

# Transfer of Technology as an International Bridge for Sustainable Development: Issues for Developing Countries

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## Abstract:

For equitable and appropriate measures needed for Sustainable Development, technology transfer works as a bridge in bilateral and multilateral agreements. The concept needs to clarify the Principle of Sustainable Development based on Common but Differentiated Responsibilities, accessibility and affordability, capacity building, resilience, adaptation as well as mitigation. Policies and Regulations regarding technology transfer discussed in the Montreal Protocol and Kyoto Protocol are significant. As climate change becomes the current problem, ESTs have drawn the attention of the UNFCCC. The fundamental challenges before the world are social disparities, degradation of soil, and depletion of water and natural resources. Technology transfer works as the platform for interaction between developed nations and developing nations to achieve Sustainable Development. A case study of Taiwan is reflected to explain the situation prevailing for countries that are not within the limits of the International Court of Justice or the UNFCCC. Overall, the transfer of technology has been the most crucial factor in maximizing trust and reducing tension to overcome the problem of climate change and other issues associated with it.

**Keywords:** Transfer of Technology, Developing Nations, Sustainable Development, Environmentally Sound Technology, Climate Change, UNFCCC, Common but Differentiated Responsibility, Intellectual Property Rights.

## I. Introduction:

Transfer of Technology is a means of achieving Sustainable Development. The flow of technology with sustainable objectives has beneficial results for economic development, environmental protection, and social issues. For instance, renewable energy is a critical component of Sustainable Development. With innovative technology, cleaner and more sustainable energy sources create less dependence on fossil fuels, thus making technology a vital element of sustainability.

The capacity of developed countries to invest in Research and Development for technological innovations gives them an edge in technological development. The developing countries can better benefit by tapping the innovations from developed countries with the most minor investments. Thus, technology transfer from developed countries is inevitable.

## II. Sustainable Development:

The term Sustainable Development was adopted in the late 1980s. The concept came to light in the report of the UN Commission of Environment and Development. The report is famously known as the

Brundtland Report and was called after Norwegian Prime Minister Gro Harlem Brundtland. The concept calls for the preservation of resources for the next generations. This intergenerational equity principle was in force for almost 25 years. Later on, the idea included economic development in its scope, along with the protection of the environment and social inclusion. Sustainable development is aimed to be achieved by meeting the 17 SDGs by the year 2030. These goals are set according to the respective capacities and priorities of different Nations. Technological innovations help in the immediate realization of the 2030 Agenda for Sustainable Development by many techniques.<sup>1</sup> Improvement of real incomes by increased productivity and less cost of goods; facilitating the effective deployment of innovative ideas to economic environmental and social hurdles which act as binding limits on development; support for inclusive types of participation in social and economic set up; replacement of environmentally costly modes of productions with sustainable equivalents and providing policymakers robust tools for designing and planning developmental steps. UNCTAD gives examples of a vast range of advanced techniques that have the potential to speed up progress for the achievement of the goals of Sustainable Development.<sup>2</sup> The notion of sustainable development is crucial as the world is now facing severe social, economic, and environmental challenges. The Sustainable Development Goals relate to social, economic, and ecological sustainability, and the goals include removing poverty, improving health, eliminating discrimination, reducing inequalities, providing work for all, economic growth, and protection of climate.

### III. Background of Transfer of Technology:

The traditional model of technology transfer that started in the 1950s was having large-scale foreign funding and investment in developing countries<sup>3</sup> However, they are focused exclusively on pouring hardware without bothering about the development of human resources. For example, a lack of expertise in developing countries is a hurdle to the effective diffusion of Environmentally Sustainable Technologies (ESTs).<sup>4</sup>

To have an effective technology transfer, significant capacity-developing activities are necessary. Such endeavors are taken up by UNEP (United Nations Environment Programme) and the UNDP (United Nations Development Programme). From the beginning, the focus has been on the broad socioeconomic side of improvement.<sup>5</sup>

At this stage, it is imperative to have a clear definition of the terms. The concept of technology is limited to the flow of production capacity, necessitating the false premise that technology transfer is undoubtedly expensive. For this purpose, analyzing the Kyoto Protocol is essential. Bosselmann has defined technology as "the complete body of knowledge applicable to human endeavor as well as the physical embodiments of the technology."<sup>6</sup>

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<sup>1</sup> Henrich Skaug Saetra, The Promise and Pitfalls of Techno-Solutionism for Sustainable Development, (2023) Available at <https://www.researchgate.net/publication/3697719917>

<sup>2</sup> UNCTAD, Technology and Innovation Report, 2018: Harnessing Frontier Technologies for Sustainable Development (United et al.), New York and Geneva.

<sup>3</sup> Gill Wilkins, Technology Transfer for Renewable Energy: Overcoming barriers in Developing Countries, (2002)

<sup>4</sup> Javier Carrillo Hermosilla and Pablo Martinipez Chapla, "Technology Transfer and Sustainable Development in Emerging Economies: The Problem of Technology Lock-In," Deposito Legal: M-20073 ISSN:1579-1873

<sup>5</sup> Michael Dutschke et al., "Risks and Chances of Combined Forestry and Biomass Projects under the Clean Development Mechanism"<sup>4</sup>.

<sup>6</sup> Klaus Bosselmann, Poverty Alleviation and Environmental Sustainability Through Improved Regimes of Technology Transfer, 2 Law Env't & Dev J 19 (2006)

#### IV. Definition of Technology Transfer:

Maskus<sup>7</sup> considers that technology includes particular production processes, internal organizational structures, management methods, financing techniques, marketing aspects, or amalgamation of technology, which can take various forms. Further, it may be documented by patent blueprints requiring know-how on the part of the staff. To summarize, technology transfer is based on the diffusion and adoption of technology, including know-how, between parties like private enterprises, administration, financial bodies, and NGOs, as well as research bodies like colleges and Universities. Moreover, it may be direct or indirect and may involve market mechanisms.

The process of technology transfer is complex, especially at the international level. It is made up of many components with a number of parties of concern, including Governments, international bodies, and developing countries. The process involves training to understand the technology, to utilize it, and to reproduce the technology further, including the ability to select the technology, adapt the technology to local conditions, and interpret it with indigenous technologies<sup>8</sup>

#### V. Advantage of Transfer of Technology: Case study:

The benefits of technology transfer can be studied from the case of a developing country that did not have access to the arrangements of the UNFCCC and Kyoto Protocol, helping the transfer of financial and technical matters. Taiwan is one such country that is neither a member of the United Nations nor of the International Court of Justice and hence excluded from the UNFCCC by Article 20. Further, the country is not part of ratification of the Kyoto Protocol. Being a developing country, it depends on international trade and some fossil fuels. It imports 80% of its coal and crude oil. Because of global activity, Taiwan's Greenhouse gas emissions are as high as 22<sup>nd</sup> in the world. It produces 1% of the world's emissions. Its carbon dioxide emission rate is also very high. It needs to gain technical know-how and experience in implementing GHG reduction policies and policies for the improvement of energy efficiency. It has to procure the necessary technology and equipment by itself. The costs faced by Taiwan are higher than in other developing countries.

Without outside assistance, the process of reducing GHG emissions is time-consuming. This delay wastes further resources and slows down domestic development. The example of Taiwan is the best case to explain the benefits of technology transfer. The approach to technology transfer spelled out in most Multilateral Environment Agreements (MEAs) is based on the concept of Common but Differentiated Responsibility.<sup>9</sup>

The transfer of technology is a crucial factor for sustainable development by facilitating the sharing and diffusion of environmentally sound and socially acceptable technologies in the countries that are undergoing the transition of economic growth. The technologies are expected to improve the standard of living and enhance wealth in developing nations. Agricultural and manufacturing innovations are indeed

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<sup>7</sup> Keith E. Maskus, "Using the International Trading System to Foster Technology Transfer for Economic Development," MICH St. L. Rev 219 (2005)

<sup>8</sup> Intergovernmental Panel on Climate Change Special Report Methodological and Technological Issues in Technology Transfer- Summary for Policy Makers (2000)

<sup>9</sup> This Principle includes two fundamental elements: the Common Responsibility of Countries for the environment at the national, required, and global levels And the need to take into account each country's contribution to a particular problem and its capacity to control the danger.

to increase productivity. The availability of clean water and the affordability of vital medicines strengthen the standard of life.

A number of characteristics and circumstances in developing countries that hinder technological development are lack of financial resources, infrastructure, scientists and researchers, quality and business government, brain drain, small market size, formal and informal rules and regulations, cash-strapped governments, inability to draw private investment in R& D. In view of such hurdles, the transfer of technology to developing nations is crucial.

## VI. Significance of Montreal Protocol<sup>10</sup> For Technology Transfer:

The Protocol strives to protect the ozone layer by phasing out Ozone Depletion Sources (ODS) like Chlorofluorocarbons (CFC), hydrofluorocarbon (HCFC), halogens, methyl bromide, Chloro-bromomethane. Article 10A establishes the regime for the transfer of EST, providing;

Each party shall take every practicable step, consistent with that of the programs backed by the financial assistance, to ensure that the best available, environmentally safe substitutes and related technologies are unconditionally transferred to developing countries and that the transfers referred to occur under fair and most familiar conditions.<sup>11</sup>

UNEP collects information to prepare an inventory of EST (Environmentally Sound Technologies) to phase out the ODS. Further, it has been active in undertaking capacity-building activity at the national level in developing countries.<sup>12</sup> The types of projects for the transfer of EST implemented by the Montreal Protocol include efforts to replace CFC-band foam-blowing machinery with new non-CFC equipment.<sup>13</sup> India has declared that it has successfully phased out a critical ozone-depleting and climate-warming substance, 1-Dichloro-1-fluoroethane, i.e., HCFC-141b, in cooling equipment systems. India is ambitious to phase out even the other ozone-depleting substances in the cooling systems.<sup>14</sup>

## VII. The Concept of Common but Differentiated Responsibilities:

CBDR is a significant principle accepted in the UNFCCC regime, which takes into account the differing capabilities and responsibilities of the individual countries in addressing the problem of climate change. All the countries accepted the Principle. The developed countries have a more significant role to play in the mitigation of climate change. The CBDR is mainly based on the historic responsibility crystallized to polluters' pay combined with the responsibility to address climate change.

This concept has undergone a dynamic change since 2011, when countries decided to determine their contribution to the GHGs individually. The CBDR Principle is also contrary to the component of MFN (Most Favoured Nation) of WTO, which calls for non-discrimination in trade. The dichotomy between the transfer of technology via trade and climate change remains.

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<sup>10</sup> The Montreal Protocol, 1987, was entered to protect the ozone layer by phasing out both the production and consumption of ODS (ozone-depleting substances).

<sup>11</sup> David Strelncer and Peter Linguits, *Environmentally Technology Transfer to Developing Countries: Practical Lessons Learned During Implementation of the Montreal Protocol*.

<sup>12</sup> Gilbert M. Bankobeza, *Ozone Protection, The International Legal Regime*, (2005)

<sup>14</sup> The Economic Times, December, 03, 2023

### VIII. Mechanisms of Technology Transfer:

Sustainability is achieved not only through the development of technical strategies, the formulation of legal structures, or the usage of financial components. The process involves compromises for the society, mindset, and method of life, which depends on the financial support for all levels of education. Further, nations can use Science and innovative technology to improve accessibility, establish regulatory structures, and strive to have solutions for challenges related to environment, energy, and food. When operating sustainability mechanisms, technology transfer should be as per the goals of sustainable development, implying affordable and clean energy, economic growth, innovation, infrastructure, sustainable cities, and similar communities<sup>15</sup>. The flows and methodologies are subject to variation.<sup>16</sup> The distribution or storage of technologies, pertinent sets of information, and results of their application can be termed as technology transfer. Transfer of Technology is a complex process that considers various components and variables. The mechanisms covering innovation and the transfer of technology have led to the development of applications in the sense of sustainable development framing as an expanded means of research in terms of bibliometric quantity, quality, and structural indications.<sup>17</sup>

### IX. UNFCCC AND THE KYOTO PROTOCOL (The concept of affordability):

It is worth noting that the UNFCCC is the centre stage for the international community's endeavour<sup>18</sup> to combat global warming. The Protocol recognizes that the transfer of EST is very significant for attaining the aim of stabilization of GHG concentration at a level that prevents detrimental interference with climate.<sup>19</sup> ICRIER, (2019). Further, the transfer of EST is designed to assist developing countries with responding to climate change through the mechanism of diffusion and utilization of proper mitigation and adaptation technology.<sup>20</sup>

The UNFCCC endorses the special duties of the developed countries in ensuring the proper execution of the objectives in terms of financial assistance and technology transfer. It also recognizes that developing countries need to alleviate the poverty of the masses.<sup>21</sup>

There are many vague, ambiguous commitments regarding the stabilization of GHG emissions and no specific stipulation for the reduction of GHG emissions. There is a need for substantial technological innovation in the league with rapid transfer of technology and skills.

The technology transfer schemes are governed by Articles 4.5 and 4.7 of the convention. The precise intention and consequences of the provision of the articles could be more specific. It is significant to note

<sup>15</sup> Henrich Skaug Saetra, The Promise and Pitfalls of Techno-Solutionism for Sustainable Development, (2023) Available at <https://www.researchgate.net/publication/369719917>.

<sup>16</sup> Wang C.L., Natural Sustainability and Education for Sustainable Development, (2016)

<sup>17</sup> Lisa Craiut et al., Technology Transfer in the Context of Sustainable Development- A Bibliometric Analysis of Publications in the Field, (2022) Available at <https://www.mdpi.com/journal/sustainability>.

<sup>18</sup> Peter D. Cameron, The Kyoto Process: Past, Present and Future, In Kyoto: From Principles to Practice, International Environmental Law and Policy (2001).

<sup>19</sup> Amrita Golder et al., Climate Change, and Technology Transfer – Barriers, Technologies and Mechanisms, Working Paper 382,

<sup>20</sup> Methods for Climate Change Technology Transfer Needs Assessment and Implementing Activities: Experiences of Developing and Transition Countries, Climate Technology Initiative Draft Report. (2001)

<sup>21</sup> Helen Argalias et al., Introduction: Environmentally Sound Technology- An Overview: UN Conference on Trade and Development on Advanced Technology Assessment (2000)

an inherent difficulty in the UNFCCC regarding establishing effective control or the transfer of EST, as the range of technology to be transferred needs to be more specific.

#### **X. CLIMATE CHANGE FACTOR (Technological Adaptation):**

For a successful climate change treaty, there must be an accelerated effort to transfer climate-friendly technology from developed to developing countries. Such measures must include direct assistance from developed countries, including considerable and predictable public finance. The challenge has to be grasped more fundamentally for building solid and sustainable markets for low-carbon solutions. It necessitates a set of complementary efforts on multiple fronts covering explicit promises by major developing countries to the types of national measures necessary to convey the demand for genuine technology.

Other essential elements in a new global climate agreement cover specific developed country emission targets to drive the global carbon market and, thereby, low-carbon technology deployment in developing countries. Further, the new technology body has to monitor, assess, and advise on technology-related issues. Overall, there should be a sincere commitment to carry on the technology transfer.

It is pertinent to note that other elements of a global strategy are better considered outside the UN climate paradigm. Such issues are cooperation on R&D and demonstration, which bilateral and plurilateral initiatives can follow. The WTO forum best addresses efforts to reduce trade barriers. The actual transfer of technology takes place through trade in goods and services. Thus, technology transfer involves a set of trade and investment policies where intellectual property issues come in the way. There is a division in the view as to what role intellectual property rights can play, whether in aiding the transfer of technology or blocking the transfer. The enormous tension between intellectual property rights and the transfer of low-carbon technology has to be resolved.

A new global climate change structure will only be feasible if it includes steps to transfer technology from developed countries with the know-how to developing countries where most future GHG emissions would occur. This central and enduring issue is the critical factor in the complex and polarizing negotiation. The process involves deep-seated tensions between North and South, varied commercial interventions, and ultimately, countries' competition position in the emergency of low-carbon energy.

#### **XI. Conclusion:**

Sustainable Development considers environmental issues, social challenges of disparity, overcoming the hurdles of technology in-degradation of soil, and depletion of water and natural resources. With advances in technology for sorting out the problems related to the environment and human activity, the goals of sustainability can be achieved through proper technology transfer.

North–South or South–South interaction is nothing but an international bridge that is emerging out of the road for sustainable development. Climate change has been one of the main challenges facing humankind. Undesirable emissions need to be controlled, leading to mitigation and adaptation. With the evolution of time, issues such as CBDR, Affordability and Accessibility of Technology, Adaptation, Mitigation, and Resilience are being solved. However, some mistakes still exist between the developed nations and fast-growing developed countries like China and India.

Technology transfer rules need to be set appropriately to maximize the trust factor and reduce tensions so that international disturbances on health and climate can also be fought together with appropriate technologies in various places.

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