



ELSEVIER

Contents lists available at [ScienceDirect](https://www.sciencedirect.com)

International Economics

journal homepage: www.elsevier.com/locate/inteco

Who's winning the low-carbon innovation race? An assessment of countries' leadership in renewable energy technologies[☆]

Clément Bonnet^{a,c,*}, Emmanuel Hache^{a,b,c}, Gondia Sokhna Seck^a, Marine Simoën^a, Samuel Carcanague^b

^a IFP Énergies Nouvelles, 1–4 av. de Bois Préau, F-92852, Rueil-Malmaison, France

^b French Institute for International and Strategic Affairs (IRIS), France

^c Economix-CNRS, University of Paris Nanterre, France

ARTICLE INFO

JEL classification:

Q42
Q55
O31
O38

Keywords:

Patent data
Energy transition
Renewable energy technology
Innovation
International relations

ABSTRACT

Intellectual property is a central issue in climate negotiations. On the one hand, it shapes and encourages innovation in low-carbon technologies. On the other hand, it can reduce access to these technologies by giving patent holders market power. We analyse the interactions between climate negotiations and the acquisition of renewable energy technology patents. First, we present the history of climate negotiations, emphasizing the role of technologies. Second, we conduct an empirical analysis aimed at determining which countries could be considered leaders in renewable energy technologies (RETs). Major changes were observed in the geographical distribution of low-carbon innovation during the 2000s, foreshadowing a reorganization of the geopolitical balances of innovation in renewable energies.

1. Introduction

The consequences of global warming will affect all countries (Stern et al., 2006). And because atmospheric temperature has the characteristics of a public good, its protection requires countries to commit to reducing their greenhouse gas (GHG) emissions. This way of thinking about climate change is well known and places international climate negotiations, conducted within the UNFCCC¹ framework, at the core of all hopes in the fight against climate change. However, the willingness shown by most States to make each session of the Conference of the Parties (COP) a success can partially conceal the geopolitical mechanisms that drive these negotiations. After the failure of COP15 in Copenhagen in 2009, US President Obama welcomed a significant agreement, “one that takes us farther

[☆] This study received the financial support of the French National Research Agency (ANR) and this article is part of the GENERATE (Renewable Energies Geopolitics and Future Studies on Energy Transition) project. The authors are very grateful to François Kalaydjian and Jérôme Sabathier for their insightful comments and suggestions. Any remaining errors are of course ours. The views expressed herein are strictly those of the authors and are not to be construed as representing those of IFP Énergies Nouvelles.

* Corresponding author. IFP Énergies Nouvelles, 1–4 av. de Bois Préau, F-92852, Rueil-Malmaison, France.

E-mail address: clement.bonnet@ifpen.fr (C. Bonnet).

¹ United Nations Framework Convention on Climate Change.

<https://doi.org/10.1016/j.inteco.2019.07.006>

Received 22 January 2019; Received in revised form 18 July 2019; Accepted 19 July 2019

Available online xxx

2110-7017/© 2019 Published by Elsevier B.V. on behalf of CEPII (Centre d'Etudes Prospectives et d'Informations Internationales), a center for research and expertise on the world economy.

than we have ever gone before as an international community”, and welcomed the fact that the United States had renewed its leadership in the international climate negotiations.² More recently, COP21 was almost unanimously hailed as a success by both governments and most media (Bodansky, 2016).

However, facts are stubborn and significant doubts remain as to the achievement of the objectives of the Paris Agreement. The nationally determined contributions (NDCs) pledged by States at COP21 would lead to an average global warming of between 2.6 °C and 3.1 °C above pre-industrial levels (Rogelj et al., 2016). Moreover, their revision following ratification of the agreement by a significant proportion of the countries concerned would likely limit global warming below 3.5 °C.³ Three major risks undermine efforts to achieve the COP21 objectives (Peters et al., 2017): the low level of emission reduction commitments made so far, the low deployment rate of low-carbon technologies, and the centrality of so-called negative emission technologies, which are crucial in most scenarios but remain largely hypothetical to date.⁴ It is also worth mentioning the non-linearity of GHG emission reduction costs which considerably increases financing needs after 2030, yet the commitments made at COP21 do not go beyond that date (Rose et al., 2017).

In many cases, these risks are related to low-carbon technology and diffusing it extensively. As such, limited diffusion of low-carbon technology may contribute to considerably increasing global warming mitigation costs (Iyer et al., 2015). This is not surprising since the energy transition to combat global warming can be described as a technological revolution (Criekemans, 2018). Understanding the gap between the objectives of the international community and the concrete actions of governments, means understanding the geopolitical issues related to low-carbon technologies and how they can influence the evolution of climate negotiations. In this article, we will focus more particularly on renewable energy technologies (RETs) because they are both central to policies to reduce energy production-related GHG emissions and perceived as very innovative sectors.

Low-carbon technologies are the subject of intense geo-economic competition between States. In many sectors, innovation and its protection are proving essential for the sustainability of economic growth, security and national sovereignty more generally. In the case of renewable energy sources, China's emergence and Western fears of losing a technological advantage have revived protection against foreign investment, which has increased in recent years. Germany, for example, changed its system in July 2017 after several takeovers of companies in sensitive sectors by foreign investors, including a wind energy company, WindMW GmbH, which came under Chinese control in 2016. The United States, the United Kingdom and China, for their part, amended their legislation to this effect in 2018, and France adapted its legislation under the PACTE Act. Although the energy sector in general is subject to protection measures, more explicit inclusion of low-carbon technologies is being considered in the areas subject to foreign investment protections, particularly in France, with a variety of measures to put in place (total ban, control, etc.). Intellectual property is a field in which geo-economic power can be exercised and the low-carbon nature of an innovation adds a level of complexity to this analysis by linking intellectual property to climate negotiations.

This geo-economic competition has had a crucial influence on international climate negotiations. In this respect, this article synthesizes and complements two corpus of literature on the role of technology in international climate negotiations. First, several studies conduct geographical, legal and geopolitical analyses to assess the extent to which industrial property may have been a blocking factor in international climate negotiations, and question its real impact on technology transfer. Thus, Barton (2007) conducted an early study comparing the impact of industrial property rules on the international technology transfer of PV solar, wind and biomass technologies. The study concluded that no results can be generalized to all technologies. Several other studies showed how Western and Southern countries have opposed each other on the issue of industrial property in the context of climate negotiations (Correa, 2013; Chuffart-Finsterwald, 2014; Abdel-Latif, 2015; Shabalala, 2016). Ockwell et al. (2010) analysed the two conflicting discourses developed by the two groups of countries on industrial property. While developed countries argue that strong IP regimes are necessary for technology transfer as they guarantee that firms will not be imitated by their competitors, developing countries highlights how patents can prohibit access to new technologies by allowing firms to raise their prices. Their article highlights the oversimplification of both visions and these results suggest that countries might adopt a strategy that combines, in the context of international negotiations, a position that may differ from their national low-carbon technology strategy. Second, there are several empirical studies on the transfer of low-carbon technologies. Dechezleprêtre et al. (2013) evaluated the factors that explain why inventors in one country patent their inventions in foreign countries. They concluded that inventors are more reluctant to protect their inventions: (i) in countries where industrial property rules are too lax, (ii) in countries where the knowledge accumulated in the same technology is stronger. These results underlined the strategic nature of patent filings in foreign countries. In a relatively similar but more comprehensive study in terms of data, Dussaux et al. (2018) demonstrated that a strict industrial property regime will not have the same impacts on technology transfer depending on whether or not a country is part of the OECD. A study by Verdolini and Bosetti (2017) provided additional insights. The authors showed that climate policies implemented by a country may or may not attract patent applications from foreign inventors depending on the policy instrument. The non-market nature of their instruments would explain the low capacity of non-OECD countries to attract technology transfers. It pinpointed that the relations between climate negotiations, patent systems and technology transfer are difficult to apprehend and hard to generalize to all countries and technologies.

In this context, this paper aims to question the existence of technological leadership in renewable energy technologies based on a

² To put these remarks into perspective, the President was greeted on the last day of the negotiations by Hillary Clinton with the words “Mr. President, this is the worst meeting I've been to since the eight-grade student council” (Meilstrup, 2010).

³ <https://climateactiontracker.org/global/temperatures/>.

⁴ On this point, simulation exercises show that if these technologies cannot be deployed on a large scale, short-term actions must be significantly more ambitious than those announced so far (Larkin et al., 2018). Some authors speak of a bet made on the future, given the great uncertainties around negative-emitting technologies (Fuss et al., 2014).

Download English Version:

<https://daneshyari.com/en/article/13462584>

Download Persian Version:

<https://daneshyari.com/article/13462584>

[Daneshyari.com](https://daneshyari.com)