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Beyond the Paris Agreement: Intellectual Property, Innovation Policy, and Climate Justice

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Abstract: The multidisciplinary field of climate law and justice needs to address the topic of intellectual property, climate finance, and technology transfer to ensure effective global action on climate change. The *United Nations Framework Convention on Climate Change* 1992 (UNFCCC) established a foundation for the development, application and diffusion of low-carbon technologies. Against this background, it is useful to analyse how the *Paris Agreement* 2015 deals with the subject of intellectual property, technology transfer, and climate change. While there was discussion of a number of options for intellectual property and climate change, the final *Paris Agreement* 2015 contains no text on intellectual property. There is text, though, on technology transfer. The *Paris Agreement* 2015 relies upon technology networks and alliances in order to promote the diffusion and dissemination of green technologies. In order to achieve technology transfer, there has been an effort to rely on a number of formal technology networks, alliances, and public–private partnerships—including the UNFCCC Climate Technology Centre and Network (CTCN); the World Intellectual Property Organization’s WIPO GREEN; Mission Innovation; the Breakthrough Energy Coalition; and the International Solar Alliance. There have been grand hopes and ambitions in respect of these collaborative and co-operative ventures. However, there have also been significant challenges in terms of funding, support, and operation. In a case of innovation policy pluralism, there also seems to be a significant level of overlap and duplication between the diverse international initiatives. There have been concerns about whether such technology networks are effective, efficient, adaptable, and accountable. There is a need to better align intellectual property, innovation policy, and technology transfer in order to achieve access to clean energy and climate justice under the framework of the *Paris Agreement* 2015. At a conceptual level, philosophical discussions about climate justice should be grounded in pragmatic considerations about intellectual property and technology transfer. An intellectual property mechanism is necessary to provide for research, development, and deployment of clean technologies. There is a need to ensure that the technology mechanism of the *Paris Agreement* 2015 can enable the research, development, and diffusion of clean technologies at a scale to address the global challenges of climate change.

Keywords: intellectual property; technology transfer; innovation law; innovation policy; climate law; climate justice; climate finance

1. Introduction

There has been a longstanding debate in international climate talks about public policy settings in respect of intellectual property, technology transfer, and climate change. As [Shabalala \(2016\)](#) has observed, ‘The development and diffusion of technologies is a fundamental and necessary element to ensuring that standards of living are maintained and poverty continues to be reduced as global warming is mitigated and weather impacts are minimised’.

Indeed, there was significant discussion about intellectual property and environmentally sound technologies in the initial negotiations, which led to the formation of the *United Nations Framework Convention on Climate Change* 1992 (UNFCCC).¹ In recent times, the topic was debated as part of the negotiations of the *Copenhagen Accord* 2009, the *Cancún Agreements* 2010, the *Durban Decisions* 2011, the *Doha Climate Gateway* 2012, the *Warsaw Opportunity* 2013, and the *Lima Call for Climate Action* 2014.² The topic of intellectual property and climate change was debated in the Paris climate negotiations—but the final *Paris Agreement* 2015 only addresses the topic of technology transfer. While there has been some limited agreement in relation to technology transfer, there has also been an impasse in respect of intellectual property.

Intellectual property plays a significant role in the debate over the regulation of the environment, biodiversity, and climate change. Patent law provides exclusive rights in respect of scientific inventions—including in the fields of climate adaptation technology and climate mitigation technology (Lane 2011; Sarnoff 2016c). There have been significant patent disputes over clean technologies—such as climate-ready crops (Rimmer 2012),³ hybrid vehicles,⁴ and a range of other subject matters. There have also been complex issues relating to management of patent rights in terms of ownership and licensing (Wishart 2018). Moreover, there has a discussion about the application of patent flexibilities to clean technologies—including public sector licensing, patent pools, compulsory licensing, technology transfer, and parallel importation.

Under designs law, there has also been conflict over green technologies—such as electric vehicles (Sainsbury 2018).⁵ Trade mark law offers recognition for eco-labels under certification trademarks (Chon 2009, 2014, 2018; Chon et al. 2018). Consumer law provides remedies in respect of misleading and deceptive conduct—such as greenwashing. Notably, competition and consumer regulators have taken action over the controversy of Volkswagen’s ‘Dieselgate’ (Pearse 2012; Ewing 2017; Australian Competition and Consumer Commission 2016).⁶

Increasingly, trade secrets have played a role in green technologies (Sandeem and Levine 2016; Sumanadasa 2018). The United States Government has taken action over the appropriation of trade secrets by Chinese entities from flagship renewable energy companies, such as SolarWorld and the American Superconductor Corporation.⁷ Copyright law and database protection also play a role in the regulation of access to environmental information and data (Derclaye 2014; Cunningham 2014; Cunningham, 2018; Hyland-Wood 2018). There are also significant connections between intellectual property, plant breeders’ rights, access to genetic resources, and Indigenous knowledge

¹ *United Nations Framework Convention on Climate Change* 1992, Opened for signature 9 May 1992, 1771 UNTS 107 (entered into force 21 March 1994).

² *Copenhagen Accord* 2009, UN Doc. FCCC/KP/CMP/2009/L.9 (18 December 2009); *Cancún Agreements* 2010, *Outcome of the Work of the Ad Hoc Working Group on Long-Term Cooperative Action Under the Convention*, CP.16, http://unfccc.int/files/meetings/cop_16/application/pdf/cop16_lca.pdf and *Outcome of the Work of the Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol at its Fifteenth Session*, -/CMP.6 http://unfccc.int/files/meetings/cop_16/application/pdf/cop16_kp.pdf; *Durban Decisions* 2011, CP.17, http://unfccc.int/meetings/durban_nov_2011/meeting/6245/php/view/decisions.php; *Doha Climate Gateway* 2012, COP. 18/CM 18, https://unfccc.int/key_steps/doha_climate_gateway/items/7389.php *Warsaw Opportunity* 2013, CP. 19, http://unfccc.int/meetings/warsaw_nov_2013/meeting/7649.php and *Lima Call for Climate Action* 2014, CP. 20, http://unfccc.int/meetings/lima_dec_2014/meeting/8141/php/view/decisions.php

³ In *Monsanto v The Controller of Patents & Designs, Trademark and Geographical Indications* (2013), OA/02/2012/PT/DEL, India’s Intellectual Property Appellate Board dismissed an appeal by Monsanto over the Patent Office’s rejection of a patent application for a transgenic plant with increased stress tolerance.

⁴ *Toyota Motor Corporation v. Paice LLC* 128 S. Ct 2430 (Mem) U.S. (2008).

⁵ *Nikola Corporation v. Tesla Inc.*, United States District Court for the District of Arizona (2018), Case 2:18-cv-01344-GMS.

⁶ There are a number of Australian class actions over ‘Dieselgate’ – including *Cantor v Audi Australia Pty Ltd* NSD1307/2015; *Dalton & Anor v Volkswagen AG & Anor*, Federal Court of Australia, NSD1459/2015; *Richardson v Audi AG and Audi Australia Pty Ltd* NSD1472/2015; *Roe v Skoda Auto a.s, Volkswagen AG and Volkswagen Group Australia Pty Ltd* NSD1473/2015; and *Tolentino v Volkswagen Group Australia Pty Ltd*, Federal Court of Australia, NSD1308/2015.

⁷ *U.S. v Wang Dong et al.* (W. D. Pa, 1 May 2014); and *U.S. v. Sinovel Wind Group Co Ltd, et al* (2018), U.S. District Court, Western District of Wisconsin, No. 13-cr-00084.

(McManis and Ong 2018; Adhikari and Lawson 2018; Savaresi 2018). Intellectual property litigation may well be an important new form of climate litigation (Congressional Research Service 2017).

This article is part of a growing literature on intellectual property, technology transfer, and climate change (Rimmer 2011). There have been a number of significant contributions in this still-emerging field. Lane (2011) considered intellectual property management and litigation in respect of green technologies. Brown (2013) explored the topic of intellectual property and environmental technologies. Menell and Tran (2014) edited a compilation of influential works in the field of intellectual property, innovation, and the environment. Sarnoff (2016b) also edited a research collection on the debate over intellectual property, clean technologies, and climate change. Zhuang (2017) examined intellectual property, international trade law, and climate change. Baker et al. (2017) considered the interlinkages between intellectual property, sustainable development, and climate change. Chon et al. (2018) investigated the use of public–private partnerships in respect of intellectual property—including in the field of green technologies. International climate lawyers have also considered intellectual property as part of the growing discipline of international climate law and international environmental law (Farber and Peeters 2016; Klein et al. 2017).

Innovation law and policy also have an important role to play in respect of climate change. The relationship between intellectual property and innovation policy is a complex one (Bessen 2015). Often, there are various combinations of intellectual property and innovation policy—with matching, mixing, and layering (Hemel and Ouellette 2018). As Sarnoff (2016a) has observed, there should be a better framework for the analysis of innovation policy, in the context of intellectual property and climate change. Sarnoff (2016a, pp. 221–22) recommends:

As we move forward, we also will need to better evaluate the choices that we make to avoid wasting massive resources and missing opportunities when seeking to generate desperately needed innovation outputs. In particular, we need to understand and track the outputs better, interrogate and evaluate the internal cultures of both private entities and public bureaucracies, and match decision making with developing theoretical and empirical analyses.

He has highlighted ‘the importance of comparative analysis of public and private institutions and of their innovation-relevant features’ (Sarnoff 2016a). A 2018 Nobel Laureate in Economics, Nordhaus (2013), emphasised the need to develop suitable innovation laws and policies to encourage the research, development, and deployment of clean technologies.

The International Council on Human Rights Policy (2016) has stressed that matters of technology transfer are critical to debates over climate change, human rights, and climate justice. The Council observes that technology transfer has a variety of political, ethical, and practical dimensions. The Council discusses the nexus between intellectual property, technology transfer, human rights, and climate justice:

Technology transfer is needed both to help poorer and more vulnerable countries and communities adapt to the now inevitable consequences of climate change in the short term, and to assist them in moving on to low-carbon development pathways in the long term. Highlighting the human rights benefits of technological interventions may create a space for re-framing and circumventing the unsustainable dynamic that has largely characterized debate of this subject. Human rights offer a strong ethical and legal basis from which technology transfer may be approached (The International Council on Human Rights Policy 2016, p. 126).

The Council (2016, p. 127) stresses: ‘Technology transfer in the UNFCCC also has a practical dimension—it is impossible to imagine dealing effectively with the global problem of climate change if advanced technologies are not made available where they are most needed.’ It is essential that the multidisciplinary field of climate law and justice adequately and sufficiently address the topic of intellectual property, technology development, and climate change (Farber and Peeters 2016).

Shue (2014, p. 211) has observed that ‘choices about which nations are to bear the current costs of technological transitions obviously implicate international fairness.’ Phelan (2018) analysed the human rights dimensions of intellectual property and climate change. As Ghosh (2011) has pointed out, intellectual property needs to take into account matters of intergenerational equity and justice. International legal scholarship needs to grapple with questions of innovation in the Anthropocene (Stephens 2018). Visions of climate justice will remain unfulfilled if matters of technology are neglected.

This article provides a critical evaluation of the co-operative models of intellectual property and technology transfer promoted at the Paris international climate negotiations. Drawing upon the approach and methodology of the Productivity Commission (2016), this study considers whether the measures are effective, efficient, adaptable, and accountable. This article has an eight-part structure (including the introduction and the conclusion). Part 2 considers the debate over the *Paris Agreement* 2015; the failure to achieve consensus in respect of intellectual property policy options; and the text on technology transfer. Part 3 considers the evolution of the UNFCCC Climate Technology Centre and Network and its operation. Part 4 focuses on the establishment of the World Intellectual Property Organization’s WIPO GREEN initiative. Part 5 explores the Mission Innovation project announced at the Paris climate talks. Part 6 focuses on the Breakthrough Energy Coalition established under the leadership of Bill Gates. Part 7 examines the International Solar Alliance, which has been developed by India and France. The conclusion in Part 8 calls for a better co-ordinated approach to intellectual property and climate change. Arguably, there is a need for a more systematic approach to intellectual property and clean technologies in order to promote larger goals of climate justice, human rights, and sustainable development.

2. Intellectual Property and Technology Transfer under the *Paris Agreement* 2015

The preamble to the *Paris Agreement* 2015 recognises ‘the need for an effective and progressive response to the urgent threat of climate change on the basis of the best available scientific knowledge.’⁸ The preamble highlights the need to take ‘full account of the specific needs and special situations of the least developed countries with regard to funding and transfer of technology.’ The preamble highlights ‘the principle of equity and common but differentiated responsibilities and respective capabilities, in the light of different national circumstances.’

In this context, there was significant debate about whether the *Paris Agreement* 2015 would resolve outstanding issues in respect of intellectual property, technology transfer, and climate change.

The Paris Climate Talks considered a number of issues related to intellectual property, technology transfer, finance, and climate change. According to leaked documents, the European Union sought to block the inclusion of explicit text on intellectual property and trade in the international climate negotiations (Corporate Europe Observatory 2015). United States industry associations lobbied the United States delegation to push for strong protection of intellectual property rights in the international climate talks (NECEC 2015). In contrast to the position of such developed countries, India pushed for the adoption of intellectual property flexibilities in the final agreement (Gupta 2015). Indeed, India’s Prime Minister Narendra Modi (2015) emphasised in his speech at the Paris Climate Talks:

We need an ambitious technology initiative, driven by a public purpose, not just market incentives. This includes intellectual property. For this, we need to scale up Green Climate Fund that will improve access to technology and intellectual property.

A number of other middle powers—such as China, Brazil, and South Africa (members of the BRICS/BASIC group)—also advocated for wider forms of technology transfer. Developing countries in the Group of 77 pushed for the adoption of intellectual property flexibilities. Least developed

⁸ *Paris Agreement to the United Nations Framework Convention on Climate Change*, opened for signature 12 December 2015 (entered into force 4 November 2016) (in UNFCCC, Report of the Conference of the Parties on its Twenty-First Session, Addendum, UN Doc FCCC/CP/2015/10/Add.1, 29 January 2016).

countries, small island states, and countries vulnerable to climate change expressed the desire for clean technologies to be available in the public domain.

The Ad Hoc Working Group on the Durban Platform for Enhanced Action (2015) had developed a wide range of public policy options in respect of intellectual property and climate change.

Draft Article 56.3 laid down a number of options. The first option called for a number of possibilities to facilitate technology transfer. India played a key role as the architect and advocate of this option. Item A recommended that developed countries ‘provide financial resources to address barriers caused by intellectual property rights (IPRs) and facilitate access to and the deployment of technology, including inter alia, by utilizing the Financial Mechanism and/or the establishment of a funding window under the Green Climate Fund/the operating entities of the Financial Mechanism.’ Item B asked for ‘an international mechanism on IPRs to be established to facilitate access to and the deployment of technology to [developing country Parties].’

Item C promoted other arrangements to be established to address intellectual property rights—such as ‘collaborative research and development, shareware, commitments related to humanitarian or preferential licensing, fully paid-up or joint licensing schemes, preferential rates and patent pools.’ Even the corporate sector has become quite interested in models of sharing clean technologies. There has been much excitement about Elon Musk’s announcement in respect of the open licensing of Tesla’s electric vehicles, batteries, and other clean technologies (Rimmer 2018).

Item D suggested that ‘funds from the Green Climate Fund will be utilized to meet the full costs of intellectual property rights (IPRs) of environmentally sound technologies and know-how and such technologies will be provided to developing country Parties free of cost in order to enhance their actions to address climate change and its adverse impacts.’ Such co-operative models of intellectual property echo some of the mechanisms established in the field of public health in relation to biotechnology and access to medicines.⁹ However, unlike in the field of public health, there was a lack of agreement amongst nation states on the suitability of such co-operative mechanisms.

The second option was that ‘Parties recognize that IPRs create an enabling environment for the promotion of technology innovation in environmentally sound technologies.’ This option represented the view of developed countries, industry associations, and multinational companies that there should be strong protection of intellectual property under the *Paris Agreement 2015*.

The third option favoured by developed countries was that ‘IPRs are not to be addressed in this agreement.’ The United States and the European Union, in particular, were of the view that other venues were better equipped to deal with questions about intellectual property and climate change.

The fourth option was for ‘Developed country Parties to make available Intellectual Property (IP) through multilateral institutions as public good, through purchase of intellectual property.’ Least developed countries, small island states, and countries vulnerable to climate change were particularly interested in public interest approaches to intellectual property.

The *Paris Agreement 2015*, though, did not resolve some of the tensions and conflicts between the nation states.¹⁰ None of these mooted options were embedded in the final text.

In the end, there was a lack of consensus amongst the negotiating parties on intellectual property and climate change in the final text of the *Paris Agreement 2015*.

There is some extensive text, more generally, about technology research, development, and dissemination in the *Paris Agreement 2015*. Article 10 of the *Paris Agreement 2015* addresses the topic of technology. Article 10.1 lays down a general principle: ‘Parties share a long-term vision on the importance of fully realizing technology development and transfer in order to improve resilience

⁹ The United Nations Secretary-General’s High-Level Panel on Access to Medicines, *Promoting Innovation and Access to Health Technologies*, Geneva: The United Nations, 2016, <http://www.unsgaccessmeds.org/final-report/>.

¹⁰ *Paris Agreement to the United Nations Framework Convention on Climate Change*, opened for signature 12 December 2015 (entered into force 4 November 2016) (in UNFCCC, Report of the Conference of the Parties on its Twenty-First Session, Addendum, UN Doc FCCC/CP/2015/10/Add.1, 29 January 2016).

to climate change and to reduce greenhouse gas emissions'. Article 10.2 emphasises: 'Parties, noting the importance of technology for the implementation of mitigation and adaptation actions under this Agreement and recognizing existing technology deployment and dissemination efforts, shall strengthen cooperative action on technology development and transfer.' Article 10.3 states: 'The Technology Mechanism established under the Convention shall serve this Agreement.' Article 10.4 observes: 'A technology framework is hereby established to provide overarching guidance to the work of the Technology Mechanism in promoting and facilitating enhanced action on technology development and transfer in order to support the implementation of this Agreement, in pursuit of the long-term vision referred to in paragraph 1 of this Article.' Article 10.5 provides a longer articulation of the issue:

Accelerating, encouraging and enabling innovation is critical for an effective, long-term global response to climate change and promoting economic growth and sustainable development. Such effort shall be, as appropriate, supported, including by the Technology Mechanism and, through financial means, by the Financial Mechanism of the Convention, for collaborative approaches to research and development, and facilitating access to technology, in particular for early stages of the technology cycle, to developing country Parties.

Article 10.6 notes: 'Support, including financial support, shall be provided to developing country Parties for the implementation of this Article, including for strengthening cooperative action on technology development and transfer at different stages of the technology cycle, with a view to achieving a balance between support for mitigation and adaptation.' Article 10.6 comments: 'The global stocktake referred to in Article 14 shall take into account available information on efforts related to support on technology development and transfer for developing country Parties.'

The Paris Climate Talks also saw a number of announcements on innovation—including Mission Innovation, the Breakthrough Energy Coalition, and the International Solar Alliance. In order to achieve technology transfer, there has been an effort to rely on a number of formal technology networks—including the UNFCCC Climate Technology Centre and Network; WIPO GREEN; Mission Innovation; the Breakthrough Energy Coalition; and the International Solar Alliance. There have been high hopes and ambitions in respect of these collaborative and co-operative ventures. However, there have also been significant challenges in terms of funding, support, and operation. There also seems to be a significant level of overlap and duplication between a variety of different ventures.

3. UNFCCC Climate Technology Centre and Network

The Technology Mechanism is meant to play a pivotal role in encouraging research, development, and diffusion of clean technologies to address climate change mitigation and adaptation. However, it is argued, the institution has struggled to realise its full potential and fulfil the ambitions for technology development, collaboration, and transfer.

At the Copenhagen negotiations, India and the United Kingdom's Carbon Trust pushed for the establishment of a network of climate innovation centres as a compromise option for nation states (Rimmer 2011). The *Copenhagen Accord* 2009 took up the proposal. The Technology Mechanism was established at the *Cancún Agreements* 2010 and was then reinforced in the *Durban Decisions* 2011, the *Doha Climate Gateway* 2012, the *Warsaw Opportunity* 2013, and the *Lima Call for Climate Action* 2014. The United Nations Environment Programme was selected to be the host of the hub of the UNFCCC Climate Technology Centre and Network (CTCN).¹¹ The CTCN includes 11 consortium institutions and a strategic partner in the Norwegian-based DNV GL.

Ultimately, the *Paris Agreement* 2015 relies on the existing infrastructure of the Technology Mechanism of the CTCN (even though the mechanism has been slow to come into full operation). The role of the *Paris Agreement* 2015 is to provide a technology framework in respect of technology

¹¹ UNFCCC Climate Technology Centre and Network, <https://www.ctc-n.org/>.

development and transfer. The regime also seeks to provide climate assistance. The system also seeks to provide technical information about clean technologies. There remains a significant debate about whether the Technology Mechanism is fulfilling its goals in stimulating clean technology development and diffusion.

The Technology Executive Committee (2017) has highlighted the need to enhance financing for the research, development, and demonstration of climate technologies. The Committee has taken into account data in respect of patents relating to clean technologies:

Data on patent applications is another way to examine R&D activity. The rate of increase of patent applications for biofuels, solar PV, and wind is far higher than that of overall patents for all fields during the past decade. Patent applications for agriculture and water supply also increased rapidly between 1990 and 2010. Furthermore, RD&D programmes help to build professional networks among researchers and organizations that advance the industry. In addition, research focused on other goals may also improve climate technologies. However, it is important to note that not all patents result in a commercialized product or service and that these developments take time (Technology Executive Committee 2017, p. 7).

There is a brief consideration of empirical research on intellectual property and climate technologies (Dechezleprêtre et al. 2011, 2016). The larger focus is on enhancing the finance and increasing the effectiveness of research, development, and demonstration of clean technologies. There has also been concern about whether the principles of fairness, equity, and justice have informed the decision-making of the CTCN. The approach of [The International Council on Human Rights Policy \(2016\)](#) is to link discussions of technology transfer with larger concerns about climate justice and human rights.

The Technology Executive Committee and the UNFCCC CTCN (2017) provided an honest appraisal of their performance in 2017. There was an emphasis on the need for innovation in respect of climate technologies at COP23:

To achieve the goals of the Paris Agreement, there is a pressing need to accelerate and strengthen technological innovation so that it can deliver environmentally and socially sound, cost-effective and better-performing climate technologies on a larger and more widespread scale. But there is no 'one size fits all' approach. Different innovation approaches are needed.

The Technology Executive Committee stressed the need '(a) To prioritize resources (human, institutional and financial) for such innovation efforts, in accordance with their needs, priorities and capacities;' '(b) To enhance public and private partnership in the RD&D of climate technologies by increasing expenditure for it and providing a clear policy signal of a long-term commitment to act on climate change;' '(c) To strengthen national systems of innovation and enabling environments, including through market creation and expansion and capacity- building;' '(d) To enhance existing and build new collaborative initiatives for climate technology innovation, including for sharing expertise, good practices and lessons learned;' '(e) To create an inclusive innovation process that involves all key stakeholders, facilitating the incorporation of diverse and relevant expertise, knowledge and views and generating awareness of the benefits and impacts;' and '(f) To acknowledge and protect indigenous and local knowledge and technologies and incorporate them in their national innovation systems.'

The CTCN observed: 'With the CTCN fully operational, both the number of requests and their progression by stage of development has increased each month, and responses to over 24 requests for technical assistance have been successfully implemented.' There has been a steady rise in applications for membership of the network—with 377 applications accepted. The CTCN commented:

The CTCN is actively engaging with the GEF and multilateral development banks and their regional climate technology transfer and finance centres. Collaborative activities with multilateral development banks include the implementation of technical assistance requests with scalable investment potential.

The organisation has increasingly relied on its network for support: 'The CTCN has increasingly drawn on the expertise of its Network members to respond to requests for technical assistance received from developing countries and it anticipates that this trend will continue.'

The CTCN has acknowledged challenges in terms of its lean organisational structure. The CTCN has highlighted that there have been funding issues and problems: 'Securing sustained funding to enable the CTCN to continue to deliver on its mandates is an issue of concern'. The organisation elaborates that the CTCN has struggled to raise enough funds from bilateral donors, network members, and the Financial Mechanism:

The raising of funds for CTCN operations has clearly been a challenge, with the CTCN only achieving half of its originally planned five-year USD 100 million budget. The CTCN is becoming more proficient at raising funds from various sources, but the task nevertheless remains challenging and, at times, the limited funds raised have affected the level of the CTCN operations. Compounding this situation is the fact that the fundraising environment is becoming more competitive.

The CTCN has obtained some funding from the Green Climate Fund, but that has been labour-intensive and has increased the timeline for projects. The report also notes that the organisation has often been limited to the provision of technical assistance. There are real questions about whether the CTCN will be able to accelerate the clean technology revolution on a shoestring budget.

The 2017 Progress Report of the UN CTCN (2017) highlights its role in terms of providing technical assistance, knowledge sharing, and collaboration and networking. The progress report observes: 'Technology transfer does not take place in a vacuum' (CTCN 2017, p. 14) It stresses: 'The performance of a given technology is dependent on a wide range of factors including the objectives and capacity of a country, adequate information and decision-making tools, enabling environments and access to adequate finance for technology deployment and up-scaling' (CTCN 2017, p. 14). Strikingly, the report is focused on questions of technology deployment rather than necessarily research and development. It is noticeable that the annual report does not address intellectual property rights in general or specifically in relation to patent law, plant breeders' rights, and other forms of intellectual property.

There have also been concerns that the CTCN have supported research and development into dubious, unproven technologies—such as so-called 'clean coal' technologies related to carbon capture and storage (Kelly 2018).

In her book on *Intellectual Property Rights and Climate Change*, Wei Zhuang noted that there were efforts in COP22 to reinforce the Technology Mechanism:

With a view to enhancing the development and transfer of EST's, the COP-22 adopted several decisions in Marrakesh in November 2016, including (1) Decision—/CP.22 Enhancing climate technology development and transfer through the Technology Mechanism and (2) Decision—/CP.22: Linkages between the Technology Mechanism and the Financial Mechanism of the Convention (Zhuang 2017, pp. 95–96).

Moreover, she noted that the European Union and its members, and a number of developed countries, such as Canada, the United States, Switzerland, and Japan, 'pledged more than \$23 million to support technology transfer in developing countries through Climate Technology Centre and Network with a view to accelerating the development and transfer of innovative ESTs' (Zhuang 2017, p. 96). The Trump Administration, though, has shown little enthusiasm for funding international climate institutions.

The *Marrakech Action Proclamation for our Climate and Sustainable Development* 2016 stressed: ‘We call for an increase in the volume, flow and access to finance for climate projects, alongside improved capacity and technology, including from developed to developing countries.’¹²

At the Bonn Climate Conference in 2017 (COP 23), there was a review of the effective implementation of the CTCN.¹³ There was a decision on enhancing climate technology development and transfer through the Technology Mechanism.¹⁴ There remain questions about whether the Technology Mechanism of the CTCN is effective, efficient, adaptable, and accountable (given its modest funding and its scale). As such, there has been consideration of alternative mechanisms for technology transfer.

At the Katowice climate negotiations in 2018 (COP 24), the *Katowice Climate Package* was adopted.¹⁵ There was a further statement on enhancing climate technology development and transfer through the Technology Mechanism.¹⁶ There was also a statement on linkages between the Technology Mechanism and the Financial Mechanism of the UNFCCC.¹⁷ Nonetheless, developing countries complained that the demand for greater development and transfer of technologies remained an unresolved issue (Presna *Latina* 2018). There remained no resolution of the outstanding issue of intellectual property and climate change.

Arguably, there should be a declaration on intellectual property and climate change—uniting the approaches of the UNFCCC, WIPO, and the WTO. Such a declaration could deal with matters of intellectual property management, protection, and enforcement. Moreover, such a declaration could also deal with possible intellectual property flexibilities—such as public licensing, technology transfer, compulsory licensing, parallel importation, and patent pools.

4. WIPO GREEN

The World Intellectual Property Organization (WIPO) has a long history of engagement with questions about intellectual property and technology transfer (Maskus and Saggi 2014).¹⁸ The WIPO Development Agenda has led to a certain level of engagement with matters in respect of intellectual property, sustainable development, and the environment (De Beer 2009; Cimoli et al. 2014; Bannerman 2016).¹⁹ WIPO has sought to consider climate change as a global policy issue.²⁰ In addition to the UNFCCC Climate Technology Centre and Network, there has also been another technology institution established under WIPO.

On Intellectual Property Day in 2009, Francis Gurry (2009), the Director-General of WIPO, commented: ‘Human activity, including decades of technological development, has damaged our planet’. He has maintained: ‘As human activity caused the problem, so too can human activity find the solutions’. He has insisted: ‘Green innovation—the development and diffusion of technological means to tackle climate change—is key to halting the depletion of the earth’s resources.’

¹² Marrakech Climate Change Conference, COP 22, November 2016, http://unfccc.int/meetings/marrakech_nov_2016/meeting/9567/php/view/decisions.php#c Marrakech Action Proclamation for Our Climate and Sustainable Development 2016, http://unfccc.int/files/meetings/marrakech_nov_2016/application/pdf/marrakech_action_proclamation.pdf and the Marrakech Partnership for Global Climate Action 2016 http://unfccc.int/files/paris_agreement/application/pdf/marrakech_partnership_for_global_climate_action.pdf

¹³ Decision 14/CP.23 Review of the Effective Implementation of the Climate Technology Centre and Network, FCCC/CP/2017/11/Add.2, <http://unfccc.int/resource/docs/2017/cop23/eng/11a02.pdf#page=4>

¹⁴ Decision 15/CP.23 Enhancing Climate Technology Development and Transfer Through The Technology Mechanism, FCCC/CP/2017/11/Add.2, <http://unfccc.int/resource/docs/2017/cop23/eng/11a02.pdf#page=6>

¹⁵ Katowice Climate Package 2018, COP 24, https://unfccc.int/decisions_katowice

¹⁶ COP 24 Enhancing Climate Technology Development and Transfer Through The Technology Mechanism, https://unfccc.int/sites/default/files/resource/cp24_auv_tm.pdf

¹⁷ COP 24 Linkages between the Technology Mechanism and the Financial Mechanism https://unfccc.int/sites/default/files/resource/cp24_auv_TM%20FM.pdf

¹⁸ World Intellectual Property Organization, ‘Supporting Technology and Knowledge Transfer’, <http://www.wipo.int/patents/en/technology/index.html>

¹⁹ World Intellectual Property Organization Development Agenda <http://www.wipo.int/ip-development/en/agenda/>

²⁰ World Intellectual Property Organization, ‘Climate Change and IP’. http://www.wipo.int/policy/en/climate_change/

There has been a larger discussion about the role of WIPO in the furtherance of the United Nations' Sustainable Development Goals. Gurry (2017) has spoken about the intersection between intellectual property and the sustainable development goals (SDGs). He emphasised that there is a strong connection between intellectual property and SDG 9 dealing with industry, innovation, and infrastructure. Gurry also observed that innovation has an impact on a number of other SDGs—including SDG 2 Zero Hunger, SDG 3 Good Health and Well-Being, SDG 6 Clean Water and Sanitation, SDG 7 Affordable and Clean Energy, SDG 8 Decent Work and Economic Growth, SDG 11 Sustainable Cities and Communities, and SDG 13 Climate action. He also suggests that innovation as a policy can assist in realising other SDGs—notably SDG 1 No Poverty, SDG 8 Decent work and economic growth, SDG 14 life below water, and SDG 15 Life on Land. Moreover, SDG 17 is a modality in terms of partnerships for the goals.

Gurry's key policy initiative has been to establish the institutional mechanism of WIPO GREEN in 2013. It is intended to be an interactive marketplace that promotes innovation and diffusion of green technologies. WIPO GREEN articulates its role in these terms:

Addressing climate change and achieving sustainable development is dependent on economic growth that works with, rather than against, the environment. Innovative green technology solutions can help by allowing us to do more with less—be it alternative energy production, using technology to save energy, new forms of transportation or greener forms of agriculture or forestry. The challenge is enhance the environment for innovation, while enabling speedier diffusion of these new green technologies to all parts of the world, including to developing countries where the need is particularly great.²¹

WIPO GREEN has a database and network to enable connections with technology and service providers. WIPO GREEN says that it provides 'a practical, market-based contribution to the challenges presented by climate change.'

There has been debate and discussion over the performance of WIPO GREEN thus far (Rimmer 2014). The role and function of WIPO GREEN has been evolving over time (WIPO 2016).²² Gurry has stressed: 'WIPO GREEN is an important initiative in the context of supporting innovation, technology development and transfer through collaborative approaches, as highlighted by the *Paris Agreement*' (WIPO 2016).

Since its establishment in 2014, WIPO GREEN has evolved. The network has grown to 82 partners in 2017. WIPO GREEN has developed technology databases—with Asia IP Exchange, the Association of University Technology Managers, the Danish Patent and Trademark Office, the Eco-Patent Commons (although that is now defunct), IPNexus, and TechnologieAllianz. WIPO GREEN has undertaken case studies on green lanterns, paraffin cookstoves, waterless toilets, home solar systems, and green biobeds. The new Canadian Government of Justin Trudeau sought to collaborate with WIPO GREEN in 2017 (WIPO 2017). There remain questions about whether WIPO GREEN is an efficient, effective, and adaptable model to accelerate innovation and diffusion of green technologies at scale.

In 2019, WIPO was positive about its contribution with WIPO GREEN, emphasising that 3000 technology entries had been listed in its online market (Harris 2019). Gurry stressed: 'This important public-private partnership is an expression of WIPO's unique ability to convene a wide range of stakeholders in pursuit of a common goal' (Harris 2019). He insisted that the initiative had been productive: 'In this instance, WIPO has organized an online marketplace with a wide range of green technologies from a worldwide pool of contributors, ranging from small enterprises to Fortune 500 companies, to facilitate new connections in addressing climate change' (Harris 2019). WIPO GREEN emphasised that major companies such as Fujitsu, Siemens, and Haier had participated in the online marketplace.

²¹ WIPO GREEN, <https://www3.wipo.int/wipogreen/en/>

²² World Intellectual Property Organization, *WIPO GREEN – Year in Review 2016*, Geneva: World Intellectual Property Organization, 2016, http://www.wipo.int/edocs/pubdocs/en/wipo_pub_greenreport_2016.pdf

Given the enormity of the climate challenges, WIPO GREEN needs to scale up further if it is going to achieve its aims and goals. There is also a need to ensure that there is external evaluation of the performance of the Technology Mechanism—as well as the usual internal oversight.

In terms of public policy, WIPO has been quiet in terms of the substantial public policy options in respect of intellectual property, technology transfer, and climate change. In the lead-up to the *Paris Agreement 2015*, WIPO released a Global Challenges Report, looking at the role of intellectual property in innovation and diffusion of green technologies (Lybecker and Lohse 2015). This study stressed that: ‘Environmental innovation is key to addressing the global challenge of climate change’ (Lybecker and Lohse 2015, p. 31). This report contended that: ‘Robust IP protection and a sound enabling policy environment in particular can afford innovators the security to invest in the development of relevant technologies as well as their transfer and diffusion on an international scale, in particular to low- and middle-income countries’ (Lybecker and Lohse 2015, p. 31). The report added that ‘complementary policy interventions’ aim ‘to create the conditions that are necessary for the development, diffusion and transfer of green technologies’ (Lybecker and Lohse 2015, p. 31). The study is noncommittal about the choice of research and development, and environmental policies: ‘The most effective mechanism depends on a range of factors, such as the type of technology, the maturity of the market, competing technologies, the lifecycle stage of the technology, as well as the risks and uncertainty surrounding the process of technology development’ (Lybecker and Lohse 2015, p. 31).

There has been a concern that WIPO has pursued a technocratic vision of intellectual property and sustainable development. Bannerman (2018) maintained that WIPO needs adopt a much more substantive vision of the United Nations Sustainable Development Goals. Amongst other things, this would require a greater engagement with intellectual property and access to clean energy.

5. Mission Innovation

Nobel Laureate Joseph Stiglitz has been critical of governments and international organisations, only relying on intellectual property rights as an incentive for research and development for new technologies. He has been an advocate of prize-based models of encouraging research and development as an alternative or a supplement to intellectual property in the area of public health and access to essential medicines (Stiglitz 2007). Stiglitz and his collaborators have considered the benefits and drawbacks of financing mechanisms—looking at direct financing, and prize financing (Baker et al. 2017).

In the field of clean technologies, there has been experimentation with environmental prizes, such as the H-Prize (encouraging research into hydrogen), the L-Prize (relating to energy efficient lighting), and the Progressive Insurance Automotive X Prize (concerning green cars) (Rimmer 2011, pp. 343–76). There has been a larger discussion about alternative models which could encourage further research and development and deployment of clean technologies.

At the *Paris Agreement 2015*, there were a number of announcements of new technology networks and alliances—one of which was a modified version of prize. Mission Innovation represented an effort to develop large-scale international challenges to encourage the development of clean technologies.

Mission Innovation was launched on the 30th November 2015 in Paris, France (Mission Innovation 2015a). The initiative was supported by the Governments of Australia, Brazil, Canada, Chile, China, Denmark, France, Germany, India, Indonesia, Italy, Japan, Mexico, Norway, Republic of Korea, Saudi Arabia, Sweden, the United Kingdom of Great Britain and Northern Ireland, the United Arab Emirates, and the United States of America. Mission Innovation observed: ‘While important progress has been made in cost reduction and deployment of clean energy technologies, the pace of innovation and the scale of transformation and dissemination remains significantly short of what is needed’ (Mission Innovation 2015a).

Under the project, ‘participating countries have come together to launch Mission Innovation to reinvigorate and accelerate public and private global clean energy innovation with the objective to make clean energy widely affordable’ (Mission Innovation 2015a). The programme was intended to ‘Double Governmental Investment in Clean Energy Innovation’ (Mission Innovation 2015a).

Mission Innovation promised that ‘this endeavour should help facilitate affordable access to critical technologies.’ (Mission Innovation 2015a). The programme also highlighted the role of ‘Private Sector and Business Leadership’ (Mission Innovation 2015a, Mission Innovation stressed: ‘Business needs to play a vital role in the commercialization and cost-effectiveness of clean energy breakthroughs, and participating countries commit to work closely with the private sector as it increases its investment in the earlier-stage clean energy companies that emerge from government research and development programs’ (Mission Innovation 2015a). In terms of implementation, ‘Participating countries will build and improve technology innovation roadmaps and other tools to help in our innovation efforts, to understand where research and development is already happening, and to identify gaps and opportunities for new kinds of innovation’ (Mission Innovation 2015a). Moreover, ‘participating countries may also pursue joint research efforts through public-private partnerships as well as joint research among participating countries’ (Mission Innovation 2015a). Moreover, the participating countries agreed to information sharing in respect of their clean energy research.

Mission Innovation charts clean energy research and development investment by participating countries (Mission Innovation 2015b).

Mission Innovation has established a number of innovation challenges, which have been aimed at accelerating research, development, and demonstration in a range of technology areas (Mission Innovation 2015c). There are seven innovation challenges. First, there was a Smart Grids Innovation challenge to enable future grids that are powered by affordable, reliable decentralised renewable electricity systems. There have been significant legal controversies around Smart Grids in terms of intellectual property, information security, and privacy (Arnold 2018). Second, there was an off-grid access to electricity innovation challenge. Third, there was a carbon capture innovation challenge. Fourth, there was a sustainable biofuels innovation challenge. Fifth, there was a converting sunlight innovation challenge. Sixth, there was a clean energy materials innovation challenge. Finally, there was an affordable heating and cooling of buildings innovation challenge. Much like prize-based innovation awards, these innovation challenges seem to be an alternative means of encouraging research and development (in addition to the intellectual property regime) (Baker et al. 2017).

It is not clear how the various innovation challenges will deal with intellectual property. There is a failure to match the innovation policy with a suitable intellectual property policy (Hemel and Ouellette 2018).

Mission Innovation also has a focus on private sector engagement. Mission Innovation (2018b) stresses: ‘Mission Innovation assists member governments with identifying opportunities and engaging the private sector by exchanging information to improve understanding of clean energy innovation needs and perspectives, and by encouraging investment to expand and enhance the innovation pipeline.’

Mission Innovation has entered into letters of intent on collaboration with the International Renewable Energy Agency and the International Energy Agency.

Mission Innovation still seems a nascent, immature venture. The Third Mission Innovation Ministerial (MI-3) (2018) in May 2018 discussed steps to enhance public and private investment and collaboration on clean energy research and innovation. The reported mid-term results seem very much focused on the establishment of innovation challenges (Mission Innovation 2018a). Mission Innovation does seem to suffer from a level of duplication of existing institutions. In many ways, its proposed role and function overlaps with that of the Green Climate Fund, CTCN, and WIPO GREEN. Moreover, Mission Innovation fails to address some of the fundamental underlying policy and practical issues surrounding intellectual property, clean technologies, and climate change. Thus far, Mission Innovation does not seem to be an efficient, effective, adaptable, and accountable model to accelerate innovation and diffusion of green technologies at scale.

6. Breakthrough Energy Coalition

The Breakthrough Energy Coalition (the Coalition) is another partnership, which was formed at the time of the Paris negotiations. The Coalition has been driven in particular by private investors and has been led by Bill Gates.

At Microsoft, Bill Gates was an advocate of strong protection of intellectual property rights in respect of information technology. His views of optimal protection of intellectual property have been moderated since he became a philanthropist. At the Gates Foundation, Bill Gates and Melinda Gates have been focused on innovation and sustainable development. In particular, they have been concerned about education, nutrition, gender equality, and poverty. The Gates Foundation has subscribed to a vision of ‘creative capitalism’ (Kinsley 2009).

Historically, the Gates Foundation took a rather noncommittal approach to clean technologies and climate change—in contrast to its much stronger leadership role in respect of development areas, such as agriculture, public health, and education (Rimmer 2010, 2015). In 2013, Bill Gates observed: ‘The foundation believes that climate change is a major issue facing all of us, particularly poor people in developing countries, and we applaud the work that others are doing to help find solutions in this area’ (Bell & Melinda Gates Foundation 2013). He maintained: ‘While we do not fund efforts specifically aimed at reducing carbon emissions, many of our global health and development grants directly address problems that climate change creates or exacerbates’ (Bell & Melinda Gates Foundation 2013).

As a result of this rather equivocal position, the Gates Foundation was the subject of criticism in respect of its credentials on climate action. In an article in *The Nation*, Naomi Klein (2013) expressed concerns about the huge fossil fuel holdings of some charities, including the Gates Foundation, and argued that this was inconsistent with public health goals. In her book, *This Changes Everything*, Klein (2014) lamented: ‘Though he professes great concern about climate change, the Gates Foundation had at least \$1.2 billion invested in just two oil giants, BP and ExxonMobil, as of December 2013, and those are only the beginning of his fossil fuel holdings.’ In her more recent book, *No is Not Enough*, Klein (2017) reiterates her scepticism about billionaire philanthropists providing solutions in respect of climate change.

In response to such criticism, the Gates Foundation has divested its entire holding in BP (Carrington 2016). Mike McGinn—former Seattle Mayor and a leader in the Divest Gates campaign—observed: ‘They’re moving their financial capital - now it’s time to use their moral capital and publicly commit to divestment’ (Carrington 2016). He commented: ‘By taking a public stand, Bill and Melinda Gates could help change the debate and speed up the international response to global warming’ (Carrington 2016).

As well as shifting his approach to investment in respect of fossil fuels, Bill Gates has also evolved in terms of his position in respect of clean technologies. At the Paris Climate negotiations, Gates seemed interested in making a stronger contribution towards boosting financial investment in transformative energy technologies.

The Coalition—established by Bill Gates—was designed to encourage investment in clean technologies.²³ The group includes Jeff Bezos (of Amazon), Marc Benioff, Richard Branson (of Virgin), Reid Hoffman, Jack Ma, George Soros, Tom Steyer, Meg Whitman, Mark Zuckerberg (of Facebook), and Nat Simons. The first institutional investor was the University of California. There have been questions about the transparency, accountability, and governance of the Coalition—given that it is composed of private philanthropists and investors.

In terms of its justification for its initiative, the Coalition maintained: ‘The existing system of basic research, clean energy investment, regulatory frameworks, and subsidies fails to sufficiently mobilize investment in truly transformative energy solutions for the future’.²⁴ There seems to be an underlying

²³ Breakthrough Energy Coalition, <http://www.breakthroughenergycoalition.com/en/news.html>

²⁴ Breakthrough Energy Coalition, <http://www.breakthroughenergycoalition.com/en/news.html>

assumption here that existing international models for technology transfer and climate finance have been unsuccessful. The Coalition insisted: ‘We can’t wait for the system to change through normal cycles.’ The Coalition contended that the market did not adequately support innovative news for clean technology:

Experience indicates that even the most promising ideas face daunting commercialization challenges and a nearly impassable Valley of Death between promising concept and viable product, which neither government funding nor conventional private investment can bridge. This collective failure can be addressed, in part, by a dramatically scaled-up public research pipeline, linked to a different kind of private investor with a long-term commitment to new technologies who is willing to put truly patient flexible risk capital to work. These investors will certainly be motivated partly by the possibility of making big returns over the long-term, but also by the criticality of an energy transition.

The Coalition promised: ‘We will form a network of private capital committed to building a structure that will allow informed decisions to help accelerate the change to the advanced energy future our planet needs.’

After 2 years of operation, Bill Gates elaborated on the investment focus of the Coalition:

Energy transitions take a long time, but there’s more urgency than ever to prevent the worst impacts of climate change. We need new models of investment and new partnerships between governments and a broad network of investors, companies, and energy customers. Breakthrough Energy is designed to help facilitate those partnerships and bring more energy products from the lab to the market more quickly (Fehrenbacher 2017).

The Coalition has expanded to include corporations, banks, and institutional investors—such as GE, Microsoft, Virgin, Wells Fargo, and others.²⁵ It has announced five pilot public–private collaborations with Canada, the European Commission, France, Mexico, and the United Kingdom.

One of the investment vehicles of the Coalition is Breakthrough Energy Ventures.²⁶ The Breakthrough Energy Ventures have identified a number of grand challenges in five fields that are the biggest contributors to global greenhouse gas emissions — electricity, transportation, agriculture, manufacturing and building. Thus far, the organisation has identified several technical quests in which research and development could help achieve an emission-free future. The investments of the fund will take place over the next two decades (Condliffe 2016).

The Coalition will initially focus on energy storage, solar fuels, global micro-grids, zero-carbon building materials, and geothermal energy (Fehrenbacher 2017). Gates (2017) has also stressed that the Gates Foundation is also investing in areas that developing countries have said are crucial in respect of agriculture, food security, and climate change. It is unclear how the Coalition and the Gates Foundation will deal with intellectual property developed out of its philanthropic investments. While Bill Gates has historically been a defender of strong intellectual property rights protection, the Gates Foundation has increasingly adopted open access policies.²⁷

Of late, Gates (2018) had become much more focused on climate change as a global problem. He emphasised in 2018: ‘We’ll need technological breakthroughs that let us run the economy—grow food, make things, move people and goods, and so on—without emitting greenhouse gases.’ Gates has maintained: ‘Entrepreneurs also need new market structures that will create incentives to bring innovations out of the lab and into the market.’ He has suggested that ‘putting a price on pollution that

²⁵ Breakthrough Energy, <http://www.b-t.energy/coalition/who-we-are/>

²⁶ Breakthrough Energy Ventures <http://www.b-t.energy/faq/>

²⁷ (Bell & Melinda Gates Foundation 2013) Bill & Melinda Gates Foundation Open Access Policy, <https://www.gatesfoundation.org/How-We-Work/General-Information/Open-Access-Policy>

causes climate change will create a clear market signal that will help drive adoption of the renewable sources of energy we can deploy today.’

There has been criticism of the initiative. Klein (2017), in particular, has been trenchantly critical of billionaire-led initiatives on climate action—saying that they lack transparency and accountability. She is of the view that such models are unlikely to achieve outcomes that value climate justice. There has been uncertainty about the details of the initiative. The level of financial commitment of the investors—beyond Bill Gates—is still unclear. It also remains to be seen whether the investment of the Coalition will be sufficient to adequately bolster government support and assistance in renewable energy.

7. The International Solar Alliance

The International Solar Alliance (ISA) was launched by France and India at the Paris international climate talks.²⁸ The *Framework Agreement on the Establishment of the International Solar Alliance* 2017 lays down the aims and objectives of the International Solar Alliance.²⁹

A weakness of the *Framework Agreement on the Establishment of the International Solar Alliance* 2017 is that there is no discussion of intellectual property, law, and practice.

The ISA is ‘a common platform for cooperation among sun-rich countries lying fully or partially between the Tropics of Cancer and Capricorn who are seeking to massively ramp up solar energy, thereby helping to bend the global greenhouse emissions curve whilst providing clean and cheap energy.’ The ISA has acquired the status of an international organisation. The headquarters for the organisation are situated in Gurugram, in the periphery of New Delhi. The International Solar Alliance has formed a partnership with the United Nations Development Programme and has sought to supplement existing programmes on solar energy and facilitate technology transfer (Chandrasekaran 2016). The international organisation aimed to ‘accelerate the deployment of solar energy in 121 sun-rich countries situated between the Tropics of Cancer and Capricorn’ (Chandrasekaran 2016). The five key focus areas include the promotion of solar technologies; the formulation of projects and programmes to promote solar applications; the development of innovative financial mechanisms to reduce cost of capital; a common-knowledge e-Portal; and a capacity building portal.

According to France, ‘23 countries have taken part in an ISA consultation on their priorities in the fields of solar energy for agriculture and rural areas, solar mini-grids, rooftop installations and e-mobility’ (Chandrasekaran 2016). A hundred priority projects have been advanced to launch a first phase of fundraising. The International Solar Alliance is focused on investment in solar energy: ‘To make solar energy affordable for the poorest, the Alliance underscores the importance of channelling capital, reducing costs through financial mechanisms, promoting universal access to energy and supporting the creation of common standards to guarantee appropriate product quality in the use of products by member countries’ (Chandrasekaran 2016). There are grand ambitions in terms of the mobilisation of finance: ‘To achieve these objectives, the Alliance aims to implement financial instruments to mobilize over \$1 trillion in solar energy investment by 2030’ (Chandrasekaran 2016).

In March 2018, India hosted the first ISA summit (France Diplomatie 2018). Twenty-three Heads of State expressed support for a common platform to work towards ambitious targets for clean energy (The Economic Times 2018). India’s Prime Minister, Narendra Modi emphasised that the development of solar energy would reduce the carbon footprint of the earth and also contribute towards economic prosperity (Times of India 2018). He highlighted the importance of access to affordable renewable energy. The French President Emmanuel Macron has been a strong advocate of the ISA (Pasricha 2018). He stressed the need to remove obstacles in scaling up clean energy. ‘We only have one planet, and we

²⁸ International Solar Alliance <http://newsroom.unfccc.int/lpaa/renewable-energy/international-solar-alliance/>

²⁹ *Framework Agreement on the Establishment of the International Solar Alliance* (New Delhi, 18 July 2017) https://www.aph.gov.au/Parliamentary_Business/Committees/Joint/Treaties/SolarAlliance/Treaty_being_considered

are sharing it' (Pasricha 2018). Rwandan President Paul Kagame, chairman of the African Union, observed that half the members of the ISA are African countries: 'The sunniest countries in the world should not lack for energy' (Pasricha 2018).

After signing the Framework Agreement on the 18th July 2017 and tabling the proposal in Parliament on the 4th September 2018, Australia joined the ISA in December 2017 (Turnbull et al. 2017). The [Joint Standing Committee on Treaties \(2017\)](#) considered the *Framework Agreement on the Establishment of the International Solar Alliance*.

The National Interest Analysis (2017) noted: 'Australia's membership of the ISA will increase opportunities for research linkages and commercialisation of new technologies.' The National Interest Analysis (2017) highlighted Australia's expertise in solar energy—particularly noting the work of public researchers at the Australian National University and the University of New South Wales. The National Interest Analysis (2017) highlighted the advantages of membership of the organisation for Australia: 'ISA membership will provide an opportunity for Australia to deepen our cooperation with key strategic partners, India and France, and reinforce our dialogue with other members of the ISA.' The National Interest Analysis (2017) also noted: 'Ratification will highlight our commitment to the Paris Agreement, including our support to help other countries achieve their Nationally Determined Contributions.' The National Interest Analysis (2017) also observed: 'The ISA can contribute to achieving the Paris Agreement goals, as it strives to promote solar technologies and investment, develop innovative finance mechanisms and support capacity building.' There was no regulation impact statement accompanying the National Interest Analysis. There was no expectation of any costs being associated with the body. There was no need for any accompanying legislation.

The [Joint Standing Committee on Treaties \(2017\)](#) heard evidence that the ISA would help to promote the development of public–private partnerships. The Department of the Environment and Energy told the Committee that there would be benefits in being a founder member:

As a founding member, Australia could influence the ISA's governance arrangements and could also have the opportunity to shape ISA's forward direction from the outset. We would work with other members to help ensure ISA complements the work of other relevant international organisations to ensure that we don't have crossover and overlap, and we would also advocate for transparency in governance.

The Committee queried the balance between aid funding and industry development in respect of the International Solar Alliance. The Department of the Environment and Energy maintained that the role of the International Solar Alliance was to be a broker or facilitator, not a direct funder of projects. The [Joint Standing Committee on Treaties \(2017\)](#) supported the ratification of the Framework Agreement: 'The Committee notes the aspirational nature of the Framework Agreement and acknowledges that it opens the way for Australia to promote its expertise and experience in the field of solar technology.'

Like some other new institutional initiatives, it is difficult to judge the performance of the International Solar Alliance, because it has been slow to come into being. There seem to be issues in terms of duplication—with the Green Climate Fund, CTCN, WIPO GREEN, the International Energy Agency, and the International Renewable Energy Agency (IRENA) performing similar roles. It remains to be seen whether this flurry of new technology networks, alliances, and coalitions will be successful in realising such goals and aspirations.

8. Conclusions

After the conclusion of the *Paris Agreement 2015*, there still remains a need to develop international policies, rules, and practices on intellectual property, technology transfer, and climate change. There have been some further efforts at COP22, COP23, and COP24 to boost climate finance and

technology transfer.³⁰ There has been no progress in developing international agreement on policy settings for intellectual property, sustainable development, and climate change. There should be a better process to evaluate, in an ongoing process, whether technology institutions, policies, and measures are effective, efficient, adaptable, and accountable in the international climate framework (Productivity Commission 2016).

At a conceptual level, this paper has sought to highlight the nexus between the philosophical debate over climate justice and the pragmatic discussion over intellectual property, technology transfer, and climate change. Brown (2018) has reflected that there is a need for greater engagement on the debate over intellectual property, technology transfer, and climate change. She commented:

IP and climate change are intertwined. Technology and IP law have key, though not determining, roles in the climate change landscape, at national, regional, and international levels, in private and state hands (Brown 2018, p. 990).

Brown (2018, p. 990) laments that there has been a failure to adequately to consider such matters: ‘Yet the power conferred by IP law means that it would be misguided for the IP regime to be ignored, for whatever reason, in climate change policymaking discussions; TRIPS Council and WIPO discussions regarding climate change should continue and national IP laws should engage more with climate change.’ If climate justice is to be achieved, there is a need for fair and equitable access to clean technologies.

This paper has argued that there is a need for an intellectual property mechanism in respect of international climate law—as well as a Technology Mechanism and a Finance Mechanism in the Green Climate Fund. After the conclusion of the *Paris Agreement* 2015, there still remains a need to develop international policies, rules, and practices on intellectual property, technology transfer, and climate change. There have been some further efforts at COP22 and COP23 to boost climate finance and technology transfer. There has been no progress in developing international agreement on policy settings for intellectual property, sustainable development, and climate change. Correa (2016, p. 89) has suggested that inspiration could be derived from the field of intellectual property, public health, and access to medicines:

Should a declaration on the TRIPS Agreement and climate change be promoted to address developing countries’ concerns on the subject? A WTO declaration on ESTs adopted by the WTO Conference would have political value and help to orient States and stakeholders . . . Although the Declaration on the TRIPS Agreement and Public Health only refers to access to drugs, the confirmation of the ‘flexibilities’ contained in the Agreement equally applies to other areas, including ESTs.

Such a declaration could help to provide a common approach across international institutions—including the UNFCCC, the World Trade Organization, and the World Intellectual Property. A declaration would help provide guidance on procedural matters in respect of intellectual property, clean technologies, and climate change. A declaration would also assist in the delineation of intellectual property flexibilities—such as public licensing, technology transfer, compulsory licensing, parallel importation, and patent pools. A declaration would also be constructive in relation to matters of the protection and enforcement of clean technologies, and environmentally sound technologies.

³⁰ Marrakech Climate Change Conference, COP 22, November 2016, http://unfccc.int/meetings/marrakech_nov_2016/meeting/9567/php/view/decisions.php#c; Marrakech Partnership for Global Climate Action 2016 http://unfccc.int/files/paris_agreement/application/pdf/marrakech_partnership_for_global_climate_action.pdf; Marrakech Action Proclamation for Our Climate and Sustainable Development 2016, http://unfccc.int/files/meetings/marrakech_nov_2016/application/pdf/marrakech_action_proclamation.pdf; Fiji Momentum for Implementation 2017, Decision 1/ CP.23, 18 November 2017, <http://unfccc.int/resource/docs/2017/cop23/eng/113.pdf>; and Katowice Climate Package 2018, COP 24, https://unfccc.int/decisions_katowice

At the very least, there needs to be further international debate over intellectual property, human rights, and climate justice (Correa 2013).

In order to promote technology transfer, there has been a reliance on a number of formal technology networks and alliances—including the CTCN; WIPO GREEN; Mission Innovation; the Breakthrough Energy Coalition; and the International Solar Alliance. There is a need to properly evaluate climate change-related public-private partnerships (Sarnoff and Chon 2018). Thus far, such initiatives have made some modest progress in terms of research and development and deployment of clean technologies. Such technology projects have not addressed the outstanding issue of intellectual property and climate change—either at a policy level, or at a much more practical level of intellectual property management. Some commentators are sympathetic to mixed models of innovation funding. Sarnoff (2016a) contends that ‘overlapping (or hybrid) approaches may sometimes be needed to correct perverse incentives of either providing public financing or inducing private financing’ (Sarnoff 2016a, p. 201). Likewise, Hemel and Ouellette (2018) have advocated innovation policy pluralism: ‘Innovation policy pluralism can frame conversations, encourage experimentation, and enrich the menu of options available for producing and disseminating knowledge goods.’ However, there has been significant overlap and duplication between these initiatives and some pre-existing institutions. Some organisations such as CTCN have been underfunded relative to their role and ambition. Furthermore, these co-operative efforts have not yet evolved to a scale to adequately address the global problems of climate change. There is a need for an effective, effective, adaptable, and accountable Technology Mechanism for clean technologies embedded within the *Paris Agreement* 2015. There remains a gulf between the high aspirations and principles of bureaucratic initiatives, and their performance. There is a need to encourage greater grassroots contributions to technological change in order to challenge the hegemony of the fossil fuel industry.

In her book on climate justice, Robinson (2018, p. 117) reflected in the wake of the *Paris Agreement* 2015 and the *United Nations Sustainable Development Goals* 2015: ‘We will all benefit if the peoples of the developing world are supported with incremental finance and greater access to technology, on a scale that the international community has often promised but has rarely managed to deliver’. She stressed that climate finance and technology transfer should not be considered to be merely aid or charity, observing: ‘In the fight to tackle climate change, it is enlightened self-interest’ (Robinson 2018, p. 117).

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Appendix A. Cases

Cantor v Audi Australia Pty Ltd NSD1307/2015

Dalton & Anor v Volkswagen AG & Anor, Federal Court of Australia, NSD1459/2015

Monsanto v The Controller of Patents & Designs, Trademark and Geographical Indications (2013), OA/02/2012/PT/DEL

Nikola Corporation v. Tesla Inc., United States District Court for the District of Arizona (2018), Case 2:18-cv-01344-GMS.

Richardson v Audi AG and Audi Australia Pty Ltd NSD1472/2015

Roe v Skoda Auto a.s, Volkswagen AG and Volkswagen Group Australia Pty Ltd NSD1473/2015

Tolentino v Volkswagen Group Australia Pty Ltd, Federal Court of Australia, NSD1308/2015

Toyota Motor Corporation v. Paice LLC 128 S. Ct 2430 (Mem) U.S. (2008).

U.S. v. Sinovel Wind Group Co Ltd, et al. (2018), U.S. District Court, Western District of Wisconsin, No. 13-cr-00084.

U.S. v Wang Dong et al. (W. D. Pa, 1 May 2014)

Appendix B. International Treaties

Cancún Agreements 2010, Outcome of the Work of the Ad Hoc Working Group on Long-Term Cooperative Action Under the Convention, CP.16, http://unfccc.int/files/meetings/cop_16/application/pdf/cop16_lca.pdf

COP 24 Enhancing Climate Technology Development and Transfer through the Technology Mechanism, https://unfccc.int/sites/default/files/resource/cp24_auv_tm.pdf

COP 24 Linkages between the Technology Mechanism and the Financial Mechanism, https://unfccc.int/sites/default/files/resource/cp24_auv_TM%20FM.pdf

Copenhagen Accord 2009, UN Doc. FCCC/KP/CMP/2009/L.9 (18 December 2009)

Decision 14/CP.23 Review of the Effective Implementation of the Climate Technology Centre and Network, FCCC/CP/2017/11/Add.2, <http://unfccc.int/resource/docs/2017/cop23/eng/11a02.pdf#page=4>

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Doha Climate Gateway 2012, COP. 18/CM 18, https://unfccc.int/key_steps/doha_climate_gateway/items/7389.php

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