



# Environmentally Sound Technologies; Transfers to Developing Nations: An Overview of the Legal Framework, Mechanisms, Barriers and the Flexibilities in Trade Laws for Transfers.

Aruna Akula<sup>1\*</sup>, Dr S. Sumitra<sup>2</sup>

<sup>1\*</sup>Research Scholar: Dr B.R. Ambedkar College of Law, Andhra University.

<sup>2</sup>Research Scholar: Dr B.R. Ambedkar College of Law, Andhra University.

**Citation:** Aruna Akula, Dr S. Sumitra, (2024), Environmentally Sound Technologies; Transfers to Developing Nations: An Overview of the Legal Framework, Mechanisms, Barriers and the Flexibilities in Trade Laws for Transfers., Educational Administration: Theory and Practice, 30(5), 3794-3801

Doi: 10.53555/kuey.v30i5.3535

## ARTICLE INFO

## ABSTRACT

This paper aims to present the necessity of apportioning low-carbon technologies to developing nations. A review is undertaken to determine the basis for the transfer of technology across borders and the international framework of laws and rules governing such transfer. The paper presents the mechanisms of the transfer of technology. The paper also reviews the factors that drive the transfer and the factors that hinder the shift of technologies to developing countries. The transfer of technology obviously takes place through trade. Therefore, the present paper reviews trade rules governing technology transfer. In this regard, this paper examines the nexus between climate law and trade law, flexibilities in the business rules and the impact of intellectual property protection to foster the transfer of technologies to developing countries, which ultimately results in Sustainable Development.

**Key Words:** Sustainable Development, Technology Transfer, Mechanisms, Barriers, WTO, TRIPS, Article 27, of UDHR.

## Introduction

Technology transfer plays a decisive role in the achievement of sustainable development and broad sustainable development goals. Since decades, international discussions have been focused on the equitable distribution of technologies across national borders. International efforts to supply technology to third-world countries have yet to yield fruitful results. There are a number of issues to attend to, which include the identification of appropriate technologies to aid the production and technology transfer across countries and enhancing capabilities of the developing countries to receive the technology by enabling human, financial, physical, and institutional capacities. A large number of developing nations need such capabilities, which causes gaps in international technology transfer. For the effective transfer of technology, complementary efforts are required from either side. Domestic regulatory frameworks and institutional capabilities have to cater to the genuine technological requirements of developing countries. The developed countries need to understand the needs, space, and suitability of the receiving countries.

Technological innovation continues to be within the province of developed nations. Third-world countries rely on acquired technologies rather than production on their own because of their constrained resources. The ambition for technology transfer sprouted in the 1970s when the newly liberated states raised their voices at the forums of the United Nations for fiscal aid and technological assistance in view of the past exploitation gone through.

The thrust for technology transfer grew when its role in Sustainable Development was recognized. The scope of Sustainable Development has been widened by including the objectives of economic development, preservation of the ecosystem, conservation of resources, and social inclusion. Economic growth and ecological balance were considered to be contrary to each other. The latter has to be compromised for economic development. The scenario reversed with the invention of environmentally sound technologies, henceforth

referred to as ESTs. These technologies are nil or less polluting, use renewable sources of energy, and produce zero waste, thereby necessary for the protection of the environment.

The developed countries who own the ESTs are able to pursue the path of economic development without disturbing the target set at the Paris Convention to reduce the temperature by one-degree centigrade at the pre-industrial level. The problem lies with developing countries, which are more numerous, highly populated, and aggressively developing their economies. These countries are likely to surpass very soon the level of greenhouse gas emissions that were previously caused by industrialized countries. It is obligatory for developing countries to reduce the use of carbon-intensive technologies to grow their economies.

Moreover, the Montreal Protocol made it compulsory for the member countries to phase out the ozone-depleting substances from their products. It is challenging for developing countries to part with their finances for the development of ESTs. Acquisition of technology has become mandatory.

### **Factors Supporting the Claims of Transfers:**

- i) Common but Differentiated Responsibility.
- ii) Article 27 of the Human Rights Declaration specifies the sharing of scientific advancements.
- iii) Human rights approach.
- iv) Polluter Pay and Precautionary principle.

The Climate change instrument, UNFCCC, 1992 spelled out the principle of Common but Differentiated Responsibility. It requires the developed countries to act as they are mainly responsible for the degeneration of the environment. The basis for differentiated responsibility lies in the history of exploitation by the colonial powers, the doctrine of common concern for the environment, and the financial and other limitations to developing technologies.

Climate change has degraded many of the human rights declared in the ICESCR and ICCPR. The human rights approach gives strength, fairness, and justice to the claim for technology transfer. Further, the human rights approach determines the priorities and scope for technology transfer to developing nations.<sup>1</sup> Article 27 of the UDHR entitles people to enjoy the fruits of scientific innovations. It is established that there was little disagreement among the drafters of the UDHR over incorporating Article 27.<sup>2</sup> The incorporation of Article 27 in the ICESCR as Article 15 gave force to the Human Rights of Science. UNESCO, while drafting Article 15, stressed that the entitlement to technology is the determining factor for achieving many other rights. The most crucial role of the transfer of technology is the achievement of Sustainable Development. Human activities for economic growth resulted in environmental problems. People in developing countries experience a deterioration in their quality of life. People in disadvantaged areas are vulnerable to environmental problems as they are dependent on climate-related sectors for their livelihood. Environmental problems are undermining the living conditions, such as the right to food, water, habitat, and a clean environment. Sustainable Development envisages tackling environmental problems, keeping in view social challenges like inequality, poverty, and inclusive growth. The concept has given way to the most ambitious Sustainable Development Goals. These goals are 17 in number, which include 169 targets that constitute 'Agenda. 2030'. These goals aim to achieve social, economic, and environmental sustainability. The replacement of Millennium Development Goals (MDGs) shows the priority of keeping scientific and technological advancements and the protection of the environment simultaneously. Technology helps in achieving all 17 sustainable development goals.<sup>3</sup> For example, agricultural sustainability technologies help increase food production, thereby achieving Goal 2, 'Zero hunger.' The goal for gender equality, mentioned as Goal number 5, is facilitated by technologies like mobile safety apps for women and the Gap Square app for checking bias in pay scales.<sup>4</sup> Technology has a vital role in sustainable development. It introduces new energy systems in transport and industry, solves water supply and waste disposal problems, introduces biodegradable packing, and designs new products that are compatible with nature. Sustainable Development emphasizes the wise utilization of natural reserves and the balance of the ecosystem. This objective is achieved easily by the use of environmentally sound technologies. These technologies are renewable and discharge negligible wastes with zero emissions, which is consequently essential for sustainable development. The polluter-pay principle lays the onus on developed States for their past actions. Therefore, these countries should bear the burden of the cost of restoration and mitigation. The precautionary principle is invoked to prevent future damage, predict environmental problems, and to take appropriate precautions,

### **Instruments governing the transfer of technology to developing nations:**

Almost 80 international instruments and regional agreements are prevailing in this field. Every instrument has its objectives and scope. In the broader sense, one type is for standard setting, like TRIPS. The 2<sup>nd</sup> type is for increasing technology transfer and capacity building in developing nations, for example, the Montreal Protocol. The Montreal Protocol also has a financing mechanism. Instruments like TRIPS and Montreal Protocol refer to developing nations. Convention on Biodiversity has provisions for Differential Treatment. Some conventions refer to particular technologies, like the Convention on the Law of Seas. Instruments like TRIPS are binding. The binding decision depends upon the law laid out by the member states of the TRIPS agreement. Agenda 21 is soft law.

**A. Instruments at the multilateral level:**

- i) The Montreal Protocol, which safeguards the atmospheric ozone layer, is one example.
- ii) The Paris Convention on Industrial Property Protection.
- iii) The Biodiversity Convention
- iv) Climate Change Convention of the United Nations
- v) Rio Declaration on Environment and Development; United Nations Conference on Environment and Development.
- vi) Trade-Related Intellectual Property Rights Agreement.
- vii) Agreement for Trade related Technical Barriers

**B. Multilateral level instruments**

- i. Resolution of UN General Assembly for Establishing a New International Economic Order.
- ii. Agenda 21

**C. Agreements at the Regional level and Sub-Regional Level'****D. Inter-Governmental Drafts;**

- i. Code of conduct for technology transfer
- ii. Code of Conduct for Transnational Corporations

**E. Expert Meetings on Arrangements for Transfer of Technology among Countries.**

UNFCCC is the crucial legal framework that places an obligation on developed countries to transfer technology on the basis of the doctrine of historic responsibility and the doctrine of differentiated capabilities for providing technological and financial backing to developing countries. Developing nations must create an environment that enables them to receive and disseminate the technologies into their systems. The UNFCCC has created a body (SBSTA) to render technological advice required for the transfer of technology and an implementing body, SBI. The UNFCCC has a decision-making body, which is the Conference of Parties, which, in turn, establishes implementing agencies, the Expert Group (EGTT), and the Executive Committee (TEC). A technology mechanism has been created by COP 16 to foster the transfer of technology with affordable costs and complete information. This body is prepared to work with an executive committee (TEC) and the Center for Technology Network (CTCN). The executive committee includes members from both developed and developing nations and makes policies for the transfer of technology. The TEC thus constitutes a center for action. The CTCN executes the policies framed by the TEC.<sup>5</sup> Developing countries have the facility to lay requests at CTCN. The UNFCCC created funding mechanisms like GEF, (which implements assessment of technology and finances pilot projects in select countries. GCF Global Climate Fund was established under the Copenhagen Accord to implement adaptation and mitigation programs in developing countries. The World Bank established a climate investment fund referred to as the Clean Technology Fund. The framework convention gives the basis for the creation of funds. Many developed nations contributed to the fund. The Asia Pacific Partnership is another procedure for the transfer of technology. Australia, India, Japan, Korea, the US, and China collaborated to create a multilateral initiative for the dissemination of environmentally sound technologies in various fields. Border adjustment measures are created in the form of taxes, quotas, charges, allowances, and technical standards on imports. The BAMs form the last remedies after the utilization of all the trade flexibilities for technology transfer. Apart from the legal framework, policies were framed for communication and coordination to create an enormous market to meet the transfer requirement. The UNDP catered to the technology needs assessment center to analyze the situation of recipient countries.

TNAs help in identifying, assessing, and prioritizing the technological requirements in developing countries. The TNAs are called to be made at the National level and work in accordance with the requirements of the stakeholders. The TNA has to align its work with the National Development Plans. TNA is beneficial for individual countries. The Expert body (EGTT) was a broad mechanism for technology transfer. The group is constituted of experts from developing countries and developed countries. The EGTT must execute a complete process of international technology transfer.

The EGTT is required to report to the subsidiary body. The COP, 2015 removed the differences between the obligations of the countries and obliged each member nation to make targets and adopt measures to achieve its Nationally Determined Contributions.

**The mechanisms of International Technology Transfer:**

The transfer majorly occurs through trade in services and goods. Foreign direct investment fosters the transfer of technology. The best example is the investment made by Japan in Thailand for the production of CFC-free refrigerators. Thailand requires investment very much as it is required to phase out the ozone-destroying substances as per the Montreal Protocol. The local requirement drives the transfer of technology.<sup>6</sup> The second important mechanism is licensing. The producer of the technology grants a license to the buyer to carry out the production. This process is regarded as the safest one, as there is minimal scope for spillover of the technology. The other mechanisms of technology transfer are;

- Joint ventures
- Collaboration on technical matters

- Purchase of plant equipment products
- Technical service agreement
- Contracting procedure
- Turnkey contracts
- Contract with product combination
- Management contracts
- Production focus
- Joint research venture
- Expert services
- Clean development mechanism

### **The dichotomy between climate law and trade law in the process of technology transfer:**

As we see the mechanisms of technology transfer, it can be easily said that the transfer takes place through trade, by whatever name it may be called. There needs to be coordination between the environmental law and the trade law with respect to the transfer of technology to developing nations.<sup>7</sup> Climate law invokes the principle of differential treatment and lays down primary responsibilities for developed countries. The trade law is based on the principle of non-discrimination. Climate law does not have any provisions for trade in the process of transferring technology to developing nations. The trade law contains provisions for the transfer of technology in the context of economic development and environmental protection. Developed countries favor an approach that exclusively promotes markets through enabling environments. At the same time, most developing countries think that supporting developing capabilities is independent of market conformity.<sup>8</sup> The developing countries look at the process for assistance and for fulfilling their obligations with respect to standards set for environmental protection. There is a need to reconcile these two fields.<sup>9</sup> The doctrine of 'Common Concern' brings strength to the claim in the form of Jus Cogens. The idea of Common Concern was mooted in UNGA resolutions in the late 1980s, ever since the declaration on climate change was made. The doctrine of Common Concern has affected several instruments. Humankind's concern is taken as a fundamental norm for the protection of the atmosphere.<sup>10</sup> The lack of a link between trade law and climate law does not mean that these are contrary to each other. The linkage was first discussed in the 1992 Framework Convention. Later on, no progress was made in the Paris Agreement. The Montreal Protocol mandates Governments to substitute chlorofluorocarbons with sustainable products that are not available in developing countries. Thus, the transfer of technology is compulsory.

### **Expanding trade law for the transfer of technology**

The UNCTAD<sup>11</sup> Held in 1964, it witnessed the developing nations' frustrations and the developed nations' disappointments. The UNCTAD formed the basis for the establishment of NIEO. The declaration called for restructuring the international order towards more significant equity for developing countries, particularly regarding a wide range of trade, finance, commodity, and debt-related issues. The issues of NIEO were first the massive expansion of international organizations for cooperative purposes. Second, the growing importance of states representing Western civilizations is due to the progress of decolonizing. Third, there are growing gaps between economically developed countries and developing nations. The Bretton Wood institutions, namely the World Bank and the IMF, were established in 1944 to rebuild the post-war economy and promote international cooperation. An attempt was made to thrust the transfer of technology to developing nations subject to a multilateral Code of Conduct. The process did not go forward due to resistance from MNCs and the Developed Countries. The WTO was formed in 1995 after GATT. The TRIPS Agreement under the WTO provides for technical assistance. The first ministerial conference of the WTO was held in 1996, which adopted a plan of action for improving the maximum capacity of least-developed countries to respond to and accept the challenges and opportunities offered by the trading system. The Doha Declaration on TRIPS Public Health is a landmark in technology transfer. At the Doha Declaration, the members stressed that Article 66.2 has to be made mandatory. It was agreed that the TRIPS Council should implement a mechanism for monitoring and full implementation of the obligation. There is a need for developing countries to harmonize their IPR laws with TRIPS, catering to their unique technical needs while addressing the globalized nature of intellectual property protection.

A number of provisions in the GATT Treaty and the TBT Agreement provide for liberalized trade in environmental goods and also for deviating from the trade rules in matters concerning human, animal, and plant life and the conservation of natural resources. The flexibilities in trade laws have to be widely used to enhance the transfer of technology to developing nations.

### **The Problems to Overcome in the Transfer of Technology**

**Market failures:** The process of transferring technology through private channels needs to be more satisfactory in meeting the needs of developing countries. The development of technology is costly. MNCs wish to receive a fair return on their investments. Many factors account for the insufficient transfer of technology. Poor policies account for lower FDI and licensing. Information problems like which products to sell, through which mode, and the terms are also one cause. The presence of weak IPRs tends to increase the cost of licensing.

Most of the transfers are lost at the stages of negotiations itself. The producers have full knowledge of the technology, but they will only share if there is an enforceable contract. The buyers can only enter into the contract if they know the actual cost. Many transactions fail at the negotiation stage.<sup>12</sup> This asymmetry in information has to be solved. The flow of technology transfer is further hindered by the weak capacity to absorb the technology, distance from markets, and poor infrastructure. Market failures have to be addressed to ensure the flow of the transfer of technology to public goods like ESTs, medical technologies, and educational materials. The underdeveloped financial power, giant import duties, inflation, substantial interest rates, colossal tax rates, tariff measures, and market risks are potential barriers to the transfer of technology. Firms in developing countries are facing a debt crisis due to the enormous interest payments. EST projects need to be more market-attractive. The other barriers are substandard evaluation and assessment procedures, the need for more information, and legal, regulatory, and policy barriers. For example, the subsidies act as barriers to investment in renewable energy technologies. Another major factor is a lack of absorption capacity, such as a lack of human and institutional skills.

**Financial barriers:** Lack of financial resources is a significant barrier to the transfer of technology. Many projects have been dropped because of a lack of funds, a lack of credit history, and a lack of knowledge in marketing, making it challenging to attract investors. The cost of deployment and adaptation is often neglected, leading to losses and discouraging companies from going into investment. Investment is to be made in upgrading existing technologies. Success stories of investments in green energy sectors shall increase the availability of finance. Robust domestic financial plans will enhance public investment and grants. Specific financing mechanisms were established in the multilateral environment agreements like GEF (Global Environment Facility), which finances investments made according to the Rio Convention and the Multilateral Fund established under the Montreal Protocol.

**Subsidies:** subsidies are regarded as helpful in facilitating the transfer of climate change technologies. Such subsidies must conform with the trade rules and regulations. Some consider subsidies as a barrier, as they have spoilt the market for a new technology by continuous dependency on subsidies, resulting in the production of an inferior technology.

**Intellectual Property Rights:** IPR is a double-edged sword in the discussion of the transfer of technology. A system with weak protection of ownership over technology can discourage the transfer of EST. At the same time, strong protection creates a monopoly and prevents the dissemination of the technology. Developed countries prefer robust IPR systems to enable the inventors to derive profits from their work. Developing countries prefer weak IPR laws in order to access existing technologies at lower costs. The TRIPS Agreement brought uniformity in the IPR laws. The Agreement laid down the standards for protection. At the same time, the Agreement ensures incentives to promote technology transfer to least-developed countries. There is consensus among researchers that IPRs do not pose a block to the transfer of technology.<sup>13</sup> Most of the ESTs are not patented at all. Such patents can be used freely.<sup>14</sup> Further, patent owners worry about other problems more than the risk of patent infringement. Moreover, technology is dynamic. New technology comes faster compared to making a copy of the old one. The MNCs choose different modes of technology transfer. If the IPRs are stronger in recipient countries, the firms choose the licensing mode.<sup>15</sup> In places with weak IPRs, FDI mode is opted chiefly. The development of environmentally sound technologies is done mainly with public funds. Therefore, few ESTs are only patented and are available in the public domain. The effect of IPR on the transfer of technology, being a contentious issue, has led to the establishment of a Technology Mechanism (TM). Its arm, the Technology Executive Committee (TEC), was assigned to create climate-friendly IPRS. No significant development took place. The transfer of ESTs generally takes place through two channels. Trade in goods that have no emissions, like wind turbines, energy-efficient furnaces, and electric vehicles, is transferred by Foreign direct investment by MNCs. IPR protection had a significant positive effect on imports of hybrid and cleaner vehicles. Foreign direct investment increased in solar PV solar thermal heating, lighting, and cleaner vehicles. The effect on non-OECD countries is positive in solar PV cells and wind turbines, as well as in the absorptive capacity of receiving countries. Indian companies have faced trouble in obtaining rights to produce CFC substitutes.<sup>16</sup> Article 7 of TRIPS emphasizes that IPRs must help transfer and disseminate technology to achieve social, economic, and welfare objectives. Japan has achieved a technological process due to proper management of the battery patent system and favoring licenses for technology transfer with strict rules of FDI. Brazil, China, and India followed the path of creative imitation from the inception, followed by the acquisition of technology from an accessible and affordable IPR angle. These countries have slowly increased their absorptive capacities, followed by increased technology transfer. The IPR protection resulted in an increase in FDI with a subsequent increase in licensing as a technique of transfer of technology. TRIPS does not stipulate strict patent criteria as long as the protection does not violate the provisions of the Agreement. It is worth considering that vast amounts of data on technologies are already available in the public domain or under compulsory licenses. The very old saying that it is better to teach how to fish rather than supply fish is applicable to technology transfer as well. The developing countries should be equipped sufficiently to manufacture, use, develop, distribute, and market the technologies. This process happens when the system possesses the following:

- Importance is given to research and development and financing.
- Perks for innovation.
- Laws or policies adopted to support investment and innovation.
- The availability of appropriate and adequate information about the technology is quintessential to entrepreneurs.
- A foreseeable IPR system is sought for the registration of patents and trademarks.
- Skilled human resources and a business-friendly environment are required.

**European Patent Office:** EPO provides information and comprehensive classification of clean energy technology and climate change mitigation technology. Information relating to patent situations in various areas is available. Relatively more time is needed to grant patents in clean energy technologies. Conclusively, IPRs do not block the transfer of technology. Quality patents protect the interests of both the inventors and the public by offering high legal security followed by broad dissemination of technology. The period of 20 years for the protection of patents is reasonably good. Increasing the term would hinder dissemination, and reducing the term would hinder investment. Several provisions of TRIPS directly influence the transfer of technology. For example, compulsory licensing in technology related to clean water supply and sanitation. Compulsory licensing for technology, which can be used for public purposes or a government-related program. Article 66.2 of TRIPS expressly requires member countries to provide incentives to the firms that are engaged in the transfer of technology to least-developed countries and also requires them to submit a report to the Trips Council.<sup>17</sup>

**Capacity:** The need for more capacity may be in enacting and enforcing rules and regulations and in purchasing skills and expertise. It was observed that in many developing countries, people refused to switch to ESTs even when no extra cost was involved. The denial is due to the need for more knowledge about the use of the new technology. Similarly, the transfer of technology would not alone meet the requirement; maintenance, adaptation, diffusion, and reproduction of the technology are required.

**Development assistance and technology cooperation:** Many countries have started development programs to facilitate the transfer of technology to developing countries. Japan's 'Green Initiative Programme' aims to provide a transfer of energy saving and renewable energy technologies. Canada established 'Watershed Management 2000' in Brazil. The US-Philippines, 'The Technology Cooperation Agreement Pilot Project for Transfer of Non-fossil Fuel Energy Technologies,' has financing features that act as per host countries' needs and investment in the private sector.

**Technical barriers:** Certain barriers are specific to a particular technology or a country. For example, in Indonesia, inadequate incentives for research and development and high capital costs are specific barriers. Another example is the enormous transaction costs that have caused the failure of establishing a biomass-based energy plant in Chennai by Greenpower Company Ltd, with a Japanese partnership. In the case of investment in energy sectors, the investors have to compete with the fossil fuel-based firms, which are still cheaper. Renewable energy firms and emerging clean coal technologies have to be augmented with technology-push policies and programs as the market usually needs to be improved.<sup>18</sup> The future is all about electric vehicles, and there are many requirements for N-S collaboration in this field. Developed countries dominate the electric vehicles. India, China, and Brazil are emerging markets for electric vehicles. The lack of collaboration and apprehension regarding IPRs and technology spillovers are potential barriers to the transfer of EVs.

**Other barriers:** The mode of transfer of technology is another barrier to the transfer of technology. In vertical transfers, only the finished products reach the end users, and there is no transfer of technology. In horizontal transfers, the intellectual property is transferred, but it occurs only among private entities, and the spillover occurs at a languid pace. Rules and regulations and IPRs hinder the transfer of technology in this mode. The success of transfer also depends upon the nature of technology and the ownership. Some technologies may cater to something other than the local needs. In some cases, the transfers are trade-related, and the significant barriers are the transactional costs. There needs to be indicators to assess the extent of the transfer of technology to developing countries. The developing nations are not satisfied with the extent of the transfer of technology.<sup>19</sup>

### The Way Forward

The transfer of technology to developing nations is essential for the overall human development. The transfer of technology should be need-specific. African countries are still facing hunger and poverty. Agricultural technologies are required in alleviating poverty in the African countries. Transportation, building, and infrastructure technologies are required in Asian countries. Developing countries like India, Sri Lanka, Bangladesh, and Pakistan require technologies related to industrial growth, power, transportation, logistics,

communication, and infrastructure. The said countries are rich in natural resources but need more industrial technologies.

Moreover, climate restrictions act as barriers to developing countries, which prohibit the use of conventional energy. The transfer of technology should be need-specific and not one-size-fits-all. The transfer should be a broad process that involves passing all the information and expertise along with the technology so that developing countries can absorb and assimilate the technology into their communities.

The operational lapse has to be removed through consolidated efforts from various stakeholders, such as the government, public and private sectors, NGOs, international organizations, and finally, the beneficiaries. Continuous assessment of technology needs gives a direction for the allocation of funds. The most problematic factor in the transfer of technology is the need for enforcement machinery. There are no sanctions on countries that break from the commitments made at international forums. The country, the USA, has declared that it will withdraw from the Paris Agreement. The country demands that the obligations of developed countries and developing countries should be the same. This action is against the principle of common but differentiated responsibility. It is laudable that developing countries are also making serious efforts to produce clean technologies and transmit them through trade and investments.<sup>20</sup>

### Conclusion

The obligation for the transfer of technology has its basis in the doctrine of Common but Differentiated Responsibility. Many efforts were put into collaborative global technology transfer. The intricacies in the character of technology, the mode selected for transfer and stakeholders involved made the process of technology transfer challenging. Financial constraints are the most significant barriers to the transfer of technology. The finances must be mobilized for research and development, as well as the transfer and absorption of the technology. The other vital barriers, like regulatory framework, inadequate information, and IPR protection, have to be addressed. Technology transfer helps the parties on both sides to meet the commitments made to address the climate change problem. Many problems need to be addressed, and so many measures need to be adapted to facilitate climate-related technology development, transfer, and assimilation. Economic, social, and legal barriers hinder the International Transfer of Technology. Removal of the barriers is the utmost priority, and political and regulatory efforts are required at both national and international levels. Developing nations should centre their attention on increasing their capacity to create and maintain the technology received. Developed countries should encourage technological development locally. As the environmental objectives solely may not be sufficient, international agencies have to identify other key factors and motivators that drive technology transfer.

### References:

1. Dibyendu Shabalala, "Climate Change, Human Rights and Technology Transfer: Normative Challenges and Technical Operations." (2014), Cambridge University Press, <https://doi.org/10.1017/9781316838952003>
2. Morsink, Johannes (1999), *Universal Declaration of Human Rights: Origins, Drafting and Intent* (Philadelphia: University of Pennsylvania Press): [https://www.un.org/en/about.us/udhr/history\\_of\\_the\\_declaration](https://www.un.org/en/about.us/udhr/history_of_the_declaration).
3. The United Nations Sustainable Development Agenda 2030 recognizes trade-related measures as an essential tool for the achievement of the Sustainable Development Goals.
4. Henrich Skaug Saetra, et al., eds. *Technology and Sustainable Development, The Promise and Pitfalls of Techno-Solutionism*, Routledge Taylor and Francis Group, (2023)
5. See, generally, Anthi Koskina et al., "Trade in Clean Energy Technologies: Study from Protection to Protectionism through Obligations for Technology Transfer in Climate Change law or vice versa?" *Journal of World Energy Law and Business* (2020)
6. Smarzynski, B., "Composition of Foreign Direct Investment and Protection of Intellectual Property Rights: Evidence from Transition Economies" Washinton DC (2000).
7. Zaker Ahmed, "Climate Technology, Trade and Doctrine of Common Concern," Available at Brill.com
8. Nimisha Pandey et al. (2021), "Beyond Technology Transfer: Innovation Cooperation to Advance Sustainable Development in Developing Countries. *Wiley Inter-Disciplinary Reviews, Energy and Environment*. Available at <https://doi.org/10.1002/wire>.
9. Panagiotis Delimatsis, 'Introduction: Climate Change and Trade Law – Challenges for Governance and Coordination' Downloaded from Pub Factory.
10. UN DOC 43/53, adopted on 06/12/1988, Paragraph 1 of the Resolution recognized that climate change is an essential condition that sustains life on earth. The Resolution was the first ever user of the concept.
11. The UNCTAD sought to become a permanent UN institution with a secretariat, a conference that meets every five years, and a trade and development board that carried on the link between the conference and

- committees on trade-related aspects in commodities among LDCs. The UNCTAD has become a forum for N-S bargaining on economic matters.
12. Keith E Maskus, "Using the International Trading System to Foster Technology Transfer for Economic Development," 2005 MICHST.L.REV.219 (2005) <https://heinonline.org/HOL/License>
  13. Johnson DKN, and Lybecker. M, "Challenges to Technology Transfer: A Literature Review of the Constraints on Environment Technology Dissemination" (2009)
  14. Copenhagen Economics, 'Are IPR a Barrier to the Transfer of Climate Change Technology' (2009)
  15. Wolfgang Keller, International Trade, Foreign Direct Investment, Technology Spillovers, Working Paper 15442 <http://www.nber.org/papers/W15442>, October 2009, JEL NO.F1, F2, L2, O3, O4
  16. Jayashree Watal, Jha V & Hoffman V (2000), "Achieving Objectives of Multilateral Environmental Agreements. A package of trade measures and positive measures", United Nations publication.
  17. Jasmeeth Gulati, "Challenges Before International Technology Transfer, Maximizing the Principle of Sustainable Development," (2012) Published by The Indian Society of International Law
  18. Herzog. H, (2017), "Financing CCS Demonstration Projects: Lessons learned from Two Decades of Experiencing," Energy Proceedings, Vol 1 1.4
  19. Joyeeta Gupta, "Evaluation of the Climate Change Regime and Related Developments" in Yearbook of International Cooperation on Environment and Development, 19, 20 (Helge et al. et al., Eds. 1999).
  20. Maria Anna Corvaglia, "South-South Technology Transfer Addressing Climate Change and its Missing International Regulatory Framework," CCLR 2 (2014).