3

The History of the Clean Energy Regime Complex

> The world has changed. Our institutions have not. We cannot effectively address problems as they are if institutions don't reflect the world as it is. . . . I have no illusions. Reforms are a question of power. I know there are many competing interests and agendas. But the alternative to reform is not the status quo. The alternative to reform is further fragmentation.
> *–UN Secretary-General António Guterres, Secretary-General's Address to the General Assembly, 19 September 2023, New York*

After the 1973 oil crisis the world began to take notice of the importance of energy security and supply in a new way. In the late 1970s and early 1980s, renewable energy was discussed in international forums as a potential solution to "peak oil." An increasing focus on securing domestic energy supplies and diversifying energy portfolios through the development of domestic renewable energy resources began to take hold in the industrialized world as well as EMDEs, particularly as exogenous energy shocks triggered price hikes and political unrest. The World Bank's Energy Sector Management Assistance Program (ESMAP) – focused on assisting EMDEs in addressing their energy challenges – first reported on renewable energy development in 1989 (ESMAP 1989). While renewable energy as a tool for development was used much earlier through bilateral aid projects (i.e. hydropower development in Southeast Asia in the 1950s), most of the energy development at that time was focused on oil and coal. The normative discourse connecting sustainable energy to development only became salient in the early 2000s, nearly 50 years later.

Through the UN climate change negotiations and resulting agreements, the roles and responsibilities for leading emissions reduction, enabling technology transfer, and providing financial support for a low-carbon future were formulated and institutionalized. Emerging economies, like China, India, Brazil, Indonesia, and South Africa, and developing countries most vulnerable to climate change formed coalitions such as the G-77+China, BASIC (consisting of Brazil, South Africa, India, China), Alliance of Small Island Developing States (AOSIS), and Least

Developed Countries (LDCs); these coalitions played a significant role in shaping the international negotiations for climate change and sustainable development (Bernstein 2013; Hochstetler 2012; Najam 2005; Roberts and Parks 2007; Vanhala and Hestbaek 2016). Coalition groups have underlined the need for financial aid and technology transfer for mitigation and adaptation and differentiated responsibilities for carbon emissions reduction due to historical emissions from past industrializations, stemming from disproportionate vulnerabilities to climate change. Industrialized economies also developed a coalition, called the Umbrella Group (Australia, Canada, Iceland, Israel, Japan, New Zealand, Kazakhstan, Norway, Ukraine, and the United States) with European nations represented under the European Union, while African and Arab nations formed their own alliances, including the African Group of Negotiators and the Arab States.[1] The diverging coalitions forced a change in multilateral governance.

Climate change and the promotion of clean energy technology as a mitigation solution was first institutionalized through the United Nations Framework Convention for Climate Change (UNFCCC), which entered into force in 1994. The UNFCCC established the roles and responsibilities between industrialized economies (Annex I) and developing countries (non-Annex I), placing the main responsibilities for emissions reduction on Annex I countries in addition to the expectation that they would support non-Annex I nations through financial assistance and technology transfer managed through international facilities (UN 1994). But by the early 2000s, global climate governance exhibited growing divisions and dissatisfaction with existing institutions following failures to reach a binding international climate change agreement. European countries like Germany pushed for a multilateral solution (Röhrkasten 2015), while the United States shirked a binding multilateral climate treaty. Emerging markets and developing economies continued to push for differentiated responsibilities and financial support from Annex I Parties. The United States's position was based on a perception of the fundamental unfairness and "disparity of treatment between Annex I Parties and Developing Countries" in the Kyoto Protocol (Roberts and Parks 2006: 4; US Congress 1997). As outlined in the 1997 US Senate Byrd–Hagel Resolution, which passed with a unanimous vote of 95–0, the United States opposed signing the Kyoto Protocol on the grounds that unless developing countries also signed with a similar compliance period, the treaty would lead to serious "harms to the United States economy, including significant job loss, trade disadvantages, [and] increased energy and consumer costs" (US Congress 1997: 3). The United States defected from the Kyoto Protocol in 2001 and pursued alternative pathways to lead and participate in the sphere of climate and clean energy governance instead of a binding multilateral climate treaty.

[1] See https://unfccc.int/process-and-meetings/parties-non-party-stakeholders/parties/party-groupings.

These divergent interests spurred the proliferation of alternative and fragmented forms of governance for climate change and renewable energy, which led to a rise in transnational initiatives throughout the mid 2000s. By 2010, global politics shifted in the clean energy realm with a convergence of state interests around the promotion of sustainable energy and development with a subsequent movement toward multilateral promotion of clean energy development as the primary vehicle for climate change mitigation. By 2015, the UN Climate Change Conference (COP-21) in Paris finally resulted in a legally binding international treaty on climate change, the Paris Agreement, which was adopted by 196 parties (UNFCCC 2015). The resulting framework continues to advance the differentiated roles and responsibilities for finance, technology transfer, and emission reduction under NDCs specific to each country context.

The clean energy regime complex has evolved between the climate change regime and energy regime as an area with overlapping institutions, fragmented governance, and diverging state interests. The subsequent governance structure following the proliferation of initiatives and expansion of intergovernmental organizations into the clean energy domain resembles a regime complex that incorporates multilateral, bilateral, and transnational actors, but lacks a formalized, hierarchical structure centered around a multilateral treaty. The functional aspects of the institutions proliferating within the clean energy issue area fostered international cooperation, norm diffusion, policy advising, and financial support crucial to spurring energy transitions. However, diverging state interests have led to overlapping institutions, turf wars, forum shopping, and asymmetries in access to finance and support across EMDEs. Regime complex evolution and change is shaped by state interest divergence, normative contestation, organizational expansion, and institutional interplay (Chelminski et al. 2022). It can also be shaped by hierarchies among institutions and the feedback loops of state interests as driving change in the regime complex architecture, which then influence state interests through a co-evolutionary feedback loop (Green 2022; Henning and Pratt 2023; Hoffmann 2006; Rosenau 1992; Young 2010).

The evolution of the clean energy governance sphere over time shows how the world has changed the way it prioritizes solving climate change through energy transitions to net zero. However, for EMDEs reliant on finance and technology transfer from the industrialized economies, the institutional landscape matters in terms of the relative access to finance for developing renewable energy projects and for supporting a transformation of their energy sectors, as well as policy support and capacity building. This chapter traces the history of clean energy governance over three periods (Period 1: 1980–2001; Period 2: 2002–2008; Period 3: 2009–2023) and examines how the roles played by states, multilateral and bilateral organizations, transnational initiatives, and norm diffusion drive

regime complex emergence over time. The following sections divided across the three periods examine the roles of these actors, and the subsequent structure and functionality of the clean energy regime complex in fostering energy transitions in EMDEs.

Period 1: 1980–2001 – Multilateral Failures

The oil shocks of the 1970s raised awareness of the limits of natural resources and the need for sustainability as the decade turned. Energy increasingly became a priority in the global agenda. The discourse surrounding energy during this time was focused mainly on energy security and security of supply. The 1980 Brandt Report – published by the Independent Commission on International Development – detailed steps to promote North–South cooperation – energy was first depicted as an issue related to development at the United Nations Conference on New and Renewable Sources of Energy Conference held in Nairobi in 1981 (Critchfield 1981; Van de Graaf 2013b). However, a proposal to create a special energy body within the World Bank was tabled after objections by the Reagan administration in the United States claiming that it could not justify engaging in international development after recent domestic social spending cuts (Van de Graaf 2013a). The United States delegation instead encouraged a better use of existing institutions and primary reliance on private investment to spur renewable energy development. The discourse connecting energy and development faded from the spotlight in multilateral negotiations, to be replaced later by climate change.

Despite failed efforts to create a renewable energy body within the World Bank, other international institutions began to expand into this issue area. The IEA responded by creating the Working Party on Renewable Energy Technologies as an advisory body to the IEA in 1982 (Van de Graaf 2013a). As the IEA was created to maintain the security of supply among countries of the Organisation for Economic Co-operation and Development (OECD), this marked one of the first expansions of an existing intergovernmental organization into the clean energy issue area. There was also a small flow of World Bank funding to clean energy projects, as shown in Figure 3.1. The funding totaled USD 3.1 billion in Period 1 (World Bank 2016a). Other sources of multilateral funding, such as the CDM, had not begun to issue funding until Period 2. The presence of clean energy finance flows in the absence of an institutionalized framework for renewable energy is an important indicator, as the utility modifier mechanism function of the emerging clean energy regime complex.

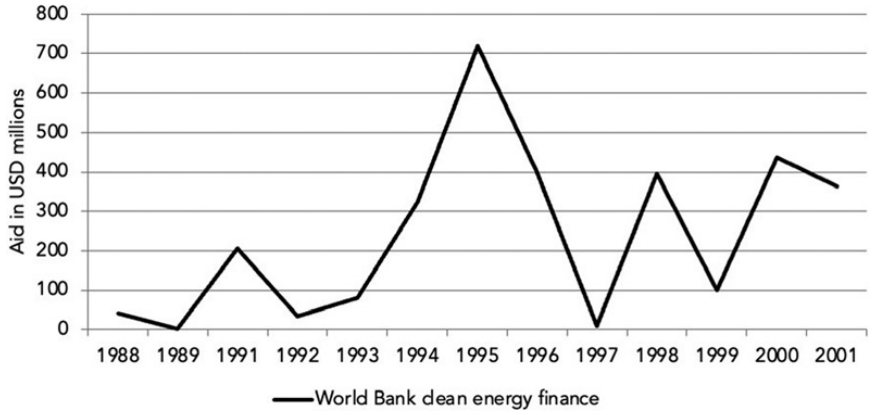

Figure 3.1 World Bank clean energy finance (Period 1).
Source: World Bank 2016a

Clean energy development through technology transfer to EMDEs was increasingly advanced through the climate change negotiations and resulting agreements. The UNFCCC in 1994 institutionalized the responsibility of Annex I countries to provide financial support and technology transfer to non-Annex I EMDEs. The 1998 Kyoto Protocol included provisions for the Joint Implementation (JI) mechanism and the CDM, which are the instruments intended to stimulate technological innovation and diffusion in EMDEs. Beginning in 2004 (Period 2), the CDM and JI mechanism began funding projects (UNEP DTU 2016). Since then, these two financial mechanisms have made important inroads in facilitating the diffusion and deployment of a set of technologies, such as implementing hydropower projects, wind farms, energy efficiency investment projects, biomass energy projects, gas recovery and utilization, rural electrification using solar panels, installation of energy-efficient boilers, geothermal heating projects, and N20 emissions reduction projects.[2] Nevertheless, the CDM and JI were limited in their effectiveness and insufficient in stimulating necessary policies to address persistent economic and regulatory barriers that stifle the growth of renewable energy technologies across countries (Castro 2014; Chan 2015; Michaelowa and Jotzo 2005). Additionally, the coverage of the CDM and JI projects is not equally distributed across countries, indicating asymmetry in access that is characteristic of a regime complex. Some CDM projects, for example, have been concentrated in emerging economies such as China, India, Brazil, and Mexico. Some progress was made at the subsequent UNFCCC COPs as the number of mechanisms concerning technology transfer and clean energy grew in number and scope: COP-7 adopted the Technology

[2] See http://CDM.unfccc.int/Projects/index.html.

Transfer Framework, COP-14 adopted the Poznan Strategic Programme on Technology, and COP-19 adopted a provision for a technology mechanism consisting of the Technology Executive Committee and the Climate Technology Centre and Network (CTCN), which is now hosted by UNEP.[3]

During this period, climate change negotiations promoted the idea that the development of clean energy technologies was a compromise between emissions reduction and development. In this paradigm, clean energy technologies were seen as a necessary but costly investment to enable climate change mitigation, and thus required substantial financial support to enable climate mitigation. The benefits of these technologies, such as the economic viability of low carbon growth and green industrial policy, were kept separate from the climate change mitigation discourse until the early 2000s in Period 2 (Fletcher and Rammelt 2017). The climate change regime made great strides in raising the issue's international salience. It also succeeded in pushing forward technology transfer and regulatory changes for the signatories of the Kyoto Protocol. However, the climate change regime had various regulatory and political limitations, particularly the increasing divergence in preferences among key influential governments – such as the government of the United States – and domestic coalitions within these countries, raising issues of two-level games (domestic–international interactions) (Putnam 1988).

Following the Kyoto Protocol, international attention to renewable energy increased. There were several key organizational evolutions. The IEA's Working Party on Renewable Energy was institutionalized into a renewable energy unit, but not until 1999. As the principal international organization governing energy, the IEA has come under criticism for failing to address renewable energy in a substantial way. Critics denounced the IEA for prioritizing fossil fuels and for its focus principally on OECD members, leaving out EMDEs, which were growing in importance for the future of energy governance. Dissatisfied actors – particularly key EU countries like Germany – lobbied for the creation of a new organization devoted specifically to renewable energy (Röhrkasten 2015).

Despite the Kyoto Protocol's role in raising awareness of climate change and the need for climate mitigation technologies, the nexus between climate change, energy, and development was not fully salient in international policymaking at the end of the 1990s; this is exemplified by the absence of a specific goal for energy development in the Millennium Development Goals (MDGs). The MDGs were eight goals and targets agreed upon by the UN General Assembly in 2000 (UNGA 2000). The goals ranged from eradicating extreme poverty, to combating

[3] See http://unfccc.int/cooperation_and_support/technology/items/1126.php.

HIV/AIDS, to ensuring environmental sustainability for all by 2015.[4] Access to reliable, modern fuels is necessary for overcoming poverty and delivering quality education and health services (FEMA 2006). Yet in this period, energy was not one of the MDGs, even though access to clean energy is necessary to achieve all of them, as clearly outlined in the Kyoto Protocol. Since energy was considered to underpin all of the other pillars, the creators of the MDGs assumed energy would also be fully integrated into their implementation; however, this has not been the case. The prioritization of energy as a development goal was not globally apparent until the creation of the Sustainable Development Goals in 2015 under Period 3. Unfortunately, the lack of institutionalization of energy as an MDG pillar limited the integration of energy access into development programming and national implementation projects over the following 20 years.[5]

Kyoto Protocol's Indirect Impacts on Institutional Change

The slow progress of climate change negotiations is indicative of diverging approaches to solving climate change. While some states pursued multilateral solutions, others pursued bilateral cooperation, smaller coalitions, and continued governance through existing organizations. Nevertheless, Period 1 marks the appearance of clean energy on the international agenda. The norms surrounding clean energy are related to clean energy technologies as a tool for balancing climate change mitigation and development. Energy as a pillar of development was not institutionalized during this period, and as evident with the MDGs, energy was considered secondary to the other major development issues on the international agenda. This period also shows the rise of multilateral and bilateral support for renewable energy projects.

The United States' dissatisfaction with the climate change regime was due to the burden of climate mitigation being placed on industrialized economies without equivalent burdens for compliance on economic competitors and EMDEs with rising and comparable carbon emissions, such as China; this motivated its exit from the Kyoto Protocol in 2001. The departure of the United States had a major impact on the overall effectiveness of the climate change regime since the major emitters were no longer signatories. While Germany was dissatisfied with the energy regime and actively lobbied to create a standalone organization for renewable energy, the EU's disappointment with the bulwarks within the climate change regime led it to name and shame reluctant governments in international politics, such as the United States. The fragmented governance resulting from these diverging state interests included a handful of unilateral initiatives, club governance, and failed multilateral

[4] See www.un.org/millenniumgoals. [5] SE4ALL interview, 2014.

processes. This is demonstrated in the next period by a proliferation of transnational initiatives for climate change and clean energy, as well as increasing institutional entrepreneurship starting in the early 2000s (Bulkeley et al. 2014; Hoffmann 2011; Keohane and Victor 2011).

Period 2: 2002–2008 – Growth in Transnational Initiatives

In the wake of failures to create a multilateral climate treaty under the Kyoto Protocol, there was a rise in clean energy development finance from multilateral and bilateral sources. This period also marked a shift in the normative discourse reframing climate change mitigation and investment in clean energy as "decoupling" growth from emissions. Under this framework, EMDEs and industrialized economies alike could invest in green industrial policy, climate-friendly, clean energy technologies and spur economic growth while reducing emissions and environmental impact to assuage concerns over the economic harms of a climate treaty.[6] The decoupling normative agenda was first promoted by the OECD in 2001 and developed from conceptualizations advanced by the World Business Council for Sustainable Development (Fletcher and Rammelt 2017; UNEP 2011). The concept of decoupling was then taken up by the European Union, woven into the UNEP Green Economy Initiative, and later embedded within the UN Sustainable Development Goals, under Period 3 (Fletcher and Rammelt 2017).

Following the United States' exit from the Kyoto Protocol, and despite an overall frustration with the lack of progress on the multilateral negotiations for climate change, the number of transnational initiatives for climate change multiplied, and many of them had a focus on promoting clean energy technologies (Andonova et al. 2009; Biermann et al. 2009; Bulkeley et al. 2014; Chelminski et al. 2022). After the EU proposal for a formal agreement on renewable energy targets at the 2002 World Summit on Sustainable Development in Johannesburg failed, European countries initiated the Johannesburg Renewable Energy Coalition (JREC), an informal intergovernmental network involving 90 countries that pledged their support for renewable energy (Andonova and Levy 2003).

To maintain international cooperation on the issue of renewable energy, European countries were instrumental in creating transnational organizations and networks such as the Renewable Energy and Energy Efficiency Partnership (REEEP) (Andonova and Levy 2003; Pattberg et al. 2009). The UK government and the World Wildlife Fund (WWF) founded REEEP with a bottom-up approach.[7] The main aim of REEEP was to provide finance for renewable energy and energy efficiency projects in EMDEs, offer knowledge resources, and facilitate connections

[6] See Aden 2016 for global trends in decoupling. [7] REEEP interview, 2014.

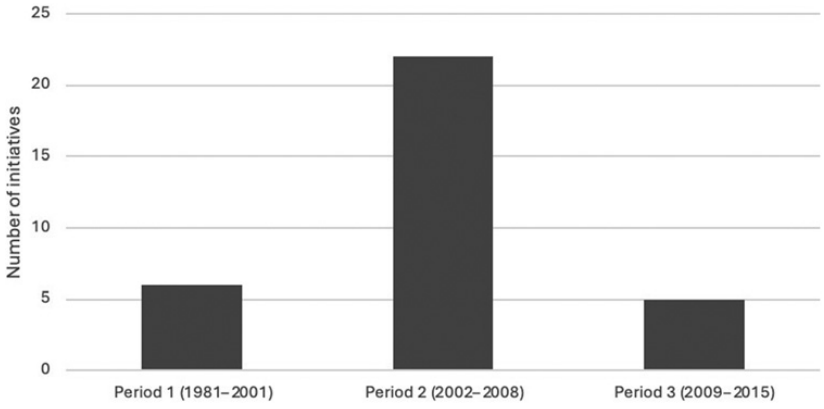

Figure 3.2 Growth in transnational initiatives for clean energy across three periods.
Source: Author's calculation using Bulkeley et al. 2014; Chelminski et al. 2022

for scaling up renewable energy business models through sub-networks like the Sustainable Energy Regulation Network, which compiles summaries of energy policies for more 160 countries. To distinguish itself from other new organizations in the clean energy issue area, REEEP focused on creating markets for renewable energy technologies and supporting entrepreneurs in accelerating from early stage to being able to attract international investment.[8]

While these organizations were mainly non-profits or private, non-governmental entities with limited funding, their creation during this period was an effort by countries and non-state actors to ramp up international cooperation on clean energy, since multilateral efforts were failing during Period 2 (see Figure 3.2). Transnational actors and networks offered conventions and forums to increase cooperation and epistemic and technical expertise, and spurred the diffusion and convergence of norms around clean energy deployment as a solution to climate change at a time of contracted multilateral cooperation.

Germany spearheaded development of an international conference focusing on renewable energy through several regional committee meetings in the lead-up to the Bonn Conference in 2004. Several outcomes of this conference included: the formation of the IRENA, the debut of international renewable energy conferences, the development of country-level action plans, and the creation of the Renewable Energy Policy Network for the 21st Century (REN21). Following Bonn, the international renewable energy conferences were held every two years around the world: Beijing, Washington, Delhi, Abu Dhabi, and Cape Town. While

[8] REEEP interview, 2014.

REN21 was not an intended objective or outcome, there was a desire to maintain the impetus of the Bonn Conference by creating an initiative that would help coordinate efforts for renewable energy on an international level.[9] REN21 was created as a convener among five multi-stakeholder groups – international organizations, intergovernmental organizations, NGOs, the private sector, and academia; it's main function was to stimulate and support the rapid uptake of renewables by demonstrating to policymakers the role that renewable energy can play in meeting energy demands. The work of REN21 is mainly epistemic, as it provides a flagship report, *Global Status Report on Renewables*, that has been published annually since 2005, as well as databases of renewable policies around the world.

In the following years there was a proliferation of public-private partnerships, and voluntary initiatives for climate change and clean energy featured prominently among their objectives. Out of the 60 transnational initiatives identified in the Transnational Climate Change Governance database, 80% were focused on clean energy (Bulkeley et al. 2014). Public transnational arrangements are typically government initiatives that go beyond an intergovernmental framework at the national level, involving a mixture of subnational levels of governments across borders, including legislators, local municipalities, and units of intergovernmental organizations (Andonova et al. 2009; Slaughter 2004). The JREC and the Major Economies Forum are two examples of public arrangements created during this time involving representatives of central government units (Andonova and Elsig 2012). The C40 Cities initiative is also a public arrangement, but it is a global network of engaged megacities around the world that are committed to developing and implementing policies to reduce carbon emissions and mitigate climate change.[10]

Alongside the evolution of the transnational institutional landscape of the clean energy regime complex, G8 member states were exhibiting diverging preferences in pushing for the creation of multilateral organizations, such as the International Partnership for Energy Efficiency Cooperation (IPEEC) and in initial efforts to establish the IRENA. To build international support for establishing IRENA, the German government hosted two international conferences and a series of bilateral talks with governments around the world between 2004 and 2007 (Van de Graaf 2013b). At the 2005 G8 Gleneagles Summit, climate change, clean energy, and energy efficiency were major issues on the agenda and were underlined in the Gleneagles Plan of Action on Climate Change, Clean Energy and Sustainable Development (G8 2005; Van de Graaf 2013a). Leaders of the G8 then called for the IEA to undertake the programming and outreach on these issues. The energy

[9] REN21 interview, 2014. [10] See www.c40.org/history.

efficiency agenda was pushed among states – namely within the European Union – that wanted to accelerate the deployment of clean technologies, increase energy efficiency, and mitigate the effects of climate change beyond the jurisdiction of the IEA. The European Union was dissatisfied with the IEA's implementation of the renewables agenda, which overemphasized the role of fossil fuels and downplayed the viability of clean energy (Van de Graaf 2013a).

When the UK and Germany proposed the incorporation of climate change and emissions targets in a G8 agreement, the agenda was blocked by US President George W. Bush in the lead-up to the 2007 G8 Summit in Heilingedamm, until rising powers like China and India made similar pledges (Borger et al. 2007; Van de Graaf 2013a). However, by the G8 summit in 2007 in Heilingedamm, leaders agreed to pursue substantial but unspecified cuts in greenhouse gasses and to work with the UN to create a new international agreement on global warming (Mason and Krumenacker 2007). A few months later, in December 2007 at UNFCCC COP-13 in Bali, world leaders agreed to the Bali Plan of Action, which strongly underlined the need for enhanced action on technology development and transfer to EMDEs to support action on climate mitigation and adaptation, including the creation of mechanisms and tools (UNFCCC 2008). While the fact that this agreement contained no binding commitments was a dissatisfying outcome for the climate change regime, the discussion of clean energy technology development as a solution for climate mitigation within the climate change regime set the stage for stronger international cooperation on clean energy and technology diffusion.

In parallel to the rise in transnational initiatives for clean energy, the levels of clean energy finance begin to rise during Period 2 and increase substantially over time. An analysis of international public finance flows to renewables in EMDEs found a total of USD 18.8 billion allocated during Period 2 (see Figure 3.3 for flows between 2002 and 2008) (IEA et al 2022). The significant financial flows suggest that despite bulwarks in achieving multilateral cooperation over climate change, development assistance continues to target climate change mitigation through energy sector development in EMDEs.

Period 2 also saw the rise of transnational initiatives in reaction to stalled multilateral processes that were not successful in achieving strong commitments to solving the problems of climate change and sustainable development. Governments moved toward transnational initiatives for different reasons: to avoid the multilateral processes entirely, to speed up action, or to build support outside of the multilateral processes in order to achieve a critical mass of support among nations for success within multilateral processes. While governments in the European Union preferred multilateral processes, the lack of commitments from major emitters and of a critical mass of key country actors led EU governments to create broad-based international coalitions and partnerships as a tool to garner

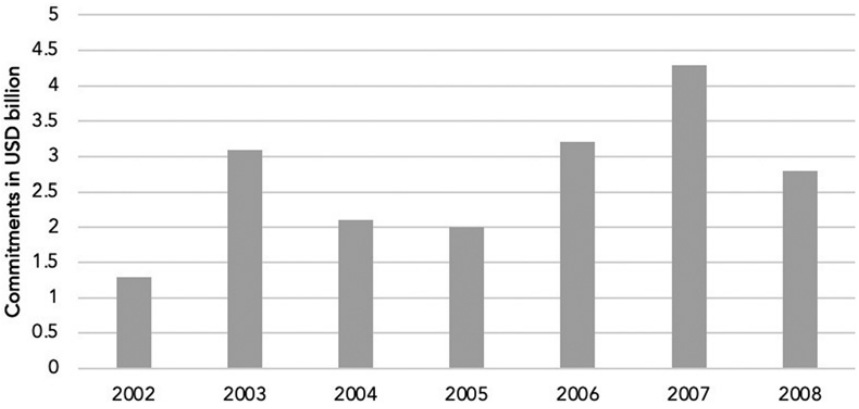

Figure 3.3 Total international public finance flows to renewables in EMDEs during Period 2.
Source: IEA et al 2022

support for creating an international clean energy regime. The United States and Australia (until its ratification of the Kyoto Protocol in 2007) pursued the creation of voluntary agreements and coalitions or forums to best serve their interests and find an easier consensus that would please domestic constituents, evidencing two-level games (Putnam 1988).

In parallel, the rise and overall flows of international public finance for clean energy suggest that these institutions were driving renewable energy expansion in EMDEs. The increase in financing for clean energy begins to take off in Period 3. The increase of financial flows is evidence that clean energy is becoming a bigger priority, failures in the climate change regime notwithstanding. The rise in clean energy finance also demonstrates a governance function of the clean energy regime complex, namely financing for renewable energy deployment.

During the second period there were clear efforts by state and non-state actors to drive governance of climate change in different directions, resulting in the rise of transnational initiatives, as well as increased financing of clean energy development. The transnational initiatives were successful in diffusing clean energy norms on the international agenda, promoting policies, and beginning to mobilize finance through multilateral and bilateral organizations. In combination with the rise of transnational clean energy initiatives, the growth of international organizations into the clean energy issue domain, such as the expansion of the IEA, contributed to the development of a clean energy regime complex. This organizational expansion was a response to signals of changing state interests in that issue area.

Global norms began to shift around this time in recognition of the rising threat of climate change and the need for finance. Transnational climate movements

gained traction as activist networks such as the Climate Action Network and Climate Justice Now! pushed collectively for stronger commitments under the UNFCCC (Hadden 2015). Transnational advocacy networks and climate movements, in concert with international organizations, raised awareness of the threats of global warming as society grappled with how to solve it during Period 2. The urgency of global energy transition to net zero intensified during Period 3.

Period 3: 2009–2023 – The Emergence of the Clean Energy Regime Complex

Period 3 was characterized by institution building in the multilateral sphere, ranging from the adoption of the Paris Agreement to the creation of IRENA and the launch of the Climate Investment Funds (CIF). The Sustainable Development Goals finally institutionalized access to clean and affordable energy as integral to development. The Paris Agreement was adopted by 196 Parties at the UN Climate Change Conference (COP21) in Paris in 2015 (UNFCCC 2015). The agreements marks a significant landmark in climate change and clean energy governance history whereby state interests once again moved toward cooperation on climate mitigation through multilateral forums. Likewise, the rise in clean energy development finance during this period was monumental. One of the most important changes during Period 3 was a demonstrated shift in norms to support clean energy.

Early in Period 3, the United States played a role in the growth of public-private partnerships, coalition-type governance, and bilateral cooperation – all beyond the multilateral sphere. The US position on climate change shifted between 2008 and 2009 following the change in administration. Under President Bush, the Major Economies Process on Energy Security and Climate Change was created as a coalition to build cooperation on the issues outside of the multilateral processes of the UN, with which the United States had long been dissatisfied. The aim of this forum was to reduce long-term greenhouse gas emissions and involved 17 of the world's largest economies (Biermann et al. 2009: 23). This forum remained within the paradigm of the climate change regime. The Major Economies Process was in direct conflict with the UN multilateral process as demonstrated during the Bali COP-13, and European countries threatened to boycott the next meeting of the Major Economies Process if a decision was not reached at the UNFCCC COP-13 (Black 2007). Representatives from the G-77+China argued that the UN climate regime should be the central platform to discuss climate governance (Biermann et al. 2009). When Barack Obama took office in 2009, the Major Economies Process was renamed the Major Economies Forum (MEF) for Energy and Climate and involved 16 world leaders. The Clean Energy Ministerial (CEM) was then created out of the MEF on Energy and Climate process to shift paradigms

toward technology promotion.[11] The CEM shifted to a more positive approach: instead of emissions reduction and costs, the CEM focused on promotion of renewables and the various benefits gained through green jobs and renewable energy production. The CEM is an international forum to promote policies and programs that advance clean energy technology, share best practices, and encourage the clean energy transition.[12] Similar to other US-led initiatives, the CEM was created as a government initiative at the ministerial level, which aimed to catalyze industry engagement in the private sector.

The development of IRENA culminated during Period 3. The dynamics surrounding the creation of IRENA were driven by state regime dissatisfaction and preference divergence combined with collective action. IRENA was created as an initiative pushed by dissatisfied states during the first two periods of analysis – particularly Germany, Spain, and Denmark – who felt the IEA was not receptive to or assertive enough in pushing the renewable energy agenda (Lesage et al. 2010; Lesage and Van de Graaf 2016; Van de Graaf 2013a). The other major concern was the limited membership of the IEA, which was restricted to OECD member states and left out major energy consumers and producers among EMDEs. While the IEA pushed back against the creation of IRENA, demonstrating organizational agency, efforts to reform the IEA to increase budgetary allocations to renewable energy programming were initially defeated (Lesage and Van de Graaf 2009; Van de Graaf 2013a: 115). Germany, and to a lesser extent Spain and Denmark, proposed the creation of IRENA at several international conferences and fostered international support before the formal launch of IRENA in Bonn, Germany, in 2009. While the Obama administration was not necessarily in favor of the creation of IRENA, it joined IRENA to distinguish itself from the Bush administration (Van de Graaf 2013b).

The IRENA includes 168 member states and the European Union, and 15 member states in accession. Its budget rivals the IEA's (Lesage et al. 2010). The IRENA is primarily an epistemic platform disseminating data and information on policy, technology, and financial knowledge about renewable energy (Röhrkasten 2015; Urpelainen and Van de Graaf 2015: 168). Its primary goal is to support EMDEs in their energy transition by promoting the widespread adoption of all forms of renewable energy, including bioenergy, geothermal energy, hydropower, and ocean, solar, and wind energy.[13] While membership has grown quickly, the agency and power of the organization is limited to soft governance promoting renewables without taking a firm stance against fossil fuels (Röhrkasten and Westphal 2013; Overland and Reischl 2018).

[11] US DOE interview, 2014. [12] See www.cleanenergyministerial.org/About.
[13] See www.irena.org/About/Vision-and-mission.

Organizational agency is evident in the IEA's efforts to stay relevant in response to the prioritization of sustainable energy, primarily through organizational adjustment to take advantage of new partnership and funding opportunities. The IEA has dramatically expanded its programming into the clean energy issue area from its original mandate of maintaining oil supply and stock in response to the 1973 oil crisis. The principal role of the IEA is to assess the total energy mix including renewables, not just renewables in isolation. The IEA continues to work in the fields of renewables, assessing their competitiveness against other energy sources and their outlook in IRENA's world energy scenarios. The IEA has been very collaborative with IRENA from its inception. In January 2012, the two agencies signed a partnership agreement that identifies three areas of cooperation: (1) development and publication of the joint Global Renewable Energy Policies and Measures Database, which expands on the existing IEA database to cover up to 150 countries, including all IRENA member countries; (2) cooperation in technology and innovation, including the involvement of IRENA in the IEA Technology Collaboration Programmes (TCPs); and (3) sharing of renewable energy statistics data and methods between the two organizations (IRENA 2012). In 2019, the two organizations signed another memorandum of understanding building from the 2012 agreement to further strengthen their cooperation and partnership on data sharing, SDG7 tracking, and other areas of international cooperation and coordination (IEA 2023c).

The evolution of the clean energy issue as it relates specifically to barriers to the clean energy technologies' diffusion in EMDEs has changed throughout the course of the UNFCCC climate change negotiations. The climate technology issue has been on the agenda since the CDM and was created within the Kyoto Protocol in 1998. However, EMDEs have pushed technology transfer and related financing needs to the center of climate change debates, issues which eventually became institutionalized through the Technology Mechanism established at COP-16 in Cancun in 2010. Created in 2013 within the UNFCCC and hosted by UNEP, the CTCN was created in 2013 to facilitate effective implementation of the Technology Mechanism with the Technology Executive Committee, under the guidance of the COP.[14] The CTCN is a consortium led by UNEP and includes UN Industrial Development Organization (UNIDO), along with 11 international research and development bodies such as the Asian Institute of Technology.[15] This institutional development was largely driven by state demands within the climate change negotiations, and efforts to implement and establish partnerships among clean energy initiatives.

[14] See http://unfccc.int/ttclear/templates/render_cms_page?TEM_tcn.
[15] See www.ait.ac.th/news-and-events/2013/news/ait-to-partner-in-unep2019s-climate-technology-centre-and-network/#.UyRoIvldVOJ.

The CIF is one of the world's largest multilateral climate finance mechanisms in the world at USD 12.1 billion pledged.[16] The CIF was established in 2008 by the World Bank and other major multilateral development banks to provide concessional finance to promote international cooperation on climate change. The CIF was not only created by multilateral development banks: It is also governed by them, and its projects are implemented through the development agency architecture, whereby funds to countries are allocated through the appropriate multilateral development bank, including the African Development Bank (AfDB), ADB, European Bank of Reconstruction and Development (EBRD), the Inter-American Development Bank (IDB), and the International Finance Corporation (IFC). Programs targeted by the CIF have enabled 370 climate mitigation and adaptation projects in 72 EMDEs worldwide, as of 2024.[17] The CIF also works in consultation with a range of stakeholders, both internationally and in recipient countries: recipient governments, civil society organizations, indigenous peoples, private-sector entities, multilateral development banks, bilateral development agencies, UN agencies, the Global Environment Facility (GEF), UNFCCC, the Adaptation Fund, and scientific and technical experts. These trends show increasing interinstitutional cooperation and interaction on clean energy during Period 3.

The growing collaboration and co-adjustment of international organizations is an effort by state actors to stay relevant in the face of the prioritization of clean energy. The increasing isomorphism and overlap of programs related to sustainable energy and energy access across the plethora of organizations and initiatives contribute to the emergence of regime complex dynamics and system-level effects of the regime complex. The emergence of a regime complex for clean energy was evident during Period 3 in the presence of significant interaction and recognition among the clean energy initiatives, multilateral and bilateral organizations, and transnational initiatives, which also overlap with the climate change, energy, and trade regimes. These initiatives interact and collaborate across intergovernmental organizations, the private sector, and transnational networks, as exemplified by the SE4ALL initiative, which involved UN organizations, public-private partnerships, and multilateral development banks. Transnational governance initiatives partnering with intergovernmental organizations such as REN21 and REEEP create more collaborations with IRENA, IEA, IPEEC, and UNEP to gain legitimacy and authority and to further diffuse norms (Chelminski et al. 2022; Park 2006).

The framing of justice norms within the climate change issue areas has been pushed by the transnational advocacy networks and climate NGOs since the UNFCCC Copenhagen Agreement in 2009 (Allan and Hadden 2017; Hadden 2015). The climate justice norms have become more salient in discourses around

[16] See www.cif.org/cif-funding. [17] See www.climateinvestmentfunds.org/about-cif.

the energy transitions (Allan 2020). Since the emergence of the clean energy regime complex and the adoption of the UNFCCC Paris Agreement in 2015, multilateral and bilateral development banks have increasingly and more explicitly targeted energy transitions and clean energy technology deployment in EMDEs. For example, at the COP-26 in 2021, France, Germany, the European Union, the United States, and the United Kingdom – as the IPG announced the first JETP with South Africa. The JETP is a plurilateral structure that provides financial and technical assistance coordinated through intergovernmental partnerships to support coal-dependent EMDEs to accelerate energy transitions and expedite the early retirement of coal assets (IISD 2022; IPG 2022). In addition to South Africa, JETP programs have been launched in India, Indonesia, Vietnam, and Senegal and the donor pool involves multilateral and bilateral development banks and international financial institutions that help catalyze private investment (IISD 2022). This program embodies a shift in global climate politics and norms since the first period of analysis in the 1990s as to the implementation of the Global North's (Annex-I countries') responsibilities to support climate change mitigation and energy transitions in EMDEs. The JETP also embodies how clean energy development is used as a vehicle for decoupling continued economic growth while mitigating climate change.

The institutional isomorphism and shift towards clean energy – whether through the creation of new organizations or the expansion of existing organizations into the clean energy issue domain – resulted in the rise of clean energy development finance. International public finance flows for clean energy totaled USD 153.5 billion between 2009 and 2019, according to IEA et al. (2022) (see Figure 3.4). International public finance for clean energy represents a smaller fraction of total global climate finance flows, including from public and private sources, which doubled in the past decade according to the Climate Policy Initiative. Between 2011 and 2020, public climate finance totaled USD 2.4 trillion (for all climate finance projects globally, not only clean energy projects in EMDEs), nearly matched by private flows for a total of USD 4.8 trillion according to data from Climate Policy Initiative (CPI 2022).

The rise of development finance for clean energy and the proliferation of organizations providing support to EMDEs is one of the most relevant aspects of clean energy regime complex evolution, leading to the changes happening on the ground in recipient countries. The clean energy regime complex institutional landscape, albeit fragmented, decentralized, and characterized by overlapping institutions, diffuses norms and provides policy support, finance, and training around achieving net zero through the adoption of clean energy technologies. The changes to the international institutional landscape can have a direct and indirect bearing on the resulting availability and asymmetries of finance and development aid to support EMDEs in transitioning to net zero. As shown in Figure 3.5 based on

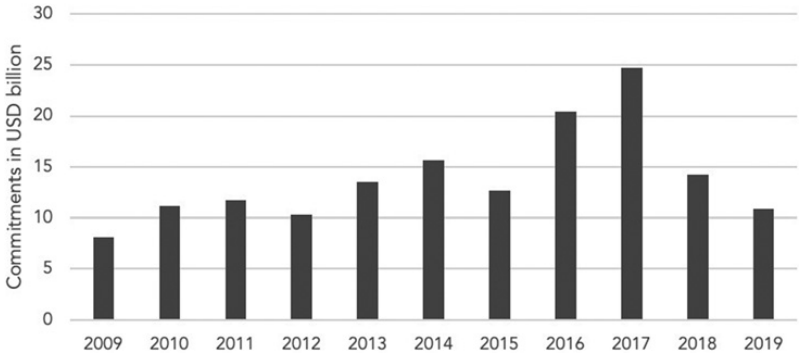

Figure 3.4 International public finance flows to clean energy in EMDEs during Period 3.
Source: IEA et al. 2022

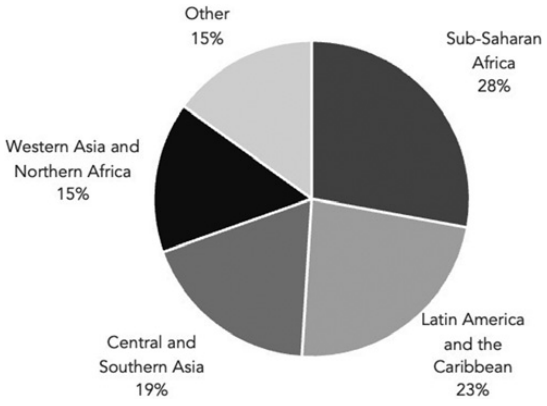

Figure 3.5 International public finance to renewables in EMDEs by geographic distribution (2010–2019).
Source: IEA et al. 2022

data collected by IEA, IRENA et al. (2022), the total international public finance to EMDEs is not equitably distributed across all EMDEs, with certain regions receiving more funding than others with much variability over time. For instance, in 2019, 24 countries received 80% of all renewable energy finance commitments (IEA et al. 2022). This captures asymmetries in access that may demonstrate the impacts of fragmented governance of the clean energy regime complex.

Conclusions on the History of the Clean Energy Regime Complex

The global governance of the clean energy issue area is characterized by the presence of significant interaction and recognition among the clean energy

initiatives, multilateral and bilateral organizations, and transnational initiatives, which also overlap with the climate change, energy, and trade regimes. The emergence of the clean energy regime complex was driven by a combination of dissatisfaction among state interests with the proliferation of new institutions, the diffusion of norms leading to normative change among states, and, finally, the convergence of state interests in support of the institutionalization of clean energy development through multilateral channels. The evolution of the clean energy regime complex across the three periods showed that initial state dissatisfaction with existing regimes during Period 1 provided impetus for existing institutions to expand and new institutions to arise in the clean energy issue domain. The institutional proliferation and interaction promulgated normative change during Period 2. The convergence of state interests was seen to result from this normative change in favor of institutionalization of clean energy objectives. Period 3 demonstrates the emergence of the clean energy regime complex.

The most visible evidence of the regime complex evolution as related to energy transitions in EMDEs is the rise in clean energy finance, as embodied in the CIF, the Clean Technology Fund (CTF), and the emergence of the JETP financing structure. The normative change in driving clean energy development in EMDEs is demonstrated in part by steady bilateral finance flows, the rise in multilateral finance flows, and later changes in the multilateral system. The clean energy regime complex diffuses norms around clean energy technology deployment and provides policy advising, climate finance, and technical training to reduce barriers and to speed up the deployment of clean energy technologies to mitigate climate change in EMDEs. The changes to the international institutional landscape can impact the availability of finance and development aid to support EMDEs in transitioning to net zero. The next three chapters provide an empirical analysis of the effectiveness of the clean energy regime complex in overcoming barriers to geothermal development in Indonesia and the Philippines.