Foley, 2014; Parker & Karlsson, 2010, p.923-4). For instance, the Australian Prime Minister Malcom Turnbull or UN's Secretary-General Ban Ki-Moon stated the significance of collective, respectively concerted leadership to secure the future (Grasinger, 2015; Ki-Moon, 2008). Scholars agree that leadership is an essential determinant of success and failure in addressing transnational challenges and forging global governance arrangements (Young, 1991; Sjöstedt, 1994; Underdal, 1994). The complexity of the issue, for instance because of the number of actors involved and the intricacy of the problem, and the global effects of global warming and climate change longs for joint action (Underdal, 1994; Karlsson et al., 2011). As nearly all countries are involved in addressing the challenge,[3] the need for global governance arrangements is obvious. Without leadership and a joint solution, efforts and even targets would not add up to the goal humankind should have according to scientist. Furthermore, the diverse state of development of countries strongly affects the capabilities, also in regard of hard and soft resources such as knowledge and technology. Diffusion and distribution can be guided and preferences shaped to raise measures to slow down and, eventually, reign in climate change.

So far, no research on environmental leadership has taken in all aspects of it, analyzed the diverse connected fields and lived up to the complexity of its object of investigation. Most often, the focus of even latest research was on the EU alone or on international conferences like the COP 3 in Kyoto in 1997 or the COP 15 in Copenhagen and recognition of leaders (e.g. Kilian & Elgström, 2010; Parker & Karlsson, 2010; Karlsson et al., 2011; Karlsson et al., 2012; Parker et al., 2012). Consequently, by not acknowledging the intricacy of environmental leadership and actually failing to provide a clear definition of the matter, previous research has fallen short to provide a thorough overall analysis of the global competitors. Claiming environmental leadership cannot be assessed in its entirety by a non-extensive and small-scale research project or perhaps at all, the focus of this study will be on one sole aspect of environmental leadership, namely solar energy leadership. This study will contribute to the discourse by analyzing employed policy strategies and discarding the aspect of perception as sole object of investigation. Additionally, in a holistic approach, the analysis will encompass six dimensions of policy strategies that could

[3] Over 150 parties handed in Intended Nationally Determined Contributions (INDCs) prior to the COP 21 in Paris, 2015 (UNFCCC, 2015).

have an impact on the domestic solar energy development. By expanding the spectrum of cases based on previous research (Kilian & Elgström, 2007; Karlsson et al., 2011, 2012; Parker et al., 2012), it will analyze the approaches of all perceived leaders.

There are two main arguments for the choice of solar energy. On the one hand, in times of global instability, especially due to tensions between Western countries and the Russian Federation in regard of the Ukraine crisis and the Syrian war, energy security and its impact on national sovereignty are of utmost significance, as threats and actual stops in gas distribution have shown (e.g. BBC, 2015a; Oberthür & Kelly, 2008). Whereas fossil fuels entail and build up dependencies on supplier, price and supply, renewable energy sources (RES) have been one solution to decouple nation state's energy supply and, thus, to strengthen national sovereignty, since other (political) actors cannot influence their natural occurrence. On the other hand, while major world powers and global conferences have acknowledged climate change to be a threat not only to biodiversity but also to humankind, the importance of RES has risen even further (e.g. China, 2015; China, 2014). National efforts to increase the proportion of RES in the energy supply and, thereby, foster carbon dioxide (CO2) emission mitigation have seen considerably more support during the last decade. First, hydropower is substantially dependent on natural preconditions such as the existence of rivers, streams and lakes and, hence, its employment is extremely limited. Second, wind energy is consuming large pieces of land and sea while simultaneously depending on wind strength – not talking about not-assessed long-term influences of wind parks on global wind cycles. Recent research confirms the universal potential of solar energy due to its abundancy and solar energy has been recognized in politics as a game changer in climate mitigation as well (e.g. China, 2015; China, 2014). Being a global phenomenon, the assessment of the employed policy strategies to facilitate the development of the solar energy sector in regards of energy supply is of significance.

Transposing leadership now on solar energy, global leaders combine political actions to frame issues and challenges in the first place, find solutions and gain experience with them, promote the best practices demonstrating their feasibility and superiority, create incentives and shape preferences of other actors, step in to negotiate and pass deals for joint efforts sealed by international agreements. These leadership aspects, which can be defined as modes of leadership, will guide the analysis of the six dimensions of policy strategies for solar energy leadership including policies, research

and development (R&D), institutionalization, international agreements, support for less-developed countries including knowledge transfer and financial support, and customs.

This will be conducted by an exploratory and inductive study analyzing the behavior of the European Union as compared to the USA and China from a leadership perspective. Starting with the Intended Nationally Determined Contributions (INDCs) of these three cases handed in prior to the COP 21 in Paris in 2015, material from 2009 to 2016 will be analyzed by qualitative content analysis to illustrate, identify and label the employed policy strategies of solar energy leadership. Thereby and in addition, it will be explored how fruitful a specified leadership analysis could contribute to explain variations in domestic solar energy development.

1.1. Outline of the Thesis

In order to present a plausible and comprehensive argument, it is necessary to evaluate previous research first and the next chapter will revisit the latest and most relevant studies. Taking this as a starting point, this study will provide first an exhaustive argument of the relevance of leadership and second an operationalized definition of political leadership disassembling it into four ideal-typical modes according to major scholars in Chapter 3. Chapter 4 will state the research question, the aim and relevance of this study as well as its contribution. Following, Chapter 5 will present the design of the study, in particular the operationalization of the dimensions of policy strategy in regard of solar energy leadership. Furthermore, this chapter will unfold an argument for the selection of cases, videlicet the European Union, the USA and China, the methodological approach, the material considered and the delimitations of the study. Chapter 6 will analyze each dimension of policy strategies employed by the three cases. The seventh chapter will discuss the results answering the research question and identifying which empirical ideal types of solar energy leadership materialized in the examination of the cases. The final chapter will conclude the whole research project.

2. Previous Research

Over the last decades, European studies has seen a rise of studies on the political aspects of climate change, which have considerably changed and gone through a diverse set of phases. When research laid its eye on climate change mitigation in the late 1990s and early 2000s, the USA had already retreated from a frontrunner position

in environmental protection. Hence, nearly all studies focused on the EU that stepped into the void that emerged from the renunciation of the cross-Atlantic country (Oberthür, 1999; Gupta & Ringius, 2001; Vogler, 2005; Elgström, 2007; Groenleer & Van Schaik, 2007; Damro, Hardie & MacKenzie, 2008; Oberthür & Kelly, 2008; Kelemen, 2010; Parker & Karlsson, 2010). This Eurocentrism held for at least a decade and, still, the European perspective is at the heart of research.

Right from the start, political climate change research identified leadership as a being crucial for the global development, mainly due to the complexity of issue in terms of the magnitude of involved actors and policy areas, so scholars utilized leadership theory to explain behavior on the world stage (Gupta & Ringius, 2001; Vogler, 2005; Oberthür & Kelly, 2008). Thereby, the modes of leadership introduced by Oran R. Young (1991), Arid Underdal (1994) and Raino Malnes (1995) were the most prominent, and research still uses them frequently to scrutinize actor behavior in climate change matters (Gupta & Ringius, 2001; Groenleer & Van Schaik, 2007; Elgström, 2007; Paterson, 2009; Kilian & Elgström, 2010; Parker & Karlsson, 2010; Parker et al. 2012).

Within leadership research in the area of climate change, it is easy to discover strong foci. First, the focal point on global conferences and multilateral environmental agreements (MEAs) is striking. Most scholars analyzed specific aspects such as interest realization, recognition, cohesion, autonomy and congruency, or actors themselves, mainly the EU, at one or two global conferences such as the COPs of the UNFCCC (Oberthür, 1999; Vogler, 2005; Elgström, 2007; Groenleer & Van Schaik, 2007; Oberthür & Kelly, 2008; Paterson, 2009; Kelemen, 2010; Kilian & Elgström, 2010; Karlsson et al. 2011; Karlsson et al. 2012; Parker et al., 2012). A substantial amount of these scholars identified perception to be key to leadership, as leadership contenders are in need of followers. In early perception studies, self-perception and the contrast to others' was more important, especially in regard of the EU's self-proclaimed leadership resulting in analysis whether the EU can live up to its aspirations and ambitions (Vogler, 2005; Elgström, 2007; Council, 1990). While perception analysis have prevailed, deeds and performance of actors have not been considered as strongly or in single studies particularly in recent years, aside from a few exceptions (Vogler, 2005; Oberthür & Kelly, 2008; Paterson, 2009; Parker & Karlsson, 2010).

Over the years, there was a shift towards the followers' perception of potential leaders that was called recognition (Kilian & Elgström, 2010; Karlsson et al. 2011; Karlsson et al. 2012; Parker et al., 2012). The new focus emphasized the demand side of leadership and, thus, analyzing followers, their interests, perception and relation to leadership contestants (Gupta & van der Grijp, 2000; Elgström, 2007; Kilian & Elgström, 2010; Karlsson et al. 2011; Karlsson et al. 2012; Parker et al., 2012). In particular, the study by Karlsson, Parker, Hjerpe and Linnér that resulted in several articles was vital for the advance of climate change and environmental leadership research. They were the first after Bertil Kilian and Ole Elgström (2010) to acknowledge the competitive aspect of leadership in their study. Not only the contender status of the USA as a potential leader alongside the EU was expressed, as did only a few earlier studies (e.g. Paterson, 2009), but also of China, as it has considerably gained recognition on the global stage (Karlsson et al. 2011; Karlsson et al. 2012; Parker et al., 2012).

Despite the shifts, changes and developments in political climate change and environmental leadership research, there is a gap to be filled. By looking at followers and the demand side of leadership in this regard, scholars have partly overcome Eurocentrism issues. Thereby, they identified China next to the revitalized USA and weakened EU as candidates on the stage. However, neither has a study looked beyond the USA's roles in MEAs nor scrutinized the efforts of China in terms of global environmental leadership and climate change mitigation. As scholars claim that the EU has lost some of its leadership momentum, all three of them have to be examined as equally important contestants on the leadership stage taking all dimensions of leadership into account. Perception or recognition analyses are not sufficient to confirm leadership in a field that so profoundly affects the world as does climate change. Even pledges are only words, and words are known to be wind. Consequently, deeds and performances including not only roles at global conferences and in international agreements, but also their domestic policies, R&D efforts, institutionalization, support for less developed countries and customs have to be analyzed. Being aware that it is not possible to do this in all climate change aspects in one study, since it would be beyond scope, this following study will narrow it down to one sole aspect of environmental leadership, namely solar energy leadership.

3. Theoretical Framework: Significance and Modes of International Political Leadership

"Leaders matter; but political leaders matter more than most and for more reasons than most." (Foley, 2013, p.1) This is the first sentence of Michael Foley's book *Political Leadership: Themes, Contexts, and Critique* (2013). In the preamble, he unfolds his exhaustive argument on the manifold facets of political leadership. When looked upon any modern system, "it appears to be the case that there is practically no problem that cannot be attributed to an alleged failure of leadership, and no solution that cannot be achieved through an alternative leadership" (Foley, 2013, p.2). Functions of political leaders and expressions of political leadership have expanded their diversity and serve in a vast variety of ways; from breaking down structural complexity to bringing simplified order; from tipping the balance in decision-making processes to shaping policy agendas itself; from providing a sense of strategic directions to guaranteeing continuity in fast-paced times; from capturing and guiding public attention to serving as an overarching symbol and personification of an idea, a cause or policy; not least, evoking a sense of social solidarity and cultural identity by expressing shared values or national interests (Foley, 2013). In addition, leaders pave the way, experiment with approaches and share knowledge and best-practice solutions, especially in the face of common international challenges (Foley, 2013; Rhodes & t' Hart, 2014).

Furthermore, when the history of a great reform is the object of research, leadership is at its core, according to Rhodes and t' Hart's *Oxford Handbook of Political Leadership* (2014). Although there is no unified theory of leadership, but "too many definitions, and too many theories in too many disciplines" (Rhodes & t' Hart, 2014, p.16), and there is no agreement on what the essence of leadership is, how it should be studies or why, scholars concur that leaders or leadership are necessary but not sufficient criteria for change (Rhodes & t' Hart, 2014). Among the variety of definitions, Nannerl O. Keohane's (2010) quote of Schumpeter's clarification of *leaders* seem to be fundamental stating, "[l]eaders determine or clarify goals for a group of individuals and bring together the energies of members of that group to accomplish those goals" (p.23). During the 20th century, leadership theories thrived and, as Rhodes and t' Hart (2014) note adequately, "left us with a bewildering array of concepts, frameworks, propositions, stories, assessments, prescriptions, and clichés about leadership across many academic disciplines and professional domains" (p.3).

They identify the study of leadership as a complex and disjointed interdisciplinary enterprise and offer insight in political leadership from all perspectives (Rhodes & t' Hart, 2014).

Since the 1990s, typologies, forms and modes of political leadership have been introduced for the attempt of analyzing methods and styles leaders utilize within an increasingly international or globalizing context. Young (1991), Underdal (1994) and Malnes (1995) are the most quoted authors in this regard and are commonly used as a key point of departure in scholarly works (Parker & Karlsson, 2014). Identifying similarities and common features of the distinct terms of former authors, Parker and Karlsson (2014) conclude that there are not three modes, as previous research suggested, but four modes of leadership: structural, directional, idea-based and instrumental. First, structural or coercive leadership aims at shaping preferences and influencing behavior of other actors utilizing power and material resources to create incentives and coercion, costs and benefits, threats and promises (Young, 1991, p.288-293; Underdal, 1994, p.186-7). Second, directional or unilateral leadership can be circumscribed as leading by example and demonstrating will employing frontrunner approaches or technology demonstrating feasibility, value and superiority of particular policy solutions (Malnes, 1995, p.92; Underdal, 1994, p.183-5). Third, idea-based or intellectual leadership uses framing and promotion of specific ideas of policy solutions to create joint solutions as well as raise consciousness over a long period of time (Young, 1991, p.298-302; Malnes, 1995, p.98-101). Finally and closely connected to the latter, instrumental, entrepreneurial or problem-solving leadership is based on negotiating skills to pass deals with participants who would otherwise try to avoid commitment; however, disparate from intellectual leadership, its approach focuses on the presence, the actual negotiation, and not on long-term solutions (Underdal, 1994, p.187-191; Young, 1991, p.293-298; Malnes 1995). The ideas of the intellectual leaders often serve as a foundation for the problem-solving leadership with the former leaders not being enabled to control what the negotiating instrumental leader will come up with (Young, 1991, p.300-1). Table 2 offers a synoptic view on the modes of leadership.

Table 2: *Modes of Leadership.*

Leadership Mode	*Aim*	*Implementation*
Structural/coercive	To shape preferences and influence behavior of others	Utilizing power resources creating incentives/benefits or coercion/costs
Directional/unilateral	To lead by example, demonstrate will, show feasibility, value and superiority of solutions	Employing frontrunner approaches and technology
Idea-based/intellectual	To raise consciousness over a long period of time and create joint solutions	Framing issues and promoting specific ideas of policy solutions
Instrumental/entrepreneurial/ problem-solving	To pass deals	Employing negotiation skills

4. Research Questions, Relevance and Contribution

The objective of this exploratory study is to develop a theorization of how political leadership could have an impact on domestic solar energy development. Theorization means in this case the identification of empirical ideal types of solar energy leadership as manifested in six dimensions of policy strategies and analyzed by theoretical, ideal-typical modes of leadership. These modes of leadership will serve as the deductive coding frame of the qualitative content analysis of the three cases, which have been identified as potential leaders by previous research, the European Union, the USA and the People's Republic of China. Supposing the employment of specific strategies regarding the dimensions in regard of solar energy development, the efforts of the cases will represent mixes of leadership modes. Hence, it will be possible to identify empirical ideal types of solar energy leadership by an inductive approach. Thereby, it will be explored how fruitful a specified leadership analysis could contribute to explain variations in domestic solar energy development. The Intended Nationally Determined Contributions (INDCs) prior to the COP 21 in Paris in 2015 will serve as a starting point providing insight into which further material should be assessed to illustrate the employed strategies, covering material from 2009 to 2016 that either affected and still shapes or reviews policies shaping solar energy development.

Solar energy leadership has to be seen in the context of environmental leadership, since the apparent aim of the development and increase of solar energy is to foster CO2 emission mitigation and, hence, support efforts to address climate change. Thereby, this study seeks to contribute primarily to European studies and

environmental leadership research, as the European Union has been in the focus of this specific research area for decades and proclaims its leadership in the respective area.[4] In addition, environmental policies have been one driver of the European integration process resulting in a substantial amount of EU legislation. Repeatedly, the EU's efforts have been critically examined and previous research has confirmed that its leadership momentum has faded (e.g. Kilian & Elgström, 2010; Karlsson et al., 2012). Nevertheless, the EU has not given up its aspirations and still wants to live up to its ambitions, while contenders have emerged expanding the field of potential leaders.

This leads to a comparative analysis of employed approaches, perspectives and solutions of three cases and opens space for discussing best-practice solutions and approaches, their feasibility and impact by assessing implemented political measures. Thereby, this study will attempt to fill the gap that has emerged from the sole focus on the self-perception and recognition of potential leaders, the analysis of global conferences or the European Union's leadership aspirations by previous research. This study will contribute to political environmental studies by considering employed policy strategies and discarding the aspect of perception as sole object of investigation. Additionally, in a holistic approach, the analysis will encompass six dimensions of policy strategies that could have an impact on the domestic solar energy development. By expanding the spectrum of cases based on former studies by Kilian and Elgström (2007), Karlsson et al. (2011; 2012) and Parker et al. (2012) and including all perceived leaders, namely the USA and China, instead of only assessing the EU, this study will furthermore open room for discourse on policy strategies and how to lead in addressing solar energy development. Thus, this exploratory and inductive study will not only set up a typology for empirical ideal-types of solar energy leadership and attempt to theorize how leadership could have an impact on solar energy development, but also provide implications for political actors to choose measures, modes of leadership and policy strategies to position themselves internationally in the context of solar energy. Furthermore, it will serve as an illustration of a tool for the development of a typology of political actors in solar energy leadership, which might be transposed onto other areas.

[4] See Chapter 2 Previous Research.

5. Design

This chapter will elaborate on the methodological design. First, it will present the operative dimensions of policy strategies and their relevance for solar energy leadership. Subsequently, an argument will be unfolded for the case selection. Thereafter, the methodological approach, the empirical material and delimitations will be presented.

5.1. Operative Dimensions of Policy Strategies

As the objective of this exploratory study is to develop a theorization for how environmental leadership could have an impact on domestic solar energy development, it is necessary to decompose leadership into different dimensions of policy strategies, which affect the development of the domestic solar energy sector. The following dimensions have been deployed: Policies, R&D, institutionalization, international agreements, support for less-developed countries and customs. The following subchapters will unfold arguments for the dimensions providing statements on the significance of each in regard of domestic solar energy and their connection to leadership.

5.1.1. Policies

First, policies are the obvious way to have an impact on domestic solar energy development. Their implementation is the basis of all changes and shapes the progress within the national context. In terms of solar energy, promotional strategies are of importance, from subsidies and exclusive feed-in tariffs to the lowering of procedural requirements e.g. for building permits of solar photovoltaic (SPV) installations and solar energy plants.

Policies introduced and enforced by law are sticks and carrots for actors within the field and, thereby, are based on the argument of structural or coercive leadership. Despite being domestically implemented, experimenting with policy solutions and demonstrating their feasibility or superiority are key features of directional leadership. By framing and shaping the perception, intellectual leadership can be a characteristic of policies as well.

5.1.2. Research and Development

It is not far-fetched that there is a suggested connection of a knowledge-intensive field such as energy to its dependence on technology. Without the technology behind, there is neither production and deployment of energy nor any development or progress. Hence, it is necessary to compile a technological dimension for the analysis of solar energy leadership and, in particular, include research and development (R&D) efforts, since it contributes to the advance of knowledge and technology. Measures aiming at the collection of knowledge and furthering of technological progress of solar energy have to be considered starting with the basic subsidies or funding of research. In this, central and national funds might come together with regional, municipal and local support. Standardization, knowledge transfer and sharing efforts are also of significance and shall not be neglected.

Albeit it is not the main idea of R&D efforts, structural leadership supports the advance by offering benefits, for instance in form of research grants. However, at the core of technological leaders is frontrunner and leading-by-example mentality, experimenting with different approaches and sharing, framing and promoting best-practice solutions. Thus, it substantially relies on directional and idea-based leadership.

5.1.3. Institutionalization

Without a framework, the best policies and R&D efforts go to waste. Institutions are necessary to monitor, supervise, control, and, in case, be able to sanction or fine actors in the field. Therefore, the creation of public awareness of environmental issues and the institutionalization of the environment itself can be utilized to build a functioning management system. Solar energy regimes supervising all activity can be set up in disparate ways and endowed with various forms of authority. May the framework be set up formal by state institutions or complemented with non-institutional actors such as environmental non-governmental organizations (eNGOs) and economic actors controlling each other, the forms of a managing system can be across a wide spectrum, and empowered and integrated in different ways.

As institutionalization is usually a long-term process, intellectual leadership with consciousness and values is at the core. The implementation of the ideas can nonetheless vary and lead to directional leadership in terms of leading by example by

employing exemplary or frontrunner structures of supervision. Manifestations of instrumental leadership could take various perspectives into account to find agreement.

5.1.4. International Agreements

Identifying the need of assessment, most of all former research in the field has focused on global conferences acknowledging their significance. The COP 3 in Kyoto in 1997 and COP 15 in Copenhagen in 2009, which evolved from the UNFCCC, were significant events in the development of climate change awareness and the fight against the effects of global warming resulting in global agreements and national promises and contributions. Not neglecting the importance of global conferences, multilateral (trade) agreements and bilateral co-operations are likewise important for the assessment of solar energy leadership. For instance, the North American Free Trade Agreement (NAFTA) was argued to be the "greenest" trade agreement that has been signed so far (Mol, 2001, p.125), and deals concluded by EU MS with other countries – for instance between Germany and India – have impact on solar energy development (*Tagesschau*, 2015). Leadership is not only fact-based, but also depends on international participation, initiatives and recognition. The study by Kilian and Elgström (2010) is not only confirming this view that perception is essential for leaders but also pointing out that it might be time for bilateral alliance building (p.268). Despite referring to an international framework, agreements with other countries can have major impacts on domestic developments, in particular when it comes to global climate conferences leading to commitment to global protocols or bilateral agreements for instance resulting in co-operation on the matter.

Considering international agreements in terms of leadership, idea-based or intellectual leadership is the underlying theme by raising consciousness and promoting solutions. Nevertheless, rather instrumental leadership is daily fare, as the process is explicitly fast and characterized by negotiations (Young, 1991, p.298). Directional leadership can exert influence as well but remains in the background as does structural leadership, which could also play a role in form of benefits in terms of side payments and promises in agreements with only a few actors.

5.1.5. Support for Less-Developed Countries

In spite of the fact that support for less-developed countries is again on first sight not domestically relevant, there are features significant for domestic development. Similarly to international agreements, efforts of support not only strengthen the

international position by acting as a solidary leader sharing knowledge and providing financial aid, but also have effects on domestic industries. As all are facing the same challenge together, cutting-edge technology and knowledge has to spread quickly to have the best impact in fighting for the common goal. Thereby, the domestic solar sector can be put forward to co-operate with foreign projects making them both thrive. As a result, the domestic industry would be fostered and the international position strengthened.

Encouraging co-operation and providing direct financial support rely on the creation of incentives, thus, structural leadership. In addition, solidarity towards less-developed countries is always connected to sharing and spreading ideas and values as well as policy solutions and, therefore, are manifestations of intellectual leadership and in some cases directional leadership. If negotiations are involved, instrumental leadership might be influential as well.

5.1.6. Customs

In contrast to the chapters on international agreements and support for less-developed countries that considerably connected to outflows of values and resources, customs deal with influx in terms of products and how it is managed. Rooted in sovereignty concerns and the maintenance of domestic power and industry, protectionist efforts such as tariffs on SPV and related products or non-tariff barriers are still in place.

Protectionism works explicitly against the efforts of achieving a common goal and is not a sign for leadership on the global stage, but rather for lagging behind, despite being based on the sticks or threats of structural power. It undermines the system of sharing, spreading and pervading on the global stage. However, custom policies can be utilized as structural leadership efforts to foster the development of the domestic industry.

5.2. Selection of Cases

In terms of solar energy, there is a small set of frontrunners on display on the world stage, despite the acknowledgement of the potential of solar energy. For picking cases, the consideration of major economic powers is of importance as they are able to act as global leaders and be recognized for their efforts, since they can make a change. This view is confirmed by recent studies by Karlsson and Parker's research team identifying the leadership recognition of the cases as the highest and at roughly the same level

(Karlsson et al. 2011; Karlsson et al. 2012; Parker et al., 2012). This chapter will also identify polity aspects that will have an impact on the analysis.

5.2.1. The European Union

Repeatedly, the EU has proclaimed its environmental leadership (e.g. European Council, 2007; EC, 2015a), and its aspiration to be "a global standard bearer on climate change" (Parker & Karlsson, 2010, p.924). Referring and according to previous research on environmental leadership,[5] this claim has to be tested whether it can be uphold in the respect of solar energy, which is a significant contributor to climate mitigation. Acknowledging the Union's institutional structure encompassing 28 member states (MS) with distinct energy policy paths, the EU is a collective actor facing internal diversity.[6] Energy and environment have been integrated into the shared competences between the Union and its MS in the Lisbon Treaty (EU, 2012, TFEU[7] Art.4; TFEU Art. 2(2)), but have to respect the principles of conferral, subsidiarity and proportionality (European Union, 2010, TEU[8] Art.5). Having ceased the right to adopt legislation resulting for instance in *Directive 2009/28/EC* on the promotion of energy from renewable sources, the 2020 CEP and 2030 CEF, the Union is of relevance (EP & the Council, 2009), while directives have to be in translated into national law highlighting the role of MS (TFEU Art.288). Single MS can also account for substantial installations of solar energy capacity, for instance Germany was the frontrunner in installed capacity up to last year (IEA PVPS, 2016; Table 1 in the Appendix).

5.2.2. The United States of America

Despite the disengagement from international environmental governance and the abdication of its leadership role under the George W. Bush administration in the area of climate change (Parker & Karlsson, 2010), the USA is recognized as an economic leader and exerts influence internationally with its Gross Domestic Product (GDP) amounting to $17.4 trillion (World Bank, 2015). In addition, the USA was leading in environmental matters during the 1980s and, under the Obama presidency, the USA

[5] Compare Chapter 2 Previous Research.
[6] For instance, Latvia and Estonia do not employ any promotional policies for solar energy (Pablo-Romero, 2013). On the other hand, Germany and Italy alone account together for more than 45 GW of solar energy capacity and the former was the leader in installed capacity in 2014 (IEA PVPS, 2016; Table 1 in the Appendix).
[7] Treaty of the Functioning of the European Union.
[8] Treaty of the European Union.

caught up with the EU's leadership recognition on the global stage by 2010 despite its reliance on oil (Karlsson et al., 2012; EIA[9], 2016; Bang & Schreurs, 2010). At the COP 21 in Paris, Obama stated that the agreement would contribute to American leadership and that the United States had transformed into the global leader in fighting climate change over the last seven years (Reuters, 2015b). Furthermore, in terms of installed capacity, the USA can account for more than 25 GW and places third in the last year's annual installation (IEA PVPS, 2016; Table 1 in the Appendix). Therefore, the examination of the USA and its federal states as they have the competence to introduce bills, as long as their legislation does not infringe on any constitutional rights (U.S. Const.[10] art. VI, §2; Daunt, 2014), will contribute to the assessment of the solar energy leadership.

5.2.3. The People's Republic of China

While ten Chinese cities had to raise red smog alarm last year (BBC, 2015b), and despite its weak environmental protection standards, China's economy is of international importance with a GDP of about $ 10.4 trillion, carrying implications for the world economy (World Bank 2015). In addition, over the last years, China has taken considerable action to expand its solar energy sector. In 2014, it became world leader in yearly installed solar capacity as well as in total installed capacity of solar energy only considering single nation states (China, 2014; Chu, 2015; IEA PVPS, 2016; Table 1 in the Appendix). Confirmed by previous research, the global recognition of China as a potential leader in the fight against climate change has considerably risen and has definitively caught up with the EU some years ago (Karlsson et al., 2011; Karlsson et al. 2012; Parker et al., 2012). Hence, the investigation of China can further the debate of solar energy leadership by widening the perspective and expanding the traditional foci on Western cases, as it has never been assessed before as leader in climate mitigation. China also is set apart from the first two cases in its organizational structure. Although its provinces have the competence to flesh out national action plans, China remains a single nation-state marked by democratic centralism with a strong centralized and hierarchical internal structure (China, 2014; C. Wang, 2013).

[9] U.S. Energy Information Administration.
[10] U.S. Constitution.

5.3. Empirical Material

This research project will encompass the analysis of a wide range of material to cover the dimensions of policy strategies. In total, eight specific policy and program documents particularly shaping solar energy policy and the development of the sector were examined. In addition, five declarations and the Lisbon Treaty of the European Union have been included as well as the INDCs of the cases, which has been the starting point for the identification of material by shedding light on efforts of the cases to address climate change, including solar energy development. The relevant policies could be identified by the assistance of the INDCs and, to complement this information, sixteen official homepages of ministries and other institutional bodies have been taken into consideration stating the diverse efforts of the cases. Nevertheless, it has to be stated that official documents could not be identified for the analysis of all dimensions in the three cases. Due to the absence of material published by institutional sources, twenty publications on the policy strategies including one book, eight studies by researchers and non-governmental organizations, two websites and nine newspaper articles have been identified and analyzed to comprehensively illustrate the policy strategies of the cases. Overall, the material covers the timeframe 2009 to early 2016.

Ideally, only official statements of the efforts of the cases regarding the dimensions published by the institutional bodies would be considered to provide a higher consistency. However, they are not existent for all dimensions. Furthermore, the project would ideally take all policies of EU MS, U.S. states and Chinese provinces into consideration. Due to time, scope, and resource limitations, this is not feasible for this research project. Therefore, studies, reports and reviews on the policies on these subordinated levels are included to complement the analysis of the overall strategies. Due to the issue of availability and the mentioned limitations, the analysis of the material only serves as illustration of the employed strategies of the cases and does not claim to provide completeness.

5.4. Methodological Approach

This research project is set up in two parts. First, by employing qualitative content analysis, Chapter 6 will illustrate the policy strategies of the three cases, that is how

they have approached solar energy development utilizing established leadership modes. Second, discussing the findings, the objective of Chapter 7 is to develop a theorization identifying empirical ideal-types of solar energy leadership, based on Uta Gerhardt's development of ideal types that was inspired by Max Weber's work (Kluge, 2013). Thereby, the overall analysis utilizes partly directed (part 1) and conventional (part 2) content analysis (Hsieh & Shannon, 2005).

In the first step (Chapter 6), the modes of leadership as laid out in Chapter 2 will deductively guide the exploratory and directed content analysis of the operative dimensions of policy strategies as predetermined codes (Hsieh & Shannon, 2005; Schreier, 2012). As single actions can represent several modes at the same time, the codes are part of a multi-dimensional typology not classification, since they are not mutually exclusive (Kluge, 2013; Hempel & Oppenheim, 1936). The successive analysis of the material will provide insight in how the three cases approach each dimension of policy strategies and solar energy development employing distinct and representative measures of modes of leadership. The guiding questions were the following: What measures are employed to influence solar energy development? Which mode of leadership do they represent?

The second part (Chapter 7) will discuss the findings inductively identifying the empirical ideal types of solar leadership following conventional content analysis (Hsieh & Shannon, 2005). As no theory exists on solar energy leadership, conventional content analysis can be utilized to derive empirical ideal types (Hsieh & Shannon, 2005). The identified ideal types are part of a typology as well, since they do not aim at being exhaustive.

5.5. Delimitations

All research is endangered by the threat of being invalid, infeasible or not being capable to live up to criteria such as fullness. As all studies, this research project will have several limitations. First, it is necessary to point out that this research will focus on the operative dimensions for the assessment of actions in the field of solar energy and, in the end, the development of a theorization how political environmental leadership could have an impact on domestic solar energy development. Thereby, it will not consider other variables, such as the financial crisis and the development of the world economy despite their impact on capital and resource intensive fields and industries like energy, or the catastrophe of Fukushima leading to major changes in

energy strategies around the world. Nevertheless, the dimensions are subject to the criterion of fullness. That means that they are meant to cover all aspects of direct measures and influences of the cases. Furthermore, interrelatedness between the dimensions of policy strategies can be identified, however, the interplay will not be considered in this analysis.

Qualitative research has to face the challenge of identifying important material. This may come to be a more problematic issue, as the material, in particular from China, might be hard to identify, access and assess facing a language barrier as a hindrance. As thesis in English and my set of languages limited to European languages, there was need for support and translation for the identification of material and the translation of Chinese documents to address this issue. Still, also due to transparency and structural issues, it is hard to identify, get access to and assess material from China. Consequently, mistakes and misunderstandings can occur due to the language barrier on both sides and may lead to wrong wordings. China itself puts forward that even the English versions of official documents are unofficial and only used as reference and does not represent the official statement (e.g. China, 2015).

In addition, the fact that the institutional bodies under investigation are of considerable size, the amount of material for the analysis has to be limited and, thus, only aims at illustrating the employed strategies of the cases due to the appropriate scope of this research project. In particular, it was not possible to assess every EU MS, US state and China's province policies in the process. Studies, reports, reviews and articles were used to complement the information that could be gathered by analyzing official documents and homepages of institutional bodies.

6. Analysis

This chapter will successively assess the operative dimensions of policy strategies revisiting the cases in sequence.

6.1. Policies

Various policy areas may touch upon domestic solar energy development, such as energy and natural resources, climate action and environment(al protection) as well as regional and local development leading to a complex structure characterized by amendments, complementation and interrelatedness.

6.1.1. EU

The 2020 CEP and 2030 CEF are the most crucial adopted acts leading to further environmental legislation (Latvia & EC, 2015). As part of the Europe 2020 Strategy, the 2020 CEP, which was set up in 2007 and enacted in 2009, introduced three key targets for addressing climate change, among those to rise the proportion of energy from RES to 20% in the final gross consumption (EC, 2010b). Incorporating the vision of a larger proportion of RES and the highly ambitious goal, the 2020 CEP is a measure of idea-based and directional leadership by framing, raising consciousness and leading by example. The successor, the 2030 CEF, rendered the concrete and fixed targets for the MS of the 2020 CEP to more flexible, self-determined and non-binding commitments (EC, 2014). Thus, it can only been interpreted as an intellectual leadership effort, disengaging from the directional leadership aspect.

One policy mechanism introduced with the first package and planned to be reviewed with the second is the EU Emission Trading System (ETS) (EC, 2010b; EC, 2014; DG Climate, 2016c). Being the first of its kind and a frontrunner approach, the EU ETS is clearly a manifestation of directional leadership (DG Climate, 2016c). In addition, by putting a price on C02 emissions, costs are imposed on emitters. Thus, the ETS represents a structural leadership measure for the domestic industries.

The second most prominent legislation established under the 2020 CEP was the so called *Renewable Energy Directive* (2009/28/EC)[11], which introduced the overall target of the 2020 CEP "to achieve a 20% share of energy from renewable sources in the Community's gross final consumption of energy" (EP & Council, 2009, L 140/26 (96)) and a share of 10% of renewables in the transport sector as well. Promoting the idea of a low-carbon society and, at the same time, strengthening RES represents the employment of frontrunner approaches and the vision of a solution. Forcing the MS and the industries and economies to conform to it by the threat of fines is a coercive measure. Setting fixed and binding targets can, thus, be understood as an effort characterized by intellectual, directional and structural leadership.

As directives has to be transposed (EU, 2012: TFEU Art.288), the distinct policy strategies employed by the MS have to be considered as well. María del P. Pablo-Romero (2013) exposes in her study on the status of solar energy policies in the EU the specific policy mechanisms MS introduced to raise the proportion of energy from

[11] The 2009/28/EC Directive on the promotion of the use of energy from renewable sources.

SPV in relation to the 2020 objectives. She identifies that overall 25 of the EU27 MS introduced policies to promote SPV; eighteen of those MS employed feed-in tariffs (FITs) and feed-in premiums (FIPs), fifteen subsidies, four net metering, twelve tax incentives[12], five trading schemes with green certificates, and five soft loans (Pablo-Romero, 2013). All policies are manifestations of structural leadership in the first place, because they create incentives and benefits for the RES industry. Additionally, some measures, in particular net metering and the green certificate trading, could also be seen as directional leadership, as they are frontrunner approaches to promote RES (Pablo-Romero, 2013).

By experimenting with variety of policy solutions, introducing ambitious targets demonstrating will and, in particular, the early introduction of the ETS, the EU has implemented the modes of directional and intellectual leadership. However, with the establishment of the 2030 CEF and its more flexible and non-binding commitments, the EU has considerably decreased the level of the efforts. Nevertheless, the ETS and the transposing promotional policies of the MS on the promotion serve as mechanisms of structural leadership to contribute to the development of solar energy by creating benefits and cost. Still, on national level, uniform leadership movement cannot be identified, also confirmed by Eurostat data (2014; 2015). Not all of the MS employ structural leadership measures nor can they account for directional or idea-based efforts.[13]

6.1.2. USA

As pointed out, the federal structure of the USA shapes the policies on solar energy. In fact, there are incentives available throughout the USA at the utility, county, state and federal level, which can take various shapes including tax credits, solar rebates, premium FITs and net metering, or solar production incentives (SEIA, 2016). According to Solar Energy Industries Association (SEIA) (2016) and the Database of State Incentives for Renewables & Efficiency (DSIRE) (2015a), the most important policies are renewable portfolio standard policies (RPSPs), which have been introduced by 29 states so far and which profoundly vary from state to state. Setting up requirements for "utility companies to source a certain amount of energy they

[12] Including tax deductions and tax credits, exemptions and reduced tax rates.
[13] In 2014, eight of the 27 MS (Bulgaria, Czech Republic, Estonia, Italy, Lithuania, Romania, Finland and Sweden) had reached their targets already, whereas six countries (Bulgaria, Czech Republic, Estonia, Italy, Lithuania, Romania, Finland and Sweden) were at least 5% below (Eurostat, 2014).

generate or sell from renewable sources such as wind and solar" (SEIA, 2016), RPSPs represent implementation of structural leadership exerting coercion towards the utilities. In addition, the standards employ directional and intellectual leadership to some extent, since they frame the issue and establish incremental targets for raising the proportion of energy from RES gradually over a certain amount of year to 10% to 40% in that state (DSIRE, 2015a; SEIA, 2016). According to the North Carolina Clean Energy Technology Center (NCCETC) in 2014, eighteen states have established RPSPs that include more specific requirements (carve-outs) to promote particularly solar energy technologies, and, thus, strengthen their efforts in directional leadership (NCCETC, 2014). DSIRE can identify 23 states with such provision, the most ambitious among those being the RPSP of Arizona aiming for 4.5% by 2025 (DSIRE, 2015b).

The second most significant policies in U.S. states are Solar Power Purchase Agreements (SPPAs), which offer customers the opportunity to host SPV on their roofs providing them with solar energy without upfront cost. Most often, net metering by utility services accompanies SPPAs. According to the policy review conducted by the NCCETEC and the Meister Consultant Group (2016), there were proposals, enactments or studies of solar policy changes in at least 46 states in the field of net metering, valuation of distributed solar, fixed or solar charges, third-party or utility-led rooftop ownership an community solar. As SPPAs and net metering should be considered more often in the European context being (Pablo-Romero, 2013), since the experimenting with them can be understood as frontrunner strategies leading to an interpretation as directional leadership. In addition, SPPAs create incentives for new installations and, thus, are examples of structural leadership.

Another structural leadership measure is California's tax exclusion policy for new SPV installations, which is the most significant state measure creating strong incentives (California State Senate, 2014; SEIA, 2016). However, this policy strategy has only been applied in California, while other states, such as Florida and Georgia have been considerably inactive in promoting new SPV installations (SEIA, 2016).

On federal level, the Office of Energy Efficiency & Renewable Energy (OEERE) (2016a) as part of the Department of Energy (DOE) states President Obama's Climate Action Plan and deployment commitments as the most crucial policy strategies. In these, the USA committed itself to advance the deployment by 885 MW

from 2014 onwards, at an estimated gross deployment of 15.9 GW in the first quarter of 2014 (OEERE, 2016a). Setting targets, the policy demonstrated will and, therefore, can be considered as directional leadership measure. Another political action was set up in December 2015, when Congress renewed the solar tax credits of thirty percent for new installations until the end of this decade (*Bloomberg New Energy Finance*, 2015). As tax credits create incentives and shape preferences, they are mechanisms of structural leadership.

In conclusion, in spite of commitments and the tax credits, the overall U.S. policy strategies in solar energy development cannot be seen as considerably strong in either mode of leadership. Structural and directional leadership can be identified to some extent, however, even stronger on the state than on the federal level. The multitude of RPSPs and SPPAs were introduced as directional and structural measures, still not being considerably ambitious. In particular, California's single and unmatched policy of tax exclusion is the most substantial structural leadership effort.

6.1.3. China

China's policy strategy on solar energy development is set up in the National Program on Climate Action (NPCA) (2014-2020). Despite the fact, the only specifics in regard of solar energy that were introduced in the NPCA are the goal of 100 million KW, respectively 100 GW by 2020 and the "construction of a number of large-scale photovoltaic power plants" (China, 2014, p.8). Concerning existing legislation, it is pointed out in the NPCA that the relevant laws and regulations are weak and the institutional mechanisms, policies, systems and standards are not perfect (China, 2014).[14] The program identifies the need for improvement and maintenance of climate change related legislation in all respective fields, among others renewable energy (China, 2014). For this, an overall policy framework has to be established (China, 2014), that was still lacking for renewables or specifically solar energy (Yan, 2011). Although the NPCA remains vague and shallow on concrete measures (China, 2014), it demonstrates will setting a target, frames the importance of solar energy and highlights necessary institutional change, therefore, is marked by directional and intellectual leadership.

[14] Studies by Ying (2011) and Yan (2011) as well as a review of Forbes (Trefis Team, 2015) confirm this view.

The same mix of leadership is also the characteristic of China's 12th Five-Year Plan (2011-2015) introducing the aim of 11.4% of its primary energy coming from renewable sources by 2015 and 15% by 2020. Establishing a renewable energy quota system setting targets between 2% and 10% excluding hydropower for each province, to which they will have to conform to, additionally represents structural leadership by exerting coercion (Chu, 2015).

Already in 2005, China introduced the Renewable Energy Law (amended 2009) that was a first step and set up a framework for the promotion, support and funding for renewable resource technologies including solar from research to utilization (MOFCOM[15], 2013). With the amendment in 2009, China introduced two separate policies to promote SPV installations, namely the Building-integrated photovoltaics (BIPV) subsidy program and the Golden Sun program[16] (Jones, 2011a). The former supports small-scale rooftop and BIPV systems, whereas the latter aims at larger installations, technological support and market incentives to accelerate the industrialization of solar energy (Jones, 2011a). By financial incentives covering up to 70% of the investment (Jones, 2011a), the programs are manifestations of structural leadership. Another structural leadership measure was the introduction of the renewable energy feed-in tariffs in 2012/13 that supported commercial or industrial enterprises to generate solar energy for self-consumption (Chu, 2015; Jones, 2011a).

In addition to these subsidy policies, China employed preferential loan and land policies for solar companies. Lin Jones (2011b) identifies loans for three companies[17] amounting to more than RMB 300 billion that are more than €40 billion, and, probably, that are not the only subsidies. The same companies were additionally provided with large parcels of land at prices below market level to lower their production costs (Jones, 2011b). As the programs, these measures represent structural leadership creating benefits for the industry.

In addition, and as the promotional policies are capped for each province,[18] eight eastern provinces[19] have introduced local SPV subsidies as promotional policies to increase the overall subsidies to solar power projects by 20-50% (Azure International

[15] China's Ministry of Commerce.
[16] The Golden Sun program accounts for RMB 20 billion, that is nearly €2.7 billion (U. Wang, 2009).
[17] Yingli Solar, Suntech and Trina Solar (Jones, 2011a).
[18] The Golden Sun Program establishes a cap of 20 MW for each province including installations fostered by the BIPV program (Jones, 2011c).
[19] Namely Hebei, Henan, Jiangsu, Jiangxi, Shaanxi, Shandong, Shanghai and Shanxi.

in Chu, 2015; Jones, 2011c). More than half of China's provinces have further established commercial and industrial time of use pricing policies for solar energy in addition to a diverse repertoire of promotional strategies (Azure International in Chu, 2015; Jones, 2011c). All measures aim at creating incentives and are structural leadership measures in the end.

Summarizing employed policies on solar energy, China utilizes in particular manifestations of structural leadership, such as subsidies, provisions and loans, to foster advance of its domestic solar energy on national and provincial level. Furthermore, the material, especially the NPCA and the 12th Five-Year Plan, clearly shows will and the utilization of framing, thus, directional and intellectual leadership. This is especially evident in the INDC in which China states its plan to introduce an ETS (China, 2015).

6.2. Research and Development

The knowledge- and technology-intensity of solar energy seems apparent. Therefore, the question is how the cases foster technological advance, especially considering the fact that solar energy technology has not been advanced to its full potential due to storage limitations, energy losses in the translation process and in the very production process. The diverse layers of support due to organizational structures have to be taken into consideration.

6.2.1. EU

Integrated into the Europe 2020 Strategy, specifically in the Horizon 2020, the EU introduced the aim to become the global leader in renewable energy (DG R&I, 2016a). To achieve this, the EC has set up a target for investment in research and development, namely that the funding of R&D should amount to 3% of the EU's GDP (DG Energy, 2016).[20] By setting targets, raising consciousness and framing, directional and idea-based leadership coin the overall Horizon 2020 strategy.

The seventh Framework Programme (FP) (2007-2013)[21] of the EC dedicated €2,350 million to the energy sector focusing on RES, cleaning other sources of energy,

[20] The EU and its MS are not on track for achieving their goal, as the average amounts roughly to 2% of their GDP (Eurostat, 2014).
[21] Projects are still running under the Horizon 2020, the eighth FP (DG R&I, 2015a; DG R&I, 2016b).

energy efficiency and smart networks (DG R&I, 2016b). According to CORDIS[22] (2016), there are 66 projects specialized on solar energy accounting for more than €280 million of funding under the seventh FP. The Horizon 2020 and the Strategic Energy Technology (SET) Plan shape the eighth framework period for energy research funding by the EC, dedicating €5,931 million to non-nuclear energy research for the period 2014 to 2020 (EC, 2015e). Despite emphasizing the importance of SPV technology and its advance (EC, 2015f; DG R&I, 2015b; DG R&I, 2016a; DG R&I, 2016b), the Horizon 2020 accounts for 35 solar projects amounting only to roughly €94 million (CORDIS, 2016).[23] By providing funding, thus, incentives for R&D and emphasizing the importance of solar energy, structural and intellectual leadership are the employed key modes.

It shall be mentioned that some funded R&D projects are not about technological advance in terms of research in the first place, but focus on knowledge transfer and collaboration, for instance *STAGE-STE* and *CHEETAH* (CORDIS, 2016). In addition, the EU provides financial support for research institutes and facilities such as the Cyprus Institute, which cooperates with the Joint Research Centre of the EU and focuses on solar energy (Cyprus Institute, 2016). These efforts aim at idea-based leadership employing means of structural leadership.

By overall goals and framing, the EU utilizes intellectual paired with directional leadership. The FPs offer additionally substantial funding for R&D of solar technology, may it be thermal, concentrated, PV or storage options. Consequently, the emphasis is on manifestations of structural leadership. On national, regional and local level, difficulties to find data manifest. However, large projects seek financial aid directly from the Union. It has to be pointed out that the leverage effect increases EC funding by including MS and economic actors as investors. Since it was not feasible to detangle the data, it was more appropriate to state only the amount of the EC subsidies.

6.2.2. USA

Due to the privatized nature of the U.S. market, one might suspect that there is no considerable funding by the government. However, this holds not true as the DOE'S

[22] CORDIS, Community Research and Development Information Service, is the EC's provided platform for listing projects under the seventh FP.
[23] The funding period is still open for applications and will continue for four more years (DG R&I, 2016a).

OEERE initiated the SunShot Initiative, which accounts for roughly $200 million in R&D investments in solar technologies (OEERE, 2016b). Aiming at reclaiming American technological and market leadership, improving energy independence and, thus, energy security, strengthening competitiveness, SunShot supports the fight against climate change attempting to raise the availability of clean, low-cost and reliable solar energy (OEERE, 2016b). Thereby, the initiative represents modes of idea-based leadership by raising consciousness and structural leadership by providing funding for the research.

The polity structure of the USA again fosters support on a state level. As a paragon, solar frontrunner state California has established two major programs to advance solar energy research: the Public Interest Energy Research (PIER) Program that provides $62.5 million for electricity R&D and demonstration efforts until 2015 and the California Solar Initiative Research and Development program that accounts for $50 million or roughly $9 million per year (California Public Utilities Commission, 2016). Incorporating the vision of a solar state and providing funding, the projects represent likewise idea-based and structural leadership. Other states seem considerably more reluctant to provide substantial funding for solar R&D efforts and the initiatives of California remain unmatched.

Concluding, the USA has not considerably engaged in R&D in terms of solar energy. The few projects are based on idea-based leadership employing structural leadership measures. Policy strategies depend individual governmental leaders of single states and the federal government, since their approach is decisive for the introduction, continuation or abolishment of programs. Today, supporting policies are rare and, consequently, leadership measures remain weak.

6.2.3. China

Among the measures for enhanced action on climate change, China states in its INDC its will “to strengthen research and development (R&D) and commercialization demonstration for low-carbon technologies, such as … renewable energy” (China, 2015, p.7). At the same time, China wants to increase financial support, innovate the application of funds and explore new investment and financing mechanisms for low-carbon development, such as public-private partnerships (China, 2015). This is supposed to go hand in hand with the implementation of preferential taxation policies for promoting the development of new energy and improvements of pricing, grid

access and procurement mechanisms for solar, wind and hydro power (China, 2015). Despite this statement, the National Program on Climate Action (2014) remains vague, only pointing out the importance of the development of low carbon technologies, among others, it states the need to promote R&D efforts in solar energy technology (China, 2014). Thus, it can only be seen as weak manifestation of idea-based leadership aiming at raising consciousness.

In article 12 of the Renewable Energy Law, the Ministry of Commerce of China (MOFCOM) emphasizes the priority of technological advance in the field:

> "Article 12 In the development of science and technology and high-tech industrial development, the state shall give priority to the scientific and technological research in, and the industrialization of, the development and utilization of regenerable resources, incorporate the said research and development and utilization into the national scientific and technological development planning and high-tech industrial development planning, arrange for funds to support the scientific and technological research in, and application, demonstration and industrialization of, the development and utilization of regenerable energies, promote the progress of the technology relating to the development and utilization of regenerable energies, decrease the production cost of the products of renewable energies, and enhance the product quality" (MOFCOM, 2013).

Again, the law remains unclear of the exact measures, but emphasizes the importance, and, therefore, represents idea-based leadership. Further documents on the actual measures are not available for the international public, thus cannot be assessed in terms of leadership. Possibly, they would give insight in measures of structural leadership resulting from the law.

In terms of provincial R&D support, there are only overviews available only including superficial information on provincial policies telling of demonstration projects provided with grants under the Golden Sun framework and supported by provincial funding (e.g. Chu, 2015). Regarding technology, the laws are said to be insufficient rather lacking any ambition that would represent leadership modes (Yan, 2011). In addition, proper standardization and governmental control have not been enforced in an appropriate way (Yan, 2011).

Overall, China seems to abandon leadership measures in the technology sector. While technology is not advancing substantially, the market is harmed by weak regulations and enforcement. Furthermore, the specifics on the funding of solar R&D

projects cannot be properly identified and is even lacking to be sufficient (Yan, 2011). Concluding, China's structural leadership measures are either lagging behind or hidden behind a language, cultural or perhaps even political barrier.

6.3. Institutionalization

Even if there is political action, the efforts will not make a difference without an effective governance framework providing monitoring, supervision and control. The polities considerably vary in the three cases and, therefore, special attention has to be paid to their structure.

6.3.1. EU

Within the European Union, the fight against climate change became intensified and more institutionalized by the establishment of the DG Climate Action in 2010 (DG Climate, 2016a). Formerly being part of the DGs for Environment, External Relations, and Enterprise and Industry, it gained its independence to address more effectively climate change acknowledging the importance of the challenge by gathering expertise on the matter and strengthening its position, for instance in negotiations (EC, 2010a). Co-operation of DGs is common and so the DG Climate Action is teaming up with DG Energy when it comes to policies addressing renewable energies. The establishment of a separate DG can be interpreted as a manifestation of intellectual and directional leadership, because it shapes the framing of climate action innovatively.

On national level, there was no establishment of ministries solely for climate matters. Most commonly, ministries dealing with environmental issues are in charge, rarely others such as ministries for energy. However, in terms of solar energy, ministries for energy are the responsible institutions, sometimes connected to ministries of economic affairs. Over the last decades, MS started, in particular due to article 6 of the Treaty of the European Union[24] and the Cardiff process, to employ a more cooperative and inclusive approach considering environmental perspectives in other policy areas in order to foster positive-sum solutions (Hertin & Berkhout, 2016). This inclusive approach can be considered as innovative as well and, thus, represents directional leadership.

[24] TEU Art. 6(1) provides legal value to the Charter of Fundamental Rights (CoFR), in which environmental policy integration is enshrined (CoFR Art.37) (EU, 2000).

In addition to the official governmental institutions, representative associations, eNGOs and private actors as well as the civil society including individual citizens may seek to engage with the EU's actions by EC's public consultations (EC, 2016; TEU Art.10(3), Art.11). Furthermore, it is provisioned that any individual citizen is entitled to raise their voice concerning instances of maladministration in the activities of the Union institutions, bodies, offices or agencies (e.g. TFEU Art.24, Art. 227, Art. 228). Industry associations and eNGOs are the first to raise concerns when policies are identified either to lack proper implementation or to be badly administered. Empowering non-state actors in terms of drafting and supervision, and thereby raising awareness and creating collaborations can be characterized as directional and intellectual leadership measures, as it is still a frontrunner approach. In particular, the engagement in the dialogue with non-state actors could be interpreted as manifestation of instrumental leadership, since it can result in a negotiating process weighing interests and perspectives.

The EU employs a distinct approach that can be seen as innovative due to its organizational structure. Involvement of stakeholders throughout the process and especially beforehand is characteristic for EU action due to EU's better regulation approach (EC, 2016). This considerable inclusion of third parties in the legislative process is a frontrunner practice that the EU has strengthened over the last years (EC, 2016). Consequently, directional, idea-based and instrumental leadership shape the Union's institutionalization.

6.3.2. USA

The USA still employs a more separated organizational structure, resembling the EU's before singling out the DG Climate Action. Up to now, the Department of State (DOS), which is in charge of international relations, has been involved with partnerships and negotiations on climate change on the international stage; the Bureau of Oceans, International Environment and Scientific Affairs (OES) is responsible for climate change action in this regard (DOS, 2016). Furthermore, the independent federal Environmental Protection Agency (EPA) advises the government, supervises the execution of environmental policies and enforces them (EPA, 2016). The EPA can even be seen as a department of environment, because it is given authority by legislative acts of Congress and its head is considered cabinet-rank (EPA, 2016). However, domestically, the DOE's OEERE addresses renewable energies such as

solar. This complex framework of institutions is neither innovative nor emphasizes it the framing of solar energy development. Consequently, manifestations of the modes of leadership cannot be identified.

The USA are furthermore known to be a center of lobbyism, and associations such as Solar Energy Industries Association (SEIA) try to lobby for policies promoting solar energy on federal and state level, because the multilevel governance system opens different arenas for approaching policymakers (SEIA, 2016; Torfing et al., 2012). eNGOs have been part of the political culture since the rise of environmentalism during the late 1960s, 1970s and 80s, although they have lost their momentum (Hajer, 1997; Mol, 2001). Although involving stakeholders in the process, the approach does not represent any mode of leadership.

The U.S. polity remains diffuse that can be characterized as a complex but loose network of institutions that is only utilized for specific efforts but not aligned in their overall vision towards a solar energy development. Neither is framing strongly considered nor does the system approach the issue in an innovative way. Coercion or incentives are also not utilized. Rather an absence than a manifestation of leadership modes characterizes the institutionalization in the USA.

6.3.3. China

The distinct governance structure of China results in a complex system of councils and ministries. The Ministry of Commerce (MOFCOM), which answers to the State Council (government), was in charge of the Renewable Energy Law. The Ministry of Finance, the Ministry of Environmental Protection and the Ministry of Science & Technology as well as the Foreign Investment Administration and the National Energy Administration of the National Development and Reform Commission are also of relevance, as they for instance introduced the BIPV and Golden Sun programs.[25] In addition, provincial, regional and local governments are important, since they are in charge of supervision. This diffuse multitude and complex net of institutional bodies leads to a high risk of dysfunctional, inefficient and fraudulent policies and practices, as control of subordinated levels cannot be regarded as granted (Ying, 2011). In this system of democratic centralism, power is partly excessively centralized leading to arbitrary action of individuals, while other institutions do not comply with superior

[25] See Chapter 6.1.3.

authorities, enforce law laxly or even undermine countermeasures on the other hand (C. Wang, 2013). Jonathan Schwartz's (2004) study on eNGOs in China confirms that local governments focus on short-term economic growth that result almost inevitably in declining incentives for environmental protection. An example for lax enforcement offers Ying (2011) revealing that provinces went beyond the caps for subsidies, and control of companies in terms of standards, material and production cost are considerably questionable, even in regard of national subsidy policies like the Golden Sun program. Thus, the governmental institutional framework does not represent any of the modes of leadership and rather represents the opposite, their absence.

Despite this diffuse complexity, centralism is notably inherent in China leading to a weak position of non-state actors in the framework of Chinese polity (Denyer, 2015; Gao, 2013). They have to face state countermeasures, if they do not conform to the governmental view (Denyer, 2015; Gao, 2013). In particular, eNGOs have not come to rise in China so far, being constraint and only allowed by the state to form to pursue state goals (Schwartz, 2004; Gao, 2013). Besides the issue of bureaucratic registration, eNGOs have to face difficulties in proper litigation against enterprises with lax environmental procedures (Gao, 2013). Thus, they remain "merely capable of voicing complaints through social and news media" (Gao, 2013, para.11). Acknowledging the trust in eNGOs by the civil society, China utilizes them particularly for attracting international funding for environmental protection and educating the public (Schwartz, 2004). This could be understood as structural leadership, as China exerts coercion on eNGOs.

Overall, the institutional structure of China does not represent any mode of leadership in a strong way. In spite of the utilization of eNGOs, structural leadership that would be incorporated in a strong supervision and control system is not in place. The exclusion of non-state actors also constitutes rather the opposite of directional leadership, as it lacks an innovative approach.

6.4. International Agreements

As previous research has demonstrated, there is need of analyzing and acknowledging international efforts of the cases in the matter of climate action. In fact, international conferences and bi- and multilateral agreements can affect domestic developments including solar energy, since states commit to action and create opportunities for

economic actors. In spite of increasing their participation and initial action in climate change agreements, the cases vary in their positioning.

6.4.1. EU

In 2005, the EC published a communication on how to tackle climate change outlining key elements of the EU's strategy, and, particularly, emphasizing co-operation with third countries (EC, 2005). Arrangements have been set up with a number of OECD countries such as USA, Canada, Japan and Australia, but also with the BRICS, South Korea and the Ukraine (DG Climate, 2016b). Furthermore, there was support for interactions with regional groupings on environmental and climate change issues such as the African, Caribbean and Pacific (ACP) countries, Asia Europe Meeting (ASEM), the Association of South East Asian Nations (ASEAN), the Gulf Cooperation Council (GCC), Latin American and Caribbean (LAC) countries and the Organisation of the Petroleum Exporting Countries (OPEC) (DG Climate, 2016b). The DG Climate Action highlights in particular the bilateral co-operation with China, India and South Africa (DG Climate, 2016b). In joint declarations, collaboration in fields such as renewable energies including solar are anchored (e.g. EU & China, 2005). The same holds true for the EU-India co-operation, in which both sides commit to facilitate transfer, deployment and dissemination of sustainable and efficient energy systems and promoting renewables (EU & India, 2006). Despite the lack of exact information, this engagement in this multitude of agreements can be considered as directional and idea-based leadership, since this engagement is leading by example, sharing knowledge, furthering specific framings and promoting solutions. In some cases, the EU may have employed instrumental or structural leadership to influence behavior or pass deals. However, the material could not confirm this suggestion.

Furthermore, the EU fought valiantly for saving the Kyoto Protocol in the late 1990s and this is conceived as a major win for its environmental leadership. Bringing Russia back to the table by the creation of incentives, structural leadership characterized the EU's action. Since then, despite commitment and the attempt, the EU struggled with implementing measures and fulfilling the KP obligations (Parker & Karlsson, 2010). However, ever since, the EU's track record can show participation in all major conferences with the attempt to take the lead shaping the framing of the issue (Karlsson et al. 2011; Karlsson et al. 2012). Thereby, the EU employed measures of directional and idea-based leadership.

Regarding initiatives, the EU and its MS are at the forefront to initiate solar energy cooperation. In the wake of the COP 21, India and France founded the International Solar Alliance bringing together 121 countries and aiming at a total amount of $1000 billion in funding, €300 million provided by France alone (Ministry of New and Renewable Energy India, 2016). This capital shall be used for the "massive deployment of affordable solar energy and to pave the way for future solar generation, storage and good technologies" (Ministry of New and Renewable Energy India, 2016). Another agreement was set up between Germany and India to support the building of solar energy plants with cheap loans that will amount to €1.5 billion is one paragon example for the bilateral solar agreements established by EU's MS (*Tagesschau*, 2015). This can also be seen as support and transfer activity; however, as the countries established a wide-ranging co-operation involving several areas, it is closer to an international agreement. Structural and idea-based leadership are at the core of these examples, raising consciousness by framing, shaping preferences with benefits and influencing behavior. However, as negotiations are central, instrumental leadership is necessary in order to finalize and conclude agreements.

The efforts of the EU to strengthen its international position seeking participation, initiative and co-operation resulting in recognition can be interpreted as intellectual and directional leadership measures, because it led to ambitious targets combined with a multilateral approach shaping the domestic solar energy development by leading by example, emphasizing the importance and, thus, framing the issue. Additionally, it created incentives for other actors and the own industry leading to global collaboration, partnerships and support. So manifestations of structural leadership were utilized as well, although it cannot be stated to what extent.

6.4.2. USA

As scholars confirm, under the Obama administration, the USA increased their international efforts and participation in multilateral agreements (Bang & Schreurs, 2010). This became palpable at the COP 15 in Copenhagen, when the USA stepped forward to save an agreement and finalize a resolution together with China and the other BASIC countries (Karlsson et al., 2012). This can be especially considered as an effort characterized by instrumental, directional and intellectual leadership, since negotiations were involved and together the actors could pass the agreement. Thereby, they demonstrated will and established their framing.

In addition, the USA has built up several bilateral climate and energy partnerships so far, in particular with India, China, Canada and Mexico for fighting climate change. In co-operation with Mexico, the Bilateral Framework on Clean Energy and Climate Change was established in 2009 to promote clean energy and establish a mechanism for political and technical co-operation and information exchange (DOS, 2016; OPS[26], 2009). A joint statement in 2015 laid out the efforts including setting up a bilateral clean energy and climate policy task force to deepen the collaboration in specific areas, among others clean electricity, grid modernization and global and regional climate modeling (DOS, 2016). In the wake of the COP 21 in Paris, the USA and Canada cooperated and produced a joint statement on climate and energy leadership released by the U.S. Office of the Press Secretary (OPS) to secure joint efforts to achieve the INDCs and R&D efforts (OPS, 2016). In terms of clean energy, the collaborating sides pledged to facilitate grid access for energy from RES and to support technology innovation (OPS, 2016). In addition, the USA teamed up with China releasing a clean energy announcement in 2009, introducing several measures for enhancing progress of clean technologies, amongst them the U.S. China Renewable Energy Partnership to support energy deployment from RES and facilitate state-to-state and region-to-region partnerships to share experience and best practices (OPS, 2009). Also in 2009, the USA engaged with India to establish a partnership on clean energy, energy security and climate change (DOS, 2016). The Joint Clean Energy Research and Development Center, which got $100 million in public and private funding over 5 years, worked on the advance of RES technologies including solar (DOS, 2016). As forms of framing, raising consciousness, demonstrating will and leading by example are central to these agreements and declarations, idea-based and directional leadership characterize them. Furthermore, the engagement with India resulted in structural leadership providing benefits and influencing behavior.

Although none of the measures can be seen as efforts solely aiming at solar energy development, they still connected to solar development. By attempting to foster collaboration with other countries including the field of RES, the USA established its framing, shaped preferences, influenced behavior and demonstrated will. Thus, the measures of the USA can be considered as intellectual, structural and directional. As

[26] U.S. Office of the Press Secretary.

agreements are always based on negotiations, instrumental leadership is also inherently involved.

6.4.3. *China*

In China's NPCA (2014), the significance of international co-operation is emphasized. The promotion of a fair and reasonable international climate regime that adheres to the principles of the UNFCCC and the common but differentiated responsibilities considering the respective capabilities are highlighted as well as safeguarding the interests of developing countries (China, 2014). China states its responsibility as a big country but emphasizes its role as developing country especially in need of support in terms of knowledge transfer and capacity building (China, 2014). Thereby, China contributes to the framing of the issue in a specific way, thus, employs intellectual leadership.

On the global stage, China has participated in climate change negotiations from the first hour signing the Kyoto Protocol one month after the EU in 1998 resulting in its entry into force in February 2005, together with all other countries that had ratified it by then (UNFCCC, 2014). However, its commitments and even stalling actions during the COP 21 have been criticized by other delegates in terms of less ambitious goals and commitments (Clark, 2015), which can be interpreted as structural power but not in terms of leadership in regard of solar energy development. Nonetheless, China accounts also for significant action in saving the agreement at the COP 15 in Copenhagen in co-operation with the USA and the other BASIC countries, as pointed out in Chapter 6.4.2. (Karlsson et al., 2012). Likewise, this can be especially considered as an effort characterized by instrumental, directional and intellectual leadership, since negotiations were involved and, together, the actors could pass the agreement. Thereby, they demonstrated will and established their framing.

Within the South-South co-operation in Asia, China has taken considerably more action implementing seven trilateral co-operations with the United Nations Development Programme (UNDP) and other developing countries (UNDP, 2015). China identifies potential for mutual benefits in promoting its low-carbon and adaptation technologies and products (China, 2014). Although the co-operations are not focusing specifically on solar energy, several of them foster renewable energy technology exchange (UNDP, 2015). China employs measures of directional and idea-based leadership in the South-South co-operation, demonstrating its will and

anticipating its framing. Possibly, structural and instrumental leadership were involved as well in forging the collaboration, but there were no documents available to confirm this.

The Information Office of the State Council of China (2012) stated in a white paper its energy policy highlighting bilateral dialogue and cooperative mechanisms in the field of energy with a vast set of countries, unfortunately, not stating the specific nature. Again, China's efforts remain hidden behind a barrier inaccessibility.

Concluding, China positions itself as a developing country with all connected needs. Despite stating its self-recognized responsibility as a big country, China's efforts in regard of solar energy leadership are less ambitious and more focused on security of energy supply for its economy and getting support rather than committing to it. Hence, China attempts to employ intellectual leadership by framing itself in the context. Only rarely, China steps forward to engage in the agreements employing other measures of the leadership modes. At least, that is what the accessible material shows.

6.5. Support for Less-Developed Countries

In all three cases, the actors employ distinct strategies to address support for less-developed countries, thereby fostering knowledge transfer, R&D, production or installations of solar power.

6.5.1. EU

The EC and EU are the largest aid donator in the world (OECD, 2016). This holds true for the field of solar energy as well. Initiated by the DG Climate Action, Solar Energy for All and the Africa-EU Energy Partnership are main co-operations under which a vast number of projects, for instance the Renewable Energy and Adapting to Climate Technologies Window in Africa (REACT), have emerged (DG Climate, 2016b; DG Climate, 2014). The Africa-EU Energy Partnership accounts for €95 million in grants for energy projects aiming to reduce energy poverty throughout the continent (DG Climate, 2016b). For rural communities in Africa and the Caribbean, the EU established funding amounting to €125 million in 2013 (DG Climate, 2016b). Another public-private partnership fund for supporting renewable energies in emerging markets is the Global Energy Efficiency & Renewable Energy Fund (GEEREF), which was initiated by the EC in 2006 financed also by Norway and Germany, accounting for €222 million in 2015 (GEEREF, 2016). Additionally, the DG International

Development and Cooperation (DG DEVCO) has sparked EuropeAid programs throughout the world, which reach from South and Latin America, to Morocco and Sub-Saharan Africa to India and Pacific island states (DG DEVCO, 2016). All these projects, contributing partly to the expansion of solar energy also by providing business opportunities, are instances of leading by example as well as promoting the framing and ideas of the EU by financial support. Hence, they can be understood as measures of directional, intellectual and structural leadership.

In addition to funding solar energy projects, the EU supports knowledge transfer projects financially. Among those, Climate Change Technology Transfer Centres in Europe and Latin America (CELA) under the umbrella framework of ALFA program, which received funds amounting to €75 million (CELA, 2016; DG DEVCO, 2016). CELA fosters knowledge distribution and exchange as well as provides capacity-building measures on a global level, including RES (CELA, 2016). Another illustration is the Vocational Training Centre for Renewable Energies and Industrial Maintenance in Cape Verde supported by Luxembourg (DG Climate, 2014). Although structural leadership is in place by capital flows, knowledge sharing, promotion of ideas and leading by example, thus, directional and idea-based leadership are at the core of the project.

All these illustrations of support for less-developed countries can account for financial support and/or capacity building efforts including knowledge transfer. Covering large parts of the world, EU's support emphasizes the focus on idea-based and directional leadership supported by structural leadership measures, since it engages in framing and shaping the discourse, leading by example and creating incentives for political and economic actors.

6.5.2. USA

The U.S. American institution for international development aid is to U.S. Agency for International Development (USAID), whose budget amounts to not even 1% of the federal budget (USAID, 2016). The large energy project today is Power Africa, which is meant to connect sub-Saharan households to electricity with the most significant contribution being the installation of an industrial-size SEP in Rwanda (USAID, 2016). Launched in 2013, the initiative is a transaction-based support framework for energy projects across Africa and accounts for $7 billion in financial support from the U.S. government alone creating leverage effects and raising private capital (USAID,

2016). The creation of incentives for economic actors to engage in development efforts can be seen as structural leadership measures. The project itself can be understood as sharing ideas, framing and leading by example and, thus, as efforts of intellectual and directional leadership.

In addition to the USAID, the DOS, responsible for international co-operation, set up the U.S.-Indonesia Partnership on Climate Change and Clean Energy in the wake of the Copenhagen Accord in 2009. Focusing more on support than co-operation, the partnership offers a total of $136 million in U.S. funding for climate protection measures and capacity building (DOS, 2016). Furthermore, USAID'S Indonesia Clean Energy Development Program enhances efforts on addressing regulatory barriers, capacity constraints and supporting development of RES, while fostering private enterprises to cooperate in trade and development regarding RES (USAID, 2016; DOS 2016). Thus, again, the partnership encompasses measures of directional and intellectual leadership strengthened by structural leadership contributions.

Overall, despite focusing only on specific parts of the world, the USA employs a strategy utilizing measures of directional, intellectual and structural leadership in regard of support for less-developed countries. Thereby, it heavily relies on leverage effects and incentives for enterprises, which is in particular of significance for the solar industry sector as it can profit from it. Consequently, the USA employs structural leadership measures to further not only development of less-developed countries but also its own domestic industry sectors despite not utilizing an intellectual leadership approach.

6.5.3. China

In its INDC, China states its status as developing country and a set of actions developed and developing countries should do in order to foster climate action. Therein,

> "[d]eveloped countries shall provide support for developing countries to formulate and implement national adaptation plans…. developed countries … shall provide new, additional, adequate, predictable and sustained financial support to developing countries.... developed countries shall transfer technologies and provide support for the research, development and application of technologies to developing countries based on their technology needs…. developed countries … shall provide support to developing countries in capacity building in all areas" (China, 2015, p.18-19).

By identifying itself as a developing country, China does not engage with the responsibility of sharing knowledge and technology as well as providing financial support. Instead, China utilizes agreements and co-operation to foster its own development by offering opportunities for its domestic industry. This could be understood as structural leadership in regard of the domestic solar industry. Otherwise, China refrains from employing measures that would represent leadership modes.

6.6. Customs

For customs, it is relevant where products are produced and to which countries they are exported. In the matter of SPV parts, cells and modules, China, Malaysia and Taiwan are the most prominent countries of origin, as they can provide SPV products to a considerably low price (*pv magazine*, 2016). Therefore, the imposition and maintenance of anti-dumping (AD) tariffs and countervailing duties (CVD) protects domestic industry sectors from countries with competitive advantage.

6.6.1. EU

In 2013, the EC introduced a tariff on solar glass from China of 17.1% to 42.1% dependent on the co-operation with the investigation as an anti-dumping measure (Clover, 2013). For avoid dumping prices, a minimum import price was set for SPV products from China. The EU decided not to seize the tariffs, but impose them even retrospectively on imports from Malaysia and Taiwan as well, as Chinese producers were trying to circumvent the imposed tariffs via third countries (Gifford, 2016).[27] For domestic sector development, the protectionist measures such as the employed tariffs impose costs on and decrease imports. Thereby, they attempt to affect the domestic industry positively. Hence, the measures can be understood as manifestation of structural leadership in regard of the domestic solar industry development, however not as structural leadership in terms of supporting the expansion of solar energy. The employment of protectionism results in the absence of a leveled market and free competition and is a sign for the absence of leading by example, thus, directional leadership preventing joint solutions, as idea-based leadership would aim for.

[27] Imports from Malaysia and Taiwan were exempted from the ruling before (Gifford, 2016).

6.6.2. USA

Over the last years, imports of PV cells and modules have seen a change in tariffs in the USA (Roselund, 2014a; Roselund, 2014b; Gifford, 2015). U.S. rulings imposed and raised AD tariffs and CVD of 21.73%[28] and up to 238.95%[29] on in particular but not only Chinese and Taiwanese SPV products to protect its own manufacturing (Gifford, 2015). AD tariffs and CVD distinguish not only products by the country of origin, but also from specific manufacturing enterprises, for instance due to non-cooperation with the Department of Commerce (Roselund, 2014a; Gifford, 2015).

The USA approaches customs in a similar way as the EU. The employment of protectionism results in the absence of a leveled market and free competition and is a sign for the absence of leading by example, thus, directional leadership, preventing joint solutions, as idea-based leadership would aim for. For domestic sector development, the protectionist measures such as the employed tariffs impose costs on and decrease imports aiming at supporting the domestic industry. Therefore, the measures can be understood as structural leadership in regard of the domestic solar industry development, however not as structural leadership in terms of supporting the expansion of solar energy.

6.6.3. China

So far, China has introduced low tariffs on solar products for most favored nations including all members of the World Trade Organization (WTO). For SPVs and crucial parts, the duties remain at 20%, while batteries are even exempt from any duty (General Administration of Customs, 2016). For non-favored nations, the duties amount up to 100% of the value for SPVs and parts, and 30% for batteries (General Administration of Customs, 2016). The duties inhibit the import of solar products and can shape the domestic market, especially as the production costs in China are lower than in most other countries (*pv magazine*, 2016; Reuters, 2015a). Thus, China supports its own solar industry sector and refrains from opening the market completely for foreign products to raise global competition. Although the tariffs are considerably lower, China employs a similar approach as the USA and EU, supporting its domestic industry with structural power. This structural leadership in regard of its own solar industry is nevertheless limited as there are no tariffs on batteries used for solar

[28] AD and CVD for Yingli Green Energy Holding Company Limited.
[29] AD and CVD for not listed companies.

products. In this case, China employs a strategy that could be understood as directional leadership by leading by example.

7. Discussion of the Findings

The objective of this exploratory study was to develop a theorization of how political leadership could have an impact on domestic solar energy development by illustrations of the employed policy strategies in the six operative dimensions of solar energy development. It could be identified that the cases constitute three distinct approaches of solar energy development representing a specific set of leadership modes. As there is a considerable variation in the actual domestic solar development, as data of the IEA (2016) shows, it can be suggested that the employed policy strategies may contribute to the domestic solar development. Now, it is possible to elaborate on which ideal-typical leadership modes the policy strategies of the cases employed and how they might reflect on the domestic development. The three distinct policy strategies with their manifestations of specific sets of leadership modes lead to the discovery of three empirical ideal types of solar energy leadership: the visionary, the pretender and the hidden leader.

7.1. The Visionary

The visionary creates and shapes ideas, finds solutions and experiments with them, implements both and spreads them. The visionary not only demonstrates will, but attempts to lead the development by example utilizing resources to shape preferences and behavior. Thus, manifestations of directional and idea-based leadership are the two core modes of leadership shaping the policy strategy. The utilization of resources represents structural leadership measures to strengthen the efforts in regard of directional and intellectual leadership. Thereby, advanced institutionalization and policies, as well as global ideological and financial support are characteristics of the visionary's approach. Self-presentation is an important factor, but recognition has to be achieved to unfold its power. The visionary might fail its ambition by neglecting structural and directional leadership measures. This would result in weakened idea-based leadership manifestations, as they would not be substantiated by further measures. However, it seems possible that a visionary does not employ structural power, but only engages in the dialogue shaping the framing and furthers the

development by leading by example and experimenting with solutions, thus employs only intellectual and directional leadership manifestations.

In this study, the EU is a visionary of solar energy development. The Union attempts to take the lead both domestically and internationally. Whether this truly is the case, has to be examined, as there are several issues the EU has to face. At the COP 15 in Copenhagen, the EU lost its leading momentum with its self-perception as a leader is stronger than the recognition by others, its 2030 CEF is vague and does not set any fixed targets or paths, and the tariffs on solar products inhibit faster domestic progress to go solar. Nevertheless, the EU and its MS experiment with policy solutions and try to engage in sharing best practices, knowledge transfer and support internally and externally. Institutional monitoring and control structures are strong and even complimented by non-state actors such as eNGOs, economic actors and civil society. Whether the EU has found the best way to foster development of the solar sector, its production industry and new installations, can be questioned, as Pablo-Romero (2013) did. Nevertheless, it tries to contribute to the development ideologically, if not substantially.

Visionaries are not save from competition and even internal struggles. Both can lead to a decline and development to the second category, a pretender.

7.2. The Pretender

The pretender has a strong position on the world stage and is mainly driven by self-interest and the furthering of its global power. Showing especially structural strength, the pretender focuses on single actions, for instance international agreements or supporting single projects. However, domestically, the pretender is far from furthering development and employs a non-innovative approach, resulting in the status of underdevelopment in the respective field. Hence, the pretender follows policy strategies only utilizing single measures of structural, directional and/or intellectual leadership measures to construct an illusion of being a frontrunner or strong supporter.

The USA are the example of a pretender in the context of solar energy development. There are no universal promotional policies, no long-term R&D funding, no strong institutionalization and control. If it was not for the Californian government, the USA would not be able to even pretend its ambition to foster solar energy. On the international stage, the pretender can emerge, distinguish itself and put its own interest first, when the visionary fails, as the USA did at the COP 15 in Copenhagen.

For pretenders, there is a chance of engaging with the respective field and, thereby, developing into a visionary. On the other hand, one could imagine that a pretender disengages completely, but as long as the pretender can uphold the illusion, it probably will because it strengthens its position on the global stage.

7.3. The Hidden Leader

The hidden or hiding leader has advanced the development in the respective field while not being noticed or recognized as a leader in the first place/yet. While domestic measures increased and fostered development, the hidden leader has not emerged on the global stage to take the lead possibly by even understating its competence, influence or possibilities. It might even be the case that a hidden leader utilizes barriers such as cultural, language or political for hiding. Consequently, hidden leaders can openly pursue their own interest, for instance getting support, and will not be as fiercely criticized as the other two types for doing so. Overall, a mix of leadership modes characterizes the hidden or hiding leader's employed policy strategy. Structural leadership and idea-based leadership are utilized to foster domestic development, but not engaging externally. Directional leadership is rather rarely or poorly employed in the overall strategy.

In terms of solar energy development, China can be identified as hidden or hiding leader. It has substantially advanced in the solar sector over the last years, as the data of the IEA (2016) shows. Now leading in annually and total installed capacity, China has gone beyond the promotional measures of the USA, although it faces issues of dysfunctionality in the institutionalization and engages only for own interest internationally. During the identification process of the material, this study had to face issues of availability and accessibility. Without the support of a translator, it would not have been possible to assess the material. Not only was the language barrier tangible, but even an either cultural, political or ignorance-based barrier. Consequently, the accessibility and availability of documents constituted issues during the research. China's status as a developing country supports the hiding of the progress, and it entails that it does not have to commit itself as strongly as the visionary or even the pretender.

The hidden leader has the potential of becoming a visionary by emerging on the global stage and stepping forward in the matter. An overall strategy with clear ambitions would be as necessary as the strengthening of the domestic framework of

policy strategies. However, there are other developments possible: staying a hidden or hiding leader, disengaging from the field, becoming a pretender or evolving into something new.

8. Conclusions

The objective of this exploratory study was to develop a theorization of how political leadership could have an impact on domestic solar energy development by illustrations of the employed policy strategies in the six dimensions of solar energy development. Therefore, it decomposed solar energy leadership in six crucial operative dimensions of policy strategies that potentially affect the domestic solar energy development. Employing ideal-typical modes of leadership theory as a deductive coding frame, the three cases of China, the USA and EU were analyzed, which revealed profound differences in the employed strategies. Consequently, three empirical ideal types of solar energy leadership were identified: The visionary, the pretender and the hidden leader. While the first utilizes in particular manifestations of directional and structural leadership to substantiate its idea-based leadership efforts, the second only employs single measures of the same leadership modes and relies particularly on structural power, whereas the third relies on domestic structural and idea-based leadership effort. As there is a considerable variation in the actual domestic solar development, as data of the IEA (2016) shows, it can be suggested that the distinct employed policy strategies may contribute to the domestic solar development.

In the end, the question who has been the leader in domestic solar energy development should be addressed. From the analysis, it is relatively apparent that the USA has not been able to live up to be a leader attempting to push forward its own interest pretending to be a leader. Despite its strong advance in installations, China hides behind its status as a developing country and lacks strong supervision and control mechanisms covering its efforts to not be put in responsibility. According to the method of elimination and as the naming of visionary might suggest, the European Union would have been the leader in the field. However, its efforts have decreased domestically and new installations have slowed down. Solar energy accounts still only for less than 1% of the gross final consumption (Eurostat, 2015). Therefore, my suggestion is to refrain from identifying a leader in solar energy development, but engage with the discourse of how policy strategies can foster the development and advance by employing specific modes of leadership. All three cases show considerable

elements of policy strategy representing manifestations of leadership modes and can, thus, contribute to the discussion.

8.1. Implications

Based on previous research, this study did not only consider the EU and the USA but also included for the first time China in leadership measures in regard of one aspect of climate change mitigation. The findings of the employed approaches and strategies in solar development might be found surprising. The suggestion of hidden leaders implies that cases should be included that have not been considered in previous research. By the inclusion of China, this study attempted to open up space for discourse on practices to foster development of RES and in the end climate action, at the hand of solar energy. Thereby, measures, solutions and strategies were examined that can be utilized by global actors to position themselves on the global stage.

8.2. Further Research

This project was limited in scope and scale. In-depth studies of single cases or focusing on other cases might confirm or reshape the suggested empirical ideal types. For instance, studies could consider Japan being placed third in the total solar capacity (IEA PVPS, 2016; Table 1 in the Appendix) or focus on India as uprising solar power. Furthermore, as it has been explicitly stated, interrelatedness of the dimensions has not been taken into consideration, but a profound analysis of the connections could unearth substantial findings. Besides the interrelatedness, the process of policy strategy formation could be analyzed as well and how it influences the strategies and the development in the end.

The methodological approach could be applied to the assessment of other fields to discover whether the typology could be applied. Instances could be other renewable energies such as wind and hydro power. However, the theorization could be put to a test in all fields of environmental policy such as waste management, carbon capture and reforestation. In the end, it might even be fruitful to go beyond and apply the theorization to other political field including social policy, civil rights, digitalization, transportation and economics.

9. References

Aguirre, A. (2015). President Obama answers 6 questions on climate change. *VOGUE*, 30 November. Retrieved from http://www.vogue.com/13374071/president-obama-climate-change-cop21-paris/ (accessed 22 March 2016).

Bang, G. & Schreurs, M. A. (2010). A green deal: Framing US climate leadership. In R. Wurzel and J. Connelly (Eds.), *The European Union as a leader in international climate change politics* (pp. 236-251). New York: Routledge.

BBC. (2015a). Russia halts gas supplies to Ukraine after talks breakdown. 01 July. http://www.bbc.com/news/world-europe-33341322 (accessed 9 March 2016)

BBC. (2015b). China smog sparks red alerts in 10 cities. 24 December. http://www.bbc.com/news/world-asia-china-35173709 (accessed 24 Feb. 2016).

Bloomberg New Energy Finance. (2015). Impact of tax credit extensions for wind and solar. 17 December. Retrieved from http://about.bnef.com/white-papers/impact-of-tax-credit-extensions-for-wind-and-solar/ (accessed 02 May 2016).

California Public Utilities Commission. (2016). Retrieved from http://www.cpuc.ca.gov (accessed 07 April 2016).

California State Senate. (2014). An act to amend Section 73 of the Revenue and Taxation Code, relating to taxation, to take effect immediately, tax levy. Senate Bill No. 871, Chapter 41. Retrieved from California State Legislature: http://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201320140SB871 (accessed 02 May 2016).

CELA. (2016). Retrieved from http://www.cela-project.net/en (accessed 07 April 2016).

Chu, Jenny. (2015). China analysis 2015. The °Climate Group. Retrieved from http://www.theclimategroup.org/_assets/files/RE100-China-analysis.pdf (accessed 05 April 2016).

Clark, P. (2015). COP 21: China accused of blocking progress at Paris climate talks. *CNBC*, 8 December. Retrieved from http://www.cnbc.com/2015/12/08/cop21-china-accused-of-blocking-progress-at-paris-climate-talks.html (accessed 02 May 2016).

Clover, I. (2013). EU imposes maximum 42.1% anti-dumping tariff on Chinese solar glass exporters. *pv magazine*, 27 November. Retrieved from http://www.pv-magazine.com/news/details/beitrag/eu-imposes-maximum-421-anti-dumping-tariff-on-chinese-solar-glass-exporters_100013572/ (accessed 09 April 2016).

CORDIS. (2016). Retrieved from http://cordis.europa.eu (accessed 27 April 2016).

Cyprus Institute. (2016). Retrieved from http://www.cyi.ac.cy (accessed 12 April 2016).

Damro, C., Hardie, I. & MacKenzie, D. (2008). The EU and climate change policy: Law, politics and prominence at different levels. *Journal of Contemporary European Research*, Vol. 4(3), 179-192. Retrieved from http://www.jcer.net/index.php/jcer/article/view/110 (accessed 12 March 2016).

Database of State Incentives for Renewables & Efficiency (DSIRE). (2015a). Renewable Portfolio Standard Policies. Retrieved from https://www.seia.org/sites/default/files/DSIRE_Renewable-Portfolio-Standards.jpg (accessed 02 April 2016).

Database of State Incentives for Renewables & Efficiency (DSIRE). (2015b). Renewable Portfolio Standards with solar or distributed generation provision. Retrieved from http://ncsolarcen-prod.s3.amazonaws.com/wp-content/uploads/2015/03/Renewable-Portfolio-Standards-with-Solar-and-DG-Provisions.pdf (accessed 02 April 2016).

Daunt, L. (2014). State vs. federal law: Who really holds the trump card? *Huffington Pos*t, 28 January. Retrieved from http://www.huffingtonpost.com/lesley-daunt/state-vs-federal-law-who-_b_4676579.html (accessed 02 May 2016).

Denyer, S. (2015). Chinese law would bring civic groups under state security supervision. *The Washington Post*, 23 March. Retrieved from https://www.washingtonpost.com/world/chinese-law-would-bring-civic-groups-under-state-security-supervision/2015/03/23/5d8ad994-cce7-11e4-8730-4f473416e759_story.html (accessed 02 May 2016).

Department of State (DOS). (2016). Bilateral climate and energy partnerships. Retrieved from http://www.state.gov/e/oes/climate/c22820.htm (accessed 16 April 2016).

Directorate General Climate Action (DG Climate). (2014). Climate technology transfer. Retrieved from http://ec.europa.eu/clima/publications/docs/climate_technology_transfer_en.pdf (accessed 10 Feb. 2016).

Directorate General Climate Action (DG Climate). (2016a). Retrieved from http://ec.europa.eu/clima (accessed 06 April 2016).

Directorate General Climate Action (DG Climate). (2016b). International action on climate change. Retrieved from http://ec.europa.eu/clima/policies/international/index_en.htm (accessed 06 April 2016).

Directorate General Climate Action (DG Climate). (2016c). The EU Emission Trading System (EU ETS). Retrieved from http://ec.europa.eu/clima/policies/ets/index_en.htm (accessed 21 April 2016)

Directorate General Energy (DG Energy). (2016). Renewable energy. (Last update 01 April). Retrieved from http://ec.europa.eu/energy/en/topics/renewable-energy/ (accessed 01 April 2016).

Directorate General Research & Innovation (DG R&I). (2015a). EU support for photovoltaic. Retrieved from http://ec.europa.eu/research/energy/eu/index_en.cfm?pg=research-photovoltaics-support (accessed 10 Feb. 2016).

Directorate General Research & Innovation (DG R&I). (2015b). Horizon 2020: Work programme 2014-2015: 10. Secure, clean and efficient energy. Retrieved from http://ec.europa.eu/research/participants/data/ref/h2020/wp/2014_2015/main/h2020-wp1415-energy_en.pdf (accessed 02 April 2016).

Directorate General Research & Innovation (DG R&I). (2016a). Horizon 2020. http://ec.europa.eu/research/fp7/index_en.cfm (accessed 12 April 2016).

Directorate General Research & Innovation (DG R&I). (2016b). Horizon 2020: Work programme 2016-2017: 10. Secure, clean and efficient energy. Retrieved from http://ec.europa.eu/research/participants/data/ref/h2020/wp/2016_2017/main/h2020-wp1617-energy_en.pdf (accessed 02 April 2016).

EIA (U.S. Energy Information Administration). (2016). Monthly energy review. Retrieved from https://www.eia.gov/totalenergy/data/monthly/#summary (accessed 16 Feb. 2016).

Elgström, O. (2007). The European Union as a leader in international multilateral negotiations – a problematic aspiration? *International Relations*, Vol. 21(4), 445–58. doi: 10.1177/0047117807083071.

Environmental Protection Agency (EPA). 2016. https://www3.epa.gov (accessed 12 April 2016).

European Commission (EC). (2005). Winning the battle against global climate change. Retrieved from http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52005DC0035 (accessed 06 April 2016).

European Commission (EC). (2010a). Commission creates two new Directorates-General for Energy and Climate Action. IP/10/164. Retrieved from http://europa.eu/rapid/press-release_IP-10-164_en.htm?locale=en (accessed 12 April 2016).

European Commission (EC). (2010b). Energy 2020: A strategy for competitive, sustainable and secure energy. COM(2010) 639 final. Retrieved from EurLex: http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52010DC0639&from=EN.

European Commission (EC). (2014). A policy framework for climate and energy in the period from 2020 to 2030. COM(2014) 015 final. Retrieved from EurLex: http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52014DC0015&from=EN.

European Commission (EC). (2015a). COP 21, UN climate change conference, Paris. Retrieved from http://ec.europa.eu/priorities/energy-union-and-climate/climate-action-emission-reduction/cop21-un-climate-change-conference-paris_en (accessed 10 Feb 2016).

European Commission (EC). (2015b). Europe 2020 Strategy. (Last update 22 June). Retrieved from http://ec.europa.eu/europe2020/europe-2020-in-a-nutshell/targets/index_en.htm (accessed 01 April 2016).

European Commission (EC). (2016). Better regulation. Retrieved from http://ec.europa.eu/smart-regulation/index_en.htm (accessed 02 May 2016).

European Council. (1990). European Council Dublin 25 and 26 June (reproduced from the Bulletin of the European Communities, No. 6/1990). Retrieved from the Archive for European Integration, University Pittsburgh. http://aei.pitt.edu/1401/1/Dublin_june_1990.pdf (accessed 19 March 2016).

European Council. (2007). *Presidency Conclusions*. Retrieved from https://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/en/ec/93135.pdf (accessed 19 March 2016).

European Parliament (EP) & the Council. (2009). Directive 2009/28/EC on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC. *Official Journal of the European Union*, L 140/16-140/62. Retrieved from http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32009L0028&from=EN.

European Union. (2000). Charter of Fundamental Rights. *Official Journal of the European Union*, 2000/C 364/01-364/22. Retrieved from http://www.europarl.europa.eu/charter/pdf/text_en.pdf.

European Union. (2010). Consolidated version of the Treaty on European Union. *Official Journal of the European Union*, 83/13-83/388. Retrieved from http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1455118337348&uri=CELEX:12010M/TXT.

European Union. (2012). Consolidated version of the Treaty on the Functioning of the European Union. *Official Journal of the European Union*, 326/47-326/390. Retrieved from http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A12012E%2FTXT.

European Union & The People's Republic of China (EU & China). (2005). Joint Declaration: EU and China Partnership on Climate Change. Retrieved from http://ec.europa.eu/clima/policies/international/cooperation/china/docs/joint_declaration_ch_eu_en.pdf (accessed 06 April 2016).

European Union & India. (2006). Joint statement. EU-India Summit. Retrieved from http://ec.europa.eu/clima/policies/international/cooperation/india/docs/eu_india_joint_statement_en.pdf (accessed 06 April 2016).

Eurostat. (2014). Europe 2020 indicators. Retrieved from http://ec.europa.eu/eurostat/web/europe-2020-indicators (accessed 01 April 2016).

Eurostat. (2015). Renewable energy statistics. Data extracted in May. Retrieved from http://ec.europa.eu/eurostat/statistics-explained/index.php/Renewable_energy_statistics (accessed 19 March 2016).

Foley, M. (2014). *Political leadership: Themes, contexts, and critiques*. London: Oxford University Press. doi: 10.1093/acprof:oso/9780199685936.001.0001.

Frizell, S. (2015). Obama says U.S. embraces its responsibility for climate change. *TIME Magazine*, 30 November. Retrieved from http://time.com/4129065/cop-21-paris-obama/ (accessed 22 March 2016).

Gao, R. (2013). Rise of environmental NGOs in China: Official ambivalence and contested messages. *Journal of Political Risk*, Vol. 1(8), December 2013. Retrieved from http://www.jpolrisk.com/rise-of-environmental-ngos-in-china-official-ambivalence-and-contested-messages/ (accessed 02 May 2016).

General Administration of Customs of the People's Republic of China. (2016). Retrieved from http://www.customs.gov.cn (accessed 30 April 2016).

Gifford, J. (2015). U.S. maintains solar tariffs, mixed response from industry. *pv magazine*, 09 July. Retrieved from http://www.pv-magazine.com/news/details/beitrag/us-

maintains-solar-tariffs--mixed-response-from-industry_100020138/ (accessed 09 April 2016).

Gifford. J. (2016). EU tariffs on Chinese solar companies shipping via Malaysia, Taiwan. *pv magazine*, 12 February. Retrieved from http://www.pv-magazine.com/news/details/beitrag/eu-tariffs-imposed-on-chinese-solar-companies-shipping-via-malaysia--taiwan_100023212/ (accessed 09 April 2016).

Global Energy Efficiency & Renewable Energy Fund (GEEREF). (2016). Retrieved from http://geeref.com (accessed 06 April 2016).

Groenleer, M. L. P. & Van Schaik, L. G. (2007). United we stand? The European Union's international actorness in the cases of the International Criminal Court and the Kyoto Protocol. *Journal of Common Market Studies*, Vol. 45(5), 969–998. Retrieved from https://www.parlement.com/9353202/d/onderzoekspapers/groenleer%20en%20van%20schaik.pdf (accessed 12 March 2016).

Gupta, J. & Grubb, M. (Eds.). (2000). *Climate change and European leadership: A sustainable role for Europe?* Dordrecht: Kluwer Publishers.

Gupta, J. & Ringius, L. (2001). The EU's climate leadership: Reconciling ambition and reality [Abstract]. *International Journal of Sustainable Development (IJSD*), Vol. 2(2), 281–99. doi: http://dx.doi.org/10.1504/IJSD.1999.004323.

Gupta, J. & Van der Grijp, N. (2000). Perceptions of the EU's role. Is the EU a leader? In J. Gupta and M. Grubb (Eds.), *Climate change and European leadership: A sustainable role for Europe?* (pp. 67–82). Dordrecht: Kluwer.

Hajer, M. A. (1997). *The politics of environmental discourse: Ecological Modernization and the policy process*. Oxford: Oxford University Press. doi:10.1093/019829333X.001.0001.

Harris, P. (2007). Sharing the burdens of global climate change: International equity and justice in European policy. In P. G. Harris (Ed.), *Europe and global climate change: Politics, foreign policy and regional cooperation* (pp. 349–90). Cheltenham: Edward Elgar.

Hempel, C. G. & Oppenheim, P. (1936). *Der Typusbegriff im Lichte der neuen Logik*. Leiden: A. W. Sijthoff's Uitgeversmaatschappij N.V.

Hertin, J. & Berkhout, F. (2003). Analysing institutional strategies for environmental policy integration: The case of EU enterprise policy. *Journal of Environmental Policy & Planning*, Vol. 5(1), 39-56. doi: 10.1080/15239080305603.

Hsieh, H.-F. & Shannon, S.E. (2005). Three approaches to qualitative content analysis. *Qualitative Health Research*, Vol. 15(9), November, 1277-1288. doi: 10.1177/1049732305276687

Information Office of the State Council of the People's Republic of China. (2012). China's Energy Policy 2012. Retrieved from http://www.china.org.cn/government/whitepaper/node_7170375.htm (accessed 02 May 2016).

International Energy Agency Photovoltaic Power System Programme (IEA PVPS). (2016). 2015 snapshot of global PV markets. Retrieved from http://www.iea-pvps.org/index.php?id=trends0 (accessed 09 April 2016).

Jones, L. (2011a). China's national solar subsidy programs. Retrieved from https://sites.google.com/site/chinapolicyinfocus/china-s-solar-subsidy-programs/china-s-solar-industry/china-s-national-solar-subsidy-programs (accessed 01 May 2016).

Jones, L. (2011b). Other forms of government support. Retrieved from https://sites.google.com/site/chinapolicyinfocus/china-s-solar-subsidy-programs/other-forms-of-government-support (accessed 1 May 2016).

Jones, (2011c). Provincial/municipal subsidy programs. Retrieved from https://sites.google.com/site/chinapolicyinfocus/china-s-solar-subsidy-programs/other-forms-of-government-support/provincial-municipal-subsidy-programs (accessed 01 May 2016).

Karlsson, C., Parker, C., Hjerpe, M. & Linnér, B.-O. (2011). Looking for leaders: Perceptions of climate change leadership among climate change negotiation participants. *Global Environmental Politics*, Vol. 11(1), The MIT Press. Retrieved from http://muse.jhu.edu/journals/gep/summary/v011/11.1.karlsson.html.

Karlsson, C., Hjerpe, M., Parker, C. & Linnér, B.-O. (2012). The legitimacy of leadership in international climate change negotiations. *Ambio*, Vol. 41(1). Royal Swedish Academy of Science. doi: 10.1007/s13280-011-0240-7.

Keohane, N. O. (2010). *Thinking about leadership*. Princeton: Princeton University Press. Retrieved from https://books.google.se.

Ki-Moon, B. (2008). Remarks to the General Assembly high-level thematic debate: Addressing climate change: The United Nations and the world at work. *UN News Centre*, 11 February. Retrieved from http://www.un.org/apps/news/infocus/sgspeeches/statments_full.asp?statID=185.

Kilian, B. & Elgström, O. (2010). Still a green leader? The European Union's role in international climate negotiations. *Cooperation and Conflict*, 09/2010, Vol. 45(3). SAGE. doi: 10.1177/0010836710377392.

Kluge, Susann. (1999). *Empirisch begründete Typenbildung*. Opladen: Leske & Budruch. doi: 10.1007/978-3-322-97436-5.

Latvia & the European Commission (Latvia & EC). (2015). Intended Nationally Determined Contribution of the EU and its Member States. Retrieved from http://www4.unfccc.int/submissions/indc/Submission%20Pages/submissions.aspx. (accessed 19 March 2016).

Malnes, R. (1995). 'Leader' and 'Entrepreneur' in international negotiations: A conceptual analysis. *European Journal of International Relations*, (1)1, 87–112, SAGE. doi: 10.1177/1354066195001001005.

Ministry of Commerce (MOFCOM). (2013). Renewable Energy Law of the People's Republic of China. 20 December. Retrieved from http://english.mofcom.gov.cn/article/policyrelease/Businessregulations/201312/20131200432160.shtml (accessed 05 April 2016).

Ministry of New and Renewable Energy India. (2016). International Solar Alliance will be the first international and inter-governmental organisation of 121 countries to have headquarters in India with United Nations as strategic partner. Press Information Bureau, Government of India, 15 January. Retrieved from http://pib.nic.in/newsite/PrintRelease.aspx?relid=135794 (accessed 29 April 2016).

Mol, A. P. J. (2001). *Globalization and environmental reform: The ecological modernization of the global economy*. Cambridge, Mass: The MIT Press. Retrieved from eBook Collection (EBSCOhost).

North Carolina Clean Energy Technology Center (NCCETC). (2014). States with in-state resources RPS requirements. Retrieved from http://ncsolarcen-prod.s3.amazonaws.com/wp-content/uploads/2015/01/2014-Daniel-In-State-RPS-Requirements.pdf (accessed 02 April 2016).

North Carolina Clean Energy Technology Center & Meister Consultants Group. (2016). The 50 States of Solar: 2015 Policy Review, Q4 2015. Retrieved from https://nccleantech.ncsu.edu/wp-content/uploads/50sosQ4-FINAL.pdf (accessed 05 April 2016).

Oberthür, S. (1999). The EU as an International Actor: The Protection of the Ozone Layer [Abstract]. *Journal of Common Market Studies (JCMS)*, Vol. 37(4), 641–59. doi: 10.1111/1468-5965.00200.

Oberthür, S. & Kelly, C. R. (2008). EU leadership in international climate policy: Achievements and challenges. *International Spectator*, Vol. 43, 35–50. doi: 10.1080/03932720802280594.

OECD. (2016). Retrieved from http://www.oecd.org (accessed 29 April 2016).

Office of Energy Efficiency & Renewable Energy (OEERE). (2016a). Solar energy in the United States. Retrieved from http://energy.gov/eere/solarpoweringamerica/solar-energy-united-states (accessed 01 April 2016).

Office of Energy Efficiency & Renewable Energy (OEERE). (2016b). SunShot Initiative. Retrieved from http://energy.gov/eere/sunshot/sunshot-initiative (accessed 07 April 2016).

Office of the Press Secretary (OPS). (2009). U.S. Mexico announce bilateral framework on clean energy and climate change. 16 April. Retrieved from https://www.whitehouse.gov/the-press-office/us-mexico-announce-bilateral-framework-clean-energy-and-climate-change (accessed 10 April 2016).

Office of the Press Secretary (OPS). (2016). U.S.-Canada joint statement on climate, energy and arctic leadership. 10 March. Retrieved from www.whitehouse.gov/the-press-office/2016/03/10/us-canada-joint-statement-climate-energy-and-arctic-leadership (accessed 10 April 2016).

Pablo-Romero, M. del P. (2013). Solar energy: Incentives to promote PV in EU27. *AIMS Energy*, Vol. 1, 28-47. AIMS Press, 2013. doi: 10.3934/energy.2013.1.28.

Pallemaerts, M. & Williams, R. (2006). Climate Change; The international and European Policy Framework. In M. Peeters and K. Deketelaere (Eds.), *EU climate change policy: The challenge of new regulatory initiatives* (pp. 22-50). Cheltenham: Edward Elgar. Retrieved from https://books.google.se/books?id=CmDGGjkVHAEC&pg=PR3&lpg=PR3&dq=peeters+deketelaere&source=bl&ots=K6kmyktWRF&sig=a0EjsARHZYPG4Ss2e9BnGJZI3m4&hl=de&sa=X&ved=0ahUKEwiTirXOvczLAhXpbZoKHYbrB6UQ6AEIMTAC#v=onepage&q=peeters%20deketelaere&f=false.

Paterson, M. (2009). Post-Hegemonic Climate Politics? *British Journal of Politics and International Relations*, Vol. 11, 140–58. doi: 10.1111/j.1467-856X.2008.00354.x.

Parker, C. F. & Karlsson, C. (2010). Climate change and the European Union's leadership moment: An inconvenient truth. *Journal of Common Market Studies*, Vol. 48(4), 923-943. doi: 10.1111/j.1468-5965.2010.02080.x.

Parker, C. F. & Karlsson, C. (2014). Leadership and international cooperation. In Rhodes, R. A. W. & t' Hart, P. (Eds), *The Oxford handbook of political leadership* (580-595). New York: Oxford University Press.

Parker, C., Karlsson, C., Hjerpe, M. & Linnér, O. (2012). Fragmented climate change leadership: making sense of the ambiguous outcome of COP-15. *Environmental Politics*, Vol. 21(2), 268-286. doi: 10.1080/09644016.2012.651903.

pv magazine. (2016). pvXchange module price index. Retrieved from http://www.pv-magazine.com/investors/module-price-index/ (accessed 30 April 2016).

Reuters. (2015a). EU increases anti-dumping duties on Chinese solar glass imports. 14 August. Retrieved from http://www.reuters.com/article/2015/08/14/eu-trade-china-solar-idUSL5N10P2O420150814 (accessed 19 March 2016).

Reuters. (2015b). Obama calls Paris climate pact 'best chance' to save the planet. 13 December. Retrieved from http://www.reuters.com/article/us-climatechange-summit-usa-obama-idUSKBN0TV0SQ20151213 (accessed 26 April 2016).

Rhodes, R. A. W. & t' Hart, P. (Eds). (2014). *The Oxford handbook of political leadership*. New York: Oxford University Press.

Roselund, C. (2014a). Solar trade war: US imposes preliminary anti-dumping tariffs of 26-165% on solar PV from China, Taiwan. *pv magazine*, 25 July. Retrieved from http://www.pv-magazine.com/news/details/beitrag/solar-trade-war--us-imposes-preliminary-anti-dumping-tariffs-of-26-165-on-solar-pv-from-china--taiwan_100015851/#axzz3fPZZ3GDP (accessed 09 April 2016).

Roselund, C. (2014b). US trade authorities increase tariffs on solar imports from China in final ruling. *pv magazine*, 17 December. Retrieved from http://www.pv-magazine.com/news/details/beitrag/us-trade-authorities-increase-tariffs-on-solar-imports-from-china-in-final-ruling_100017539/#axzz3fPZZ3GDP (accessed 09 April 2016).

Schreier, M. (2012). *Qualitative content analysis in practice*. Los Angeles, London, New Delhi, Singapore, Washington D.C: SAGE.

Schwartz, J. (2004). Environmental NGOs in China: Role and limits. *Pacific Affairs*, Vol. 77(1), Spring, 28-49. Retrieved from JSTOR http://www.jstor.org/stable/40022273.

Sjöstedt, G. (1994). Negotiating the Uruguay Round of the general agreement on tariffs and trade. In W. I. Zartman (Ed.), *International multilateral negotiation: Approaches to the management of complexity* (pp. 44–69). San Francisco: Jossey–Bass Publishers.

Tagesschau. (2015). Merkel in Neu-Delhi: Indisch-deutsche Regierungskonsultationen. 05 October. Retrieved from http://www.tagesschau.de/multimedia/video/video-121813.html (accessed 19 March 2016).

The People's Republic of China (China). (2014). **国家**应对气候变化规则 [National Program on Climate Action (NPCA) (Period 2014-2020)]. September. Retrieved from http://www.sdpc.gov.cn/gzdt/201411/W020141104591413713551.pdf (accessed 03 April 2016).

The People's Republic of China (China). (2015). Enhanced Actions on Climate Change: China's Intended Nationally Determined Contributions (INDC). 30 June. Retrieved from http://www4.unfccc.int/submissions/indc/Submission%20Pages/submissions.aspx (accessed 22 March 2016).

Torfing, J., Peters, B.G., Pierre, J. & Sorensen, E. (2012). Horizontal, vertical, and diagonal governance. In *Interactive Governance* (pp. 85-104). Oxford and New York: Oxford University Press. Retrieved from https://books.google.se/books?id=mgLIheNnyX8C&pg=PA93&lpg=PA93&dq=multilevel+governance+opportunity+structure+usa&source=bl&ots=3X2xJsW3aa&sig=_FI_PWvmSwyRPLUUdKoBn5ElSv4&hl=de&sa=X&ved=0ahUKEwiIu5XCjMDMAhXDKCwKHeVXDkYQ6AEIOTAC#v=onepage&q=multilevel%20governance%20opportunity%20structure%20usa&f=false (accessed 02 May 2016).

Trefis Team. (2015). The opportunities and challenges in the Chinese solar market. Forbes, 10 November. Retrieved from http://www.forbes.com/sites/greatspeculations/2015/11/10/the-opportunities-and-challenges-in-the-chinese-solar-market/#7489134d637f (accessed 01 May 2016).

Underdal, A. (1994). Leadership theory: Rediscovering the arts of management. In W. I. Zartman (Ed.), *International multilateral negotiation: Approaches to the management of complexity* (pp.178–197). San Francisco: Jossey–Bass Publishers.

UNDP. (2015). UNDP in China: South-South cooperation. Retrieved from http://www.cn.undp.org/content/china/en/home/ourwork/south-south-cooperation/south-south-cooperation.html (accessed 06 April 2016).

United Nations Framework Convention on Climate Change (UNFCCC). (2014). Status of ratification of the Kyoto Protocol. Retrieved from http://unfccc.int/kyoto_protocol/status_of_ratification/items/2613.php (accessed 06 April 2016).

United Nations Framework Convention on Climate Change (UNFCCC). (2015). INDCs as communicated by parties. Retrieved from http://www4.unfccc.int/submissions/indc/Submission%20Pages/submissions.aspx (accessed 22 March 2016).

USAID. (2016). https://www.usaid.gov (accessed 13 April 2016).

U.S. Constitution. Article VI, §2. Retrieved from The U.S. National Archive & Records Administration (accessed 02 May 2016).

Vogler, J. (2005). The European contribution to global environmental governance. *International Affairs*, Vol. 81(4), 835–850. doi: 10.1111/j.1468-2346.2005.00487.x.

Wang, C. (2013). Democratic centralism: The core mechanism in China's political system. Quishi Journal (English Edition), Vol. 5(4). Retrieved from http://english.qstheory.cn/politics/201311/t20131113_290377.htm# (accessed 02 May 2016).

Wang, U. (2009). Here comes China's $3B, 'Golden Sun' projects. *Greentech Media*. Retrieved from http://www.greentechmedia.com/articles/read/here-comes-chinas-3b-golden-sun-projects (accessed 01 May 2016).

World Bank. (2015). GDP ranking 2014. *World Development Indicators Database*. Retrieved from http://datacatalog.worldbank.org/ (accessed 10 Feb. 2016).

Wurzel, R. and Connelly, J. (Eds.). (2010). *The European Union as a leader in international climate change politics*. New York: Routledge.

Yan, S. (2011). Chinese solar industry development policy situation, problems and countermeasures. North China Electric Power University. Retrieved from http://www.doc88.com/p-5177143343612.html (accessed 30 April 2016, translated).

Ying, Y. (2011). Burned by the sun. *chinadialogue*. Retrieved from https://www.chinadialogue.net/article/show/single/en/4232-Burned-by-the-sun (accessed 01 May 2016).

Young, O. R. (1991). Political leadership and regime formation: On the development of institutions in international society. *International Organization*, Vol. 45(3), 281–309. Retrieved from JSTOR http://www.jstor.org/stable/2706733.

10. Appendix

Table 1: *New PV Installations and Total Installed Capacity in 2015. Data from IEA PVPS, 2016.*

Rank	*Country*	*New Installation (in GW)*	*Rank*	*Country*	*Total Capacity (in GW)*
1	China	15.2	1	China	43.5
2	Japan	11	2	Germany	39.7
3	USA	3.5	3	Japan	34.4
4	UK	3.5	4	USA	25.6
5	India	2	5	Italy	18.9
6	Germany	1.5	6	UK	8.8
7	South Korea	1	7	France	6.6
8	Australia	0.9	8	Spain	5.4
9	France	0.9	9	Australia	5.1
10	Canada	0.6	10	India	5