TRANSFER OF TECHNOLOGY AND CLIMATE CHANGE: A LEGAL STUDY

Dissertation submitted to Jawaharlal Nehru University in partial fulfillment of the requirements for award of the degree of

MASTER OF PHILOSOPHY

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DECLARATION

I declare that the dissertation entitled "TRANSFER OF TECHNOLOGY AND CLIMATE CHANGE: A LEGAL STUDY" submitted by me for the award of the degree of Master of Philosophy of Jawaharlal Nehru University is my own work. The thesis has not been submitted for any other degree of this University or any other university.

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CERTIFICATE

We recommend that this dissertation be placed before the examiners for evaluation.

Prof Bharat H. Desai
Chairperson, CILS

Prof Bharat H. Desai
Supervisor

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Neelam Goswami

CONTENTS

Abbreviations

AC	Alternative Current
AF	Adaptation Fund
AWG-LCA	Ad hoc Working Group on Long Term Cooperative Actions
CBD	Convention on Biological Diversity
CCS	Carbon Capture Storage
CDM	Clean Development Mechanism
CERD	Charter of Economic Rights and Duties
CFT	Climate Friendly Technology
COP/CMP	Conference of Parties/ Conference of the Parties
CTI	Climate Technology Initiative
DC	Direct Current
DMD	Doha ministerial declaration
EGTT	Expert Group on Technology Transfer
EIT	Economies in Transition
EST	Environmentally Sound Technologies
EU	European Union
FDI	Foreign Direct Investment
FM	Financial Mechanism
GEF	Global Environment Facility
GHG	Green house gas
IPCC	Intergovernmental Panel on Climate Change
IPR	Intellectual Property Rights
ITT	International Technology Transfer

KP	Kyoto Protocol
LDC	Least Developed Countries
MNC	Multinational Corporation
NIEO	New International Economic Order
ODA	Official Development Assistance
OECD	Organisation for Economic Cooperation and Development
PV	Photo Voltaic
R & D	Research and Development
SBI	Subsidiary Body for Implementation
SBSTA	Subsidiary Body for Scientific and Technological Advice serving as the Meeting of the Parties
TNA	Technology Needs Assessment
ToT	Transfer of Technology
TRIPS	Trade Related Aspects of Intellectual Property Rights
TT	Technology Transfer
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nation Framework Convention on Climate Change
US	United States
WMO	World Meteorological Organisation
WTO	World Trade Organisation

Number of Tables and Figures

Introduction

Climate change has emerged as one of the common concerns of humankind. The frequency and severity of natural disasters are exacerbated by the rising greenhouses gases (herein after GHG) concentrations in the atmosphere. The impacts of climate change are affecting the developing and least developed countries more because of their vulnerability. This has to be resolved in the manner that is equitable and fair to all, taking into account the historical accountability of developed countries for emitting GHGs since the time of the industrial revolution. Thus, the effort to combat climate change is guided by the principle of common but differentiated responsibility and respective capability. The developing countries look to the developed countries for technological cooperation and financial assistance. Transfer of technology from technically developed states to other states which lack these technologies is important for a balanced development.

Ironically the developed countries are technologically advanced but they do not allow any compromise with their developmental process in the wake of rising concerns of climate change. They are equipped with clean and climate friendly technologies. Ironically the developing countries are technologically backward. The developing countries have raised their voice at different multilateral environmental forums for the transfer of technologies and finance to help them in the developmental process. United Nations Framework Convention on Climate Change (UNFCCC) is the main multilateral environmental agreement that provides a platform for concerted international action to mitigate climate change and to adapt to its impacts. Its provisions are far sighted, innovative and embedded in the concept of sustainable development. The Convention has near universal membership with 192 members having ratified it.

The UNFCCC entered into force on 12th March 1994.The Convention's ultimate objective is to achieve stability of GHGs in atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. . In the light of increasing scientific evidence about the risks of climate change, it soon became evident to policy makers that a more stringent agreement was necessary, in addition to the framework under the UNFCCC. It was at the meeting in Kyoto, Japan in 1997 where Third Conference of Parties agreed to the Kyoto Protocol to the UNFCCC. The Protocol entered into force on 16 February 2005.

Article 4.5 of the UNFCCC provides that "the developed country Parties and other developed Parties included in Annex II shall take all practicable steps to promote, facilitate and finance, as appropriate, the transfer of, or access to, environmentally sound technologies and know-how to other Parties, particularly developing country Parties".

Thus, the developed countries are under an obligation to provide environmentally sound technologies and know-how to other Parties, particularly developing country parties. As a corollary, it appears that technology transfer remains one of the important pillars in the implementation of the Convention.

In view of the significance of technology transfer in the UNFCCC scheme of things, it has been placed consistently in negotiations from the first meeting of the COP-1 (UNFCCC) till last COP-14 in the Poznan. In the Bali Action Plan emphasis was on enhanced action on technology development and transfer to support action on mitigation and adaptation (Para. 1 (d)).

Though UNFCCC agreement contains many references to technology transfer to developing countries, yet the focus of implementation has generally been on creating conditions in developing countries conducive to foreign investment and building capabilities to absorb and utilize imported technologies. It has led to lesser emphasis on measures which governments of technology supplier countries can and should take to facilitate and accelerate technology transfer. Similarly there has been absence of effective methods of measuring and verifying the extent of transfer of environmentally sound technologies (herein after ESTs).

Scope and Objective of Study

This study examines the meaning of technology transfer (hereinafter ToT) and the evolution of the debate of ToT in multilateral negotiations. Role of technology transfer in climate change mitigation and adaptation will be taken into account. The study seeks to find the obligations of developed countries towards developing countries regarding transfer of technology. Besides seeking answer to the above questions, the possible legal barriers preventing the flow of technology transfer has been examined. An effort has been made to analyse the process in which ToT is being addressed in the post Kyoto negotiations.

The study has sought to identify the obligations of developed countries under the UNFCCC and the Kyoto Protocol (hereinafter KP) to transfer environmentally sound technologies to developing countries and how far they have been complied with. The legal constraints hampering the transfer of technology to developing countries have been looked into especially the role of intellectual property laws. UNFCCC Conference of Parties (hereinafter COP) and the Kyoto Protocol-Meeting of the Parties (MOP) have played a pivotal role in the climate specific legal issues. The important steps taken by the COP/CMP have been duly considered. Thus the works by the Expert Group on Technology Transfer (hereinafter EGTT) has been analysed from this perspective. The proposals forwarded by developing countries under the current climate negotiations on technology transfer and to what extent they have been incorporated in the present regime are quite relevant. The problem of finance crucial for ToT has been also taken up in this study.

Research Methodology

The present study has been mainly analytical one. It is based upon primary and secondary sources. Apart from United Nations instruments, books, journals, conference papers and relevant internet sources/online materials has been consulted.

This study is divided in **four chapters** as follows.

First chapter covers the legal instruments and provisions relating to the technology transfer. it examines UNFCCC and KP, main legal instruments dealing with climate change and other associated issues as well as the governing bodies under the convention and progress they have made in the technological development of the developing countries.

Second chapter starts with the definition of technology transfer. It covers the entire debate of technology transfer between developed and developing countries pertaining to transfer of climate friendly technologies. It throws light on the condition of the developing countries, evolution of the debate of technology transfer in the international multilateral environmental agreements and channels of transfer of technologies. In addition it also depicts variants of clean energy technologies and it details about the biofuels, wind energy and solar energy technologies also. Besides it discusses briefly about the capacity building and enabling environment for the absorption of clean technologies in developing countries.

Third chapter is deals with the legal barriers hampering the dissemination of clean technologies to the developing countries. It highlights the IPRs and lack of finance as basic constraints to the dissemination of clean technologies as well as the complexities and intentions of developed countries towards the IPRs regimes. Perspectives of developing countries and developed countries are also examined. At international negotiations developing world present their grievances but in vain. But successive efforts of developing countries are leading to prepare the grounds for the approval of their demands either for flexibilities under TRIPS or financial availability as positive nodes from certain quarters of the world. It also examines the position of the world regarding the spread of clean technologies thereby reflects the big gap between the two parts of the world.

Fourth chapter seeks to examine the expectations of the developing countries in the post KP-2012 regime. On the basis of existing developments at the international discussions and comments by the states parties to the Convention, it depicts the suggestions regarding legal provisions to be included in the post 2012 regime.

Last chapter provides conclusions of the study.

Chapter I

Conceptual Analysis of the Transfer of Technology

Introduction

This chapter focuses on the conceptual analysis of the transfer of technology (herein after ToT). It concentrates on the broad aspects of the concept of transfer of technology as it is evidenced in the existing literature, UNFCCC and negotiations of the subsidiary bodies of the Convention. Beginning with mitigation and adaptation technologies it will cover the different channels and their fruition in the flow of technologies to the developing countries. With the analysis of the concept of capacity building and enabling environment the concept of transfer of technology is complemented. Without the analysis of embedded concepts of technology transfer the discussion of transfer of technology can not complete. Thus the meaning of technology transfer is not interpreted only as the transfer of capital goods, equipment and machines.

Mitigation

Mitigation refers to human interventions to reduce emissions of greenhouse gases from the sources or to enhance their removal by sinks.[1] Mitigating climate change and achieving stabilisation of GHGs in atmospheric concentrations is the ultimate objective of the UNFCCC which requires GHGs reductions including energy-related carbon dioxide (CO2) emissions. It is possible only by the development and deployment of improved and new low-carbon technologies.[2]

Mitigation Technologies

Mitigation technologies are a term used to describe those technologies that reduce the levels of GHGs emissions. Many of the mitigation technologies focus on reducing carbon dioxide emissions from fossil fuel combustion as they form the largest share of overall GHG emissions.

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[1] See UNDESA (2008), United Nations Department of Economic and Social Affairs, "Climate Change: Technology Development and Technology Transfer", Accessed on 21 December 2008 available at http://www.un.org/esa/sustdev/sdissues/energy/op/beijing_hlccc_nov08/back_paper.pdf

[2] See Debra Justus, Cédric Philibert, *International Energy Technology Collaboration and Climate Change Mitigation Synthesis Report,* OECD/IEA, 2005

Mitigation technologies cover carbon dioxide capture and storage (CCS) technologies, renewable energy technologies (e.g., wind, solar, biomass fuel), energy efficiency technologies, conservation technologies (e.g., efficient vehicles, efficient buildings), fuel switching, nuclear fission, forest management and agricultural soils management technologies.[3] Many of these available technologies are not yet fully competitive under current policies and markets.[4] The World Bank (2000)[5] notes that the quality of energy is low for two billion people worldwide who are dependent on biofuels, and combustion of these fuels leads to poor indoor air quality.

UNFCCC in its definition singles out mitigation technologies and does not mention about adaptation technologies as they play marginal role. The references to above 'practices and processes' refers to behavioural and lifestyle changes, ensuring that Article 4.1 (c) strikes a balance between two polar views regarding the role of technology in the climate debate: one giving prominence to carbon-free technologies that would permit life to proceed as 'normal', the other giving greater prominence to changes in behaviour.[6]

The developmental process is very rapid in the developing countries especially economies in transition to meet the urgent needs of food, education, health, infrastructural development and industrial development et cetera. So, for sustainable development they are advised not to ride on the unsustainable path of growth, that is unlimited emission of GHGs in development process. Energy supply at large is required for any development process in the developing countries. Energy efficiency and development of renewable energy technologies is to be focused in the developing states. They have ample natural resources to be harnessed to produce renewable energy. The developing countries have large untapped potential in renewable energy resources which can be exploited to fulfil energy needs which is key element to economic development and poverty alleviation. Decentralized electricity generation based on renewable energy supplies (e.g., wind, solar, biomass) can be a key

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[3] See Murphy, Deborah et al. (Aug 2005), *Climate Change and Technology*, International Institute for Sustainable Development, [Online: web] Accessed on 22 October 2008 available at http://www.iisd.org/

[4] Ibid

[5] World Bank (2000), Energy Services for the World's Poor. *Energy Sector Management Assistance Programme*. No. 20824. Cited in See Murphy, Deborah et al. (Aug 2005), *Climate Change and Technology*, International Institute for Sustainable Development, [Online: web] Accessed on 22 October 2008 available at http://www.iisd.org/

[6] See Yamin, Farhana and Depledge (2004), *"The International Climate Change Regime a Guide to the Rules, Institutions and Procedures"*, Cambridge: Cambridge University Press

component to grid extension in socio-economic development and lead to improved local and indoor air quality associated with health benefits[7].

The developed counties initiative is required for the transfer of appropriate technologies. Though, renewable energy is projected to meet only 2.5 percent of overall global demand of energy by 2030.[8] The potential market for renewable energy is impressive in developing countries because of climate, untapped potential, geographic size and undeveloped power infrastructure. Advanced renewable energy technologies, including those in the areas of small hydro, biomass and photovoltaic technologies, will be in high demand in all developing countries. Therefore, it is beneficial commercially for developed countries also to transfer technologies in the concerned area to developing countries.[9]

India and China are growing economies. They have large coal reserves. Their concerns of economic development and energy security priority will lead them to share the two thirds of the increase in world coal consumption over the next thirty years.[10] Seeing the growth rate and development pace of these two countries, clean coal technologies and carbon capture and storage (CCS) will be indispensible to limit the GHG emissions.[11]

India China, Japan and Korea have potential to develop more capacity to nuclear project to meet their energy needs. It is environmentally friendly as it can offer near- zero emission options.[12]

To solve the climate change problem decarbonisation of energy supply is in need. Research and development (hereinafter R&D) and large scale investment is needed to ensure long term clean technologies. These technologies include CCS, fuel cells, hydrogen systems, renewable energy, biotechnologies and advanced technologies which can transform the vehicles into

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[7] See Murphy, Deborah et al. (Aug 2005), *Climate Change and Technology*, International Institute for Sustainable Development, [Online: web] Accessed on 22 October 2008 available at http://www.iisd.org/

[8] International Energy Agency (IEA). 2004a. Key World Energy Statistics. Paris: IEA., cited in Murphy, Deborah et al. (Aug 2005), *Climate Change and Technology*, International Institute for Sustainable Development, [Online: web] Accessed on 22 October 2008 URL: http://www.iisd.org/

[9] See Murphy, Deborah et al. (Aug 2005), *Climate Change and Technology*, International Institute for Sustainable Development, [Online: web] Accessed on 22 October 2008 available at http://www.iisd.org/

[10] See Energy Information Administration (2004), International Energy Outlook 2004 cited in Murphy, Deborah et al. (Aug 2005), *Climate Change and Technology*, International Institute for Sustainable Development, [Online: web] Accessed on 22 October 2008 available at http://www.iisd.org/

[11] See Murphy, Deborah et al. (Aug 2005), *Climate Change and Technology*, International Institute for Sustainable Development, [Online: web] Accessed on 22 October 2008 available at http://www.iisd.org/

[12] See Planet Ark. (2004), *Suppliers Readying for Asia Nuclear Power*. Reuters News service, cited in Murphy, Deborah et al. (Aug 2005), *Climate Change and Technology*, International Institute for Sustainable Development, [Online: web] Accessed on 22 October 2008 available at http://www.iisd.org/

environmentally friendly vehicles. It is possible only when technology meets the concern of health, safety, reliability and cost effectiveness.[13]

Afforestation and reforestation is another way that can increase the carbon sinks and enhance mitigation. In the agricultural sector, advanced technologies, such as aerobic composting of manure and the use of air seeders to reduce fertilizer use can reduce methane and nitrous oxide emissions. Landfill gas recovery and use technologies and recycling and waste containment programs can reduce methane emissions related to the disposal and treatment of industrial and municipal waste. This can be used as source of renewable energy[14].

Thus, it seems that there is need of a comprehensive policy to save the climate from disastrous effect of GHGs in the atmosphere.

Adaptation

Intergovernmental Panel on Climate Change (hereinafter IPCC) defines adaptation as adjustments in practices, processes or structures which can moderate or offset the potential for damage or take advantage of opportunities created by a given change in climate[15]. The Convention's definition of climate change limits its scope to additional changes to climate system attributed directly or indirectly to human activity.[16]

Technologies for adaptation are those that "reduce the vulnerability, or enhance the resilience, of a natural or human system to the impacts of climate change".[17] These

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[13] See also Hoffert et al. 2002. "*Advanced Technology Paths to Global Climate Stability: Energy for a Greenhouse Planet*," Science, Vol. 298 (1 November), pp. 981-987

[14] See cited in Murphy, Deborah et al. (Aug 2005), *Climate Change and Technology*, International Institute for Sustainable Development, [Online: web] Accessed on 22 October 2008 available at http://www.iisd.org/

[15]IPCC (2001), "*Climate Change 2001: Impacts, Adaptation, and Vulnerability, Summary for Policymakers and Technical Summary of the Working Group II Report*" Intergovernmental Panel on Climate Change, Geneva, Cited in Ian Burton et al, (2002), "*From Impacts Assessment to Adaptation Priorities: the Shaping of Adaptation Policy*", Climate Policy 2(2002) 145 -159, [Online Web] Accessed on 4 March 2009, available at http://www.undp.org/cpr/disred/documents/wedo/icrm/climate_policy_paper2.pdf

[16] UNFCCC Article 1.2 states that, ' climate change' means a change of climate which is attributed directly or indirectly to human activity that alters the composition of global atmosphere and which is an addition to natural climate variability observed over comparable time periods. Cited in Farhana Yamin and Joanna Depledge, The International Climate Change Regime, A Guide to Rules, Institutions and Procedures, pp-214-215, Cambridge University Press, U.K.

[17]See Vladu, I.F. (2005), *Technologies for Adaptation to Climate Change under the UNFCCC Process.* Presentation at UNFCCC seminar on the development and transfer of environmentally sound technologies for adaptation to climate change. Tobago, 14-16 June 2005. Cited in cited in Murphy, Deborah et al. (Aug 2005), *Climate Change and Technology*, International Institute for Sustainable Development, [Online: web] Accessed on 22 October 2008 URL: http://www.iisd.org/

technologies comprises[18] high efficiency water-saving agro-technologies such as spray and drip irrigation; water efficiency and reuse technology for industrial water; treatment technology of industrial and household wastewater; household water-saving technology; high-efficiency flood-controlling technology; agro-biological technology; agricultural and animal breeding technology; production technology for new-type fertilizers; disease and pest control technology for cropland, forest, and grassland; cultivation technology of fast-growing high-yield forest and high efficiency firewood forest; technology for recovery and reconstruction of wetland, peat land, mangrove and coral reef ecosystems; technology for observation and pre-warning of flood, drought, sea level rise, agricultural disasters, desertification, glacier collapse etc.[19] These are the very important as developing countries still rely more on agriculture and forestry as economic activities and even technologies in the industrial sector are found to be obsolete. They need adaptation technologies from developed world to become participant in the global fight against climate change.

Adaptation technologies are very crucial to the developing countries as they are more vulnerable to the climate change and their survival is at stake. Most of the developing countries are nascent economies and they are in urgent need to meet socio, economic and health demands. Extreme weather events (e.g., heat waves, smog, droughts, and extreme rainfall), increase air pollution and water and food borne enteric diseases, so, long term and short term adaptation technologies are of utmost importance for the developing countries.[20] The United Nations Development Program estimated that the adaptation needs of the developing countries to cope with the impacts of global warming will cost more than $80 billion up to 2015.[21] In Bali, negotiators also reached agreement on implementation of the Adaptation Fund that was created under the Kyoto Protocol, setting up the Global Environment Facility (GEF), as the day-to-day implementing body for the fund and creating

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[18] South Centre(2007), *Integrating development in climate change, A Framework Policy Discussion Paper on Key Elements for the Development of the Post-2012 Global Climate Policy Regime, Special policy discussion paper (November 2007),* Accessed 28 October 2008 URL: www.southcentre.org.

[19] Ibid

[20] See Murphy, Deborah et al. (Aug 2005), *Climate Change and Technology*, International Institute for Sustainable Development, [Online: web] Accessed on 22 October 2008 available at URL: http://www.iisd.org/

[21] UNDP (2007/2008), United Nations Development Program, "Fighting Climate Change: Human Solidarity in a Divided World," *Human Development Report, 2007/2008.* Summary, p. 26-27, Accessed 28 January URL: hdr.undp.org/en/reports/global/hdr2007-2008/

an executive board comprised of a majority of the developing countries to oversee the expenditures from the fund.

Channels of Transfer of Technology

There are various channels of transfer of technology. They can be either market based (including trade, foreign direct investment and technology licensing) or informal means (such as imitation and mobility of the technical and managerial personnel). They are detailed in the following sections respectively.[22]

A. Market channels

First of all market channel for transfer of technology includes trade in goods and services, through foreign direct investment, licensing, joint ventures and cross border movement of personnel. In the context of climate change transfer of technological inputs in the shape of machinery, design and hardware which can increase the productivity comes under the purview of trade in goods and services.

Second channel is an important and old way to transfer the technology. It is foreign direct investments through multinational corporations (MNCs) which play an active role in the deployment of new technologies.[23] MNCs through their subsidiaries carry the technologies in the host countries. Their motivation is always backed to control the ownership of knowledge based assets.[24] The knowledge based assets may cover manufacturing chemical formulas, machinery design, factory-floor management, and numerous producer services such as financial methods and construction blueprints. It is alleged that most of the MNCs carry obsolete technologies to the developing countries. The developing countries can adopt appropriate regulatory measures to drive the technologies for their advantage. Protection of

[22]See also Keith E. Maskus, (2003) Encouraging International Technology Transfer , UNCTAD/ICTSD Capacity Building Project on Intellectual Property Rights and Sustainable Development, This case study by Prof. Keith E. Maskus has been prepared in the context of the Project on TRIPS and Development Capacity Building sponsored by the Department of International Development (DFID UK). The Project is being implemented by the secretariat of the United Nations Conference on Trade and Development (UNCTAD) (Project Number INT/OT/1BH) and the International Centre for Trade and Sustainable Development (ICTSD). The broad aim is to improve the understanding of TRIPS-related issues among developing countries and to assist them in building their capacity for ongoing as well as future negotiations on intellectual property rights (IPRs).
For details on the activities of the Project and available material, see <http://www.ictsd.org/unctad-ictsd>. , Keith E. Maskus, Using the International Trading System to Foster Technology Transfer for Economic Development, Michigan State Law Review [Vol. 2005:1]

[23] Ibid

[24] Ibid

proprietorship of owners of the technologies through the IPR protection may help recipients to develop confidence in the suppliers.

Third major channel for transfer of technology is through licensing. MNCs may retain proprietary control technical know-how yet licensee may acquire production or distribution rights. In the case of public health the provision of compulsory licensing is permitted under Agreement on Trade Related Aspects of Intellectual Property Rights (hereinafter TRIPS) mechanisms the same course may be acquired for the issue of transfer of technologies for climate change mitigation and adaptation. Note that in this regard patents, trade secrets, copyrights, and trademarks serve as direct means of information transfer.[25]

Joint ventures are setting a new trend in the developing countries in the transfer, development and deployment of new technologies in industrial sector. This trend is required in the all sectors for transfer of environmentally sound technologies for sustainable development. International firms provide superior technology which can be harnessed by local producers through better management techniques.[26]

Some technologies cannot be imported in formulas, know-how or design but needs trained engineers and personnel for application of the technology. There is need of cross border movement of the people. The developing countries are to be given flexibility and facilities in developed countries to update themselves and proficient for the transferred technologies. On the other side MNCs do not bring skilled personnel in the developing countries rather they employ cheap labour of developing countries. It has advantages and disadvantages both. At least skilled in specific technologies trained personnel need to come to train the host countrymen and thereby effective transfer of technologies can take place.

It is important to note that trade, foreign direct investment; licensing, joint ventures, and personnel movements are interdependent processes. These decisions are made jointly by firms seeking to maximize returns on their technological assets. Policy environments affect these decisions, both in overall scope and in their substitution among channels.

Foreign direct investment (hereinafter FDI), licensing, joint ventures, and personnel movements are interdependent processes to maximise the technological development. But it

[25] Ibid
[26] Ibid

all depends upon the policies of both foreign and host countries. These are the tools of international trade and market transactions which facilitate the transfer of technologies.[27] However it is possible when both developed and developing countries participate equally at the negotiations table. IPR issues along with other non- legal issues come in the way of these market tools in the smooth transfer of technologies. So it is not very advantageous for low income countries as they are not on equal terms. But still it provides at least some scope for them to become technologically development.

(i) Trends in Market-Mediated International Technology Transfer (ITT)

Either through trade, FDI or other channels, low income countries and especially sub-Saharan countries have been benefited minimally as actual flow of technologies to them have been very low from Organisation for Economic Cooperation and Development (hereinafter OECD) countries. Technology transfer is much lower in sub-Saharan countries. Total trade in technology intensive goods grew rapidly in the last three decades.[28] The upper middle income countries share more for technology intensive exports from OECD countries. However it is to be noted that even they only account for only three percent of total share of exports of OECD countries. They have entered in the technology trade since 1980s. The lower middle income countries have greater share of OECD FDI flows than trade in technology intensive goods, for instance China is able to attract investment. This is more or less same for the low income countries. But share of skill intensive and technology intensive trade and FDI to low income countries is not supposed to be very encouraging. Now there is a need of evenly distribution of technological development to both middle and low income countries.[29]

(ii) Market Failures and the Need for Intervention

Technological development is not the exclusive domain of public sector in the developed countries. Many of the developing countries are complaining since a long time that the flows of ITT through private channels are inadequate.[30] Implicitly the claim is that the volume (and quality) of technology transfers is well below the required. In principle, this deficiency could be the result of failures in private markets for technology, failures in surrounding factor and

[27] Ibid
[28] Ibid
[29] Ibid
[30] Ibid

product markets, and failures in public policy. As in the U.S. subsidies are provided to the research and development (hereinafter R&D) to the technology development which results in the technologies patented by the private entities.[31] The patent holder charges exorbitant rate to the licensing of technologies. Besides, they do not lead to the capacity building or self reliance in the development of that technology in the developing countries. Therefore, the developing countries may not afford to access the technologies. This trend is to be modified by the big powers like U.S. so that the patented technologies can be transferred easily to the developing states. Public policy changes on the part of the developing countries is also required such as trade policies, economic policies and legal policies, these all to be resolved to facilitate the transfer of technology.[32]

B. Non-Market Channels

When technology transfer takes place from one country to another without involving formal transaction is considered through the non-market channel for instance imitation, departure of the employees et cetera.[33]

(i) Imitation

Imitation is the most effective non-market channel of ITT (international technology transfer). It may be achieved through product inspection, reverse engineering, decompilation of software, and even simple trial and error.[34] Whether it is legal or illegal depends upon the scope of intellectual property protection and the security of trade secrets from unfair completion.[35] It very attractive for the developing countries as it bears no cost to be paid to

[31] See also Maskus, Keith E., (2003), "Encouraging International Technology Transfer", Accessed on 5 November 2008, available at http://www.iprsonline.org/unctadictsd/docs/CS_Maskus.pdf. This case study by Prof. Keith E. Maskus has been prepared in the context of the Project on TRIPS and Development Capacity Building sponsored by the Department of International Development (DFID UK). The Project is being implemented by the secretariat of the United Nations Conference on Trade and Development (UNCTAD) (Project Number INT/OT/1BH) and the International Centre for Trade and Sustainable Development (ICTSD). The broad aim is to improve the understanding of TRIPS-related issues among developing countries and to assist them in building their capacity for ongoing as well as future negotiations on intellectual property rights (IPRs).

[32] Ibid

[33] Ibid

[34] Ibid

[35] Ibid

the owner of technology. Its negative impacts can be thwarted by integrating local skills to develop indigenous technologies.[36]

(ii) Departure of Employees

Under this, skilled personnel trained in one firm in one country move to other firm or country and start the same knowledge based industry. In this way technological transfer takes place without compensation to the owner of the technology. But it is subject to the legal treatment of labour mobility and non-competing clause et cetera.[37]

(iii) Data in Patent Applications and Test Data

Another means of acquiring technology without compensation is to study available information about the technologies. Patent applications, registered abroad, are available for this purpose. Rival firms in principle can read such applications, learn the underlying technologies, and develop competing processes and products that do not infringe the claims of the original applicants.[38] Thus, patents provide both a direct source of technology transfer, through FDI and licensing, and an indirect form through inspection. However, there is much debate over whether such patent disclosures provide sufficient information that rival engineers can understand the technologies.[39]

A related source of information is confidential test data provided by patent applicants to governments. Government agencies may choose to share such data, possibly after a period of exclusivity awarded to the original applicants, to domestic rivals in order to avoid research duplication costs and accelerate generic competition.

(iv) Temporary Migration

Further the temporary migration of students, scientists, and managerial, technical personnel to universities, laboratories, and conferences located in the developed countries may carry out the transfer of technology. It is long lasting form of transfer of technology.[40]

The major task for developing countries is to encourage its expatriate students and professionals to return home and undertake local scientific, educational, and business

[36] Ibid
[37] Ibid
[38] Ibid
[39] Ibid
[40] Ibid

development. Chinese experience can be illustrated in case of establishment of Suntech Solar Power Cop. Ltd_by its founder who studied in the Australia and returned to the country and made significant contribution to make China a power in solar energy production and export.[41] Following table illustrates briefly the various channels of transfer of technology.

[41] See J.H. Barton, "New Trends in Technology Transfer Implications for National and International Policy, *Issue Paper No. 18,* International Centre for Trade and Sustainable Development (ICTSD) Geneva, Switzerland, [Online: web] Accessed on 22 October 2008 available at , http://www.iprsonline.org/resources/docs/Barton%20%20New%20Trends%20Technology%20Transfer%200207.pdf

Table-1 Channels of International Technology Transfer [ITT]

Foreign Direct Investment	Major tool of international trade through which developing countries can acquire developed technologies from the developed counterparts.
Joint ventures	Under joint owned companies, the industrialising partner gains direct access to training and technology. The foreign firms secure low cost production. The firm in host country becomes recipient of technology.
Company acquisition	Technology acquisition through acquisition of foreign companies along with the skilled personnel, management, and equipment.
Licensing	A local company compensates to the foreign firm for acquiring the license to produce or manufacture the goods. This requires more technical knowledge at local level than in joint ventures.
Imitating	Under this firm imitates the technique of foreign firms in production. It may involve various means.
Subcontracting	A local firm manufactures a component or sub-assembly for a foreign manufacturer located either in new industrialised country or overseas.
Original Equipment Manufacturer [OEM]	It is a specific form of subcontracting. Like joint venture it needs close partnership with foreign firms. In gem local firm produces the commodity which is marketed by the foreign firm through its channels under its brand and name. Even selections of equipment, manager, engineers are determined by the foreign firms.
Informal means	Under this firm hiring foreign managers, engineers, or personnel in foreign universities and local personnel trained in foreign companies.
Strategic Partnership	Development of technology by a firm in developing country in equal partnerships of foreign firms.
Foreign Buyers	A foreign buyer contracts to local firm to supply product for advanced market for example J.C. Penney in United States and Mitsui in Japan.

Trends in the Technology Development in the Developed and the Developing Countries

Variations in the process of technology development in the developed and developing countries ultimately affect the further diffusion and deployment of technologies. There are two ways of developing a technology through (i) public sector or public funds and (ii) private sector. The proportion of these two sectors in the research and development of technologies varies from industry to industry, time to time and from developed to developing countries. In case of life saving things balance is shaped by the public funds or public sector establishments for example United States National Institute of Health shape the research and clinical tests done by the pharmaceutical industries in United States of America (hereinafter U.S.).[42]

In India heavy subsidies is given by the government to the pharmaceutical industries in research and clinical testing as private sector is reluctant to take initiatives in this context. In the computer sector early developments were supported by the public sector but contemporary research is supported primarily by the private sector industries. For example in the United States, overall the government, universities and non-profit institutions fund roughly account for 95 billion dollars for research and industry sector funds about 181 billion dollars for research and development.[43]

In developed countries the share of public sector is 34 percent and 66 percent by the private entities in the development of new technologies.[44] Contrary to it, in developing countries government plays bigger role as comparison to private sector in research and development of new technologies. For instance in Brazil and India this distribution weighs heavily in favour of public sector and it is 59 percent of former and 77 percent in case of latter.[45] Examination of above data reveals that still basic infrastructural development to speed up the follow on technological development in environmental field is to be done by the government in

[42] See J.H. Barton, "New Trends in Technology Transfer Implications for National and International Policy, *Issue Paper No. 18,* International Centre for Trade and Sustainable Development (ICTSD) Geneva, Switzerland, [Online: web] Accessed on 22 October 2008 available at , http://www.iprsonline.org/resources/docs/Barton%20%20New%20Trends%20Technology%20Transfer%200207.pdf

[43] Ibid

[44] Ibid

[45] Ibid

developing countries so that industries can see benefits and no loss in adventuring in the research and development of climate mitigation and adaptation technologies.

Above discussion also answers the question why there is not as much transfer of technology as per the requirement by the developing countries. The aforesaid story reveals that majorities of technologies are developed and owned by the private sector so conducive environment is essential for the transfer of technologies from the developed to the developing world. But the developed countries can transfer public domain technologies howsoever it may be less in number. As well they can include provisions while patenting the technologies so as to smooth the transfer. Climate instability is the challenging issue like health so its special treatment is required in international law and related negotiations.

It cannot be ignored. This challenge has to be taken up as it is nowhere less than an epidemic. An environmentally harmful activity in one place may pose crisis for the people of other place so cooperative action is needed on the part of the developed countries. As what happened at Bali Conference on the issue of technology transfer and financial mechanism to support to developing countries is clear.[46] They played role to derail the talks on the issue of transfer of technology.

Important Clean Energy Technologies

The key to reduce emissions globally lies in the accelerated deployment of clean technologies.[47] There are few clean technologies of which transfer can bring significant changes in the growth without compromising with the climatic system; they are in the areas of carbon dioxide capture and storage (CCS), renewable energy (e.g., wind, solar, biomass fuel), energy efficiency and conservation (e.g., efficient vehicles, efficient buildings), fuel switching, nuclear fission, forest management and agricultural soils management). The following picture illustrates the potential of different sectors to reduce GHGs.[48]

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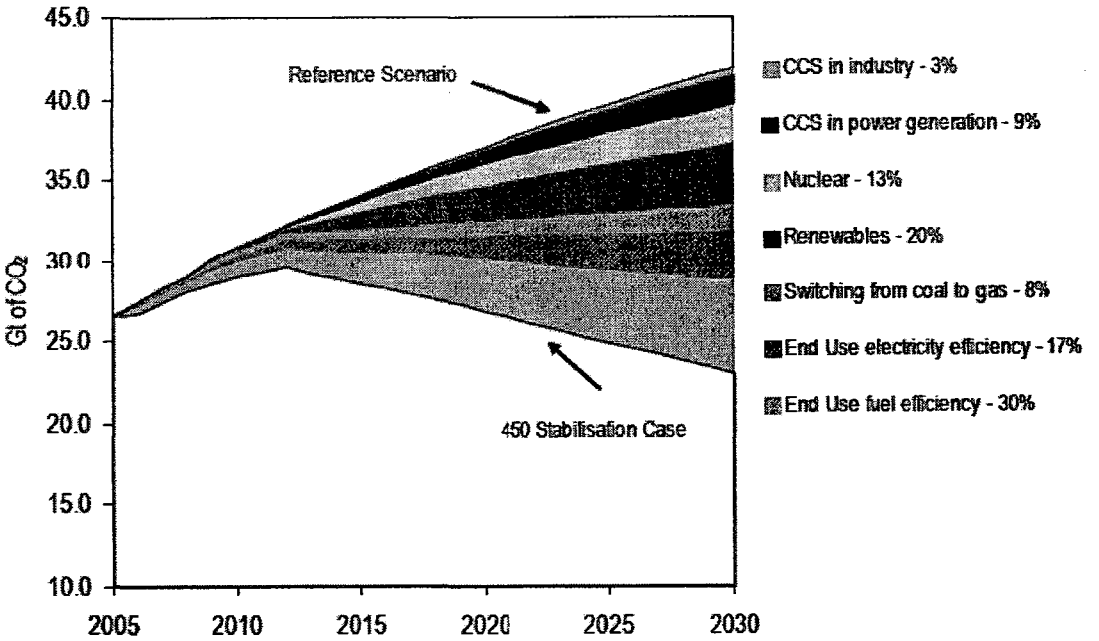
[46] Technology transfer has been included as one of the four building blocks of the Bali roadmap along with mitigation, adaptation and fund

[47] PEW Environment Group, "A Guide to the Latest United Nations Negotiations: A Summary of the Core Issues", Accessed on 20 March, available at URL: http://www.pewtrusts.org/uploadedFiles/wwwpewtrustsorg/Reports/Global_warming/UN_Negotiations_08.pdf

[48] See Murphy, Deborah et al. (Aug 2005), *Climate Change and Technology*, International Institute for Sustainable Development, [Online: web] Accessed on 22 October 2008 available at URL: http://www.iisd.org/

Figure- 1 Different sectors and their potential to reduce GHG emissions[49]



Energy related emissions account for more than eighty percent of global CO_2 emission responsible for climate change. Therefore, improvements in energy efficiency and development of low carbon sources of energy offer great potential for reducing emission in the future. As per International Energy Agency (hereinafter IEA) efficient production and use of energy can contribute 78 percent reductions in the emission of CO_2 by 2030. Another 12 percent reduction may possible from renewable sources of energy and rest ten percent from additional nuclear power.[50]

Kyoto Protocol Article 2.1 to the UNFCCC expressly encourages Parties to the Convention to achieve energy efficiency enhancements and to develop and increase the proportion of new and renewable sources of energy. Besides the climate change objectives, the Johannesburg Plan of Implementation points out to the enhancement of international and regional cooperation, 'to improve access to reliable, affordable, economically viable, socially

[49] See also International Energy Agency, World Energy Outlook 2007. Paris: International Energy Agency (2007), cited in UNDESA (2008), United Nations Department of Economic and Social Affairs, "Climate Change: Technology Development and Technology Transfer", Accessed 21 December 2008 available at URL:http://www.un.org/esa/sustdev/sdissues/energy/op/beijing_hlccc_nov08/back_paper.pdf

[50] Ibid

acceptable and environmentally sound energy services, as an integral part of poverty reduction programmes'.[51]

As the world steps to combat global warming, climate instability, developing countries are also likely to face increasing demands to take greater action to reduce the emission of GHGs and particularly carbon dioxide (CO_2).[52] So they have to obtain the new environmental friendly technologies (hereinafter ESTs) in order to participate equally in dealing with the crisis.

Technologies may be transferred either through product, equipment incorporating knowhow as ozone layer safe coolant compounds or photo voltaic (hereinafter PV) panels for off-grid electrical supply or to license to manufacture or develop the transferred technology at indigenous level (through indigenous firm or joint venture). Final way is to support developing national capability to research and produce the product independently of licensor. Following chart shows the development of new technologies in different parts of the world. It reflects that the developed countries are far ahead in the development of new technologies.

Historically they have played major role in the emission of GHGs in the atmosphere as two hundred years earlier to the developing countries industrial development took place. Therefore responsibility is presumed to be on the big and old polluters. So it is not charity given by developed countries but the genuine rightful demand of developing countries.[53]

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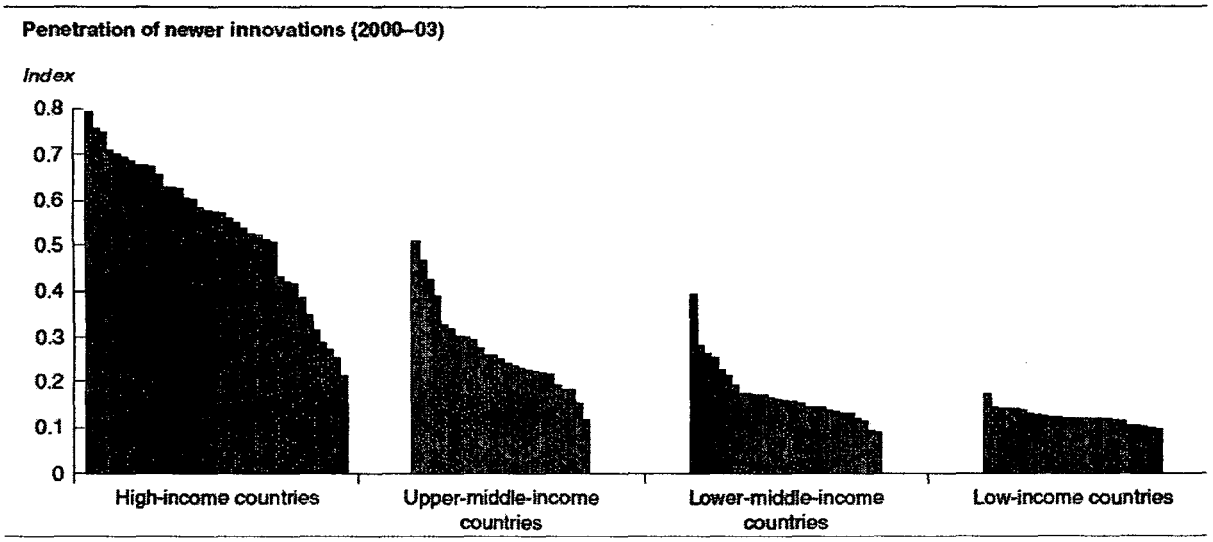
[51] United Nations (2002), *Report of the World Summit on Sustainable Development*, New York: United Nations cited in UNDESA (2008), United Nations Department of Economic and Social Affairs, "Climate Change: Technology Development and Technology Transfer",Accessed 21 December2008URL:http://www.un.org/esa/sustdev/sdissues/energy/op/beijing_hlccc_nov08/back_paper.pdf

[52] As happened in the Accra climate talk (concluded from 21-27 August, 2008) where developed countries tried to divide developing countries to assign the emission reductions to which developing countries opposed strongly. Developing countries said that developed countries are historically responsible to the climate change and developing countries minimally contribute the emission.

[53] See Earth Negotiation Bulletin (2008), *Summary of the Third Session of the Ad Hoc Working Group under the Convention and Sixth Session (part one) of the Ad Hoc Working Group under the Kyoto Protocol,* Vol. 12 No. 383, Published by the International Institute for Sustainable Development (IISD), Accessed on 22 November 2008, available at www.iisd.ca/download/pdf/enb12383e.pdf, Third World Network (2008), *"Accra News Updates and Climate Briefings"*, Accra Climate Change Talks, 21 August-27 August 2008, accessed on 20 January, available at URL: http://www.twnside.org.sg/climate.htm

Figure 2- Penetrations of new technologies in different parts of the world by income level.[54] Each bar represents a single technology, and the height of the bar shows its penetration level in the country type.

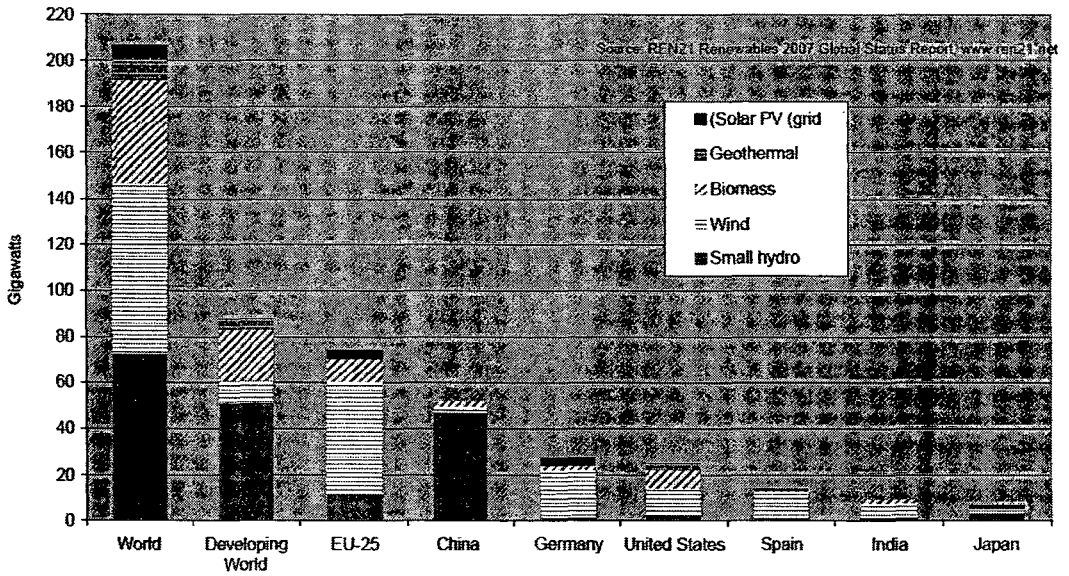


The above chart makes it clear that still lower middle income countries and low income countries lagging behind technologically in comparison with the developed countries. Hence their apprehension regarding the commitments to reduce GHGs will hamper their economic growth is somewhat not groundless. In fact developed countries are not complying with Article 4.7[55] of the UNFCCC that is ToT to developing counterpart. Tariff, non-tariff barriers including IPR and host of other issues are resorted by the developed countries to avoid the technology transfer to developing countries.

[54]See World Bank (2008b): *GEP, Technology Diffusion in the Developing World.* Washington, D.C. USA cited in Morgan Brazilian et al,(2008), Considering technology within the UN climate change negotiations, Energy Research Centre of the Netherland

[55] Article 4.7 states as, "The extent to which developing country Parties will effectively implement their commitments under the Convention will depend on the effective implementation by developed country Parties of their commitments under the Convention related to financial resources and transfer of technology and will take fully into account that economic and social development and poverty eradication are the first and overriding priorities of the developing country Parties". Cited in United Nations (1992), *United Nations Framework Convention on Climate Change,* FCCC/INFORMAL/84, GE.05-62220 (E) 200705, Accessed on 22 August 2008, available at URL: http://unfccc.int/resource/docs/convkp/conveng.pdf

Figure 3- Penetration of renewable energy technologies in developed and developing countries[56]



The above chart[57] clears the position of the developing countries regarding the use of renewable sources of energy. They are very critical for developing world to fulfil the obligations of Convention without compromising with the basic priorities. As well it reflects the strong hold of developed countries in this regard.

Photo Voltaic (herein after PV) technology involves high cost so, firms are not willing to invest in research and development on their own, unless government provide subsidies. Such as in the United States of America (herein after U.S.) great boom in ethanol production is the result of the research funded by the government.[58] It is very novel technology. It involves a panel which produces electricity when exposed to the sunlight. It is costlier than biofuels and

[56] See REN21 (2008): *2007 Global Status Report.* REN 21. Paris. Available at http://www.ren21.net. cited in Morgan Brazilian et al,(2008), Considering technology within the UN climate change negotiations, Energy Research Centre of the Netherland

[57] Ibid

[58] See Barton, John H. and Osborne, George E.,(2007), "Intellectual Property and Access to Clean Energy Technologies in Developing Countries An Analysis of Solar Photovoltaic, Bio fuel and Wind Technologies", *ICTSD Trade and Sustainable Energy Series Issue Paper No. 2.* International Centre for Trade and Sustainable Development: Geneva, Switzerland, Accessed 20 October 2008 available at URL: http://ictsd.net/downloads/2008/11/intellectual-property-and-access-to-clean-energy-technologies-in-developing-countries_barton_ictsd-2007.pdf

wind energy technology in the terms of installed kilowatt/hour. Currently its increasing installation may reduce the cost in future.[59]

Its most common application is off-grid application in rural electrification or pumping water or lighting in remote areas. In such situations it can be far less expensive than efforts to extend the grid in the rural areas. More important it is environmental friendly than using kerosene lamps or diesel generator in the remote rural areas. With the dipping of cost grid supply may be possible. The first generation of technology uses crystalline silicon, much the same material used in the semi-conductors for computers. These silicon slices are treated with surface modifications which made them better acceptor of light. It involves other equipments such as battery to store the energy to supply when sunlight is not available. Another one needed is inverter to convert the current into alternative current for consumption along with control mechanisms. The production of PV panels requires a large scale manufacturing capability to reduce its cost and make it manageable. Improvement process emphasises on production of less expensive PV cells.[60]

The newer technologies that is being explored involves thin films of semiconductors that is applied to the surface of material like glass this leads to the reduced costs and installation of big units. The new thin films account for the nine percent of the market in 2005. It is concentrated in the developed countries and the four leading firms accounts for the forty five percent of the market. There are only five firms in the developing countries producing at least 10MWp. Patents issue obstructs the way of developing countries that will be dealt in third chapter of the study.[61]

In China industries which conducted research on the PV cells are encouraged by the government policies. China's success story can be taken from the Suntech Power Company Ltd founded in 2001.[62] Sixty percent of PV cells in China are produced by this company. Its founder studied in Australia and brought many patented invention to the country and acquired Japanese firm MSK in the 2006. Now it is 4th largest PV cells producing firm.[63] India's firm that is BP Solar Company a joint venture, BP Solar shares 51 percent and TATA shares 49

[59] Ibid
[60] Ibid
[61] Ibid
[62] Ibid
[63] Ibid

percent. Due to oligopoly structure of the industry basic technologies are available the developing countries or they may obtain licenses on reasonable terms.[64]

Bio-fuel Technologies

Bio-mass is the sources of bio-fuel, derived from various sources such as corn or sugar or wastes of other products. They may be used as source of energy. Bio-mass may be either burnt directly to convert into heat for industrial use or for the steam generation to produce the electricity which can be converted in transportation fuel.[65]

There are two important ways to produce transportation fuel from bio-mass. One is production of ethanol either from sugar or corn for use in automotive fuel. Brazil is leader in the global market in ethanol production. U.S. follows Brazil in the production of ethanol. Contrary to the Brazil in U.S.A. ethanol is produced from corn rather than sugar. Second alternative is in Europe where bio-diesel is produced without involving the process of sugar at any intermediate.[66] Ethanol production process in U.S.A. is based on the corn, involving grinding of corn, treatment to produce sugar, and then fermentation of sugar into ethanol. Finally, distillation of ethanol is done to produce an additive to be used as part of fuel. Contrary to it, in Brazil sugar is produced in traditional way and then parallel fermentation and distillation to produce ethanol to be used as part of fuel. In Europe process is entirely different and bio-diesel is obtained from the starch of the grain.[67]

New approach to produce the bio-fuel is not only from plant starch rather from all components of the plant. Currently public research is taking place in this area. Ottawa based Canadian firm is working in this area and the enzymes using is available for sale in the future. In addition there is possibility of producing fuel from the algae as bio-mass which is more environmental friendly. Recently U.S. government awarded 23 million U.S. dollar to the four corporations and a university for work on fermentation of organisms to convert bio-mass into ethanol.[68]

For efficient use of bio-fuel the automotive engines that use the fuel and special additives needed to enable engines to use particular new fuels are needed. New technologies for all

[64] Ibid
[65] Ibid
[66] Ibid
[67] Ibid
[68] Ibid

these purposes are required in developing countries. As Brazil has designed special 'Flex Fuel' vehicle, that allow cars to shift back and forth from gasoline to ethanol which is used on large scale in the cars. Now it is patented technology. Brazilian programme began in the wake of oil crisis in 1973 in order to make self reliant in the production of energy.[69] This can be followed in India. This indicates another thing that is developing countries can join together to become self reliant against the developed countries.

Aforementioned analysis aims to reveal the developments in the some alternative technologies to shift to ESTs and the division of the world regarding the developments and participation. It is aimed to examine the conditions of developing countries. Further, it is to examine the causes of gulf between developed and developing countries regarding development of clean technologies.

There are technological issues and tariff barriers in the participation of the developing countries in the aforementioned developments. Technological issue is related with the adaptation process and availability of the material needed for the production of the energy. Second is the patent issue as a legal issue which involves cost to afford the license or patented technology, obstructing transfer of technology to developing countries. Besides subsidies, tariff barriers to participate in global export market also put hurdles in the way of developing countries. Though, there are substantial ethanol industries in the developing countries such as India Thailand, Malaysia, Japan, Pakistan, and China (built largest plant for ethanol production). Patent issues are likely to arise more in the future due to development in the technology.[70]

It appears that developing countries have adequate access to the current generation of technology. As it is traditional technology and developed countries are interested to bring those technologies in the developing countries. But that seems not easy as if developing countries enter in the production they not only bear to R & D cost but face the protectionism from developed countries to their firms. Further patent on future technologies such as methods, enzymes or microorganisms may obstruct the ways of developing countries. Patents holder may be willing to transfer through license but their costs may be too high to afford. So more or less, the constraints are the same as with the former that is tariff, patents, standards et cetera.

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[69] Ibid
[70] Ibid

Wind Technology

The wind sector provides ample opportunity for the developing countries to build the wind farms with equipments from global market without enormous intellectual property cost. Though, it is difficult for the developing countries to compete in the global market for wind turbines as the existing leaders are reluctant to share the technologies in the fear of creating new competitors and loosing of markets. In addition if a developing country firm enters in the generation of energy using this technology, due to low sale they will not be able to fetch their R&D costs. In spite all odds India and China are able to take a position in the development of wind energy. India holds 5th largest producer of wind turbines in the world.[71]

[71] Ibid

Following table shows presence of the technology in different parts of the world.

Table-1 Leading firms of the world in the wind technology[72]

Firm	Nationality	Market share
Vestas	Denmark	28.2 %
Gamesa	Spain	15.8 %
GE Wind	United States	15.5 %
Enercon	Germany	15.4 %
Suzlon	India	7.7 %
Siemens	Germany	7.3 %
Nordex	Germany	3.4 %
REPower	Germany (acquired in 2007 by Suzlon)	3.2 %
Acciona	Spain	2.8 %
Goldwind	China	2.8 %

In spite of R&D cost and patent problems a firm in developing country is not at ease to compete, China and India is making significant progress in the development and diffusion of technology. Suzlon an Indian private company account 7 percent of the global share of wind turbine production. It has fourth largest installed park of wind power facilities.

Capacity Building

Capacity building is a significant crosscutting issue. It is featured in the climate change regime prominently though it is nowhere defined either in the Convention or Protocol or COP decisions.[73] It can be defined as the process of creating or enhancing capacities within a

[72] Ibid

[73]Decisions 4/CP.7, Annex, paragraph 15 provides a definition of capacity-building in relation to technology transfer. United Nations (2001), *Report of the Conference of the Parties on its Seventh Session, held at Marrakesh from 29 OCTOBER to 10 November 2001 Addendum Part two: Action Taken by the Conference of*

country to perform specific tasks on an ongoing basis in order to attain a given developmental objective[74]. It refers assisting developing countries to build, develop, enhance and improve the capabilities to implement and achieve the objectives of the convention and protocol. Further it includes institutional capacity building, enhancement/ creation of an enabling environment, national communication, climate change programme, greenhouse gas inventories and their database and their utilisation, adaptation and vulnerability assessment and measures to implement the adaptation measures, education, training, scientific observation and development of technology transfer et cetera[75]. It is general meaning outlined in the Marrakesh Agreement.[76]

Detailed commitments regarding capacity building have been laid down in the Marrakesh Agreement framework decisions for developing countries and economies in transition. As well as implementation process and machineries have been detailed in the same. Human resource development, institutional strengthening and creation of a receptive environment are the basic aspects of capacity building.[77]

Capacity Building Commitments

UNFCCC lacks a general provision on capacity building but mentions it in three separate provisions: as follows.

First is Article 4.5 which states the need to develop and enhance 'endogenous capacities 'in the context of technology transfer, next is Article 5 (c) which provides for cooperation to improve endogenous capacities relating to research and systematic observation; and finally in Article 9.2 (d) which requires SBSTA in the context of scientific programmes and international research, to provide advice on ways and means of supporting endogenous capacity-building in developing countries.[78]

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the Parties, FCCC/CP/2001/13/Add.1, Accessed on 2nd November 2008, available at URL: http://unfccc.int/resource/docs/cop7/13a01.pdf

[74] GEF 1997, cited in Farhana Yamin and Joanna Depledge, *the International Climate Change Regime, A Guide to Rules, Institutions and Procedures,* Cambridge University Press, U.K.

[75]See United Nations (2001), *Report of the Conference of the Parties on its Seventh Session, held at Marrakesh from 29 OCTOBER to 10 November 2001 Addendum Part two: Action Taken by the Conference of the Parties,* FCCC/CP/2001/13/Add.1, Accessed on 2nd January 2009, URL: http://unfccc.int/resource/docs/cop7/13a01.pdf

[76] Decision 4/CP.7,Annex, paragraphs 15-21, capacity building means as per Marrakesh Agreement 'a process which seeks to build, develop, strengthen, enhance and improve existing scientific and technical skills, capabilities and institutions in non Annex I Parties to enable them to assess, adapt, manage and develop ESTs',Accessed on 2nd January 2009, available at URL: http://unfccc.int/resource/docs/cop7/13a01.pdf

[77] See Farhana Yamin and Joanna Depledge, *The International Climate Change Regime, A Guide to Rules, Institutions and Procedures,* Cambridge University Press, U.K.

[78] Ibid

The Convention provisions are imported into Protocol as a result of Articles 10, 11, and 15. Like Convention Protocol lacks general provision for capacity building. Article 10 (c) requires all Parties to cooperate to promote technology transfer and know-how, contains implicit reference to developing technology related capacities. Articles 11 and 15 are on the line of Articles 5 and 9 of the Convention.[79]

Capacity building is an essential element which has led to the adoption of around twenty COP decisions directly on or related to capacity building and/or enabling activities and funding by the GEF. Two broad phases of the development of concept of capacity building are, first from COP 1 to COP-4 which saw capacity building issues being dealt with in discrete manner along with other agenda but COP-5 addressed it as an agenda. COP 7 laid two frameworks for capacity building one for developing countries and other for economies in transition[80].

By the COP-7 a framework for meaningful and effective actions to enhance the implementation of Article 4, paragraph 5, of the Convention consisting five themes for transfer of ESTs to developing countries. Capacity building is one of the themes for ToT. It was defined as in the context of enhancing the implementation of Article 4, paragraph 5, of the Convention, capacity building is a process which seeks to build, develop, strengthen, enhance and improve existing scientific and technical skills, capabilities and institutions in Parties other than developed country Parties, and other developed Parties not included in Annex II, particularly developing country Parties, to enable them to assess, adapt, manage and develop environmentally sound technologies.[81]

The purpose of capacity building is to strengthen the capacities of developing country Parties, to promote the widespread dissemination, application and development of environmentally sound technologies and know-how, to enable them to implement the provisions of the Convention. Capacity building under this framework should be guided by the principles established in the decisions related to capacity building (decisions 2/CP.7 and 3/CP.7)[82].

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[79] Ibid
[80] Ibid
[81] Ibid
[82] See Decision 2/CP. 7, 3/CP.7. United Nations (2001), *Report of the Conference of the Parties on its Seventh Session, held at Marrakesh from 29 OCTOBER to 10 November 2001 Addendum Part two: Action Taken by the Conference of the Parties,* FCCC/CP/2001/13/Add.1, Accessed on 2nd January 2009, available at URL: http://unfccc.int/resource/docs/cop7/13a01.pdf

As per the convention Capacity building must be country-driven, addressing specific needs and conditions of developing countries and reflecting their national sustainable development strategies, priorities and initiatives.[83]

Meaning of Enabling Environments

The enabling environments component of the framework focuses on government actions, such as fair trade policies, removal of technical, legal and administrative barriers to technology transfer, sound economic policy, regulatory frameworks and transparency, all of which create an environment conducive to private and public sector technology transfer (UNFCCC defines through Article 4.5 and 4/CP.7).[84] It is one of the five themes of the of the framework envisaged in the Marrakesh Accords to develop meaningful and effective actions to enhance the implementations of Article 4.5 of the Convention by increasing and improving the transfer of ESTs and knowledge. Enabling environments are the responsibility of parties transferring as well as receiving technologies.[85]

Technology transfer cannot be hardware transfer alone; it must necessarily involves building human and institutional capacity to handle the technology and the raising of awareness among users and other stakeholders, including civil society.[86] In the UNFCCC context, the

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[83] According to the COP -7 decision, developed country Parties and other Parties included in Annex II shall take all practicable Steps to make available resources to developing countries in the implementation of capacity building to enhance the implementation of Article 4, paragraph 5, taking into account the scope of capacity building (the provisions of paragraphs 18 and 19 of Annex/COP -7). These resources should include adequate financial and technical resources to enable developing countries to undertake country-level needs assessments and to develop specific capacity-building activities consistent with enhancing the implementation of Article 4, paragraph 5; (b) To respond to the capacity-building needs and priorities of developing countries in a coordinated and timely manner, and support activities implemented at the national and, as appropriate, sub regional and regional levels; (c) To give particular attention to the needs of least developed countries and small island developing States, all Parties should improve the coordination and effectiveness of capacity-building activities relating to the development and transfer of technologies. All Parties should promote conditions conducive to the sustainability and effectiveness of these capacity-building activities. Secretariat and GEF work in cooperation to implement the decision pertaining to capacity building for technology transfer.

[84] See also Enabling Environments for Technology Transfer, Draft Technical Paper, submitted by Tata Energy Research Institute, India to the UNFCCC Secretariat, Bonn APRIL 2003, pp-09; United Nations (2001), *Report of the Conference of the Parties on its Seventh Session, held at Marrakesh from 29 OCTOBER to 10 November 2001 Addendum Part two: Action Taken by the Conference of the Parties,* FCCC/CP/2001/13/Add.1, Accessed on 2nd January 2009, available at URL: http://unfccc.int/resource/docs/cop7/13a01.pdf

[85] See Enabling Environments for Technology Transfer, Draft Technical Paper, submitted by Tata Energy Research Institute, India to the UNFCCC Secretariat, Bonn APRIL 2003, pp-04

[86] See Lall, S. (1992): *Technological capabilities and industrialization.* World Development 20 (2): 165-186. Forsyth, T. (2007): *Promoting the "development dividend" in climate technology transfer: can cross-sector partnerships help?* World Development 35 (10): 1684-1698. Reddy, A.K.N (1991): *Barriers to improvements in energy efficiency.* Energy Policy 19 (10), 953-961. Cited in Morgan Brazilian et al,(2008), Considering technology within the UN climate change negotiations, Energy Research Centre of the Netherland

term generally refers to appropriate conditions for the uptake and deployment of low-carbon technologies.

Enabling environments are directly linked to barriers that are unique and implicit to EST transfer in a number of ways. The IPCC Third Assessment Report (IPCC TAR) has recognized the fact that "the successful implementation of greenhouse gas mitigation options would need to overcome technical, economic, political, cultural, social, behavioural, and/or institutional barriers. The potential mitigation opportunities and types of barriers vary by region and sector, and over time." Technology transfer in the UNFCCC context has been identified as a five-stage sequence involving assessment, agreement, implementation, evaluation and adjustment, and replication of both hard and soft technologies conducive to the mitigation of and adaptation to climate change.[87]

Barriers to technology transfer exist at every stage of the technology transfer sequence. For instance, a major barrier in the assessment stage is the lack of access to information and education programs, as seen in the industry and energy supply sectors particularly. Small and medium scale enterprises (SMEs) above all lack the finances for cleaner technologies; this combined effect often causes them to rely on low-grade technologies and fuels.[88] Besides not only government rather other stakeholders have to take efforts to create enabling environment for transfer of clean technologies. It may vary sector wise. Following table reveals the various stakeholders in this effort.

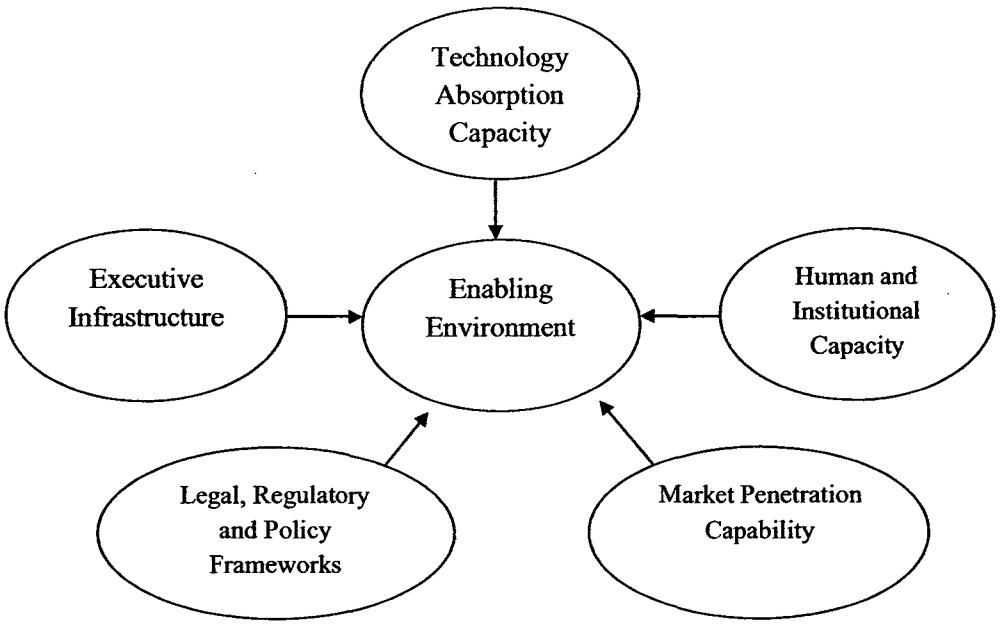
[87] IPCC(2000), "*Methodological and Technological Issues in Technology Transfer*", Cited in *Enabling Environments for Technology Transfer, Draft Technical Paper*, submitted by Tata Energy Research Institute, India to the UNFCCC Secretariat, Bonn APRIL 2003,

[88] IPCC (2001), "*Climate Change: 2001. Mitigation*", Report of the Working Group III to the Third Assessment Report of the Intergovernmental Panel on Climate Change. Cited in Enabling Environments for Technology Transfer, Draft Technical Paper, submitted by Tata Energy Research Institute, India to the UNFCCC Secretariat, Bonn APRIL 2003,

Table- 3- Means for creating enabling environments for transfer among countries

Stakeholder	**Examples of specific tools and activities**
Multilateral organization or donor government	Technical assistance and design, information networks and clearinghouses that disseminate information on technologies, financial support
Donor government	Trade finance, incentives to private sector, R&D policy, support for policy formulation in host countries, plus all of the above
Recipient government	Macroeconomic reforms, tax incentives, directed subsidies, voluntary agreements, laws on intellectual property protection, joint venture regulations, training to NGOs, support for adaptive R&D
Private firm or industry	Demonstration programs, technical training programs, research and development
Non-governmental organization	Training of users, demonstration programs, local capacity building, awareness campaigns

Figure -4 Enabling environments schematic presentation[89]



The above figure depicts factors which can be addressed by the developing countries for the transfer of technology. New clean technologies are usually owned by the private sector, so conducive environment essential is for transfer of ESTs. Capacity building is a critical element to the creation of enabling environment. There is need to create institutional, human and absorptive capacity for the proficient application and deployment of ESTs. This is required in all sectors of the economy. Capacity building is another important theme of the framework envisaged in the Marrakesh Accords to develop meaningful and effective actions to enhance the implementations of Article 4.5 of the Convention. Since COP 7, capacity building has been on the agenda of COP sessions and its subsidiary bodies (SBSTA and SBI). The purpose of the enabling environments component of the framework is to improve the effectiveness of the transfer of environmentally sound technologies by identifying and analysing ways of facilitating the transfer of environmentally sound technologies, including the identification and removal of barriers at each stage of the process.

[89] See UNFCCC (2003): Enabling Environments for Technology Transfer. UNFCCC/TP/2003/2. Bonn. Cited in Enabling Environments for Technology Transfer, Draft Technical Paper, submitted by Tata Energy Research Institute, India to the UNFCCC Secretariat, Bonn APRIL 2003, pp-18

The following means identified in the framework **(Marrakesh Accords)** for creating enabling environments for technology transfer. [90]

(a) All Parties, particularly developed country Parties, are urged to improve, as appropriate, the enabling environment for the transfer of environmentally sound technologies through the identification and removal of barriers, including, inter alia, strengthening environmental regulatory frameworks, enhancing legal systems, ensuring fair trade policies, utilizing tax preferences, protecting intellectual property rights and improving access to publicly funded technologies and other programmes, in order to expand commercial and public technology transfer to developing countries;

(b) All Parties are urged to explore, as appropriate, opportunities for providing positive incentives, such as preferential government procurement and transparent and efficient approval procedures for technology transfer projects, which support the development and diffusion of environmentally sound technologies;

(c) All Parties are urged to promote joint research and development programmes, as appropriate, both bilaterally and multilaterally;

(d) Developed country Parties are encouraged to promote further and to implement facilitative measures, for example export credit programmes and tax preferences, and regulations, as appropriate, to promote the transfer of environmentally sound technologies;

(e) All Parties, particularly developed country Parties, are encouraged to integrate, as appropriate, the objective of technology transfer to developing countries into their national policies, including environmental and research and development policies and programmes;

(f) Developed countries are encouraged to promote, as appropriate, the transfer of publicly owned technologies.

Besides this in **the COP 13/SBSTA session** a detailed recommendations were made on the basis of lessons learned with the implementation of the framework. It asked to developed countries to make efforts for enabling environment for the transfer of ESTs. It provides for public private partnership and national and international cooperation for the same. Additionally it provided for joint R&D between developed and developing parties so as to give opportunity to non Annex I Parties to participate in the development of clean

[90] See UNFCCC/CP/2001/13/Add.1, pp -24, United Nations (2001), *Report of the Conference of the Parties on its Seventh Session, held at Marrakesh from 29 OCTOBER to 10 November 2001 Addendum Part two: Action Taken by the Conference of the Parties,* FCCC/CP/2001/13/Add.1, Accessed on 2nd November 2008, available at http://unfccc.int/resource/docs/cop7/13a01.pdf

technologies. As well it asks to IPR issues in the transfer of technology. In this way it is a brief discussion of the UNFCCC provisions and principles embedded for the transfer of technology.

The development, application and diffusion of low/zero carbon technologies, as well as technologies to compete fairly on the market, is of critical importance in preventing climate change. Technology transfer has gone through a lot changes. Since 1990s there are increments in the flow of funds to facilitate the transfer of technologies. Still there is a long way to walk by developing countries.

Conclusion

Aforementioned discussion confirms that developing countries have to fight tooth and nail to get their due from developed countries. They have come a long way through many negotiating tables but the result is not up to the mark. There are many barriers in the way which they have to cross to become self reliant in the development of new clean technologies. Finance and issues related to the trade of technologies cannot be missed. Intellectual property rights protection and availability of finance is critical for obtaining ESTs from developed countries. They are notable among other constraints that will be taken up in the next chapter.

Chapter II

Legal framework for the Transfer of Technology

Introduction

This chapter focuses on the legal provisions of the ToT provided in the climate change conventions of the climate change Convention. United Nations Framework Convention on Climate Change (herein after UNFCCC) and Kyoto Protocol (hereinafter KP) to the Convention provide for the obligations of developed countries to equip and support the developing countries to deal with the challenge of climate change. Transfer of technology is one of the means which can equip the developing countries to face the challenges posed by the climate instability. In this context the historical responsibility of the developed countries is quite relevant. As such the issue of transfer of clean environmental friendly technologies (herein after ESTs) to the developing countries assumes great significance. This is especially so since there is a technological gap between the developed and the developing countries.

Technology has become an essential component of a comprehensive climate change strategy. This includes global efforts to limit and reduce greenhouse gas emissions and decrease the adverse impacts of climate change. Technological progress can take place through scientific innovation and invention, through the adoption and adaptation of pre-existing technology but new-to-the-market technologies, and through the spread of technologies across firms, individuals, and the public sector.[91]

It seems that continuous advances in sustainable development on a global scale require the use of new, cleaner, appropriate low-carbon technologies to combat climate change. Policies facilitating innovation and large-scale adoption of low-carbon technologies play a central role in global efforts to address climate change, alongside the policies targeted directly at reducing emissions.

Developing countries face great challenges in modernising their economies, creating stability in their countries and building efficient governments on one side and allocating available fund for better environmental technologies on the other side. The fund required for adoption

[91] The International Bank for Reconstruction and Development (2008), *World Bank, Accelerating Clean Energy Technology Research, Development, and Deployment: Lessons from Non-energy Sectors*, Working Paper 138. Washington.

of better technologies which have comparatively less impact on environment are given consideration only after country's economic development needs are met. Governments are yet to relate to the fact that sustainable development strategies that consider climate change technologies and responses can contribute significantly to changing national development paths to make development more sustainable for many countries.

Meaning of the Transfer of Technology (hereinafter ToT)

Technology transfer is the process of sharing of skills, knowledge, technologies, methods of manufacturing, samples of manufacturing and facilities among governments and other institutions to ensure that scientific and technological developments are accessible to a wider range of users who can then further develop and exploit the same. This is usually practised among countries, organisations, industries, universities, governments and other institutions to ensure that scientific and technological developments are accessible to a wide range of users.[92] This facilitates further development of technology into new products, processes, applications and services and is a continuous process.

There are various perspectives on the concept of technology and its transfer.[93] In the context of climate change, the broad and inclusive term "technology transfer" encompasses diffusion of technologies and technology cooperation across and within countries. While there already exists a range of technologies for mitigating and adapting to climate change, new technologies are likely to emerge because of the urgency and attention currently accorded to climate change.[94] The concept in this context envisages technology transfer between developed countries, developing countries and countries with economies in transition. It comprises the process of learning to understand, utilise and replicate the technology,

[92] See IPCC (2000), *"Summary for Policymakers Methodological and Technological Issues in Technology Transfer: A Special Report of IPCC Working Group III"*, Intergovernmental Panel on Climate Change

[93] See Eric Martinot, Jonathan E. Sinton, and Brent M. Haddad, (1997) *International Technology Transfer for Climate Change Mitigation and the cases of Russia and China,* Annual Reviews Energy Environ. 1997, Pp. 357–401, The classical economic view defines transfer of technology as information stuffed commodity transferred from one agent to another. This definition has met with many criticisms. Though transfer of technology was traditionally considered as a subject of economic regime, now it is considered as the two way learning process from one country to other or between other agents. It is now considered as cooperative process, capacity building to develop, replicate, adapt and manage the transferred technologies between the actors.[93]

[94] Newell, Richard G. (2008) "International Climate Technology Strategies." Discussion Paper 08-12, Harvard Project on International Climate Agreements, Belfer Centre for Science and International Affairs, Harvard Kennedy School, October 2008.

including the capacity to choose and adapt to local conditions and integrate it with indigenous technologies.[95]

Technology transfer can be intangible or tangible as it can be done through either a product or technical knowhow and skill. The 'stabilisation of green house gases in the atmosphere', the envisaged objective of climate change deliberations[96] requires rapid technological innovation, transfer and implementation of technologies. The Intergovernmental Panel on Climate Change[97] (hereinafter IPCC) gives a broader definition of technology transfer in the context of climate change. It has defined the concept as a broad set of processes covering the flows of know-how, experience and equipment for mitigating and adapting to climate change amongst different stakeholders such as governments, private sector entities, financial institutions, non-governmental organizations and research or education institutions.[98]

Climate Change and Developing Countries

The developing countries are the most vulnerable to climate change impacts because they have fewer resources either technologically or financially for mitigation and adaptation to climate change. Climate change is anticipated to have far-reaching effects on the sustainable development of developing countries including their ability to attain the Millennium Development Goals by 2015 formulated by the United Nations. With the current activities going at the same scale, greenhouse gas emissions could rise by 25 – 90 per cent by 2030 relative to 2000 and the global temperature could increase up to 3°C during this century.[99]

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[95] Ibid

[96] *United Nations Framework Convention on Climate Change*, 1992. Article 2 "The ultimate objective of this Convention and any related legal instruments that the Conference of Parties may adopt is to achieve, in accordance with the relevant provisions of the Convention, stabilisation of greenhouse gas concentrations in the atmosphere at such a level that would prevent dangerous interference with the climate system. Such a level should be achieved within a timeframe sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner". See also Special Report of Intergovernmental Panel on Climate Change Working Group III titled as , *Methodological and technological issues in technology transfer* , published by IPCC pp-03.

[97] This intergovernmental body was created in 1988 by United Nations Environmental Programme (UNEP) and World Meteorological Organisation (WMO) in 1988 the 40th Session of the WMO Executive Council (EC-XL). It was constituted to collect and analyse scientific information on climate and all aspects relevant to climate change and its impacts and to formulate realistic response strategies. The mandate set in Resolution 4 (1) also points out the need to formulate realistic strategies to meet the climate change challenges taking into consideration its social, political and economic aspects.

[98] IPCC (2000), *Methodological and technological issues in technology transfer*, Special Report of Intergovernmental Panel on Climate Change Working Group III, pp- 3.

[99] Even with a temperature rise of 1– 2.5°C the IPCC predict serious effects including reduced crop yields in tropical areas leading to increased risk of hunger, spread of climate sensitive diseases such as malaria, and an increased risk of extinction of 20 – 30 per cent of all plant and animal species. IPCC (2000), *Methodological and technological issues in technology transfer*, Special Report of Intergovernmental Panel on Climate Change Working Group III, pp- 3.

By 2020, up to 250 million people in Africa could be exposed to greater risk of water stress. Over the course of this century, millions of people living in the catchment areas of the Himalayas and Andes face increased risk of floods as glaciers retreat followed by drought and water scarcity as the once extensive glaciers on these mountain ranges disappear. It is believed that sea level rise could lead to inundation of coasts worldwide with some small island States possibly facing complete inundation and people living with the constant threat of tropical cyclones now face increased severity and possibly increased frequency of these events with all associated risks to life and livelihoods.[100]

Evolution of the Debate for the Transfer of Technology

Since 1950s the newly independent states have been highly dissatisfied with the existing economic disparities. In fact development has been the top priority of the developing countries who gained independence around 1950s. Technological development was recognised as a prerequisite for socio-economic development by these states. They immediately found themselves far behind to the industrialised countries in technological advancement. Many developing countries sought to acquire the modern technologies as early as in 1950s but the process of transfer was not as easy as developing countries had contemplated. The developing countries viewed foreign investment and the accompanying transfer of technology as means of rapid economic transformation. There was a consensus among newly independent states that there existed a technological gap between the developed and the developing countries.

As transnational corporations became major players in international economic relations, one-sided transfer of technology agreements came into existence. These agreements included right to build, operate and maintain the manufacturing plants. The technology transfer was done mainly of obsolete technologies. This did not facilitate adequate technological progress, as they failed to develop indigenous technological capacity in the host country.

Transfer of technology became a subject matter of discussion in international economic forum especially in the wake of demand for a new economic law regime by the newly

[100] Intergovernmental Panel on Climate Change, Climate Change (2007), "*Mitigation of Climate Change*", edited by B. Metz, O.R. Davidson, P.R. Bosch, R. Dave and L.A. Meyer. Cambridge, UK and New York: Cambridge University Press (2007)

independent states. The New International Economic Order (hereinafter NIEO)[101] became the basis on which the developing countries framed their demands at international forums. Transfer of technology was an integral part of NIEO scheme. Among others, one of the tenets of NIEO was "access to the achievement of modern science and technology and creation of indigenous technology and promoting transfer of technology."

The studies by the United Nations Conference on Trade and Development (hereinafter UNCTAD)[102] revealed the problems caused by the technological gap that existed among the members states of United Nations. Major functions of UNCTAD were to promote international trade between countries which are at different level of development and to formulate principles and policies on international trade and related problems on economic development. UNCTAD assumed an active role in promoting the transfer of technology from the developed to the developing nations. The General Assembly by its resolution 44/228(1989) mandated to examine and recommend modalities for favourable access as well as transfer of technology in particular to the developing countries on concessional and preferential terms.[103]

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[101] The term was derived from the *Declaration for the Establishment of a New International Economic Order*, adopted by the United Nations General Assembly in 1974, and referred to a wide range of trade, financial, commodity, and debt-related issues (1 May 1974, A/RES/S-6/3201). Along with the declaration, a Programme of Action and a Charter of Economic Rights and Duties of States were also adopted. The main themes of NIEO were; Developing countries must be entitled to regulate and control the activities of Multinational Corporation operating within their territory. (2)They must be free to nationalize or expropriate foreign property on conditions favourable to them. (3)They must be free to set up associations of primary commodities producers similar to the OPEC; all other States must recognize this right and refrain from taking economic, military, political, or measures calculated to restrict it. (4)International trade should be based on the need to ensure stable, equitable, and remunerative prices for raw material, generalized non-reciprocal and non-discriminatory tariff preferences, as well as transfer of technology to developing countries; and should provide economic and technical assistance without any strings attached.

[102] The United Nations Conference on Trade and Development (UNCTAD) was established in 1964 as a permanent intergovernmental body. It is the principal organ of the United Nations General Assembly dealing with trade, investment, and development issues. The organization's goals are to "maximize the trade, investment and development opportunities of developing countries and assist them in their efforts to integrate into the world economy on an equitable basis." The creation of the conference was based on concerns of developing countries over the international market, multi-national corporations, and great disparity between developed nations and developing nations. In the 1970s and 1980s, UNCTAD was closely associated with the idea of a New International Economic Order (NIEO). Currently, UNCTAD has 193 member States and is headquartered in Geneva, Switzerland

[103] David M. Haug, *The international transfer of technology: lessons that east Europe can learn from the failed third world experience*, Harvard journal of law and technology, vol.5,spring issue, 1992

The Charter of Economic Rights and Duties of States (hereinafter CERDS)[104] came into existence in 1974 on the persistent demand of the developing states for an equitable and favourable participation in the international economic system. The pattern of voting for this in the General Assembly reflected the intention of developed countries towards changing the existing international economic and political system. It addressed the issue of technological gap between developed and developing countries. in this context para 1 of Article 13 CERDS provided that

> "Every state has the right to benefit from advances and development in science and technology for the acceleration of its economic and social development." Further Article 13 (2) states, "all states should promote international scientific and technological cooperation and transfer of technology with proper regard for all legitimate interests, including inter alia rights and duties of holders ,suppliers and recipients' of technology."[105]

In addition, Article 13(3) provided that the developed countries should cooperate with least developing countries through their scientific and technological infrastructures. Article 13 (4) further provided that all states should cooperate in developing guidelines or regulations for transfer of technology taking fully into account the interests of developing countries. [106]

In order to promote further development of technology in the developing countries, Advisory Service on Transfer and Development of Technology was established in1976 within UNCTAD's transfer of technology division to provide technical assistance and operational assistance to the developing countries.[107]

Another legal development to regulate the transfer of technology was an International Draft Code of Conduct on the Transfer of Technology[108] prepared by the UNCTAD in 1978.[109] To

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[104] See also Charter of Economic Rights and Duties of the States was adopted by General Assembly in its Resolution no. 3281 (29) (xxix) on 12 December. 120 voted in favour 6 members opposed and 10 abstentions. K.C.Reddy, M.Jagdishwara and S.Chandrashekhara, The New International Economic Order Perspective, Ashish Publishing House , New Delhi

[105] See K.C.Reddy, M.Jagdishwara and S.Chandrashekhara, The New International Economic Order Perspective, Ashish Publishing House , New Delhi

[106] Ibid

[107] David M. Haug, *The international transfer of technology: lessons that east Europe can learn from the failed third world experience* , Harvard journal of law and technology, vol.5,spring issue, 1992

[108] UNCTAD (1985), "Draft International Code of Conduct on the Transfer of Technology, as at the close of sixth session of Conference on June 1998" (Geneva: United Nations), United Nations publication, No. TD/Code TOT/47

[109] Draft International Code of Conduct on Transfer of Technology came into existence through General Assembly Resolution A/RES/40/184; Though UNCTAD was working since mid 1970s on the formulation of a Code of Conduct on Transfer of Technology as called for in the Programme of Action for a New International

the developing countries, the critical sections of the code are those which encourage technology transfer (Chapter 1, Section 2.1(i) and (iii))[110] and to promote arrangements for transferring only what the receiving country needs (Chapter 1, Section 2.1(viii).[111] Special treatment for the developing countries is provided in the chapter sixth of the Code. Besides, UNCTAD's Plan of Action (2000)[112] is comprehensive in nature as it touches the different

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Economic Order. Code consists of various provisions which deals with technology transfer to developing countries.

[110] Chapter 2, Section 2.1,(i), To establish general and equitable standards on which to base the relationships among parties to transfer of technology transactions and governments concerned, taking into consideration their legitimate interests, and giving due recognition to special needs of developing countries for the fulfilment of their economic and social development objectives. Chapter 2, Section 2.1,(iii), To encourage transfer of technology transactions, particularly those involving developing countries, under conditions where bargaining positions of the parties to the transactions are balanced in such a way as to avoid abuses of a stronger position and thereby to achieve mutually satisfactory agreements.

[111]Chapter 2, Section 2.1,(viii), To promote adequate arrangements as regards unpackaging in terms of information concerning the various elements of the technology to be transferred, such as that required for technical, institutional and financial evaluation of the transaction, thus avoiding undue or unnecessary packaging.

[112] UNCTAD X Plan of action of action, "78. The technological gap between developed and developing countries is wide and for most of them increasing. Technology flows tend to be associated with investment in and expansion of technologically sophisticated industries. A better understanding needs to be achieved of the various channels for transfer of technology, such as FDI and trade. Technology does not automatically flow from developed countries to developing countries. Reducing the technology gap requires efforts on the part of developing countries to acquire and cultivate technology, as well as efforts on the part of developed countries to transfer technology and know-how.

80.....Other technologies such as environmentally sound technologies, biotechnology and new materials development also present opportunities for developing countries provided they have access to these technologies and the skills, absorptive capacity and finance to adopt and adapt them.

81. Technological development is therefore important for the integration and participation of developing countries in the international trading system. Such development can be facilitated by domestic and international actions, including human resource development, establishment and strengthening of appropriate policy and legal frameworks and the competitive environment, encouraging the establishment of more sophisticated industries, establishment of science and technology institutes and infrastructure, encouragement of business support services, and home country measures that encourage the transfer of technology, as well as environmentally sound technologies, to developing countries, in particular the least developed countries, on the terms laid down in Agenda 21 adopted at the Rio Summit.

82. There is need for an exchange of best practices and the provision of technical and, where possible, financial assistance to countries seeking to improve their technological capabilities. There is also need for the provision of advisory services to countries, and even firms, to help them articulate needs for specific technology, to acquire it knowledgeably and to use it effectively. Among the obstacles to effective transfer of technology to enterprises located in developing countries are the weak infrastructures, restricted financial resources and limited bargaining capacity of recipient enterprises.

83. There is need to help developing countries in assessing their technology needs, identifying technology suppliers and concluding mutually beneficial technology deals and partnerships in areas such as information technology, biotechnology and environmentally sound technologies.

84. The importance of transfer of technology to developing countries has been recognized in various forums. In the context of WTO, the TRIPS Agreement states that developed country members should provide incentives to their enterprises and institutions for the purpose of promoting and encouraging technology transfer to the least developed countries in order to enable them to create a sound and viable technological base." Cited in United Nations (2001), *Compendium of International Arrangements on Transfer of technology: Selected Instruments Relevant provisions in selected international arrangements pertaining to transfer of technology,* United Nations publications, UNCTAD/ITE/IPC/Misc.5, pp-140-141 available at http://www.unctad.org/en/docs//psiteipcm5.en.pdf ;

and important aspects of transfer of technology. It recognises technological backwardness of the developing countries; technology needs assessment and finance for technological development. It also reiterates the developed countries obligations under World Trade Organisation (hereinafter WTO), Agreement on Trade Related Aspects of Intellectual Property Rights (TRIPS Agreement) to give incentives to their enterprises to promote technological development in the developing countries.

Transfer of technology has emerged as one of the key issues in the multilateral environmental negotiations since 1970s. The U.N. Conference on Human Environment, (Stockholm 1972), had included transfer of technology as one of the point for discussion and had stated in principle 9 as,

> "Environmental deficiencies generated by the conditions of under-development and natural disasters pose grave problems and can best be remedied by accelerated development through the transfer of substantial quantities of financial and technological assistance as a supplement to the domestic effort of the developing countries and such timely assistance as may be required."

With the release of report of World Commission on Environment and Development in 1987,[113] sustainable development took centre stage in all environmental initiatives. However transfer of technology and financial assistance to the developing countries is essential to transform the concept of sustainable development into a reality. Further, the United Nations Convention on Law of Sea,[114] the Vienna Convention for the Protection of the Ozone

[113]The United Nations convened the Brundtland Commission, formally the World Commission on Environment and Development (WCED), known by the name of its Chair Gro Harlem Brundtland in 1983. The commission was created to address growing concern "about the accelerating deterioration of the human environment and natural resources and the consequences of that deterioration for economic and social development." In establishing the commission, the UN General Assembly recognized that environmental problems were global in nature and determined that it was in the common interest of all nations to establish policies for sustainable development. its report is available on http://www.un-documents.net/wced-ocf.htm

[114] See also Law of the Sea (1982): *International Legal Materials,* Volume 21, Number 5, September 1982; also available at http://www.un.org/Depts/los/los_docs.htm; The United Nations Convention on the Law of the Sea (UNCLOS), also called the Law of the Sea Convention or the Law of the Sea treaty, is the international agreement that resulted from the third United Nations Conference on the Law of the Sea (UNCLOS III), which took place from 1973 through 1982. The Law of the Sea Convention defines the rights and responsibilities of nations in their use of the world's oceans, establishing guidelines for businesses, the environment, and the management of marine natural resources. The Convention, concluded in 1982, replaced four 1958 treaties. UNCLOS came into force in 1994, a year after Guyana became the 60th state to sign the treaty. To date, 158 countries and the European Community have joined in the Convention. However, it is now regarded as a codification of the customary international law on the issue. Transfer of technology is included in Articles 144 and 266 respectively.

layer,[115] the Montreal Protocol on Substances that Deplete the Ozone Layer[116] and the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, [117]also include provisions related to transfer of technology. The Rio Earth Summit in 1992[118] gave birth to the United Nations Convention on Climate Change (UNFCCC), the Convention on Biological Diversity (CBD), and Agenda 21[119], and they all envisage transfer of technology (hereinafter ToT) as a key issue. For the purpose of this study, however the

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[115] See also The Vienna Convention (1985): *International Legal Materials,* Volume 26, Number 6, November 1987; available at http://www.unep.org/ozone/Handbook2000-part1;
The Vienna Convention for the Protection of the Ozone Layer was adopted in 1985 and entered into force in 1988. Protect human health and the environment against adverse effects resulting from human activities: The ultimate objective of the Convention is to protect human health and the environment against adverse effects resulting from human activities which modify or likely to modify the ozone layer and urges the Parties to take appropriate measures in accordance with the provisions in the Convention and its Protocols which are in force for that Party.

[116] See also The Montreal Protocol (1987): *International Legal Materials,* Volume 26, Number 6, November 1987; also available at http://www.unep.org/ozone/mont_t.html; The Montreal Protocol on Substances That Deplete the Ozone Layer is an international treaty designed to protect the ozone layer by phasing out the production of a number of substances believed to be responsible for ozone depletion. The treaty was opened for signature on September, 16, 1987, and entered into force on January 1, 1989, followed by a first meeting in Helsinki, May 1989. Since then, it has undergone seven revisions, in 1990 (London), 1991 (Nairobi), 1992 (Copenhagen), 1993 (Bangkok), 1995 (Vienna), 1997 (Montreal), and 1999 (Beijing). It is believed that if the international agreement is adhered to, the ozone layer is expected to recover by 2050. Due to its widespread adoption and implementation it has been hailed as an example of exceptional international co-operation.

[117] See also Basel Convention (1989): UNEP (1999). *Basel convention on the control of transboundary movements of hazardous wastes and their disposal*, SBC No. 99/001; available at http://www.basel.int/text/con-e.htm; The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, usually known simply as the Basel Convention, is an international treaty that was designed to reduce the movements of hazardous waste between nations, and specifically to prevent transfer of hazardous waste from developed to less developed countries (LDCs). It does not, however, address the movement of radioactive waste. The Convention is also intended to minimize the amount and toxicity of wastes generated, to ensure their environmentally sound management as closely as possible to the source of generation, and to assist LDCs in environmentally sound management of the hazardous and other wastes they generate. The Convention was opened for signature on 22 March 1989, and entered into force on 5 May 1992.

[118] See Rio Declaration on Environment and Development (1992): *International Legal Materials*, Volume 31, Number 4, July 1992.
The United Nations Conference on Environment and Development, also known as the Rio Summit, Earth Summit was a major united nations conference held in Rio de Janeiro from June 3 to 14 1992. 172 governments participated, with 108 sending their heads of state or government. Some 2,400 representatives of nongovernmental organizations (NGOs) attended, with 17,000 people. The issues addressed included: (i) systematic scrutiny of patterns of production particularly the production of toxic components, such as lead in gasoline, or poisonous waste including radioactive chemicals; (ii) alternative sources of energy to replace the use of fossil fuels which are linked to global climate change; (iii) new reliance on public transportation systems in order to reduce vehicle emissions, congestion in cities and the health problems caused by polluted air and smog; (iv) the growing scarcity of water. Two important Conventions came into existence the first one is Climate Change Convention and second is the Convention on Biological Diversity.

[119] See also Agenda 21 (1992): available at http://www.unep.org/Documents/Default.asp?DocumentID=52; United Nations (2001), *Compendium of International Arrangements on Transfer of technology: Selected Instruments Relevant provisions in selected international arrangements pertaining to transfer of technology,* United Nations publications, UNCTAD/ITE/IPC/Misc.5, available at http://www.unctad.org/en/docs//psiteipcm5.en.pdf

UNFCCC and the Kyoto Protocol provides for the transfer of technology to the developing countries.

Transfer of Technology in International Environmental Agreements

Beginning with the establishment of the United Nations, ToT finds its place invariably in every international agreement related with the socio-economic or the environmental issues. The Montreal Protocol on Substances that Deplete Ozone Layer 1987 is noteworthy for its successful implementation. Article 10A of the Protocol requires the Parties to the Protocol to[120],

> "Take every practicable step, consistent with the programmes supported by the financial mechanism, to ensure: (a) that the best available, environmentally safe substitutes and related technologies are expeditiously transferred to Parties operating under paragraph 1 of Article 5; and (b) that the transfers referred to in subparagraph (a) occur under fair and most favourable conditions."

It has grown to global participation due to judicious combination of trade measures, with positive measures of financial and technology transfers. The Montreal Protocol established a Multilateral Fund to assist developing countries to comply with its commitments, and it has been facilitator in technology transfer, though very few agreements took place under this agreement.[121]

Principle 9 of the Rio Declaration[122] encourages the transfer of technology in the context of sustainable development and provides that

> "States should cooperate to strengthen endogenous capacity-building for sustainable development by improving scientific understanding through exchanges of scientific and technological knowledge, and by enhancing the development, adaptation, diffusion and transfer of technologies, including new and innovative technologies."

Rio Declaration further addressed requirements for the states to develop domestic policies supportive of sustainable development, including participation, environmental legislation, liability and compensation for environmental damage, internalisation of environmental costs,

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[120] See IPCC Working Group III (2000), "*Methodological and Technological Issues in Technology Transfer*", IPCC. available at http://www.grida.no/publications/other/ipcc_sr/?src=/climate/ipcc/tectran/

[121] Ibid

[122] Ibid

environment impact assessment and international cooperation. Agenda 21[123] supported these principles with more detailed proposal for action. Chapter 34 of Agenda 21 deals exclusively with transfer of technology.[124]

Convention on Biological Diversity[125](herein after CBD) concluded at the Rio Earth Summit addresses one of the most pressing issues of modern era, which is sustainable management of living resources of the planet, adopts comprehensive approach to the conservation of planet's biodiversity and sustainable use of its biological resources. The convention provides scope for facilitating access to transfer of technology in Article 16[126] and Article 19.[127] CBD

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[123]Ibid

[124] Extracts of Chapter 34 states that, "Environmentally sound technologies (herein after ESTs) including expertise and related issues should be made available to developing countries. Developing countries should have access to relevant information on technological choices, and the international information exchange systems and clearing houses should be developed. Access to and transfer of ESTs should be on favourable terms including concessions and preferential terms as mutually agreed, taking into account the need to protect IPRs as well as the special needs of developing countries for the implementation of Agenda 21. Specific measures should include policies and programmes to encourage public and private technology transfer and regulatory measures, include subsidies and tax policies, and appropriate mechanisms for improved access and transfer of relevant technologies. National capacities, particularly of developing countries, should be built to develop and manage environmentally sound technologies, including human resource development, and strengthen research and development capacities. The development of indigenous technology and technology assessment should be promoted, "a collaborative network of research centres" should be established and "programmes of cooperation and assistance" should be strengthened. The importance of technology transfer through business commerce is recognised, and while the availability to developing countries is of concern, "fair incentives to innovators" should also be provided; here the role of patent and property rights should be examined. Long-term partnerships between holders and users of environmentally sound technologies, and between companies in developed and developing countries as well as joint ventures should be promoted."

[125] See also Convention on Biological Diversity (1992): *International Legal Materials*, Volume 31, Number 4, July 1992; available at http://www.unep.ch/bio/conv-e.html and http://www.biodiv.org/convention/articles.asp?lg=0.

[126] Ibid; Article 16 deals with Access to and Transfer of Technology, " 1. Each Contracting Party, recognizing that technology includes biotechnology, and that both access to and transfer of technology among Contracting Parties are essential elements for the attainment of the objectives of this Convention, undertakes subject to the provisions of this Article to provide and/or facilitate access for and transfer to other Contracting Parties of technologies that are relevant to the conservation and sustainable use of biological diversity or make use of genetic resources and do not cause significant damage to the environment.

2. Access to and transfer of technology referred to in paragraph 1 above to developing countries shall be provided and/or facilitated under fair and most favourable terms, including on concessional and preferential terms where mutually agreed, and, where necessary, in accordance with the financial mechanism established by Articles 20 and 21. In the case of technology subject to patents and other intellectual property rights, such access and transfer shall be provided on terms which recognize and are consistent with the adequate and effective protection of intellectual property rights. The application of this paragraph shall be consistent with paragraphs 3, 4 and 5 below.

3. Each Contracting Party shall take legislative, administrative or policy measures, as appropriate, with the aim that Contracting Parties, in particular those that are developing countries, which provide genetic resources are provided access to and transfer of technology which makes use of those resources, on mutually agreed terms, including technology protected by patents and other intellectual property rights, where necessary, through the provisions of Articles 20 and 21 and in accordance with international law and consistent with paragraphs 4 and 5 below.

addresses access to and the transfer of technology relevant to conservation and sustainable use of biological diversity including biotechnology. Further access of technology to the developing countries should be on fair and favourable terms in accordance with financial mechanisms.

Negotiating History of UNFCCC

The world's climate has always varied naturally. Rising concentrations of GHGs in the earth's atmosphere over the last two centuries since the industrial revolution are overriding this natural climatic variability and is leading to potentially irreversible climate change. The 1992 UNFCCC provides the foundation for intergovernmental efforts to address this problem.

Increasing scientific evidence of human interference with the climate system, coupled with growing public concern over global environmental issues, began to push climate change onto the political agenda in the mid-1980s. For up-to-date scientific information, the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP) together established the Intergovernmental Panel on Climate Change (IPCC) in 1988. That same year, following a proposal by Malta, the United Nations General Assembly

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4. Each Contracting Party shall take legislative, administrative or policy measures, as appropriate, with the aim that the private sector facilitates access to, joint development and transfer of technology referred to in paragraph 1 above for the benefit of both governmental institutions and the private sector of developing countries and in this regard shall abide by the obligations included in paragraphs 1, 2 and 3 above.
5. The Contracting Parties, recognizing that patents and other intellectual property rights may have an influence on the implementation of this Convention, shall cooperate in this regard subject to national legislation and international law in order to ensure that such rights are supportive of and do not run counter to its objectives.

[127] Ibid; Article 19 deals with the Handling of Biotechnology and Distribution of its Benefits as follows
1. Each Contracting Party shall take legislative, administrative or policy measures, as appropriate, to provide for the effective participation in biotechnological research activities by those Contracting Parties, especially developing countries, which provide the genetic resources for such research, and where feasible in such Contracting Parties. 2. Each Contracting Party shall take all practicable measures to promote and advance priority access on a fair and equitable basis by Contracting Parties, especially developing countries, to the results and benefits arising from biotechnologies based upon genetic resources provided by those Contracting Parties. Such access shall be on mutually agreed terms. 3. The Parties shall consider the need for and modalities of a protocol setting out appropriate procedures, including, in particular, advance informed agreement, in the field of the safe transfer, handling and use of any living modified organism resulting from biotechnology that may have adverse effect on the conservation and sustainable use of biological diversity. 4. Each Contracting Party shall, directly or by requiring any natural or legal person under its jurisdiction providing the organisms referred to in paragraph 3 above, provide any available information about the use and safety regulations required by that Contracting Party in handling such organisms, as well as any available information on the potential adverse impact of the specific organisms concerned to the Contracting Party into which those organisms are to be introduced.

took up the issue of climate change for the first time and adopted the resolution on *Protection of Global Climate for Present and Future Generations.*[128]

In 1990, the IPCC issued its First Assessment Report,[129] confirming human-induced climate change as a threat and calling for a global treaty to address the problem. This was taken up in the Ministerial Declaration of the Second World Climate Conference, held in Geneva in October/November in 1990.[130] The UN General Assembly in December 1990[131], formally launched negotiations on a framework convention on climate change by its Resolution 45/212. These negotiations were conducted by the Intergovernmental Negotiating Committee (hereinafter INC). On 9 May 1992, the INC adopted by consensus the United Nations Framework Convention on Climate Change. The Convention was opened for signature at the UN Conference on Environment and Development (UNCED), "Earth Summit", in Rio de Janeiro, Brazil, on 4 June 1992, and came into force on 21 March 1994.

The Convention sets an ultimate objective of stabilizing atmospheric concentrations of greenhouse gases at the levels that would prevent "dangerous" human interference with the climate system. The Convention however, does not quantify this dangerous level. It is expected to be achieved within a time frame sufficient to allow ecosystems to adapt naturally to the climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner. In order to achieve this objective, all Parties to the Convention – those countries that have ratified, accepted, approved, or acceded to, the treaty – are subject to an important set of general commitments which place a

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[128] United Nations General Assembly, A/RES/43/53, 6th December 1988 available at http://www.un.org/documents/ga/res/43/a43r053.htm

[129] The Intergovernmental Panel on Climate Change (IPCC) is a scientific intergovernmental body work to evaluate the risk of climate change caused by human activity. The panel was established in 1988 by the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP), two organizations of the United Nations. The IPCC does not carry out research, nor does it monitor climate or related phenomena. A main activity of the IPCC is publishing special reports on topics relevant to the implementation of the UN Framework Convention on Climate Change (UNFCCC), an international treaty that acknowledges the possibility of harmful climate change. The IPCC bases its assessment mainly on peer reviewed and published scientific literature. The IPCC is only open to member states of the WMO and UNEP. IPCC reports are widely cited in almost any debate related to climate change. The IPCC first assessment report was completed in 1990, and served as the basis of the United Nations Framework Convention on Climate Change (UNFCCC).

[130] The Second World Climate Conference was an important step towards a global climate treaty. Sponsored by the World Meteorological Organization WMO), the United Nations Environment Programme UNEP), and other international organizations, the conference was held in Geneva from 29 October to 7 November 1990. The main objective of the Conference was to review the UNEP/WMO World Climate Programme (WCP) and to recommend policy actions. The first assessment report constituted the critical element. Available at http://unfccc.int/resource/ccsites/senegal/fact/fs221.htm

[131] Ibid

fundamental obligation on both the industrialized and the developing countries to respond to the climate change.[132]

At present there are 192 Parties to the Convention.[133] Since the convention's entry into force, parties have met annually in the Conference of the Parties (COP) to monitor its implementation and continue talks on how best to tackle climate change. Till now 14 meetings of Conference of Parties have taken place. Last one took place in 2008 at Poznan in Poland.[134] The many decisions taken by the COP at its annual sessions now make up a detailed rulebook for the effective implementation of the Convention.[135]

The principles of equity and "common but differentiated responsibilities" enshrined in the Convention had required developed countries Parties to take the lead in reducing GHG emissions. To this end, Annex I Parties are committed to adopt national policies and measures with the non-legally binding aim that they should have returned their greenhouse gas emissions to 1990 levels by the year 2000.[136]

Annex I Parties[137] must submit regular reports to the Conference of Parties (herein after COP supreme decision making body of the Convention), known as national communications, detailing their climate change policies and measures. In addition, Annex I Parties must

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[132] Ibid

[133] *Fact sheet: An introduction to the United Nations Framework Convention on Climate Change (UNFCCC) and its Kyoto Protocol* available at http://unfccc.int/files/press/backgrounders/application/pdf/unfccc_and_kyoto_protocol.pdf

[134] Till date 14 conference of parties meeting took place, last COP took place in Poznan, available at http://unfccc.int/search/search?q=cop&entqr=0&output=xml_no_dtd&sort=date%3AD%3AL%3Ad1&ud=1&client=unfccc_frontend&oe=UTF-8&ie=UTF-8&proxystylesheet=unfccc_frontend&site=default_collection

[135] The landmark Marrakesh Accords adopted at COP 7 (Marrakesh, October/November 2001) and Bali Action Plan (adopted at COP- 13) was especially important in elaborating the Convention's rulebook on issues of particular concern to developing countries.

[136] Ibid

[137] The Convention divides countries into two main groups: those that are listed in its Annex I, known as Annex I Parties[137], and those that are not, known as non-Annex I Parties.[137] Some Annex I Parties are also listed in the Convention's Annex II, and are known as Annex II Parties.[137] They include both the relatively wealthy industrialized countries that were members of the Organisation for Economic Co-operation and Development (hereinafter OECD) in 1992, plus the countries with economies in transition (the EITs), including the Russian Federation, the Baltic States together several Central and Eastern European States.
There are 41 Annex 1 Country Parties available at http://unfccc.int/parties_and_observers/parties/annex_i/items/2774.php

There are 153 Countries are non Annex 1 Parties. The per capita emissions of Annex I Parties are higher than those of most developing countries and they have greater financial and institutional capacity to address climate change. available at http://unfccc.int/parties_and_observers/parties/non_annex_i/items/2833.php

submit an annual inventory of their greenhouse gas emissions. The OECD members of Annex I are also listed in the Convention's Annex II. These Annex II Parties are obligated to provide "new and additional financial resources" to the developing countries to help them tackle climate change, as well as to facilitate the transfer of climate friendly technologies to both developing countries and economies in transition (hereinafter EITs).

All the remaining countries, basically, the developing countries, make up the group of non-Annex I Parties, report in more general terms on their actions to address climate change and adapt to its effects. The time frame for the submission of their initial national communications, including their emission inventories, is less tight than for Annex I Parties and is contingent on the receipt of funding. Because of this, non-Annex I Parties started to submit their national communications later than Annex I Parties. Non-Annex I Parties are not obliged to submit an annual emission inventory, nor are their national communications subject to in-depth review.[138]

Technology Related Commitments under the UNFCCC

Technology development and transfer is included in both the UNFCCC and its Kyoto Protocol. New technologies play a critical role in achieving objective of UNFCCC.[139] In implementing measures to address the issue of climate change and to deal with its adverse impacts, financial resources and transfer of technology to developing countries was considered to be essential. Therefore, transfer of technology for the climate change mitigation and adaptation has been included as one of the key issues in UNFCCC. Within UNFCCC transfers of technology connotes the broad aspect of transfer such as access to ESTs and know how to implement them.

UNFCCC envisages and addresses all aspects of technology transfer such as technology research, development, diffusion in accordance with Articles 4.1 (c), 4.3, 4.5 and other relevant Articles of the Convention such as Articles 4.8 and 4.9. In fact the nature and scope of technologies covered by the Convention is indicated by Article 4.1(c)[140] which provides

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[138] See A Guide to Climate Change Convention Process, pp- 06-07, available at http://unfccc.int/resource/process/guideprocess-p.pdf

[139] See Debra Justus, Cédric Philibert, *International Energy Technology Collaboration and Climate Change Mitigation Synthesis Report,* OECD/IEA, 2005.

[140] See also United Nations Framework Convention on Climate Change (1992): *International Legal Materials,* Volume 31, Number 4, July 1992; and available at http://www.unfccc.de/resource/convkp.html

that all Parties shall "promote and cooperate in the development, application and diffusion, including transfer, of technologies, practices and processes that control, reduce or prevent anthropogenic emissions of greenhouse gases ....in all relevant sectors, including the energy, transport, industry, agriculture, forestry and waste management sectors".

The need to finance technology development and transfer is identified in Article 4.3[141], which says that developed countries shall provide "such financial resources including for the transfer of technology, needed by developing country Parties to meet the agreed full incremental costs of implementing measures" covered by Article 4.1 (which refers to technology transfer in Article 4.1(c)). Further it states that developed countries shall "take into account the need for adequacy and predictability in the flow of funds and the importance of appropriate burden sharing among the developed country Parties".

The Convention obliges developed countries to "take all practicable steps to promote, facilitate and finance, as appropriate, the transfer of, or access to, environmentally sound technologies and know-how to other Parties, particularly developing country Parties, to enable them to implement the provisions of the Convention." further it states that, in this process, the developed countries "shall support the development and enhancement of endogenous capacities and technologies of developing country Parties"

For non- Annex I Parties compliance with the Article 4.1 (c)[142] is closely linked to Articles 4.3 and 4.5[143] which define obligations of Annex II Parties for technologies transfer. The general perception among the developing countries that meeting the UNFCCC obligation is to reduce the economic growth appears to be is addressed in Article 4.7.[144] This provision seeks to remove this hesitation of the developing countries to the extent to which they will effectively implement their commitments under the Convention. The convention also states that the effective implementation of the commitments under the convention by the developing country parties depends on the financial resources and transfer of technology, which takes

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[141] Ibid, International Centre for Trade and Sustainable Development (ICTSD), (2008), "Climate Change, technology transfer and Intellectual Property Rights", International Institute for Sustainable Development, Switzerland

[142] See United Nations (1992), *United Nations Framework Convention on Climate Change,* FCCC/INFORMAL/84, GE.05-62220 (E) 200705, Accessed on 22 August 2008, available at URL: http://unfccc.int/resource/docs/convkp/conveng.pdf

[143] Ibid

[144] Ibid

into account the fact that the economic and social development and poverty eradication are the first and overriding priorities of the developing country parties.

Article 11.1[145] of the Convention further prescribes that the financial resources shall be provided for the transfer of technology on a grant or concessional basis. The Kyoto Protocol, in Article 10(c),[146] reiterates the requirement of all Parties to cooperate in the development, application, diffusion and transfer of environmentally sound technologies that are in the public domain. Article 11.2 of the Protocol repeats the commitment of the developed country Parties to provide financial resources for the technology transfer.

Obligations of the Parties

Article 4.1(c) mentions explicit obligations requiring all the parties to promote and cooperate in the development, application and diffusion of clean technologies and mitigation related behavioural practices and processes. The recent analysis of the information given by Annex I Parties shows that the environment and climate change are still not the principal areas of corporate interest for the technological development.

The Reporting Guidelines of the Convention mandates Annex II Parties to provide in their national communications information relating to private/public sector technology transfer. They are also required to provide success and failures stories of the technology transfer developing world. In addition they are required to report on activities for financing access by the developing countries to 'hard' and 'soft' environmentally sound technologies and action taken by the Annex II governments to promote, facilitate and finance technology transfer, and support indigenous capacities and technologies of developing countries. They may report on how private sectors are encouraged to transfer the technologies.

Kyoto Protocol &Transfer of Technology

Articles 10[147] and 11[148] of the Protocol incorporate the provisions of Articles 4.1, 4.3 and 4.5 of the Convention. Article 10 (c) of the convention clarifies, strengthens and expands the scope for the commitment in Article 4.1 (c) of the convention. Article 10 (c) provides that all Parties shall

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[145]Ibid

[146] United Nations (1998) *Kyoto Protocol to the United Nations Framework Convention on Climate Change,* Accessed on 2nd August 2008, available at URL: http://unfccc.int/resource/docs/convkp/kpeng.pdf

[147] See United Nations (1998) *Kyoto Protocol to the United Nations Framework Convention on Climate Change,* Accessed on 2nd August 2008, URL: http://unfccc.int/resource/docs/convkp/kpeng.pdf

[148] Ibid

'Cooperate in the promotion of effective modalities for the development, application and diffusion of, and take all practicable steps to promote, facilitate and finance, as appropriate, the transfer of, or access to, environmentally sound technologies, know-how, practices and processes pertinent to climate change, in particular to the developing countries, including the formulation of policies and programmes for the effective transfer of environmentally sound technologies that are publicly owned or in the public domain and the creation of an enabling environment for the private sector to promote and enhance the transfer of, and access to, environmentally sound technologies'.

Unlike Article 4.1 (c) Article 10(c) covers both adaptation and mitigation technologies as it refers to the technologies 'pertinent to climate change' particularly the developing countries'. The adaptation concerns foreshadow the mitigation concerns in the provision. This commitment is qualified by the 'as appropriate' so acknowledges that developing countries have a role in developing, financing and transferring climate technologies and not just as recipients of transferred technologies.[149]

The instrument also includes the concept of ESTs in lieu of the word 'technologies'. The concept of ESTs is mentioned in Decision13/CP.1 [150] and reflects agreed language on ESTs in Chapter 34 in Agenda 21[151]. ESTs encompass technologies that have the potential for significantly improved environmental performance relative to other technologies. ESTs technologies are less polluting, use resources in sustainable manner, recycle more of their wastes, and handle all residual wastes in more environmentally acceptable way than their substitutes. ESTs reflect the true character of technologies which is to be transferred in the context of climate change and broader in scope than technologies defined in the Convention. ESTs are sign of the system rather than mere technologies as it include know-how, procedures, goods and services, equipment as well as organisational and managerial procedures.

The Kyoto Protocol is one step ahead in implementation of the existing commitment. It makes distinction between publicly and privately owned technologies and recognises the

[149] See Farhana Yamin and Joanna Depledge, The International Climate Change Regime, A Guide to Rules, Institutions and Procedures, pp-306, Cambridge University Press, U.K.

[150]See United Nations (1995), *Report of the Conference of the Parties on its First Session, held in Berlin, Part Two: Action taken by the Conference of the Parties at its First Session,* FCCC/CP/1995/7/Add.1, pp-40. available at http://unfccc.int/cop4/resource/docs/cop1/07a01.pdf

[151] See also Agenda 21 (1992): available at http://www.unep.org/Documents/Default.asp?DocumentID=52; United Nations (2001), *Compendium of International Arrangements on Transfer of technology: Selected Instruments Relevant provisions in selected international arrangements pertaining to transfer of technology,* United Nations publications, UNCTAD/ITE/IPC/Misc.5, available at http://www.unctad.org/en/docs//psiteipcm5.en.pdf

leading role of governments in the transfer of public technologies. However, as regards the technologies, it makes a change in the developing countries' role for creation of enabling environment for the privately owned technologies.

The clean development mechanism (hereinafter CDM) under the Kyoto Protocol, however, is not identified as a means for transfer of ESTs to the developing countries to fulfil objectives of the Protocol. But it may contribute to the transfer of technology by financing emission reduction projects that use technologies currently not available in the host countries.

Transfer of technologies has been always a separate agenda in each of the Conference of the Parties. At COP-1 Parties agreed to place the issue of transfer of technology on the agenda of each COP in order to provide continuous advice to improve the operational modalities of transfer of technology. It was at the COP-7 (Marrakesh Accords) a framework for implementation of Article 4.5 of the Convention, was laid down that was a significant step on the technology transfer issue.

Conference of the Parties

The COP is the supreme body of the convention. It is supported by the two subsidiary bodies: the Subsidiary Body for the Scientific and Technological Advice and Subsidiary body for Implementation. It serves also as the Meeting of the Parties to the Kyoto Protocol. The Convention comprises provisions dealing with the establishment and functioning of the COP.[152] As a supreme body it has the overall responsibility to keep under regular review the implementation of the Convention and any related legal instruments (chapeau Article 7.2). The COP is entitled to take decisions for effective implementation of the Convention. Sub-paragraphs (a) to (m) of Article 7.2 lists specific functions[153] of the COP. Additionally, 'a

[152] See Farhana Yamin and Joanna Depledge, The International Climate Change Regime, A Guide to Rules, Institutions and Procedures, pp-306, Cambridge University Press, U.K.

[153] Article 7.2 sub-paragraphs from (a) to (m) are as, "(a) Periodically examine the obligations of the Parties and the institutional arrangements under the Convention, in the light of the objective of the Convention, the experience gained in its implementation and the evolution of scientific and technological knowledge;
(b) Promote and facilitate the exchange of information on measures adopted by the
Parties to address climate change and its effects, taking into account the differing circumstances, responsibilities and capabilities of the Parties and their respective commitments under the
Convention;
(c) Facilitate, at the request of two or more Parties, the coordination of measures adopted by them to address climate change and its effects, taking into account the differing circumstances, responsibilities and capabilities of the Parties and their respective commitments under the Convention;
(d) Promote and guide, in accordance with the objective and provisions of the
Convention, the development and periodic refinement of comparable methodologies, to be agreed on by the Conference of the Parties, inter alia, for preparing inventories of greenhouse gas emissions by sources and removals by sinks, and for evaluating the effectiveness of measures to limit the emissions and enhance the removals of these gases;

catch all' or 'savings clause has been included at Article 7.2 (m), enabling the COP to exercise any other functions required for the achievement of the objectives of the Convention. It gives broad legal powers ensuring the COP's legal authority. This could ensure protection against ultra virus type challenges because Convention's Rules of Procedure provides that Parties have a right to challenge the competence of the COP.[154]

The COP may be said to have international legal personality as the United Nations Office of Legal Affairs stated in the 1993 that once UNFCCC was in force it would establish an international entity/organisation with its own separate legal personality, statement of principles, organs and a supportive structure in the form of the Secretariat. Such an international legal capacity is a prerequisite for giving effect to the basic objectives of the Convention.

Article 7.2 (d)[155] mandates COP to

> 'Promote and guide ...the development and periodic refinement of comparable methodologies...inter alia, for preparing inventories of greenhouse gas emissions ...and removals....and for evaluating the effectiveness of measures to limit the emissions and enhance the removals of these gases'.

This is an area on which the COP regularly takes decisions. Further Article 7.2 (e) requires the COP to

> 'Assess, on the basis of all information made available to it .....the implementation of the convention ....the overall effects of the measures taken pursuant to the Convention , in particular environmental,

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(e) Assess, on the basis of all information made available to it in accordance with the provisions of the Convention, the implementation of the Convention by the Parties, the overall effects of the measures taken pursuant to the Convention, in particular environmental, economic and social effects as well as their cumulative impacts and the extent to which progress towards the objective of the Convention is being achieved;
(f) Consider and adopt regular reports on the implementation of the Convention and ensure their publication;
(g) Make recommendations on any matters necessary for the implementation of the Convention;
(h) Seek to mobilize financial resources in accordance with Article 4, paragraphs 3, 4 and 5, and Article 11;
(i) Establish such subsidiary bodies as are deemed necessary for the implementation of the Convention;
(j) Review reports submitted by its subsidiary bodies and provide guidance to them;
(k) Agree upon and adopt, by consensus, rules of procedure and financial rules for itself and for any subsidiary bodies;
(l) Seek and utilize, where appropriate, the services and cooperation of, and information provided by, competent international organizations and intergovernmental and non-governmental bodies; and
(m) Exercise such other functions as are required for the achievement of the objective of the Convention as well as all other functions assigned to it under the Convention". cited in See also United Nations Framework Convention on Climate Change (1992): *International Legal Materials*, Volume 31, Number 4, July 1992; and available at http://www.unfccc.de/resource/convkp.html

[154] See Farhana Yamin and Joanna Depledge, The International Climate Change Regime, A Guide to Rules, Institutions and Procedures, pp-76-77, Cambridge University Press, U.K.

[155] Ibid

economic and social effects as well as their cumulative impacts and the extent to which progress towards the objective of the Convention is being achieved'.

This forms the basis of COP's regular consideration of Parties inventory data and national communications as well as other types of information, such as GEF and IPCC reports. In addition COP can make any recommendation on any matter for the implementation of the Convention, and can establish any subsidiary bodies for the same.[156]

COP's Decisions on the Transfer of Technology

Each session of COP results in a report comprising its proceedings and its actions. It may adopt legally binding instruments (such as amendments, annexes and protocols), and its actions take the form of decisions, resolutions or declarations. Decisions concerning internal and administrative matters are not legally binding but observed as general principles of international law. In fact decisions concerning commitments of the parties are not legally binding like treaties, formal amendments and Protocols. Legal implications and status of the decisions depend upon the content, conduct of the Parties and legal expectations such as Marrakesh Accords contain many decisions with significant legal implications and interpretations of the rules of the UNFCCC and KP.[157]

Part one of the report records the procedural and organisational elements. Part two contains decisions, declarations and resolutions adopted in the session[158]. Till now 14 COP meetings have taken place.

The COP-7 is a milestone which was held in 2001 in Marrakesh. Marrakesh Accords is the part of the Marrakesh Ministerial Declaration.[159] this COP decided (vide decision 4(2)) to establish an Expert Group on Technology Transfer with the objective of enhancing the implementation of Article 4.5 of the Convention and to identify the ways to advance and facilitate the technology transfer activities. Further in the paragraph 5 of the Decision 4 there is request a to the developed country Parties to provide technical and financial help to the developing countries in the implementation of Article 4.5 and also activities identified in the

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[156] Ibid

[157] Ibid

[158] See Farhana Yamin and Joanna Depledge, The International Climate Change Regime, A Guide to Rules, Institutions and Procedures, pp-76-77, Cambridge University Press, U.K.

[159] United Nations (2001), *Report of the Conference of the Parties on its Seventh Session, held at Marrakesh from 29 OCTOBER to 10 November 2001 Addendum Part two: Action Taken by the Conference of the Parties,* FCCC/CP/2001/13/Add.1, available at http://unfccc.int/resource/docs/cop7/13a01.pdf

annexed framework to the Decision 4/CP.7. By the same decision a framework for the implementation of the Article 4.5 has been added in an annex.[160] The annex titled as "framework for meaningful and effective actions to enhance the implementation of Article 4, paragraph 5, of the Convention" envisages five themes for the said objective that is effective implementation of Article 4.5. They are technology needs assessments, technology information, enabling environments, capacity building and mechanisms for technology transfer.

First theme is the Technology Needs Assessment (hereinafter TNA) is a set of country driven activities to determine mitigation and adaptation technology priorities. Although Article 4.5 refers technology transfer to the developing countries, this framework covers all non- Annex I Parties. The objective of TNA is to facilitate the transfer of technology and access to ESTs under Article 4.5. It should be undertaken subject to the provisions of resources from Annex II Parties and any other assistance offered by other parties and organisation. This information is to be available through the non – Annex Parties national communications and other reports and channels (clearing house).[161] The purpose of technology needs assessments is to assist in identifying and analysing priority technology needs, which can form the basis for a portfolio of EST projects, and programmes which can facilitate the transfer of, and access to, the ESTs and know-how in the implementation of Article 4, paragraph 5, of the Convention.[162]

Second theme is Technology Information, which defines means including hardware, software and networking to facilitate the flow of information between relevant stakeholders. The scope of information includes economic, environmental and technical parameters as well as information about the availability of ESTs. Secretariat is mandated to develop quick access network to provide information for update ESTs. COP -8 mandated further to develop an information clearing house and a network of technology information centres.[163] The secretariat implemented its pilot project with the establishment of a technology transfer information clearing house (TT: CLEAR) in September 2001.

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[160] See Farhana Yamin and Joanna Depledge, The International Climate Change Regime, A Guide to Rules, Institutions and Procedures, pp-76-77, Cambridge University Press, U.K.

[161] See Farhana Yamin and Joanna Depledge, The International Climate Change Regime, A Guide to Rules, Institutions and Procedures, pp-76-77, Cambridge University Press, U.K.

[162] United Nations (2001), *Report of the Conference of the Parties on its Seventh Session, held at Marrakesh from 29 OCTOBER to 10 November 2001 Addendum Part two: Action Taken by the Conference of the Parties,* FCCC/CP/2001/13/Add.1, available at http://unfccc.int/resource/docs/cop7/13a01.pdf

[163] See Farhana Yamin and Joanna Depledge, *The International Climate Change Regime, A Guide to Rules, Institutions and Procedures,* pp-76-77, Cambridge University Press, U.K.

At present, TT: CLEAR acts as a gateway to technology information that enables users, including practitioners and private sector users, to find information on many issues related to technology transfer.[164] The technology information component serves to establish an efficient information system in support of technology transfer and to improve the generation and the flow of, access to, and quality of technical, economic, environmental and regulatory information relating to the development and transfer of ESTs under the Convention.[165]

The third theme is related with enabling environment. It refers government actions such as fair trade policies, removal of technical, legal and administrative barriers to technology transfer. Furthermore sound economic policies, regulatory frameworks and transparency all of them create an environment conducive to private and public sector technology transfer. It includes tax policies' intellectual property rights policies and preferential treatment to export of ESTs for the import of technology transfer.[166] The purpose of the enabling environments component of the framework is to improve the effectiveness of the transfer of environmentally sound technologies by identifying and analysing ways of facilitating the transfer of environmentally sound technologies, including the identification and removal of barriers at each stage of the process.[167]

The fourth theme is the capacity building which is an integral part of technology transfer. For the purpose of Article 4.5 capacity building is defined as a 'process, which seeks to build, develop, strengthen, enhance and improve existing scientific and technical skills, capabilities and institutions in Non-Annex 1Parties (NAIP) to enable them to assess, adapt, manage and develop ESTs". It is to be guided by the principles laid down by the Decision 2/COP-7(2001)

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[164]UNFCCC(2007) *Expert Group on Transfer of Technology Five Years of Work,* available at http://unfccc.int/resource/docs/publications/egtt_eng.pdf

[165] United Nations (2001), *Report of the Conference of the Parties on its Seventh Session, held at Marrakesh from 29 OCTOBER to 10 November 2001 Addendum Part two: Action Taken by the Conference of the Parties,* FCCC/CP/2001/13/Add.1, available at http://unfccc.int/resource/docs/cop7/13a01.pdf

[166] See Farhana Yamin and Joanna Depledge, *The International Climate Change Regime, A Guide to Rules, Institutions and Procedures,* pp-76-77, Cambridge University Press, U.K.

[167]United Nations (2001), *Report of the Conference of the Parties on its Seventh Session, held at Marrakesh from 29 OCTOBER to 10 November 2001 Addendum Part two: Action Taken by the Conference of the Parties,* FCCC/CP/2001/13/Add.1, available at http://unfccc.int/resource/docs/cop7/13a01.pdf

and Decision 3/COP-7 (2001).[168] What is included in the capacity building is set out in Decision 3/COP-7, Annex, and Paragraph 18. The purpose of capacity building under this framework is to strengthen the capacities of Parties other than the developed country Parties and other developed Parties not included in Annex II, particularly developing country Parties, to promote the widespread dissemination, application and development of environmentally sound technologies and know-how, to enable them to implement the provisions of the Convention.[169]

Fifth theme is the mechanism for technology transfer. Mechanism for technology transfer is to facilitate through financial, institutional and methodological activities enhanced coordination among stakeholders to engage them in efforts to accelerate the development, diffusion, transfer of and access to ESTs. Further, it aims dissemination of technological development through technology cooperation, partnership among different stakeholders [public/public, private/private and private/public] and the development of projects and programmes.[170] The purpose of the proposed mechanisms is to develop meaningful and effective actions to enhance the implementation of Article 4, paragraph 5, of the Convention by increasing the transfer of and access to environmentally sound technologies and know-how.[171]

Expert Group on Technology Transfer

Expert Group on Technology Transfer (hereinafter EGTT) was established as part of Framework Decision taken in Marrakesh Accords.[172] Its principal mandate is to enhance the

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[168]Decision 3/COP.7. paragraph 17 cited in United Nations (2001), *Report of the Conference of the Parties on its Seventh Session, held at Marrakesh from 29 OCTOBER to 10 November 2001 Addendum Part two: Action Taken by the Conference of the Parties,* FCCC/CP/2001/13/Add.1, available at http://unfccc.int/resource/docs/cop7/13a01.pdf

[169] Ibid

[170] Decision 3/COP.7. paragraph 22 cited in United Nations (2001), *Report of the Conference of the Parties on its Seventh Session, held at Marrakesh from 29 OCTOBER to 10 November 2001 Addendum Part two: Action Taken by the Conference of the Parties,* FCCC/CP/2001/13/Add.1, available at http://unfccc.int/resource/docs/cop7/13a01.pdf

[171] Decision 3/COP.7. paragraph 23 cited in United Nations (2001), *Report of the Conference of the Parties on its Seventh Session, held at Marrakesh from 29 OCTOBER to 10 November 2001 Addendum Part two: Action Taken by the Conference of the Parties,* FCCC/CP/2001/13/Add.1, available at http://unfccc.int/resource/docs/cop7/13a01.pdf

[172] Decision 4/COP-7. Paragraph 2, cited in United Nations (2001), *Report of the Conference of the Parties on its Seventh Session, held at Marrakesh from 29 OCTOBER to 10 November 2001 Addendum Part two: Action*

implementation of Article 4.5 including by analysing and identifying ways to facilitate and advance technology transfer activities and to make recommendations to the Subsidiary Body for Scientific and Technological Advice in this regard. The EGTT comprises twenty members: three members each from Africa, Asia, Latin America, Caribbean, one member from the small island developing states, seven members from Annex I Parties and three from 'relevant international organisations' are other members. The EGTT members are nominated by the Parties that are by their groups- but serve in their personal capacity, confirming its technical and expert nature. Members must have expertise in one of the several specified areas –green house gases mitigation and adaptation technologies, technology assessments, information technology, resource economics and social development.[173]

EGTT work programme is approved by SBSTA. The programme is aiming to advance the five key themes and areas identified in the framework for meaningful and effective actions plus a sixth cross cutting area analysing information from national communications relevant to the EGTT's work. Its report is used by the Secretariat for the implementation of activities under the framework decision, which is discussed at SBSTA.

The EGTT has collaborated with the Global Environment Facility (hereinafter GEF), the United Nations Development Programme (hereinafter UNDP), the United Nations Environment Programme (UNEP) and the Climate Technology Initiative (CTI) on providing technical assistance to non-Annex I Parties to conduct Technology Needs Assessments (TNAs). Currently more than 25 non-Annex I Parties have completed their TNAs.[174] Over the years, EGTT's work has become result oriented with targeted and instructive products, which Parties can use while formulating their mitigation and adaptation technology strategies.

Taken by the Conference of the Parties, FCCC/CP/2001/13/Add.1, available at http://unfccc.int/resource/docs/cop7/13a01.pdf

[173] See Farhana Yamin and Joanna Depledge, The International Climate Change Regime, A Guide to Rules, Institutions and Procedures, pp-76-77, Cambridge University Press, U.K.

[174] UNFCCC(2007) Expert Group on Transfer of Technology Five Years of Work, available at http://unfccc.int/resource/docs/publications/egtt_eng.pdf

Since the adoption of the Marrakesh Accords, work on the development and transfer of technologies under the UNFCCC process has focused on the implementation of activities identified under each key theme of the technology transfer framework.

An emerging area of work of the EGTT is related to innovative options for financing the development and transfer of technologies. This work aims to improve access to financing from a wide range of available sources given the limited capacity of public financing sources, in order to realise the increasing number of technology transfer projects. Two workshops on innovative financing have been organized by the secretariat in collaboration with the EGTT, which generated critical learning and common understanding on means of financing technology needs in the developing countries, as well as possible innovative ways to engage the private sector in technology transfer activities under the Convention.

Another emerging area of work of the EGTT deals with technologies for adaptation to climate change. This work aims to improve the current knowledge and understanding of adaptation to climate change, including the assessment of technologies for adaptation, the process of technology development and transfer as relevant to adaptation, and its implications for climate policy. It has prepared technical paper on the application of ESTs for adaptation to climate change which is helpful to determine the policies related to environment and technologies.

An important decision (Decision 10/CP.8 COP, Delhi 2002)[175] was influenced by the Johannesburg Plan of Implementation at World Summit on Sustainable Development along with the Convention's provisions for transfer of technology. It reiterated the commitments lay in the previous COP meeting such as transfer of technology and capacity building for enhancing the implementation of Article 4.5 of the Convention.

Much progress took place at Buenos Aires (Decision 6/COP.10)[176] regarding the issue of the transfer of technology. It was agreed that issues relating to implementation of Articlen4.5 of

[175] United Nations (2002), *Report of the Conference of the Parties on its Eighth Session, Held at New Delhi from 23 October to 1 November 2002,* FCCC/CP/2002/7/Add.1, available at http://unfccc.int/resource/docs/cop8/07a01.pdf

[176] United Nations (2004), *Report of the Conference of the Parties on its tenth session, held at Buenos Aires from 6 to 18 December 2004 Addendum, Part Two: Action taken by the Conference of the Parties at its tenth session,* FCCC/CP/2004/10/Add.1, available at http://unfccc.int/resource/docs/cop10/10a01.pdf

the Convention on the development, transfer of, access to ESTs and knowhow is a continuing process. An assessment of technologies, of terms of access and technology needs of Parties will continue to be undertaken to ensure that substantive progress is made. It refers to an integrated approach towards technology transfer. It has reiterated the commitments laid down in Article 4.7 of the Convention (commitments of the developed countries related to transfer of technology and financial support to developing countries).

COP urged Annex II Parties to increase technical and financial support if possible for the enhancement and development of endogenous capacities and technologies of developing countries. It further provides that EGTT should make recommendation for enhancing implementation of the framework for effective and meaningful action to enhance implementation of Article 4.5 of the Convention fostering private and public partnership for the development of ESTs. Joint research between Annex II and non-Annex I Parties for the development of ESTs is important step in the decision. Networking between TT: CLEAR and regional technology information centres was emphasised by the COP.[177]

The eleventh Conference of the Parties (Decision 6/COP.11)[178] to the UNFCCC and the first Conference of the Parties serving as Meeting of the Parties to the Kyoto Protocol (COP/MOP 1) took place in Montreal, Canada, from 28 November to 10 December 2005. COP 11 addressed issues such as capacity building, technology development and transfer, the adverse effects of climate change on developing and least developed countries, and several financial and budget-related issues, including guidelines to the Global Environment Facility (GEF).

Technology transfer was addressed by the SBSTA in the same meeting. Transfer of technology was divided into sub-agendas. First relates to the implementation of the framework for meaningful and effective actions to enhance the implementation of Article 4.5 of the Convention. Second is related with the 2006 Work Programme of the Expert Group on

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[177]Earth Negotiations Bulletin (2004), *Summary of the Tenth Conference of Parties to the UN Framework Convention to the Climate Change,* Vol.12, No.260, Published by the International Institute for Sustainable Development (IISD), also available at http://www.iisd.ca/download/pdf/enb12260e.pdf

[178] Earth Negotiation Bulletin (2005), *Summary of the Eleventh Conference of the Parties to the UN Framework Convention on Climate Change and First Conference of the Parties Serving as the Meeting of the Parties to the Kyoto Protocol,* Vol.12,No.29, International Institute for Sustainable Development (IISD), Accessed on 22 August 2008http://www.iisd.ca/download/pdf/enb12291e.pdf. United Nations (2005), *Report of the Conference of the Parties on its eleventh session, held at Montreal from 28 November to 10 December 2005 Addendum Part Two: Action taken by the Conference of the Parties at its eleventh session,* FCCC/CP/2005/5/Add.1, available at http://unfccc.int/resource/docs/2005/cop11/eng/05a01.pdf

Technology Transfer (EGTT). Finally COP in its decision on implementation of the framework for meaningful and effective actions to enhance the implementation of Article 4.5 of the Convention invited parties to submit their view on the continuation of the EGTT. It also requests the Secretariat to organize a senior-level roundtable discussion on lessons learned, technology deployment, transfer, cooperation and partnerships, and requests SBSTA to take into account existing technology-based international initiatives and partnerships undertaken between parties when considering future work for enhancing the implementation of the framework.[179]

The twelfth COP was held in Nairobi. Decision 5/COP.12 deals with the issue of technology transfer. It reviewed the implementation of commitments and various other provisions of the Convention relating to such matters as the financial mechanism, national communications, technology transfer, capacity building, and the adverse impacts of climate change on the developing and least developed countries (LDCs) and of response measures and the special needs of LDCs (Article 4.8 and 4.9). A major focus of both COP/MOP 2 and COP 12 was on long-term action on climate change and on developing a framework for action once the Kyoto Protocol's "first commitment period" is over in 2012.

As regards the issue of technology transfer, main issue was the review of the mandate of the EGTT and decide a new mandate for its continuity. Significant disagreement between the developed countries and the developing countries started over this issue. G-77/China proposed for the establishment of a new body under the Convention, the Technology Development and Transfer Board and a Multilateral Technology Acquisition Fund to buy intellectual property rights; and developing indicators to monitor implementation of the technology transfer framework. But developed countries opposed this and insisted on strengthening and continuing of EGTT. So COP decided to extend the EGTT's life for one year.[180]

The next most important COP was held in Bali from 3-15 December 2007. The conference involved a series of events, including the thirteenth Conference of the Parties (COP 13) to the

[179] Ibid

[180] Earth Negotiation Bulletin (2006), *Summary of the Twelfth Conference of Parties to the Framework Convention on Climate Change and Second Meeting of the Parties to the Kyoto Protocol,* Vol. 12 No. 318, Published by the International Institute for Sustainable Development (IISD), Accessed on 22 August 2008 http://www.iisd.ca/download/pdf/enb12318e.

UN Framework Convention on Climate Change (UNFCCC) and third Conference of the Parties serving as the Meeting of Parties to the Kyoto Protocol (COP/MOP 3). The COP and COP/MOP were assisted in their work by the Subsidiary Body for Scientific and Technological Advice (SBSTA) and the Subsidiary Body for Implementation (SBI), which convened for their 27th sessions from 3-12 December. In addition, the Ad Hoc Working Group on Further Commitments for the Annex I Parties under the Kyoto Protocol met for its resumed fourth session (AWG 4) from 3-15 December.

During COP 13 numerous contacts groups and informal discussions were also arranged to help negotiations move forward. These meetings resulted in the adoption of 15 COP decisions and 13 COP/MOP decisions as well as the approval of a number of conclusions by the subsidiary bodies. These outcomes covered a wide range of topics and they are finalizing the Adaptation Fund under the Protocol, a decision on reducing emissions due to deforestation in the developing countries, outcomes on technology transfer, capacity building, the Kyoto Protocol's flexible mechanisms, the adverse effects of combating climate change, national communications, financial and administrative matters, and various methodological issues.[181]

The Bali Action Plan identifies four key elements and they are mitigation, adaptation, finance and technology. It is the technology transfer which is one of the key elements. On technology development and transfer, the COP decides to consider effective mechanisms and enhanced means for the removal of obstacles to financial and other incentives for the scaling up of technology development and transfer. it seems the discussions on technology transfer revolve around three issues: institutional arrangements, performance indicators, and financing. On the issue of institutional arrangement the developed countries insisted on the extension of EGTT whereas G77/China asked for a new institution for the transfer of technology. After discussion both agreed to extend the terms of EGTT for further five years with the capacity to report to SBSTA and SBI. Discussion over performance indicators had initially originated from a G-77/China proposal seeking a set of indicators to monitor and assess implementation and effectiveness of the technology transfer framework. It was agreed that the EGTT would develop indicators that would be used by SBI. The G-77/China proposed a new funding

[181] Earth Negotiation Bulletin (2007), *Summary of the Thirteenth Conference of Parties to the UN Framework Convention on Climate Change and Third Meeting of the Parties to the Kyoto Protocol,* Vol. 12 No. 354, , Published by the International Institute for Sustainable Development (IISD), Accessed on 22 August 2008 http://www.iisd.ca/download/pdf/enb12354e.pdf

mechanism under the Convention. The US proposed a facility or programme under the GEF instead. They finally agreed on a "strategic" programme under the GEF.[182]

The United Nations Climate Change Conference in Poznan, Poland, was held from 1-12 December 2008. The conference involved a series of events, including the fourteenth Conference of the Parties (COP 14) to the UN Framework Convention on Climate Change (UNFCCC) and fourth Conference of the Parties serving as the Meeting of the Parties to the Kyoto Protocol (COP/MOP 4).

In support of these two main bodies, four subsidiary bodies have been convened: the fourth session of the Ad Hoc Working Group on Long-term Cooperative Action under the Convention (AWGLCA 4); the resumed sixth session of the *Ad Hoc* Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol (AWG-KP 6); and the twenty-ninth sessions of the Subsidiary Body for Implementation (SBI 29) and Subsidiary Body for Scientific and Technological Advice (SBSTA 29). These meetings resulted in the adoption of COP decisions, COP/MOP decisions and a number of conclusions by the subsidiary bodies. They covered a wide range of topics, including the Adaptation Fund under the Kyoto Protocol, the 2009 work programmes of the AWG-LCA and AWG-KP, and outcomes on technology transfer, the Clean Development Mechanism (CDM), capacity building, national communications, financial and administrative matters, and various methodological issues.[183] Further COP requests GEF to provide technical support to developing countries to prepare or update their technology needs assessments, to address gaps in current GEF operations relating to technology transfer, leveraging private sector investment, and promoting innovative project development. This all aim to strengthen developing countries technologically.[184]

As agreed upon in the last (COP.13),[185] on strategic programme under GEF, in this COP.14 (held in Poznan), GEF reported on the strategic programme to scale up the investment for

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[182] Ibid (Full report available here)

[183] Earth Negotiation Bulletin (2008),*Summary of the Fourteenth Conference of Parties to the UN Framework Convention on Climate Change and Fourth Meeting of Parties to the Kyoto Protocol,* Vol. 12 No. 395, Published by the International Institute for Sustainable Development (IISD), Accessed on 22 January 2009 http://www.iisd.ca/download/pdf/enb12395e.pdf

[184]Ibid

[185] Earth Negotiation Bulletin (2007), *Summary of the Thirteenth Conference of Parties to the UN Framework Convention on Climate Change and Third Meeting of the Parties to the Kyoto Protocol,* Vol. 12 No. 354, ,

technology transfer. The developing countries stressed that the amounts are insufficient and urged for urgent implementation and a more strategic approach. On the other hand developed countries supported the GEF report and stressed on the importance of technology assessment. Canada, US, Australia and EU were in favour of using GEF fund to leverage the funds outside of the Convention. The discussions on the fourth review of the financial mechanism resumed with a clear division between developed countries supporting the work of the GEF as adequate, and developing countries expressing profound concerns over the performance of the financial mechanisms and the GEF as an operating entity.[186]

Recent Developments

In the Bonn Climate Talks (April, 2009, Bonn, Germany) [187] considerable amount of divergence has been seen regarding the issue of technology transfer and finance. On financial resources, the G-77/China underscored the need for new and additional, appropriate, predictable, sufficient, and in addition to ODA financial resources, as well as for funding of incremental costs. India noted lack of metrics for measuring incremental costs. Mexico reiterated its proposal for a Green Fund financed by assessed contributions by developed countries. Norway highlighted its suggestion for financing using revenues from the auctioning of carbon credits. India highlighted problems with harmonizing a global carbon tax. Some countries proposed to address the issue of historical responsibility, the principle of common but differentiated responsibilities and respective capabilities. On the issue of technology transfer China underscored the need for a technology roadmap and preferred an action-based mechanism. Many of the developing countries said the further elaboration of technology needs assessments should not detract from their implementation. The EU recommended that the UNFCCC should play a catalytic role.[188]

Published by the International Institute for Sustainable Development (IISD), Accessed on 22 August 2008 http://www.iisd.ca/download/pdf/enb12354e.pdf

[186] Third World Network (2009), Third World Network Poznan News Updates, Third World Network, also available at Website: www.twnside.org.sg

[187] Earth Negotiations Bulletin (2009), Summary of the Fifth Session of the *Ad Hoc Working* Group on Long-Term Cooperative Action and the Seventh Session of the A*d Hoc Working* Group on Further Commitments for Annex I Parties under the Kyoto Protocol, 29 March - 8 April 2009 Vol. 12 No. 407, *Published by the* International Institute for Sustainable Development (IISD), Accessed on 22 April 2009 http://www.iisd.ca/download/pdf/enb12407e.pdf

[188] Ibid

On institutional arrangements the developed countries stressed on strengthening of existing mechanism whereas developing countries proposed for a new one.[189] The G-77/China's proposed multilateral technology fund; Mexico's proposed Green Fund; and the use of an integrated financial architecture versus the use of a sector- or area-specific approach. Parties further discussed the need for an assessment mechanism and whether mechanisms should be under the COP. Brazil underscored the need to ensure that assessment mechanisms do not themselves become a barrier to technology transfer. Here barriers in the flow of technologies to developing countries will be taken up in the third chapter. Further negotiation series took place recently in Bonn.[190]

On the issue of finance many of the developing countries highlighted the need for adaptation funding over and above existing ODA; bridging the gap between available and required funding; new, additional and predictable sources; and simplified access without conditionalties. The developing countries also stressed the need for public financing, mentioning that the private sector and carbon markets should play a complementary role, as private sector funding is not a predictable one. But developed countries including EU and US stressed sufficiency of private sector funding and carbon markets funding as well.[191]

On the issue of technology transfer, while many parties highlighted the need for increased transfer of adaptation and mitigation technologies, but parties held divergent views on means of implementation and funding sources. Many developing countries stressed the need for public sector funding for technology transfer, with the African Group underscoring that for adaptation technologies in particular, public finance is critical due to lack of private sector interest. On financing of technology transfer, the G-77/China noted that technology financing

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[189] In Accra climate talks (august 2008) developing countries/G 77 proposed for a new technology transfer mechanism and an enhanced mechanism for finance. For detail see Third World Network (2008), *"Accra News Updates and Climate Briefings"*, Accra Climate Change Talks, 21 August-27 August 2008, accessed on 20 January, available at URL: http://www.twnside.org.sg/climate.htm

[190] Bonn climate talks (completed on 12th June)[190] are a part of ongoing negotiations under the UNFCCC and the Kyoto Protocol. The Convention's Subsidiary Body for Implementation (SBI) and the Subsidiary Body for Scientific and Technological Advice (SBSTA) held their 30th sessions. The sixth session of the *Ad Hoc* Working Group on Long-term Cooperative Action under the Convention (AWG-LCA 6) and the eighth session of the *Ad Hoc* Working Group on Further Commitments for Annex I Parties under the Protocol (AWG-KP 8) also took place. for detail see Earth Negotiation Bulletin (2009), *Summary of the Bonn Climate Change Talks,* Vol. 12 No. 241, Published by the International Institute for Sustainable Development (IISD), Accessed on 22 June 2009, available at http://www.iisd.ca/download/pdf/enb12421e.pdf

[190] Ibid

[191] Ibid

must be new, adequate, predictable and stable. Brazil opposed attaching conditionalities to funding, and in particular, the use of co-financing mechanisms.

The debate also extended to intellectual property rights (IPRs) which will be seen in the third chapter under the title of constraints to the transfer of technology. On implementation mechanisms, the EU urged to forge a link between technology transfer and low-carbon development strategies, while the US argued for the use of voluntary technology-oriented agreements. It was strongly opposed by the developing countries. Further Norway and Switzerland proposed Development of national strategies or actions plans as means for facilitating technology development and transfer. This was again opposed as it imposes conditions on the flow technologies.[192]

Conclusion

In the above discussion legal frameworks for the climate change and different mechanisms under the different conventions have been dealt with. The issue of technology transfer and finance have been taken up as a cross-cutting issue at each session of the COP (Convention) and Protocol and its subsidiaries bodies. It has started as a regular and integral phenomenon from COP.7.finance intermingles with the flow of technologies so finance as a means for facilitating technology transfer have been discussed in the annual sessions of COP. It is taken up and discussed in the subsidiaries bodies of the Convention.

It can be inferred from the above discussion that even after restless efforts of the developing countries at different forum they have not been successful to get their due. It seems legal instruments are not going to help; attitudinal changes on the part of developed countries are required for the same. The developing countries also highlighted the shortfalls of existing financial mechanisms and demanded the additional institutions of finance under the Convention.

There is no match between supply and demand. Besides finance for facilitating technology transfer, there should be capacity building and creating conducive environment for the absorption of transferred technologies in the developing countries. Along with this other conceptual matters relating to transfer of technologies will be taken up in the next chapter.

[192] Ibid

Chapter III

Legal Barriers in the Transfer of Technology

Introduction

This Chapter examines the various constraints hampering the transfer of environmentally sound technologies. There seems to be constraints at the domestic level such as infrastructural facilities, labour, absorptive capacity and research and development capacity will be discussed. In the context there could be possible legal barriers related with intellectual property rights of the innovator of the technology. The legal provisions given in the Trade Related Intellectual Property Rights (hereinafter TRIPS) protects the rights of innovators of technologies. One of the crucial points which cannot be missed is the problem of funding for access and affordability of clean energy technologies to developing nations. It is necessary to look into the efficiency of funding mechanisms given under the UNFCCC for technology transfer and how much they have been successful in fulfilling the demands of developing nations.

Technological development is imperative in facing the challenges of climate change. It is a critical and fundamental factor in reducing GHGs and enhancing the existing abilities and lowering the cost of reducing these emissions. Economically, financially and technologically developing countries are not as well off as their counterparts, developed countries. Hence, developing countries need to access climate friendly technologies at affordable cost so as not to compromise their economic growth (sustainable development).[193] But there are numerous difficulties and constraints at national and international level for instance infrastructural, regulatory, and legal. Besides, IPR policies and above all financial constraints cause obstruction in the availability of technologies to developing countries.

Barriers in the Recipient Country

There are following barriers at the recipient country level which has to be addressed to create absorptive capability by the developing countries for new technologies.

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[193] Martin Khor,(2008), *Note on Access to Technology, IPR and Climate Change* Accessed on 21 October 2008 URL: http://www.epo.org/about-us/events/archive/2008/epf2008/forum-1/details1/kohr_de.html

(i) Market conditions

Developing countries are required to take policy measures to make market conditions conducive for absorption of technologies. It includes ease of market entry for new firms and technologies; availability of capital; the degree of internalization of social and environmental concerns through taxes, subsidies, insurance and other mechanisms. Unstable market situations, low level of competitiveness, small size of markets, and low income consumers hinder international technological investments.[194]

(ii) The legal system

Next step is to order the legal system for smooth transfer of CFT. It includes the intellectual property rights (hereinafter IPRs) regime, the allocation (e.g., among firms or between the public and private sectors) of liability for past and future environmental damage, freedom of speech and information, and ease of litigation.[195]

(iii) Infrastructure facilities include the design of cities and other settlements, transport systems and utilities and their flexibility in permitting the adoption of alternative technologies, lifestyles and production systems.[196]

(iv) Social, political and cultural structures should be suitable to adopt the new technologies. It includes social practices, beliefs and norms that prevent acceptance of climate change mitigation, and adaptation options. Further there is lack of awareness of environmentally sound technologies, energy efficiency benefits and inefficient life-styles.[197]

(v) Psychology of the people to be modified includes raising awareness, understanding, and attitudes relating to energy efficiency, its causes and potential impacts, and changes in technology and lifestyles.[198]

(vi) Informational barriers include lack of access to information; access to relevant technical data and awareness about climate change related issues, options for mitigation and

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[194] See United Nations Department of Economic and Social Affairs, "Climate Change: Technology Development and Technology Transfer", Accessed on 21 December 2008 available at URL: http://www.un.org/esa/sustdev/sdissues/energy/op/beijing_hlccc_nov08/back_paper.pdf&

[195] Ibid
[196] Ibid
[197] Ibid
[198] Ibid

adaptation and advanced technologies. Another noticeable fact is lack of information about potential donors and project developers. Political barriers take account of lack of public mechanisms that support technology transfer and ineffective governance.[199]

(vii) Organizational and Institutional barriers comprise lack of compatible or adequate organizational and institutional frameworks (legal, financial, regulatory, enforcement, etc.); and lack of coordination among activities of existing organizations and institutions.[200]

Market and financial barriers are frequently present due to a shortage of financial resources and a lack of developed markets in the developing countries. Shortage of finance is caused by poor macroeconomic conditions, which may include underdeveloped financial sectors, high import duties, high or uncertain inflation or interest rates, uncertain stability of tax and tariff policies and investment risks.[201] This is disincentive to private sector mainly to small and medium enterprises to invest in the ESTs. Markets may not exist due to lack of financial institutions or systems to ensure that investments are made for the use of the transferred technology, lack of confidence in economic, commercial or technical viability, lack of manufacturers, lack of consumer awareness and acceptance of technology, the latter being largely driven by cultural habits.[202]

Other important barriers are: insufficient human and institutional capabilities; inability to access, select, import, develop and adapt appropriate technologies; lack of science, engineering and technical knowledge available to private industry; insufficient R&D due to lack of R&D investments and inadequate science and educational infrastructure; and institutionalized corruption in both developed and developing countries. [203]

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[199] Ibid

[200] Ibid

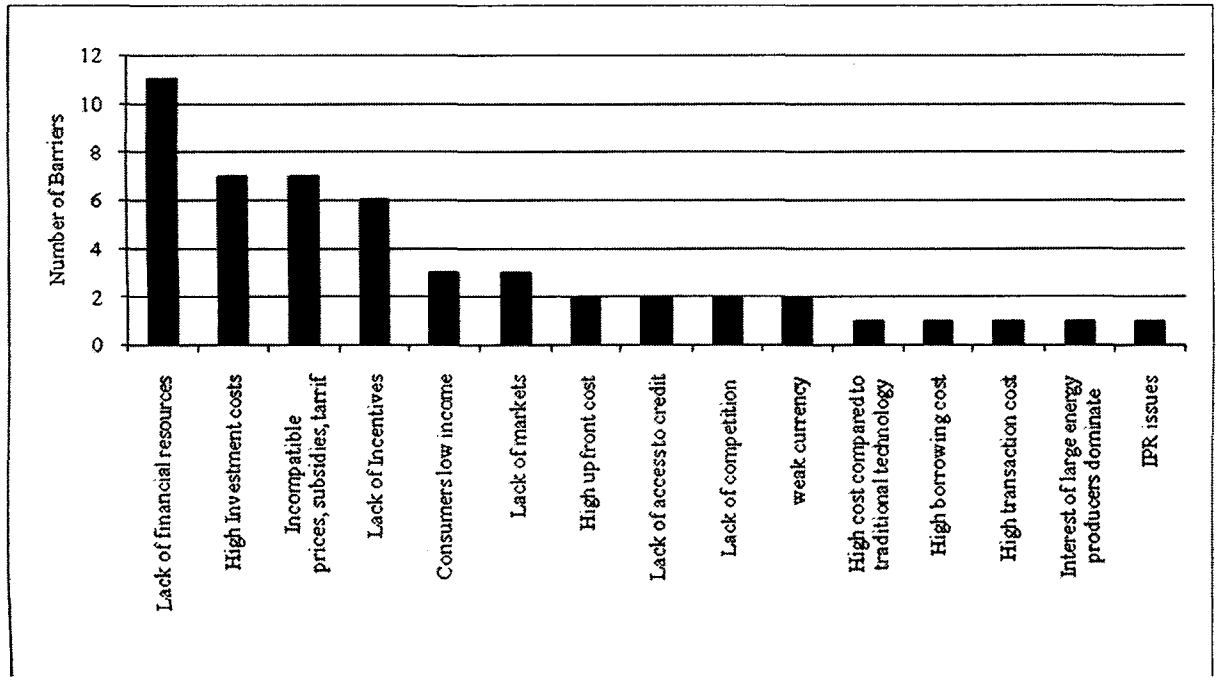
[201] See IPCC (2000), Intergovernmental Panel on Climate Change, Special Report on Methodological and Technological Issues in Technology Transfer, edited by B. Metz, O. Davidson, J.-W. Martens, S. van Rooijen and L. Van Wei McGrory. Cambridge, UK and New York: Cambridge University Press (2000)., pp-27, cited in UNDESA (2008), United Nations Department of Economic and Social Affairs, "Climate Change: Technology Development and Technology Transfer", Accessed on 21 December 2008 available at URL: http://www.un.org/esa/sustdev/sdissues/energy/op/beijing_hlccc_nov08/back_paper.pdf&

[202] Ibid

[203] Ibid

On the Basis of information given by the 25 non- Annex countries that have carried technology needs assessments, most commonly reported barriers to technology transfer could be identified. Following figure depicts them. Lack of financial resources, high investment costs, incompatible prices, subsidies and tariffs, and lack of incentives are most frequently reported.[204]

Figure -5 Frequency of economic and market barriers to technology transfer reported by non-Annex I Parties.[205]



In order to know the more about the barriers to technology transfer to developing countries assessment of all barriers are essential. Identification of barriers is essential for the deployment and diffusion of climate friendly technologies to developing world.

Intellectual Property Rights and Transfer of Technology

IPR protects human innovations and intellectual efforts. IPRs include (utility patents, design patents and plant patents), trade secrets, trademarks and copyrights etc. Patents are granted by the government to innovators which enable rights holders to exclude third parties from

[204] SBSTA (2006). Subsidiary Body for Scientific and Technological Advice to the United Nations Framework Convention on Climate Change, Synthesis report on technology needs identified by Parties not included in Annex I to the Convention, FCCC/SBSTA/2006/INF.1. New York: United Nations (2006).pp-27, cited in UNDESA (2008), United Nations Department of Economic and Social Affairs, "Climate Change: Technology Development and Technology Transfer", Accessed on 21 December 2008, available at URL: http://www.un.org/esa/sustdev/sdissues/energy/op/beijing_hlccc_nov08/back_paper.pdf&

[205] Ibid

utilising or exploiting or commercialising the protected inventions in the countries where they are registered. To patent any innovation, it needs to be new, have an inventive step and industrial application.[206] Developed and developing countries have different perceptions regarding the protection of intellectual property rights protection. Developed countries view IPRs protection as an incentive to develop, innovate and to promote the flow of technology to developing countries in the given context. Developing countries consider IPRs protection regime as a barrier to the transfer of clean technologies to them.[207]

Private sector plays a big a role in international investment and technology development. They are supported by domestic and international developments such as liberalisation of markets, development of legal and financial systems, and tariff reductions under General Agreement on Tariffs and Trade (hereinafter GATT) etc.

From developed countries perspectives it ensures economic returns to the innovator (for whatever cost incurred on R & D development of technology) and to an extent enabling transfer and availability of potential technologies.

Difference of Views on TRIPS Agreement

Developed countries view IPR regime as a primary means for technology development by offering incentive to the inventors to reap the profits of their labour. Developing countries tend to concerned to access existing technologies at affordable prices and to make them more widely available. Hence, developing countries do not want strong IPR laws like industrialised world as they consider it as obstruction to the diffusion and deployment of new technologies. By 1990s developing countries started to realise that instead of close economy policy they have to adopt more liberalised policies for economic and updated growth. So they began to believe that strong IPR laws would attract more foreign investment leading technological development. These developments led development of international standard for IPR protection in 1990s.[208]

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[206] See also IPCC (2000). Intergovernmental Panel on Climate Change, "Special Report on Methodological and Technological Issues in Technology Transfer", edited by B. Metz, O. Davidson, J.-W. Martens, S. van Rooijen and L. Van Wei McGrory. Cambridge, UK and New York: Cambridge University Press (2000).

[207] See Carlos M.Correa,(2005), "*Can TRIPS Agreement Foster Technology transfer to Developing countries*," Keith Maskus and Jerome H. Reichman (Editors) International Public *Goods and Transfer of Technology under a Globalised Intellectual Property Regime,* Cambridge University Press, UK , New York

[208] See also IPCC (2000). Intergovernmental Panel on Climate Change, "Special Report on Methodological and Technological Issues in Technology Transfer", edited by B. Metz, O. Davidson, J.-W. Martens, S. van Rooijen and L. Van Wei McGrory. Cambridge, UK and New York: Cambridge University Press (2000).

In 1994 TRIPS Agreement negotiated in the context of a trade negotiations (Uruguay round of talks) and therefore it was accepted as part of package of trade negotiations. Main provisions of TRIPS are: [209]

1. Establishment of a minimum standard for the protection and enforcement of variety of intellectual property rights;
2. Principle of 'national treatment' preventing discrimination in favour of domestic industries;
3. Inclusion of principle of 'most favoured nation' to prevent discrimination between investors from different signatories to the TRIPS Agreement.

In the context of transfer of clean technologies TRIPS regime on patent is particularly relevant. Patent protects inventions for 20 years to the right holder, set minimum standards or conditions that must be met for patents to be issued. It has established procedures for issuing license.[210] For developing countries 5 years grace has given to enforce the TRIPS regime. For least developed ones five years more have been given to comply with the requirements of the regime.[211]

Developing countries believe that strong IPR regimes not only restrict the diffusion of technologies but prevent also follow on inventions.[212] As patent holder of technology concerned covers the broad areas to prevent the other parts of the world to move on that and develop the technology. Here developed countries argument that strong IPR laws lead technological transfer and diffusion can be negated by a survey report (done by Trebilcock and Howse in 1995) which revealed that IPRs rated least important of five factors affecting investment in Thailand. Further World Bank's 1998 World Development Report cautions that, "There is now a risk of excessively strict IPRs adversely affecting follow on innovations and actually slowing down the pace of technological development." Further this Report identifies that 'IPRs covers not just product but broad areas of technologies.'[213]

[209] Ibid
[210] Ibid
[211] Ibid
[212] Ibid
[213] Ibid

Technological development is the basic objective of the TRIPS Agreement and starts from the Preamble and extends to different provisions. The Preamble of TRIPS[214] notes the particular needs of developing countries in the context of technological improvement. Specifically it states that:

> "Recognizing the underlying policy objectives of national systems for the protection of intellectual property, including developmental and technological objectives;
> Recognizing, also the 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."

First paragraph indicates that IPR protection meant to enhancement of technological development. Second one recognises that least developed countries (hereinafter LDCs) can take maximum benefits from the given flexibilities against the IPR regime in the agreement to acquire the technologies without bearing the higher costs.[215] It may be free access through imitation of already technologies. In this way technological development can reach to the lower rang of global society. Creation of "sound and viable technological base" is one of the basic objectives of TRIPS indicated by the Preamble. This has been supported by the other provisions of the agreement.[216]

The forward motion is given by the Article 7 of the agreement[217] which states that 'the protection and enforcement of intellectual property 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'. Its language refers that ToT as a basic and positive objective of the TRIPS. But technology dissemination do not mean to the unauthorised acquiring of technologies such as imitation and copying etc. But its interpretation has been matter of debate. It is also necessary to cast Article 7 as an objective

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[214] Ibid, see also TRIPS (1994): GATT /WTO (1994), *The Results of the Uruguay Round of Multilateral Trade Negotiations – The Legal Texts*, Sales No. GATT/1994/4, (Geneva: GATT secretariat); and available at http://www.wto.org/english/docs_e/legal_e/final_e.htm, Keith E. Maskus, "Using the International Trading System to Foster Technology Transfer for Economic Development" 2005 MICH. ST. L. REV. 1

[215] See Keith E. Maskus, "Using the International Trading System to Foster Technology Transfer for Economic Development" 2005 MICH. ST. L. REV. 1

[216] Ibid

[217] See also TRIPS (1994): GATT /WTO (1994), *The Results of the Uruguay Round of Multilateral Trade Negotiations – The Legal Texts*, Sales No. GATT/1994/4, (Geneva: GATT secretariat); Accessed 26 March 2009 available at URL: http://www.wto.org/english/docs_e/legal_e/final_e.htm, Keith E. Maskus, "Using the International Trading System to Foster Technology Transfer for Economic Development" 2005 MICH. ST. L. REV. 1

for the global system. Thus the regime adopted by developing and developed states or through bilateral or multilateral negotiations should promote the ToT and dissemination. If some rules of the regime may be shown to interfere with technology transfer or its dissemination there is scope to complement them with other obligations.

Another provision which gives leverage to the countries to take measure to promote the public interest in sectors of vital importance to their socio-economic and technological dissemination is Article 8.1.[218] Further Article 8.2[219] recognises flexibilities provided in the regime against the abuse of IPR protection given in the agreement.[220] So countries may take policy measures to prevent the abuse of IPRs by the right holders or they resort to such practices which unreasonably restrain trade or adversely affect the international transfer of technology. But any such measures must be consistent with TRIPS. Nonetheless, the language again recognizes the centrality of technology transfer as an objective for the IPR system.[221]

The most direct language on technology transfer arises in Article 66.2, which states: "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."[222] There are several noteworthy aspects of this Article. First, it requires only developed countries to provide such incentives, and only on behalf of the LDCs. No obligations or rights are created for the developing and transition countries. Second, it is a positive obligation, as indicated by use of the word "shall," and this interpretation was

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[218] See TRIPS (1994): GATT /WTO (1994), *The Results of the Uruguay Round of Multilateral Trade Negotiations – The Legal Texts*, Sales No. GATT/1994/4, (Geneva: GATT secretariat); and available at http://www.wto.org/english/docs_e/legal_e/final_e.htm,

[219] Ibid

[220] See also Keith E. Maskus, "Using the International Trading System to Foster Technology Transfer for Economic Development" 2005 MICH. ST. L. REV. 1, Carlos M. Correa (2002*) Implications of the Doha Declaration on the TRIPS Agreement and Public Health,* World Health Organization, Geneva Accessed 15 October 2008 available at http://www.who.int/medicines/areas/policy/WHO_EDM_PAR_2002.3.pdf

[221] See Keith E. Maskus, "Using the International Trading System to Foster Technology Transfer for Economic Development" 2005 MICH. ST. L. REV. 1,

[222] See also Hutchison, Cameron (2006), "Does TRIPS Facilitate or Impede Climate Change Technology Transfer into Developing countries?" *University of Ottawa law & Technology Journal,* vol.3:2: pp517-37, International Centre for Trade and Sustainable Development (ICTSD), (2008), "Climate Change, technology transfer and Intellectual Property Rights", International Institute for Sustainable Development, Switzerland, Keith E. Maskus, "Using the International Trading System to Foster Technology Transfer for Economic Development" 2005 MICH. ST. L. REV. 1

affirmed by the Doha Declaration.[223] Third, while the incentives involved must promote and encourage technology transfer, the language does not say they must actually achieve increases in ITT. Indeed, governments cannot coerce private firms to take up these incentives.[224]

Noteworthy thing is that most of the technologies in the developed countries are owned by the private firms and patented. So here it expected from developed world that developing or LDCs should create conducive environment for the import and absorption of technologies. noteworthy aspects of this Article is that it requires only developed countries to provide incentives for ToT and no obligations or rights are created for the developing and transition countries. Second, it is a positive obligation, as indicated by use of the word "shall," and this interpretation was affirmed by the Doha Declaration. Finally, Article 66.2 does not mention IPRs specifically.[225]

Recognizing that developing countries and LDCs would face considerable difficulties in implementing TRIPS, Article 67 requires developed countries to provide financial and technical help to them to implement the agreement. It covers even formulation of laws and rules for the protection of IPRs and to prevent their abuse. It includes creating conducive condition for the absorption of transferred technologies.[226]

Given tension between IPR protection and technology transfers, a balancing act is necessary to ensure international IPR rules to advance public policy objectives.[227] Such balancing act is particularly necessary between the objectives of TRIPS and technology transfer for reducing GHGs emission in the air.[228] As TRIPS establishes comprehensive minimum standards for IPR protection both in terms of covered areas and their applicability to all members of the WTO. The TRIPS Agreement's objectives (contained in the Article 7 of the Agreement) states that the objective of the protection and enforcement of IPR rules should be to

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[223] Ibid
[224] Ibid
[225] Ibid
[226] Keith E. Maskus, "Using the International Trading System to Foster Technology Transfer for Economic Development" 2005 MICH. ST. L. REV. 1
[227] See International Centre for Trade and Sustainable Development (ICTSD), (2008), "Climate Change, technology transfer and Intellectual Property Rights", International Institute for Sustainable Development, Switzerland
[228] See also Keith E. Maskus, "Using the International Trading System to Foster Technology Transfer for Economic Development" 2005 MICH. ST. L. REV. 1
International Centre for Trade and Sustainable Development (ICTSD), (2008), "Climate Change, technology transfer and Intellectual Property Rights", International Institute for Sustainable Development, Switzerland

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 the social and economic welfare...." even Article 8 ensures protection from the abuse of IPR protection by the patent holder that measures , " may be needed to prevent the abuse of intellectual property rights by the right holders or the resort to practices which ....adversely affect the international transfer of technology." [229]

Despite these objectives set in the language of TRIPS it has not yet able to achieve a balance between IPR protection and ToT. Still there is no broad understanding on this issue in IPR related discussions at the WTO and the kind of policies either national or international to promote the tot. However there is provision for least developing countries but no such specific mentions for the developing and EIT countries. As Article 66.2 of the TRIPS Agreement requires developed country WTO members to "provide incentives to enterprises and institutions in their territories for the purpose of promoting and encouraging technology transfer to least developed country members." But concerns are the same that is inadequate technological development of least developing countries.[230]

UNFCCC and KP contain specific commitments on technology transfer. Article 4.5 of the UNFCCC[231] urges developed country parties to take all practical steps to promote, facilitate and finance the transfer of, or access to, environmentally sound technologies and knowhow, particularly to developing countries. Article 10 of the KP[232] reaffirms these commitments. Further Article 4.3 of the UNFCCC requires developed country Parties to financial resources needed by the developing countries to meet the agreed full incremental costs of implementing their obligations, including for the related transfer of technology.[233] This is not alone rather

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[229] Ibid
[230] Ibid
[231] See United Nations (1992), *United Nations Framework Convention on Climate Change,* FCCC/INFORMAL/84, GE.05-62220 (E) 200705, Accessed on 22 August 2008, available at URL: http://unfccc.int/resource/docs/convkp/conveng.pdf

[232] See United Nations (1998) *Kyoto Protocol to the United Nations Framework Convention on Climate Change,* Accessed on 2nd August 2008, available at URL: http://unfccc.int/resource/docs/convkp/kpeng.pdf
[233] See International Centre for Trade and Sustainable Development (ICTSD), (2008), "Climate Change, technology transfer and Intellectual Property Rights", International Institute for Sustainable Development, Switzerland

supported by the Article 4.7 of UNFCCC[234] which complements the commitments of aforesaid Articles. So, effective implementation by developed country Parties of their commitments on transfer of technology is inherently linked to the extent to which developing country parties are required to implement their own commitments.

Climate change is an issue which needs concrete considerations and potential solutions. The exact role of IPR in the transfer of technologies remains unclear; however, IPR is not mentioned expressly in UNFCCC or KP provisions. However, IPR issue has been raised in the discussion of EGTT both as an element of and a potential obstacle to an "enabling environment" for ToT. In a report by UNFCCC that identified common needs and barriers to the transfer of ESTs in developing countries, IPR did not feature as an important barrier in the broad range of economic and market barriers to the transfer of technology. Yet no comprehensive study has been conducted on the potential impacts caused by IPRs on the different categories of ESTs.[235] On the basis of existing literature there are contrasting views on the IPRs impacts on transfer of clean technologies. At one end it is found that impact of patents on access to solar, wind, and bio-fuel technologies in developing countries might not be significant.[236] On the other end a study of European Patent Office (2007) hah revealed the increasing number of patent claims in the wind and biofuel technologies.

Nonetheless there are already significant calls to address adverse effects of IPR on transfer of ESTs. On the eve of the Bali Conference European Parliament adopted a resolution which stated that post Kyoto agreement may require "corresponding adjustments' to be made to other international agreements including on IP. Even during discussion on Bali Action Plan several developing countries have asserted that IPR is one of the various obstacles to be addressed in a systematic and cross-cutting manner to promote transfer of technology.[237] In the first meeting of AWG on Further Commitments for Annex I Parties under KP and the AWG on Long-term Cooperative Action under the Convention (held in Bangkok in April 2008) Cuba, India, China, Tanzania, Indonesia and others stressed the need to address IPR

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[234] See United Nations (1992), *United Nations Framework Convention on Climate Change,* FCCC/INFORMAL/84, GE.05-62220 (E) 200705, Accessed on 22 August 2008, available at URL: http://unfccc.int/resource/docs/convkp/conveng.pdf

[235] Ibid

[236] John H. Barton(2007) *New Trends in Technology Transfer Implications for National and International Policy,* Issue Paper No. 18, International Centre for Trade and Sustainable Development (ICTSD), Geneva, Switzerland

[237] See International Centre for Trade and Sustainable Development (ICTSD), (2008), "Climate Change, technology transfer and Intellectual Property Rights", International Institute for Sustainable Development, Switzerland

issues within technology discussions, while some developed countries as U.S. and Australia argued that IPR protection was not a barrier, but a catalyst for technology transfer.[238]

Flexibilities Provided in the TRIPS Agreement

TRIPS Agreement provides not only minimum guidelines for the IPR protection but also flexibilities to accommodate public policies and priorities. This has been confirmed by the Doha Declaration paragraph 4, however in the context of public health and empowers the governments to make policies this regard. Here it is necessary to have a brief look into DMD Paragraph 4 to support the discussion of IPR protection and technology development and transfer for climate mitigation and adaptation.

Paragraph 4 reads that,

> "TRIPS Agreement does not and should not prevent members from taking measures to protect public health. Accordingly, while reiterating our commitment to the TRIPS Agreement, we affirm that the Agreement can and should be interpreted and implemented in a manner supportive of WTO members' right to protect public health and, in particular, to promote access to medicines for all.
>
> In this connection, we reaffirm the right of WTO members to use, to the full, the provisions in the TRIPS Agreement, which provide flexibility for this purpose".

It is very controversial part of the Doha Ministerial Declaration (hereinafter DMD).[239] The second part of paragraph 4 of the Doha Declaration reflects one of the main concerns of developing countries that are full use of flexibilities. The developing countries got recognition of their objective that nothing in the TRIPS Agreement shall prevent them to take measures to protect public health. Now they can take pro competitive measures as compulsory licence and imports the goods for health care. It was an achievement as freedom from pressures from pharmacy giants and concerned governments.[240]

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[238] Ibid

[239] See Carlos M. Correa (2002), *"Implications of the Doha Declaration on the TRIPS Agreement and Public Health"*, World Health Organization, Geneva, [Online: web] Accessed 15 October 2008 available at http://www.who.int/medicines/areas/policy/WHO_EDM_PAR_2002.3.pdf

[240] Carlos M. Correa (2002) *Implications of the Doha Declaration on the TRIPS Agreement and Public Health,* World Health Organization, Geneva, Accessed 15 October 2008 available at URL: http://www.who.int/medicines/areas/policy/WHO_EDM_PAR_2002.3.pdf

Spelling out some of the available flexibilities was the main objective of the Declaration. Public health and public interest gives leverages to the developing countries to make laws for acquiring technologies without inviting the violation of TRIPS Agreement.[241] Climate instability is threatening to the survival of planet. Like public health, climate change is a global challenge, threatening to the human lives hence, climate mitigation and adaptation can be a valid ground under TRIPS Agreement for allowing the flexibilities to be used as exception to the IPR protection. Even it could be considered to refer to 'public interest' in most of the patent laws.

The confirmation (DMD) that the TRIPS Agreement has left room for flexibility at the national level has important political and legal implications. It indicates that the pressures to impede the use of available flexibilities run counter to the spirit and purpose of the TRIPS Agreement, especially in the light of the recognized "gravity of the problems" faced in the area of public health by developing countries and LDCs. This is relevant to discuss here as they legal implication for climate change technologies. This is unquestionable that developing and LDCs are more vulnerable to the impacts of climate change crisis.

Article 31 of TRIPS Agreement provides this flexibility with certain conditions for granting compulsory licence (case by case determination, prior negotiation in certain cases with the patent owners, remuneration etc.) but it does not limit the grounds on which such licences can be issued.[242]

It is key instrument in the hands of developing countries to limit the exclusive rights of patent holder to fulfil certain objectives of public policy, particularly to avail the alternative sources of medicine at lower prices. It is nowhere excluded that these flexibilities cannot be used for climate friendly technologies for which developing countries are in need as they are more vulnerable to adverse impacts of climate change.[243]

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[241] Ibid

[242] See also International Centre for Trade and Sustainable Development (ICTSD), (2008), "Climate Change, technology transfer and Intellectual Property Rights", International Institute for Sustainable Development, Switzerland, TRIPS (1994): GATT /WTO (1994), *The Results of the Uruguay Round of Multilateral Trade Negotiations – The Legal Texts*, Sales No. GATT/1994/4, (Geneva: GATT secretariat); Accessed 26 March 2009 available at URL: http://www.wto.org/english/docs_e/legal_e/final_e.htm

[243] Ibid

Exclusion of ESTs from patent laws is possible on the aforesaid line. They can imitate and import the alternative technology process and deploy to fight against climate change. DMD specifically employs the expression compulsory license which is not found in the TRIPS.

Voluntary license and compulsory license are two means to imitate the patented technology, product or process. Voluntary license can be acquired by applying to the patent holder with the determined price or royalty by the patent holder. If the patent holder charges exorbitant prices or refuses to issue license then the firm can apply to the government to grant it compulsory license. There are no restricted grounds on which compulsory licence can be issued, this flexibilities is provided by the TRIPS to WTO members are confirmed by the WTO ministerial Declaration on TRIPS and Public Health (in Doha).[244] It is not necessary to declare the state of emergency as discussed above.[245]

In his speech to the UNFCCC Conference of the Parties in Bali, the Brazilian Foreign Minister proposed that a statement similar to the Doha Declaration on the TRIPS Agreement and Public Health should be considered in the climate change context. The European Parliament, for its part, has recommended launching a study on amendments to the TRIPS Agreement required to allow for the compulsory licensing of environmentally necessary technologies.[246]

The TRIPS Agreement recognises that of a patent owner to prevent third parties from exploiting the patent product are not absolute. Indeed, Article 30 of TRIPS[247] states that WTO Members may provide "limited exceptions" to these rights. That is countries may under certain circumstances automatically allow the use of the patented invention by a third party without consent of the patent holder. The TRIPS Agreement does not define these circumstances, which will be linked to national policies and objectives, for example, a common exception is to addresses an experimental use by the parties other than the patent owner. This type of exception may be relevant in climate change context, where adaptation of

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[244] Martin Khor,(2008), *Note on Access to Technology, IPR and Climate Change* Accessed on 21 October 2008 available at URL: http://www.epo.org/about-us/events/archive/2008/epf2008/forum-1/details1/kohr_de.html

[245] See International Centre for Trade and Sustainable Development (ICTSD), (2008), "Climate Change, technology transfer and Intellectual Property Rights", International Institute for Sustainable Development, Switzerland,

[246] Ibid

[247] TRIPS (1994): GATT /WTO (1994), *The Results of the Uruguay Round of Multilateral Trade Negotiations – The Legal Texts*, Sales No. GATT/1994/4, (Geneva: GATT secretariat); Accessed 26 March 2009 available at URL: http://www.wto.org/english/docs_e/legal_e/final_e.htm

the technology to local needs and environment will be particularly vital. It would also allow companies in developing countries to "invent around" patent claims to gain access to environmentally sound technologies which has proved important in the context of the implementation of other MEAs[248].

Apart from this Article 40 of the TRIPS Agreement cannot be missed to discuss as it recognises that some licensing practices or conditions pertaining to IPRs may be anti competitive having adverse impact on technology transfer and dissemination.[249] It means it indirectly allow member countries to take measures against anti competitive practices.[250]

In the following section legal development regarding IPRs and ToT will be discussed in the light of recent talks held under UNFCCC.

Recent Developments in IPRs and Transfer of Technology

Developed countries assert that IPR protection leads to the innovations and dissemination of technologies. Weak IPR regime do give negative incentives to the innovators and less transfer of technologies in the developing countries as IPRs holders are scared to go to the developing countries. But this is one version of story. If the data of clean energy technologies development is seen it is found that majority of the climate friendly technologies (hereinafter CFTs) are developed, owned and held by the developed country private firms. Then at international negotiations table developed countries again argue that technologies are in the private domain so developing countries have to make conducive environment for and absorption of new ESTs. Hence they have to formulate strong IPR regime so as to transfer and dissemination ESTs.

Though the technologies are owned by the developed country private firms, yet according to the UNCTAD, in the past decade, about 40% of annual national R & D spending within some OECD countries was publicly funded.[251] The private sector is often reluctant to invest in R & D especially when the technology lacks short-term commercial viability. Therefore governments take initiatives to invest in R & D to develop ESTs. For instance, in the EU governments spend more than half of the total expenditure for R&D in renewable energy. Public sector

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[248] Ibid
[249] Ibid
[250] Ibid
[251] Martin Khor,(2008), *Note on Access to Technology, IPR and Climate Change* Accessed on 21 October 2008 URL: http://www.epo.org/about-us/events/archive/2008/epf2008/forum-1/details1/kohr_de.html

spending is equally important in the US. For example for the wind, biofuels and photovoltaic sector, the US Department of energy spent approximately 356 USD million. Public sector spending is equally important in the US. For example for the wind, biofuels and photovoltaic sector, the US Department of energy spent approximately 356 USD million.[252] Noting the role governments play as the main driver of R&D for climate technologies, it is imperative to explore modalities for the transfer of publicly funded climate technologies to developing countries.

However, the issue of publicly owned technology transfer was addressed in the Rio Summit of 1992. Agenda 21 (chapter 34, paragraph 34.18a) states: "governments and international organizations should promote the formulation of policies and programmes for the effective transfer of environmentally sound technologies that are publicly owned or in the public domain." Implementation of this provision has been very weak.

Now this fact is clear that technologies are developed by the government sponsorships but patented in the hands of research institutes or private firms and they are let free to decide the cost and royalties of the technology. Though, flexibilities (as discussed earlier) are provided in TRIPS Agreement, yet procedural difficulties and marginalization in international trade market hamper those facilities.

It leads that patent filings and grants of these technologies are largely made or held by entities in developed countries. In comparison applicants from China and other developing countries own a small share of the patents for such technologies. In the renewable energy technologies, most of the patents are held by the EU and Japan and very less is owned by the developing countries. Following figure in the box illustrates this fact.[253]

Figure 6- Share of patents relating to renewable energy in total patents (percentage)[254]

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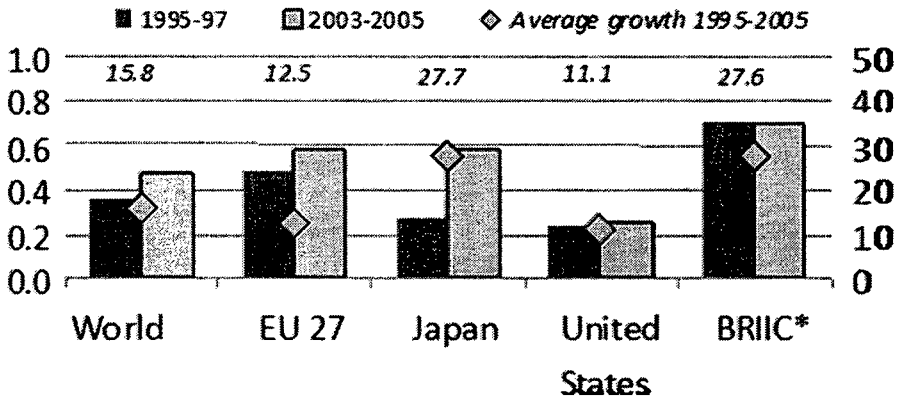
[252] See John H. Barton , December 2007 Intellectual Property and Access to Clean Energy Technologies in Developing Countries: An Analysis of Solar Photovoltaic, Biofuel and Wind Technologies, International Centre for Trade and Sustainable Development (ICTSD), Geneva, Switzerland, Accessed 20 October 2008 URL: http://ictsd.net/downloads/2008/11/intellectual-property-and-access-to-clean-energy-technologies-in-developing-countries_barton_ictsd-2007.pdf

[253] Ibid

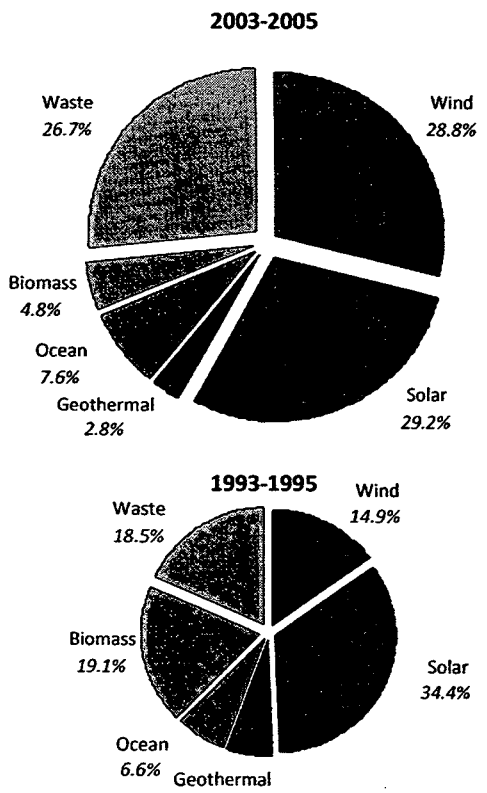
[254] OECD 2008 Compendium of Patent Statistics available at http://www.oecd.org/dataoecd/5/19/37569377.pdf cited in Shashikant Sangeeta (2009), *Patenting trends in climate-related technologies*, (TWN Briefing Paper #3 UN Climate Change Talks, 1 June – 12 June 2009), Third World Network ,Bonn, Accessed 20 June 2009 URL: www.twnside.org.sg



*Refers to Brazil, China, and India. Indonesia, Russian Federation and South Africa

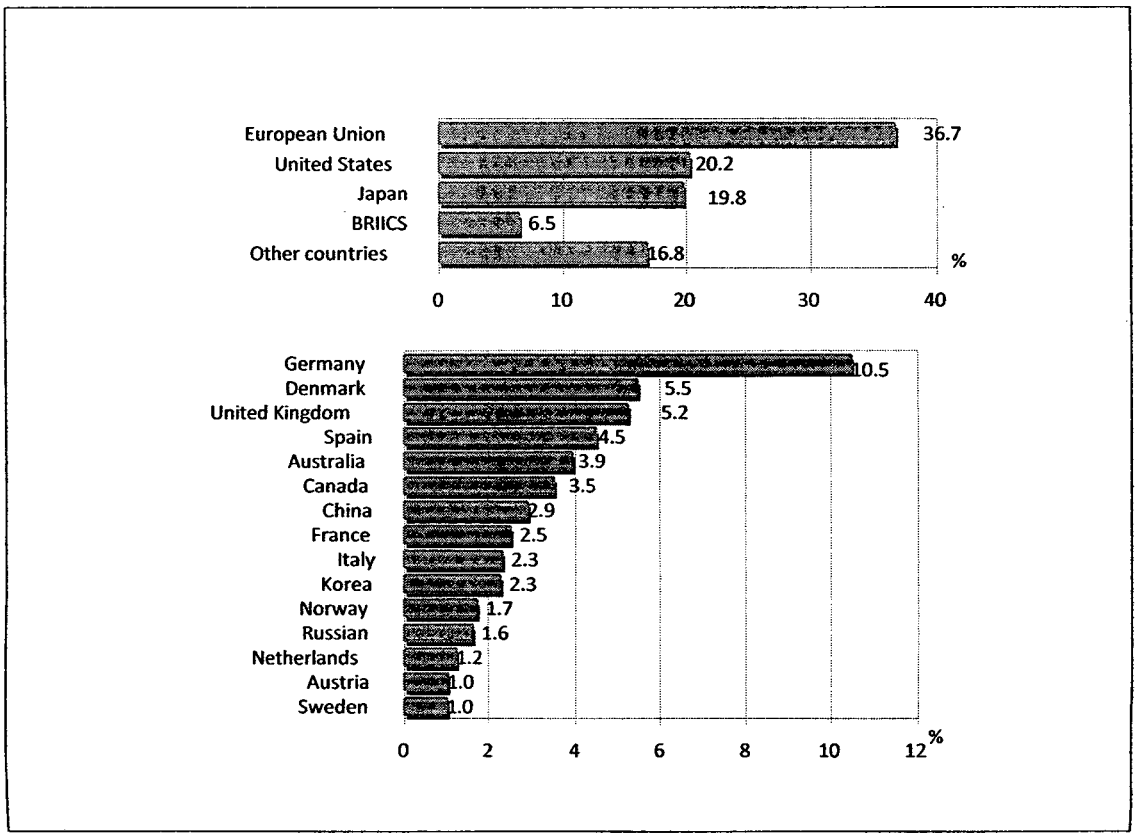
In 2005, the EU, US and Japan had the highest number of patents in renewable energy patents. Within the EU, Germany, Denmark, UK and Spain have the highest share of patents in renewable energy. Denmark had 161 patents taken between 2003 and 2005, focusing on wind energy.[255] Following pie diagram illustrates this fact on the next page.

Figure-7 Patents relating to renewable energy by technologies[256]



[255]Ibid
[256] Ibid

Figure 8- Share of countries in renewable energy patents, 2005[257]



Though significant developments took place in the RETs yet it is controlled by the developed countries giants' entities. It is very clear from the above pie diagram and its dissemination in the world through the patents ownership is shown by the consequent box picture.

In other sectors of the energy also they only dominate, for example in the solar energy and fuel cells patents filings are dominated by Japan whereas in the wind energy technologies patents filings are dominated by the Germany and Japan. The role of developing countries in the patents filing in the wind energy sectors is negligible except Chinese insignificant role.

In the case of fuel cell technology, OECD[258] statistics indicate sharp increase in the patent filings under PCT to protect the inventions since mid 1990s at an average pace of 25% a year

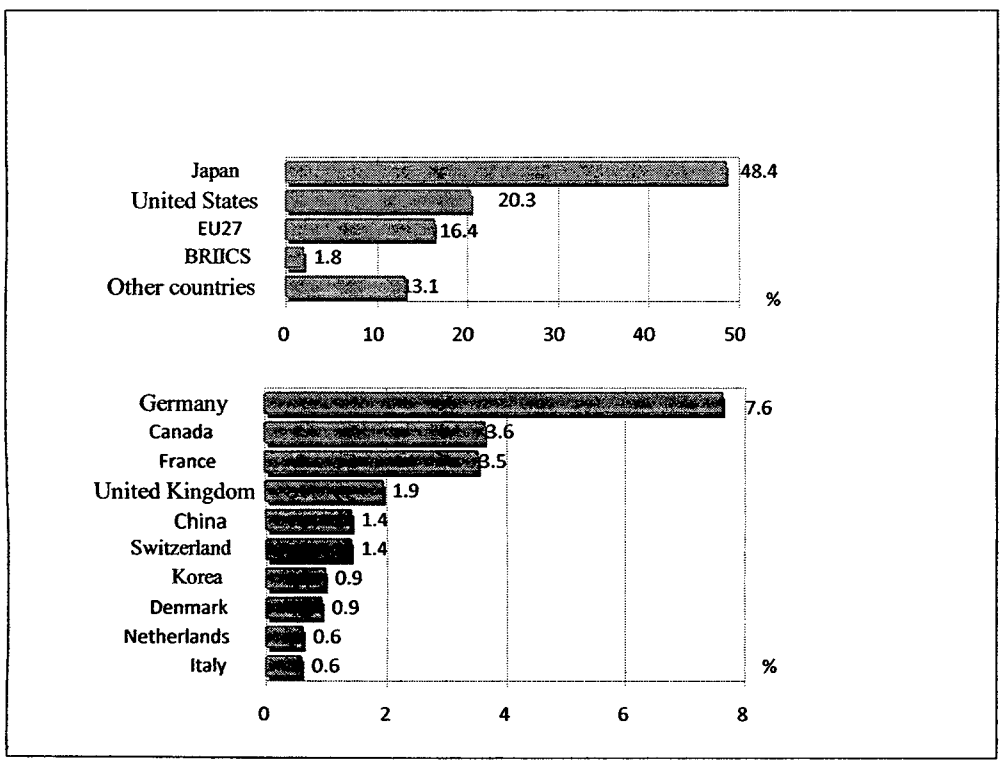
[257] Ibid

[258] See OECD 2008 Compendium of Patent Statistics available at http://www.oecd.org/dataoecd/5/19/37569377.pdf cited in Shashikant Sangeeta (2009), *Patenting trends in climate-related technologies*, (TWN Briefing Paper #3 UN Climate Change Talks, 1 June – 12 June 2009), Third World Network ,Bonn, Accessed 20 June 2009 available at www.twnside.org.sg

between 1995 and 2005.[259] In the field of fuel cells, Japan shows the strongest average growth in the number of patents.

In 2005, 48% of fuel cell patents originated from Japan, with US following with about 20% and EU with 16%. Brazil, China, India, Indonesia, Russian Federation and South Africa (BRIICS) held only 1.8% of the patents while other countries held 13.1% of the share of patents. Following box shows the untold story if left unsaid.[260]

Figure -9 Share of countries in fuel cells patents 2005[261]



Urbanisation, industrialisation and economic development are inextricably linked to the transport development. It has crucial role in world energy use and emission of GHGs. In 2004 transports sector energy use amount to 26 percent of total world energy use and was responsible for about 23 percent of world energy related emissions (IEA, 2006b). About 95

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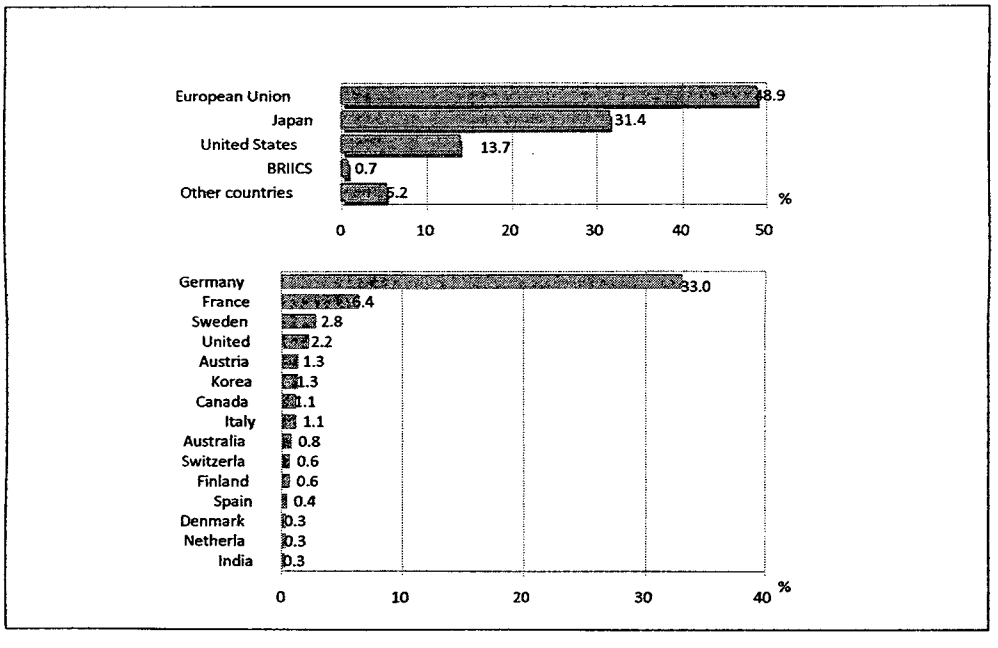
[259]See OECD (2008) Compendium of Patent Statistics available at http://www.oecd.org/dataoecd/5/19/37569377.pdf cited in Shashikant Sangeeta (2009), *Patenting trends in climate-related technologies*, (TWN Briefing Paper #3 UN Climate Change Talks, 1 June – 12 June 2009), Third World Network ,Bonn, Accessed 20 June 2009 available at www.twnside.org.sg

[260] Ibid

[261] Ibid

percent of transport energy come from oil based fuel, largely diesel (23.6 energy use or about 31 percent of total energy) and gasoline (34.4 energy use or 47 percent of TE). One consequence of this reliance, coupled with the only moderate differences in carbon content of the various oil based fuels, is that the CO_2 emission from different transport sub-sectors are approximately proportionate to the energy use.[262] In developed countries 74 percent population live in urban area and in developing country. It is about to 40 percent. This show the demand and use of transport and its consequences. As an example still 75 percent population lack transport in Ethiopia whereas in China 33 percent populace do not have access to all weather transport. In the development of automobile technology developed world dominate and reluctant to transfer the clean energy technologies.[263] Following box reveals the fact the spread of pollution control technologies in the world.

Figure-10 Share of countries in patents for automobile pollution control technologies, 2005[264]



[262]IPCC, *Climate Change2007,Mitigation of Climate Change,* Bert Metz, , Working Group III, Contribution to the Fourth Assessment Report of Intergovernmental Panel on Climate Change, Cambridge University Press, UK, New York

[263] Shashikant Sangeeta (2009), *Patenting trends in climate-related technologies*, (TWN Briefing Paper #3 UN Climate Change Talks, 1 June – 12 June 2009), Third World Network ,Bonn, Accessed 20 June 2009 URL: www.twnside.org.sg

[264]See OECD (2008) Compendium of Patent Statistics available at http://www.oecd.org/dataoecd/5/19/37569377.pdf cited in Shashikant Sangeeta (2009), *Patenting trends in climate-related technologies*, (TWN Briefing Paper #3 UN Climate Change Talks, 1 June – 12 June 2009), Third World Network ,Bonn, Accessed 20 June 2009 available at www.twnside.org.sg

In 2005, the EU, Japan and the US held the highest share in patents for automobile pollution control technologies. Brazil, China, India, Indonesia, Russian Federation and South Africa (BRIICS) held only 0.7% of the patents while other countries held 5.2% of the share of patents. Japan is the second-ranked patenting country in this specific technology field, behind Germany, which contributes to one-third of patent applications for automotive emissions control.[265]

Over the last 6 years, a total of 2,796 biofuel-related patents were published in the U.S., with the number increasing by over 150% in each of the past 2 years.[266] Analysis of biofuel-related patents published in 2006 to 2007 revealed the following breakdown of patents: biodiesel (299), agricultural biotechnology (110), ethanol and other alcohols (42), enzymes (35) and biomass (41).[267] Further broken down by ownership entity, the patents published in the selected technologies in 2006 to 2007 were 57 % owned by corporate entities, 11% owned by universities or other academic institutions and 32% undesignated i.e. the patent applications do not list the patent owner. Worldwide, the highest number of biofuel patents in 2006 to 2007 originates from U.S. (184), Germany (34), Japan (14), Italy (10) and France (10). It is claimed that in the U.S., the patents are owned by 78 different entities.[268]

There are o lots of things to discuss regarding the ESTs in different sectors and their control through patents by the developed countries but this work deals selectively in few technologies and their dissemination in the developing countries and problems faced from IPR regimes.

Impact of IPRs on Transfer of Technology

Here focus is on recent talks concluded under UNFCCC umbrella. The legal development at the international level taken in this regard will be seen under this section. At Poznan (COP 14, UNFCCC) meet developing and developed countries had differences regarding treatment

[265] Ibid

[266] Kamis, Ronald., Joshi Mandar., (2008), "Biofuel patents are booming" cited in Shashikant Sangeeta (2009), *Patenting trends in climate-related technologies*, (TWN Briefing Paper #3 UN Climate Change Talks, 1 June – 12 June 2009), Third World Network ,Bonn, Accessed 20 June 2009 URL: www.twnside.org.sg

[267] Ibid
[268] Ibid

of IPRs to transfer of ESTs. The same tunes as developing countries were against business or commercial approach to the IPRs in climate friendly technologies and asked to meet climate change emergency. A contact group was formed under the Ad-hoc Working Group on Long-term Cooperative Action (hereinafter AWG-LCA) to take this issue in detail and focus on institutional arrangements needed to deliver technology development, deployment and diffusion.[269]

Developed countries on the other hand stressed the importance of IPRs as incentive to ensure innovation, development and deployment of climate friendly technologies. The Philippines speaking for the G77 and China proposed for a 'Technology Mechanism under the UNFCCC' as institutional arrangements for delivering on technology, a Technology Action Plan and the establishment of a Multilateral Climate Technology Fund. Given climate change emergency it asked for partnership and a new look to the IPRs in dealing with ESTs.[270]

India's proposal was to recognise the importance of technology as a transformational agent and initiate urgent action in this regard. On the issue of method to implement it, India said as it was done in the case of pharmaceuticals in the IPR regime and also asked for setting up a funding mechanism that would procure IPRs and make the technologies available to developing countries at an affordable cost, compensating innovators as well. Further India called for collaborative R&D between developing and developed countries to develop ESTs on the line of research done in the agriculture in the Consultative Group on International Agricultural Research. Further she suggested for the establishment of a collaborative platform CleanNet (a network of climate technology development and diffusion centres) and of regional innovation centres that would ensure local capacity building as also local research, innovation and diffusion of appropriate technologies locally.[271] Balance between market mechanism and governments action is called for the technology and finance availability to developing countries.

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[269] See Earth Negotiation Bulletin (2008),*Summary of the Fourteenth Conference of Parties to the UN Framework Convention on Climate Change and Fourth Meeting of Parties to the Kyoto Protocol,* Vol. 12 No. 395, Published by the International Institute for Sustainable Development (IISD), Accessed on 22 January 2009 available at http://www.iisd.ca/download/pdf/enb12395e.pdf

[270] Ibid

[271] See Third World Network (2009), *Wide North-South divide over IPRs and climate technologies,* Third World Network, Accessed 20 June 2009 URL: www.twnside.org.sg

Brazil, supporting the Technology Action Plan proposal of the G77 and China, said that the plan should offer significant mitigation potentials for both new and existing technologies.[272]

Developing countries called for relaxation of intellectual property rights on climate friendly technologies at the climate talks in Bonn (29 march to 8 April 2009) under the United Nations Framework Convention on Climate Change. The range of proposals by many developing countries (including Bolivia, China, India, Philippines for G77 and China, supported by Saudi Arabia, Uganda, Pakistan) included exemptions from patentability for climate related technologies and products, the extension of exemptions and flexibilities for developing countries regarding IPRs, the regulation of the terms of voluntary licenses to exclude anti-competitive elements, and the establishment of patent pools to facilitate the easier obtaining of licenses from patent holders at discounted royalty rates.[273]

At Bonn (climate change talks 1-12 June 2009) climate talks developing and developed countries were clearly divided over the treatment of intellectual property rights (hereinafter IPRs) over climate-friendly technologies. developing countries including Bolivia, the Philippines and Indonesia called for the exclusion of patents over such technologies, developed countries such as Japan, Canada, Australia, Switzerland and the United States insisted on strong IPR regimes to ensure innovation and the development of technology opposed the use of compulsory licensing for patented technologies, which is allowed for under the WTO Agreement on Trade-Related Intellectual Property Rights (hereinafter TRIPS). Developing countries showed dissatisfaction and said that the existing flexibilities to overcome patent barriers under TRIPs were an inadequate remedy.[274] Apart from the IPR issue, the United States and Australia also questioned the need for new institutional arrangements as proposed by the G77 and China for a technology mechanism to enhance technology development, diffusion and transfer. Developing countries on the other hand

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[272] Ibid

[273] See Earth Negotiations Bulletin (2009), *Summary of the Fifth Session of the Ad Hoc Working Group on Long-Term Cooperative Action and the Seventh Session of the Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol*, 29 March - 8 April 2009 Vol. 12 No. 407, International Institute for Sustainable Development (IISD), Accessed on 22 April 2009, available at http://www.iisd.ca/download/pdf/enb12407e.pdf,

[274] See Third World Network (2009), *Wide North-South divide over IPRs and climate technologies*, Third World Network, Accessed 20 June 2009, available at www.twnside.org.sg

emphasized the legally binding commitment of developed country Parties under the Convention to enable technology transfer, and stressed that private sector played a complementary role but cannot be a substitute for public sector actions.[275]

Ghana speaking for G77 and China, said that in relation to measures to address intellectual property rights, the Group had difficulty with option 1 under paragraph 187 in the text that states that technology development, diffusion and transfer be promoted by operating the intellectual property regime in a manner that encourages the development and transfer of climate-friendly technologies.

India said that there must be provisions in the text to accelerate technology diffusion and transfer to enable the early lock-in of climate technologies. The text calls for a number of documents and technology assessments to be done for technology cooperation but these cannot be alternatives to actions. The technology framework must enable support for short-term, medium-term and longer-term technologies. There was a need for a hard look at IPRs to ensure that technology transfer is accelerated especially in areas where there were cartels.

Brazil said that technology transfer is a commitment by developed country Parties to developing countries. There must be innovative approaches to remove barriers to technology transfer. There should be no conditionalties that create new barriers to technology transfer. [276]

Japan said IPRs over medicines in health is completely different from environment and energy technologies. The cost of IPRs in environment and energy technologies is much lower than that of medicines. While technologies in medicines are limited, that is not the case for environment and energy related technologies. According to a special report of the IPCC, the main barrier to technology transfer is the lack of data or information and not IPRs. Thus, IPR protection is essential. Compulsory licensing and technology-sharing do not have a role in technology diffusion. There was a need for a more effective solution.[277]

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[275] See Earth Negotiation Bulletin (2009), *summary of the Bonn Climate Change Talks,* Vol. 12 No. 241, International Institute for Sustainable Development (IISD), Accessed on 22 June 2009, available at http://www.iisd.ca/download/pdf/enb12421e.pdf

[276] Ibid

[277] Ibid

The European Union said that it was important to see the link between technologies and the concept of low carbon development strategies as a vehicle to identify and support technology needs and capacity building needs.[278]

Finance for Climate Change

Finance is central to the UNFCCC discussions on technology. Since 1990s there are increments in the flow of funds to facilitate the transfer of technologies. Here finance for facilitating ToT from developed to developing countries is relevant under this section. In this regard role of multilateral agencies, bilateral arrangements, public-private partnership and governments will be taken for development and deployment of ESTs in developing countries. Though, characters of funds have been changed from official development assistance (hereinafter ODA) to private sector financing for ToT.

UNFCCC Article 11.1[279] of the Convention establishes financial mechanisms stating that its operation shall be entrusted to one or more existing international entities. Article 11.2[280] states that the financial mechanism's 'shall have an equitable and balanced representation of all parties within a transparent system of governance'. It will function under the guidance of and is accountable to the COP, which decides its policies, programme priorities and eligibility criteria related to this Convention. The day to day operation of the financial mechanism is entrusted to the GEF which has an independent governance structure. Purpose of financial mechanism is to give effect to the resources commitments set out in Articles 4.3, 4.4, 4.5 of the Convention. Article 11 of Kyoto Protocol[281] incorporates the Convention's financial provisions into the Protocol legal framework.

Existing sources of global environmental finance include national government spending, national private sector spending, foreign direct investment, international debt and official development assistance (hereinafter ODA). Globally, the private sector constitutes the largest share of investment and financial flows needed to address climate change, at approximately 86 percent of all such flows.[282] In stark contrast, ODA funds are currently less than 1 percent

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[278] Ibid

[279] United Nations (1992), *United Nations Framework Convention on Climate Change,* FCCC/INFORMAL/84, GE.05-62220 (E) 200705, Accessed on 22 August 2008, available at URL: http://unfccc.int/resource/docs/convkp/conveng.pdf

[280] Ibid

[281] United Nations (1998) *Kyoto Protocol to the United Nations Framework Convention on Climate Change,* Accessed on 2nd August 2008, available at URL: http://unfccc.int/resource/docs/convkp/kpeng.pdf

[282] UNFCCC (United Nations Framework Convention on Climate Change), (2007), Investment and Financial Flows to Address Climate Change.? Bonn, Germany: UNFCCC available

of global investment.[283] However, these funds are important for poor countries that are most vulnerable to climate change.

ODA includes several funding agencies such as Global Environment Facility (hereinafter GEF), the World Bank, Asian Development Bank and so on; and bilateral ODA.[284] The GEF is at the centre of the existing system of financing programs and projects to protect the global environment.[285] The objective of it is mentioned in the GEF Instrument that ? the GEF . . . shall operate for the purpose of providing new and additional grant and concessional funding to meet the agreed incremental costs of measures to achieve agreed global environmental benefits in the GEF focal areas. Climate change (mitigation and adaptation) is one of the six areas funded by the GEF. It works with the World Bank, United Nations Development Programmes (UNDP), and United Nations Environment Program (UNEP). The GEF is the officially designated financial mechanism for funding under UNFCCC. In more or less every COP meeting its work are reviewed and guidelines are issued to make it effective mechanism for funds. But in the last some recent talks developing countries started to oppose regarding the exclusive role of GEF as financial mechanism.

Now developing countries demand finance for the development, transfer and also to fund for buying IPRs ESTs crucial for climate stability. In addition they also demand finance for capacity building in developing countries to absorb the new developed and transferred ESTs. Developing and LDCs shows dissatisfaction over the funding of limited mitigation, adaptation and capacity building activities by the GEF. So they demand additional and beyond the GEF sources to fund the technology transfer.

Since the creation of the GEF, about US$ 2.4 billion have been allocated for climate change projects and resulted in the reduction of over one billion tons of GHG emissions.[286] The GEF

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at.unfccc.int/cooperation_and_support/financial_mechanism/items/4053.php, cited in Gareth Porter et al.,(2008) *New Finance for Climate Change and Environment*, WWF, Heinrich Boll Foundation, Accessed 25 September 2008 http://www.odi.org.uk/resources/download/2980.pdf

[283] Ibid

[284] See Gareth Porter et al.,(2008) *New Finance for Climate Change and Environment*, WWF, Heinrich Boll Foundation, Accessed 25 September 2008 http://www.odi.org.uk/resources/download/2980.pdf

[285] Ibid

[286] Global Environment Facility (2008), "*Report of the Global Environment Facility on a strategic programme to scale up the level of investment for technology transfer*", (FCCC/SBI/2008/5), available at http://unfccc.int/resource/docs/2008/sbi/eng/05.pdf , cited in UNDESA (2008), United Nations Department of

reported to the COP at its twelfth session that almost all climate change projects funded from the GEF Trust Fund are concerned with either the initial introduction of modern technologies in developing countries or the dissemination and broadening of their application. It estimates that 80-100 per cent of GEF climate change mitigation funding fits the technology transfer definitions used by the Convention (GEF 2006).[287]

The UNFCCC decided in 2001 to establish a Special Climate Change Fund (hereinafter SCCF) and a Least Developed Country Fund (hereinafter LDCF) to finance projects relating to climate change adaptation, technology transfer and capacity building in the various sectors, including energy, transport, industry, agriculture, forestry and waste management, as well as in economic diversification.[288] The GEF was directed to be the manager for the LDCF and SCCF, which became operational in 2002. Funding for the SCCF was raised by voluntary contributions beyond regular GEF replenishment from 13 contributing participants (Canada, Denmark, Finland, Germany, Ireland, Italy, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom).[289]

The SCCF finances projects related to: adaptation; technology transfer and capacity building; energy, transport, industry, agriculture, forestry and waste management; and economic diversification. The LDCF was established to support a work programme to assist LDC Parties, inter alia, in the preparation and implementation of the national adaptation programmes of action (NAPAs).[290] The AF was established to finance concrete adaptation projects and programmes in developing countries that are Parties to the Kyoto Protocol. The

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Economic and Social Affairs, "Climate Change: Technology Development and Technology Transfer", Accessed 21 December 2008 URL:http://www.un.org/esa/sustdev/sdissues/energy/op/beijing_hlccc_nov08/back_paper.pdf

[287] Global Environment Facility (2006), *"Global Environment Facility, Report of the Global Environment Facility to the Conference of the Parties"*, (FCCC/CP/2006/3), cited in UNDESA (2008), United Nations Department of Economic and Social Affairs, "Climate Change: Technology Development and Technology Transfer", Accessed 21 December 2008, available at http://www.un.org/esa/sustdev/sdissues/energy/op/beijing_hlccc_nov08/back_paper.pdf

[288] See Gareth Porter et al.,(2008) *New Finance for Climate Change and Environment*, WWF, Heinrich Boll Foundation, Accessed 25 September 2008 http://www.odi.org.uk/resources/download/2980.pdf

[289] Ibid

[290] Ibid

Fund is to be financed with a share of proceeds from the CDM project activities and to receive funds from other sources.[291]

The World Bank has been the leader in facilitating the development of carbon finance – the purchase of GHGs emission reductions in conjunction with the Clean Development Mechanism (hereinafter CDM) of the UNFCCC's Kyoto Protocol. The Bank established the prototype carbon fund in 1999, and its group of carbon funds has now grown to 10 and is worth more than $2 billion. Most of these funds were established with money provided by European states that had purchased carbon reductions carried out in the developing world.[292] The World Bank estimates the additional costs of low carbon energy technology in developing countries to be between USD25-50 billion/yr.[293]

Recent Developments in the Multilateral Negotiations

In the Bali Conference COP 13 set guidelines for the GEF to work as an operating entity of the financial mechanism of the Convention and continue to improve access to Global Environment Facility funds, for those countries that are particularly vulnerable to the adverse effects of climate change. At the meeting Contact Group for the Review of Financing Mechanism under SBI, G-77 and China presented a comprehensive proposal for financing expressing dissatisfaction over the efficiency of GEF as financing entity. Proposal was titled as Elements of a Draft Decision on Additional Guidelines for the Review of the Financial Mechanism of the Convention. It comprised objectives and methodology, which are meant to complement existing guidelines adopted in previous Conferences of the Parties (COPs).

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[291] See UNDESA (2008), United Nations Department of Economic and Social Affairs, "Climate Change: Technology Development and Technology Transfer", Accessed 21 December 2008, available at URL:http://www.un.org/esa/sustdev/sdissues/energy/op/beijing_hlccc_nov08/back_paper.pdf

[292]See World Bank. (2008a). Carbon Finance at the World Bank: List of Funds. carbonfinance.org/Router.cfm?Page=Funds&ItemID=24670. Cited in Gareth Porter et al.,(2008) *New Finance for Climate Change and Environment*, WWF, Heinrich Boll Foundation, available at http://www.odi.org.uk/resources/download/2980.pdf

[293] See World Bank. (2007). *Catalyzing Private Investment for a Low Carbon Economy: World Bank Group Progress on Renewable Energy and Energy Efficiency in Fiscal 2007.* Washington, D.C.: World Bank. ifc.org/ifcext/enviro.nsf/AttachmentsByTitle/p_CatalyzingPrivateInvestment_CoverInformation/$FILE/CoverInformation.pdf. cited in Gareth Porter et al.,(2008) *New Finance for Climate Change and Environment*, WWF, Heinrich Boll Foundation, Porter, Gareth et al.,(2008) *New Finance for Climate Change and Environment*, WWF, Heinrich Boll Foundation, Accessed 25 September 2008 URL: http://www.odi.org.uk/resources/download/2980.pdf

The objectives include the examination of options for all other sources (apart from GEF) of financing that would assist developing countries, and develop options for innovative means of financing climate change activities in developing countries. The other objectives were development of options for improvement of the complementarities of the financial mechanism with other sources of investment and financial flows for mitigation and adaptation to climate change and the examination of practical ways for scaling up of the level of resources and enabling the most efficient use of available resources. The development of endogenous technologies in developing countries and to gather elements for the development of a framework to be used as a guide for the financing of all climate change activities from all sources were other objectives presented in the proposal.

G-77 and China outlined a general methodology which includes reviewing technical papers and reports prepared by the UNFCCC Secretariat relevant to the financial needs of developing countries, reports from the UN Commission on Sustainable Development and other UN agencies and international organizations as well as relevant bilateral and multilateral funding institutions and governmental and non-governmental organizations.[294] It also includes looking at the national communications of Parties to the Convention and in other mechanisms such as technology needs assessment and the National Adaptation Program of Actions (NAPAs), as well as information available on private sector financing and investment for climate change activities.[295] The rationale behind the strategic proposal was to go beyond the GEF by citing the massive resources required by developing countries to address the effects of climate change as stressed in the recently-concluded fourth Assessment Report of the Intergovernmental Panel on Climate Change.[296]

At Poznan, the discussions on the fourth review of the financial mechanism resumed with a clear division between developed countries supporting the work of the GEF as adequate, and developing countries expressing profound concerns over the performance of the financial mechanisms and the GEF as an operating entity.[297]

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[294] See Third World Network (2007), *G77-China's proposal on review of climate change financing,* Accessed on 24 Sep 2008 available at www.twnside.org.sg

[295] Ibid

[296] Ibid

[297] See Earth Negotiation Bulletin (2008),*Summary of the Fourteenth Conference of Parties to the UN Framework Convention on Climate Change and Fourth Meeting of Parties to the Kyoto Protocol,* Vol. 12 No. 395, Published by the International Institute for Sustainable Development (IISD), Accessed on 22 January 2009, available at http://www.iisd.ca/download/pdf/enb12395e.pdf

The G77 and China tried to stress that the funds available are inadequate and how the co-financing requirements are making it burdensome to obtain funds through the GEF. On the other hand the EU tried to highlight the effective performance of the GEF as an operating entity of the financial mechanism. On the report by the GEF, developing countries stressed that the amounts are not sufficient, and urged for urgent implementation and a more strategic approach. China said that the mobilization for concessional finance needs to be increased. It also stressed the need for urgent implementation, and for the need to make it easier for developing countries to access the money.

India noted that the funding is limited and urged for a speedier and strategic longer term focus on technology transfer. It also suggested that there should be a focus on how to promote the transformation of markets.

In the Fifth Session of the Ad- Hoc Working Group on Long-term Cooperative Action and the Seventh Session of the Ad- Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto protocol (held from 29 March - 8 April 2009, Bonn),[298] the main emphasis of the AWG-LCA was to concentrate on the key elements of the Bali Action Plan (decision 1/CP.13), namely mitigation, adaptation, finance and technology, as well as on a shared vision for long term cooperative action under the Convention. In the same US recognized its unique position as the largest historical emitter of greenhouse gases and as a country with important capabilities, but underscored that the US alone cannot provide the solution to the climate change problem.[299]

India called for deep, mid-term emission reductions from Annex I countries and the fulfilment of commitments related to finance and technology transfer. US also assured the emissions reduction by 15 percent from current levels by 2020 and 80 percent by 2050.[300] China said for a technology roadmap. Further developed countries asserted for strengthening of existing mechanism and developing countries demanded for new institutions for delivery of funds for the said purpose. India proposed two issues first one is that developed countries

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[298] See Earth Negotiations Bulletin (2009), *Summary of Fifth Session of the Ad- Hoc Working Group on Long-term Cooperative Action and the Seventh Session of the Ad- Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto protocol,* International Institute for Sustainable Development (IISD), Vol. 12 No. 407, Bonn, Accessed on 22 April 2009 URL: http://www.iisd.ca/download/pdf/enb12407e.pdf

[299] Ibid

[300] See Third World Network (2009), *Finance and technology – make or break issue in Copenhagen,* Bonn, www.twnside.org.sg,

have commitment under the Convention to finance and second to bear the incremental cost by the developed countries. Developed countries were in the same tone that private financing along with FDI and strong IPRs protection is essential to attract investment and transfer of technology.[301]

In Bonn talks held from (1-12th June in 2009)[302] divergence between developing and developed countries was clear as negotiations began over the issue of financing for climate change under the United Nations Framework Convention on Climate Change. First bone of contention between developed and developing was the establishment of new financing institution as demanded by the developing countries (G-77 and China). Developing countries insisted that financial mechanism must be based on equity, common but differentiated responsibilities have an equitable and geographically balanced representation of all Parties, enable direct access, be truly country driven with recipient country involvement. They had dissatisfaction with the negotiating text on financial mechanism prepared by the Chair of Ad-hoc Working Group on Long-term Cooperative Action (hereinafter AWG-LCA). Even they expressed concern that some proposals given by the Group were not included in the negotiating text. It is not in accordance with the Bali Action Plan.

India said that there should not be mingling of financial sources under the Convention with other sources that means concessional and non-concessional. The extent of the financial support must cover the agreed full costs for their national communications and the agreed full incremental costs of implementing measures relating to mitigation and adaptation On the side of developed countries Japan, U.S. and EU insisted on the existing financial mechanism (no alternative institutional arrangement for finance) and encouragement to private sector to fund to climate change mitigation and adaptation activities. They supported on multiple sources of finance.

The following box shows summary of proposals put forth by the developing countries at different at multilateral environmental negotiations.

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[301] Ibid

[302]Earth Negotiation Bulletin (2009), *summary of the Bonn Climate Change Talks,* Vol. 12 No. 241, International Institute for Sustainable Development (IISD), Accessed on 22 June 2009, available at http://www.iisd.ca/download/pdf/enb12421e.pdf

Table -3 Summary of proposals by the developing countries on technology transfer[303]

Sponsor	Proposal	How would it be financed?	How would revenues be allocated, used?	Governance mechanisms	Issues to consider
G77 and China – financial and technology mechanisms	New linked financial mechanism and technology mechanism under the UNFCCC Technology mechanism modeled broadly on Montreal Protocol: – institutional mechanism designed to address all aspects of cooperation on technology research, development, diffusion and transfer; – comprises an Executive Body, technical panels focusing on key Technologies/sectors.	Multilateral Climate Technology Fund (MCTF): "new and additional" financial resources over and above ODA. Raised from: - environmental and energy taxes, - revenue from permit auctions - public budgets - international organizations	The funds would support R&D, deployment and transfer of technologies as well as the enhancement of developing countries' domestic capacity. Promote public-private partnerships (PPPs), active private sector participation could support a range of activities: - joint EST design, R&D & technology demonstration - market development; - covering incremental costs of investment through, e.g., subsidies, export credit guarantees-capacity-building.	MCTF operates as a single window facility within the UNFCCC financing mechanism; Fully accountable to the COP of the UNFCCC; Equitable and balanced representation of all Parties; Direct access to funding by the recipients. Policies relating to the MCTF guided by the technology mechanism.	Financing mechanism complementary to technology mechanism. Funds provided outside the UNFCCC would not count as fulfilling developed countries' Commitments. This is a potential political hurdle.
Ghana – international framework agreement for	International framework agreement would address both and mitigation	Funding would come from Annex II countries, in accordance	Not specified.	TDTB: would be a standing body under the UNFCCC	Provides an institutional framework in addition to a financing

[303] See UNDESA (2008), United Nations Department of Economic and Social Affairs, "Climate Change: Technology Development and Technology Transfer", Accessed 21 December 2008, available at URL:http://www.un.org/esa/sustdev/sdissues/energy/op/beijing_hlccc_nov08/back_paper.pdf

technology development and transfer	adaptation. Two mechanisms: - Technology Development and Transfer Board (TDTB) and-Multilateral Technology Fund (MTF)	with their commitments under the UNFCCC as Per Article 4.3. Additional sources of funding, including market-based mechanisms and private sector financing.		responsible for the development, deployment, diffusion and transfer of ESTs and know-how. MTF: would operate under the authority and approach. Details of revenue raising mechanism not fully specified. guidance of and be fully accountable to the COP. (Essentially same model as in G77 and China)	scheme, which allows for a more integrated approach. Details of revenue raising mechanism not fully specified.
Mexico – World Climate Change Fund (Green Fund)	The proposed Fund could establish linkages between mitigation, adaptation and technology transfer and development.	All countries would contribute to the Fund. Contributions would be based on levels of GHG emissions, population, and gross domestic product. All contributions to the Fund would be subject to a double levy: - first levy for the Adaptation Fund the second levy for a Clean Technology Fund.	Fund would be designed to: (a) significantly increase funds available for mitigation , (b) support adaptation efforts, (c) promote transfer and diffusion of ESTs, (d) contribute to financing global climate change arrangement under UNFCCC. Portion could go to LDCs. Developing countries that choose not to join the Fund would be excluded from its benefits, without any penalty.	All contributing nations, whether developed or developing, would participate in the governance structure that would be established for the Fund. The structure would also be open to representatives of all beneficiaries.	Assessed contribution based on criteria of fairness, efficiency and 'polluter pays'. Areas of possible contention: - formula for determining contributions - opt out for developing countries; if developed countries want same option, could undermine Fund.
Norway – auctioning a	Auctioning a portion of	The percentage or the	The revenues could be used to	A designated international	Unresolved questions

share of national emission allocations	the assigned amounts (national emission allowances) to raise revenues for global climate change action	number of allowances auctioned could be set to reach revenue target. Could generate significant financial resources – estimated$15-25 billion per year.	finance adaptation activities in the first instance, but could also be used to finance mitigation.	institution would conduct the auction; governance of revenues unspecified.	include: the number/ share of allowances to be auctioned; criteria for use of the resources raised by the mechanism; governance principles of the fund.
Republic of Korea – carbon credits for NAMAs	Issuance of carbon credits for verifiable mitigation associated with Nationally Appropriate Mitigation Actions (NAMAs) taken by developing countries as per Bali Action Plan Decision 1(b)(ii).	Sale of carbon credits generated by NAMAs in international carbon markets	The proposal recommends that details on operating the scheme, including criteria and extent of credit issuance, could be worked out at the fifteenth session of the COP.	Under UNFCCC; other details not specified	Provides a vehicle for private sector participation in mitigation financing, technology transfer to developing countries. Does not address the adaptation challenge.

Conclusion

On the basis of above discussion it appears that there are many constraints to the transfer of environmentally sound technologies to the developing countries. Main barriers are relating to the intellectual property rights and finance to make able to developing countries to cope with the climate change threat. At many forums including UNFCCC developing countries raised their voice in pointing out IPRs protection as obstacle in the development, deployment and dissemination of ESTs to the developing countries.

Though, TRIPS legal framework for IPRs protection provides guidelines for the realisation of goal of IPRs, which is protection of the rights of innovator. Developed and developing countries have different interpretation for the IPRS. Former asserts that IPRs protection act as incentive to the innovations and following dissemination of the technologies. Unlike them, developing countries have contrary strong opinion so they emphasis the exclusion of ESTs from the purview of IPR regime. Neither of the opinion is correct so recognising climate

change as a global problem both need to take a practical solution. Even though new clean technologies are owned by the private entities in developed countries to an extent it is true yet what about the public funding to the development of technologies, R&D expenditure by the government (developed countries parties). It is clear by this that developed countries can reserve certain rights for the ESTs in lieu of expenditure; Public funded technologies should be transferred to fight with the climate change problem. This is being repeated by the developing country parties at the meeting held under the umbrella of UNFCCC.

It seems that the issue of finance as the cross-cutting issue forms the basis of all activities dealing with the climate change crisis. Development, deployment and dissemination of ESTs, enabling environment, capacity building in developing countries all need finance. Developing countries are nascent economies so they cannot easily shift to clean technologies replacing conventional technologies so they need huge financial support to make a shift. Though, institution arrangements are there under UNFCCC and KP yet they lag behind the requirement. There is need for much intense efforts to remove the financial gap between the two before launching the post 2012 regime for climate change. Next chapter will fill this discussion.

Chapter IV

Transfer of Technology in the post-Kyoto Regime

Introduction

This chapter examines about the issue of transfer of technology in Post Kyoto period. On the basis of existing literature it explores what is supposed to be included in the next regime regarding transfer of technology. Technology is key element to deal with climate change crisis. It is one of the building blocks of the Bail Road Map to deal with climate instability and to save the planet. New technologies have key roles in global and domestic climate change monitoring, mitigation, and adaptation strategies and actions. Hence development, deployment, diffusion, transfer, and innovation of climate-friendly technologies should be given high priority, especially to developing countries. Current discussions towards a post-Kyoto climate regime are arranged around broad topics including mitigation and adaptation, technology transfer and financial support.

The post-2012 climate change regime could ensure that the appropriate technologies for the climate change mitigation and adaptation be made available to developing countries at the affordable cost. It should be along with technical assistance and finance needed to make it easy for the developing countries to undertake their own technology research and development and to innovation. ESTs should be transferred to developing countries at preferential terms rather than at market terms.[304]

Climate friendly technologies which could be transferred to developing countries include energy efficiency, renewable energy and carbon capture and storage technologies. International technology cooperation and making existing and new ESTs available to end-users (whether commercially or through non-commercial transfer arrangements), especially in developing countries, will be among the major building blocks for a development-oriented post-2012 framework. [305]

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[304] For a discussion of some of the development issues that would be crucial in the post-2012 regime, see e.g. Martin Khor, Development issues crucial for post-2012 climate regime (TWN Briefing Paper 40, September 2007), at www.twnside.org.sg; and Tariq Banuri, Twelve Theses: Sustainable Development Agenda for Climate Change (Stockholm Environment Institute, September 2007), cited in South Centre(2007), *Integrating development in climate change, A Framework Policy Discussion Paper on Key Elements for the Development of the Post-2012 Global Climate Policy Regime, Special policy discussion paper (November 2007),* Accessed 28 October 2008available at www.southcentre.org.

[305] Ibid

Climate friendly technologies are combination of technologies such as monitoring and observation technologies, technology to mitigate the climate change, and adaptation technologies. Post 2012 regime should ensure the legal framework for transfer, deployment and development and diffusion of technologies in all sectors of economic activity so that the development growth should not be compromised in developing countries.

Technologies needed for observation and monitoring of climate change includes satellite technology on meteorological; marine and terrestrial resources etc. These should also include technologies for the manufacture of advanced meteorological and ecosystem observation equipment; high-resolution and high-precision satellite technology; technology for satellite data acquisition and remote sensing information collection and review; data exchange; and research including high-performance climate change simulation techniques.[306]

Technology to mitigate the climate change impact is crucial for developing countries as they are more vulnerable the effects of climate change. These include technologies for reducing GHG emissions[307] such as efficient energy production and utilization technology; high energy efficiency transportation technology; high-efficiency and low-pollution power generation technology; small to large-scale hydropower generation technology; clean carbon technology; renewable energy technology; building energy conservation technology; clean fuel vehicle technology; hybrid vehicle technology; urban rail-based transportation technology; fuel cell and hydrogen cell technology; oxygen-rich coal-spray blast furnace technology; new paving materials technology; new-type wall-body materials; low-GHG emission agriculture and animal husbandry technology.[308]

Here adaptation technologies are discussed in the context of post 2012 regime.[309] Adaptation technologies are complimentary to the mitigation technologies in dealing climate change. Examples include agricultural and forestry practices, coastal zone management, watershed

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[306] Ibid

[307] Global GHG emissions come from the following: production of electricity and heat – 24.6%; transportation – 13.5% (of which: motor vehicles – 9.9%, aviation – 1.6%); industry – 21.1% (of which: chemicals – 4.8%, cement – 3.8%, steel – 3.2%, aluminium – 0.8%); buildings – 15.4%; agriculture – 14.9%; land-use change and forestry (LUCF) – 18.2%; and waste – 3.6%. See Baument et al, at 57.

[308] See South Centre(2007), *Integrating development in climate change, A Framework Policy Discussion Paper on Key Elements for the Development of the Post-2012 Global Climate Policy Regime, Special policy discussion paper (November 2007),* Accessed 28 October 2008 available at www.southcentre.org.

[309] Ibid

management and disaster reduction and preparedness. This includes both "hard" (e.g., drought resistant seeds, air conditioning) and "soft" technologies (e.g., insurance mechanism, hazard assessment etc).

Technology transfer to developing countries is not one time transaction rather to create and equip with the regimes which facilitate further innovation and research in the developing countries. IPR regimes is always considered to be an obstacle in the transfer and further development through R&D, imitation by the host developing countries so the post 2012 regime should contain balancing provisions to benefit both supplier and recipient. But the urgency of issue should be considered while spelling out the flexibilities given against the IPRs. It has been very contentious issue between developed and developing countries to reach an agreement. It is very important issue regarding development and transfer of technology in developing countries as most of the technologies are owned and patented by the private companies.

Financial Issue in Post 2012 Regime

Finance is one of the four building blocks of Bali Road Map. Finance is the crosscutting issue. That shows its relevance in the post Kyoto regime. It has been a bone of contention between in all COP and subsidiary bodies meetings. Unlike developed countries developing countries insist for public and concessional funding of climate mitigation and adaptation project rather private or market funding as proposed by the former. The post-2012 framework[310] should give developing countries the incentives to create a low carbon path of economic development that allows them to continue tackling poverty while reducing greenhouse gas emissions in the process. Fund is the answer of this question. Developing countries always demand to make legal binding commitment for release of funds from developed countries at the international negotiations. A recent UNFCCC estimate indicates that for GHG emissions to return to current levels by 2030, between US$200-210 billion will be required by 2030 while for adaptation in developing countries, between US$28-67 billion[311] would be required.[312] There are some ways through which funds can be available to the developing and LDCs. They include carbon market mechanism, private investment,

[310] Ibid
[311] Ibid
[312] See UNFCCC Secretariat, Report on the analysis of existing and potential investment and financial flows relevant to the development of an effective and appropriate international response to climate change (Dialogue working paper 8, 8 August 2007).

technical assistance and capacity building, compensatory adaptation financing and sectoral fund mechanism etc.

Private investment in the climate mitigation project should be encouraged in the coming regime but it should be subject to the government policy control. As it is market mechanism in climate friendly activities should not result in commercialisation of outcome but it should be subject to mandatory obligations to fill this gap. Government's policy framework should ensure that emission trading as a part of carbon market mechanism should not turn into permit to pollute and burden of GHG emission should not shift the burden from developed to the developing countries.[313]

Transfer of technical skill and knowledge is essential for developing to developing countries. So provision for the transfer of technical skill and knowledge should be included in the post 2012 regime. It should cover to all sectors and sub sectors of the economic activity. Technical skill and knowledge is required in different sectors such as energy, transport, industry and agriculture etc to developing countries to reduce the GHG.

As India said in recently concluded Bonn summit under UNFCCC that developed countries have historical responsibility to protect the climate and being original and historical polluter they share more burden to mitigate climate change. At different occasions developing countries demand for sources of funds beyond GEF to meet the challenges of climate change taking the said ground mentioned by India. Therefore, they have to compensate to the developing countries by providing funds and transferring new technologies, skill and knowledge so that they can adopt low carbon pathways in their economic development activities. Post KP regime should incorporate these requirements regarding developing countries. Further it should include provisions relating to compensatory financing by developed to developing countries to develop and deploy GHG reducing technologies in each sectors of activity.

[313] The post-2012 framework should, however, incorporate a better system to ensure that the global carbon trade market is appropriately regulated and overseen to ensure that carbon trading does not continue to be a way through which developed countries can buy their way out of effecting effective domestic GHG emissions reductions. Appropriate regulation of the global carbon trade market through governmental oversight mechanisms will also be needed to ensure that its potential to produce real emissions reductions is achieved. See e.g. Baer et al, at 44.

A 2007 study by Oxfam International estimates that at least approximately US$50 billion will be needed annually if current GHG emissions rates are stabilized to support adaptation in developing countries.[314] More than that will be required if global GHG emissions are not cut (some studies have suggested that at least US$28-67 billion per year may in fact be required while others have suggested that the financial requirement might be in the trillions of dollars).[315]

In addition to their existing official (ODA) commitments of 0.7% of GDP,[316] the developed countries should give additional financial aid to the developing countries as a compensation for the historical responsibility of being the main drivers of current global warming trends. SCCF and Adaptation Fund are two special climate change fund. But they are not sufficient. Current level of funding for the climate stability is meagre in comparison of demand for instance only US$230 million has been committed to the UNFCCC's adaptation funds,[317] of which only US$48 million has been delivered to support LDC adaptation).[318] Climate change related insurance system at the international level should be created to meet the cost of adaptation and mitigation by the most vulnerable.

Like adaptation fund which is based on proceeds from KP- CDM, there should be a mitigation fund especially dedicated to this cause in developing countries. SCCF should be devoted for the other commitments of financing related with CC. These funds should be increased to finance GHG reduction in developing countries. In this regard, under the post-2012 framework, developed countries, being primarily responsible for GHG emissions and being financially capable of providing financial assistance, should do more to shoulder the costs of adaptation and mitigation especially in developing countries.

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[314] See Oxfam International, Adapting to Climate Change: What's Needed in Poor Countries and Who Should pay (2007), Accessed 28 October 2008, available at http://www.oxfam.org/en/policy/briefingpapers/bp104_climate_change_0705.

[315] Ibid

[316] See South Centre(2007), *Integrating development in climate change, A Framework Policy Discussion Paper on Key Elements for the Development of the Post-2012 Global Climate Policy Regime, Special policy discussion paper (November 2007),* Accessed 28 October 2008 available at www.southcentre.org.

[317] Ibid

[318] Ibid

Martin Khor has suggested four building blocks for the post 2012 regime. They are science and targets; relations between developed and developing countries; the need to link development and environment; and policy coherence.[319]

Climate change is serious threat, may cause more damage to the developing countries. For this scientific evidences should be taken into account while determining the targets for the future commitments regarding reduction of GHG. Urgency of the situation demands that there should be a target to fix the limit of temperature rise to 2 degrees centigrade and GHG concentration not to exceed to 450 parts per million of carbon dioxide equivalent. Even this is enough to cause catastrophe in developing countries. This scientifically proved target should be linked to the agreement and should form the basis of 'burden sharing principles between north and south.[320]

Next important principles to be included in the post 2012 regime is the principles of equity, historical responsibility and common but differentiated responsibilities. This is based on north south cooperation. North has to take the responsibility to compensate and make able to the developing countries to face the climate change threat. Hence it is suggested that emission cut between developed and developing countries cannot be equal. [321]

At the third level, there is needed to integrate the developmental concerns with the climate issue. So a new path of development is to be innovated which correspond with the reduction of GHG otherwise all developments will be devastated by the climate instability. Beneficiary and sufferer may be different.

Finance is very crucial issue. Climate change is big enough to demand the money which cannot be met by the private sector. As The UNFCCC Secretariat paper on investments needed to address climate change ((presented at Vienna) gave estimates of an extra investment and financial flow of US$ 200-1210 billion, in 2030 for mitigation and "tens of billions of dollars" for adaptation reflects the complexity of this issue. It is more cost effective than to repair the damaged done by the climate crisis as has happened earlier.[322] For example in the newspaper USA Today (dated 29 August 2007) it was reported that the 2005 Hurricane Katrina caused US$150 billion damage and the costs of reconstruction include

[319] Martin Khor presented this idea in his paper presented at the Vienna Climate Talks (27-31 AUGUST) held under the UNFCCC on behalf of the Third World Network
[320] Ibid
[321] Ibid
[322] Ibid

US$116 billion allocated by the US Congress as well as many more billions of dollars to be met by private financing including insurance. The 2004 tsunami would also have cost many billions of dollars in rehabilitation and reconstruction. Mitigation and adaptation measures would help prevent or reduce such expensive costs of disaster-related. IPR regime should incorporate such flexibilities so as to promote the dissemination of ESTs in developing countries; it was suggested in the paper. [323]

Fourth important point is to create coherence between national and international policies for dealing with the climate change issue. Either on the issue of technology, finance, IPR regime under TRIPS or others related to climate friendly technologies.

Bali Conference 2007

The issue of legal framework for the post Kyoto Protocol period that is post 2012, when Kyoto Protocol first commitment period will be over was taken up during the Bali Conference. Negotiators spent more time on to be consensual on two year process or Bali Road Map for finalising post 2012 regime. Contentious issue between developed and developing countries was long term cooperative action under the Convention and text on mitigation. They agreed finally on proposals put forth by India and other developing countries to the text referring to nationally appropriate mitigation actions by developing country parties in the context of sustainable development, supported by technology and enabled by finance and capacity building in a measurable, reportable and verifiable manner. EU, U.S. and other developed countries agreed to this. These decisions set a guidelines and process to produce an outcome for post 2012 regime at Copenhagen in 2009.[324]

Negotiation mainly focused on the nature of the process to move and on the four "building blocks" identified as crucial aspects for the roadmap: adaptation, mitigation, technology transfer, and financing. Another controversial issue was preamble text on mitigation referencing the IPCC's finding that Annex I parties as a group would need to cut emissions in a range of 25-40% by 2020;[325] and an operative paragraph that addressed the nature of commitments or actions by different parties. After debate between developed and developing

[323] Ibid

[324] See Earth Negotiation Bulletin (2007), *Summary of the Thirteenth Conference of Parties to the UN Framework Convention on Climate Change and Third Meeting of the Parties to the Kyoto Protocol,* Vol. 12 No. 354, , Published by the International Institute for Sustainable Development (IISD), Accessed on 22 August 2008 http://www.iisd.ca/download/pdf/enb12354e.pdf

[325] Ibid

group, final decision on the nature of process reached as AWG and separate working tracks will continue under the Convention and Protocol. EU and developing countries agreed to the inclusion of text mandating emission cut in reference to the IPCC 4th report. But Japan U.S. Canada and Russian federation were not comfortable.[326]

COP in its decision recognised the deep emission cuts essential to achieve objectives of the Convention. Recognising climate change as an urgent issue launched a comprehensive process to effective implementation of the Convention for up to 2012 and post 2012. For this COP established an Ad Hoc Working Group on Long-Term Cooperative Action that shall complete its work in 2009, and agrees that the process shall begin without delay, with the first session held no later than April 2008.[327] It will address enhanced national/international action on mitigation," as well as enhanced action on adaptation, technology development and transfer, and provision of financial resources and investment.[328]

Technology transfer and finance for technology development, deployment and diffusion is the subject to which this work focuses, hence concentration on this issue in the relevant meetings, conferences will be in the work. In this continuing process, on technology development and transfer, the COP decides to consider effective mechanisms and enhanced means for the removal of obstacles to financial and other incentives for the scaling up of technology development and transfer. Regarding financing, the COP decides to consider improved access to adequate, predictable and sustainable resources and support, and the provision of new and additional resources, including official and concessional funding. It also decides to consider positive incentives and innovative means of funding, as well as mobilization of public and private sector funding and investment, and support for capacity building in the assessment of adaptation costs.[329]

In the Bali Conference an Ad Hoc Working Group on Further Commitments for Annex I Parties under the Protocol (AWG) was established by COP/MOP 1 under Protocol Article 3.9 (future commitments) to consider Annex I parties' commitments beyond the Protocol's first commitment period.

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[326] Ibid
[327] Ibid
[328] Ibid
[329] Ibid

In summary, Bali conference presented two year roadmap comprising four building blocks for the negotiation for the post 2012 protocol. It set the outlines for the talks and negotiations for the coming regime.[330]

AWG-LCA was established in 2007 at 13th COP in Bali. It was mandated to launch a comprehensive process to enable the full, effective and sustainable implementation of the Convention through long-term cooperative action up to and beyond 2012.[331]

Issues were highly debated between developed and developing countries. The G-77/China emphasized for technologies for both mitigation and adaptation, financing and international cooperation. Ghana highlighted the importance of innovative mechanisms, incentives. Brazil and others stressed for North-South and South-South cooperation for adaptation technologies. China stressed innovative funding mechanisms and the purchase of climate-friendly technologies at preferential terms to developing countries. Africa highlighted the role of incremental costs and market mechanisms. Developing countries emphasised for the international cooperation for development of CFTs, contrary EU and Japan stressed for framework according to the needs of the country and sectoral approach respectively.[332]

India and others said that IPR regime as a barrier in the transfer of ESTs and Saudi Arabia called for compulsory licence but U.S. said it is an incentive for technology innovation and transfer and asked for elimination of tariff and non-tariff barriers to the transfer of ESTs. Mexico, Indonesia and India suggested creating a multilateral fund under the Convention with foreseeable and scalable contributions by developed countries and a transparent and inclusive governance structure.

Argentina highlighted positive experiences with the Multilateral Fund for the Implementation of the Montreal Protocol on Substances that Deplete the Ozone Layer. The EU highlighted linkages between finance and technology and suggested a toolbox on financing, and said

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[330] See Earth Negotiation Bulletin (2007), *Summary of the Thirteenth Conference of Parties to the UN Framework Convention on Climate Change and Third Meeting of the Parties to the Kyoto Protocol,* Vol. 12 No. 354, , Published by the International Institute for Sustainable Development (IISD), Accessed on 22 August 2008 http://www.iisd.ca/download/pdf/enb12354e.pdf

[331] Ibid

[332] Ibid

carbon markets and enabling environments are essential. Egypt urged new funding mechanisms and improving existing ones, such as the CDM.[333]

Next important issue discussed in the same was the issue of finance. Source of financing, financial needs for adaptation, parallel financial initiatives and necessary activities were the focal area of discussion of the in the meeting. On behalf of the developing countries, adequacy and accessibility of financing, creation of multilateral fund under the Convention, public funding as main source of funding and creation of an adaptation fund under the Convention on the basis of polluter pays principle were the focal area of concern for them. Developed countries had contrary view for example, private funding, parallel initiatives of funding and bilateral initiatives of funding. Further, China said that there must be legal binding commitment for the developed countries under the Convention to provide fund to the developing countries to meet the challenges posed by the climate change crisis.

World Bank proposed for Clean Technology Fund and a pilot programme for climate resilience and some of them expressed it will undermine Adaptation Fund under the Protocol. Developed countries seemed looking for the broader participation in mitigation efforts in the post-2012 regime, whereas developing were talking more about the adaptation efforts. Linking of two negotiation tracks (under Convention and Protocol) for the climate stability efforts were proposed by the China and U.S. (they have not taken any commitment for reduction of GHG under the Protocol), opposed by the developing countries. The meeting of Bangkok has successfully laid the ground work for substantive discussions to take place in the future. It was political conciliation of both realism and ambitious plans for the future.

During the first two weeks of June (2008 Bonn, Germany), delegates convened a meeting as a part of ongoing negotiations under the UN Framework Convention on Climate Change (UNFCCC) and Kyoto Protocol. The second session of the Ad Hoc Working Group on Long-term Cooperative Action under the Convention (AWG-LCA 2), and the resumed fifth session of the Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol (AWG-KP 5) took place from 2-12 June. At the same venue and time the twenty-eighth sessions of the Subsidiary Body for Scientific and Technological Advice (SBSTA) and the Subsidiary Body for Implementation (SBI) of the UNFCCC were held from 4-13 June. The meetings were part of ongoing discussions to enhance international cooperation on

[333] Ibid

climate change, including for the period after 2012, when the Kyoto Protocol's first "commitment period" expires.

At this session the AWG-LCA shifted its focus towards more substantive topics, with three workshops to help delegates to consider issues as adaptation, finance, and technology. Parties also discussed on a "shared vision for long-term cooperative action," climate change mitigation, and the AWG-LCA's work programme for 2009.[334]

The SBI and SBSTA took up a range of issues, some related to their regular, ongoing work under UNFCCC and Kyoto Protocol, and some more closely connected to the post-2012 discussions. The SBI examined subjects such as capacity building, technology transfer and preparations for the second review of the Protocol under Article 9. SBSTA's agenda also included items on technology transfer along with the reducing emissions from deforestation in developing countries. The work programme, adopted at the end of the meeting, aims to further discussions on all elements of the Bali Action Plan at every session of the AWG-LCA in a "coherent, integrated and transparent manner." It establishes a detailed work programme, including a timetable for eight in-session workshops to be held during 2008.

Next important meeting took place in Accra (Ghana 21-27 August 2008)[335] Delegates met for third session of the AWG-LCA and first part of sixth session of AWG on Further Commitments for Annex 1 Parties under the KP and Convention. It was part of the ongoing series of talks leading up to the Copenhagen in December 2009, deadline for an agreement on a post 2012 framework. Focus of the meeting was to continue to exchange the ideas and clarify the key elements of the Bali Action Plan, including shared vision for long-term cooperative action, which is 'mitigation, adaptation, technology and finance'.[336]

On the issue of technology and finance discussion was around the more or less same issue. Divergences between developed and developing countries were apparent. On the issue of technology developing countries parties noted the relevance of research collaboration

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[334] Ibid

[335] See also Earth Negotiation Bulletin (2008), *Summary of the Third Session of the Ad Hoc Working Group under the Convention and Sixth Session (part one) of the Ad Hoc Working Group under the Kyoto Protocol,* Vol. 12 No. 383, Published by the International Institute for Sustainable Development (IISD), Accessed on 22 November 2008, available at www.iisd.ca/download/pdf/enb12383e.pdf, In Accra climate talks (august 2008) developing countries/G 77 proposed for a new technology transfer mechanism and an enhanced mechanism for finance, available at Third World Network (2008), *"Accra News Updates and Climate Briefings"*, Accra Climate Change Talks, 21 August-27 August 2008, accessed on 20 January, available at URL: http://www.twnside.org.sg/climate.htm

[336] Ibid

between developed and developing countries and highlighted the intellectual property rights regime as a barrier to technology transfer. As well they proposed a detail account of technology mechanism for efficient technology transfer for mitigation and adaptation actions.[337]

On the issue of finance, developing countries stressed funding from Annex 1 countries while developed countries, such as the U.S. and E.U. highlighted the importance of the private sector funding, carbon market mechanism and innovative financial mechanism. They also wanted financial mechanism out of the Convention. The purpose of all discussion and exchange of ideas was to prepare the post 2012 regime. These all meant to prepare grounds and issues to be included in the post 2012 agreement. It was as usual decided to keep all elements of Bali action plan on the agenda of each session of the AWG-LCA. In the conclusion, AWG-LCA decided to advance adaptation through finance and technology, including NAPAs, investment and financial flows, and issues related to technology development, deployment, diffusion and transfer.

In the earlier chapter the discussion and proposals presented to the two meetings of AWG-LCA in April and recently concluded in June in Bonn reflected the divergence of views regarding the emission cut, technology transfer, capacity building, and funding.

Conclusion

On the basis of above discussion in the light of the COP meetings and its subsidiary bodies it can be inferred that world has recognised climate change as a serious threat and also the unequal distribution of resources between the developed and developing countries to deal with this challenge. Legal commitments, political realism and narrow self interest of the countries are hampering the realisation of the goal set by the Convention and its Protocol (UNFCCC and KP). There is an increasing recognition that technology development and transfer will play a major role in global and national strategies to combat climate change. So, the post KP regime needs strong teeth in the form of stringent binding commitments on the part of developed countries to transfer updated clean technologies to the developing countries. There is big technological gap between developed and developing countries. There

[337] Ibid

is substantial investment in the clean energy technologies in the developed countries. They are capable enough to equip their developing counterparts.

For example an estimated US$ 71 billion was invested in new renewable energy capacity worldwide in 2007, compared to US$ 55 billion in 2006 and US$ 40 billion in 2005.[338] Technology shares of the US$ 71 billion annual investment were mostly for wind power (47 per cent), solar PV (30 per cent), and solar hot water (9 per cent),[339] followed by smaller shares for small hydropower, biomass power and heat, and geothermal power and heat. An additional US$ 15–20 billion continues to be invested annually in large hydropower.[340]

Investment in renewable energy is still mostly in OECD countries, with USA and the EU together accounting for more than 70 per cent of this investment in 2006. However, investment in developing countries is growing also with 21 per cent (US$ 15 billion) of the global renewable energy investment in 2006 as compared to 15 per cent (US$ 4.2 billion) in 2004.[341] They are in the position to make accessible ESTs to developing world. Climate change is a global threat and its effect is universal so none can turn their head. At COP, SBSTA, SB and two more bodies formed under the Convention all of them have at one or other time mentioned and discussed the prospects of technology transfer and finance for enabling the developing countries to face the climate change.

[338] Renewable Energy Network is a global policy network that provides a forum for sharing of ideas and promotion of renewable energy worldwide. Open to a wide variety of dedicated stakeholders, REN21 connects governments, international institutions, non-governmental organisations, industry associations, and other partnerships and initiatives. REN21 (2007), *Renewable Energy Policy Network for the 21st Century*, Renewable 2007: Global Status Report. www.ren21.net (2007).

[339] Ibid

[340] Ibid

[341] Ibid

Chapter - V
Conclusion

Climate change has emerged as a global challenge threatening the existence of planet. The rising Green houses gases (GHG) concentrations in the atmosphere are a disaster to the climate change crisis. It is affecting both the developed and the developing countries. The impacts of climate change are affecting the developing and least developed countries more because of their vulnerability. This issue has to be resolved in the manner that is equitable and fair. The development and diffusion of clean technologies can play a major role in mitigating the effects of climate instability.

The developing countries look to the international community for technological cooperation and financial assistance. Transfer of technology from technically developed states to other states which lack these technologies is important for a balanced development. The developed countries are technologically and financially sound so they are competent to deal with the crisis posed by the climate change. They are equipped with the clean and climate friendly technologies. Contrary to it the developing countries are technologically backward. Developing countries have raised their voice at different multilateral environmental forums for the transfer of technologies and finance to access them

The basic purpose of the study has been to identify the obligations of developed countries under UNFCCC and Kyoto Protocol to transfer environmentally sound technologies to developing countries and how far they have been complied. The work has tried to identify the legal barriers in the transfer of technology. The work has also analysed the role of intellectual property laws in technology transfer as to whether it is a barrier or an incentive. The UNFCCC COP and the KP-MOP have played a pivotal role in climate specific legal issues. The important steps taken by the COP/CMP have been examined in this work. Thus the works by the Expert Group on Technology Transfer (EGTT), SBSTA and SBI have been analyzed from this perspective. The proposals forwarded by developing countries under the current climate negotiations on technology transfer and to what extent it has been incorporated in the present regime have been discussed. Problem of finance which is one of the crucial one for ToT has also been seen.

This study has attempted to assess the current status of technological diffusion and deployment in the developing countries through the analysis of available information. It has

tried to focus on the transfer of technology as a tool to deal with the crisis posed by the climate change. After strenuous efforts of developing countries they are not getting their due from the developed countries. By the end of Poznan climate talk or recent talks in the Bonn nothing fruitful could be achieved by the developing countries. Developing countries argue that developed countries are historically responsible for causing climate change so they are supposed to take responsibility to assist technologically and financially to developing countries to meet their obligations under the UNFCCC and Kyoto Protocol. In the climate talk concluded in the Bonn India called for minimum of a forty percent cutback in the GHGs emission on the part of developed countries on the ground that they are historically responsible of being the original polluter.

The study has sought to analyse the legal framework for the ToT under the Climate Change Convention which could not brought substantial benefits to the developing world. Though, the issue of technology transfer have been dealt in different MEAs pertaining to the concerned subject and objectives but for reducing GHGs in the atmosphere causing climate instability has been dealt in the UNFCCC and Kyoto Protocol. Analysis of legal provisions given in the Convention and Protocol reveal that after the journey of sixteen years of Convention achievement is not worth to be seen. Regular meetings of COP and constitution of different working groups to work specially on the allotted areas even could not brought substantial changes in the position of developing countries to meet the challenges of climate change. The study further shows that even though the historical responsibility as original polluter has been asserted by the developing countries and proved, yet developed countries are not taking the required responsibility to share the clean technologies and finance for them to deal with climate instability.

The study also reveals that the issue of technology transfer and finance which have been taken up as a cross-cutting issue at each session of the COP (Convention) and Protocol and its subsidiaries bodies could not do much. It has started as a regular phenomenon from Marrakesh Accords. Articles 4.1(c), 4.3, 4.5, and other relevant articles of the Convention (such as Articles 4.8 and 4.9) support the demands of the developing countries. They include different aspects of the transfer of technologies including development of endogenous capacities, R & D, and to make conducive environment for the absorption of technologies. But all analysis of legal provisions and distribution of clean technologies in the world reveal that more stringent binding commitments on the part of developed states are needed in the

legal instruments to oblige to transfer the technologies in complete sense as in the regime. Merely legal instruments are not going to help; attitudinal changes on the part of developed countries are required for the same. Developing countries also highlighted the shortfalls of existing financial mechanisms and demand the establishment of additional institutions of finance under the Convention. This has been made clear by the above analysis.

The study also reveals that there are many legal and non-legal barriers hampering the transfer of clean technologies to the developing countries. They are required in all sectors of economy. Developing countries have to cross those barriers to become self reliant in the development of clean technologies. As technologies are not only the transaction of commodities but the knowledge component of which transfer may enable developing countries for follow on experiments and developments of technologies. The issue of IPRs and availability of finance has been recognised significant element for obtaining mitigation and adaptation technologies from developed world. For that developing countries have proposed alternative mechanism for transfer of technology and fund for that in the climate talks for example in the Bali (December 2007) and Accra climate talks (21-27 August 2008) as they are unsatisfied with existing mechanisms.

In every discussion developed countries propose and insist for the strong IPRs regimes which have been countered by the developing countries. In this work it has been shown that TRIPS is a legal framework for IPRs protection which provides guidelines for the realisation of goal of IPRs, which is protection of the rights of innovator.

The developed and developing countries have different notions and an interpretation of IPRs. Former asserts that IPRs protection act as incentive to the innovations and following dissemination of the technologies. Unlike them, developing countries have contrary strong opinion so they emphasis the exclusion of ESTs from the purview of IPR regime. Neither of the opinion is correct so recognising climate change as a global problem both need to take a practical solution. The study further endeavours to emphasise that the demand of developing countries to transfer public domain technologies at the affordable cost is to be considered by the developed world. Further demand to bear the incremental costs to shift to ESTs by the developing world is to be borne by the developed countries is not unreasonable demand.

Technology transfer is one of the key elements to be dealt with in the in Post Kyoto period. That is why it has been included as one of the building blocks of the Bail Road Map to deal with climate instability because technological development plays a critical role in the global and domestic climate change monitoring, mitigation, and adaptation strategies and actions. Current discussions towards a post-Kyoto climate regime are arranged around broad topics including mitigation, adaptation, technology transfer and financial support.

Now the major task for the post-2012 climate change regime is to ensure that the appropriate technologies for the climate change mitigation and adaptation be made accessible to the developing countries at the affordable cost. As well as technical assistance and financial support is a prerequisite for the developing countries to undertake research and development and to create conducive capacity to absorb the transferred technologies.

The above discussion reveals the fact that there is unequal distribution of resources between the developed and the developing countries. This study also has sought the attention of the developing countries towards the issue of IPRs in this context. This is a legal barrier which has been affecting the transfer of ESTs to the developing world, needs to be dealt firmly in the post Kyoto Regime. Legal commitments, political realism and narrow self interest of the countries are also hampering the realisation of the goal set by the UNFCCC and KP.

There is big technological gap between the developed and the developing countries. There is substantial investment in the clean energy technologies in the developed countries. They are capable enough to equip their developing counterparts in this regard. So, the post KP regime needs strong teeth in the form of stringent binding commitments on the part of the developed countries to transfer updated clean technologies to the developing countries.

On the basis of above discussion, it could be summarised that in the post-2012 climate change regime more strong legal provisions. It is common mankind problem. The effect of climate change is universal so the big powers also cannot avoid natural disasters. Therefore, it is suggested that attitudinal changes are needed on the part of all the states to deal with this global crisis.

It calls for translating the aspirations and concerns of the developing countries into action. It appears that the sheer magnitude of the challenge of climate change warrants technological solutions. The developing countries need to be assisted both as regards transfer of funding as well as technology.

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