Int Environ Agreements (2015) 15:159–177
DOI 10.1007/s10784-013-9226-1

ORIGINAL PAPER

The International Renewable Energy Agency: a success story in institutional innovation?

Johannes Urpelainen · Thijs Van de Graaf

Accepted: 11 September 2013 / Published online: 20 September 2013
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Abstract This article interprets the role and significance of the International Renewable Energy Agency (IRENA) in global environmental and energy governance. First, we conduct a comparative analysis of IRENA and other recent innovations in global governance, showing that IRENA stands out with regard to the timing of creation, speed of ratification, and focus of the mandate. Second, we identify three mechanisms through which IRENA can promote the global diffusion of renewable energy: (1) by offering valuable epistemic services to its member states, (2) by serving as a focal point for renewable energy in a scattered global institutional environment, and (3) by mobilizing other international institutions to promote renewable energy. Finally, we reflect on the conditions that could make IRENA's policies a continued success and on the lessons that the experience with IRENA holds for other attempts at innovation in global governance.

Keywords Global energy governance · IRENA · Renewable energy · Institutional innovation

Abbreviations

IRENA	International Renewable Energy Agency
USD	United States dollar
OPEC	Organization of Petroleum-Exporting Countries
UN	United Nations
REN21	Renewable Energy Policy Network for the 21st Century
UNEP	United Nations Environment Programme
IEA	International Energy Agency
EU	European Union

J. Urpelainen
Department of Political Science, Columbia University, 420 W 118th Street, 712 IAB, New York, NY 10027, USA

T. Van de Graaf (✉)
Department of Political Science, Ghent University, Universiteitstraat 8, 9000 Ghent, Belgium
e-mail: thijs.vandegraaf@ugent.be

CCS	Carbon capture and storage
EPO	European Patent Office
OECD	Organization for Economic Co-operation and Development
REEEP	Renewable Energy and Energy Efficiency Program
GBEP	Global Bioenergy Partnership
FAO	Food and Agriculture Organization of the United Nations
UNFCCC	United Nations Framework Convention on Climate Change
JREC	Johannesburg Renewable Energy Coalition

1 Introduction

Governments worldwide have recognized the need to break with current unsustainable energy trends and stressed the importance of renewable sources of energy in achieving this transition (Ki-Moon 2011). Under the right conditions, renewables such as hydro, biomass, ocean, geothermal, wind, and solar offer benefits in terms of climate change mitigation (Kalkuhl et al. 2012), national energy security (Asif and Muneer 2007), economic growth (Brass et al. 2012), and innovation (Cheon and Urpelainen 2012). However, the use of renewable energy varies widely across countries and regions, with Africa and other least developed countries not realizing their full potential (Collier and Venables 2012).

Against this background, the International Renewable Energy Agency (IRENA) was established in January 2009 as a standalone international organization to facilitate cooperation and provide information to its member states on renewable energy policy. Not implementing or funding capital investment in renewables, IRENA is an "epistemic" organization that focuses on promoting the deployment of renewable energy, with a particular emphasis on capacity building and technical support in the least developed countries. Although the agency is still relatively young, as of August 2013, it already boasts an impressive total of 161 members and applicants for membership, including all but five G20 members (those five being Canada, Brazil, Russia, Indonesia and China, though the latter has announced that it intends to join IRENA).[1] The organization is headquartered in Abu Dhabi, with a Technology Centre in Bonn and a liaison office in Vienna. It has a staff of about 70 people and an annual budget (2013) of almost USD 30 million.

As a newcomer in the global governance architecture, IRENA has so far received scant attention in the academic literature.[2] When the stalemate in the post-Kyoto negotiations became apparent in Copenhagen, for example, many observers turned to the G20 or the Major Economies Forum as possible alternative or complementary forums to break the impasse without noting or seriously considering IRENA's potential in this regard (e.g., Stavins 2010). The literature on global energy governance has studied the roles of institutions such as the International Energy Agency (Florini 2011; Van de Graaf 2012), OPEC (Colgan 2013), the G8 and G20 (Van de Graaf and Westphal 2011), and the UN (Karlsson-Vinkhuyzen 2010), but not IRENA.

This relative omission is unfortunate. As an important and surprising case of institutional innovation, the agency deserves to be on the radar screen of scholars of global

[1] 'China to join International Renewable Energy Agency', Press release, IRENA, January 14, 2013, http://www.irena.org/News/Description.aspx?NType=N&News_ID=287.

[2] Exceptions are Meyer (2012, 2013) and Van de Graaf (2013).

governance and sustainability. This article shows that, despite its small budget and largely technical mandate, IRENA has already started to play an important role in environmental and energy governance. So far, the organization can be regarded as a success story in institutional innovation. If the success story continues, other institutions in the global energy landscape can learn from IRENA's success.

We aim to address three puzzling questions surrounding the creation of IRENA. First, why was the creation of IRENA successful at a time of stagnation in global (environmental) governance? We will show how exceptional both the timing and speed of IRENA's creation were compared with broader patterns of global governance innovation. A key factor that explains why this particular effort bared fruit while so many others failed is the benefits that IRENA's approach holds for both developed and developing countries. Second, how could IRENA wield influence despite its soft mandate? From a legalistic viewpoint, IRENA's powers are fairly limited. Yet, we argue that the new agency promises to have important effects on outcomes with regard to renewable energy policy worldwide, some of which are already starting to materialize. For example, IRENA's creation has served as a salutary shock to the International Energy Agency and other international organizations who are keen to capitalize on the growing global interest in renewables. Finally, can IRENA serve as a model of institutional innovation? We examine the conditions under which IRENA can successfully discharge its core mission and we address the question of which unique lessons the experience with IRENA offers for other efforts at institutional innovation in global governance.

IRENA's successful start is important for global environmental politics. Renewable energy is a promising solution to climate change mitigation, air pollution, and the damage caused by fossil fuel extraction (REN21 2012). Although IRENA does not present itself as an environmental organization, its activities contribute to the growth of sustainable energy, especially in the least developed countries. Perhaps surprisingly, IRENA's deliberate downplaying of environmental issues has allowed it to promote effectively the cause of environmental sustainability. As discussed in the conclusion, this strategy may hold promise for international environmental institutions more generally.

Our analysis draws on semi-structured elite interviews with officials from involved international organizations, as well as on primary and secondary sources. Our interviewees were selected on the basis of availability, knowledge, and centrality in the decision-making process. Because most interviews were granted on the condition of anonymity, we refer to them in a non-attributable way. While our primary aim is not to test theories, our research is informed by multiple theories. Rather than to confine ourselves to a monocausal framework, we adopt an eclectic stance and pay attention to factors as diverse as interests (e.g., Moravcsik 1997), power-political factors (e.g., Krasner 1991), and the role of framing (e.g., Wendt 1999). Apart from occasional references, we do not provide a full overview of IRENA's governance structure because this has been adequately covered elsewhere (Van de Graaf 2013; Meyer 2012, 2013) and because previous research has underscored that the legal structures, formal mandate, financial means, and size of international bureaucracies are not always accurate predictors of their role and influence (Bauer et al. 2009; Biermann and Siebenhuener 2009).[3] We begin by offering a systematic comparison of IRENA with other international organizations with regard to the timing and speed of its negotiation and ratification processes, as well as the core focus of its mandate. Then, we highlight IRENA's actual and potential roles, functions, and achievements. In the

[3] For a different perspective see Ivanova (2009), who argues that UNEP's functioning as an "anchor organization" for the global environment has been constrained by its formal status, governance, financing structure, and location.

final part of the article, we discuss the extent to which IRENA can be regarded as a "model" of successful institutional innovation in global governance.

2 Comparing IRENA to other international organizations

IRENA stands out among other international organizations, in particular those created recently, in at least three respects. First, the creation of IRENA itself is somewhat exceptional given the relative stasis in multilateralism. Second, IRENA has achieved an impressive rate of ratification. Finally, IRENA maintains a sharp focus on its core mandate to promote renewable energy.

2.1 The 'miracle' of IRENA's creation

In an era of stagnating institutional innovation in international environmental governance, and a slowdown in the birth rate of international organizations more generally, the creation of an entirely new bureaucracy has become quite exceptional. These conditions make IRENA's creation all the more interesting for scholars and practitioners of global governance. We begin by reviewing the context of IRENA's creation and then characterize the significance of the event.

Evidence suggests that the engine of progress in international environmental governance has stalled somewhat in the last decade, at least if that progress is defined by the treaty-oriented strategy of liberal environmentalism. Park et al. (2008) note that we are far removed from "that euphoric summer of 1992," when the world's governments gathered in Rio to discuss the global environment and development. Data from the International Environmental Agreements Database Project confirms that the rate of institutional innovations—treaty formation or amendment—is stagnating. Figure 1 illustrates this slowdown in the number of new multilateral environmental agreements and amendments since 1980. The years 2005–2012 feature the lowest rates of treaty formation and amendment in recent history.

Moreover, there is evidence that the rate of creation of international organizations in general is slowing down. There are currently around 250 intergovernmental organizations but, as Fig. 2 shows, this number has much decreased since the mid-1980s (although it has also somewhat recovered from its dip in 2002). The number of new multilateral treaties deposited with the United Nations Secretary General dropped significantly in the past few years. When looking at 5-year periods, the numbers are down from 20 (1990–1995) to 17 (1995–2000), 12 (2000–2005) and 9 (2005–2010), prompting Pauwelyn et al. (2012) to conclude that international law is "stagnating." In this regard, environmental governance seems to follow more general trends in multilateralism.

But while the growth of classic multilateralism is slowing down, other forms of governance seem to be thriving in world politics. Examples include transgovernmental networks, public–private partnerships, and plurilateral clubs of states such as the G20 (Abbott et al. 2013). In combination, these trends hint at a shift from classic multilateralism toward other forms of governance. The creation of IRENA stands out as an important exception to these general trends. No equally large or institutionalized international organization has been created over the past 10 years.

While it is impossible to pinpoint a single explanation, IRENA's creation owes much to the sustained political activism within a few European countries, led by Germany in particular. For the German government, creating an international agency for renewable energy promotion was an attempt

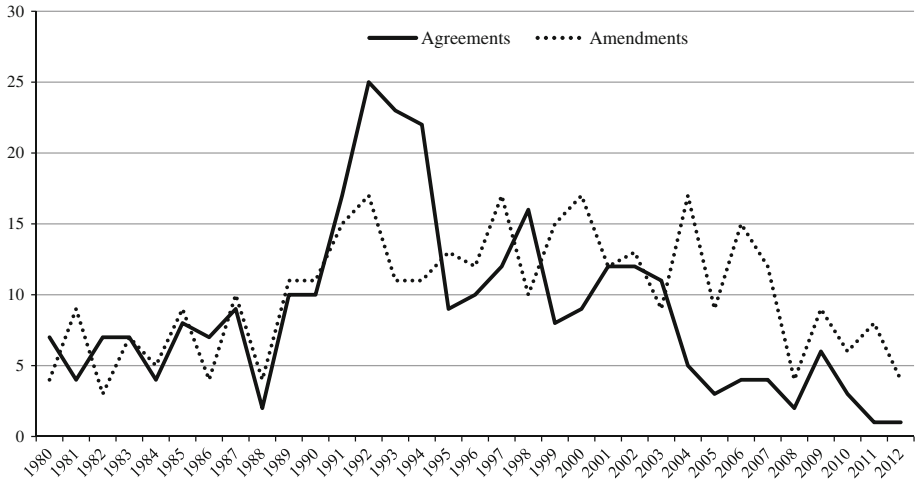

Fig. 1 Multilateral environmental agreements and amendments, 1980–2012. Data compiled from the International Environmental Agreements Database Project, available at iea.oregon.edu. Accessed in May 2013

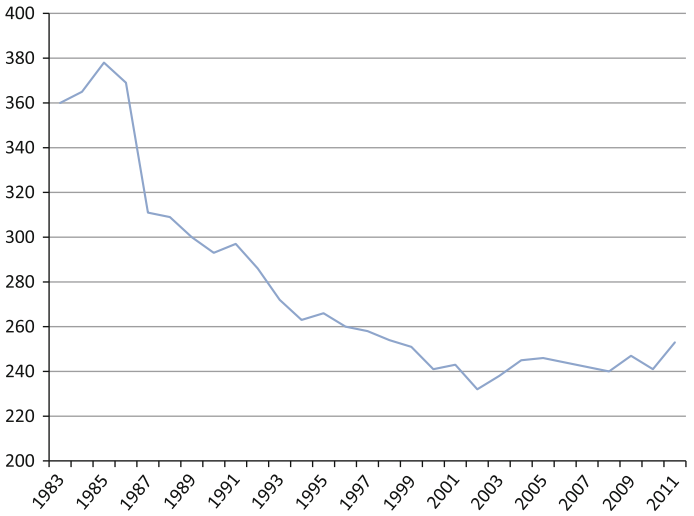

Fig. 2 Number of international intergovernmental organizations, 1983–2011. Data compiled from the Yearbook of International Organizations, available at http://www.uia.org/yearbook. Accessed in August 2013

to push ahead development and exploitation of international markets and, at the same time, to stabilize and promote its own funding instrument – a thoroughly contentious issue at home and throughout the EU – the Renewable Energy Resources Act (Hirschl 2009).[4]

[4] A similar kind of motivation seems to lie behind the new "Renewables Club" (or, in German, "Club der Energiewende-Staaten") created on June 1, 2013. According to the German Minister for the Environment,

The late German politician Hermann Scheer, who had for decades promoted renewable energy on domestic and international arenas (Scheer 2007), played a key role in the creation of IRENA as a domestic political entrepreneur, both developing the proposal to create IRENA and bringing it into the coalition agreement of the federal government after the 2002 elections. His proposal found resonance and support in other European countries such as Denmark and Spain. As green leaders, these countries and Germany were dissatisfied with the existing set of multilateral institutions, notably the International Energy Agency (IEA), which they saw as vanguards of the fossil and nuclear energy industries. By establishing a new international agency dedicated to renewables, rather than retooling the IEA, this coalition hoped to give the renewable energy sector a louder voice in the international arena (Van de Graaf 2013).

The coalition was aided by a conducive international environment featuring both high oil prices and growing public concern about climate change. Oil prices quadrupled between 2004 and 2008, reaching a nominal record of almost 150 dollars per barrel in the summer of 2008 (British Petroleum 2013), the year before IRENA's creation. These record oil prices catapulted energy security concerns to the top of many national political agendas. Meanwhile, public concern with global warming has been steadily, if not linearly, on the rise in the past two decades. Between 1998 and 2006, American citizens became more aware of the scientific consensus that climate change is occurring (Pidgeon and Fischhoff 2011). Polls show that more than 63 % of the population in Europe and North America saw climate change as a serious threat in 2007–2008 (Gallup 2011). The number dropped in both regions in subsequent years, possibly due to the global recession, confirming that 2008 represented a unique window of opportunity to set up an institution such as IRENA.

In short, the swift birth of IRENA contrasts markedly with the declining rate of multilateral innovation, both in global environmental governance and in world affairs more broadly. By proposing to set up an entirely new bureaucracy for renewable energy cooperation, Germany and its partners swam against the tide of declining multilateralism. In doing so, they took a huge risk for they did not know whether their initiative would muster the necessary diplomatic support. One of the key reasons why their efforts proved successful while so many other attempts at multilateral innovation failed is the sustained activism by a few political entrepreneurs, who were able to capitalize on what Kingdon (1984) terms a "problem stream" (*in casu*, concern with high oil prices and climate change) to push forward their preferred solution of creating IRENA.

2.2 A fast ratification rate

IRENA's rapid negotiation and ratification process makes the agency even more noteworthy. Just two preparatory conferences took place, one in April and one in October 2008, before the agency saw the light of day in January 2009. As discussed above, this fast negotiation process can be explained with reference to the unique window of opportunity created by exceptionally high oil prices and a growing interest in clean technologies.

Footnote 4 continued
Peter Altmaier, the launch of this club of ten "pioneering" countries shows that "[w]e in Germany do not stand alone with our Energiewende, but are a part of a strong group of leaders." In other words, this new initiative too appears to be the continuation of domestic politics at the international level. The precise goal of the new Club is still somewhat vaguely defined as "to work together as advocates and implementers of renewable energy at global level," although the Club is clearly also intended to support IRENA, which itself is a member http://www.bmu.de/N50089-1/.

The new renewables agency has also seen one of the fastest expansions of membership of any international organization in recent history. In a little over four years, by early June 2013, the EU and no fewer than 159 states from all continents and at very different levels of development signed onto the agency's statute. Of these, both the EU and 111 states had also become official members by ratifying the statute. Among states that have yet to sign IRENA's statute, China is probably the most surprising one given its position as the world's champion in the manufacturing of low-carbon technologies such as wind turbines and solar photovoltaic (PV) panels. Moreover, China has also emerged as the "epicenter of clean energy finance" attracting more investment in solar, wind, and other renewables than any other country in the world in 2012 (Pew 2013). However, top Chinese officials have announced in early 2013 that the country is planning to become a full member in the near future. Another important country that has yet to join is Brazil.

As Fig. 3 illustrates, IRENA thus comes close to some of the fastest ratification rates obtained by recent major environmental agreements.[5] The Kyoto Protocol was negotiated in 1997 but only entered into force in 2005, having only achieved 46 ratifications in its first 4 years. The Rotterdam Convention of 1998 on the international trade in hazardous chemicals had to wait years for entry into force. By 2002, only 17 countries had ratified the treaty, and ratification has continued at a lower pace than IRENA's. With 111 ratifications in slightly more than 4 years, IRENA's ratification pace is almost on a par with those of the Stockholm Convention of 2001 and the Cartagena Protocol of 2000, which are widely regarded to have an exceptionally fast ratification process among environmental treaties. The Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization has only been ratified by 19 countries since its adoption in October 2010; the number needed for the protocol to enter into force is 50. Apart from the Montral Protocol, which already dates from the 1980s, IRENA is also the only major environmental treaty listed in Fig. 3 to have been ratified in the US Senate.

Why has IRENA been so popular among states already from the very early stages? In approaching this question, it is useful to divide the world into two broad classes of countries: those that already have the capacity to deploy renewable energy (industrialized and emerging economies) and those that do not (least developed countries). While the determinants of renewable energy are many, including the availability of natural resources (Burke 2010) and prior investment in nuclear energy (Szarka 2007; Aklin and Urpelainen 2013), this distinction has been used in previous research (Urpelainen 2012) and also applied to the case of IRENA (Meyer 2012). The first group is composed of forerunners of renewable energy. Their large economic size, ability to develop clean technology, functioning capital markets, and effective governance structures have allowed them to create demand for renewables and support this demand with public policy (REN21 2012). The second group lacks the prerequisites for renewable energy growth and needs external support for increasing the share of these energy sources (Collier and Venables 2012).

Consider first the group of industrialized and emerging economies. For these countries, membership in IRENA provides three distinct benefits. First, being a member is an inexpensive way to influence renewable energy sectors in countries that depend on IRENA for expertise and technical support. Especially in developing countries, IRENA can play a

[5] While there is a large literature on why states ratify environmental treaties, and also some research into the temporality and sequentiality of these ratification processes (e.g., Bernauer et al. 2010), to our knowledge no aggregate data are available to compare the pace of ratification across (environmental) treaties. Therefore, we have only included a few treaties and conventions in Fig. 3. They were selected on the basis of availability of information, importance, and relevance as a point of reference.

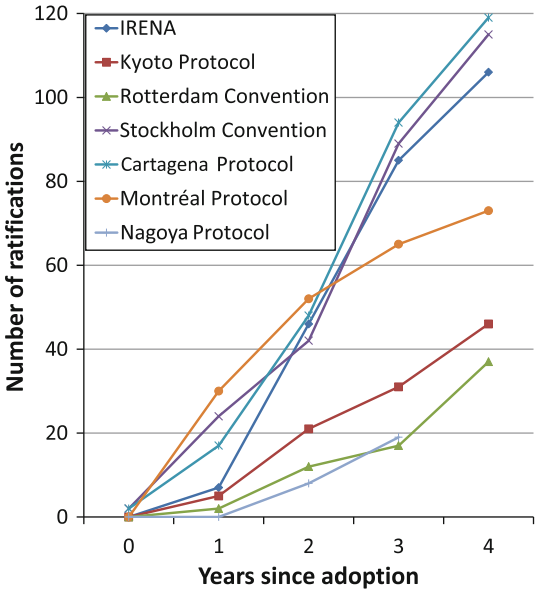

Fig. 3 Pace of ratifications of selected multilateral environmental agreements. Data compiled from the respective agreements' websites

key role in shaping policy choices and technology decisions. With so many member states, however, this benefit is likely not available equally to all members. Rather, IRENA could very well become a site for a contest over renewable energy policy. To the extent industrialized countries have conflicting preferences over renewable energy policies and technologies, this benefit could thus be distributed competitively among developed countries. Second, while IRENA does not itself fund renewable energy projects, it allows industrialized and emerging economies to market their technologies and solutions to other countries. To the extent that the least developed countries depend on IRENA for policy design and technology choice, the organization's priorities and strategies shape the rapidly growing renewable energy market outside relatively wealthy countries with mature renewable energy markets. Third, for many political leaders, joining IRENA also brings symbolic benefits as it displays a commitment to a "good cause," whether it is climate change mitigation or the promise of green job creation (Van de Graaf 2013). Such posturing behavior is also evident in human rights (Cole 2005) and some areas of environmental protection (Cass 2012).

For the least developed countries, the incentives to join IRENA are somewhat different. They can use renewable energy to solve a wide range of problems related to power outages, dependence on foreign fuels, and environmental woes associated with the use of fossil fuels for electricity generation. By joining IRENA, the least developed countries secure access to a 'clearinghouse' of information and expertise about renewable energy and possibly also put themselves in a better position to get technology transfers and financing for renewable energy. Given their limited institutional and policy capacity, as well as the low cost of being an IRENA member, accession is both convenient and expedient.

In considering these benefits, it is also important to remember that the cost of IRENA membership is low. The budget of the agency in 2013 is only USD 29.7 million, a quarter of which is being paid for by the United Arab Emirates as the country hosting the organization's headquarters. Accession only requires signing onto the statute of the organization,

with no stringent policy or conditions imposed on membership. The financial contributions from the member states follow the weighted UN formula based on the size of each country's economy.

2.3 Maintaining a sharp focus on renewable energy

IRENA is the first major international institution specifically dedicated to the promotion of renewable energy. This is an important innovation that could herald a new approach to solving international environmental problems such as climate change, where the negotiations have become bogged down. While multilateral environmental negotiations tend to suffer from paralysis and gridlock, IRENA has avoided this pitfall by simply not dealing with environmental issues. It focuses exclusively on offering services that help countries deploy renewable energy capacity. Instead of engaging seemingly central environmental issues, IRENA has strategically adopted a narrow focus on deploying renewable energy.

Evidence for IRENA's narrow mandate can be found in its strategic planning documents. They testify to a deliberately narrow approach that does not try to justify renewable energy. It accepts the goal of renewable energy promotion as a given and focuses on maximizing the impact of policies and investment, in particular the available IRENA Work Programmes for the years 2011–2013 (http://www.irena.org/Menu/index.aspx?PriMenuID=35&mnu=Pri). They specifically emphasize that IRENA should, even in the context of global climate change, focus on its main mandate. As phrased in the 2011 Programme,

> IRENA must remain comparatively lean and nimble, providing a range of well-understood services that complement what other players in the renewable energy and intergovernmental community can offer; for instance, to the global climate change debate, while acting as an advocate for renewables within the larger international system (IRENA 2011, 6).

In these documents, the only direct linkage to climate policy is the idea of supporting the least developed countries in their efforts to use climate finance to promote renewable energy. In the 2013 Work Programme, for example, the phrase "climate change" is only used once, to note that "The Rio+20 Outcome Document recognized that renewables are an essential part of the solution to the sustainability of energy systems and to the broader context of sustainable development and climate change" (IRENA 2013a, 3).

Another interesting perspective on the agency's operations can be found by looking into the composition of country delegations to IRENA's Council. Accountable to the broader Assembly of all members, this body is the executive of IRENA and meets twice a year to plan IRENA's activities. Consider, for example, the fourth meeting of the Council in November 2012 (IRENA 2013b). The 21 participating members of the Council sent a total of 71 participants. Of these only Japan, Germany, France, and Denmark—all of which sent large delegations with multiple members—sent officials from ministries of climate, ecology, or the environment. Conversely, 15 of the 21 countries sent at least one official from an energy ministry or a comparable government agency. This shows that member countries do not consider IRENA an environmental organization per se. Rather, the emphasis is on renewable energy deployment.

While the agency's narrow focus may initially seem unwarranted given the complexity of the global energy landscape, it produces three major benefits. First, it allows IRENA to be effective in its main area of work despite a small budget. A small organization such as IRENA cannot afford to spread itself too thin by allocating scarce resources into secondary activities. Even limited resources can be effective, however, if they are dedicated to a small

set of synergistic core activities. IRENA's current Director-General, Adnan Amin, seems to be well aware of this:

> We have a limited budget but I do not want to use that budget to create a huge, standing bureaucracy. Instead, I want to have a very competent and tight team in the secretariat, and to bring in external expertise as needed (interview with Adnan Amin, Director-General at IRENA, London, April 26, 2012).

Second, by maintaining a sharp focus on renewable energy, IRENA plays an important role in the contemporary patchwork of global environmental governance. No other existing organization focuses squarely on renewable energy. For the industrialized countries, the IEA offers many technical services related to energy, but this organization mostly emphasizes old forms of energy such as nuclear and fossil fuels equipped with carbon capture and storage (CCS) technology. From the World Bank to the Global Environment Facility, sustainable energy plays an increasingly important role in their project portfolios—as argued below, this could also be in part thanks to IRENA's creation and activities—but none have made renewable energy policy and deployment their clear priority.

Finally, IRENA's focus on renewable energy reduces political controversy. Countries may disagree about climate change policy, for example, but renewable energy is growing rapidly across the world and countries need policy expertise in managing and promoting such growth (REN21 2012). Given the rapid growth and potential of renewable energy, few countries can afford to stay completely outside this policy arena. Even major oil exporters such as Saudi Arabia are now investing in solar power to reduce their own oil consumption.

3 IRENA's role, functions, and achievements so far

IRENA does not set standards for behavior, nor is it able to impose legally binding obligations on its members. The agency is not even designed to serve as a framework for negotiating such obligations or commitments. Instead, IRENA focuses on the gathering and dissemination of knowledge related to renewable energy technologies and policies. Despite this 'soft' mandate, IRENA could exert significant influence on global energy and climate politics. IRENA's softness and focus on information may be one reason why IRENA has simultaneously achieved a high ratification rate and had an effective start, despite the conventional wisdom (Downs et al. 1996, 1998) that there often, if not always (Gilligan 2004), is a broader-deeper trade-off in the formation of international organizations. Here, we focus on three mechanisms through which IRENA could wield such global influence: (1) by offering valuable epistemic services to its member states, (2) by serving as a focal point for renewable energy in a scattered global institutional environment, and (3) by mobilizing other international institutions to promote renewable energy.

3.1 Epistemic services

IRENA's main activities revolve around lowering informational barriers and asymmetries, gathering and disseminating knowledge, and comparing and evaluating national regulatory frameworks to identify best practices in renewable energy governance. The agency has therefore been characterized as an "epistemic" institution, defined by Meyer (2013, 17) as

one that "assimilates basic scientific and technical research and applies it to specific legal or policy problems."

IRENA's role as an epistemic institutions can be understood in the light of a body of international relations scholarship on what international institutions can and cannot do. Many scholars emphasize the difficulties that such institutions face in trying to enforce and constrain state behavior, instead proposing that international institutionalization is more effective when it contributes to capacity building, information sharing, and coordination (Chayes and Chayes 1995; Abbott et al. 2013; Poast and Urpelainen 2013). From this perspective, IRENA's design and mandate as an epistemic institution seem warranted.

One of the main epistemic projects that the young institution has thrown its weight behind is the development of a Global Atlas for Solar and Wind, a mapping of the technical and economic potential of wind and solar energy (http://www.irena.org/globalatlas/). The website of the Atlas database shows, among other things, the average resource conditions—annual radiation for solar mean, wind speed for wind—for all regions in the world. Such a resource assessment is unprecedented and will be made for every country in the world, which catalyzes private investment by significantly reducing informational barriers to renewable energy investment. IRENA is also engaged in training professionals in renewable energy, the lack of which increases installation costs and is thus an important obstacle to increased deployment in many countries. It also does research on policy models for different countries (http://www.irena.org/menu/index.aspx?mnu=cat&PriMenuID=35&CatID=110) and hosts a database of renewable energy patents (http://www.irena.org/menu/index.aspx?mnu=Subcat&PriMenuID=35&CatID=112&SubcatID=301). Given the range of IRENA's activities, it covers all the key issues that require attention in renewable energy deployment and policy.

Although IRENA does not create legally binding rules, it provides useful services, in particular to the least developed countries, which generally lack the capacity to do resource assessments, training sessions, and policy studies independently. At the same time, the epistemic functions that IRENA provides may stir concerns among developing countries about the credibility of the produced scientific and policy knowledge. Why would Southern countries trust the knowledge offered by this international agency? They may be wary that Northern countries want to create new markets for their clean energy technology industries by advising developing countries, for example, "to go 100 % solar." These concerns relate to the fact that only a handful of countries still dominate the clean energy business. Eighty percent of clean energy innovation comes from just six countries—the United States, Japan, Germany, Korea, France, and the United Kingdom (Meyer 2013). Less than 1 % of all patent applications relating to clean energy technology have been filed in Africa (UNEP and EPO 2013).

Meyer (2013, 42) offers a good explanation of how this dilemma is resolved. Since the information that IRENA provides has value to a wide variety of actors, from governments that adopt renewable energy programs to businesses that decide whether or not to invest in renewable energy generation, "[h]igh demand from different information consumers preserves the incentives for IRENA to invest in developing high quality usable scientific information." Since these actors can make use of the information independently, there is no collective action problem involved in the spread of renewable energy. Consequently,

> The credibility of IRENA's information can thus ultimately be field tested. Developing nations wary of epistemic institutions do not need to be able to directly observe the process by which usable scientific information is assembled before deciding in a collective setting whether to adopt legal rules. Instead, they can observe whether the information proves valuable when adopted by others (Meyer 2013, 42).

This highlights the importance of IRENA as an epistemic institution. By accumulating and disseminating information, it creates an environment that allows countries to learn from each other. Such learning also alleviates concerns about false or self-serving information generated by countries that currently dominate the global clean energy market.

3.2 Focal point for renewable energy

Although a fairly small organization with a limited budget, IRENA has great visibility because no other international organization specializes in renewable energy. The organization strategically steers clear of climate change and the related distributional conflict, focusing instead fully on renewable energy and emphasizing the co-benefits it can produce. There is of course the IEA in Paris, an offshoot of the OECD, which focuses on energy policy overall. But the organization only has 28 member countries, all from the developed world. Additionally, renewables are but a small part of the IEA agenda. IRENA is able to command much more resources and staff to do analytical work on renewables for a much larger set of member states. IRENA's annual budget (USD 29.7 million in 2013) is still somewhat lower than the IEA's (USD 34.5 million in 2012) but it is not far behind.[6]

Before IRENA's creation, international renewable energy governance was scattered across a wide variety of intergovernmental networks, specialized programs, and transnational partnerships. Examples include the Renewable Energy and Energy Efficiency Program (REEEP; launched in 2003), the Renewable Energy Policy Network for the 21st Century (REN21; launched in 2005), and the Global Bioenergy Partnership (GBEP; launched in 2006 and hosted at the FAO headquarters in Rome). While many of these networks and organizations continue to exist, IRENA now serves as an umbrella organization that gives the renewables sector as a whole more visibility and voice.

At the same time, IRENA can help build more political consensus within the renewables community where there is still intense debate across renewable energy technologies and on the use of various policy instruments. The fact that Brazil, a leading country with regard to hydropower and biofuels, has not yet joined IRENA is a powerful testimony to this divide. By serving as a one-stop shop for advice on renewable energy technologies, markets, and policies—and not just for a particular renewable energy technology, but for "all forms of energy produced from renewable sources in a sustainable manner" (IRENA 2009, Article III)—IRENA might over time bring more normative coherence in this scattered policy domain.

The UNFCCC has also engaged in climate-friendly energy technology transfer as part of its mission to reduce overall greenhouse gas emissions. Since 2001, it operates a Technology Transfer Framework. In 2010, the parties to the convention complemented this with a Technology Mechanism that consists of an Executive Committee and a Climate Technology Centre and Network. The Kyoto Protocol also has so-called flexible mechanisms, such as the Clean Development Mechanism and Joint Implementation, that are designed to stimulate technology transfer and investment. A key difference with IRENA is that the technology transfer mechanisms on non-commercial terms under the auspices of the UNFCCC are redistributive and thus fraught with distributional conflict. Indeed, it is quite telling that the recently created Technology Mechanism within the UNFCCC dropped the "transfer" aspect of "technology transfers" (Meyer 2013).

[6] The figures come from the organizations' respective websites. Both annual budgets include voluntary contributions and, in the case of the IEA, revenues from the sale of publications.

3.3 Mobilizing other international institutions

IRENA is shaping the global policy landscape by drawing the attention of other institutions to renewable energy. As long as there was no focal agency for renewable energy, other international organizations could easily afford to ignore renewable energy in their daily operations. However, the existence of IRENA undermines this strategy of neglect. Given the fast growth of renewable energy, major organizations risk developing a negative reputation and losing territory should the much smaller IRENA rapidly capture the policy arena for renewable energy. As IRENA draws attention to renewable energy, other organizations can no longer afford to dismiss renewables as a fringe topic in international energy policy. This creation of interest is further strengthened by the agency's fast ratification rate, which sends a strong signal to other international organizations that they are missing a major trend in global energy development. By encouraging interorganizational competition and the diffusion of policy ideas, IRENA seems to shape the behavior of other organizations, with ripple effects throughout what may be seen as an emerging "regime complex" for renewable energy (Raustiala and Victor 2004; Orsini et al. 2013).

Although linking the growth of interest in renewable energy to IRENA is generally difficult, the trend itself is evident. Between October 2008 and June 2013, the World Bank and other multilateral development banks have invested through the Climate Investment Funds almost USD eight billion in clean technology projects in 49 developing countries, drawing co-financing worth almost USD 44 billion (https://www.climateinvestmentfunds.org/cif/aboutus). In fiscal year 2012, the World Bank's investment in renewable energy reached a new record of USD 3.6 billion, 44 % of total energy lending. In power generation, the share was as high as 84 % (World Bank 2012). The year 2012 was when the United Nations launched the Sustainable Energy For All (http://www.sustainableenergyforall.org/) initiative. One of the goals of the initiative is to double the share of renewables in the global energy mix by 2030.

Though finding direct evidence for the role of IRENA in the recent burst of excitement about and interest in renewable energy is challenging, a direct connection can be established for recent changes in the IEA. The IEA's relatively small Renewable Energy Unit was fully integrated into the Energy Markets and Security Directorate in September 2008, just a couple of months before IRENA's birth. On July 1, 2009, it became a full-fledged Division, staffed by ten full-time analysts and legally operating on a par with the IEA's Oil Market Division (IEA 2010). Moreover, in January 2012, the heads of the IEA and IRENA signed a letter of intent in which they announced that their respective organizations would cooperate closely. They agreed to jointly develop the IEA's existing database on Global Renewable Energy Policies and Measures and rename it accordingly as the IEA/IRENA database. Other forms of collaboration covered in the Letter of Intent include the regular exchange of information, the organization of joint conferences and workshops, and reciprocal participation in technical committee meetings (http://www.iea.org/newsroomandevents/news/2012/january/name,9898,en.html). This reorganization shows that IEA has responded to IRENA's creation by putting more emphasis on renewables.

4 A model of institutional innovation for global governance?

Having reviewed IRENA's characteristics and agenda, we now discuss lessons from this experience for global environmental and energy governance more generally. First, we evaluate the conditions for IRENA's continued success in a challenging global policy

environment. We discuss both opportunities and challenges, proposing some practical guidelines for how policymakers can navigate them. Next, we make a preliminary attempt to generalize from IRENA to other global environmental and energy governance initiatives that are currently searching for role and direction.

4.1 Conditions for success: opportunities and challenges

What does IRENA's future hold? While the organization has had an impressive start, there will be both challenges and opportunities for greater impact. For one, IRENA's role as a provider of epistemic services depends on its ability to provide continually the least developed countries with useful policy advice and technical assistance. To a large extent, then, the utility of IRENA's service depends on the attractiveness of renewable energy as a solution to the various problems these governments face. In the current environment, countries perceive renewable energy as an expedient solution to a variety of problems ranging from energy security (Asif and Muneer 2007) to economic development (Brass et al. 2012). IRENA's ability to meet the needs of least developed countries depends critically on the identification of policies and technologies that work under imperfect electricity and capital markets, do not require high levels of government capacity, and are economically cost-effective. Identifying solutions to these problems should be the cornerstone of IRENA's epistemic services in the future.

At the same time, the current environment for renewable energy investment provides IRENA with promising opportunities. As the cost of renewable energy generation comes down with technological advances and global market expansion (REN21 2012), it becomes increasingly lucrative to countries outside the industrialized and emerging world. While most of current renewable energy growth is found in OECD or major emerging economies, the number of countries that are now investing in renewable energy has multiplied in the past two decades. If IRENA were to become the focal agency for the technical expertise needed to expand the geographic scope of major renewable energy investments, it could catalyze major private investments in these countries that would otherwise be too difficult to implement due to regulatory and informational barriers.

The most important of IRENA's challenges are political. First, IRENA's renewable energy agenda could, at least in principle, be hijacked by other energy interests. When IRENA was established, such concerns were raised about nuclear energy, especially due to the decision to locate IRENA's headquarters in Abu Dhabi and a French woman securing the post of interim Director-General (Worldwatch Institute 2009). While supporters of Abu Dhabi noted that locating the headquarters outside Western countries could help build global support for it, Eric Martinot, an expert in renewable energy and the lead author of the REN21 Renewables Global Futures Report for the years 2005–2010, wondered whether "IRENA will be an effective change agent for renewables (i.e. promoting renewables instead of nuclear power), or will be merely an appendage to a nuclear agenda" (Worldwatch Institute 2009). Similarly, it has been suggested that the headquarter choice represented an attempt by petro-states to influence the renewables sector. So far, these fears have proven unfounded, but IRENA's success as a focal agency for renewable energy will depend on avoiding such politicization. Since IRENA cannot succeed without a broad, global base of support, "institutional capture" (Mansfield 1995) by vested interests with a hidden agenda would be a major threat to IRENA.

The other danger to IRENA pertains to climate policy. Unlike renewable energy, appropriate climate policy remains a politically controversial topic. Although most countries agree that climate change is a threat, they are far from agreeing on what to do

about it (Victor 2011). For advocates of climate policy, IRENA could appear a potential forum for promoting their views. Although the intention is good, this strategy would backfire. IRENA's ability to promote renewable energy, which is a key component of any meaningful "sustainable energy transition" with today's energy technology (Barrett 2009; Aklin and Urpelainen 2013), depends on avoiding political gridlock due to disagreements among countries about *why* renewable energy is important.

4.2 A unique or replicable process?

Can IRENA serve as a role model for future innovations in global governance? For example, does the experience with IRENA offer lessons for the Rio+20 process and Sustainable Development Goals, the post-Kyoto climate negotiations, and the Doha trade talks? To answer these questions, we build on our description of IRENA above. We argue that while IRENA may appear *sui generis* in hindsight, it did face political hurdles similar to those that characterize other major multilateral negotiations.

To begin with, the road toward IRENA has been bumpy. Scheer's original proposal to create IRENA predated the actual establishment of the new body by nearly two decades, testifying to the difficulties that he encountered in realizing his plans. During the 1990s, his proposal failed to muster sufficient interest and support in spite of his active campaigning (Van de Graaf 2013). In 2000, the G8 set up a Renewable Energy Task Force, only to completely ignore its recommendations at the next year's summit (Lesage et al. 2010). At the 2002 World Summit on Sustainable Development in Johannesburg, some European and developing countries wanted to set a global target of 10–15 % renewable energy by 2010, but these proposals were defeated by the United States and others (DeRose et al. 2003). Next, Germany and others created the Johannesburg Renewable Energy Coalition (JREC) to keep pushing for meaningful international action in this field. The European Commission hosted the secretariat of JREC and more than 80 countries associated themselves with the initiative (http://ec.europa.eu/environment/archives/jrec/index_en.htm). In 2004, Germany organized the first of a series of governmental conferences on renewable energy in Bonn. However, the political results of this conference were disappointing for many renewable energy supporters.

Crucially, the German government then decided to change tactics. Rather than pursuing an inclusive multilateral initiative from the start, it formed an "exclusive forerunner coalition" that would establish IRENA outside of the UN sphere (Hirschl 2009). At the 2008 renewables conference in Washington, DC, the German government thus announced that it would start the negotiation process to set up IRENA. Three special ambassadors were appointed to hold bilateral talks with other countries. The preparatory conferences in 2008 were attended by a large number of delegations, 70 of which decided to sign onto IRENA's statute in January 2009 (Van de Graaf 2013).

In sum, IRENA succeeded in a difficult negotiation environment. The experience holds two lessons for negotiations in other areas of world politics. First, when an attempt at institutional innovation in global governance proves unsuccessful at first, it can still succeed in the end, provided that the political activism behind the initiative is sustained. Second, where collective action problems are not a critical component of the problem at hand, institutional innovation through small coalitions of the willing can be a good way to start. The multilateralization of the initiative can be postponed to break the negotiation gridlock.

The replicability of the IRENA innovation model hinges on two critical parameters. For one, the domestic political constellation in countries that have the ability to innovate in

global governance has to be such that there is a sustained demand for international cooperation (the 'push' factor). Additionally, the issue at hand must be framed so that it does not involve a collective action problem, but offers net benefits to individual states and actors, becoming an attractive option that different actors will seek to emulate (the 'pull' factor).

5 Conclusion

This article has described and evaluated the role of IRENA in the global energy landscape. The central thrust of our argument is that IRENA presents an unusually innovative approach to promoting renewable energy. By focusing on a narrowly defined set of goals related to the deployment of renewables, IRENA has, in spite of a small budget and the lack of a proven track record, established itself as a major provider of epistemic services to the least developed countries. IRENA's mandate, which focuses on renewable energy, allows it to sidestep some of the political controversies that surround nuclear energy and climate change. The budding organization's success depends, we have proposed, to a large extent on its ability to maintain this sharp focus. It is neither politically wise nor cost-effective for IRENA to become tangled in issues that are only tangentially relevant to removing obstacles to renewable energy deployment, such as climate negotiations. More generally, IRENA's deliberate lack of emphasis on collective action and politically controversial aspects of renewable energy could suggest a promising strategy for other international organizations that deal with environmental problems. Based on IRENA's first years, the promise and pitfalls of this strategy warrant further research. For example, are the benefits of steering clear of collective action enough to outweigh the danger that international organizations lose their current, if admittedly weak, ability to regulate state behavior?

We have also argued that IRENA's success could offer useful lessons for other initiatives in global governance. Although IRENA's success may seem almost obvious with the benefit of hindsight, sustainable political activism and careful institutional design were necessary for the organization to have a promising start, and it remains to be seen if IRENA can maintain its momentum in the long run. Perhaps most importantly, the case of IRENA emphasizes the importance of creating participation incentives for countries. As a global center for renewable energy information, IRENA filled an important gap in the governance architecture. The least developed countries flocked to IRENA because they expected handsome benefits from policy advice and related information, such as resource assessments and capacity building. At the same time, industrialized and emerging economies have joined IRENA because they have incentives to participate in the process that shapes the global policy landscape for renewable energy.

We have yet to comment on the potentially more dramatic effects of IRENA on the global governance of energy and the environment. Over the medium to long term, IRENA could also gradually build up a constituency of support for the global spread of renewables. While IRENA primarily serves as a collector and transmitter of information, it has also a clear mission to promote the development and deployment of renewable energy worldwide. More than an information clearinghouse, IRENA could convey a clear pro-renewables message to a wider audience.

We know from earlier research that international institutions can increase the electoral leverage and informational status of constituencies in favor of the policies conducted by the international institution in question (Dai 2005; Baccini and Urpelainen 2012). In doing

so, international institutions can facilitate a decentralized constituency system, whereby the goals and mission of the international institution are upheld by states, not because they are cajoled by other states to comply with their international engagements, but because domestic constituencies pressure their government to behave in the way that the international institution prescribes.

Although it is too early to say if IRENA has enough legitimacy and credibility to achieve this goal, the possibility certainly cannot be rejected out of hand. Indeed, the argument has already been suggested with regard to IRENA. As Meyer (2012, 343) observes, "IRENA's focus on reducing transaction costs for investment can mobilize private financial resources that, once invested in the success of renewable energy, provide a political constituency in favor of renewable support." In other words, IRENA can help to create or empower domestic and transnational lobbies in favor of renewable energy. In theory, this could instigate a self-reinforcing dynamic, whereby leadership at home could lead to leadership abroad. Although IRENA's current direction is already promising, leadership in mobilizing the renewable energy community across the world would raise the importance of the organization to an altogether new level.

Acknowledgments We are grateful to Frank Biermann, Jeff Colgan, Sander Happaerts, Timothy Meyer, and Sarah Van Eynde for commenting on earlier drafts. We also thank the editors of *International Environmental Agreements* and the anonymous reviewers for their advice. All interviewees are commended for their openness and contribution.

References

Abbott, K. W., Green, J. F., & Keohane, R. O. (2013). *Organizational ecology in world politics: Institutional density and organizational strategies*. Paper presented at ISA, San Francisco, April 2013.

Aklin, M., & Urpelainen, J. (2013). Political competition, path dependence, and the strategy of sustainable energy transitions. *American Journal of Political Science, 57*(3), 643–658.

Asif, M., & Muneer, T. (2007). Energy supply, its demand and security issues for developed and emerging economies. *Renewable and Sustainable Energy Reviews, 11*(7), 1388–1413.

Baccini, L., & Urpelainen, J. (2012). International institutions and domestic politics: Can preferential trading agreements help leaders promote economic reform? *Journal of Politics*. http://eprints.imtlucca.it/id/eprint/77

Barrett, S. (2009). The coming global climate-technology revolution. *Journal of Economic Perspectives, 23*(2), 53–75.

Bauer, S., Busch, P. O., & Siebenhuener, B. (2009). Treaty secretariats in global environmental governance. In: F. Biermann & S. Bauer (Eds.), *International organizations in global environmental governance* (pp. 174–191). London: Routledge.

Bernauer, T., Kalbhenn, A., Koubi, V., & Spilker, G. (2010). A comparison of international and domestic sources of global governance dynamics. *British Journal of Political Science, 40*(3), 509–538.

Biermann, F., & Siebenhuener, B. (2009). The role and relevance of international bureaucracies: Setting the stage. In: F. Biermann & B. Siebenhuener (Eds.), *Managers of global change: The influence of environmental bureaucracies* (pp. 1–14). Cambridge, MA: MIT Press.

Brass, J. N., Carley, S., MacLean, L. M., & Baldwin, E. (2012). Power for development: A review of distributed generation projects in the developing world. *Annual Review of Environment and Resources, 37*, 107–136.

British Petroleum. (2013). *Statistical review of world energy*. Available at http://www.bp.com/statisticalreview.

Burke, P. J. (2010). Income, resources, and electricity mix. *Energy Economics, 32*(3), 616–626.

Cass, L. R. (2012). The symbolism of environmental policy: Foreign policy commitments as signaling tools. In: P. G. Harris (Ed.), *Environmental change and foreign policy: Theory and practice* (pp. 41–56) London: Routledge.

Chayes, A., & Chayes, A. H. (1995). *The new sovereignty: Compliance with international regulatory agreements*. Cambridge: Harvard University Press.

Cheon, A., & Urpelainen, J. (2012). Oil prices and energy technology innovation: An empirical analysis. *Global Environmental Change, 22*(2), 407–417.
Cole, W. M. (2005). Sovereignty relinquished? Explaining commitment to the international human rights covenants, 1966–1999. *American Sociological Review, 70*(3), 472–495.
Colgan, J. D. (2013). The emperor has no clothes: The limits of OPEC in the global oil market. *International Organization* (forthcoming).
Collier, P., & Venables, A. J. (2012). Greening Africa? Technologies, endowments and the latecomer effect. *Energy Economics, 34*(S1), S75–S84.
Dai, X. (2005). Why comply? The domestic constituency mechanism. *International Organization, 59*(2), 363–398.
DeRose, A. M., La Vina, A. G., & Hoff, G. (2003). The outcomes of Johannesburg: Assessing the world summit on sustainable development. *SAIS Review, 23*(1), 53–70.
Downs, G. W., Rocke, D. M., & Barsoom, P. N. (1996). Is the good news about compliance good news about cooperation? *International Organization, 50*(3), 379–406.
Downs, G. W., Rocke, D. M., & Barsoom, P. N. (1998). Managing the evolution of multilateralism. *International Organization, 52*(2), 397–419.
Florini, A. (2011). The International Energy Agency in global energy governance. *Global Policy, 2*(s1), 40–50.
Gallup. (2011). *Fewer Americans, Europeans view global warming as a threat*. Entry available at http://www.gallup.com/poll/147203/Fewer-Americans-Europeans-View-Global-Warming-Threat.aspx.
Gilligan, M. J. (2004). Is there a broader-deeper trade-off in international multilateral agreements? *International Organization, 58*(3), 459–484.
Hirschl, B. (2009). International renewable energy policy: Between marginalization and initial approaches. *Energy Policy, 37*(11), 4407–4416.
IEA. (2010). *IEA activities on renewable energy: An update*. Available at http://www.iea.org/IEAnews/0310/REN_Brochure.pdf.
IRENA. (2009). *Statute of the International Renewable Energy Agency*. Available at http://www.irena.org/menu/index.aspx?mnu=cat&PriMenuID=13&CatID=126.
IRENA. (2011). *Decision regarding the work programme and budget for 2011*. Available at http://www.irena.org/DocumentDownloads/WP2011/A_1_DC_8.pdf.
IRENA. (2013a). *Decision regarding the work programme and budget for 2013*. Available at http://www.irena.org/DocumentDownloads/WP2013.pdf.
IRENA. (2013b). *Report of the fourth meeting of the council of the International Renewable Energy Agency: List of participants*. Available at http://www.irena.org/documents/uploadDocuments/4thCouncil/C_4_SR_1.pdf.
Ivanova, M. (2009). UNEP as anchor organization for the global environment. In: F. Biermann, S. Bernd & S. Anna (Eds.), *International organizations in global environmental governance* (pp. 151–173). London: Routledge.
Kalkuhl, M., Edenhofer, O., & Lessmann, K. (2012). Learning or lock-in: Optimal technology policies to support mitigation. *Resource and Energy Economics, 34*(1), 1–23.
Karlsson-Vinkhuyzen, S. I. (2010). The United Nations and global energy governance: Past challenges, future choices. *Global Change, Peace and Security, 22*(2), 175–195.
Ki-Moon, B. (2011). *Sustainable energy for all: A vision statement by Ban Ki-Moon, Secretary-General of the United Nations*, November 2011.
Kingdon, J. W. (1984). *Agendas, alternatives, and public policies*. Boston: Little, Brown.
Krasner, S. D. (1991). Global communications and national power: Life on the Pareto frontier. *World Politics, 43*(3), 336–366.
Lesage, D., Van de Graaf, T., & Westphal, K. (2010). *Global energy governance in a multipolar world*. Farnham: Ashgate Publishing Limited.
Mansfield, E. D. (1995). Review: International institutions and economic sanctions. *World Politics, 47*(4), 575–605.
Meyer, T. (2012). Global public goods, governance risk, and international energy. *Duke Journal of Comparative and International Law, 22*, 319–348.
Meyer, T. (2013). Epistemic institutions and epistemic cooperation in international environmental governance. *Transnational Environmental Law, 2*(2), 15–44.
Moravcsik, A. (1997). Taking preferences seriously: A liberal theory of international politics. *International organization, 51*(04), 513–553.
Orsini, A., Morin, J. F., & Young, O. (2013). Regime complexes: A buzz, a boom, or a boost for global governance? *Global Governance: A Review of Multilateralism and International Organizations, 19*(1), 27–39.

Park, J., Conca, K., & Finger, M. (2008). The death of Rio environmentalism. In: J. Park, K. Conca & M. Finger (Eds.), *The crisis of global environmental governance: Towards a new political economy of sustainability* (pp. 1–12) London: Routledge.

Pauwelyn, J., Wessel, R., & Wouters, J. (2012). *The stagnation of international law*. KU Leuven, Working paper no. 97, October 2012.

Pew. (2013). *Who's winning the clean energy race? 2012 edition*. Available at http://www.pewenvironment.org/uploadedFiles/PEG/Publications/Report/-clenG20-Report-2012-Digital.pdf.

Pidgeon, N., & Fischhoff, B. (2011). The role of social and decision sciences in communicating uncertain climate risks. *Nature Climate Change, 1*, 35–41.

Poast, P., & Urpelainen, J. (2013). Fit and feasible: Why democratizing states form, not join, international organizations. *International Studies Quarterly*. doi:10.1111/isqu.12031

Raustiala, K., & Victor, D. G. (2004). The regime complex for plant genetic resources. *International Organization, 58*(2), 277–309.

REN21. (2012). *Renewables global status report: 2012 update*. REN21 Secretariat, Paris.

Scheer, H. (2007). *Energy autonomy: The economic, social and technological case for renewable energy*. London: Earthscan.

Stavins, R. N. (2010). *Options for the institutional venue for international climate negotiations*. Available at http://belfercenter.ksg.harvard.edu/files/Stavins-Issue-Brief-3.pdf.

Szarka, J. (2007). Why is there no wind rush in France? *European Environment, 17*(5), 321–333.

UNEP and EPO. (2013). *Patents and clean energy technologies in Africa*. Report available at http://www.epo.org/clean-energy-africa.

Urpelainen, J. (2012). The strategic design of technology funds for climate cooperation: Generating joint gains. *Environmental Science and Policy, 15*(1), 92–105.

Van de Graaf, T. (2012). Obsolete or resurgent? The International Energy Agency in a changing global landscape. *Energy Policy, 48*, 233–241.

Van de Graaf, T. (2013). Fragmentation in global energy governance: Explaining the creation of IRENA. *Global Environmental Politics, 13*(3), 14–33.

Van de Graaf, T., & Westphal, K. (2011). The G8 and G20 as global steering committees for energy: Opportunities and constraints. *Global Policy, 2*(s1), 19–30.

Victor, D. G. (2011). *Global warming gridlock: Creating more effective strategies for protecting the planet*. New York: Cambridge University Press.

Wendt, A. (1999), *Social theory of international politics*. New York: Cambridge University Press.

World Bank. (2012). *World Bank financing for renewable energy hits record high*. Entry available at http://go.worldbank.org/ITW1FVVIJ0.

Worldwatch Institute. (2009). IRENA politics may 'taint' agency, advocates say. *Eye on Earth*. Available at http://www.worldwatch.org/node/6169.

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