



The TRIPS Agreement Revisited – Time to Open-Up Climate Technologies for Least Developed Countries

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Because most climate technologies are patented in developed countries, intellectual property rights held over these technologies by rights holders in developed countries can impede the access of least developed countries (LDCs) to these technologies owing to difficulties such as high royalty fees, refusals to license and unnecessary conditions for transfers of technology. This paper argues that the principles and objectives of the TRIPS Agreement, as laid down in Articles 7 and 8, could be used for an interpretation fitting the need of the LDCs to access climate technologies and evaluates the potential to adopt a declaration on the TRIPS Agreement and climate change to guide the utilisation of TRIPS flexibilities. Among other things, these include using research exceptions, parallel imports, compulsory licences and competition law. This paper further evaluates potential options for utilising Articles 66.2 and 67 of the TRIPS Agreement and the potential to adopt a new agreement from a climate change standpoint to meet the urgent need of LDCs for access to and transfer of climate technologies.

Keywords: Climate Change, Technology Transfer, Least Developed Countries, Patent, TRIPS Agreement

Since the adoption of the United Nations Framework Convention on Climate Change (UNFCCC),¹ numerous studies have emphasised that achieving the objective ‘to stabilize greenhouse gas concentrations at a level that prevents dangerous anthropogenic interference with the climate system’ will only be possible through the large-scale deployment of climate change technologies.² In 2007, the Intergovernmental Panel on Climate Change (IPCC) Report clearly stated that its range of stabilisation levels could be achieved by the deployment of a ‘portfolio of technologies that are currently available and those that are expected to be commercialized in coming decades’.³ However, such a rapid transition requires substantial financial and technical means. In the context of the least developed countries (LDCs),⁴ the situation is worse because the LDCs not only lack adequate financing but also have serious shortcomings in terms of technical capacity, access and transfer of necessary technologies that are crucial for the mitigation of an adaptation to climate change.⁵

The LDCs (46 countries as of 2021) have a trivial share in global trade and ‘for the past ten years, the global share of LDC trade has hovered at around 1%’.⁶ Hence, they mostly depend on technologies from the developed countries.⁷ The dependency on

developed countries for the supply of climate technologies⁸ is further revealed in a study that stated that high-income countries produced 80% of all low carbon innovations between 2010 and 2015. Low-income countries produced almost no low carbon innovation during the same period, and in 2016, low-income countries comprising mostly LDCs accounted for just 0.01% of global low carbon climate technologies exports.⁹

Since, most climate technologies are patented in developed countries, intellectual property (IP) rights held over these technologies by holders in developed countries can impede the ability of the LDCs to access these technologies owing to hindrances such as high royalty fees,¹⁰ refusals to license¹¹ and impasse regarding transfers of technology considering potential loss of competitive advantage,¹² ‘ever-greening’ of patents by different strategies¹³ and increasing the amount of patent litigations.¹⁴ Therefore, various IP issues are involved in helping the developing countries and LDCs access and transfer of climate technologies.

During the negotiations on the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS Agreement)¹⁵ under the Uruguay Round of the General Agreement on Tariffs and Trade between 1986 and 1994, which resulted in the establishment of the World Trade Organization (WTO) along with

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several agreements, including the TRIPS, it was acknowledged that wider scope of the TRIPS Agreement requiring patents to be granted in all fields of technology, such as in the field of pharmaceuticals, might be problematic for developing countries and LDCs.¹⁶ Later discussions over the issues of the pharmaceutical patents and necessity of access to and the transfer of public-health-oriented technologies acknowledged that the technological gap between developed and developing countries has become one of the main obstacles to a successful integration of developing countries into the globalised economy.¹⁷ However, there is no conclusive evidence that the absence of IP or excluding patent protection on the Environmentally Sound Technologies (ESTs) could facilitate more access to and transfers of climate technologies in LDCs. For example, the United Nations Development Programme (UNDP) study indicated that access to key patents by developing country firms in itself is not sufficient for effective technology transfer because full use of the patent is likely to require access to a variety of related information sources that are not sufficiently disclosed or fully explained in the patent itself.¹⁸ Another study by the Sussex Energy Group reflected that developing country firms do not seem to have access to the most cutting-edge technologies, and when they have access to such technologies, there are doubts about the extent to which they have access to the know-how underlying those technologies.¹⁹ One study by the European Patent Office noted the increasing number and scope of patent claims in wind energy and biofuels technologies.²⁰

Conversely, a report by the Copenhagen Economics submitted to the European Commission stated that:

*Dismantling or weakening the intellectual property rights system would not only hinder the access of developing countries to costly technology, it would also hinder access to low-cost technology as IPR protected technology is also to be found among the low abatement cost technologies.*²¹

There are nevertheless contentions as to availability of substantial evidence to validate the perspective that stronger IP protection is indispensable for technological development and to facilitate technology transfer.²²

Since the thirteenth Conference of Parties (COP) of the UNFCCC in 2007, negotiating texts on IP have

remained bracketed, reflecting the lack of agreement on the issue.²³ The Paris Agreement was agreed upon in 2015 and specific needs and special situations of the LDCs regarding funding and transfer of technology were emphasised. However, it included no provision on the role of IP in the context of technology transfer because state parties could not reach any consensus on the IP issues during COP21.²⁴ During COP 26 in Glasgow, parties emphasised accelerating, encouraging, and enabling climate technology innovation but remained silent on the possibility to adopt an IP framework to facilitate such innovation and technology transfer.²⁵

Developed countries continued to argue for keeping IP issues under the remit of the World Intellectual Property Organization and in regard to trade-related IP issues, under the TRIPS Agreement of the WTO rather than arguing to keep them under the UNFCCC.²⁶ Despite considering the importance of the discussion over the role of IP for facilitating technology transfer under the UNFCCC process, the author considers that it would be more meaningful and effective for LDCs if they could exploit the existing options, including technology-transfer-related provisions as available under the TRIPS Agreement. That could strengthen their efforts to place the burden on the developed countries to have a coherent and complementary approach between the UNFCCC and the TRIPS Agreement concerning technology transfer.

Determining a precise role for IP remained unsettled with the TRIPS Agreement. In the absence of such a solution, this paper attempts to evaluate how LDCs can use existing provisions to facilitate access to and transfer of climate technologies to LDCs. The problems raised here are approached with a traditional legal perspective added with practical standpoints²⁷ to understanding the relevant legal provisions under the TRIPS Agreement and concluding how these could be used for LDCs to facilitate access to and transfer of climate technologies. While the doctrinal approach thus is used to understand the existing body of law with its purpose, along with its historic origins, public international law is applied to examine the nature, characteristics and mode of operations of the obligations arising out of the relevant provisions under the TRIPS Agreement.

Considering the existing debates over technology transfer under the TRIPS Agreement, one key question that this paper addresses is how the TRIPS

Agreement can be used to facilitate access to and transfer of climate technologies to LDCs. Hence, this paper is intended to analyse suitability of the existing provisions under the TRIPS Agreement to support LDCs in the context of facilitating access to and transfer of climate technologies. The paper discusses debates over the role of the TRIPS Agreement for facilitating access to and transfer of climate technologies during the TRIPS Council meeting and other WTO forums, followed by analysing how the LDCs can use options available under the TRIPS Agreement.²⁸

Technology Transfer under the TRIPS Agreement

It has been argued that only three LDCs (Bangladesh, Tanzania and the Republic of Zaire, which later became the Democratic Republic of Congo) participated in the early stages of TRIPS negotiations, and Bangladesh on behalf of the LDCs among others asked to have provisions on LDCs' waivers from TRIPS obligations and improved access to and effective transfer of technologies.²⁹ Although LDCs continuously received approval of waivers from TRIPS obligations (now extended until 1 July 2034), the intended outcomes on technical and financial cooperation as argued by LDCs remain unsatisfactory and ineffective.³⁰

Frankel argued that the TRIPS flexibilities failed to produce the desired results, particularly to assist in development of local innovation and technology transfer.³¹ Hence, the debate on the role of IP rights in combating climate change is not new to the WTO.³² As early as the third meeting of the WTO Committee on Trade and Environment,³³ the Korean delegation suggested that the TRIPS provisions relating to patentable subject matter, compulsory licences and anti-competitive practices need to be reviewed to strike a balance between the protection of patent holders and that of users to ensure a wider diffusion of ESTs.³⁴

The TRIPS Council has discussed the role of IP rights and technology transfer on several occasions, particularly regarding the extent to which the TRIPS Agreement itself facilitates technology transfer. For example, the Ecuadorian proposal submitted in February 2013 to initiate a discussion on IP, climate change and technology transfer at the TRIPS Council prompted huge debate.³⁵ The key argument of the proposal was 'to prevent IPRs from becoming a barrier for the transfer of technology to the developing countries'.³⁶

The Ecuadorian proposal received the attention of diverse members during the TRIPS Council sessions in June 2013 and October 2013. Among the developing countries, India argued for the importance of a pro-active role of public policy at national and international levels, supporting the approach proposed by Ecuador to evaluate the contribution of IP to facilitate the transfer of environmentally rational technology.³⁷ The Indian intervention asserted that in the six energy technologies (wind, solar, photovoltaic, concentrated solar power, biomass-to-electricity, cleaner coal and carbon capture), several developed countries, such as the United States (US), Japan and Germany, are clear leaders. Therefore, any diffusion of these technologies would be controlled by private entities from these few countries.

Developed countries, particularly the US, have insisted that IP rights play a positive role in promoting both green technology innovation and its transfer to the developing world during initial debate in the TRIPS Council Session of October 2013.³⁷ Several other developed countries such as members of the European Union (EU), Japan, Canada and Switzerland supported the US position, arguing that climate technologies are usually more competitive. Hence, the developing countries' assertions of comparing climate technologies with the pharmaceutical patent situation is inappropriate. Therefore, they argued that IP protection has not impeded climate-related technology transfer.³⁷ This resulted in Ecuador requesting the developed countries to provide figures and statistical data to demonstrate the number of licences of clean energy that have been granted to developing countries or concrete cases of technology transfer. However, no further report or feedback has been submitted so far to show to what extent TRIPS facilitated technology transfer or IP has facilitated technology transfer to LDCs.

On 15 February 2018, the delegation of Cambodia submitted a communication to the TRIPS Council on behalf of the LDC Group, which raised the issue of effective implementation of the technology transfer provisions, stating that 'since 1999, the LDC Members have been concerned with the lack of effective implementation of Articles 66.2 and 67 of the TRIPS Agreement particularly to clarify on the meaning of "incentives to enterprises"'.³⁸ The LDC group further requested clarifications as to how developed country members provided incentives to

their enterprises and institutions to facilitate technology transfer to LDCs.³⁹ The EU delegates, however, stated that ‘technology transfer is often one component of a more complex project’⁴⁰ and they ‘cannot force the private sector to transfer its technologies. Incentives can therefore only take the form of encouragement, promotion and facilitation’.⁴¹ The US representative added that technology transfer can proceed most effectively if it is made based on voluntary and mutually agreed terms by the involved parties rather than setting terms under the TRIPS Council.⁴¹

On behalf of LDCs, Bangladesh, Haiti and Benin contended that LDCs are not asking to force the private sector to transfer technology. Rather, they would like to have clarifications and details as to the incentives provided by the developed countries to encourage the transfer of technology to the LDCs.⁴¹ Some developed countries, such as EU member countries as represented by the EU, argued that protection of IP helps with the transfer of climate technologies and very few climate technologies are patented in LDCs.⁴¹

It is argued that WTO members can undoubtedly implement measures to tackle climate change, but in doing so, they must act within the parameters of the WTO agreements, including the TRIPS Agreement.⁴² In this respect, Tine Sommar argued that ‘the TRIPS Agreement’s explicit reference to “serious prejudice to the environment” has been less controversial than its relation to life saving medicine’.⁴³ Shabalala argued that developing countries such as China, Brazil and India are willing to produce and supply low-cost climate technologies to LDCs. Therefore, any potential limitations that TRIPS might place on developing countries such as China, India and Brazil will affect LDCs’ access to and transfer of climate technologies.⁴⁴

Zhuang observed that ‘the complexities of the TRIPS negotiations have at times resulted in rather vague provisions, particularly in the field of TRIPS flexibilities, which establish a “constructive ambiguity” and require extensive interpretation’.⁴⁵ Abbe Brown argued that countries seeking to meet obligations arising out of the climate regime, such as the Kyoto Protocol (she wrote this in 2013, prior to the Paris Agreement), would be consistent with the obligations imposed under the TRIPS Agreement.⁴⁶ Latif contended that:

Conditions differ significantly from country to country and from one economic sector to

*another ... such diversity suggests that a broad range of options and measures should be considered for addressing the linkages between intellectual property and climate change; no ‘silver bullet’ will address all the issues.*⁴⁷

Rimmer mentioned that ‘the Paris Agreement 2015 alludes to questions about intellectual property and climate change—without ever addressing them directly’.⁴⁸ While considering the unsettled issue of the relationship between IP and climate change, Joshua Sarnoff commented that:

*Unless and until international agreements develop that further regulate the international patent system or unless alternative co-ordinated approaches arise more spontaneously, we will continue to witness patent and climate change policies develop as national laboratories of democracies.... We thus should expect the relationship of the patent system (or more generally the intellectual property system) and climate change to remain controversial in a wide variety of international negotiating fora.*⁴⁹

Hence, it is the interpretations of the TRIPS Agreement that might guide how the role of IP is defined in the context of facilitating access to and transfer of climate technologies to LDCs. However, the TRIPS Agreement itself does not explicitly indicate how its provisions could be interpreted. It is worth noting in this respect Article 3.2 of the Dispute Settlement Understanding of the WTO, which states that ‘the WTO dispute settlement system serves to clarify the existing provisions of the WTO agreements “in accordance with customary rules of interpretation of public international law”’.

While stating customary rules of interpretation of public international law, the author relied on the *Vienna Convention on the Law of Treaties (VCLT)*, 23 May 1969.⁵⁰ Articles 31, 32 and 33 of the Vienna Convention are of wider relevance because those provisions reflect the general principles of interpretation that apply to any treaty, irrespective of its subject matter and it has been validated by different adjudications before the WTO dispute settlement body. For example, the WTO Appellate Body explained in *US–Hot-Rolled Steel*:

[T]he rules of treaty interpretation in Articles 31 and 32 of the Vienna Convention apply to any treaty, in any field of public international law,

*and not just to the WTO agreements. These rules of treaty interpretation impose certain common disciplines upon treaty interpreters, irrespective of the content of the treaty provision being examined and irrespective of the field of international law concerned.*⁵¹

While interpreting the text of the TRIPS Agreement, resolutions, declarations, and decisions adopted under the auspices of the WTO and under the TRIPS Council of the TRIPS Agreement have been referred to as and when required. Because WTO panels and the Appellate Body have already confirmed the customary international law status of Articles 31, 32 and 33 of the *Vienna Convention*, these have been used in this paper as an important guide for interpreting the relevant provisions of the TRIPS Agreement as and when required, either directly or indirectly.

TRIPS Agreement to Facilitate Access to and Transfer of Climate Technologies to LDCs

The concerns about the role of IP with regard to transfer of climate technologies are not new. Even before the commencement of the debate over access to medicines and the role of patents, which is popularly cited as the most classic example for debate over the role of IP and public policy issues,⁵² a range of measures and options have been proposed over the years to facilitate access to and transfer of technologies in the context of climate change. These include the use of TRIPS principles and objectives to broaden the scope of the TRIPS provisions in the context of climate change; potential to adopt a ministerial declaration on the TRIPS Agreement and climate change using the model of Doha (which addressed the issues of IP and public health with special waivers for LDCs on the pharmaceutical patents);⁵³ even further guidance as to expanded use of flexibilities available under the TRIPS Agreement, such as examining the potential of using parallel imports, compulsory licence, the exclusion of climate change technologies from patentability, the consideration of arrangements for special reduction and licensing terms to facilitate access to these technologies and use of competition law. Some of these options may even involve reviewing the TRIPS Agreement and wider agreement among WTO members.

TRIPS Principles and Objectives in the Context of Climate Change

The principles and objectives of the TRIPS Agreement as laid down in Articles 7 and 8 could be

used for an interpretation that might fit the need of LDCs for accessing climate technologies. The Preamble to the TRIPS Agreement contains two references to promotion of technology transfer to developing countries. The members recognise:

*the underlying public policy objectives of national systems for the protection of intellectual property, including developmental and technological objectives ...and ... the special needs of the least-developed country Members in respect of maximum flexibility in the domestic implementation of laws and regulations in order to enable them to create a sound and viable technological base.*⁵⁴

Article 7, entitled 'Objectives', presents the imperative statement in TRIPS regarding the importance of technology transfer: The protection and enforcement of IP rights should contribute to the promotion of technological innovation and to the transfer and dissemination of technology, to the mutual advantage of producers and users of technological knowledge and in a manner conducive to social and economic welfare, and to a balance of rights and obligations.⁵⁵ Article 7 is formulated only as a goal without specific obligations.

Nevertheless, its importance as a guiding principle of the TRIPS Agreement was supported by both the Doha Ministerial Declaration and the Declaration on the TRIPS Agreement and Public Health back in 2001.⁵⁶ Conversely, Article 8 establishes the rights of members to protect public health and the public interest. Hence, considering the climate-induced problems as potential public interest issues, appropriate (TRIPS consistent) measures could be adopted by LDCs to prevent the abuse of IP rights by right holders or the resort to practices that unreasonably restrain trade or adversely affect the international transfer of technology.⁵⁷

Despite acknowledgement under Articles 7 and 8 of TRIPS of the need for the protection of IP to contribute to technology transfer and prevent abusive practices that might adversely affect technology transfer, the agreement itself is yet to establish any concrete framework that could facilitate the transfer of technologies to LDCs.⁵⁸ As one study reflected, 'little effort has been made to operationalize Articles 7 and 8, raising questions about the capacity of the Agreement as currently drafted to promote technology transfer'.⁵⁹ However, this also requires an analysis of the TRIPS Agreement provisions in line with

the changing situation and changing needs to adjust relevant provisions to the realities of promoting innovation in climate change technologies and facilitating such transfer.

Nevertheless, the review of the TRIPS negotiations validates the relevance of Articles 7 and 8 as keystones of the agreement; therefore, Articles 7 and 8 were approved as a concession to the developing countries as some sort of guarantee to ensure fairness because they initially argued the TRIPS provisions were burdensome and unfair for them.⁶⁰ Therefore, Articles 7 and 8 could be considered a transversal ‘guiding light’ for the interpretation and implementation of the Agreement.⁶¹

According to Article 31(1) of the VCLT,⁶² ‘a treaty shall be interpreted in good faith in accordance with the ordinary meaning to be given to the terms of the treaty in their context and in the light of its object and purpose’.⁶³ The interpretative process usually searches for the ordinary meaning of the legal norms at stake.⁶⁴ This ordinary meaning shall consider the ‘context’ of the treaty and ‘its object and purpose’. The WTO Appellate Body in the case of *US–Shrimp* commented on the rules of interpretation of WTO law particularly in cases in which the text of the WTO Agreement is unclear or inconclusive by stating that:

*Where the meaning imparted the text itself is equivocal or inconclusive, or where confirmation of the correctness of the reading of the text itself is desired, light from the object and purpose of the treaty as a whole may usefully be sought.*⁶⁵

In this context, the function of Article 7 and 8 as ‘a guiding light’ for interpreting the TRIPS Agreement is especially important.

In the *Plain Packaging dispute*, the WTO Panel reiterated the relevance of Articles 7 and 8 as a guiding light while stating that:

*Articles 7 and 8, together with the preamble of the TRIPS Agreement, set out general goals and principles underlying the TRIPS Agreement, which are to be borne in mind when specific provisions of the agreement are being interpreted in their context and in light of the object and purpose of the agreement.*⁶⁶

Frankel argued that the difficulty in interpreting Articles 7 and 8 remains because ‘what amounts to “promotion of technological innovation and to the transfer and dissemination of technology” is, by its

nature, open to some debate and the viewpoint of any WTO member is likely to relate to its economic position’.⁶⁷ Hence, the developed countries could try to use it from stricter perspectives to provide broader IP protection whereas the LDCs might prefer to use it in a way that might restrict broader protection. Hence, it should allow local small innovators to make small inventions and use existing technologies for experimental use or gaining supply of cheaper technologies via parallel import. Grosse Ruse-Khan argued that Articles 7 and 8 might be used as a guiding light when it comes to implementation in domestic law considering that implementation in domestic law is the locus whereas states utilise policy space to address intersections of IP protection and other areas, such as climate change mitigation or public health protection.⁶⁸ The TRIPS Agreement allows limitations or exceptions. Therefore, patent rights are not absolute and LDCs could argue that a broader interpretation from a climate change standpoint is necessary to balance the legitimate interests of right holders and users. In this regard, the author supports the statements of Cottier and Véron because these limitations and exceptions are in some ways part of the overall effort to achieve a general balance between competing public policy interests and be argued as a process of the operationalisation of Articles 7 and 8 of the TRIPS Agreement.⁶⁹

Even if LDCs could use Articles 7 and 8 for the interpretation of the TRIPS Agreement in a way that might better fit them and allow access to climate technologies, more clarifications are needed.

TRIPS Flexibilities and Exceptions to Access and having Transfer of Climate Technologies

This section evaluates how existing TRIPS provisions, such as parallel imports, limiting duration, patentability and exclusion clause, anti-competitive practices and options for compulsory licences, can be used by LDCs from a climate change standpoint.

Parallel Importation

Parallel importation is used as a means for accessing the patented product at a lower cost by importing it from a country where the patent holder has exhausted its patent and the product is available at comparatively cheaper price. It is a general principle of international law that one country cannot interfere with another’s legislation within its borders if it is consistent with the international obligations. Hence, they cannot restrict differential prices in different

markets. It was acknowledged in the Doha Ministerial Declaration that ‘it affirms governments’ right to use the agreement’s flexibilities in order to avoid any reticence the governments may feel’.⁷⁰ The Declaration on the TRIPS Agreement and Public Health confirmed that ‘Members are free to apply an international principle of exhaustion of rights that will allow parallel importation of an IPR protected product that has been legitimately marketed in another country’.⁷¹ In the same way, parallel importation allows consumers in the parallel importing country to gain access to the product without affecting the right of the patent holder in the country where the product was first sold. However, depending upon the incentives different exhaustion systems create, they may aid or hinder technology transfer to LDCs.

Despite a seemingly broad scope to design exhaustion rules in LDCs, there is legal and economic controversy regarding the applicability of the doctrine of international exhaustion of patents under the TRIPS Agreement. Parallel imports increase competition, which lowers prices and makes technologies more accessible in LDCs. However, by the same reasoning, it could limit profits of IP owners and could discourage innovation and ultimately might discourage technology transfer. Zaman argued that ‘LDCs lack the capacity to import green products and technologies through regular means. Thus, in the absence of regular import procedures, the question of the parallel import of green technologies simply does not arise’.⁷²

Developed countries such as US and EU countries would like to limit or prohibit practices of parallel trade under the international exhaustion rules, which Watal argued as equal to an ‘unfair duplication of the rights of IPR holder’.⁷³ It could also be argued that developed countries attempting to restrict parallel trade might be detrimental to international trade of goods across countries. Hence, this could go against the Recital 1 of the TRIPS Agreement which among others stresses that ‘measures and procedures to enforce intellectual property rights do not themselves become barriers to legitimate trade’.⁷⁴ Zhuang considered that ‘countries with low level of technological advancement should allow parallel imports to ensure the lowest cost source of supply of patented ESTs for combating climate change’.⁷⁵ Parallel imports could have a positive impact in LDCs owing to their weak production capacity and dependence on export activities. Even IP right

holders, because of fierce competition of parallel traders, might consider improving accessibility by reducing prices of their own products.⁷⁶ Therefore, individual LDCs while applying parallel imports need to evaluate local conditions, patenting trends and specific technology needs of the country. Apart from parallel imports, developing countries argued for several other exceptions, such as India’s requests for limiting the term of protection for climate technologies.

Limiting Duration

India proposed reduction of the term of protection for the climate technologies. Therefore, after a short duration, climate technology would be available for imitation and copy for local technology developers. Hence, it might be available within reasonable cost. The submissions made by India before the WTO’s Committee on Trade and Environment was the reduction in the terms of protection for the IPR.⁷⁷ For example, while the term of protection for a patent under TRIPS Article 33 is a minimum period of 20 years from the date of filing, India suggested that countries may be allowed, through a suitable provision in the TRIPS Agreement, to reduce this to a much shorter term of protection to allow free access to patented climate technologies after the expiry of shorter protection time.⁷⁷ This could allow the necessary incentive to potential IP owners while allowing users of such technologies competitive access within a reasonable period.

However, the proposal was opposed by the developed countries and failed to receive final approval.⁷⁷ Even LDCs, owing to weak human resources and limited technical capacity, might not be able to take advantage of such a limiting provision. Rather, having such provisions might discourage technology developers to transfer technology to LDCs. Hence, rather than arguing for limiting duration, the LDCs could consider using Article 27 either to exclude or limit patenting of climate technologies in proper situations.

Patentability Requirements and Potential Options

Article 27.1 of the TRIPS Agreement requires WTO members to grant patents to all types of inventions in all fields of technology if these inventions meet certain basic criteria. Under this provision, to be patentable, an invention must (1) be new, (2) involve an inventive step and (3) be capable of industrial application. Although the requirements

contained in Article 27.1 reflect similar requirements under national patent laws, the TRIPS Agreement itself included no criteria for defining these terms. The absence of clear definitions under the TRIPS Agreement provides considerable discretions to the WTO members in designing and applying patentability criteria under national patent laws for the fields of technology in accordance with their developmental, scientific and technological objectives.

It is argued that the means and ways of defining the patent criteria may 'have a major impact on where countries draw the line between private exclusive rights and the public domain', and thereby could influence the follow-on innovation and transfer of patented technologies, including ESTs.⁷⁸ For example, using strict patentability standards, the LDC could allow patents for only genuine inventions, restricting patenting by minor changes. This could preserve a greater public domain for follow-up research and development.⁷⁹

Under Article 27.2 WTO members might refuse to grant patents to certain inventions, if 'necessary to protect *ordre public* or morality'. Such exemptions need to be justified to 'protect human, animal or plant life or health' or 'to avoid serious prejudice to the environment'. Hence, LDCs could consider excluding patenting of climate technologies that might restrict access to and transfer of such technologies to LDCs on the grounds that such exclusion is necessary to 'protect human, animal or plant life or health' and 'to avoid serious prejudice to the environment'. Zhuang argued that:

*Article 27.2 cannot be invoked to justify excluding ESTs from patentability because: (1) exclusion of inventions pertinent to ESTs from patentability does not necessarily contribute to the protection of ordre public or morality, (2) it is not desirable to prevent the commercial exploitation of such inventions and (3) the prevention of commercial exploitation of such inventions is not necessary to protect ordre public or morality.*⁸⁰

The main argument behind her position is that:

*to access more ESTs, Members need to open their market for ESTs rather than prevent their commercialisation...the prevention of commercialisation of 'green' inventions is not 'necessary' to achieve the intended environmental protection goals but would rather run counter to such goals.*⁸⁰

The author considers that LDCs indeed could exclude granting of patents to climate technologies if patenting of such inventions might restrict access to such technologies by the LDCs and access to such technologies are necessary to 'protect human, animal or plant life or health' or 'to avoid serious prejudice to the environment'. In this regard Articles 7 and 8 could be utilised, arguing that such an exemption is necessary for public interest and to prevent abusive practices that might restrict access to and transfer of technology. The Brazilian experience with the pharmaceutical patent might lend some support for LDCs. As earlier research of this author has pointed out, in 1999 by way of Presidential Decree, Brazil introduced a new provision requiring prior approval from the National Health Surveillance Agency (ANVISA or 'the Agency') before granting a patent, thereby ensuring that it will not endanger public health or create barriers for access to medicines.⁸¹ Therefore, all pharmaceutical patent applications submitted to the patent office must go through the ANVISA review process and patents can only be issued with prior consent from the ANVISA. The Agency denies patents to drugs that lack genuine novelty and in cases in which it judges that providing exclusive rights would be harmful to public health. ANVISA uses its authority to prevent patents that, in its judgement, would extend the terms of existing patents.⁸¹

It is argued that 'ANVISA is clearly overstepping its bounds as a public health regulatory agency to supplement the examination of patent applications in such a way'.⁸² The US Trade Representative's Special 301 Report continues to express its concerns about ANVISA's role in the analysis of drug patents since the introduction of it.⁸³ Despite criticism as it has survived over the years, it might be interesting to examine whether this kind of experiment could be used by the LDCs to exclude climate-related patents, if necessary, considering granting such patents might limit or prejudice environmental protection. In addition to using this option, LDCs could also consider options of using competition law and compulsory licences to facilitate access to climate technologies.

Anti-Competitive Practices

The South African approach of using competition law in the case of public health-related problems and restricting abusive behaviour and abuse of dominant position using pharmaceutical patents might also be useful in cases of climate-related patented

technologies.⁸⁴ In this respect, TRIPS Article 8.2 provides a basis for ensuring that IPRs do not enable right holders to indulge in anti-competitive behaviour. It recognises that WTO members could take appropriate measures to prevent the abuse of IPRs by right holders or activities that unreasonably restrain trade or adversely affect international transfer of technology. Even if the IPR holder does not abuse the IPR, the impact of its activities on competition or international transfer of technology could be a basis for action against the right holder by national competition authorities in accordance with competition law of respective countries.

However, two related issues might restrict the use of this flexibility. First, Article 8.2 of TRIPS requires that measures taken under this Article must be consistent with other provisions of the TRIPS Agreement. Second, TRIPS Article 40 restricts such measures to licensing agreements that have an anti-competitive effect. Article 40 of the TRIPS Agreement requires that ‘rule of reason’ approach should be applied to assess the anti-competitive measures. Correa points out that ‘while expressly allowing Members to adopt measures to control or prevent such practices, it takes pains to establish limits to national action in this field’.⁸⁵

Article 40.2 offers examples that might be deemed restrictive. For example, exclusive grant-back provisions, which are the obligation to transfer the improvements made on the licensed technology exclusively to the licensee, obligations imposed on the licensee not to challenge the validity of licensed rights and coercive package licensing (i.e., the obligation for the licensee to purchase from the licensor other technologies even if not considered vital by the licensee during the time of purchase). However, the assessment of restrictive practices cannot be generalised; rather, they can be assessed on a case-by-case basis. Article 40.2 states that only if such practices constitute an ‘abuse’ of IPRs and have an adverse effect on competition in the relevant market.⁸⁵

Therefore, potential actions under Article 8.2 are circumscribed by Article 40 and thereby limit the governments’ capacity to take steps that prohibit anti-competitive practices in technology transfer. This raises concerns about the scope of competition policy in fostering technology transfer by preventing anti-competitive practices.

National authorities might have difficulties taking necessary measures to redress situations in which IPR

holders from developed countries make technology available to a developing country firm through joint ventures along with several restrictive conditions. Despite having restrictive conditions, it would be difficult to take corrective measures unless one could show a competition-distorting effect, even if there might have been an impending effect (e.g. these conditions might restrict proper utilisation of climate technologies or adapting technologies to the local conditions). It is not clear whether such joint venture agreements or practices, which might have adverse effects on development objectives even without being anti-competitive, can be targeted or not by virtue of TRIPS Article 8.2.⁸⁶

Some scholars argued that it would be difficult to apply TRIPS Article 30 favourably using the existing practices of the WTO Panel in the case of a climate-related technology, unless the ‘legitimate interests of third parties’ in mitigating or adapting to climate change are given tremendous weight.⁸⁷ Hence, a restrictive interpretation could not use TRIPS Article 30 in a way that could allow action in the case of refusal to deal or supply know-how for climate technologies. Therefore, there is a need to clarify the scope of TRIPS Article 30 to enlarge the scope to facilitate transfer of climate technologies to LDCs. Nevertheless, LDCs using the experiences of public health-related measures could continue to argue that it is necessary to take anti-competitive measures to meet the objectives and principles of the TRIPS Agreement. Hence, it could prohibit practices that might restrict access to and transfer of climate technologies to LDCs. Apart from this, LDCs could also use options for compulsory licences for climate technologies under certain conditions under Article 31 of the TRIPS Agreement.

Compulsory Licence as a Feasible Option

The International Centre for Trade and Sustainable Development (ICTSD)⁸⁸ study proposed that ‘compulsory licensing [could] be utilized for the transfer of climate technologies’, arguing that:

[c]limate mitigation or adaptation could provide valid ground for compulsory licensing and could even be considered to be included in general references to ‘public interest’ in most patent laws. Some countries also foresee compulsory licences in cases in which the invention is not exploited in the country or is insufficiently exploited. Such a measure could

*restrain the anticompetitive practices feared as potentially impeding the transfer of climate-related technologies to developing countries.*⁸⁹

The ICTSD study concludes that ‘compulsory licences could thus prove an effective tool to ensure rapid access to critical climate-related technologies in developing countries’.⁸⁹The Third World Network supported this position, arguing that:

*compulsory licensing is an option that developing countries can seriously consider for those patented climate-friendly technologies for which they have need, which are expensive, and in cases where negotiations with the patent holder are unable to result in a sufficiently affordable price either for the original product or for a license for an intended generic product.*⁹⁰

Some scholars have contended that there are limitations in using Article 31 of TRIPS, with climate change not being deemed a significant enough emergency causing a threat to human life.⁹¹This position, however, is no longer legitimate, given the growing body of science into the seriousness of climate change’s impact on human life. Other scholars have raised concerns about the use of compulsory licences in respect of climate technologies, given the number of different solutions that will be required to address climate change,⁹² and the absence of know-how and other soft technologies in the compulsory transfer process.⁹³ One study argued that:

*While these criticisms may be valid, they do not necessarily undermine the potential of compulsory licensing to act as one solution to address developing countries concerns. Furthermore, until a more appropriate solution, or solutions, is devised, a flawed model is likely to be better than no action at all.*⁹⁴

Another study stated that:

*though compulsory license has been useful for facilitating access to medicines through generic manufacturing and importation, in the context of access to ESTs, there might be instances in which compulsory license could be an essentially limited option for developing countries, for those whose local firms are not technically capable of using the patented technology. These possible limitations also need to be noted.*⁹⁵

Technical know-how at large is not disclosed through patent specifications because inventors would like to keep it secret owing to confidentiality and concerns of competitiveness and particularly because a great deal of know-how is developed after filing the application. Carlos Correa and James Love indicated that US case practices⁹⁶ may be instructive in this regard, in which a transfer of know-how was required as part of a compulsory licence or settlement decree.⁹⁷

Under Article 31(f) of TRIPS, a compulsory licence can be issued essentially for supply of the domestic market of the member authorising the use of the compulsory licence. Thus, it was not possible to grant a compulsory licence to serve export markets. The TRIPS Amendment of 2005 in Article 31bis⁹⁸ allows granting of compulsory licences for exporting markets where countries lack technical and manufacturing capacity particularly for medicines. It is yet to be tested by any country to what extent Article 31bis is applied or not for exporting low-cost ESTs in case of low or no manufacturing capacity in LDCs. Matthew Littleton considered the waiver under Article 31bis TRIPS in theory possible to extend to ESTs, particularly in view of the Declaration on TRIPS and Public Health stating that ‘[e]ach Member has the right to grant compulsory licences and the freedom to determine the grounds upon which such licences are granted’.⁹⁹

However, available patent data suggest that climate technologies are not widely patented in the LDCs. Therefore, they do not enjoy exclusive protection in LDCs. Thus, these technologies could be freely imitated or copied to fit to local conditions even without any compulsory licence.¹⁰⁰ Zaman argued that:

*this is not an act of altruism; rather, it is the unwillingness of the patent holders to patent a high-tech product or process in a poor country, which is not a feasible or profitable market for that product. If at any point in time the patent holder or producer foresees any demand for the product in the market, they must apply for a licence without further delay. Thus, the absence of patents usually does not have any far-reaching benefit to poor developing countries.*¹⁰¹

In this regard, it might be more useful if WTO members agree to make a clarification by acknowledging climate change urgency as grounds for issuing compulsory licences. Despite public health-related amendment (Article. 31 bis) being unable to generate expected benefits, it is argued that

the TRIPS Agreement should be amended, or WTO members should make a clarification to allow production, import and export of climate technologies under compulsory licences, particularly to help LDCs that have no or little manufacturing capacities for climate technologies.¹⁰²

In this regard, this author has referred an alternative way to use patented technologies in case of environmental emergencies like climate change by paying an equitable royalty to the patent holder (which might encourage patent holders to also transfer technical know-how); ‘the determination of royalties may be adopted based on the ranking of concerned importing countries in the Human Development Index (HDI) of the UNDP’.¹⁰³

However, when both importing and exporting countries are LDCs and a particular technology has not been patented in either of these countries, they could utilise relevant technologies even without granting compulsory licences. For example, Bangladesh can produce limited climate technologies (e.g. solar power technologies) and as of 2020, these technologies have not been patented, which creates an opportunity for Bangladesh (the country has already taken advantage of LDC status to export pharmaceuticals to more than 100 countries) to export limited climate technologies to other LDCs.¹⁰⁴ The LDCs could also explore the potential of technical and financial cooperation under Articles 66.2 and 67 of the TRIPS Agreement for accessing and transferring urgently needed climate technologies.

Articles 66.2 and 67 of the TRIPS Agreement

Article 66.2 of the TRIPS Agreement includes a provision on technology transfer to help LDCs.¹⁰⁵ Watal and Caminero stated that the obligation under Article 66.2:

*does not say that developed country members shall transfer technology to LDCs nor even ensure the transfer of technology to LDCs, but only obliges developed country members to provide incentives to enterprises and institutions in their territory with the objective of promoting and encouraging technology transfer to LDCs.*¹⁰⁶

However, Correa claimed that Article 66.2:

*puts an obligation on developed Member countries to provide incentives to enterprises and institutions. However, the precise nature of the incentives is not established; only their end is spelled out: to enable LDC members ‘to create a sound and viable technological base’.*¹⁰⁷

The LDCs continuously requested that Article 66.2 obligations be clarified and made more effective. At the Doha Ministerial Conference in 2001, ministers agreed that the TRIPS Council would ‘put in place a mechanism for ensuring the monitoring and full implementation of the obligations’.¹⁰⁶ In February 2003, the TRIPS Council adopted a decision, establishing a mechanism that required developed country members to provide detailed information on how their incentives are functioning in practice for the technology transfer to LDCs.¹⁰⁸ In a study conducted by Surie Moon, it was concluded that it is unclear whether Article 66.2 has led to *any* increase in incentives for technology transfer to LDCs.¹⁰⁹

The TRIPS Council Decision of 29 November 2005 established a process in which LDCs were requested to provide information on what they consider priorities for technical and financial assistance. Although all LDC members were originally requested to provide the TRIPS Council with their priority needs assessments by 1 January 2008, as of November 2020, only nine of 36 LDC members have submitted assessments.¹¹⁰

The LDC officials contended that LDCs had little interest to submit such an assessment because they had the presuppositions that they might not receive adequate support from such assessment. Further, in reality, LDCs that have submitted such assessments received far short of financial and technical assistance than requested as per submitted assessment.¹¹¹ As Moon stated, ‘Of the 384 programmes listed by the reporting countries, only 11 percent met the criteria of targeting an LDC WTO member with a programme or policy that encourages technology transfer’.¹¹² A review of the nine LDCs that submitted assessments revealed that there is considerable weakness in terms of making the assessment¹¹³ report and identifying related technologies. Therefore, it is difficult to show how the respective LDCs could receive adequate financial and technical cooperation to develop a sound and viable technological base in their respective countries.

The Cambodian proposal in 2018¹¹⁴ argued that despite decisions taken in 2000¹¹⁵ and 2003¹¹⁶ concerning implementations of Article 66.2 continues to fall short of the letter and spirit of TRIPS Agreement mandate.¹¹⁷ The LDCs claimed that the notifications of developed countries refer to technical assistance projects and programs, but neither detail

the incentives provided nor specify the purpose of the incentives and how these could encourage the transfer of technology to LDCs.¹¹⁴

While Article 66.2 stated about providing incentives to local enterprises and institutions to encourage them for technology transfer to the LDCs, Article 67 requires developed country members to provide ‘technical and financial assistance’ in favour of developing countries and LDC members ‘to facilitate the implementation’ of the TRIPS Agreement.¹¹⁸

Article 67 of the TRIPS Agreement stated assistance shall include but is not limited to:

*assistance in the preparation of laws and regulations on the protection and enforcement of intellectual property rights as well as on the prevention of their abuse, and support regarding the establishment or reinforcement of domestic offices and agencies relevant to these matters, including the training of personnel.*¹¹⁹

The language used in Article 67 is vague; therefore, the exact contours of the obligations it contains are unclear.¹²⁰ Official WTO documents provide little guidance as to the exact meaning or interpretation of Article 67 or its terminology. To date, no dispute over the transitional arrangements in Part VI of TRIPS has been brought before the WTO’s dispute settlement body.¹²¹ Hence, it is difficult to evaluate actual progress of actions taken and assistance provided on the basis of reports submitted under Article 67.¹²²

Again, in terms of wording, it is not clear whether Article 67 could be used to argue necessity of technology transfer to facilitate the implementation of the Agreement or not. Despite this, using Articles 7 and 8 of the TRIPS Agreement as some sort of guiding light and bridge function, the LDCs could argue that without adequate technology transfer, it would be impossible for them to develop a sound and viable technological base and hence, they could not implement the TRIPS Agreement.¹²³ Again, Article 67 could be read in combination with Article 66.2, which clearly indicates that the purpose behind the developed countries’ obligation to incentivise enterprises and institutions are to enable LDCs ‘to create a sound and viable technological base’. David M Fox argued that ‘this language mirrors that used in the *preamble* and is further proof that the *preamble* affirms the positive obligations imposed on developed

countries in Article 66.2’.¹²⁴ Hence, the same positive obligations could be assumed from Article 67.

The continuous extension of waiver periods for TRIPS implementation in the LDCs under Article 66.1¹²⁵ since the adoption of the TRIPS Agreement and continuous approval of such extensions until 1 July 2034 (even possibility to receive further extension) itself justify the inadequacy of the financial and technological assistance received by the LDCs to create a ‘sound and viable technological base’ in their respective countries.¹²⁶ Therefore, Articles 66.2 and 67 to a greater extent fail to set an explicit obligation on developed countries to assist LDCs with technical and financial support.¹²⁷ Ahmed Abdel Latif argued that the importance of IP rights should neither be overestimated nor underestimated, and it is vital to evaluate options of practical measures and initiatives, empirical evidence and concrete cases.¹²⁸

Correa stated that it is inappropriate for developed countries to deny an existing problem, and the existing system of private appropriation of innovations may delay for 20 years the introduction of new technologies in LDCs.¹²⁹ He further argued that climate change is one of the greatest challenges that humanity is facing. Hence, a responsible international community cannot basically avoid the problems that surround IP rights and climate change. Rather, it should involve all stakeholders to identify a potential solution.¹³⁰

Some non-government organisations and other commentators criticised the priority needs assessment as merely a delay tactic used by developed country members to further postpone honouring their promises for assistance.¹³⁰ These critics also claimed that the priority needs assessment would force LDCs to spend already scarce resources on collecting data and information regarding the status of their implementation of TRIPS.¹³¹ Because there are no specific guidelines for the appropriate scope, depth, breadth and criteria of the priority needs assessments, the priority needs assessments submitted so far differ significantly in quality, scope, analytical reasoning and structure.¹³²

Again, developed countries such as the US consider that technical and financial assistance should be entirely targeted at bringing LDCs’ IP laws and institutions into compliance with the obligations of the TRIPS Agreement. Hence, transfer of technology to LDCs to attain a sustainable technical base is not a major concern.¹³³ The experiences of the nine LDCs

that have submitted priority need assessments revealed that they received inadequate funding and technical cooperation to make substantial technical and infrastructural progress. No positive outcomes have demonstrated that such an exercise helped them to have access to and transfer of climate technologies.¹³³

In the absence of specific definition of technology transfer under the TRIPS Agreement, it is difficult to measure the nature and list of incentives for technology transfer as reported under Article 66.2 and the effectiveness of technical and financial assistance activities as provided under Article 67. Shugurov argued that ‘the lack of definition was viewed by some commentators as allowing reporting Member to stretch the definition of technology transfer to meet the obligations under that provision without making the necessary policy changes’.¹³⁴ Moon observed that it is difficult to find any concrete evidence to support the notion that developed countries put in place new incentives because of Article 66.2.¹³⁵

Reviewing the reports submitted by the developed countries between 2003 and 2016 under Article 66.2 requirements, Watal and Caminero mentioned that:

*The absence of a common understanding on fundamental concepts—such as ‘transfer of technology’ or ‘incentives’ used in the text of Article 66.2—is reflected in many of the annual reports. More than the question of whether developed countries are meeting their obligation, the manner in which the reports are presented does not provide a clear picture of the action taken to incentivize the promotion of technology transfer to LDCs in a way that would enable them to have a sound and viable technological base.*¹³⁶

Considering that it is difficult to assess the nature and effectiveness of incentives to encourage technology transfer, Chakroun proposed that shifting the focus from ‘incentives to enterprises’ to technical cooperation under Article 66.2 along with assisting the LDCs for developing national innovation strategy with an adequate IP policy could contribute towards the creation of a sound and viable technological base.¹³⁷

Chakroun further suggested the technical assistance should be complemented by further technical and financial cooperation to LDCs for establishing a Technology Transfer Office (TTO) under a secured funding mechanism.¹³⁸ However, LDCs need to develop a robust needs assessment system to benefit

from the proposed TTO. Another important issue is identification of available and necessary climate technologies and potential financial means to access and having transfer of such technologies that could help the LDCs for the mitigation of and adaptation to climate change. In this regard, a dedicated database on available and necessary climate technologies along with details on the intellectual property status, potential financial mechanism or IP aid and other alternative mechanisms for financial and technical cooperation from the developed countries might be useful.¹³⁹ It is expected that such a database should indicate potential means to have dedicated funding preferably using Articles 66.2 and 67 of the TRIPS Agreement along with other potential financing options under the Paris Agreement to facilitate access and transfer of ESTs to the LDCs.

Because it might become a complex procedure to seek clarity or amendment of the TRIPS provisions, LDCs and developing countries could request under the TRIPS Council for introduction of a comprehensive stocktaking and reporting of technology transfer obligations clearly indicating ‘what has been requested and what has been provided’ based on the requests. As there is no substantive standard by which the reports submitted by the developed countries are to be evaluated, ‘developed country members are essentially free to decide how to facilitate technology transfer to LDCs’.¹⁴⁰ Therefore, it is important:

*to develop a set of substantive minimum standards that define the obligations of developed nations toward LDCs. A substantive minimum standard might take the form of requirements for certain amounts of specific programs, to be measured by financial investment or some other measure relating to technology transfer.*¹⁴¹

However, to evaluate the minimum standard of technical and financial cooperation to the LDCs, the LDCs could request from the TRIPS Council a comprehensive reporting and review mechanism, which could review ‘what has been requested and what has been provided based on the requests’. Again, such a review mechanism could address how non-fulfilment of the requests be addressed either via the dispute settlement body for non-compliance or could establish a new framework under the TRIPS Council to take remedial measures in case of the inadequacy and non-compliance of technology transfer obligations.¹⁴²

However, to introduce a remedial measure for non-compliance with Articles 66.2 and 67 of the TRIPS Agreement, a broader consensus among WTO members is necessary. The LDCs' use of TRIPS flexibilities from climate change standpoint will fail, if such interpretations are not accepted by the developed countries because developed countries could determine stricter methods of implementing TRIPS provisions within their own legal system and practice as per Articles 1(1) of the TRIPS Agreement. This may continue to restrict access to and transfer of climate technologies to LDCs. As Reichman argued, 'the TRIPS Agreement left the intellectual property glass either half full or half empty, depending on one's point of view'.¹³⁹

Since the adoption of the TRIPS Agreement, the US, the EU and Japan had drawn up a list of new topics, including new demands for higher IP protection.¹⁴³ Hence, it could be assumed that any attempts to weaken IP protection by LDCs, whether from a climate change viewpoint or from any other public policy considerations, might not be accepted by these developed countries without opposition. Hence, a declaration on climate change and the TRIPS Agreement might be required to clarify that LDCs and other developing countries should be allowed to use TRIPS flexibilities from a climate change standpoint. Further, any over-protective IP law measures that might restrict access to and transfer of climate technologies be avoided and LDCs will have freedom to use competition law, compulsory licences and other potential measures to prevent such negative effects.

Potential for a 'Declaration on TRIPS Agreement and Climate Change'

During the Doha COP-18 in 2012, The Climate Action Network argued that there should be a Declaration on Intellectual Property and Climate Change to facilitate the 'rapid and efficient uptake of technologies to address mitigation and adaptation' using the model of Doha Declaration on the TRIPS Agreement and Public Health.¹⁴⁴ Developing countries and non-governmental organisations supported the notion that a Doha-like declaration on climate change and technology transfer could be vital for encouraging technology transfer to developing countries. This was echoed by particularly India, African groups and several other Asian developing countries.¹⁴⁵ The developing countries contemplate that such a declaration would preserve the principle that:

nothing in the TRIPS Agreement can minimize or impair the flexibilities provided for in that Agreement, nor prevent or limit Members taking measures they consider necessary to protect their population from the effects of climate change and to make use of "environmentally sound technologies".¹⁴⁶

Such a declaration could create political gain for the developing countries and the LDCs. However, it is doubtful to what extent that might facilitate meaningful technology transfer to LDCs. Abbot rightly mentioned that 'Assuming that TRIPS Agreement flexibilities are well understood among experts, negotiations regarding a Declaration on IPRs and Climate Change arguably would be time-consuming and disruptive in the absence of significant foreseeable "payoff"'.¹⁴⁶

Nevertheless, this kind of declaration might have significance to create a wider awareness among LDCs, SMEs and civil society groups regarding flexibilities available under the TRIPS Agreement and potential use of these flexibilities for accessing climate-related technologies in the LDCs. Further, it could create strong public opinion and put pressure on developed countries and their private entities to enhance support for technology transfer and at least not impose restrictive licensing for accessing such technologies.

Even if a Declaration on IP Rights and Climate Change might be appropriate from the standpoint of the progressive development of international law. There is a dilemma that might trigger contention as to the potential body that should issue such a declaration and potential contents that might be included. As Abbot stated:

The Doha Declaration was adopted within the framework of the WTO and expressly applied to the TRIPS Agreement. However, because negotiations with respect to climate change are taking place in the UN framework, and because the WTO is not a UN institution, it appears more appropriate to situate an IPRs and Climate Change Declaration in the forum of the United Nations Framework Convention on Climate Change, or even more broadly in the United Nations General Assembly.¹⁴⁷

Nevertheless, the author of this paper consider that the arguments of Abbot have significance in terms of using the declaration as the highest political will of the global community to solve the problem and to draw attention from different stakeholders. However,

there is a possibility to use this as some sort of legal tool for the clarification and interpretation of the TRIPS provisions in the context of climate change. Therefore, LDCs might not be unreasonably prevented from having access to and transfer of climate technologies. It would be better to adopt a declaration on the TRIPS Agreement and climate change within the framework of the WTO. Such a declaration could guide interpretation of the TRIPS flexibilities from a climate change standpoint. While it was highly politically disputable to request such a declaration back in 2009, after the adoption of the Paris Agreement as a universal framework to tackle climate change with the participation of major emitters including the developing countries (as China, India, the EU, and USA all backing climate change objectives), it has become a favourable environment to push for such a declaration to further guide how can TRIPS be used in the context of climate change.

It could be argued that such a declaration ‘could lend credibility to IPR protection regimes’.¹⁴⁷ Hence, it could increase viability of TRIPS as a potential means for promoting not only trade but also addressing issues of global sustainable challenges and assisting the LDCs for developing sustainable technological base in their respective countries as per Articles 7 and 8 of the TRIPS Agreement. It is argued that a number of 2030 Sustainable Development Goals (SDGs) as adopted under the United Nations back in 2015 can be achieved through the adoption of clean technologies, and the TRIPS Agreement and other WTO agreements have a role play in facilitating development of, access to and transfer of such technologies.¹⁴⁸ In this regard, it could be argued that a declaration on the TRIPS Agreement and climate change should acknowledge that many of the SDGs, particularly SDG 13 on climate change, SDG 3 (health), SDG 7 (affordable and clean energy), SDG 9 (innovation and industrialisation) and SDGs 17 (technology as a means for implementation) are dependent upon the development of, access to and transfer of innovative technologies.¹⁴⁹ Hence, a potential declaration on the TRIPS Agreement and climate change has become very relevant, not only from the climate change standpoint but also from SDGs perspectives because the WTO itself, including the TRIPS Agreement, committed to act towards the realisation of sustainable development.

It is worth noting that the preamble to the Marrakesh Agreement establishing the WTO includes sustainable development and the need to protect and

preserve the environment among the key objectives. Therefore, a declaration on the TRIPS Agreement and climate change would further strengthen the commitments to SDGs and role of the TRIPS Agreement to facilitate access to and transfer of climate technologies to protect and preserve the environment. It is expected that such a declaration would be useful to avoid conflicting interpretations of the TRIPS flexibilities that might restrict access to and transfer of climate technologies to LDCs.

If the TRIPS Agreement could not assist the LDCs gaining access to and having transfers of climate technologies for addressing climate change challenges and realisation of SDGs that might risk the survival of the WTO system. Reichman argued earlier a more cooperative approach would lead to greater gains while lessening the risk of creditability of the WTO system itself.¹⁵⁰ Although a declaration could make partial progress towards removing threats of conflicting interpretations and allowing LDCs to use the TRIPS Agreement from a climate change standpoint, adoption of a new agreement might be necessary for facilitating a long-term gain for promoting trade and technological innovation as a vehicle for sustainable development as well as for managing challenges relating to climate change.

Towards a New Agreement on International Trade and Sustainable Development

The government of New Zealand, along with five other WTO members—Costa Rica, Fiji, Iceland, Norway and Switzerland—negotiated a plurilateral Agreement on Climate Change, Trade and Sustainability (ACCTS) has addressed the issues of environmental goods, environmentally relevant services, fossil fuel subsidies and voluntary ecolabelling.¹⁴⁴ Also a Report from the Swedish Ministry of Trade pointed at the potential for a new trade agreement under the auspices of the WTO and beyond for addressing issues specific to liberalising trade in climate-friendly goods and services and reforming fossil fuel subsidies.¹⁵¹ Neither the ACCTS nor the Swedish proposal contained any suggestions under or related to the TRIPS Agreement, and the role of IP in facilitating access and transfer of climate technologies to LDCs has obviously not been considered as part of the future agreement on trade and climate change. Further, the concerns of LDCs were not seriously considered in the ACCTS and Swedish proposal respectively. In contrast, this author holds that to ensure a broad-based participation of

developing countries and LDCs in such an agreement, also concerns over the TRIPS Agreement must be included in the future negotiations of such an agreement. In addition, the new agreement should not narrow down to only the TRIPS Agreement and climate change. Rather, it should address broader issues of international trade and sustainable development. Ignoring the concerns of LDCs and a substantial number of developing countries over the role of the TRIPS Agreement for facilitating access to and transfer of climate technologies might easily start a new chapter of conflict rather than closing it. For example, one study argued that:

*the threat of dangerous climate change might call for a move beyond the current framework and the adoption of a brand-new agreement on IP and climate change crafted to clarify existing flexibilities and offer new incentives for the transfer of environmentally sound technologies, both for adaptation and mitigation purposes.*¹⁵²

It stated that a new agreement could focus particularly on LDCs (but should not confine itself to only LDCs) to address situations in which IP protection could not adequately facilitate trade and investment flows to address acute climate change problems. Hence, considering potential role of the WTO towards attaining the 2030 SDGs and necessity of fine-tuning trade regime with the climate change related challenges, it is vital that the WTO should adopt a new agreement. And any such agreement should not ignore the concern of the LDCs and should give due consideration to the role of IP in facilitating access to and transfer of climate technologies to the LDCs.

Conclusion

The TRIPS Agreement was negotiated to ensure better global harmonisation and higher standards of IP right. To achieve this goal, it was also necessary to recognise the need for various types of measures to address the spectrum of diverging socioeconomic conditions and developmental goals in the world. Therefore, built-in TRIPS flexibilities that serve to reach common standards cannot be interpreted in a way that could defeat the overarching objectives and principles of the TRIPS Agreement. Therefore, LDCs should have the freedom to use the flexibilities in such a way that could prevent situations that might jeopardise the LDCs' struggle towards making sustainable technological bases in their respective countries for dealing with issues like mitigation and

adaptation to climate change. The Max Planck Declaration on Patents Protection back in 2014 stated that sovereign state parties should 'retain the discretion to adopt a patent system that best suits their technological capabilities as well as their social, cultural and economic needs and priorities'.¹⁵³ In this respect, considering climate change as a common concern of humankind, the objectives of both the WTO and the TRIPS Agreement (such as Articles 7 and 8), successive developments, such as the Doha Declaration, as well as non-WTO developments, such as technology transfer commitments under Article 4.5 of the UNFCCC and Article 10 of the Paris Agreement and SDGs could be considered using the treaty interpretation norms of the VCLT to provide more liberal interpretations of the TRIPS Agreement to ensure maximum flexibilities for facilitating access to and transfer of climate technologies to the LDCs.

While acknowledging the limitations of Articles 7 and 8 of the TRIPS Agreement, patent-related flexibilities still could accommodate issues of technology transfer in the context of climate change and technological and scientific progress and the low level of technical and financial capacity of the LDCs. In this regard, Articles 66.2 and 67 could be utilised to help LDCs via technology transfer and financing for technology transfer and encouraging joint ventures and technological collaboration in way that could help the LDCs progress towards implementation of the TRIPS Agreement and help them access and transfer climate technologies.

LDCs need more financial and technical support to assess proper technology needs with a focus on urgently needed climate technologies. This could form the basis for the proposed dedicated climate technology database with IP status and possibility to have financing and collaboration with the relevant private sectors in the developed countries or even in the developing countries like China, Brazil, India and South Africa (which might have cheaper options, obviously not sacrificing quality to be able to assist for mitigating and adapting to climate change) with a goal and specific technology oriented financial cooperation from the developed countries under Articles 66.2 and 67 of the TRIPS Agreement.¹⁵⁴ It is also important to review reports submitted by developed countries under Articles 66.2 and 67 and to make a detailed review under a comprehensive review mechanism to evaluate technologies requested and

received. If not, then possible means to address the non-compliance and further review and actions to be taken. This could help to bridge the trust deficit about the TRIPS Agreement among the LDCs, which will ultimately contribute towards improving access to and transfer of technologies and LDCs' confidence in the IP system in general and the TRIPS Agreement. This would improve the IP system to promote innovation, protecting the IP assets of private entities and technological development in the LDCs.

Further, LDCs could request at the TRIPS Council meeting to develop cooperative and differentiated IP arrangements on urgently needed technologies in cooperation with the global IP organisation-World Intellectual Property Organisation and the Climate Technology Centre and Network as established under the UNFCCC (and integral part of the technology mechanism under the Paris Agreement too). As one study indicated, cooperative IP arrangements such as cross-licensing, patent pooling, technology standards agreements and other forms of technology sharing could have the greatest positive impact in the poorest countries with the least access to finance.¹⁵⁵ Therefore, apart from utilising the available options under the TRIPS Agreement, the LDCs could lobby for more such cooperative and collaborative arrangements that might facilitate more access and transfer of climate technologies to the LDCs.

This paper evaluates how different TRIPS flexibilities be used while further could address possible challenges to utilise these specific options. Even considering the potential difficulties of using these provisions from a climate change standpoint, it requires further study concerning potential of a new declaration and/or a new agreement to facilitate access to and transfer of climate technologies to the LDCs. Climate change is not a problem that can be solved overnight. Therefore, the possibility to adopt such an agreement to facilitate access and transfer of urgently needed climate technologies requires attention and requires further research to what extent and how these issues could be addressed under the new agreement. It is necessary to evaluate how such an agreement could address issues over the TRIPS Agreement to create a win-win situation both for innovators and users of such technologies and how that could help LDCs to develop indigenous technological capacity and make a sustainable technological base in their respective countries to

manage climate change and broader sustainable development-related challenges.

References

- 1 The United Nations Framework Convention on Climate Change, 9 May 1992, 1771 U.N.T.S. 107 (entered into force 21 March 1994).
- 2 For example, the Stern Review of 2007 pointed out that, "the development and deployment of a wide range of low-carbon technologies is essential in achieving the deep cuts in emissions that are needed". Stern N, *The economics of climate change, The Stern Review* (Cambridge University Press, New York 2007).
- 3 IPCC, *Climate Change 2007 – Mitigation of Climate Change*, Contribution of Working Group III to the Fourth Assessment Report of the IPCC (Cambridge University Press, January 2008), Chapter 2.7, 158.
- 4 There are no specific criteria for defining the LDCs under the United Nations Framework Convention on Climate Change (UNFCCC) including in the Paris Agreement and under the Agreement on Trade Related aspects of Intellectual Property Rights (TRIPS Agreement) respectively. It is assumed that the UNFCCC and the TRIPS Agreement used the UN classification of the LDCs based on three criteria: low income, weak human assets, and high economic vulnerability. Criteria for Identification and Graduation of LDCs, UN-OHRLLS, <http://unohrlls.org/about-ldcs/criteria-for-ldcs/>.
- 5 Stott C, An Examination of the Least Developed Countries in the IPCC AR5 WGII, *IIED Issue Paper* (IIED, London, 2014).
- 6 Adhikari R & Ssemuwemba A, How aid for trade can best support least developed countries in the next decade, <https://oecd-development-matters.org/2021/12/10/how-aid-for-trade-can-best-support-least-developed-countries-in-the-next-decade/>.
- 7 UNCTAD, International trade in developing economies, 2020, <https://sdgpulse.unctad.org/trade-developing-economies/>.
- 8 This Article used terminologies 'climate technologies' along with other related terminologies such as Environmentally Sound technologies (ESTs), clean technologies, 'green technologies', low carbon technologies, climate friendly technologies, mitigation technologies and adaptation technologies interchangeably while considering different definitions and effects of these terminologies and particularly taking into account the objectives of all these technologies is to contribute for less polluting, improve environmental conditions and thereby contributing to mitigation and adaptation to climate change.
- 9 Pigato M, Black S J, *et al.*, *Technology Transfer and Innovation for Low-Carbon Development* (World Bank, Washington, DC, 2020).
- 10 It might become a barrier for the LDCs as they could not afford to pay for royalties and fees for expensive patented technologies, see for details, Anna D, Political economy of technology transfer, *BMJ*, 319 (1999)1298.
- 11 For example, South Korean firms and R&D institutions claimed both private firms and public institutions of developed countries refused to license several ESTs like

- HFC-134a, fuel cell and Integrated Gasification Combined Cycle (IGCC) although under the Montreal Protocol, developed countries were required to take every practicable step to ensure the transfer of necessary technologies to the developing countries. Another cited example is Indian firms were refused licenses on patented technologies for substitutes of ozone depleting substances, in order to prevent emergence of competitors; Chung R K, *Korean Trade Promotion Agency Case Study: The Republic of Korea and the Montreal Protocol* in Jha V & Hoffman U (eds.) *Achieving Objectives of Multinational Environmental Agreements: A Package of trade Measures and Positive Measures*, United Nations Conference on Trade and Development UNCTAD/ITCD/TED/6, Watal J, *Case Study India: The Issue of Technology Transfer in the Context of the Montreal Protocol* in Jha V & Hoffman U (eds.) available at http://www.unctad.org/en/docs/itcdted6_en.pdf, accessed on 12 June 2018.
- 12 “For example, though the US ethanol industry was willing to transfer technology related to pre-treatment techniques for cellulosic ethanol since there were no concerns about competition from China. However, the US ethanol industry would not share its latest biological enzyme technology advancements because it has a clear competitive advantage in this area”, ‘Accelerating climate relevant technology innovation and transfer to developing countries: Using TRIPS flexibilities under the UNFCCC’ (Analytical Note, South Centre, Geneva, 2009).
- 13 There is a possibility that mere tiny improvements over near to expire patented technologies or unpatented basic technologies might be patented to prevent competing firms from accessing the technology or prolong entry to similar products with low cost. See for details, Granstrand O & Tietze F, *IP strategies and policies for and against evergreening* (Centre for Technology Management working Paper series, Chalmers University of Technology, 2014).
- 14 There has been a rise in the number of litigations on infringements on patents over climate technologies. This has already been evident in the wind technology sector. For example, “In the US, General Electric (GE) and other firms have successfully used patent infringement litigation to block foreign access to the US market. ... the top ten assignees of wind motor technology in China are firms from developed countries with GE owning more than 200 patents on wind motor technology after its acquisition of Enron. GE has not only used patent litigations to block the entry of foreign competitors into the US market, but after acquiring Enron, it has also indulged in patent litigation in China as well”, South Centre (2009) and Liping D, *Analysis of the Technical Competitive Strategy of main Competitors in the Field of Wind Power* (Institute of Scientific and Technical Information of China, Beijing), www.bjstinfo.com.cn/iticti08/upload/attachments/200811031717870.ppt (accessed on 12 June 2018).
- 15 The Agreement on Trade Related Aspects of Intellectual Property Rights, 15 April 1994, http://www.wto.org/english/tratop_e/trips_e/t_agm0_e.htm.
- 16 Athreye S, Piscitello L & Shadlen K, Twenty-five years since TRIPS: Patent Policy and international business, *J Int Bus Policy*, 3 (2020) 315–328, <https://doi.org/10.1057/s42214-020-00079-1>.
- 17 UNCTAD-ICTSD, *Resource Book on TRIPS and Development* (Cambridge University press, New York, 2005) 737.
- 18 UNCTAD-ICTSD (20005).
- 19 Ockwell D, *Intellectual Property Rights and Low Carbon Technology Transfer to Developing Countries – A Review of the Evidence to Date* (UK-India Collaboration to Overcome Barriers to the Transfer of Low Carbon Energy Technology: Phase 2, Sussex Energy Group, UK, TERI, India, Institute of Development Studies, UK, 2008) 5.
- 20 European Patent Office, 2007, *The Age of Wind Industry?* <http://www.epo.org/topics/innovation-and-economy/emerging-technologies/Articleicle-10.html>.
- 21 Copenhagen Economics A/S and The IPR Company ApS (19 January 2009), *Are IPR a Barrier to the Transfer of Climate Change Technology?* 39.
- 22 Boldrin M & Levine D K, The case against patents, *Journal of Economic Perspectives*, 27 (1) (2013) 3-22; The Least Developed Countries Report 2007, (UNCTAD/LDC/2007, UNCTAD).
- 23 Bazilian M *et al.*, Considering technology within the UN climate change negotiations’ (2008), <https://www.ecn.nl/publicaties/PdfFetch.aspx?nr=ECN-E--08-077>.
- 24 The Paris Agreement, 12 December 2015, C.N.92.2016.TREATIES-XXVII.7.d (entered into force 4 November 2016); Azam M, A Journey from Rio to Paris via Kyoto to facilitate technology transfer to the LDCs under the UNFCCC, *Journal of Property, Planning and Environmental Law*, 13(1) (2020) 60-84.
- 25 Glasgow Climate Pact, https://unfccc.int/sites/default/files/resource/cop26_auv_2f_cover_decision.pdf (accessed on 26 December 2021).
- 26 Santamauro J P, Failure is not an option: Enhancing the use of intellectual property tolls to secure wider and more equitable access to climate change technologies, in Brown A (Ed.), *Environmental Technologies, Intellectual property, and Climate Change* (Cheltenham: Edward Elgar, 2013); Abbott F M, *Innovation and Technology Transfer to Address Climate Change: Lessons from the Global Debate on Intellectual Property and Public Health*, ICTSD’s Programme on IPRs and Sustainable Development, Issue Paper No. 24 (Geneva: International Centre for Trade and Sustainable Development, 2009); Azam M, Intellectual Property and Climate Change after COP 15: Towards Effective Framework for Technology Transfer, *Nordic Environmental Law Journal*, 2 (2010) 145-159.
- 27 From this starting point, the author tried to use doctrinal method from a pragmatic and practical perspectives, which has been rightly illustrated by Holmes as “...in the first place, to follow the existing body of dogma into its highest generalizations by the help of jurisprudence; next, to discover from history how it has come to be what it is; and finally, so far as you can, to consider the ends which the several rules seek to accomplish, the reasons why those ends are desired, what is given up to gain them, and whether they are worth the price”-, Holmes O W, The path of the Law, *Harvard Law Review*, 10 (1897) 457.

- 28 The WTO TRIPS Council is responsible for administering and monitoring the operation of the TRIPS Agreement in the Member countries.
- 29 GATT document MTN.GNG/NG11/W/50, 16 November 1989; Watal J, *Patents – An Indian Perspective* in: Watal J & Taubman A (Eds.), *The Making of the TRIPS Agreement: Personal Insights from Uruguay Round Negotiations* (2015) 308.
- 30 Azam M, Are technology transfer provisions under the TRIPS Agreement and the UNFCCC Paris Agreement working to facilitate access and transfer of climate technologies to the LDCs, *Manchester Journal of International Economic Law*, December (2021) 327.
- 31 Frankel S, The Applicability of GATT Jurisprudence to the Interpretation of the TRIPS Agreement in: Correa C (ed.), *Research Handbook on the Interpretation and Enforcement of Intellectual Property Under WTO Rules: Intellectual Property in the WTO, Vol. II* (Edward Elgar Publishing, Cheltenham, 2010) 3–23, p. 5.
- 32 For example, in 2011 China and India in a communication (TN/TE/W/79) to the WTO Trade and Environment Committee highlighted that intellectual property rights must not become a barrier for the transfer of technology to developing countries.
- 33 WT/CTE/M/3, 1995.
- 34 Report of the Meeting Held on 21–22 June 1995, Committee on Trade and Environment, 18 July 1995, WTO Doc. No. WT/CTE/M/3, Para30.
- 35 Ecuadorian Proposal, WTO Document (27 February 2013), IP/C/W/585, *Communication from Ecuador, contribution of intellectual property to facilitating the transfer of environmentally rational technology*, <https://docs.wto.org/dol2fe/Pages/SS/directdoc.aspx?filenam e=q:ip/c/w585.pdf> (25 June 2018).
- 36 Ecuadorian Proposal (2013).
- 37 TRIPS Council Discussion over Ecuador Proposal (October 2013).
- 38 Cambodian full proposal, “Communication from Cambodia on behalf of the LDC Group Proposal on the Implementation of Article 66.2 of The Trade-Related Aspects of Intellectual Property Rights (TRIPS) Agreement” (WTO Document IP/C/W/640, 15 February 2018), <https://media.ip-watch.org/weblog/wp-content/uploads/2018/02/Article-66.2-TRIPS-Council-Feb-2018.pdf?fc249d> (accessed on 21 June 2018).
- 39 ‘WTO members broaden the discussion on IP, inclusive innovation and the public interest’ (WTO, 27 February 2018) https://www.wto.org/english/news_e/news18_e/trip_27feb18_e.htm (accessed on 23 March 2018).
- 40 Cambodian Proposal (2018).
- 41 Discussion in TRIPS Council 27 February 2018).
- 42 Brown A, *Environmental Technologies, Intellectual property and Climate Change* (Edward Elgar, Cheltenham, 2013); Sommer T, *Can Law Make Life (too) Simple? - From gene patents to the patenting of environmentally sound technologies* (Copenhagen: Djøf Forlag, 2013); Rimmer M, *Intellectual property and clean energy: The Paris Agreement and climate justice* (Springer, Singapore, 2018); Shabalala D, ‘Challenges for technology transfer in the climate change arena: what interactions with the TRIPS Agreement?’ in: Calster G V & Prévost D (ed.), *Research Handbook on Environment, Health and the WTO*, (Edward Elgar, 2013) pp. 507-560; Zhuang W, *Intellectual Property Rights and Climate Change: Interpreting the TRIPS Agreement for Environmentally Sound Technologies* (Cambridge University Press, Cambridge, 2017).
- 43 Sommer T, *Can Law Make Life (too) Simple? - From gene patents to the patenting of environmentally sound technologies* (Copenhagen: Djøf Forlag, 2013), 49.
- 44 Sommer T, *Can Law Make Life (too) Simple? - From gene patents to the patenting of environmentally sound technologies* (Copenhagen: Djøf Forlag, 2013), 44.
- 45 Zhuang W, *Intellectual Property Rights and Climate Change: Interpreting the TRIPS Agreement for Environmentally Sound Technologies* (Cambridge University Press, Cambridge) 2017, 160.
- 46 Brown A, *Environmental Technologies, Intellectual property and Climate Change* (Edward Elgar, Cheltenham) 2013, 3.
- 47 Rimmer M, *Intellectual property and clean energy: The Paris Agreement and climate justice* (Springer, Singapore) 2018, 42; Latif A, Disputed impact, but not to be ignored, *Bulletin of the Atomic Scientists*, 20 February 2015, <http://thebulletin.org/climate-mitigation-and-intellectual-property-tension7997#>.
- 48 Rimmer M, *Intellectual property and clean energy: The Paris Agreement and climate justice* (Springer, Singapore) 2018, 58.
- 49 Sarnoff J, *Patents and climate change* In: J Sarnoff (ed) *Research handbook on intellectual property and climate change* (Edward Elgar, Cheltenham/Northampton, 2018) 344-345.
- 50 Vienna Convention on the Law of Treaties (VCLT), 23 May 1969, United Nations, *Treaty Series*, 1155, 331, <https://www.refworld.org/docid/3aef6b3a10.html> (accessed on 25 April 2021), Fitzmaurice M, Elias O & Merkouris P (eds.), *Treaty Interpretation and the Vienna Convention on the Law of Treaties: 30 Years On* (Brill, 2010); Corten O & Klein P, *The Vienna Conventions on the Law of Treaties: A Commentary* (Oxford University Press, 2011); Dorr O & Schmalenbach K, *Vienna Convention on the Law of Treaties: A Commentary* (Springer, 2012).
- 51 WTO Appellate Body Report, *US – Hot-Rolled Steel*, Para 60.
- 52 For example, Chapter 34 of Agenda 21, on the transfer of environmentally sound technologies, which was adopted at the first Earth Summit (1992) deals with IPRs, among other issues, and even includes a reference to the possible use of compulsory licensing.
- 53 On 14 November 2001, the WTO Doha Ministerial Conference adopted a declaration on TRIPS and Public Health which offered a much-needed clarification, confirming that “the TRIPS Agreement does not and should not prevent members from taking measures to protect public health. Accordingly ... the Agreement can and should be interpreted and implemented in a manner supportive of WTO members’ right to protect public health and to promote access to medicines for all”. The Doha Declaration confirmed the public health-oriented use of the TRIPS Agreement, Azam M, *Intellectual Property and Public Health in the Developing World* (Open Book Publishers, Cambridge) 2016.
- 54 The Preamble to the TRIPS Agreement, https://www.wto.org/english/docs_e/legal_e/27-trips_02_e.htm, (accessed on 28 June 2018).

- 55 Article 7 of the TRIPS Agreement.
- 56 Littleton M, *The TRIPS Agreement and Transfer of Climate Change-Related Technologies to Developing Countries*, DESA Working Paper No. 71(ST/ESA/2008/DWP/71, October 2008) https://www.un.org/esa/desa/papers/2008/wp71_2008.pdf(accessed on 25 December 2020).
- 57 Nevertheless, the potential for corrective action remains constrained by the requirement that such measures be consistent with the provisions (rather than the principles) of TRIPS.
- 58 The TRIPS Council however, granted a flexible implementation timeline to the LDCs to become TRIPS-compliant by July 2021, TRIPS Waiver periods for the LDCs, Azam M, *Intellectual Property and Public Health in the Developing World* (2016), Cambridge: Open Book Publishing (OBP).
- 59 Stillwell M & Tuerk E, *Towards a Full Review of The WTO's TRIPS Agreement under Article 71.1* (April 2001), http://www.ciel.org/Publications/Assessment_Trips_Articleic1e711.pdf(accessed on 25 June 2018).
- 60 Geiger C & Desautnettes L, Les Articleicles 7 et 8, Belle au bois dormant de l'accord sur les ADPIC' in C. Geiger (Ed.), *Le droit international de la propriété intellectuelle lié au commerce: l'Accord sur les ADPIC, bilan et perspectives*, Strasbourg: Lexis Nexis, 2017, p 68; Geiger C, Reconceptualizing the constitutional dimension of intellectual property' in: Torremans P (Ed.), *Intellectual Property Law and Human Rights*(3rd Ed) Kluwer Law International, 2015.
- 61 Slade A, Articles 7 and 8 of the TRIPS Agreement: A force for convergence within the International IP System, *The Journal of World Intellectual Property*, 14 (6) (2011) 413-440.
- 62 Vienna Convention on the Law of Treaties (VCLT), 23 May 1969.
- 63 Kennedy M, *WTO Dispute Settlement, and the TRIPS Agreement: Applying Intellectual Property Standards in a Trade Law Framework* (Cambridge University Press 2016).
- 64 Kennedy (2016).
- 65 WTO Appellate Body Report, *United States – Import Prohibition of Certain Shrimp and Shrimp Products*, WT/DS58/AB/R (adopted 6 November 1998), Para 114.
- 66 Report of the Panels, § 7.2404; Australia—Certain Measures Concerning Trademarks, Geographical Indications and Other Plain Packaging Requirements Applicable to Tobacco Products and Packaging—Report of the Panels; see also, Frankel S & Gervais D, Plain packaging and the interpretation of the TRIPS Agreement, *Vanderbilt Journal of Transnational Law*, 46(5) (2013) 1149–1213.
- 67 Frankel S, The WTO's application of 'the customary rules of interpretation of public international law' to intellectual property, *Victoria University of Wellington Legal Research Papers*, 4(1) (2014) 1–45, 20.
- 68 Khan G R, 'Policy space for domestic public interest measures under TRIPS' South Centre Research Paper, 22(2009) 12–13.
- 69 Cottier T & Véron P, *Concise International and European IP Law: TRIPS, Paris Convention, European Enforcement and Transfer of Technology*, 2nd edn, (2011), New York: Kluwer Law International, 95-96.
- 70 The Doha Declaration explained, https://www.wto.org/english/tratop_e/dda_e/dohaexplained_e.htm (accessed on 8 May 2021).
- 71 South Centre (2011), The Doha Declaration on TRIPS and Public Health Ten Years Later: The State of Implementation, available at https://www.southcentre.int/wp-content/uploads/2013/06/PB7_-Doha-Declaration-on-TRIPS-and-Health_-EN.pdf (accessed on 8 May 2021).
- 72 Zaman K, The TRIPS Patent Protection Provisions and their effects on transferring Climate Change Technologies to LDCs and Poor Developing Countries: A critical appraisal, *Asian Journal of International Law*, 3(1) (2013) 137-161. doi:10.1017/S2044251312000185.
- 73 Watal, J, *Intellectual Property Rights in the WTO and Developing Countries* (The Hague: Kluwer Law International, 2001).
- 74 Bonadio, E, Parallel imports in a global market: Should a generalised international exhaustion be the next step? *European Intellectual Property Review*, 33(3)(2011)153-161.
- 75 Zhuang W, *Intellectual Property Rights and Climate Change: Interpreting the TRIPS Agreement for Environmentally Sound Technologies* (Cambridge University Press, Cambridge) 2017, 277.
- 76 Bonadio, E, Parallel imports in a global market: Should a generalised international exhaustion be the next step? *European Intellectual Property Review*, 33(3) (2011)153.
- 77 Correa C, Intellectual Property Rights under the UNFCCC: Without Response to Developing Countries' Concerns, in Joshua D. Sarnoff (ed.), *Research Handbook on Intellectual Property and Climate Change*, (Edward Elgar, Cheltenham) 2016, 86.
- 78 Zhuang W, *Intellectual Property Rights and Climate Change: Interpreting the TRIPS Agreement for Environmentally Sound Technologies* (Cambridge: Cambridge University Press, 2017).
- 79 UNCTAD-ICTSD, *Resource Book on TRIPS and Development*, Cambridge University Press (2005) p. 360.
- 80 Zhuang W, *Intellectual Property Rights and Climate Change: Interpreting the TRIPS Agreement for Environmentally Sound Technologies* (Cambridge University Press, Cambridge) 2017, 255.
- 81 Azam M, The experiences of Patent Law Reforms in Brazil, India and South Africa and lessons for Bangladesh, *Akron Intellectual Property Journal*, 7(2) (2014) 61-100.
- 82 Camara Jr & Siemsen D, *Brazil: Prosecution of Pharmaceutical Patents in Brazil: Tensions Between The Brazilian Patent Office and ANVISA*, 22 July 2013, <https://www.mondaq.com/brazil/intellectual-property/253068/prosecution-of-pharmaceutical-patents-in-brazil-tensions-between-the-brazilian-patent-office-and-anvisa>(accessed on 23 June 2021).
- 83 United States Trade Representative (USTR) Special 301 Report, <https://ustr.gov/issue-areas/intellectual-property/special-301/2020-special-301-review>(accessed on 21 May 2021).
- 84 The South African Approach, Azam M, Globalizing standard of Patent Protection in WTO Law and Policy options for the LDCs, *Chicago-Kent Journal of Intellectual Property*, 13(2) (2013) 402-488.
- 85 Correa C, *Can TRIPS Agreement Foster Technology Transfer to Developing Countries?* in: K. Maskus and J.H.

- Reichman (Eds.) *International Public Goods and Transfer of Technology*, Cambridge University Press, 2005.
- 86 Nguyen T & Lidgard H, The CFI Microsoft Judgment and TRIPS Competition Flexibilities, *Currents International Trade Law Journal*, 16(3) (2008) 41-51.
- 87 Littleton M, *The TRIPS Agreement and Transfer of Climate Change-Related Technologies to Developing Countries*, DESA Working Paper No. 71(ST/ESA/2008/DWP/71, October 2008) https://www.un.org/esa/desa/papers/2008/wp71_2008.pdf.
- 88 “Founded in 1996, the International Centre for Trade and Sustainable Development (ICTSD) is an independent non-profit organisation based in Geneva, Switzerland. The goal of the organisation is to advance sustainable development through trade-related policymaking”, <https://www.ictsd.org/about-us/about-ictsd/our-mission> (accessed on 22 November 2020).
- 89 Referred in Rimmer (2011), International Centre for Trade and Sustainable Development, *Climate Change, Technology Transfer, and Intellectual Property Rights* (International Institute for Sustainable Development, 2008):6.
- 90 Khor M, *Climate Change, Technology and Intellectual Property Rights: Context and Recent Negotiations*, South Centre Research Papers:15 (11 May 2012).
- 91 As cited in Rimmer (2011) referring the study of Fiona Macmillan, ‘The World Trade Organization, and the Environment’ (Sweet & Maxwell, 2001), 31-32.
- 92 Rosenzweig S, Cooling the world by misappropriating patent rights, *IP Watch* (1 April 2009), <http://www.ip-watch.org/weblog/2009/04/01/cooling-the-world-by-misappropriating-patent-rights/>.
- 93 Maskus K, *Differentiated Intellectual Property Regimes for Environmental Technologies* (Organization for Economic Cooperation and Development, 2009) 23.
- 94 Phelan A, *Climate Change and Human Rights: Intellectual Property Challenges and Opportunities*, https://eprints.qut.edu.au/91198/1/Phelan_ANU%20Climate%20Change%20Rights%20Policy%20Paper.pdf (accessed on 23 June 2018).
- 95 South Centre (August 2009), ‘Accelerating Climate-Relevant Technology Innovation and Transfer to Developing Countries: Using Trips Flexibilities under the UNFCCC’, https://www.iisd.org/pdf/2011/tri-cc_conf_2011_trips.pdf.
- 96 “Courts in the US have approved considerable numbers of compulsory licensing requests for ESTs. One of the very interesting CL cases involved the Toyota-Paice patent decision. In August 2006, a court in the US granted Toyota a compulsory license on three Paice patents which involved a hybrid electric vehicle improvement, for a royalty of \$25 per automobile (E3G)”, South Center (August 2009).
- 97 Love J, Recent Examples of the Use of Compulsory Licenses on Patents, KEI Research Note 2, Knowledge Ecology International, March 2007; Correa M, *Technology Transfer under International Intellectual Property Standards*, in Maskus K & Reichman J (eds), *International Public Goods and Transfer of Technology under a Globalized Intellectual Property Regime*, Cambridge University Press, 2005, 239-40.
- 98 “WTO members on 6 December 2005 approved changes to the WTO’s intellectual property (TRIPS) agreement in order to make permanent a decision on patents and public health originally adopted in 2003. This was formally built into the TRIPS Agreement after acceptance of the Protocol amending the TRIPS Agreement by two thirds of the WTO’s members. The amendment took effect on 23 January 2017 and replaced the 2003 waiver for members who have accepted the amendment. Members who are yet to accept the amendment currently have until 31 December 2019 to do so...”; see for details, Amendment of the TRIPS Agreement, available at https://www.wto.org/english/tratop_e/trips_e/amendment_e.htm, accessed on 28 August, 2018.
- 99 Littleton M, *The TRIPS Agreement and Transfer of Climate Change-Related Technologies to Developing Countries*, DESA Working Paper No. 71(ST/ESA/2008/DWP/71, October 2008) 10-11.
- 100 Barton J, *Intellectual Property and Access to Clean Energy Technologies in Developing Countries: An Analysis of Solar Photovoltaic, Bio-fuel and Wind Technologies*, *Trade and Sustainable Energy Series*, Issue Paper Number 2, ICTSD, December 2007, <http://ictsd.org/i/publications/3354>; Abbott F, *Innovation and Technology Transfer to Address Climate Change, Lessons from the Global Debate on Intellectual Property and Public Health*, *Intellectual Property and Sustainable Development Series*, Issue Paper Number 24, ICTSD, June 2009.
- 101 Zaman K, *The TRIPS Patent Protection Provisions and Their Effects on Transferring Climate Change Technologies to LDCs and Poor Developing Countries: A Critical Appraisal*, *Asian Journal of International Law*, 3(1) (2013) 137-161. doi:10.1017/S2044251312000185.
- 102 Zaman K, *The TRIPS Patent Protection Provisions and Their Effects on Transferring Climate Change Technologies to LDCs and Poor Developing Countries: A Critical Appraisal*, *Asian Journal of International Law*, 3(1) (2013) 158.
- 103 “The rate depends entirely upon the location of the importing market and the rank of the importing country in the UNHDI. The formula is one, plus the number of countries on the UNHDI, minus the importing country’s rank on the UNHDI, divided by the number of countries on the UNHDI, multiplied by 0.04. The rate is then applied to the generic sales price. With 177 countries currently in the UNHDI index, the royalty rate can be expressed as: Royalty rate = $0.04 * [(178) - \text{rank importing country}] / 177$ ”. Azam further added “During the time of adoption of this royalty approach in 2004, the top rate was 4% of the generic sales price for Norway as it was number one country in HDI, 2004, and the lowest rate was 0.02%, for Sierra Leone as it was last country in the HDI, 2004”, Azam M, *Intellectual Property and Climate Change after COP 15: Towards effective framework for technology transfer*, *Nordic Environmental Law Journal*, 2 (2010) 145-159.
- 104 Azam M, *Are technology transfer provisions under the TRIPS Agreement and the UNFCCC Paris Agreement working to facilitate access and transfer of climate technologies to the LDCs*, *Manchester Journal of International Economic Law*, December (2021).
- 105 Article. 66.2 of the TRIPS Agreement stated that “Developed country Members shall provide incentives to enterprises and institutions in their territories for the purpose of promoting and encouraging technology transfer to least-developed country Members in order to enable them to create a sound and viable technological base”.

- 106 Watal J & Caminero L, *Least-developed countries, transfer of technology and the TRIPS Agreement*, WTO Staff Working Paper (ERSD-2018-01 22 February 2018).
- 107 Correa C, Intellectual Property in LDCs: Strategies for Enhancing Technology Transfer and Dissemination, *The Least Developed Countries Report 2007*, Background Paper No. 4 (Geneva: UNCTAD, 2007).
- 108 Implementation Of Article 66.2 of The TRIPS Agreement, Decision of the Council for TRIPS of 19 February 2003, Council for Trade-Related Aspects of Intellectual Property Rights (20 February 2003).
- 109 Moon S, Does Article 66.2 Encourage Technology Transfer to LDCs? An Analysis of Country Submissions to the TRIPS Council (1999-2007), UNCTAD/ICTSD Project on IPRs Policy Brief Number 2 (Geneva: UNCTAD, 2008).
- 110 Understanding the WTO: Least developed countries, https://www.wto.org/english/thewto_e/whatis_e/tif_e/org7_e.htm.
- 111 Discussion with the mid-level and high level government officials from the LDCs during Advanced Training and Advisory Programme on Intellectual Property Rights in the Global Economy for Least Developed Countries held in Dhaka, Bangladesh, August 20-24, 2018; Azam M, Can We Make a Pro-Poor and Pro-Development Intellectual Property Policy? presentation at the Advanced Training and Advisory Programme on Intellectual Property Rights in the Global Economy for Least Developed Countries (Dhaka, 21 August 2018, arranged jointly by the WIPO, SIDA, PRV and BUET).
- 112 Moon S, Does Article 66.2 Encourage Technology Transfer to LDCs? An Analysis of Country Submissions to the TRIPS Council (1999-2007), UNCTAD/ICTSD Project on IPRs Policy Brief Number 2 (Geneva: UNCTAD, 2008)113.
- 113 Azam M, Are technology transfer provisions under the TRIPS Agreement and the UNFCCC Paris Agreement working to facilitate access and transfer of climate technologies to the LDCs, *Manchester Journal of International Economic Law*, December (2021)38.
- 114 Communication from Cambodia on behalf of the LDC Group Proposal on the Implementation of Article 66.2 of The Trade-Related Aspects of Intellectual Property Rights (TRIPS) Agreement (WTO Document IP/C/W/640, 15 February 2018), <https://media.ip-watch.org/weblog/wp-content/uploads/2018/02/Article-66.2-TRIPS-Council-Feb-2018.pdf?fc249d>(accessed on 21 June 2018).
- 115 WTO Document, WT/MIN (01)/DEC/2, paragraph 7.
- 116 WTO Document, IP/C/28.
- 117 TRIPS Council Meeting 27-28 February 2018.
- 118 UNCTAD-ICTSD (2005), p.16.
- 119 Article. 67 of the TRIPS Agreement.
- 120 Hold A & Mercurio C, Transitioning to Intellectual Property: How can the WTO integrate Least Developed Countries into TRIPS? Working Paper No. 2012/37 (Bern: WTI, October 2012).
- 121 Hold A & Mercurio C, Transitioning to Intellectual Property: How can the WTO integrate Least Developed Countries into TRIPS? Working Paper No. 2012/37 (Bern: WTI, October 2012)2-3.
- 122 Hold A & Mercurio C, After the second extension of the transition period for LDCs: How can the WTO gradually integrate the poorest countries into TRIPS? Working Paper, No. 2013/42 (Bern: WTI, July 2013).
- 123 Rochel J, Intellectual property and its foundations: Using Article. 7 and 8 to address the legitimacy of the TRIPS, *Journal of World Intellectual Property*, 23 (2019), 21-39.
- 124 Fox D M, Technology Transfer and the TRIPS Agreement Are Developed Countries Meeting Their End of the Bargain? *Hastings Science and Technology Law Journal*, 10 (1) (2019) 1-38.
- 125 As per Article 66.1 of the TRIPS Agreement, the LDCs, shall not be required to apply the provisions of the TRIPS Agreement other than Articles 3, 4, and 5 for a period of 10 years due to their economic, financial, and administrative constraints and the need for flexibility to create a viable technological base. The LDCs had the first extension until 29 November 2005, which was extended until 1 July 2013, and then further extension was approved until 1 July 2021 and then extended again until 1 July 2034; Azam M, *Intellectual Property and public health in the developing world* (Cambridge: Open Book Publishers, 2016).
- 126 At the WTO's TRIPS Council meeting on 16 October 2020, Chad, on behalf of the LDC group, presented a proposal requesting further extension of the transition period beyond July 1, 2021; Communication from Chad on behalf of the LDC group, extension of the transition period under TRIPS Article 66.1 for least developed country members, IP/C/W/668 (1 October 2020), <https://docs.wto.org/dol2fe/Pages/SS/directdoc.aspx?filename=q:/IP/C/W668.pdf&Open=True>; Extension of the transition period under Article 66.1 for least developed country members (Decision of the Council for TRIPS of 29 June 2021), <https://docs.wto.org/dol2fe/Pages/SS/directdoc.aspx?filename=q:/IP/C/88.pdf&Open=True> (accessed on 28 December 2021).
- 127 Musungu S, 2nd Bellagio Series on Development and Intellectual Property, ICTSD-UNCTAD Dialogue 6 (Geneva: UNCTAD, September 2003).
- 128 Latif A, Intellectual property and Clean Energy technologies, UN Workshop on clean energy technologies (Geneva: ICTSD, 29 May 2013).
- 129 Correa C, The Burden of intellectual property rights, *Bulletin of the Atomic Scientists*(18 February 2015).
- 130 Extension of the Transition Period for LDCs: Flexibility to Create a Viable Technological Base or Simply (A Little) More Time? Intellectual Property Quarterly Update (2006) CIEL and South Centre.
- 131 CIEL and South Centre (2006).
- 132 Hold A & Christopher M, Transitioning to Intellectual Property: How can the WTO integrate Least Developed Countries into TRIPS? WTI, Bern, Switzerland (Working Paper No 2012/37|October 2012).
- 133 As of 10 January 2022, 9 LDCs that have submitted their individual priority needs to the TRIPS Council are: Sierra Leone (2007), Uganda (2007), Bangladesh (2010), Rwanda (2010), Tanzania (2010), Senegal (2011), Mali (2012), Madagascar (2013) and Togo (2013).
- 134 Shugurov M, TRIPS Agreement, International Technology Transfer and Least Developed Countries, *Journal of Advocacy, Research and Education*, 2 (2015)74-85.
- 135 Moon S, Does Article 66.2 Encourage Technology Transfer to LDCs? An Analysis of Country Submissions to the TRIPS

- Council (1999-2007), UNCTAD/ICTSD Project on IPRs Policy Brief Number 2 (Geneva: UNCTAD, 2008)2-4.
- 136 Watal J & Caminero L, *Least-developed countries, transfer of technology and the TRIPS Agreement*, WTO Staff Working Paper (ERSD-2018-01 22 February 2018)23.
- 137 Chakroun N, Using technology transfer offices to foster technological development: A proposal based on a combination of Articles 66.2 and 67 of the TRIPS agreement, *The Journal of World Intellectual Property*, 20 (2017) 103–118. <https://doi.org/10.1111/jwip.12077>.
- 138 Chakroun N, Using technology transfer offices to foster technological development: A proposal based on a combination of Articles 66.2 and 67 of the TRIPS agreement, *The Journal of World Intellectual Property*, 20 (2017) 106-108.
- 139 Azam M, Intellectual Property and Climate Change: Is TRIPS Functioning for the Technology Transfer to the LDCs? (4May 2013), SSRN: <https://ssrn.com/abstract=2793908>, Nordic IP Meeting, Munich, 4May 2013.
- 140 Michaels A, International Technology Transfer and TRIPS Article 66.2: Can global Administrative Law help Least-Developed Countries get what they bargained for?, *Georgetown Journal of International Law*, 41 (2009) 223-261.
- 141 Michaels A, International Technology Transfer and TRIPS Article 66.2: Can global Administrative Law help Least-Developed Countries get what they bargained for?, *Georgetown Journal of International Law*, 41 (2009) 259-260.
- 142 Reichman J H, The TRIPS Agreement Comes of Age: Conflict or Cooperation with the Developing Countries, *Case W. Res. J. Int'l L*, 32 (3) (2000) 442-470.
- 143 Reichman J H, The TRIPS Agreement Comes of Age: Conflict or Cooperation with the Developing Countries, *Case W. Res. J. Int'l L*, 32 (3) (2000) 467-68.
- 144 Quoted in Rimmer M, The Doha deadlock: intellectual property and climate change, (10 Dec 2012), *The Conversation*, <http://theconversation.com/the-doha-deadlock-intellectual-property-and-climate-change-11244>, this was supported in a number of other studies-Khor M, *Climate Change, Technology and Intellectual Property Rights: Context and Recent Negotiations* (April 2012), South Centre, https://www.southcentre.int/wp-content/uploads/2013/05/RP45_Climate-Change-Technology-and-IP_EN.pdf; Zhuang W, *Intellectual Property Rights and Climate Change: Interpreting the TRIPS Agreement for Environmentally Sound Technologies* (Cambridge: Cambridge University Press, 2017).
- 145 Rimmer M, The Doha deadlock: intellectual property and climate change, (10 Dec 2012), *The Conversation*, <http://theconversation.com/the-doha-deadlock-intellectual-property-and-climate-change-11244>.
- 146 Abbott M, Innovation and Technology Transfer to Address Climate Change: Lessons from the Global Debate on Intellectual Property and Public Health, ICTSD's Programme on IPRs and Sustainable Development, Issue Paper No. 24 (International Centre for Trade and Sustainable Development, Geneva, Switzerland, 2009).
- 147 Saner R, How the WTO can implement the Paris Agreement, *GREAT Insights Magazine*, 5 (3)(May/June) 2016.
- 148 Role of trade key in achieving UN Sustainable Development Goals, https://www.wto.org/english/news_e/news17_e/pf17_28sep17_e.htm (accessed on 20 January 2022).
- 149 For details on the Sustainable Development Goals, History of the 17 Goals, <https://sdgs.un.org/goals> (accessed on 20 January 2022).
- 150 Agreement on Climate Change, Trade and Sustainability (ACCTS) negotiations, <https://www.mfat.govt.nz/en/trade/free-trade-agreements/trade-and-climate/agreement-on-climate-change-trade-and-sustainability-accts-negotiations/> (accessed on 22 January 2022).
- 151 Eriksson E, Gisselman F & Swanson N, *Trade and Climate Change – promoting climate goals with a WTO Agreement*, (2021), National Board of Trade, Sweden, available at <https://www.kommerskollegium.se/en/publications/reports/2021/trade-and-climate-change/> (accessed on 22 January 2022).
- 152 Fortunato P *et al.*, Technology Transfer and Climate Change: Beyond TRIPS, *UN-DESA Policy brief* No.19 (August 2009).
- 153 The Max Planck Institute for Innovation and Competition (2014), Declaration on Patent Protection: Regulatory Sovereignty under TRIPS, www.ip.mpg.de/files/pdf2/Patent_Declaration1.pdf, p. 1.
- 154 Azam M, Intellectual Property and Climate Change after COP 15: Towards Effective Framework for Technology Transfer, *Nordic Environmental Law Journal*, 2 (2010) 145-159.
- 155 Miria A, Pigato, Simon J Black, *et al.*, Technology Transfer and Innovation for Low-Carbon Development, *International Development in Focus*, 8; <https://openknowledge.worldbank.org/handle/10986/33474>.