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The Technology Mechanism under the United Nations Framework Convention on Climate Change

A detailed analysis of unresolved issues and potential solutions

A Master's Thesis submitted for the degree of
"Master of Science"

supervised by
A. Higham and Professor Dr. G. Loibl

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Affidavit

I, **Vanessa Hamerijckx**, hereby declare

1. that I am the sole author of the present Master's Thesis, "The Technology Mechanism under the United Nations Framework Convention on Climate change - A detailed analysis of unresolved issues and potential solutions", 201 pages, bound, and that I have not used any source or tool other than those referenced or any other illicit aid or tool, and
2. that I have not prior to this date submitted this Master's Thesis as an examination paper in any form in Austria or abroad.

Vienna, 16.06.2011

Signature

Preface and Acknowledgments

"*Here is the basic rule for winning success. Let's mark it in the mind and remember it. The rule is: Success depends on the support of other people. The only hurdle between you and what you want to be is the support of other people.*" - David Joseph Schwartz

I would like to express my gratitude to a couple of special people, starting with my parents Roger and Lutgarde. No doubt they are the most important people in my life. They make me laugh when I am sad and make me laugh even more when I am happy. They listen to my concerns, dreams and ambitions and do everything they can to make me realize my dreams. One of my ambitions was to study this ETIA-programme and without their mental and financial support, I would never have been able to do this. I have not been home a lot the last couple of years and I realize they did not always have it easy with me chasing my dreams and ambitions and going from one country to another, so I would like to thank them for everything and for being the wonderful people they are. *Papa en Lutgarde, bedankt!*

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Vanessa

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List of abbreviations

COP	Conference of the Parties
CTC	Climate Technology Centre
CTCN	Climate Technology Centre and Network
CTN	Climate Technology Network
EST	Environmentally Sound Technology
GEF	Global Environment Facility
GHG	Greenhouse Gas
IPCC	Intergovernmental Panel on Climate Change
TEC	Technology Executive Committee
TM	Technology Mechanism
UNFCCC	United Nations Framework Convention on Climate Change

Abstract

Since the Industrial Revolution, developed countries' economies have been growing thanks to innovative technologies. In order to sustain industrial activities, large amounts of energy are needed. Due to industry and the combustion of fossil fuels, anthropogenic greenhouse gas emissions have increased at a high speed and have been building up in the atmosphere, leading to the concern that global temperature might increase with 1 to 5°C. In order to mitigate these greenhouse gas emissions, there is a need for environmentally sound technologies. Developing countries however depend on the imports of technologies by developed countries as they lack the capital and the talent to perform R&D activities by themselves. Unfortunately, environmentally sound technologies are not being transferred as fast as other technologies, especially to developing countries. The problem of greenhouse gas emissions causing climate change and the lack of technology transfer to mitigate greenhouse gas emissions was also clear to policy-makers. In order to enhance the development and transfer of environmentally sound technologies to developing countries, the Technology Mechanism was established during the sixteenth session of the Conference of the Parties under the United Nations Framework Convention on Climate Change. There are however some important unresolved issues left that need to be given an answer to in order to make the Technology Mechanism operational with the purpose of enhancing the development and transfer of Environmentally Sound Technologies.

Keywords: United Nations Framework Convention on Climate Change; Technology Mechanism; Technology development and transfer; Environmentally Sound Technologies; Issues

Introduction

Innovation is considered to be the driving force of economic development. Schumpeter (1954) called this process "*Creative Destruction*": "[t]*he fundamental impulse that sets and keeps the capitalist engine in motion comes from the new consumers' goods, the new methods of production or transportation, the new markets, the new forms of industrial organization that capitalist enterprise creates [...] The opening up of new markets, foreign or domestic, and the organizational development [...] that incessantly revolutionizes the economic structure from within, incessantly destroying the old one, incessantly creating a new one. This process of Creative Destruction is the essential fact about capitalism."* (Schumpeter, 1954). According to Schumpeter (1954), economic growth would be triggered by using new production processes for the production of new products for new markets. He thus fully relies on innovation to support his economic growth theory. Companies that refuse or are not able to innovate, will be destroyed by the "*creative*" ones, thus "*creative destruction*". Romer (1994) agreed on this and started his theory from the assumption that resources are scarce. Economic growth would then occur by inventions or "*recipes*" as he calls them: "[e]*conomic growth occurs whenever people take resources and rearrange them in ways that are more valuable. A useful metaphor for production in an economy comes from the kitchen. To create valuable final products, we mix inexpensive ingredients together according to a recipe. The cooking one can do is limited by the supply of ingredients, and most cooking in the economy produces undesirable side effects. If economic growth could be achieved only by doing more and more of the same kind of cooking, we would eventually run out of raw materials and suffer from unacceptable levels of pollution and nuisance. Human history teaches us, however, that economic growth springs from better recipes, not just from more cooking. New recipes generally produce fewer unpleasant side effects and generate more economic value per unit of raw material.*" (Romer, 1994). He even

went so far to make a prediction about the economic superpower in the 21st century. According to Romer (1994), the economic superpower of the 21st century would be a country that innovates by supporting new ideas and thus new inventions in the private sector. This country would thus be the most innovative one and use innovation as a trigger for growth. Buswell (Buswell, 1983) and Cooke (Cooke, 1994) went a step further by underlining the importance of technology to sustain regional economic development. In the late 1960's, the National Academy of Sciences and the National Academy of Engineering in the USA stated that "*the economic well-being of a nation is dependent on the development of its technological potential*". The importance of technology was also realized in France when the Lisle (1973) and Delion (1974) reports stated the importance of science and technology in economic growth and that funds had to be made available to support R&D. The Seventh Plan (1975-1980) had to transform this theory into practice. Britain, West Germany and many other countries supported this view (Buswell, 1983). Cooke (1994) stated that regional change and thus regional disparities are caused by technological capability: "*the innovation gap is a primary source of regional disparities*" and "*investments in technology and skills produce developmental pay-off*" (Cooke, 1994). Fagerberg (1987) then again went a step further by stating that differences in growth rates between countries could be explained by a difference in technology and innovation rates: [t]*here exist a close correlation between the level of economic development, measured as GDP per capita, and the level of technological development, measured through R&D or patent statistics.*" (Fagerberg, 1987). The next question then is: where does this technology come from? This can either come from in-house R&D or by importing technologies (Y. Sun, 2002). Developing countries, however, tend to rely on the imports of technologies or technology transfer to innovate: "[t]*he important role of imported technologies in new product sales makes it obvious that industrial enterprises in developing countries are still technologically reliant on technologies imported from developed countries*" (Y. Sun, 2002), as also confirmed by Walsh (Walsh, 1999). In general, technology transfer has always been a crucial element in a country's growth: "[...] *technology transfer has been a major determinant of the pattern of the world development and*

underdevelopment from the eighteenth century to the present." (Inkster, 1996).

Since the Industrial Revolution, economic growth has been triggered by technologies and innovation. In order to sustain industrial activities, a lot of energy is needed. In 1995, 41% of global energy was consumed by industry. This counted for 43% of global CO_2 emissions and the emissions of other GreenHouse Gasses such as CFCs, HFCs, HCFCs, CH_4, N_2O, PFCs, CF_4, C_2, F_6 and SF_6 (Worrell, et al., 2001). Developing country Parties consume 37% of the global energy use and this percentage is expected to increase as their industrial production is growing at fast rates to trigger economic development, to tackle unemployment and to build infrastructure (Worrell, et al., 2001). Because of the industrial era we are in today, anthropogenic greenhouse gas (GHG) emissions have increased rapidly due to, inter alia, industry and the use of fossil fuels. Although a greenhouse effect is needed to warm our planet and to enable life on the Earth, GHG have been building up in the atmosphere, will leads to the concern of a global increase of temperature of 1 to 5°C of the next century (Wuebbles & Atul, 2001). The IPCC attributed the accumulation of GHG to human activity by stating: "[g]*lobal atmospheric concentrations of carbon dioxide, methane and nitrous oxide have increased markedly as a result of human activities since 1750 and now far exceed pre-industrial values determined from ice cores spanning many thousands of years. The global increases in carbon dioxide concentration are due primarily to fossil fuel use and land use change, while those of methane and nitrous oxide are primarily due to agriculture. The understanding of anthropogenic warming and cooling influences on climate has improved […] leading to very high confidence that the global average net effect of human activities since 1750 has been one of warming* […]." (Intergovernmental Panel on Climate Change, 2007b). The most important GHG is carbon dioxide or CO_2: "[t]*he global atmospheric concentration of carbon dioxide has increased from a pre-industrial value of about 280 ppm to 379 ppm3 in 2005. The atmospheric concentration of carbon dioxide in 2005 exceeds by far the natural range over the last 650,000 years (180 to 300 ppm) as determined from ice cores.*" (Intergovernmental Panel on Climate Change, 2007b). In order to stop future increases of CO_2 in the atmosphere, the IPCC (2007) developed scenarios that all

include technology changes. These changes can be implemented by the use of cleaner production methodologies, for example by process integration, better logistical procedures and the development and the implementation of new processes that use more environmentally friendly raw materials or milder conditions (Martins & Mata, 2010). As already stated before, remarkable economic growths will take place in developing countries, but mostly, technologies are still being produced by developed countries (Worrell, et al., 2001). Developing countries thus depend on the imports of technologies by developed countries as they lack the capital and the talent to perform R&D activities by themselves (Y. F. Sun & Du, 2010). Unfortunately, environmentally sound technologies (ESTs) are not being transferred as fast as other technologies, especially to developing countries (Worrell, et al., 2001). The problem of GHG emissions causing climate change and the lack of technology transfer to prevent the production of GHG emissions was also clear to policy-makers. In 1992, the world's first Earth Summit in Rio de Janeiro took place (United Nations, 1997). The summit was being described as "[o]*ne of the most publicized large-scale political events since the end of the Cold War.*" (Dalby). Because of repeated warnings of scientists about human activities altering the climate, the gathering of world leaders was the largest ever. "*Given the unprecedentedly large number of heads of state attending, there were high hopes of dramatic changes in global politics and heightened attention to matters of economic reform and environmental protection.*" (Dalby). The goal was to stop the use of environmentally unsound technologies and to promote the shift to sustainable development paths (Stilwell, 2008; United Nations, 1997). Sustainable development is being defined as: "[...] *development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts: the concept of 'needs', in particular the essential needs of the world's poor, to which overriding priority should be given; and the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs.*" (Brundtland, 1987). This goal of stopping the use of environmentally unsound technologies and of promoting the shift to sustainable development paths was laid down in article 4.5 of the United Nations

Framework Convention on Climate Change: "[t]*he 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, to enable them to implement the provisions of the Convention. In this process, the developed country Parties shall support the development and enhancement of endogenous capacities and technologies of developing country Parties. Other Parties and organizations in a position to do so may also assist in facilitating the transfer of such technologies.*" (United Nations, 1992b). The two most important terms in article 4.5 of the United Nations Framework Convention on Climate Change are *"technology transfer*" and "*environmentally sound technologies*" (ESTs). The IPCC (2000) defines technology transfer 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, NGOs and research/education institutions. Therefore, the treatment of technology transfer […] is much broader than that in the UNFCCC or of any particular paragraph of that Convention. The broad and inclusive term "transfer" encompasses diffusion of technologies and technology co-operation across and within countries. It covers technology transfer processes between developed countries, developing countries and countries with economies in transition, amongst developed countries, amongst developing countries and amongst countries with economies in transition. It comprises the process of learning to understand, utilise and replicate the technology, including the capacity to choose and adapt to local conditions and integrate it with indigenous technologies.*" (Intergovernmental Panel on Climate Change, 2000a). Chapter 34.1 of Agenda 21 defines ESTs as technologies that "*protect the environment, are less polluting, use all resources in a more sustainable manner, recycle more of their wastes and products, and handle residual wastes in a more acceptable manner than the technologies for which they were substitutes.*" (United Nations, 1992a). As developing countries still depend on the imports of technologies by developed countries (Y. F. Sun & Du, 2010), the purpose was to transfer these so-

called ESTs to developing country Parties for mitigation and adaptation purposes. In case of mitigation, examples are renewable energy technologies like solar panels, wind turbines, biomass and hydro-power generation, carbon capture and storage and nuclear power (UNFCCC, 2010a). In case of adaptation, examples are flood control technologies, tolerant/resistant crop varieties, water desalination, disease monitoring and surveillance, improved data collection etc. (UNFCCC, 2010a). At the eleventh session of the Conference of the Parties (COP) in 2005, the importance of technology and technology transfer to tackle climate change was explicitely mentioned in the preamble by stating: "[r]*ecognizing the need to realize the full potential of technology in combating climate change, and that substantial reduction in greenhouse gas emissions in the long term will rely to a large extent on the development, deployment, diffusion and transfer of environmentally sound technologies*" (UNFCCC, 2005). As mentioned before, environmentally sound technologies (ESTs) are not being transferred as fast as other technologies (Worrell, et al., 2001) and therefore, the need was recognized to enhance the transfer of ESTs (Latif, 2010). In order to answer this need, the Technology Mechanism was taken note of in paragraph 11 of decision 2 (the so-called "*Copenhagen Accord*") of the fifteenth session of the Conference of the Parties: "[i]*n order to enhance action on development and transfer of technology we decide to establish a* ***Technology Mechanism to accelerate technology development and transfer*** *in support of action on adaptation and mitigation that will be guided by a country-driven approach and be based on national circumstances and priorities.*" (UNFCCC, 2009). An important remark here is that the Copenhagen Accord and thus the Technology Mechanism was "*taken note of*" as in the meaning of "*noticed*", but that the Copenhagen Accord and thus the paragraph dedicated to the Technology Mechanism was not legally binding. I will come back to this issue when analyzing the decisions of the fifteenth session of the Conference of the Parties in the first chapter. The Technology Mechanism was then officially established in paragraph 117 of chapter B of the first decision of the sixteenth session of the Conference of the Parties: "[d]*ecides to establish a Technology Mechanism […], under the guidance of and accountable to the Conference of the Parties* […]. (UNFCCC, 2010b). Based on paragraphs 117(a) and

117(b) of chapter B of the first decision of the sixteenth session of the COP (United Nations Framework Convention on Climate Change, 2011h), the Technology Mechanism would exist out of a Technology Executive Committee (TEC) and a Climate Technology Centre and Network (CTCN). The Technology Committee would have three broad functions (UNFCCC Expert Group on Technology Transfer, 2011). First of all, its functions would be policy related (agenda setting and guidance) as stated in paragraphs 121 (b), (c), (e), (f) and (g) of chapter B of the first decision of the 16th session of the COP: "*(b) Consider and recommend actions to promote technology development and transfer, in order to accelerate action on mitigation and adaptation; (c) Recommend guidance on policies and programme priorities related to technology development and transfer with special consideration given to the least developed country Parties; (e) Recommend actions to address the barriers to technology development and transfer in order to enable enhanced action on mitigation and adaptation; (f) Seek cooperation with relevant international technology initiatives, stakeholders and organizations, and promote coherence and cooperation across technology activities, including activities under and outside of the Convention; (g) Catalyse the development and use of technology road maps or action plans at the international, regional and national levels through cooperation between relevant stakeholders, particularly governments and relevant organizations or bodies, including the development of best practice guidelines as facilitative tools for action on mitigation and adaptation.*" Second of all, the functions of the Technology Executive Committee would be facilitative as stated in paragraph 121 (d) of chapter B of the first decision of the 16th session of the COP: "*(d) Promote and facilitate collaboration on the development and transfer of technologies for mitigation and adaptation between governments, the private sector, non-profit organizations and academic and research communities*". Third of all, the functions of the Technology Executive Committee would be synthesis and analysis related as stated in paragraph 121 (a) of the first decision of the 16th session of the COP: "*(a) Provide an overview of technological needs and analysis of policy and technical issues related to the development and transfer of technologies for mitigation and adaptation.*" The purpose of the Technology Executive Committee (TEC) would be

to provide services to the UNFCCC and its Parties. Just like the TEC, the Climate Technology Centre and Network (CTCN) also has three broad functions (United Nations Framework Convention on Climate Change, 2011d). First of all, the functions of the CTCN would be facilitative as stated in paragraphs 123 (a)(ii), (a)(iii), (b), (c), (c)(ii) and (c)(iv) of chapter B of the first decision of the 16th session of the COP: "*(a) At the request of a developing country Party: (ii) Facilitating the provision of information, training and support for progammes to build or strengthen capacity of developing countries to identify technology options, make technology choices and operate, maintain and adapt technology; (iii) Facilitating prompt action on the deployment of existing technology in developing country Parties based on identified needs; (b) Stimulating and encouraging, through collaboration with the private sector, public institutions, academia and research institutions, the development and transfer of existing and emerging environmentally sound technologies, as well as opportunities for North–South, South–South and triangular technology cooperation; (c) Facilitating a network of national, regional, sectoral and international technology centres, networks, organization and initiatives with a view to: (ii) Facilitating international partnerships among public and private stakeholders to accelerate the innovation and diffusion of environmentally sound technologies to developing country Parties. (iv) Stimulating the establishment of twinning centre arrangements to promote North–South, South–South and triangular partnerships, with a view to encouraging cooperative research and development*" Second of all, the functions of the CTCN would be advisory as stated in paragraph 123 (a)(i) of chapter B of the first decision of the 16th session of the COP: "*(a) At the request of a developing country Party: (i) Providing advice and support related to the identification of technology needs and the implementation of environmentally sound technologies, practices and processes.*" Third of all, the functions of the CTCN would be to provide assistance. This could be directly or through Regional centres and the network. This is stated in paragraphs 123 (a)(i), (c)(iii) and (c)(v) of chapter B of the first decision of the 16th session of the COP: "*(a) At the request of a developing country Party: (i) Providing advice and support related to the identification of technology needs and the implementation of environmentally sound*

technologies, practices and processes; (iii) Providing, at the request of a developing country Party, in-country technical assistance and training to support identified technology actions in developing country Parties; (v) Identifying, disseminating and assisting with developing analytical tools, policies and best practices for country-driven planning to support the dissemination of environmentally sound technologies." The purpose of the Climate Technology Centre and Network (CTCN) would be to provide services to developing country Parties (UNFCCC Expert Group on Technology Transfer, 2011). Although the establishment of the Technology Mechanism is a great break-through in the field of technology development and transfer, it still has to be developed in order to make it operational. Paragraph 128 of chapter B of the first decision of the 16th session of the COP stated that there are still matters that need to be solved in order for decisions to be taken during the 17th session of the COP, so that the Technology Mechanism could become operational in 2012. The matters, "*issues*", of paragraphs 128 (a), (b) and (d) of chapter B of the first decision of the 16th session of the COP will, together with two other matters, be analyzed in this thesis in order to contribute to the Technology Mechanism's operationality: "*128. Underlines the importance of continued dialogue among Parties in 2011 through the Ad Hoc Working Group on Long-term Cooperative Action under the Convention, including on the following matters, with a view to the Conference of the Parties taking a decision at its seventeenth session, in order to make the Technology Mechanism fully operational in 2012: (a) The relationship between the Technology Executive Committee and the Climate Technology Centre and Network, and their reporting lines; (b) The governance structure of and terms of reference for the Climate Technology Centre and Network and how the Climate Technology Centre will relate to the Network, drawing upon the results of the workshop referred to in paragraph 129 below; (d) The potential links between the Technology Mechanism and the financial mechanism.*" The importance of the operationality of the Technology Mechanism is stated by (Latif, 2010): "[w]*hile technology transfer has been a key objective of the United Nations Framework Convention on Climate Change (UNFCCC) since its inception, little had been achieved to operationalize its key provisions in this area. Developing countries have*

been demanding, for many years, concrete steps to strengthen this fundamental 'pillar' of the climate regime […]. From this perspective, the new Technology Mechanism can be an important meeting point for developed and developing countries to work together, in a positive spirit, to accelerate the diffusion and actual deployment of climate friendly technologies." It is important to realize that there is a huge difference between the establishment of a Mechanism and the operationality of a Mechanism. The Technology Mechanism was established in paragraph 117 of chapter B of the first decision of the 16th session of the COP. However, so far, it is not operational yet, which means there is no Technology Mechanism duty station or office where it executes its functions. The objective is to reach a decision on the Technology Mechanism during the 17th session of the COP in 2011 and to work towards making the Technology Mechanism operational in 2012, as laid down in paragraph 128 of chapter B of the first decision of the 16th session of the COP. Let me point out that the Technology Mechanism, as it is perceived by Parties, has no precedent in or outside the UNFCCC in terms of scope, role or approach (Expert Group on Technology Transfer, 2010). The Technology Mechanism should support the entire technology cycle from the point where a technology is being developed until the point it is being diffused in all sectors of the economy to support both adaptation and mitigation (Expert Group on Technology Transfer, 2010). Because of the fact that the Technology Mechanism is unique and that academic literature on it is non-existing, this will be the first attempt to contribute to the UNFCCC's Technology Mechanism from the academic side.

Let me finish by giving an overview of the structure of this thesis. This thesis will be divided into two chapters. The first chapter will give an overview of the evolution of technology development and transfer throughout the sixteen sessions of the Conference of the Parties that eventually led to the establishment of the Technology Mechanism at the latest 16th session of the Conference of the Parties.

The second chapter will then build on the first one. The second chapter will be dedicated to the analyses of five unresolved issues, as already mentioned earlier, to contribute to the operationality of the Technology Mechanism and to enhance the technology development and transfer process.

Chapter 1: The evolution of technology development and transfer throughout the sixteen sessions of the Conference of the Parties from 1995 until 2010

~ Towards the Technology Mechanism ~

Before going through the various sessions of the Conference of the Parties, I will start by defining what is meant by technology, technology development and technology transfer.

Technology refers, in this case, to the term "*Environmentally Sound Technologies*" or ESTs. Chapter 34.1 of Agenda 21 defines ESTs as technologies that "*protect the environment, are less polluting, use all resources in a more sustainable manner, recycle more of their wastes and products, and handle residual wastes in a more acceptable manner than the technologies for which they were substitutes.*" (United Nations, 1992a).

Technology development as a whole is governed by a complex set of processes and it took economists a long time to understand them. Technology development or technical change is classified into two areas: invention and innovation. An invention takes place when something is being done in a completely new way. Innovation then takes place when existing technologies are being modified to make the production of desirable goods and services more efficient (Weyant, 2011).

Technology transfer is defined 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, NGOs and research/education institutions. Therefore, the treatment of technology transfer […] is much broader than that in the UNFCCC or of any particular paragraph of that Convention. The broad and inclusive term "transfer"*

encompasses diffusion of technologies and technology co-operation across and within countries. It covers technology transfer processes between developed countries, developing countries and countries with economies in transition, amongst developed countries, amongst developing countries and amongst countries with economies in transition. It comprises the process of learning to understand, utilise and replicate the technology, including the capacity to choose and adapt to local conditions and integrate it with indigenous technologies." (Intergovernmental Panel on Climate Change, 2000b). As the definition states, both "*hard*" and "*soft*" *technologies*" can be transferred. "*Hard*" technologies can be tools, equipment and machinery. "*Soft*" technologies can be training, software and knowledge spillovers (Challenger, 2002).

Having defined the relevant terms, I will now go through the sixteen sessions of the Conference of the Parties from 1995 until 2010 to show how technology development and transfer evolved in the international climate change arena. This evolution will be based on decisions of sessions of the COP, so the next part can be described as the **legal** evolution of technology development and transfer in the international climate change community.

1.1. The United Nations Framework Convention on Climate Change, 1992 (United Nations, 1992b).

Before going through the sixteen sessions of the Conference of the Parties, I will first start at the very beginning: the establishment of the United Nations Framework Convention on Climate Change. This Convention laid the basis for the 16 sessions of the Conference of the Parties that followed and thus needs to be analyzed first.

As pointed out before, the transfer of technologies is not a modern phenomenon, but goes back to, at least, the 18th century (Inkster, 1996). At the Earth Summit in 1992, the Rio Conventions were signed. The Rio Conventions existed out of five documents. Two of these documents were conventions (the United Nations Framework Convention on Climate Change and the Convention on Biological Diversity. The other three documents were the Rio Declaration on Environment and Development, the Statement on Forest Principles and Agenda 21, which was an action plan on sustainable development to the 21st century and beyond (Freestone, 1994). The objective of the UNFCCC was laid down in article 2 of the United Nations Framework Convention on Climate Change and is to stabilize GHG at a level that would prevent humans from changing the climate: "[t]*he ultimate objective of this Convention and any related legal instruments that the Conference of the Parties may adopt is to achieve, in accordance with the relevant provisions of the Convention, stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time frame 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.*" (United Nations, 1992b). During the Convention, two Convention Bodies were established (United Nations Framework Convention on Climate Change, 2011a): the Conference of the Parties and the Subsidiary Bodies. Article 7.1 of the

Convention established the Conference of the Parties (COP), while article 7.2 of the Convention laid down the mandate of the COP : "[a] *Conference of the Parties is hereby established.*" and "[t]*he Conference of the Parties, as the supreme body of this Convention, shall keep under regular review the implementation of the Convention and any related legal instruments that the Conference of the Parties may adopt, and shall make, within its mandate, the decisions necessary to promote the effective implementation of the Convention.* […]." The Subsidiary Bodies exist out of two bodies, namely the Subsidiary Body for Scientific and Technological Advice (SBSTA) and the Subsidiary Body for implementation (SBI). The Subsidiary Body for Scientific and Technological Advice (SBSTA) was established in article 9.1 of the Convention to provide the COP with information on scientific and technological issues: "[a] *subsidiary body for scientific and technological advice is hereby established to provide the Conference of the Parties and, as appropriate, its other subsidiary bodies with timely information and advice on scientific and technological matters relating to the Convention. This body shall be open to participation by all Parties and shall be multidisciplinary. It shall comprise government representatives competent in the relevant field of expertise. It shall report regularly to the Conference of the Parties on all aspects of its work.*" One of the tasks of the SBSTA, as described in article 9.2(c), touches upon technology transfer: "[i]*dentify innovative, efficient and state-of-the-art technologies and know-how and advise on the ways and means of promoting development and/or transferring such technologies.*" Article 10.1 of the Convention established the Subsidiary Body for Implementation: "[a] *subsidiary body for implementation is hereby established to assist the Conference of the Parties in the assessment and review of the effective implementation of the Convention. This body shall be open to participation by all Parties and comprise government representatives who are experts on matters related to climate change. It shall report regularly to the Conference of the Parties on all aspects of its work.*"

Another important basis for the future sessions of the Conference of the Parties are articles 4.1, 4.5, 4.7, 4.9, 9.2 and 11.1 of the Convention. Article 4 lists the Parties' commitments in general, while articles 4.1, 4.5, 4.7 and 4.9 are dedicated to the

commitments of Parties concerning technology development and transfer in particular. Article 4.1(c) of the Convention states: "[p]*romote 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 not controlled by the Montreal Protocol in all relevant sectors, including the energy, transport, industry, agriculture, forestry and waste management sectors*". Article 4.5 of the Convention obliges developed Parties to promote, facilitate and finance the transfer of ESTs to, especially, developing Parties: "[t]*he 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, to enable them to implement the provisions of the Convention. In this process, the developed country Parties shall support the development and enhancement of endogenous capacities and technologies of developing country Parties. Other Parties and organizations in a position to do so may also assist in facilitating the transfer of such technologies."*. Article 4.7 states the importance of technology transfer as a mean to tackle climate and puts pressure on developed Parties to comply with article 4.5 of the Convention: "[t]*he 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.*" Developed Parties, having to promote, facilitate and finance the transfer of ESTs, cannot just choose which ESTs they prefer to promote and transfer. Instead, they have to answer to the specific needs and special situations of the Least Developed Countries (LDC). This is laid down in article 4.9 of the Convention: "[t]*he Parties shall take full account of the specific needs and special situations of the least developed countries in their actions with regard to funding and transfer of technology.*"Article 9.2 of the Convention states the functions of the SBSTA. Important here are articles 9.2(c) of the Convention:

"[i]*dentify innovative, efficient and state-of-the-art technologies and know-how and advise on the ways and means of promoting development and/or transferring such technologies.*" and articles 9.2(e) of the Convention: "[r]*espond to scientific, technological and methodological questions that the Conference of the Parties and its subsidiary bodies may put to the body.*" In order to enable technology transfer activities, article 11.1 defined a financial mechanism: *"[a] mechanism for the provision of financial resources on a grant or concessional basis, including for the transfer of technology, is hereby defined […]."*

Technology and technology transfer appeared throughout the entire Convention and its importance cannot be neglected. First of all, a Subsidiary Body was established with a focus on, inter alia, technology. Second of all, technology transfer had been defined as one of the legal obligations of developed country Parties. Third of all, a financial mechanism was defined to be sure that technology transfer activities could take place. This conclusion is not surprising, as the need for and importance of technology transfer was already addressed in Chapter 34.4 of Agenda 21 (United Nations, 1992a): "[t]*here is a need for favourable access to and transfer of environmentally sound technologies, in particular to developing countries, through supportive measures that promote technology cooperation and that should enable transfer of necessary technological know-how as well as building up of economic, technical, and managerial capabilities for the efficient use and further development of transferred technology.*"

1.2. Decision 13 of the first session of the Conference of the Parties at Berlin, 1995 (United Nations Framework Convention on Climate Change, 1995).

The 13th decision of the first session of the COP was dedicated to technology transfer. Although the decision itself was very short, the first steps towards a Technology Mechanism were put. Concerning the technology transfer, the Convention secretariat received two major tasks. First of all, it had to make a report about whether developed country Parties were complying with their commitments related to the transfer of ESTs, as laid down in paragraph 1(a) of decision 13 of the first session of the COP: "[t]*o prepare an itemized progress report […] on concrete measures taken by the Parties listed in Annex II to the Convention [developed country Parties], with respect to theircommitments related to the transfer of environmentally sound technologies and the know-hownecessary to mitigate and facilitate adequate adaptation to climate change […]*". Secondly, the Convention secretariat had to collect information and make an inventory/assessment of economically viable ESTs and know-how. This inventory/assessment also had to contain information about the terms under which the transfer of ESTs and know-how could take place. This task was laid down in paragraph 1(b) of decision 13 of the first session of the COP: "[t]*o collect information from relevant sources, from, inter alia, the Commission on Sustainable Development, United Nations agencies, the Intergovernmental Panel on Climate Change and the Subsidiary Body for Scientific and Technological Advice, and to prepare an inventory and assessment of environmentally sound and economically viable technologies and know-how conducive to mitigating and adapting to climate change. This inventory should also include an elaboration of the terms under which transfers of such technologies and know-how could take place.*" As it name already suggests, the SBSTA was to play a major role in technology transfer. The report and inventory/assessment had to be delivered to the COP through SBSTA, as one of its key areas is to promote the development and transfer of ESTs (UNFCCC, 2011). Since the Convention secretariat can only fully report to the COP, if it receives all relevant information from Parties, it is the responsibility of the

Parties to ensure that the Convention secretariat receives all information concerning measures taken by Parties to promote, facilitate and finance technology transfer. For the first time, the term "*operational modalities*" was used. Operational modalities are the "*instruments for delivering support to countries*" (EGTT, 2010) and are thus the tools with which functions are being executed. They do not answer the question of what is being delivered to countries, but how it is being delivered to countries. This term will play a central role in issue three that will be analyzed. Paragraph 4(c) of decision 13 of the first session of the COP states that the COP decided that it would provide continuous advice to improve the operational modalities for the effective transfer of technology. These operational modalities, which were already mentioned in 1995, are still a legally unresolved issue today and was not touched upon during the sixteenth session of the COP.

1.3. Decision 7 of the second session of the Conference of the Parties at Geneva, 1996 (United Nations Framework Convention on Climate Change, 1996a).

By 1996, the Convention secretariat had made the progress report, which reported the measures developed country Parties had taken to promote, facilitate and finance technology transfer, as well as the inventory/assessment of environmentally sound and economically viable technologies and know-how, as laid down in the preamble of decision 7 of the second session of the COP: "[h]*aving considered the progress report presented by the Convention secretariat on commitments related to the transfer of environmentally sound technologies and know-how, as well as the inventory and assessment of environmentally sound and economically viable technologies and know-how conducive to mitigating and adapting to climate change* […]." It proved, however, to be a hard task for the Convention secretariat to compare the different Parties' activities and measures concerning technology transfer. Because of a lack of a standardized reporting system, Parties reported to a different degree and breadth, which made it hard to compare their activities. At that point, the Convention secretariat could not tell which country party had done more to promote, facilitate and finance technology transfer and whether country Parties had complied with their commitments. Paragraphs 45 and 46 of the second compilation and synthesis of first national communications from Annex I Parties (document FCCC/CP/1996/12) stated this problem of heterogeneous reporting: "[d]*ue to the varying degree and breadth of reporting it was not possible to quantify aid flows supportive of the Convention at an aggregate level and it was therefore difficult to draw a comparative summary of the comprehensiveness of activities.*" and *"*[t]*he information differed considerably in format, thoroughness and level of detail and consequently a comprehensive portrayal of technology transfer activities is not possible at this stage."* (United Nations Framework Convention on Climate Change, 1996b). To solve this problem, paragraph 2(a) of decision 7 of the 2nd session of the

COP requested the Convention secretariat to make suggestions to improve the reporting format: "[t]*o further enhance its progress reports on access to, and the transfer of, environmentally sound technology […] make suggestions with regard to further improvements in the format for information on existing environmentally sound technologies and know-how from Annex II Parties* [developed country Parties]." In decision 13 of the 1st session of the COP, it was decided that country Parties were responsible for the information flow on technology transfer to the Convention secretariat. A year later in decision 7 of the 2nd session of the COP, the need was expressed to homogenize the information flow coming from Parties. Moreover, in order to successfully prepare reports, the Convention secretariat was requested to involve experts from Parties in paragraph 2(d) of decision 7 of the 2nd session of the COP: "[t]*o expedite the preparation of reports on adaptation technology and the terms of transfer of technology and know-how conducive to mitigating and adapting to climate change, and, in preparing these reports, to draw on nominees with expertise in these fields from Parties* […]". What the Convention secretariat did conclude from the national reports was that although country Parties discussed the provision of assistance in the field of capacity building, which is being referred to as "*soft*" technologies, the actual assistance provided was in the form of "*hard*" technologies, so it was the transfer of the actual equipment such as machinery and technologies that took place, as stated in paragraphs 46 and 47 of the second compilation and synthesis of first national communications from Annex I Parties (document FCCC/CP/1996/12): "[t]*he bilateral cooperation activities reported were often related to "hard" technologies rather than to the "soft" technologies of capacity building, training and research.*" and "[t]*he majority of Parties in their discussions on bilateral channels of assistance either explicitly or implicitly touched on assistance in capacity building.*" (United Nations Framework Convention on Climate Change, 1996b). Because of the fact that bilateral cooperation activities were mostly related to "*hard*" technologies instead of to "*soft*" technologies, paragraph 2(c) of decision 7 of the 2nd session of the COP requested the Convention secretariat to take action to identify the existing technology information activities on the one hand and the information needs on the other. Based on this information, the Convention

secretariat would then develop options, such as the resources required, to improve existing information centres and to sep up new additional ones. These centres then ought to be readily accessible to developing country Parties and provide information fast: "[t]*o identify existing technology information activities and needs, with a view to developing options for building on existing specialized information centres and networks to provide fast and one-stop databases relating to state-of-the-art, environmentally sound and economically feasible technology and know-how in a manner that would be readily accessible to developing countries. The options should consider the need and resources required for improving existing, and setting up additional, technology information centres and networks.*" Basically, the capability of developing country Parties to undertake mitigation activities stands or falls with, inter alia, the provision of information. An example would be that developing country A has the ability to cut its greenhouse gas emissions by using solar panels. Thanks to technology transfer, the solar panels were successfully delivered in country A. However, people in country A do not know how to install and use these solar panels, so at this point, these solar panels are useless and are not beneficial to anyone. Thus, people in country A need specific technical skills through, for example, short/long-term trainings given by specialists, consultants or consultancy agencies (Organisation for Economic Co-operation and Development, 2002a), providing people in country A with the needed information on how to install and maintain solar panels. A couple of years later though, a team of local specialists might find out that hydropower in country A would have generated more "*green*" energy than solar panels at a lower cost. The government however was not aware of this and thus its choice to opt for solar panels was an uninformed one. In order to avoid such scenarios and ensure that developing countries could access know-how and information on environmentally sound and economically feasible technology easily, the possibility was mentioned to rely on existing centres and networks, which provide information and fast, one-stop databases (paragraph 2(c) of decision 7 of the 2nd session of the COP). Agenda 21 (United Nations, 1992a) already identified the need of scientific and technological information in chapters 34.8 and 34.9: "[t]*he primary goal of improved access to technology information is to enable informed*

choices, leading to access to and transfer of such technologies and the strengthening of countries' own technological capabilities." and "[d]*eveloping countries would also need to have access to the know-how and expertise required for the effective utilization of the aforesaid technologies.*" At this point, two of the three organs of the Technology Mechanism were born: centres and networks. The "*watchdog*" in the entire process is the Subsidiary Body for Implementation (SBI). Its task is to evaluate and report on the activities of technology transfer by developed country Parties to the COP to make sure country Parties are complying with their commitments (paragraph 3 of decision 7 of the 2nd session of the COP) and to estimate the overall effectiveness of the Convention (United Nations Framework Convention on Climate Change, 2011a). At this stage, technology transfer was well born. Developed country Parties had to provide the Convention secretariat with information on measures taken for technology transfer (paragraph 4(a) of decision 7 of the 2nd session of the COP) and developing country Parties on technology and know-how needs (paragraph 4(g) of decision 7 of the 2nd session of the COP), the information was to be homogenized, the Convention secretariat had access to a pool of experts from country Parties to extend its knowledge, information on ESTs would become more spread thanks to centers and networks and the SBI would check, whether the country Parties were actually involved in the technology transfer process. To ensure the effective transfer of technology, the COP also urged country Parties in paragraph 4(d) of decision 7 of the 2nd session of the COP to improve the enabling environment, such as the removal of barriers, for activities of the private sector that advance technology transfer: "[...] *to improve the enabling environment, including the removal of barriers and the establishment of incentives, for private sector activities that advance the transfer of technologies to address climate change and its adverse impacts.*". Enabling environment can be defined as: "*the combination of contextual elements allowing progress to be made towards a clearly defined goal.*"(Akhtar-Schuster, Thomas, Stringer, Chasek, & Seely, 2011). This means that in order to have an enabling environment, institutional, financial, legal and science-policy challenges have to be dealth with (Akhtar-Schuster, et al., 2011). In case of technology transfer, six challenges have to be dealt with when creating an enabling environment (United

Nations Framework Convention on Climate Change, 2011b). First of all, there should be national institutions that deal with technology innovation. Second of all, there should be "*involvement of social and managing technologies in a macroeconomic policy framework*" (United Nations Framework Convention on Climate Change, 2011b). Third of all, sustainable markets for ESTs should be created and maintained. Fourth of all, there should be national institutions that introduce or enforce codes and standards and protect intellectual property rights. Fifth of all, research and development in the field of technologies should be supported. Sixth of all, means to address equity issues have to be available. According to the IPCC's Fourth Assessment Report (Intergovernmental Panel on Climate Change, 2007a), enabling environments are needed both in developing as in developed country Parties for the successful transfer of ESTs. Every barrier to technology transfer, for example the lack of incentives that promote investments in ESTs, is to be identified and tackled in order to facilitate the technology transfer process and to turn the "*disabling*" environment into an enabling environment. David Peniket from ICE Futures Europe comments on this by saying: "[i]*f you want more investment, he suggests, you lower emissions caps, meaning fewer permits, higher prices and a better reward for those who avoid polluting.*" (Kahya, 2010). WIPO (World Intellectual Property Organization, 2010a) calls the private sector "*a key player*" in ESTs' investments and innovation in general. On the one hand, it would make sense to invest a lot of money in a green growth, because the benefits can be expected to be higher than the costs of R&D and implementing ESTs. Benefits could be modernized infrastructure, lower energy costs, new jobs, less employees falling ill because of the impacts of climate change (for example asthma). However, private investors look at it from another side as well. They want to be sure that they will make profit when investing money and are highly risk-averse. They will continue to invest in a green sector only if this sector is profitable. So speculation by investors is crucial for the development of ESTs. The problem is that the green sector is an under-regulated market. What if ESTs are developed, but not being bought and used? In this case, the investors will loose their money and will stop to invest. The task of the international community would then be to introduce stronger pollution controls and fines if pollution limits are

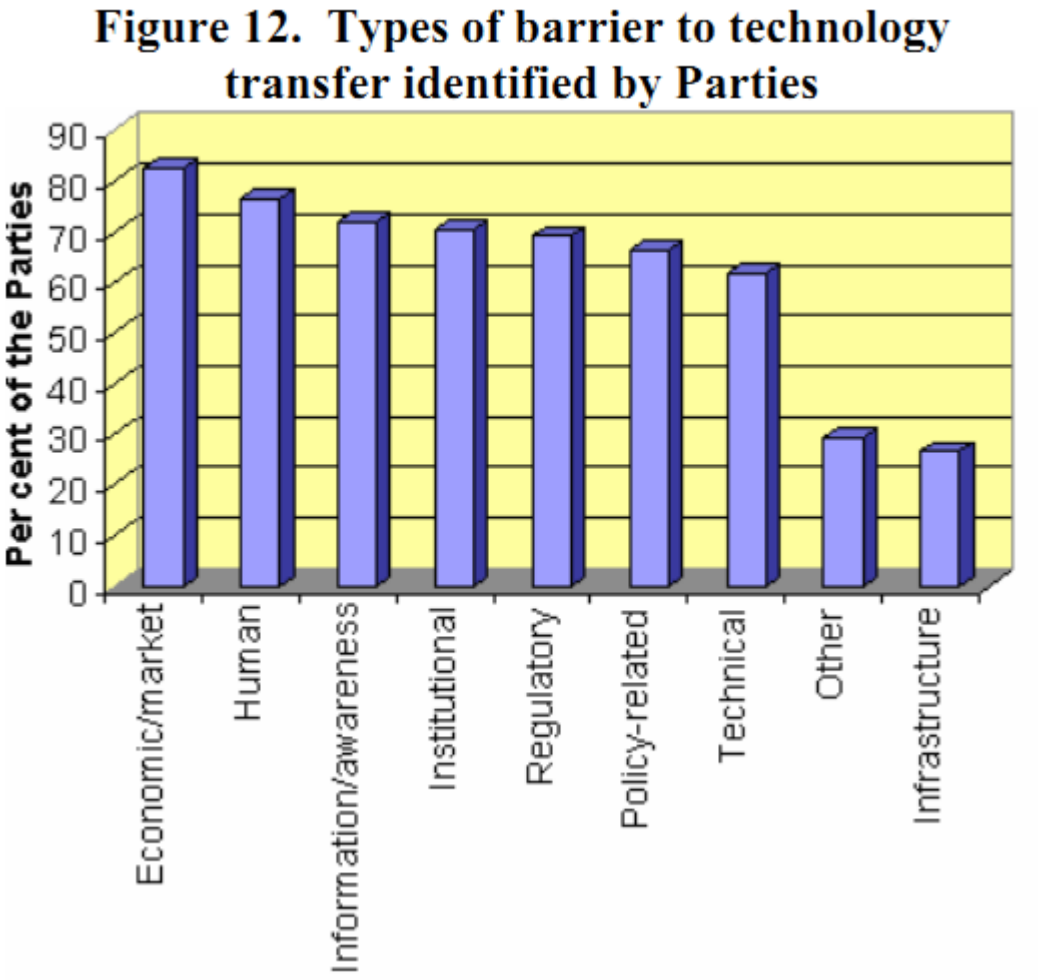
exceeded. In this case, the demand for cleaner, more fuel-efficient engines will increase and so will the profits of the investors (World Intellectual Property Organization, 2010a). So the problem in 1996 and still today is that the private sector is not doing as much as it should, because incentives are lacking (Kahya, 2010). This problem was already identified in 1992 and was noted in Agenda 21 (United Nations, 1992a), which addressed the need for cooperation between the private and public sector, which are both important suppliers of ESTs.

1.4. Decision 9 of the third session of the Conference of the Parties at Kyoto, 1997 (United Nations Framework Convention on Climate Change, 1998)

In 1997, the important role of the private and public sector in the development and dissemination of ESTs had been further underlined. The "*enabling environment issue*" described in decision 7 of the second session of the Conference of the Parties was mentioned again as the need for "*continued efforts by Parties to remove existing market barriers to technology dissemination*" was recognized (preamble of decision 9 of the third session of the COP). For the first time, the Global Environment Facility (GEF) was mentioned in a COP decision related to technology transfer in paragraph 2(b) of decision 9 of the third session of the COP: "[t]*o consult with the Global Environment Facility […] and solicit information on their capabilities and abilities to support the work of (an) international technology information centre(s), as well as national and regional centres […].*" The GEF provides grants to developing countries and economies in transition to support projects which are related to, inter alia, climate change. In this case, the role of the GEF would be to support the work of international technology information centers (see decision 7 of the 2nd session of the COP). The support the GEF offers is financial. Since its foundation in 1991, the GEF has been financing the transfer of ESTs to help developing countries to tackle climate change. These grants and invesments by the GEF go up to several billion dollars. "*GEF has invested about $250 million annually in energy efficiency; renewable energy; emerging, low-carbon, energy-generating technologies; cost-effective short-term response measures; and sustainable urban transport. The GEF has allocated a total of nearly $3 billion to support climate change activities since its inception, and leveraged more than $15 billion in co-financing*" (Global Environment Facility, 2010d). Out of 149 developing countries and economies in transition (International Monetary Fund, 2010), almost 100 of them are being supported by the GEF in their technology transfer activities (Global Environment Facility, 2010d). Paragraph 3 of decision 9 of the third session of the COP builds

further on these international technology information centers and financial issues by requesting the SBI to consider options to fund such information centers and increase support: "[r]*equests the Subsidiary Body for Implementation to consider options for funding (an) international technology information centre(s) and enhancing support for national or regional centres.*" Moreover, the SBSTA should report any conclusions concerning information centers and enhancing support for national and regional centers to the SBI, as laid down in paragraph 4 of decision 9 of the third session of the COP: "[r]*equests the Subsidiary Body for Scientific and Technological Advice to forward any conclusions regarding technology information centres and enhancing support for national or regional centres to the Subsidiary Body for Implementation for consideration.*" In this third COP, the emphasis clearly lies on technology information centers and its funding in order to tackle the information problem mentioned in decision 7 of the 2nd session of the COP. The lack of information is one of the six barriers in the technology transfer process identified by the IPCC (Intergovernmental Panel on Climate Change, 2000a) and also states that barriers may arise at each stage of the technology transfer process. Different barriers pose different problems to different sectors, also depending whether the country's economy is developed, emerging or developing. The first barrier is the political and economic one, the most frequently identified barrier to the transfer of ESTs, identified by 82% of the Parties (paragraph 126 of the second synthesis report on technology needs identified by Parties not included in Annex I to the Convention) (United Nations Framework Convention on Climate Change, 2009b). This may include the lack of financial means, the lack of investors and because of this FDI. The importance of FDI in technology transfer is described as follows: "*increasing FDI […] demonstrates that many ESTs can diffuse rapidly without direct government action"* (Intergovernmental Panel on Climate Change, 2000a). This issue is addressed in paragraph 5(a) of decision 9 of the third session of the COP, in which Parties are asked to create an enabling environment to stimulate private sector investments in ESTs and their transfer: "[u]*rges Parties* […] [t]*o create an enabling environment to help further stimulate private-sector investment in, and transfer of, environmentally sound technologies* [...]". Other examples of this third barrier are the

existence of environmentally unsound technologies, which are cheaper. High transportation costs, uncertainty in prices due to governmental interventions in the domestic market, the absence of a central decision-making entity, bureaucracy, corruption (regulations that make it impossible for ESTs to enter the market successfully), the absence of a legal system that provides incentives for the use of ESTs, political instability etc. (Intergovernmental Panel on Climate Change, 2000a). The second barrier is described as insufficient human capabilities and is the second most frequently identified barrier to technology transfer by 76% of the Parties (United Nations Framework Convention on Climate Change, 2009b). The percentages being provided by the UNFCCC are being represented by the chart below:



(United Nations Framework Convention on Climate Change, 2009b)

Figure 1: Types of barriers to technology transfer identified by Parties

The IPCC (Intergovernmental Panel on Climate Change, 2000a) considers human capacity as essential at every stage of the technology transfer process: "[a]*dequate human capacity is* ***essential*** *at every stage of every transfer process. The transfer of many ESTs demands a wide range of* ***technical, business, management and regulatory skills****. The availability of these skills locally can enhance the flow of international capital, helping to promote technology transfer."* (Intergovernmental Panel on Climate Change, 2000a). However, this essential dimension of technology transfer seems to lack in 66% of the questioned Parties by the UNFCCC. First of all, there might be a lack of staff in general and of skilled personnel in specific to prepare

technology transfer activities and projects, to install and maintain the ESTs in operation etc. Second of all, the ability to put trust in these new technologies may lack, because of existing traditions and values. The consequence is that there will be no social acceptance and therefore, the ESTs will not be implemented. A way to overcome this barrier is to recruit national experts. People who know the traditions and values on the one hand and the benefits and utilization of the ESTs on the other. However, the financial means to employ these experts on a full-time basis may lack and also the capability of choosing the right experts (United Nations Framework Convention on Climate Change, 2009b). The third barrier is the lack of information and awareness or the lack of access to information and is identified as a barrier to technology transfer by 70% of the Parties. This barrier may pose a problem for various stakeholders (United Nations Framework Convention on Climate Change, 2009b), who are looking for answers to their questions: which ESTs are available? Where do I find the relevant technical data? Which ESTs will have the biggest benefits at the lowest cost in a specific situation? Another problem may appear when there is a lack of awareness about the various options for mitigation and adaptation. These problems are partially addressed by the international technology information centers, which are supported by the GEF. The fourth barrier is the lack of understanding of local needs, which can be put under the information and awareness barrier. To overcome this barrier, country Parties have to identify technology criteria for assessment when doing a Technology Needs Assessment (TNA) (United Nations Development Programme, 2010). A Technology Needs Assessment is being defined as: "[t]*echnology needs assessment entails the identification and evaluation of technical means for achieving specified ends. From a climate change and developmental perspective, TNA prioritises technologies, practices, and policy reforms that can be implemented in different sectors of a country to reduce greenhouse gas emissions and/or to adapt to the impacts of climate change by enhancing resilience and/or contributing to sustainable development goals.*" (United Nations Development Programme, 2010). The technology criteria identification is the second step in the TNA-process, which looks at three factors: the contribution to development goals, the contribution to climate change mitigation or adaptation and

the market potential. The contribution to development goals involves an analysis of the benefits ESTs would bring in terms of food security, health improvements, protection from natural disasters, social acceptability and the potential for reducing non-climate (United Nations Development Programme, 2010). The contribution to climate change mitigation includes, for example, the GHG emission reduction potential (United Nations Development Programme, 2010). The contribution to the market potential includes, for example, the commercial availability of the technology and the technology's replicability , applicability , adaptability and potential scale of utilisation (United Nations Development Programme, 2010). The fifth barrier is described as business limitations, which is related to the first economic barrier. An example could be the risk aversion attitude in financial institutions, that are unwilling to invest in the development, transfer and implementation of ESTs as these investments are coupled to risks as already described above. The sixth barrier is the institutional one and is identified as a barrier to technology transfer by 69% of the Parties (United Nations Framework Convention on Climate Change, 2009b). Examples are insufficient cooperation between the government and other stakeholders, a lack of R&D programmes and funds, a lack of technological and environmental standards and institutions to check them etc. To tackle these barriers, the Convention secretariat was requested to evaluate them as laid down in paragraph 2(c) of decision 9 of the third session of the Conference of the Parties: "[t]*he Conference of the Parties […] [r]equests the Convention secretariat […] [t]o consider specific case studies […] with the aim of evaluating barriers to the introduction and implementation of environmentally sound technologies and know-how, and of promoting their practical application* […]." Finally, paragraph 5(a) of decision 9 of the third session of the Conference of the Parties urged cooperation from country Parties in terms of creating an enabling environment to boost private sector investments "[t]*o create an enabling environment to help further stimulate private-sector investment in, and transfer of, environmentally sound technologies*" and to improve the reporting efforts when writing national communications on technology needs and on technology transfer activities as stated in paragraph 5(b) of decision 9 of the third session of the COP "[t]*o improve reporting in national*

communications on technology needs and technology transfer activities".

The "*principal achievements*" of the third session of the Conference of the Parties, which are important for the sequel of this thesis are the limitations and reductions of GHG-emissions and the establishment of so-called "*flexible mechanisms*" as stated by (Bettelheim & d'Origny, 2002): "[t]*he principal achievements of the third COP held in Kyoto in December 1997 were, first, to agree that Convention Annex I countries* [developed country Parties] *would be bound to quantitative GHG-emissions limitations and reductions commitments […] for the first commitment period 2008-2012 and, second, to provide flexible mechanism to help achieve these commitments in an economically efficient manner.*" This was officially laid down in article 3.1 of the Kyoto Protocol to the UNFCCC, which states: "[t]*he Parties included in Annex I* [developed country Parties] *shall, individually or jointly, ensure that their aggregate anthropogenic carbon dioxide equivalent emissions of the greenhouse gases listed in Annex A do not exceed their assigned amounts, calculated pursuant to their quantified emission limitation and reduction commitments inscribed in Annex B and in accordance with the provisions of this paragraph, with a view to reducing their overall emissions of such gases by at least 5 per cent below 1990 levels in the commitment period 2008 to 2012.*" In contrary to developed country Parties, developing country Parties are not bound by GHG-emissions limitations and reductions as stated in the preamble of decision 1 of the third session of the Conference of the Parties: "[r]*ecalling also that, according to the Berlin Mandate, the process will not introduce any new commitments for Parties not included in Annex I* [...]". There is no single paragraph that lays down the establishment of these so-called "*flexible mechanisms*", but there are three paragraphs devoted to these three flexible mechanisms. Article 6 of the Kyoto Protocol to the UNFCCC is devoted to "*Joint Implementation*" or "*JI*", article 12 of the Kyoto Protocol to the UNFCCC is devoted to the "*Clean Development Mechanism*" or "*CDM*" and article 17 of the Kyoto Protocol to the UNFCCC is devoted to "*Emissions Trading*".(Bettelheim & d'Origny, 2002)Joint Implementation and the Clean Development Mechanism work in a similar way. "*An Annex I legal (public or private) entity* [from a developed country Party] *finances emissions*

reductions or removals in another Annex I country (JI), or non-Annex I country [developing country Party] *(CDM) and acquires emissions-reduction units (ERUs) for JI or certified emissions reductions (CERs) for CDM projects that count towards fulfilling the financing country's national emissions-reduction commitment.*" (Bettelheim & d'Origny, 2002). I will go through the CDM more in depth as it is a mechanism that joins developed and developing country Parties. Article 12.2 of the Kyoto Protocol to the UNFCCC says: "[t*]he purpose of the clean development mechanism shall be to assist Parties not included in Annex* I [developing country Parties] *in achieving sustainable development and in contributing to the ultimate objective of the Convention, and to assist Parties included in Annex I* [developed country Parties] *in achieving compliance with their quantified emission limitation and reduction commitments under paragraph 3*." According to Bettelheim & d'Origny (2002), the CDM was created under pressure, mainly from the United States to involve developing country Parties in achieving the Convention's objective. The wish of involving developing country Parties is not surprising. According to the OECD (Organisation for Economic Co-operation and Development, 2002b), developing countries would account for about 70% of the increase in global CO_2 emissions between 2002 and 2030. Most of these CO_2 emissions come from the burning of fossil fuels. Therefore, transfer and deployment of ESTs that emit less or no CO_2 will be heavily required. Out of the three existing flexible mechanisms, the CDM is the only mechanism that involves developing country Parties in global mitigation: "[t*]he stated purpose of the CDM is to reduce compliance costs for industrialized countries while encouraging sustainable development in poorer nations through the* ***introduction of more environmentally friendly technologies to developing countrie****s.* ***Technology transfer is, therefore, a crucial component of clean development in genera****l and its governance can be expected to influence the extent to which its potential is realized*." (Wang, 2010). Without technology transfer to developing country Parties, CDM-projects cannot be realized and thus emission reductions cannot be realized in developing countries. Keeping the increase of global CO_2 emissions of 70% in mind, coming from developing country Parties, CDM-projects are crucial mitigation activities. Since 2003, there are 3.145 CDM-projects

registered, while another 53 are proposed that are estimated to be credited with more than 2,7 billion tons of CO_2 emission reductions (United Nations Framework Convention on Climate Change). 36% of these projects claims technology transfer and represent about 59% of the estimated emission reductions (United Nations Framework Convention on Climate Change, 2008a).

1.5. Decision 4 of the fourth session of the Conference of the Parties at Buenos Aires, 1998 (United Nations Framework Convention on Climate Change, 1999b)

Decision 4 of the fourth session of the Conference of the Parties put special emphasis on the developing countries' commitments and needs. The providing of assistance as stated in paragraph 4 of decision 4 of the fourth session of the Conference of the Parties would help developing country Parties to contribute to the ultimate objective of the Convention as stated in paragraph 1 of decision 4 of the fourth session of the Conference of the Parties: "[a]*grees that strengthening the capacities and capabilities of developing country Parties to address climate change will help these Parties to contribute to the ultimate objective of the Convention and to achieve sustainable development* [...]". Paragraph 3 of decision 4 of the fourth session of the Conference of the Parties requested developed country Parties to take "*practicable steps*" to promote, facilitate and finance the transfer of ESTs and know-how to developing country Parties and to support capacity-building and institutions in developing country Parties to enable this technology transfer: "[r]*equests [developed country] Parties (a) To take all practicable steps to promote, facilitate and finance, as appropriate, the transfer of environmentally sound technologies and know-how to developing country Parties and their access thereto; (b) To support capacity-building and the strengthening of appropriate institutions in developing countries to enable the transfer of environmentally sound technologies and know-how* [...]". Paragraph 4 of decision 4 of the fourth session of the Conference of the Parties also urged developed country Parties to provide developing country Parties with assistance in terms of building institutional frameworks, capacity for adaptation and in strengthening endogenous capacities: "[...] *requests [developed country] Parties […] (a) To assist developing country Parties in their efforts to build capacity and institutional frameworks to improve energy efficiency and utilization of renewable energies through multilateral and bilateral cooperative efforts; (b) To provide assistance to developing country Parties to build capacity for sustainable*

management, conservation and enhancement, as appropriate, of sinks and reservoirs of all greenhouse gases not controlled by the Montreal Protocol, including biomass, forests and oceans as well as other terrestrial, coastal and marine ecosystems; (c) To assist developing country Parties to build capacity to adapt to the adverse effects of climate change; (d) To assist developing country Parties to strengthen their endogenous capacities and capabilities in the areas of technological and socio-economic research and systematic observation relevant to climate change and its associated adverse effects [...]". Developed country Parties were also asked to provide developing country Parties with a list of publicly owned ESTs and know-how related to adaptation and mitigation as stated in paragraph 7(b) of decision 4 of the fourth session of the Conference of the Parties: "[...] [developed country Parties] *to provide, as appropriate, for reference by developing country Parties, a list of environmentally sound technologies and know-how related to adaptation to and mitigation of climate change that are publicly owned* [...]". Not only developed country Parties, but also the Convention secretariat was asked to support the transfer of ESTs by strenghtening its capacity-building activities in developing country Parties, as laid down in paragraph 12(c) of decision 4 of the fourth session of the Conference of the Parties: "[r]*equests the Convention secretariat […] [t]o further strengthen its activities in support of capacity-building in developing country Parties with regard to the transfer of environmentally sound technologies and know-how.*" An important aspect lied on the financial side, which was already laid down in article 4.3 of the Convention in 1992: "[t]*he developed country Parties […] shall provide new and additional financial resources to meet the agreed full costs incurred by developing country Parties in complying with their obligations under paragraph 12, paragraph 1. They shall also provide such financial resources, including for the transfer of technology, needed by the developing country Parties to meet the agreed full incremental costs of implementing measures […].*" In decision 4 of the fourth session of the Conference of the Parties, the international community went one step further by also including international organizations in the technology transfer process. First of all, they are being asked to provide financial means to developing countries to meet their incremental costs as laid down in paragraph 2 of decision 4 of

the fourth session of the Conference of the Parties: "[e]*ncourages all relevant international organizations to mobilize and facilitate efforts to provide financial resources needed by developing country Parties to meet their agreed incremental costs, including development and transfer of technologies* [...]". Second of all, Parties and international and non-governmental organizations were asked to identify projects and programmes to improve the diffusion and implementation of ESTs as laid down in paragraph 8 of decision 4 of the fourth session of the Conference of the Parties: "[i]*nvites all Parties and interested international and non-governmental organizations to identify projects and programmes incorporating cooperative approaches to the transfer of technologies which they believe can serve as models for improving the diffusion and implementation of clean technologies under the Convention* [...]". Last, but not least, the Convention secretariat was asked to prepare a budget for the next two years, so until 2000. When preparing this budget, priority had to be given to the capacity-building of Parties to stimulate technology transfer. This also included assessing and synthesizing information on ESTs and know-how as laid down in paragraph 12(b) of decision 4 of the fourth session of the Conference of the Parties: "[i]*n preparing the budget for the next biennium, to give priority to activities on the theme of building the capacity of Parties to enhance the transfer of environmentally sound technologies, as defined in the secretariat progress report, including assessing and synthesizing information on environmentally sound technologies and know-how, and in so doing to identify specific tasks* [...]". Important for decision 9 of the fifth session of the Conference of the Parties was the task of establishing a consultative process by the SBSTA, as laid down in paragraph 9 of decision 4 of the fourth session of the Conference of the Parties. The purpose of this consultative process was to consider a list of questions and issues and to make recommendations on how they should be addressed. These issues could come either from Parties and/or from the Convention secretariat's progress report on technology transfer: "[r]*equests the Chairman of the SBSTA to establish a consultative process to consider the list of issues and questions contained in the annex to this decision, as well as any additional issues and questions subsequently identified by Parties, and to make recommendations on how they should be addressed in order to achieve*

agreement on a framework for meaningful and effective actions to enhance implementation of paragraph 4.5 of the Convention." The issues and questions were divided into four categories: practical steps to promote, facilitate and finance, as appropriate, transfer of, and access to, environmentally sound technologies and know-how; support for the development and enhancement of endogenous capacities and technologies of developing country Parties; assistance in facilitating the transfer of environmentally sound technologies and know-how; other questions. An issue to be addressed in the field of practical steps to promote, facilitate and finance, as appropriate, transfer of, and access to, environmentally sound technologies and know-how was to consider mechanisms for technology transfer, which would eventually be established paragraph 117 of chapter B of decision 1 of the sixteenth session of the Conference of the Parties as the Technology Mechanism. The other organs of the Technology Mechanism, being the centre and the network, were also issues touched upon in the consultative process (Annex of decision 4 of the fourth session of the Conference of the Parties): access to relevant technical, legal and economic information at centres was to be promoted and enhanced and a consensus on practical next steps to improve existing technology centers and networks, in order to accelerate the diffusion of ESTs was to be developed. Once the issues and questions were identified and analyzed, the chairman of SBSTA was then requested to report on the outcome of this consultative process to the SBSTA at its 11th session in order to recommend a decision for adoption by the COP at its 5th session, as laid down in paragraph 10 of decision 4 of the fourth session of the Conference of the Parties: "[...] *requests the Chairman of the SBSTA to report on the outcome of the consultative process to the SBSTA at its eleventh session, with a view to recommending a decision for adoption by the Conference of the Parties at its fifth session* [...]".

1.6. Decision 9, 10 and 11 of the fifth session of the Conference of the Parties at Bonn, 1999 (United Nations Framework Convention on Climate Change, 2000a)

At this fifth session of the Conference of the Parties, there were three important decisions, related to technology transfer, made, being decisions 9, 10 and 11. Decision 9 of the fifth session of the Conference of the Parties deals with the development and transfer of technologies in general and reports on the status of the consultative process more in particular. Decision 10 deals with capacity-building in developing countries, while decision 11 deals with capacity-building in countries with economies in transition. Important thus is the recognition that a difference is being made in terms of capacity-building depending on the degree of economic development.

Decision 9 is based on the conclusions of the 11th session of the SBSTA (United Nations Framework Convention on Climate Change, 2000b). First of all, the consultative process was extended until the sixth session of the Conference of the Parties, because of two further workshops being organized in Asia and the Pacific Region in January 2000 and in Latin America and the Caribbean region in March/April 2000 and to give the Chairman of SBSTA the time to report on their outcome, as laid down in paragraph 2 of decision 9 of the fifth session of the Conference of the Parties and paragraph 75(c) of the eleventh session of the SBSTA: "[a]*grees to extend, until its sixth session, the consultative process referred to in decision 4/CP.4 and to request the Chairman of the SBSTA, with the assistance of the secretariat, to complete the regional workshops by early 2000, resources permitting, and to report on the outcome of the regional workshops in the Asia and the Pacific region and in the Latin America and the Caribbean region at the twelfth session of the SBSTA* […]". Furthermore, the Chairman of the SBSTA was requested to hold a meeting with experts and Representatives before its twelfth session to consider the progress of the consultative process, as laid down in paragraph 3 of decision 9 of the fifth session of the Conference of the Parties and paragraph 75(h) of the eleventh

session of the SBSTA: "[r]*equests the Chairman of the SBSTA […], to hold a meeting with experts and representatives of Parties before the twelfth session of the SBSTA […] to consider the progress of the consultative process* [...]" and its outcome as stated in paragraph 4 of decision 9 of the fifth session of the Conference of the Parties and paragraph 75(j) of the eleventh session of the SBSTA: "[i]*nvites the Chairman of the SBSTA to hold consultations among Parties in August 2000 regarding the outcome of the consultative process* [...]". The outcome of the consultative process was then requested to be made available at the thirteenth session of the SBSTA and to make a draft text with the purpose to be adopted by the COP at its sixth session, as laid down in paragraph 5 of decision 9 of the fifth session of the Conference of the Parties and paragraph 75(k) of the eleventh session of the SBSTA: "[r]*equests the Chairman of the SBSTA […] to make available at the thirteenth session of the SBSTA a report on the outcome of the consultative process incorporating a draft text on a framework for meaningful and effective actions to enhance the implementation of paragraph 4.5 of the Convention, with a view to adopting a decision at its sixth session* [...]".

This decision 9 of the fifth session of the Conference of the Parties indicates the importance of the consultative process and the need, expressed by Parties, to clarify issues and questions concerning technology transfer.

Decision 10 deals with capacity-building in developing countries or "*soft technology*". The base line is that capacity-building activities are conducted by the UNFCCC, International Organizations, bilateral and multilateral institutions etc., but that the push should be country-driven, as stated in the preamable of decision 10 of the fifth session of the Conference of the Parties: "[u]*nderlining that capacity-building for developing countries must be country-driven, reflecting their national initiatives and priorities, and that it is primarily to be undertaken by developing countries and in developing countries in partnership with developed countries, in accordance with the provisions of the Convention* […]". It is, for example, the responsibility of individual country Parties to promote conditions, which promote the development of human, institutional and technical capacity and to create an enabling environment for private sector investments, which then stimulates capacity-building

activities (preamble of decision 10 of the fifth session of the Conference of the Parties). Another example is the advice to use national experts to do studies and implement projects at national level, as laid down in paragraph 1 (e)(iv) of decision 10 of the fifth session of the Conference of the Parties: "[u]*sing […] national experts or consultants to undertake studies and to design, and implement projects at the national level* [...]". When capacity-building activities then actually do take place, they should be assessed to determine their effectiveness, gaps and weaknesses, as laid down in paragraph 1(c) of decision 10 of the fifth session of the Conference of the Parties: "[e]*xisting capacity-building activities and programmes should be comprehensively assessed to determine their effectiveness and to identify gaps and weaknesses in the ongoing efforts* [...]". The assessment could include the strengthening of institutions, like centers, which undertake capacity-building activities, to enable them to collect, analyse and provide information on climate change, which is relevant to policy- and decision-making, as mentioned in paragraph 1 (e)(ii) of decision 10 of the fifth session of the Conference of the Parties: "[b]*uilding expertise and strengthening institutions, including collaborating centres, in developing countries which can undertake capacity-building activities at the national, subregional and regional levels, so as to enable them to collect, analyse and provide information on climate change relevant to policy- and decision-making, using state-of-the-art information technology* […]". Centres are thus the information collectors and providers, providing and spreading information on ESTs on the one hand and on climate change policy and decision-making on the other. In order to be aware of the capacity-building activities and needs, developing countries were asked to provide information on capacity-building needs and priorities, while International Organisations and OECD Party members were asked to provide information on their capacity-building activities concerning climate change, as stated in paragraphs 2, 3 and 4 of decision 10 of the fifth session of the Conference of the Parties. The secretariat was then asked to bring all capacity-building needs from developing countries and activities by developed countries together in a printed and electronic version before the 12th sessions of the Subsidiary Bodies, as laid down in paragraphs 5(a) and 5(b) of decision 10 of the fifth session of the Conference of the Parties.

Decision 11 of the fifth session of the Conference of the Parties, dealing with capacity-building in countries with economies in transition, is more or less a copy of decision 10 of the fifth session of the Conference of the Parties, with the only difference that it is less extensive. In decision 10 of the fifth session of the Conference of the Parties, there are more challenges to be dealt with, as the preamble of decision 11 of the fifth session of the Conference of the Parties states: "*[r]ecognizing that the constraints to implementing the Convention in **developing countries** include the **lack** of financial resources and appropriate institutions; the **lack** of access to necessary technologies and know-how, including information technology; and the **lack** of regular opportunities to exchange information and views among developing countries [...]*". For example, UNFCCC national focal points have the task to handle climate change in developing countries and to play an important role in the assessment mentioned above, as laid down in paragraph 1(d) of decision 10 of the fifth session of the Conference of the Parties. For countries with economies in transition, there are no UNFCCC focal points, although assessments do take place, as laid down in paragraph 1(b) of decision 11 of the fifth session of the Conference of the Parties. The reason why less assistance is foreseen for countries with economies in transition is because these countries are part of the Annex I Parties to the Convention, which means they are being perceived and treated as a developed country. The WTO describes economies in transition as "[c]o*untries moving from centrally planned to market-oriented economies. These countries - which include China, Mongolia, Vietnam, former republics of the Soviet Union, and the countries of Central and Eastern Europe - contain about one-third of the world's population.*" (World Trade Organization, 2004). There are two reasons why transition economies are being perceived and treated as developed country Parties. First of all, reaping the benefits of globalization, all transition economies have been growing, at different rates, since the beginning of the new century: "[...] *at the onset of the new century all transition economies are already growing albeit at different rates. So the question is no longer how to stop recession and depression, but how to accelerate the rate of growth and sustain it at the highest possible level for the longest possible period.*" (Kolodko, 2001). Because of this economic growth, transition economies will have

more resources available to undertake mitigation activities than developing country Parties. Moreover, if the economic growth of a transition economy is rapid, it will be considered as an emerging economy. A country with an emerging economy is being defined as: "[a] *country is deemed 'emerging' if its per capita GDP falls below a certain hurdle that changes through time. Of course, the basic idea behind the term is that these countries 'emerge' from less-developed status and join the group of developed countries. In development economics, this is known as convergence.*" (Bekaert & Harvey, 2002). In case of an emerging economy, the possibility for increased use of renewable energy is huge (Sadorsky, 2009). Second of all, as these countries are growing and developing, their energy demand will increase too (Sadorsky, 2009). Between 2005 and 2030, China's energy demand, for example, is expected to be 45% of the increase in world energy demand (Sadorsky, 2009). If this energy is generated by the burning of coal, impacts on the climate will be considerable and mitigation actions will have to be undertaken. Developing country Parties, however, are not legally bound to reduce their GHG-emissions. Keeping the above scenario in mind, this would be catastrophic for the climate. In order to avoid this, transition economies are being treated as developed country Parties, legally bound to reduce their GHG-emissions. The current division between developing country Parties and country Parties with economies in transition, however, is not always in line with the general notion and can thus be confusing and even problematic. For example, according to the UNFCCC-division between developed and developing country Parties, China is not an economy in transition, but a developing country party (United Nations Framework Convention on Climate Change, 2011g). However, according to the International Monetary Fund (International Monetary Fund, 2010), China is an economy in transition. The UNFCCC-division is without a doubt in favour of China and not in favour of the climate. First of all, developing country Parties are not legally bound to reduce their GHG-emissions during the first commitment period, which is from 2008 until 2012 (Global Greenhouse Warming.com, 2011; United Nations Framework Convention on Climate Change, 1998). Second of all, developing countries Parties receive more help in terms of capacity-building as described above, they also receive financial

support as described in article 4 paragraph 3 of the United Nations Framework Convention on Climate Change: "[t]*he developed country Parties […] shall provide new and additional financial resources to meet the agreed full costs incurred by developing country Parties […]. They shall also provide such financial resources, including for the transfer of technology, needed by the developing country Parties to meet the agreed full incremental costs of implementing measures* […]." (United Nations, 1992b), as well as ESTs and know-how as laid down in article 4 paragraph 5 of the United Nations Framework Convention on Climate Change: "[t]*he developed country Parties and […] shall take all practicable steps to promote, facilitate and finance […] [the] 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* […]." This division is problematic, because it gives China a favoured treatment it does not need and because it endangers the future of the climate change negotiations. China is, within the UNFCCC, a developing country party, which is not legally bound by emission reductions as stated in the preamble of decision 1 of the third session of the Conference of the Parties: "[r]*ecalling further that one aim of the process was to strengthen the commitments in paragraph 4, paragraph 2(a) and (b) of the Convention, for developed country [...] Parties […] and to set quantified limitation and reduction objectives within specified time-frames, such as 2005, 2010 and 2020, for their anthropogenic emissions by sources and removals by sinks of greenhouse gases not controlled by the Montreal Protocol [.] Recalling also that, according to the Berlin Mandate, the process will not introduce any new commitments for [developing] Parties […]*." To many countries, this is not fair, as China was with 6.533.018,3 kt CO_2 the biggest CO_2 emitter in the world in 2007, surpassing the United States of America, which emitted 5.832.194,0 kt CO_2 in 2007 (latest available data) (The World Bank, 2011a). As a response, Russia and Japan announced that they would not sign up for a second commitment period from 2013 on, if the US and China are not on board (Ten Kate & Morales, 2011). This is a serious matter, as the Kyoto Protocol will expire in 2012 and that a second commitment period would set, again, binding emission targets for developed country Parties from 2013 until 2018 (Xinhua, 2011). The US then answered that

China had to sign first, since it emits more CO_2 per year than the US. China then defended itself by stating that the CO_2 emissions, metric tons per capita, were much higher in the US (19,3) than in China (5,0) (The World Bank, 2011b) and that China, as a developing country party, is not legally bound by any emission reductions. It thus becomes clear that the above mentioned UNFCCC-division between developed Parties/Parties with economies in transition and developing country Parties makes a huge difference when it comes to commitments and the receivement of support in terms of financial resources and "*hard*" and "*soft*" technologies. Moreover, the difference in commitments between country Parties can create tensions and endanger the entire Convention on climate change.

1.7. Decision 1 of the sixth session of the Conference of the Parties at the Hague, 2000 (United Nations Framework Convention on Climate Change, 2001)

In box A of decision one of the sixth session of the Conference of the Parties, Parties had reached a general agreement on, i.a. technology transfer and its financing, despite of the fact that paragraphs lack and the lay out differs from the previous sessions of the Conference of the Parties.

Developing the consultative process, which was established during the fourth session of the Conference of the Parties, an intergovernmental consultative group was established, consisting out of technical and scientific experts on technology transfer. Building on the consultative process and its issues and questions, this group was to create a clearing house and regional technology information centers to facilitate the exchange and review of information, to advise the SBSTA on further actions to be taken and to focus on ways in order to eliminate technology transfer barriers. Note that the idea of consultative processes was in the lift and obviously well received by all Parties[1]. While the consultative process itself was established in 1998 and extended in 1999, a consultative group with a clear mandate was established in this first decision of the sixth session of the Conference of the Parties.

Another important matter concerning technology transfer was the establishment of the Convention fund. The Convention fund is managed by the GEF and the funding itself made available by developed country Parties. The Convention fund would support activities in developed country Parties in the fields of, inter alia, technology transfer and technical support and capacity-building. Although they are being perceived as developed country Parties, Parties with economies in transition would also receive financial support as new and additional funding would be made available for to support capacity-building activities.

1 The UNFCCC decision-making procedure is based on the multistakeholder process, which means that the views of all Parties are being heard and integrated through dialogue and consensus (United Nations Framework Convention on Climate Change, 2011e).

1.8. Decision 4 of the seventh session of the Conference of the Parties at Marrakesh, 2001 (United Nations Framework Convention on Climate Change, 2002).

The cornerstone of decision 4 of the seventh session of the Conference of the Parties was based on the implementation of article 4, paragraph 5 of the United Nations Framework Convention on Climate Change, which says: "[t]*he developed country Parties […] 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, to enable them to implement the provisions of the Convention. In this process, the developed country Parties shall support the development and enhancement of endogenous capacities and technologies of developing country Parties. Other Parties and organizations in a position to do so may also assist in facilitating the transfer of such technologies.*" In order to enhance this implementation, the "[f]*ramework for meaningful and effective actions to enhance the implementation of article 4, paragraph 5, of the Convention*" was adopted, as stated in paragraph 4 of decision 4 of the seventh session of the Conference of the Parties: "[d]*ecides to adopt the framework for meaningful and effective actions to enhance the implementation of article 4, paragraph 5, of the Convention* [...]". This entire framework is based on the development and transfer of ESTs and know-how. The annex in which the framework was noted, was divided into five parts: technology needs and needs assessments, technology information, enabling environments, capacity building and mechanisms for technology transfer. First of all, developing country Parties had to start by undertaking a Technology Needs Assessment (TNA) in order to be able to identify and analyse priority technology needs. In order to be successful, a TNA has to be country-driven, since every country has to identify and determine its own mitigation and adaptation technology priorities, involving different stakeholders (the private sector, governments, the donor community, bilateral and multilateral institutions, non-governmental organizations and academic and research institutions)

and being assisted by developed country Parties and other organizations.

This TNA is supported by the second point: technology information. Technology information could be technical parameters, economic and environmental aspects of ESTs and the availability of these ESTs from developed country Parties for technology transfer, as laid down in paragraph 8 of the Annex of decision 4 of the seventh session of the Conference of the Parties: "[t]*he technology information component of the framework defines the means, including hardware, software and networking, to facilitate the flow of information between the different stakeholders to enhance the development and transfer of environmentally sound technologies. This technology information component of the framework could provide information on technical parameters, economic and environmental aspects of environmentally sound technologies and the identified technology needs of [...] particularly developing country Parties, as well as information on the availability of environmentally sound technologies from developed countries and opportunities for technology transfer.*" In order to facilitate the access to this kind of information, the Convention secretariat was asked to develop a new search engine on the Internet, as stated in paragraph 10(a) of the Annex of decision 4 of the seventh session of the Conference of the Parties: "[...] *to develop a new search engine on the Internet that will allow for quick access to existing inventories of environmentally sound and economically viable technologies and know-how, including those conducive to mitigating and adapting to climate change* [...]". Paragraph 11 of the Annex of decision 4 of the seventh session of the Conference of the Parties stated the need for a network of technology information centres and a clearing house to be established by the eighth session of the COP: "[a]*n information clearing house, including a network of technology information centres, should be established under the auspices of the secretariat, by the time of the eighth session of the Conference of the Parties* [...]". The third factor was the enabling environment. Developed country Parties were asked to create enabling environments by identifying and getting rid of existing barriers, ensuring fair trade policies, imposing tax preferences, protecting intellectual property rights etc. to ensure the transfer of ESTs to developing countries, as laid down in paragraphs 14(a) and 14(b) of the Annex of decision 4 of the seventh session of the

Conference of the Parties: "[a]*ll 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* [...]" and "[a]*ll 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* [...]". The fourth factor was capacity building. The purpose was to build and strengthen scientific and technical skills and capabilities to enable developing country Parties to be able to use and maintain ESTs, as laid down in paragraph 15 of the Annex of decision 4 of the seventh session of the Conference of the Parties: "[...] *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 […] particularly developing country Parties, to enable them to assess, adapt, manage and develop environmentally sound technologies.*" Every country has of course different technology needs and therefore different capacity-building needs, so the capacity-building process also has to be country-driven, as stated in paragraph 16 of the Annex of decision 4 of the seventh session of the Conference of the Parties: "[c]*apacity building must be country-driven, addressing specific needs and conditions of developing countries and reflecting their national sustainable development strategies, priorities and initiatives. It is primarily to be undertaken by and in developing countries in accordance with the provisions of the Convention.*" Proposals for capacity-building were demonstration projects to train people how to use ESTs (paragraph 18(c) of the Annex of decision 4 of the seventh session of the Conference of the Parties), training in project development and management of ESTs, (paragraph 18(f) of the Annex of decision 4 of the seventh session of the

Conference of the Parties) etc. To ensure that capacity-building takes place, it was up to developed country Parties to provide developing countries with financial and technical resources, as laid down in paragraph 20(a) of the Annex of decision 4 of the seventh session of the Conference of the Parties: "[d]*eveloped country Parties […] shall take all practicable steps: (a) To make available resources to assist developing countries in the implementation of capacity building to enhance the implementation of article 4, paragraph 5, taking into account the provisions of paragraphs 18 and 19 above. 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*." The fifth factor are the mechanisms for technology transfer. The main focus here lies on the various stakeholders participating in the technology transfer process, as laid down in paragraph 22 of the Annex of decision 4 of the seventh session of the Conference of the Parties. There are three mechanisms for technology transfer discussed. First of all, the coordination of all stakeholders in different regions and countries had to be enhanced. Second of all, these stakeholders were to be engaged in cooperative efforts to accelerate, inter alia, the development and diffusion of ESTs by forming partnerships (for example private-public) and technology cooperation. Thirdly, the development of projects and programmes had to be supported to support the formation of these partnerships: "[t]*he mechanisms for technology transfer, as identified in this section, are to facilitate the support of financial, institutional and methodological activities: (a) to enhance the coordination of the full range of stakeholders in different countries and regions; (b) to engage them in cooperative efforts to accelerate the development and diffusion, including transfer, of environmentally sound technologies, know-how and practices to and between Parties other than developed country Parties […], particularly developing country Parties, through technology cooperation and partnerships (public/public, private/public and private/private); and (c) to facilitate the development of projects and programmes to support such ends*." Besides this framework, there was also a group of experts established in paragraph 2 of decision 4 of the seventh session of the Conference of the Parties called the Expert Group on

Technology Transfer (EGTT). Their main goal was to enhance the implementation of article 4.5 of the Convention by, for example, identifying ways to facilitate technology transfer activities and based on these conclusions, making recommendations to the SBSTA: "[d]*ecides to establish an expert group on technology transfer to be nominated by Parties, with the objective of enhancing the implementation of article 4, paragraph 5, of the Convention, including, inter alia, by analysing and identifying ways to facilitate and advance technology transfer activities and making recommendations to the Subsidiary Body for Scientific and Technological Advice.*" At the 12th session of the COP, the progress of this expert group was to be reviewed. To ensure the implementation of the framework, the GEF was requested to provide financial support, as laid down in paragraph 3 of decision 4 of the seventh session of the Conference of the Parties: "[r]*equests the* Global Environment Facility*, as an operating entity of the financial mechanism of the Convention, to provide financial support for the implementation of the annexed framework through its climate change focal area and the special climate change fund established under decision 7/CP.7* [...]", the Convention secretariat was asked to consult with international organisations on their abilities to offer support to activities identified in the framework, as laid down in paragraph 5(a) of decision 4 of the seventh session of the Conference of the Parties: "[r]*equests the Convention secretariat: (a) To consult with relevant* international organizations*, and solicit information on their capabilities and abilities to support certain activities identified in the framework for meaningful and effective actions contained in the annex to this decision* [...]" and developed country Parties were asked to provide technical and also financial support, as stated by paragraph 4 of decision 4 of the seventh session of the Conference of the Parties: "[u]*rges developed country Parties to provide technical and financial assistance* [...]".

1.9. Decision 10 of the eighth session of the Conference of the Parties at New Delhi, 2002 (United Nations Framework Convention on Climate Change, 2003).

In decision 10 of the eighth session of the Conference of the Parties, no new mechanisms were created or established. Instead, the COP congratulated the Convention secretariat and its different organs with its achievements, as stated in the preamble of decision 10 of the eighth session of the Conference of the Parties. In paragraph 10(a) of decision 4 of the seventh session of the Conference of the Parties, the Convention secretariat was asked to create an online search engine that would allow country Parties to have access to technology information. Eight months later, country Parties were able to test the Convention secretariat's online technology information system (TT:CLEAR) (United Nations Framework Convention on Climate Change, 2011k). In two cases, progress had been noted and welcomed in decision 10 of the eighth session of the Conference of the Parties. First of all, progress had been made in the implementation of the framework for meaningful and effective actions to enhance the implementation of article 4, paragraph 5, as stated in the preamble of decision 10 of the eighth session of the Conference of the Parties: "[w]*elcoming the initial progress made in the implementation of the framework for meaningful and effective actions to enhance the implementation of article 4, paragraph 5, of the Convention* [...]". Second of all, progress had been made by the Expert Group on Technology Transfer, which had been established in paragraph 2 of decision 4 of the seventh session of the Conference of the Parties. In order to make technology transfer more efficient, paragraph 2(a) of decision 10 of the eighth session of the Conference of the Parties requested the Chair of the SBSTA to conduct consultations and facilitate collaboration among expert groups: "[t]*o request its Chair to conduct consultations and facilitate collaboration among expert groups established under the Convention, to the extent practicable, on their work programmes on cross-cutting issues, including those relating to technology transfer*

and capacity-building activities". Moreover, the SBSTA had to come up with "*innovative ways*" to address the outcomes of the TNAs, which had been requested in decision 4 of the seventh session of the Conference of the Parties a year earlier and had been done by developing countries and countries with economies in transition, as stated in paragraph 2(b) of decision 10 of the eighth session of the Conference of the Parties: "[t]*o take into account, when examining at its nineteenth session the work programme of the Expert Group on Technology Transfer for the following year, innovative ways to address the outcomes of technology needs assessments already completed by developing country Parties and Parties with economies in transition* [...]".

1.10. The ninth session of the Conference of the Parties at Milan, 2003 (United Nations Framework Convention on Climate Change, 2004).

Unlike the classification of the previous eight sessions of the Conference of the Parties, there is no decision called "[d]*evelopment and transfer of technologies*" in this ninth session of the Conference of the Parties. This does not mean that technology transfer is not touched upon, but unlike the previous eight sessions of the COP, the main focus now laid on the financing of technology transfer. paragraph 1(d) of decision five of the ninth session of the Conference of the Parties states: "[t]*echnology transfer and its associated capacity-building activities shall also be essential areas to receive funding from the Special Climate Change Fund*". The Special Climate Change Fund (SCCF) was established in paragraph 2 of decision 7 of the seventh session of the Conference of the Parties: "[d]*ecides [...] that a special climate change fund shall be established to finance activities, programmes and measures, relating to climate change, that are complementary to those funded by the resources allocated to the climate change focal area of Global Environment Facility and by bilateral and multilateral funding* [...]". This Special Fund was to finance activities or programmes that are related to climate change, inter alia technology transfer, on the one hand and which were complementary to the activities and programmes financed by the GEF on the other, as stated in paragraph 2 and 2(b) of decision 7 of the seventh session of the Conference of the Parties: "[t]*ransfer of technologies* [...]". Although the SCCF was to finance projects in the areas of adaptation; technology transfer and capacity building; energy; transport; industry; agriculture; forestry and waste management and economic diversification (United Nations Framework Convention on Climate Change, 2011i), it seems that out of these eight categories, technology transfer and capacity-building were the most important ones, being described as "*essential areas to receive funding [...]*.", as stated in paragraph 1(d) of decision 5 of the ninth session of the Conference of the

Parties. Although there had been no decision made solely on technology transfer and development, technology transfer was obviously still regarded as a powerful tool to tackle climate change. The SCCF's financial resources were to support four major areas within technology transfer, as laid down in paragraph 3 of decision 5 of the ninth session of the Conference of the Parties. First of all, the SCCF would support the implementation of the results of TNAs (paragraph 3(a) of decision 5 of the ninth session of the Conference of the Parties). Secondly, activities with the purpose of providing technology information (paragraph 3(b) of decision 5 of the ninth session of the Conference of the Parties) or capacity-building (paragraph 3(c) of decision 5 of the ninth session of the Conference of the Parties) would also receive funding from the SCCF. Thirdly, activities or programmes to implement or create enabling environments were also to be supported by the SCCF, as laid down in paragraph 3(d) of decision 5 of the ninth session of the Conference of the Parties. Note that these four priority areas are based on the framework for meaningful and effective actions to enhance the implementation of article 4, paragraph 5, of the Convention. In decision 4 of the seventh session of the Conference of the Parties, these four out of five priority areas were identified and agreed upon and at the ninth session of the Conference of the Parties financing in terms of the SCCF was foreseen. At the eighth session of the Conference of the Parties, the Convention secretariat was congratulated, because of the progress made in the implementation of the framework for meaningful and effective actions to enhance the implementation of article 4, paragraph 5. At this ninth session of the Conference of the Parties, country Parties wanted to guarantee the continuation of the implementation of the framework for meaningful and effective actions to enhance the implementation of article 4, paragraph 5, of the Convention by identifying technology transfer and capacity-building as the second top priority area to receive funding from the SCCF after adaptation activities, as laid down in paragraph 1(c) of decision 5 of the ninth session of the Conference of the Parties .

1.11. Decision 6 of the tenth session of the Conference of the Parties at Buenos Aires, 2004 (United Nations Framework Convention on Climate Change, 2005).

Compared to the ninth session of the Conference of the Parties, at the tenth session of the Conference of the Parties, decision six was devoted to technology development and transfer. However, no new mechanism or initiatives were agreed upon or established. By now, Parties officially realized that technology transfer and development was not a one time occasion, but a continuing process and that progress had to be made, as laid down in the preamble of decision 6 of the tenth session of the Conference of the Parties: "[a]*greeing that issues relating to the implementation of article 4, paragraph 5, of the Convention on the development and transfer of, or access to, environmentally sound technologies and know-how is a continuing process, and that, inter alia, the assessments of technologies, of terms of access, and of technology needs of Parties will continue to be undertaken under the Convention, to ensure that further substantive progress is made* [...]". To ensure that this entire process did continue and that progress was being made, four points were agreed upon. First of all, the Expert Group on Technology Transfer was asked to make recommendations to enhance the implementation of the framework for effective and meaningful actions to enhance the implementation of article 4, paragraph 5, of the Convention. Suggestions made were the establishment of public and/or private partnerships, improved cooperation with the private sector etc., as laid down in paragraph 2 of decision 6 of the tenth session of the Conference of the Parties: "[r]*equests the Expert Group on Technology Transfer to make recommendations for enhancing implementation of the framework for effective and meaningful actions to enhance the implementation of article 4, paragraph 5, of the Convention [...] including innovative public and/or private partnerships, enhanced cooperation with the private sector, cooperation with the relevant conventions and intergovernmental processes, and medium- and long-term planning of the Expert Group on Technology*

Transfer, based on terms of reference for these recommendations to be agreed upon at the twenty-second session of the Subsidiary Body for Scientific and Technological Advice (May 2005) with a view that the outcome of this work would provide inputs towards the review of the Expert Group on Technology Transfer by the Conference of the Parties at its twelfth session (November 2006) in accordance with decision 4/CP.7, including possible revision of key themes in the existing framework [...]". Second of all, developed country Parties were urged to continue providing developing country Parties with financial and technical support for the development of technologies and, where possible, to increase the support, as stated in paragraph 1 of decision 6 of the tenth session of the Conference of the Parties: "[u]*rges [developed country] Parties [...] to continue to provide and where possible increase financial and technical support for the development and enhancement of the endogenous capacities and technologies of developing country Parties* [...]". It was agreed upon that these commitments by developed country Parties were essential for developing country Parties to be able to fulfill their commitments under the convention, as stated in the preamble of decision 6 of the tenth session of the Conference of the Parties: "[a]*greeing also that the implementation of the commitment of developed country Parties and other developed Parties included in Annex II to the Convention as stated in article 4, paragraph 5, of the Convention are essential conditions for the effective implementation by developing country Parties of their commitments under the Convention* [...]". Thirdly, joint research and development programmes between developed country Parties and countries Parties with economies in transition, with the purpose of developing ESTs, were encouraged in paragraph 3 of decision 6 of the tenth session of the Conference of the Parties: "[d]*ecides to encourage Parties to explore the opportunity for further joint research and development programmes/projects between [developed country Parties] and [developing country Parties] for the development of environmentally sound technologies* [...]". Fourthly, the topic of technology information was touched upon. The Convention secretariat was encouraged to continue with a pilot project it had been working on. The purpose of this project was to provide country Parties with technical and financial information (in terms of costs) when strengthening

technology centres in developing country Parties, as laid down in paragraph 4 of decision 6 of the tenth session of the Conference of the Parties: "[e]*ncourages the secretariat to continue its work on a pilot project on networking between the technology information clearing house TT:CLEAR and national and regional technology information centres that would provide Parties with a clear understanding of the technical feasibility and cost implications of the strengthening of technology centres in developing countries* [...]".

1.12. Decision 6 of the eleventh session of the Conference of the Parties at Montreal, 2005 (United Nations Framework Convention on Climate Change, 2006).

Decision 6 of the eleventh session of the Conference of the Parties started with a preamble, that, for the first time, explicitly underlined the importance of technology and technology transfer to tackle climate change: "[r]*ecognizing the need to realize* ***the full potential of technology*** *in combating climate change, and that substantial reduction in greenhouse gas emissions in the long term will* ***rely to a large extent on the development, deployment, diffusion and transfer of environmentally sound technologies***". In decision 6 of the eleventh session of the Conference of the Parties, a large focus was put on the SBSTA and the EGTT. First of all, Parties were invited to submit their views and suggestions concerning the status of the EGTT and its continuation, as laid down in paragraph 1 of decision 6 of the eleventh session of the Conference of the Parties: "[i]*nvites Parties, in supporting the review of the progress of the work and terms of reference, including, if appropriate, the status and continuation, of the Expert Group on Technology Transfer by the Conference of the Parties [...], to submit to the secretariat [...] their views and suggestions on the status and continuation of the Expert Group on Technology Transfer* [...]". These views and suggestions were to take into account the progress and achievements of the EGTT, as stated in paragraph 1(a) of decision 6 of the eleventh session of the Conference of the Parties: "[...] [p]*rogress and achievements of the Expert Group on Technology Transfer in enhancing the implementation of the framework* [...]" and the availability and allocation of resources for the EGTT, as laid down in paragraph 1(c) of decision 6 of the eleventh session of the Conference of the Parties. Secondly, it was up to the Convention secretariat to bring all these views and suggestions into one document and make it available for discussion for the next, 25th SBSTA meeting, as decided upon in paragraph 2(a) of decision 6 of the eleventh session of the Conference of the Parties: "[r]*equests the secretariat: (a) To compile the submissions*

of Parties referred to in paragraph 1 into a miscellaneous document and make it available for consideration by the Subsidiary Body for Scientific and Technological Advice at its twenty-fifth session (November 2006) [...]". Moreover, the Convention secretariat was asked to organize a discussion between Parties, international financing organizations, the private sector and other stakeholders at the 25th SBSTA meeting to discuss and exchange experience, lessons learnt, know-how and strategies for international technology cooperation and partnerships in the development, deployment, diffusion and transfer of ESTs, as laid down in paragraph 2(b) of decision 6 of the eleventh session of the Conference of the Parties: "[t]*o organize a senior-level round-table discussion between Parties, international financing organizations, the private sector and other stakeholders at the twenty-fifth session of the Subsidiary Body for Scientific and Technological Advice to discuss and exchange views on issues, experience and lessons learned, and strategies for short-, medium- and long-term international technology cooperation and partnerships in the development, deployment, diffusion and transfer of environmentally sound technologies and know-how to enable more informed decisions on actions in the future* [...]". Thirdly, at its 25th session, the SBSTA was to consider its future work for enhancing the implementation of the framework for meaningful and effective actions to enhance the implementation of article 4, paragraph 5, of the Convention, as decided upon in paragraph 3 of decision 6 of the eleventh session of the Conference of the Parties: "[r]*equests the Subsidiary Body for Scientific and Technological Advice, when considering, at its twenty-fifth session, future work for enhancing the implementation of the framework for meaningful and effective actions to enhance the implementation of paragraph 4, paragraph 5, of the Convention* [...]". In order to do this, the SBSTA had to take into account three factors. First of all, it had to look at recommendations from the EGTT for enhancing the implementation of the framework, as laid down in paragraph 3(a) of decision 6 of the eleventh session of the Conference of the Parties: "[r]*ecommendations of the Expert Group on Technology Transfer for enhancing the implementation of this existing framework pursuant to the terms of reference for this work agreed by the Subsidiary Body for Scientific and Technological Advice at its twenty-second session* [...]". Secondly, it

had to take into account technology-based partnerships and initiatives between Parties in the development, deployment, diffusion and transfer of ESTs, as laid down in paragraph 3(b) of decision 6 of the eleventh session of the Conference of the Parties: "[e]*xisting technology-based international cooperative activities, partnership and initiatives undertaken between Parties in the development, deployment, diffusion and transfer of environmentally sound technologies* [...]". Thirdly, it had to consider the Parties' views and recommendations concerning the review of the future role of the EGTT, as laid down in paragraph 3(c) of decision 6 of the eleventh session of the Conference of the Parties: "[s]*ubmissions of Parties referred to in paragraph 1 relating to the review of the future role of the Expert Group on Technology Transfer.*" The conclusion so far is that technology transfer was not just a theory or an idea anymore or a push by one Party, but an interactive playing ground for different Parties. The EGTT made recommendations to the SBSTA. The EGTT was then evaluated by the different stakeholders. After that, it was up to the SBSTA to create its agenda in function of, inter alia, the EGTT's recommendations and the Parties's views and suggestions concerning the EGTT's status and continuation. To make sure every Party was involved in the technology transfer process and was being kept up-to-date, the Convention secretariat was to organize a knowledge exchange forum. At this stage, there was a true interdependency between the different Parties: going from the Convention secretariat and its organs to governments, the private sector, international organizations and so on.

1.13. Decision 5 of the twelfth session of the Conference of the Parties at Nairobi, 2006 (United Nations Framework Convention on Climate Change, 2007a)

The crucial role played by the EGTT and the SBSTA in the technology transfer process, became clear once again in decision 5 of the twelfth session of the Conference of the Parties. Having reviewed the progress the EGTT had made in terms of identifying ways to facilitate and advance technology transfer activities, paragraph 1 of decision 5 of the twelfth session of the Conference of the Parties stated to extend the EGTT's mandate for another year until 2007: "[d]*ecides to extend the Expert Group on Technology Transfer for one year including its current membership* [...]". At this twelfth session of the Conference of the Parties, the SBSTA held its 25th session and made a draft decision concerning the development and transfer of technologies (United Nations Framework Convention on Climate Change, 2007b). paragraph 2 of decision 5 of the twelfth session of the Conference of the Parties decided to forward this draft text for consideration to SBSTA's 26th session. At the thirteenth session of the COP, a decision would then be made concerning this draft text: "[d]*ecides to forward the text of a draft decision, for consideration by the Subsidiary Body for Scientific and Technological Advice, at its twenty-sixth session, with a view to adopting a decision on this matter at the thirteenth session of the Conference of the Parties.*" The SBSTA's draft decision (Annex II) (United Nations Framework Convention on Climate Change, 2007b) built on the tenth session of the COP, during which joint research and development programmes between developed country Parties and countries Parties with economies in transition, with the purpose of developing ESTs, were encouraged and on the eleventh session of the COP, during which the Convention secretariat was asked to organize a knowledge exchange forum to discuss, inter alia, strategies for international technology cooperation and partnerships in the development, deployment, diffusion and transfer of ESTs. Annex II (draft decision) took note of many actions, partnerships, joint research and development programmes that contributed to the development, transfer and

deployment of ESTs, as laid down in the preamble of Annex II of the SBSTA's draft decision: "[n]*oting the range of important actions and partnerships undertaken by Parties within and outside the framework of the Convention that contribute to the development, transfer and deployment of environmentally sound technologies, including through joint research and development programmes* [...]". In paragraph 1 of decision 6 of the tenth session of the COP, developed country Parties were urged to continue providing developing country Parties with financial and technical support for the development of technologies and, where possible, to increase the support. At the time of the twelfth session of the COP, enhanced financing partnerships, such as the Global Energy Efficiency and Renewable Energy Fund and EU Energy Initiative and financial contributions made by the GEF, the SCCF, the LDC Fund, the World Bank and the CTI were noted. These examples illustrate the rapid evolution of the technology transfer process and that with every remark that was made, an answer already followed the next or second next session of the COP. Despite the progress that was made, the SBSTA recognized the need to accelerate innovation in the development, deployment, adoption, diffusion and transfer of ESTs among all Parties, especially from developed to developing countries, for both mitigation and adaptation purposes and that actions to tackle climate change required the uptake of new and existing ESTs and the creation of enabling environments (preamble of Annex II of the SBSTA's draft decision). Paragraph 1 of Annex II of the SBSTA's draft decision refers to the division of the framework for meaningful and effective actions to enhance the implementation of article 4, paragraph 5, of the Convention: technology needs and needs assessments, technology information, enabling environments, capacity building and mechanism for technology transfer. Paragraph 1 of Annex II of the SBSTA's draft decision stated that there was an general agreement that this division was a solid basis to enhance the implementation of art. 4, par. 5: "[a]*grees that the five themes listed in the framework, and the structure, definitions and purpose of the current technology transfer framework, continue to provide a solid basis for enhancing the implementation of article 4, paragraph 5.*" Built on these five areas, a set of actions was adopted to enhance the implementation of the framework in paragraph 2 of Annex II of the SBSTA's draft decision: "[a]*dopts the*

set of actions for enhancing the implementation of the five thematic areas of the framework for meaningful and effective actions to enhance the implementation of article 4, paragraph 5 of the Convention [...]". Basically, every priority area was coupled to several operational modalities to enhance the implementation of the framework. One operational modality per priority area will be presented. For example, in order to support the technology needs and needs assessment area, the GEF, intergovernmental organizations, international financial institutions etc. were asked to provide capacity-building for developing country Parties to enable them to conduct, report and use TNAs, as laid down in paragraph 3(d) of Appendix I of the SBSTA's draft decision: "[t]*he Global Environmental Facility (GEF) and its implementing agencies, other intergovernmental organizations (IGOs), international financial institutions (IFIs), Climate Technology Initiative (CTI) and Parties that are in a position to do so are requested to provide capacity-building for [developing country] Parties to conduct, report and use TNAs* [...]". In order to enhance the technology information area, the Convention secretariat was, for example, requested to share experiences and lessons learnt among national and regional experts on TT:CLEAR (online search engine that allows Parties to have access to technology information), as laid down in paragraph 2, paragraph 4(a)(iii) of Appendix I of the SBSTA's draft decision: "[t]*o share experiences and lessons learned among national and regional experts participating in the pilot project on TT:CLEAR* [...]". Thirdly, in order to create enabling environments for technology transfer, different stakeholders, for example, were invited to prepare technical studies on barriers and recommendations in order to develop enabling environments, which would accelerate the development and transfer of ESTs, as laid down in paragraph 5(a) of Appendix I of the SBSTA's draft decision: "[p]*arties, the secretariat, relevant international organizations and initiatives, and the private sector are invited to prepare, for consideration by the COP, technical studies on barriers, good practice and recommendations for developing enhanced enabling environments that accelerate the development and transfer of environmentally sound technologies (ESTs), at the national and international levels* [...]". Fourthly, in order to enhance the capacity-building for technology transfer, Parties were requested to organize, for

example, management training sessions, sessions concerning the operation of climate technologies and workshops on capacity-building for adapting to the adverse effects of climate change, as stated in paragraph 6(d) of Appendix I of the SBSTA's draft decision: "[p]*arties, IGOs and other institutions and initiatives are encouraged to organize training in management and operation of climate technologies; to establish/strengthen relevant organizations/institutions in developing countries for capacity-building for technology transfer; to establish/strengthen training, expert exchange, scholarship and cooperative research programmes in relevant national and regional institutions in developing countries for transfer of ESTs; and to organize seminars/training/workshops on capacity-building for adapting to the adverse effects of climate change.*" The last priority area "*mechanisms for technology transfer*" looked, inter alia, into innovative options for financing the development and transfer of technologies. One option is for International Organizations to provide technical support through coaching and training programmes to developing countries and countries with economies in transition to transform project ideas resulting from TNAs to project proposals that meet the standards of the international financial providers, as stated in paragraph 8(a) of Appendix I of the SBSTA's draft decision: "[r]*elevant international organizations and initiatives [...] are invited to provide technical support through coaching and training programmes for project developers in developing countries and countries with economics in transitions (EITs) to transform project ideas resulting from TNAs into project proposals that meet the standards of the international financial providers.*" While this framework was adopted in decision 4 of the seventh session of the Conference of the Parties, five years later there was a push to enhance the execution of the framework by adopting a set of operational modalities, that actually laid down what Parties could do to improve the development and transfer of ESTs. Going back to the draft decision, a lot of paragraphs are options, which means Parties have to indicate which option they favour. In the final decision, these options will have disappeared and an paragraph everyone agrees upon will replace the several options. I will discuss those options that are relevant for this thesis and thus related to technology transfer. Paragraph 3 of Annex II of the SBSTA's draft decision consists

out of two options. The first option proposed to strengthen the EGTT. The second option proposed to establish a Technology Development and Transfer Board (TDTB), which would be a standing body under the COP. In both cases, the organ would use the above discussed set of actions as a basis for their future work programme. Paragraph 6 of Annex II of the SBSTA's draft decision also consists out of two options. The first one gives the set of actions immediate effect. As this set of actions would serve as a basis for the work programme of either the EGTT or the TDTB, the second option is in favour of the EGTT formulating its first work programme. Paragraph 11 of Annex II of the SBSTA's draft decision then continues with the enabling environment, also existing out of two options. Both options urge country Parties to create an enabling environment for industry and the research community. What is different however, are the means described how country Parties should get to this enabling environment. According to option 1, country Parties (with the focus on developed country Parties) should use different instruments like carbon pricing, carbon taxes, tradable carbon permits and carbon contracts, tax exemptions, technology export insurance or loans, subsidies and/or implicitly through regulation to push both private and public industry to get to news ways to emit less GHG. Option 2 however does not use the term "*instruments*", but the word "*actions*" to get to the same result. What these actions could be however, is not specified. The last relevant paragraph is paragraph 14 of Annex II of the SBSTA's draft decision. In both cases, Parties are being asked to provide information, through national communications, so that the progress concerning the implementation of the framework can be monitored. The difference however lies in the mandate of the organ, which is responsible for monitoring the progress. According to the first option, it is up to the SBSTA to monitor Parties's progress. According to the second option, it is up to the COP to monitor the progress. Looking at the mandate of both organs, it is the COP, which is responsible for reviewing the implementation of the Convention and national communications, examining Parties' commitments and assessing the progress made in achieving the Convention's objective (United Nations Framework Convention on Climate Change, 2011a). The SBSTA is responsible for promoting the development and transfer of ESTs and providing the COP with scientific information.

It has no control function, though, but is an information provider (United Nations Framework Convention on Climate Change, 2011a). In cases like these, in which a proposal consists out of paragraphs with different options, it is up to the Parties to express their preference for an option and to make amendments to an option. Since the decision-making process in based on consensus, every Party has veto power. Therefore, all Parties should agree on the entire text and make it "*their*" text, which will eventually be adopted by the COP. The most important thing at the end of this decision 5 of the twelfth session of the Conference of the Parties is that although the official text only contained two paragraphs concerning the development and transfer of ESTs and that no new mechanisms or frameworks were created, a lot of work and negotiating concerning technology transfer had been done. Not during the plenary session in this case, but during the SBSTA meeting, which is, just like the plenary session, attended by government officials (United Nations Framework Convention on Climate Change, 2011a).

1.14. Decisions 1 and 3 of the thirteenth session of the Conference of the Parties at Bali, 2007 (United Nations Framework Convention on Climate Change, 2008b).

The thirteenth session of the Conference of the Parties is without a doubt one of the most famous of them all, containing the Bali Action Plan (BAP). The Bali Action Plan launched a "*comprehensive process to enable the full, effective and sustained implementation of the Convention through* ***long-term cooperative action****, now, up to and beyond 2012*" so that an agreed outcome and decision could be taken at the fifteenth session of the COP in Copenhagen in December 2009, as laid down in paragraph 1 of decision 1 of the thirteenth session on the Conference of the Parties. This comprehensive process was to be conducted under a subsidiary body under the Convention, like the SBI and the SBSTA, which would be the Ad Hoc Working Group on Long-term Cooperative Action under the Convention (AWG-LCA), as stated in paragraph 2 of decision 1 of the thirteenth session on the Conference of the Parties: "[d]*ecides that the process shall be conducted under a subsidiary body under the Convention, hereby established and known as the Ad Hoc Working Group on Long-term Cooperative Action under the Convention, that shall complete its work in 2009 and present the outcome of its work to the Conference of the Parties for adoption at its fifteenth session* [...]". According to the Bali Action Plan, there was the need for a shared vision for long-term cooperative action like a long-term global goal for emission reductions in order to achieve the Convention's objective, as laid down in paragraph 1(a) of decision 1 of the thirteenth session of the Conference of the Parties: "[a] *shared vision for long-term cooperative action, including a long-term global goal for emission reductions, to achieve the ultimate objective of the Convention* [...]". Besides that, the Bali Action Plan existed out of four major building blocks: mitigation (paragraph 1(b) of decision 1 of the 13th session of the Conference of the Parties), adaptation (paragraph 1(c) of decision 1 of the 13th session of the Conference of the Parties), technology development and transfer

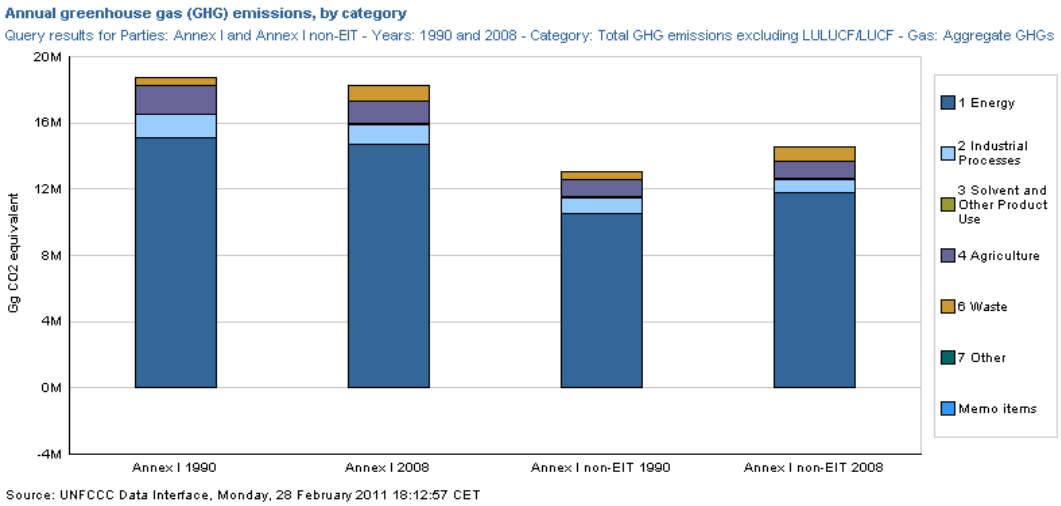
(paragraph 1(d) of decision 1 of the 13th session of the Conference of the Parties) and financing (paragraph 1(e) of decision 1 of the 13th session of the Conference of the Parties). For technology development and transfer, no new ideas or proposals came up. First of all, Parties had to get rid of the barriers that prevented or slowed down the development and transfer of ESTs to developing country Parties, as laid down in paragraph 1(d)(i) of decision 1 of the 13th session of the Conference of the Parties: "[e]*ffective mechanisms and enhanced means for the removal of obstacles to, and provision of financial and other incentives for, scaling up of the development and transfer of technology to developing country Parties in order to promote access to affordable environmentally sound technologies* [...]". Second of all, Parties had to come up with ways to accelerate technology transfer and development, as laid down in paragraph 1(d)(ii) of decision 1 of the 13th session of the Conference of the Parties: "[w]*ays to accelerate deployment, diffusion and transfer of affordable environmentally sound technologies* [...]". Thirdly, cooperation was urged for the development of current and new ESTs, as stated in paragraph 1(d)(iii) of decision 1 of the 13th session of the Conference of the Parties: "[c]*ooperation on research and development of current, new and innovative technology* [...]" and last, the effectiveness of mechanisms and tools for technology cooperation in certain sectors were to be taken into consideration, as laid down in paragraph 1(d)(iv): "[t]*he effectiveness of mechanisms and tools for technology cooperation in specific sectors* [...]". The reason for the Bali Action Plan was the fourth IPCC's report, concluding that the warming of the climate system is unequivocal[2]. According to the IPCC, the warmth our earth underwent the last half century had been unusual in at least the last 1300 years. Because of this warmth, glaciers and ice caps melted and were heavily reduced in size, resulting in a sea level rise (Pachauri R.K., 2007). In order to be able to stabilize GHG and prevent severe climate change impacts, the Bali Action Plan was adopted to, urgently, enhance the implementation of the Convention, as stated in the preamble of decision 1 of the 13th session of the Conference of the Parties: "[r]*esolving to urgently enhance implementation of the Convention in order to achieve its ultimate objective in full accordance with its principles and commitments*

2 Unmistakable, clear, unambiguous.

[...]". The development and transfer of technologies was split up in two parts: the development and transfer of technologies under the SBSTA (decision 3 of the 13th session of the Conference of the Parties) and the development and transfer of technologies under the SBI (decision 4 of the 13th session of the Conference of the Parties). One of the most important decisions taken in decision 3 of the 13th session of the Conference of the Parties was to extend the mandate of the EGTT for five years until the 18th session of the COP, which was to expire at this 13th COP, as stated in paragraph 3 of decision 3 of the 13th session of the Conference of the Parties: "[a]*grees to reconstitute the Expert Group on Technology Transfer for a further five years […] and to review, at its eighteenth session, progress of the work and terms of reference, including, if appropriate, the status and continuation of this body; and agrees that the Expert Group on Technology Transfer should provide advice as appropriate to the subsidiary bodies* [...]". Its mandate being extended, the EGTT was to establish an effective institutional arrangement to support action and when doing so, the EGTT should focus on the adequate and timely financial support, as laid down in paragraph 4(a) of decision 3 of the 13th session of the Conference of the Parties and on the development of performance indicators to monitor and evaluate the effectiveness of technology development and transfer, as stated in paragraph 4(b) of decision 3 of the 13th session of the Conference of the Parties. In order to find this support, the EGTT was to negotiate with International Organizations concerning their abilities to support the set of activities (decision 5 of decision 3 of the 13th session of the Conference of the Parties), which was established during the seventh session of the COP. The findings of these negotiations were to be reported to the subsidiary bodies at their 29th session (decision 5 of decision 3 of the 13th session of the Conference of the Parties) Important for the building block "[t]*echnology needs and needs assessment*"[3] was the introduction of the handbook "*Conducting Technology Needs Assessments for Climate Change"* (United Nations Development Programme, 2010), which was recommended to be used by developing country Parties in paragraph 7 of decision 3 of the 13th session of the Conference of the

3 The first building block is technology needs and needs assessment. The second one is technology information. The third one is enabling environments for technology transfer. The fourth one is capacity-building. The fifth one is mechanisms for technology transfer.

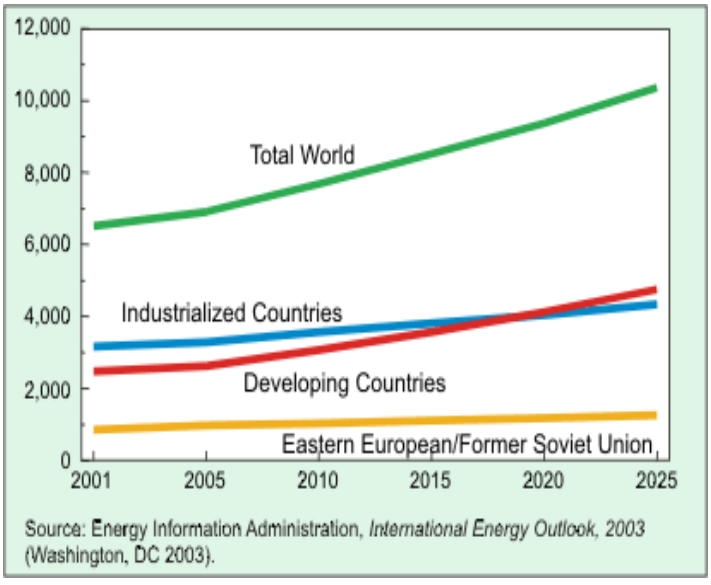
Parties: "[u]*rges* [developing country] *Parties* [...] *to use the United Nations Development Programme handbook Conducting Technology Needs Assessments for Climate Change when undertaking their technology needs assessments* [...]". This handbook together with the set of actions to enhance the implementation of the framework for meaningful and effective actions to enhance the implementation of article 4, paragraph 5, of the Convention and the urge for Parties (International Organizations, financial institutions like the GEF (paragraph 10 of decision 3 of the 13th session of the Conference of the Parties), developed country Parties etc.) to provide technical and financial support to developing country Parties (paragraph 8 of decision 3 of the 13th session of the Conference of the Parties) was to make sure that developing country Parties would be able to commit to mitigation actions to reduce their emissions growth. Looking at the trend of GHG emissions, it becomes clear why so much attention was given to the emissions growth of developing country Parties.



(United Nations Framework Convention on Climate Change, 2011c)

Figure 2: Greenhouse Gas emissions, by category, for developed and developing country Parties for 1990 and 2008

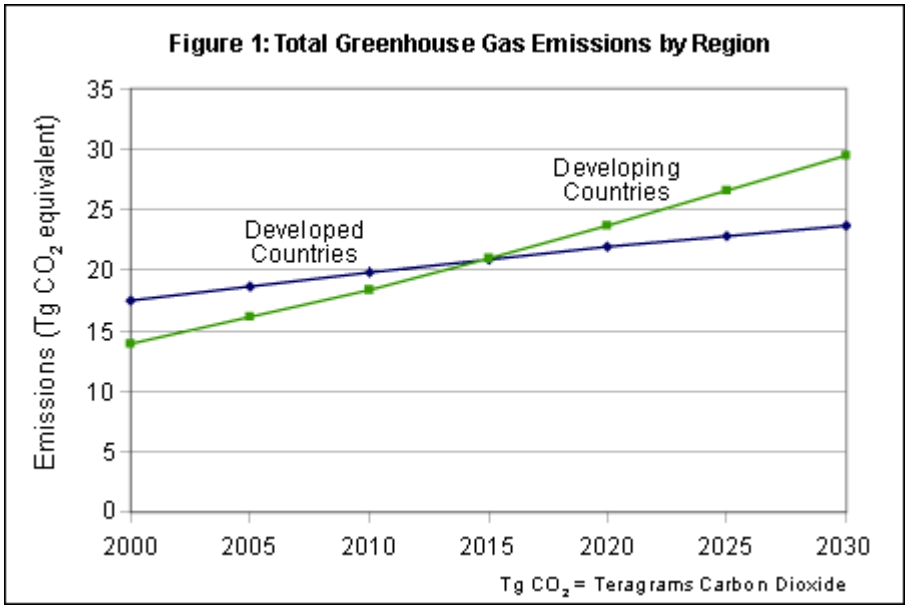
The chart above makes a comparison between developed country Parties (Annex I) and developing country Parties (non-Annex I) in terms of GHG emissions between 1990 and 2008 (latest data available). The first conclusion to be made is that developed country Parties still emit more than developing country Parties. The second conclusion however is that the emissions coming from developed country Parties decreased with 5,1% between 1990 and 2008, while the emissions coming from developing country Parties increased with 8,0% between 1990 and 2008. So, although developed country Parties are still more polluting than developing country Parties, it seems that developing country Parties may take over in terms of GHG emissions in the future. This is being confirmed by three sources. The U.S. Energy Information Administration states: "[w]*orld carbon dioxide emissions are expected to increase by 1.9 percent annually between 2001 and 2025 (Figure 5). Much of the increase in these emissions is expected to occur in the developing world where emerging economies, such as China and India, fuel economic development with fossil energy. Developing countries' emissions are expected to grow above the world average at 2.7 percent annually between 2001 and 2025; and surpass emissions of industrialized countries near 2018.*" (U.S. Energy Information Administration, 2004).



(U.S. Energy Information Administration, 2004)

Figure 3: Global CO_2 emissions between 2001 and 2025

EPA (2011) comes to a similar conclusion. According to the graph below, developing country Parties would surpass developed country Parties in terms of GHG emissions around 2015: "[d]*eveloping countries such as China will be the primary source of new emissions.*" (U.S. Environmental Protection Agency, 2011).



(U.S. Environmental Protection Agency, 2011)

Figure 4: Emissions in Tg CO_2 equivalent for developed and developing country Parties

According to the OECD (Organisation for Economic Co-operation and Development, 2002b), developing countries would account for about 70% of the increase in global CO2-emissions between 2002 and 2030.

One last remark concerning the 13th session of the Conference of the Parties is a change in terminology. The framework for meaningful and effective actions to enhance the implementation of article 4, paragraph 5, of the Convention, which is a very long name, would from this 13th session of the Conference of the Parties on be referred to as the "*technology transfer framework*", as stated in paragraph 1 of Annex I of decision 3 of the 13th session of the Conference of the Parties: "[...] *the framework for meaningful and effective actions to enhance the implementation of*

paragraph 4, paragraph 5, of the Convention (referred to hereinafter as the technology transfer framework) [...]". The second part of technology development and transfer was under the SBI. The fourth decision of the 13th session of the Conference of the Parties resembles the third decision of the 13th session of the Conference of the Parties a lot. However, an important clarification was made concerning the importance of funding of certain activities, as stated in paragraph 2 of decision 4 of the 13th session of the Conference of the Parties. These activities are: the implementation of technology needs assessments, joint research and development programmes and activities in the development of new technologies, demonstration projects, enabling environments for technology transfer, incentives for the private sector, North-South and South-South cooperation, endogenous capacities and technologies, issues associated with meeting the agreed full incremental costs, licences to support the access to and transfer of low-carbon technologies and know-how, a window for, inter alia, a venture capital fund related to, or possibly located in, a multilateral financial institution. Moreover, the EGTT was requested to assess gaps and barriers to the use of financing resources. The results of this assessment were to be made available to the SBI (paragraph 2 of decision 4 of the 13th session of the Conference of the Parties): "[...] *agrees that the Expert Group on Technology Transfer, through the Subsidiary Body for Scientific and Technological Advice, should, based on the identification and analysis of existing and potential new financing resources and vehicles, assess gaps and barriers to the use of, and the access to, these financing resources; and that the results of this work (identification, analysis and assessment) should be made available to the Subsidiary Body for Implementation not later than its thirtieth session, with a view to considering the role of new financing mechanisms and tools for scaling up development and transfer of technologies* [...]". Like the third decision of the 13th session of the Conference of the Parties, the fourth decision of the 13th session of the Conference of the Parties also requested the EGTT to develop this set of indicators to assess the effectiveness of the technology transfer framework and requested Parties to support developing country Parties in terms of money and technical support, as laid down in paragraphs 3, 4, 6 and 10 of decision 4 of the 13th session of the Conference of the Parties.

1.15. Decision 2 of the fourteenth session of the Conference of the Parties at Poznan, 2008 (United Nations Framework Convention on Climate Change, 2009a).

After the Bali Action Plan, the next milestone in technology development and transfer is the Poznan strategic programme on technology transfer, referred to in paragraph 1 of decision 2 of the fourteenth session of the Conference of the Parties: "[w]*elcomes the Poznan strategic programme on technology transfer, as a step towards scaling up the level of investment in technology transfer in order to help developing countries address their needs for environmentally sound technologies* [...]". The purpose of the Poznan strategic programme was to increase the level of investment in technology transfer in order to support developing country Parties in their switch to the use of ESTs. This first paragraph also recognized the importance of this programme to intensify technology transfer activities. The central organisation in this programme was the GEF, the developing countries' provider of financial support, as laid down in paragraph 2(c) of decision 2 of the fourteenth session of the Conference of the Parties: "[t]*o consider the long-term implementation of the strategic programme, including: addressing the gaps identified in current operations of the Global Environment Facility that relate to investment in the transfer of environmentally sound technologies; leveraging private-sector investment; and promoting innovative project development activities* [...]". The total amount of funding for the Poznan Strategic Program is $50 million (Global Environment Facility, 2010b). This amount of money is to used to finance three windows: to conduct TNAs, to pilot priority technology projects and to spread GEF experience and demonstrated ESTs, which proved to be successful (Global Environment Facility, 2010b). These three funding windows are an answer to paragraph 2(a) of decision 2 of the fourteenth session of the Conference of the Parties, during which country Parties requested the GEF to "*promptly initiate and expeditiously facilitate the preparation of projects for approval and implementation under the strategic programme referred to in paragraph 1 above in order to help developing countries*

address their needs for environmentally sound technologies" and to provide developing countries with technical support (in collaboration with other international organizations) when doing a TNA, as stated in paragraph 2(b) of decision 2 of the fourteenth session of the Conference of the Parties: "[r]*equests the Global Environment Facility […] [t]o collaborate with its implementing agencies in order to provide technical support to developing countries in preparing or updating, as appropriate, their technology needs assessments using the updated handbook for conducting technology needs assessments* […]." At the 16th session of the Conference of the Parties (as requested in paragraph 2(d) of decision 2 of the fourteenth session of the Conference of the Parties), the GEF handed in a report, which entailed a long-term implementation of the Poznan strategic programme on technology transfer. In this report, the GEF identified five elements to increase the level of investment in ESTs and to enhance technology transfer (Global Environment Facility, 2010b). One of these five elements is extremely important for this thesis, namely the support for Climate Technology Centers and a Climate Technology Network, the organs of the Technology Mechanism. Becoming more and more tangible, the Technology Mechanism was not far away from being established.

1.16. Decision 2 of the fifteenth session of the Conference of the Parties at Copenhagen, 2009 (United Nations Framework Convention on Climate Change, 2010b)

The fifteenth session of the Conference of the Parties at Copenhagen is without a doubt one of the most controversial ones. This fifteenth session of the COP was described as a deal, which was not fair, ambitious and moreover, which was not legally binding (Greenpeace, 2009a, 2009b). The most controversial part of the entire COP was, unfortunately, that part, which is important for this thesis, namely the Copenhagen Accord. The Copenhagen Accord was not formally adopted by the 193 parties to the UNFCCC. The Accord was a bargain between a number of world leaders, not a bargain between all world leaders. This "*Danish text*", presented by the Danish Prime Minister, Lars Løkke Rasmussen, was commented by Yvo de Boer, the Convention secretariat's former Executive Secretary as: "*clearly advantageous to the US and the west, would have steamrollered the developing countries, and was presented to a few countries a week before the meeting officially started."* (Vidal, 2010). When the text had been leaked, the 157 country Parties who had not been involved in the negotiations, were outraged and the fifteenth session of the Conference of the Parties had already failed before it actually started. Yvo de Boer commented: "[the Danish text] *destroyed two years of effort in one fell swoop. All our attempts to prevent the paper happening failed. The meeting at which it was presented was unannounced and the paper unbalanced* [...]" (Vidal, 2010). As a result, the Accord was rejected by country Parties like Tuvalu, Venezuela and Bolivia (Greenpeace, 2009c). This 15th session of the Conference of the Parties ended thus with an Accord, which was **not** legally binding. Instead, the Accord had only been taken note of, as stated in the preamble of decision 2 of the fifteenth session of the Conference of the Parties, because it had not been accepted by consensus: "[t]*he Conference of the Parties, [t]akes* ***note*** *of the Copenhagen Accord of 18 December 2009.*" The major consequence of the Accord was a huge loss of trust by country Parties. However, a remarkable break-through in the field of technology transfer was

made. Paragraph 11 of decision 2 of the the fifteenth session of the Conference of the Parties established the Technology Mechanism: "[i]*n order to enhance action on development and transfer of technology we decide to establish a Technology Mechanism to accelerate technology development and transfer in support of action on adaptation and mitigation that will be guided by a country-driven approach and be based on national circumstances and priorities.*" However, because of the fact that the Copenhagen Accord itself had only been taken note of and not agreed upon by all Parties, the Technology Mechanism also was taken note off and was legally still not established. The purpose of the Technology Mechanism was to accelerate technology development and transfer. The means to do this was to support actions in the field of adaptation and mitigation, which has to be country-driven since every country has different needs and therefore one action, which is successful in one country is not necessarily successful in another country, so the actions had to be based on national circumstances and priorities, as stated in paragraph 11 of decision 2 of the the fifteenth session of the Conference of the Parties. In order to support adaptation and mitigation actions, it was agreed upon that developed countries would provide developing countries with financial support, technology and capacity-building, as agreed upon in paragraphs 3 and 8 of decision 2 of the the fifteenth session of the Conference of the Parties: "[a]*daptation to the adverse effects of climate change and the potential impacts of response measures is a challenge faced by all countries. Enhanced action and international cooperation on adaptation is urgently required to ensure the implementation of the Convention by enabling and supporting the implementation of adaptation actions aimed at reducing vulnerability and building resilience in developing countries, especially in those that are particularly vulnerable, especially least developed countries, small island developing States and Africa. We agree that developed countries shall provide adequate, predictable and sustainable financial resources, technology and capacity-building to support the implementation of adaptation action in developing countries.*" and "[s]*caled up, new and additional, predictable and adequate funding as well as improved access shall be provided to developing countries, in accordance with the relevant provisions of the Convention, to enable and support enhanced*

action on mitigation, including substantial finance to reduce emissions from deforestation and forest degradation (REDD-plus), adaptation, technology development and transfer and capacity-building, for enhanced implementation of the Convention. The collective commitment by developed countries is to provide new and additional resources, including forestry and investments through international institutions, approaching USD 30 billion for the period 2010–2012 with balanced allocation between adaptation and mitigation. Funding for adaptation will be prioritized for the most vulnerable developing countries, such as the least developed countries, small island developing States and Africa. In the context of meaningful mitigation actions and transparency on implementation, developed countries commit to a goal of mobilizing jointly USD 100 billion dollars a year by 2020 to address the needs of developing countries. This funding will come from a wide variety of sources, public and private, bilateral and multilateral, including alternative sources of finance. New multilateral funding for adaptation will be delivered through effective and efficient fund arrangements, with a governance structure providing for equal representation of developed and developing countries. A significant portion of such funding should flow through the Copenhagen Green Climate Fund." In order to finance all the actions, programmes, policies etc. related to mitigation, adaptation, capacity-building, technology development and transfer, the Copenhagen Green Climate Fund was established in paragraph 10 of decision 2 of the the fifteenth session of the Conference of the Parties: "[w]*e decide that the Copenhagen Green Climate Fund shall be established as an operating entity of the financial mechanism of the Convention to support projects, programme, policies and other activities in developing countries related to mitigation including REDD-plus, adaptation, capacity-building, technology development and transfer.*" Although it seems that there had been a major step taken in the field of technology development and transfer, we have to put the Copenhagen Accord into perspective. The entire Accord, and thus all its paragraphs, were not legally binding, but were ***taken note of***. This basically meant that the Technology Mechanism was introduced and that some country Parties were in favour of the Accord and the Technology Mechanism, but legally, the Technology Mechanism did not exist yet. However, the basis for the

Technology Mechanism was there and would prove to be useful in the 16th COP at Cancun.

One of the important issues that had been agreed upon by consensus was to extend the mandate of the Ad Hoc Working Group on Long-term Cooperative Action under the Convention (AWG-LCA) for another year, so that it could continue its work and present its oucome on the sixteenth session of the Conference of the Parties, as stated in paragraph 1 of decision 1 of the fifteenth session of the Conference of the Parties: "[d]*ecides to extend the mandate of the Ad Hoc Working Group on Long-term Cooperative Action under the Convention to enable it to continue its work with a view to presenting the outcome of its work to the Conference of the Parties for adoption at its sixteenth session* [...]". The work of the AWG-LCA was, as already stated in paragraph 1 and 2 of decision 1 of the thirteenth session of the Conference of the Parties to conduct the "*comprehensive process to enable the full, effective and sustained implementation of the Convention through long-term cooperative action, now, up to and beyond 2012* [...]" and "[d]*ecides that the process shall be conducted under a subsidiary body under the Convention, hereby established and known as the Ad Hoc Working Group on Long-term Cooperative Action under the Convention [...]".*

1.17. Decision 1 of the sixteenth session of the Conference of the Parties at Cancun, 2010 (United Nations Framework Convention on Climate Change, 2011h)

The real break-through came at the the sixteenth session of the Conference of the Parties in 2010, when the Technology Mechanism [TM] was established in paragraph 117 of chapter B of decision 1 of the sixteenth session of the Conference of the Parties: "[d]*ecides to establish a Technology Mechanism* [...]". The objective of the Technology Mechanism is "[...] *to enhance action for technology development and transfer, particularly to developing countries, in support of climate change mitigation and adaptation.*" (Latif, 2011), as stated in paragraph 113 of chapter B of decision 1 of the sixteenth session of the Conference of the Parties: "[d]*ecides that the objective of enhanced action on technology development and transfer is to support action on mitigation and adaptation in order to achieve the full implementation of the Convention* [...]". Moreover, action at different stages of the technology cycle (R&D, demonstration, diffusion and transfer) is to be accelerated as laid down in paragraph 115 of chapter B of decision 1 of the sixteenth session of the Conference of the Parties: "[f]*urther decides to accelerate action consistent with international obligations, at different stages of the technology cycle, including research and development, demonstration, deployment, diffusion and transfer of technology* [...]". The entire technology development and transfer process was described as a country-driven process. It was up to the country Parties to determine their technology needs, to form partnerships, to increase public and private research etc. to, once again, support action on mitigation and adaptation, as laid down in paragraphs 114 and 116 of chapter B of decision 1 of the sixteenth session of the Conference of the Parties: "[a]*lso decides that, in pursuit of this objective, technology needs must be nationally determined, based on national circumstances and priorities* [...]" and "[e]*ncourages Parties [...] to undertake domestic actions identified through country-driven approaches, to engage in bilateral and multilateral cooperative activities on technology development and transfer and to increase*

private and public research, development and demonstration in relation to technologies for mitigation and adaptation [...]". The Technology Mechanism is some kind of "*umbrella mechanism*", existing out of three organs: a Technology Executive Committee (TEC), a Climate Technology Centre (CTC) and a Climate Technology Network (CTN), as agreed upon in paragraphs 117 (a) and 117 (b) of chapter B of decision 1 of the sixteenth session of the Conference of the Parties. The Technology Committee would have three broad functions (UNFCCC Expert Group on Technology Transfer, 2011). First of all, its functions would be policy related (agenda setting and guidance) as stated in paragraphs 121(b), (c), (e), (f) and (g) of chapter B of the first decision of the 16th session of the COP: "*(b) Consider and recommend actions to promote technology development and transfer, in order to accelerate action on mitigation and adaptation; (c) Recommend guidance on policies and programme priorities related to technology development and transfer with special consideration given to the least developed country Parties; (e) Recommend actions to address the barriers to technology development and transfer in order to enable enhanced action on mitigation and adaptation; (f) Seek cooperation with relevant international technology initiatives, stakeholders and organizations, and promote coherence and cooperation across technology activities, including activities under and outside of the Convention; (g) Catalyse the development and use of technology road maps or action plans at the international, regional and national levels through cooperation between relevant stakeholders, particularly governments and relevant organizations or bodies, including the development of best practice guidelines as facilitative tools for action on mitigation and adaptation.*" Second of all, the functions of the Technology Executive Committee would be facilitative as stated in paragraph 121(d) of chapter B of the first decision of the 16th session of the COP: "*(d) Promote and facilitate collaboration on the development and transfer of technologies for mitigation and adaptation between governments, the private sector, non-profit organizations and academic and research communities*". Third of all, the functions of the Technology Executive Committee would be synthesis and analysis related as stated in paragraph 121(a) of chapter B of the first decision of the 16th session of the COP: "*(a) Provide*

an overview of technological needs and analysis of policy and technical issues related to the development and transfer of technologies for mitigation and adaptation." The purpose of the Technology Executive Committee (TEC) would be to provide services to the UNFCCC and Parties. Besides its functions, the TEC received another important task. The TEC was to further implement the technology transfer framework (paragraph 119 of chapter B of decision 1 of the sixteenth session of the Conference of the Parties), which used to be the EGTT's responsibility, having originally a mandate until the 18th COP (paragraph 3 of decision 3 of the third session of the Conference of the Parties). At this the sixteenth session of the Conference of the Parties, however, country Parties decided to terminate the EGTT's mandate (paragraph 124 of chapter B of decision 1 of the sixteenth session of the Conference of the Parties) and transfer its responsibility concerning the technology transfer framework to the TEC. Just like the TEC, the Climate Technology Centre and Network (CTCN) also has three broad functions (United Nations Framework Convention on Climate Change, 2011d). First of all, the functions of the CTCN would be facilitative as stated in paragraphs 123(a)(ii), (a)(iii), (b), (c), (c)(ii) and (c)(iv) of chapter B of the first decision of the 16th session of the COP: "*(a) At the request of a developing country Party: (ii) Facilitating the provision of information, training and support for progammes to build or strengthen capacity of developing countries to identify technology options, make technology choices and operate, maintain and adapt technology; (iii) Facilitating prompt action on the deployment of existing technology in developing country Parties based on identified needs; (b) Stimulating and encouraging, through collaboration with the private sector, public institutions, academia and research institutions, the development and transfer of existing and emerging environmentally sound technologies, as well as opportunities for North–South, South–South and triangular technology cooperation; (c) Facilitating a network of national, regional, sectoral and international technology centres, networks, organization and initiatives with a view to: (ii) Facilitating international partnerships among public and private stakeholders to accelerate the innovation and diffusion of environmentally sound technologies to developing country Parties. (iv) Stimulating the establishment of twinning centre arrangements*

to promote North–South, South–South and triangular partnerships, with a view to encouraging cooperative research and development" Second of all, the functions of the CTCN would be advisory as stated in paragraph 123 (a)(i) of chapter B of the first decision of the 16th session of the COP: "*(a) At the request of a developing country Party: (i) Providing advice and support related to the identification of technology needs and the implementation of environmentally sound technologies, practices and processes.*" Third of all, the functions of the CTCN would be to provide assistance. This could be directly or through Regional centres and the network. This is stated in paragraph 123(a)(i), (c)(iii) and (c)(v) of chapter B of the first decision of the 16th session of the COP: "*(a) At the request of a developing country Party: (i) Providing advice and support related to the identification of technology needs and the implementation of environmentally sound technologies, practices and processes; (iii) Providing, at the request of a developing country Party, in-country technical assistance and training to support identified technology actions in developing country Parties; (v) Identifying, disseminating and assisting with developing analytical tools, policies and best practices for country-driven planning to support the dissemination of environmentally sound technologies.*" Although the functions and responsibilities of the different organs seem clear, there are still some unresolved issues that need attention in order for the Technology Mechanism to be fully and effectively operational in 2012, as laid down as objective in paragraph 128 of chapter B of decision 1 of the sixteenth session of the Conference of the Parties: "[...] *in order to make the Technology Mechanism fully operational in 2012* [...]". Five of these unresolved "*issues*", as I call them, will be analyzed in the course of this thesis and potential answers/solutions will be provided to these issues, as these are crucial to make the Technology Mechanism operational and to enhance the technology development and transfer process. Besides the Technology Mechanism, another important decision had been made, namely to extend the mandate of the Ad Hoc Working Group on Long-term Cooperative Action under the Convention (AWG-LCA) with one year, as stated in paragraph 143 of chapter VII of decision 1 of the sixteenth session of the Conference of the Parties: "[d]*ecides to extend the Ad Hoc Working Group on Long-term Cooperative Action under the Convention for one year,*

in order for it to continue its work with a view to carrying out the undertakings contained in this decision and present the results to the Conference of the Parties for consideration at its seventeenth session [...]".

1.18. Decision "x" of the seventeenth session of the Conference of the Parties at Durban, 2011

~ The future of the Technology Mechanism ~

After the failure of the fifteenth session of the Conference of the Parties at Copenhagen, expectations for the sixteenth session of the Conference of the Parties at Cancún were low (Sawyer, 2011). When looking at it from one side, one could argue that Cancún also ended up as a failure. The Kyoto protocol and its binding emission limitations/reductions will end in 2012, the end of the first commitment period, as stated in article 3.1 of the Kyoto Protocol to the United Nations Framework Convention on Climate Change: "[t]*he [developed country] Parties shall, individually or jointly, ensure that their aggregate anthropogenic carbon dioxide equivalent emissions of the greenhouse gases listed in Annex A do not exceed their assigned amounts, calculated pursuant to their quantified emission limitation and reduction commitments inscribed in Annex B and in accordance with the provisions of this paragraph, with a view to reducing their overall emissions of such gases by at least 5 per cent below 1990 levels in the commitment period 2008 to 2012.*" The sixteenth session of the Conference of the Parties at Cancún failed to reach an agreement on the future of the Kyoto Protocol and its binding emission limitations/reductions. There has been no clarification whether the second commitment period would be laid down in a completely new treaty or whether the Kyoto Protocol would be amended (Sawyer, 2011). A crucial question for this thesis then is: is technology development and transfer and thus the Technology Mechanism a lost cause? Although no pioneering agreements were made at the sixteenth session of the Conference of the Parties at Cancún, it did succeed in rebuilding trust among Parties or as Sawyer (2011) puts it: "[w]*hile the agreements do not actually take us a great deal further down the road towards saving the climate, they do constitute a renewed commitment by the international community to the multilateral UN process.*

The Mexican presidency must be commended for succeeding in creating an atmosphere of improved trust and cooperation which had been all but destroyed in the shambles of Copenhagen." Thanks to renewed trust and commitments by the international community, the Technology Mechanism and thus technology development and transfer seem to be saved as one of the main foci of the seventeenth session of the Conference of the Parties at Durban is expected to be on technology transfer and assistance provided to developing countries (Coulomb, 2011).

Methodology

The first chapter showed how technology development and transfer and the Technology Mechanism was formed stepwise since the first session of the Conference of the Parties in 1995 and how it was officially established at the sixteenth session of the Conference of the Parties in 2010. The creation of the Technology Mechanism is being described as "*one of the* ***important results*** *of Cancun". "The decision comes as the culmination of a three year negotiating process on the means to* ***enhance the transfer of climate friendly technologies*** *– particularly to developing countries. It is built upon the premise that the worldwide accelerated diffusion of these technologies is critical to global efforts to reduce green house gas emissions."* (International Centre for Trade and Sustainable Development, 2011).

There are however unresolved issues that need to be addressed and given an answer to in order to make the Technology Mechanism operational in 2012, as laid down in paragraph 128 of chapter B of decision 1 of the sixteenth session of the Conference of the Parties: "[...] *in order to make the Technology Mechanism fully operational in 2012.*" The International Centre for Trade and Sustainable Development (2011) wrote: "[h]*owever, the decision left several pending issues to be agreed upon in 2011. These include finance and a number of institutional matters regarding the relationship between the mechanism's two main bodies – the Technology Executive Committee (TEC) and the Climate Technology Centre and Network (CTCN) […]*".

In this thesis, I will address five unresolved issues and provide answers on how these issues could be addressed and solved.

I will first start by giving an overview of these five issues and thus of *what* I will be doing.

First of all, I will look at the Technology Mechanism's hierarchy, as laid down in

paragraph 128(a) of chapter B of session 1 of the sixteenth session of the Conference of the Parties: "[u]*nderlines the importance of continued dialogue among Parties in 2011 through the Ad Hoc Working Group on Long-term Cooperative Action under the Convention, including on the following matters, with a view to the Conference of the Parties taking a decision at its seventeenth session, in order to make the Technology Mechanism fully operational in 2012: (a) The relationship between the Technology Executive Committee and the Climate Technology Centre and Network, and their reporting lines* [...]". The Technology Mechanism exists out of three organs: a Committee, a Centre and a Network. The relationship between these three organs, however, is still an unresolved and much disputed issue. The main question here to be solved is thus: "*how will the Technology Mechanism look like?*"

Second of all, another "*how*" question arises concerning the functions of the Technology Mechanism. Every organ has functions it has to execute. However, it is not decided *how* these functions can and should be executed. This part will therefore be devoted to the Technology Mechanism's *operational modalities*.

The third issue is a "*what"* question, namely: "*what will be the Technology Mechanism's main areas, sectors and ESTs to be transferred in the field of mitigation and adaptation?*"

The fourth issue may be the largest obstacle of technology transfer is general and of the Technology Mechanism in particular, namely: Intellectual Property Rights. The main question here is: "*how can Intellectual Property Rights be dealt with?*". This question is heavily debated and a strong conflicting issue between developing and developed country Parties.

The fifth issue is a problem to every Party, institution and mechanism, namely: money. They key question here is: "w*ho or what will pay for the Technology Mechanism and how will this money transfer go?*". This is also laid down in paragraph 128(d) of chapter B of session 1 of the sixteenth session of the Conference of the Parties: "[u]*nderlines the importance of continued dialogue among Parties in 2011 through the Ad Hoc Working Group on Long-term Cooperative Action under the Convention, including on the following matters, with a view to the Conference of*

the Parties taking a decision at its seventeenth session, in order to make the Technology Mechanism fully operational in 2012: [t]he potential links between the Technology Mechanism and the financial mechanism [...]".

I just answered the "*what*" question of my thesis. In order to solve this "*what*" question and thus those five issues, I will continue with the "*how*" question of my thesis: "*how will I address and solve these issues?*"

In this thesis, I will not rely on numeric models or technical analyses, but I will perform a critical literature study.

As there is no academic literature on the UNFCCC's Technology Mechanism yet, an important part of literature will consist of international climate treaties under the Convention secretariat. Another crucial part of literature will be working papers of Parties and the Convention secretariat and reports of subsidiary bodies. Furthermore, academic literature in the field of climate change, technology and innovation will also prove its usefulness in this literature study.

Francis Bacon once said: "*knowledge is power*" and by conducting a critical literature study, I will look at issues from several perspectives. I will thus go through relevant literature concerning the Technology Mechanism, technology development and transfer and innovation and analyze it critically. By bringing various sources together and conducting critical analyses, it will become clear which solutions are possible for the issues of the Technology Mechanism and why.

Chapter 2: The UNFCCC's Technology Mechanism: solutions to five unresolved issues

2.1. Recalling the Technology Mechanism

The Technology Mechanism was officially established in paragraph 117 of chapter B of the first decision of the sixteenth session of the Conference of the Parties: "[d]*ecides to establish a Technology Mechanism […], under the guidance of and accountable to the Conference of the Parties* […]. (UNFCCC, 2010b). Based on paragraphs 117(a) and 117(b) of chapter B of the first decision of the sixteenth session of the Conference of the Parties (United Nations Framework Convention on Climate Change, 2011h), the Technology Mechanism would exist out of a Technology Executive Committee (TEC) and a Climate Technology Centre and Network (CTCN). The Technology Committee would have three broad functions (UNFCCC Expert Group on Technology Transfer, 2011). First of all, its functions would be **policy related** (agenda setting and guidance) as stated in paragraphs 121(b), (c), (e), (f) and (g) of chapter B of the first decision of the 16th session of the COP: "*(b) Consider and recommend actions to promote technology development and transfer, in order to accelerate action on mitigation and adaptation; (c) Recommend guidance on policies and programme priorities related to technology development and transfer with special consideration given to the least developed country Parties; (e) Recommend actions to address the barriers to technology development and transfer in order to enable enhanced action on mitigation and adaptation; (f) Seek cooperation with relevant international technology initiatives, stakeholders and organizations, and promote coherence and cooperation across technology activities, including activities under and outside of the Convention; (g) Catalyse the development and use of technology road maps or action plans at the international, regional and national levels through cooperation between relevant stakeholders, particularly governments and relevant organizations or bodies, including the development of best practice guidelines as facilitative tools for action on mitigation*

and adaptation." Second of all, the functions of the Technology Executive Committee would be **facilitative** as stated in paragraph 121(d) of chapter B of the first decision of the 16th session of the COP: "*(d) Promote and facilitate collaboration on the development and transfer of technologies for mitigation and adaptation between governments, the private sector, non-profit organizations and academic and research communities*". Third of all, the functions of the Technology Executive Committee would be **synthesis** and **analysis** related as stated in paragraph 121(a) of chapter B of the first decision of the 16th session of the COP: "*(a) Provide an overview of technological needs and analysis of policy and technical issues related to the development and transfer of technologies for mitigation and adaptation.*" The purpose of the Technology Executive Committee (TEC) would be to provide services to the UNFCCC and Parties. Just like the TEC, the Climate Technology Centre and Network (CTCN) also has three broad functions (United Nations Framework Convention on Climate Change, 2011d). First of all, the functions of the CTCN would be **facilitative** as stated in paragraphs 123 (a)(ii), (a)(iii), (b), (c), (c)(ii) and (c)(iv) of chapter B of the first decision of the 16th session of the COP: "*(a) At the request of a developing country Party: (ii) Facilitating the provision of information, training and support for progammes to build or strengthen capacity of developing countries to identify technology options, make technology choices and operate, maintain and adapt technology; (iii) Facilitating prompt action on the deployment of existing technology in developing country Parties based on identified needs; (b) Stimulating and encouraging, through collaboration with the private sector, public institutions, academia and research institutions, the development and transfer of existing and emerging environmentally sound technologies, as well as opportunities for North–South, South–South and triangular technology cooperation; (c) Facilitating a network of national, regional, sectoral and international technology centres, networks, organization and initiatives with a view to: (ii) Facilitating international partnerships among public and private stakeholders to accelerate the innovation and diffusion of environmentally sound technologies to developing country Parties. (iv) Stimulating the establishment of twinning centre arrangements to promote North–South, South–South and triangular*

partnerships, with a view to encouraging cooperative research and development" Second of all, the functions of the CTCN would be **advisory** as stated in paragraph 123(a)(i) of chapter B of the first decision of the 16th session of the COP: "*(a) At the request of a developing country Party: (i) Providing advice and support related to the identification of technology needs and the implementation of environmentally sound technologies, practices and processes.*" Third of all, the functions of the CTCN would be to **provide assistance**. This could be directly or through Regional centres and the network. This is stated in paragraphs 123(a)(i), (c)(iii) and (c)(v) of chapter B of the first decision of the 16th session of the COP: "*(a) At the request of a developing country Party: (i) Providing advice and support related to the identification of technology needs and the implementation of environmentally sound technologies, practices and processes; (iii) Providing, at the request of a developing country Party, in-country technical assistance and training to support identified technology actions in developing country Parties; (v) Identifying, disseminating and assisting with developing analytical tools, policies and best practices for country-driven planning to support the dissemination of environmentally sound technologies.*" The purpose of the Technology Executive Committee (TEC) would be to provide services to developing country Parties (UNFCCC Expert Group on Technology Transfer, 2011).

2.2. Issue number one: the UNFCCC's Technology Mechanism and its hierarchy

The first major problem already arises when looking at the Technology Mechanism's anchors: the Committee, the Centre and the Network. It was not decided upon what the hierarchy and relationship between these three organs should be (International Centre for Trade and Sustainable Development, 2011; United Nations Framework Convention on Climate Change, 2011h). According to Ishida (2009), an hierarchy emerges when one agent, who is called the superior, orders the other agent, who is being referred to as the subordinate, what to do, while the subordinate has an incentive to follow the order. In this case, the incentive to execute an order could be a legally binding paragraph of a function, which states that organ "*x*" is the subordinate, that has to execute the orders coming from superior "*y*". The communication flow is, in this case, top-down. Ishida (2009) refers to this structure as an assymetrical one. The structure, however, could also be a symmetrical one. This means that all the agents are induced to exert effort and communicate with each other. The communication is, in contrary to the assymetrical structure, bilateral, as each agent carriers the same weight in the decision-making process (Ishida, 2009). During the UNFCCC's Intersessional Negotiations in June 2010, it became clear that developed and developing country Parties had opposing views concerning the hierarchy and relationship between the Technology Mechanism's organs (Third World Network, 2010). This is not surprising, since the largest differences on the subject of technology transfer as a whole exist between developed and developing country Parties (Haum, 2010). Developed country Parties wanted the Committee (TEC) and the Centre and Network (CTCN) to be independent of each other, forming a flat hierarchy or a symmetrical structure in which no organ stood above the other. Developed country Parties were also in favour of the TEC reporting to the SBSTA, the body that provides the COP with information on scientific and technological issues. The USA clarified its point of view by stating that the TEC and CTCN were two bodies with two completely different tasks and that because of this, no body was

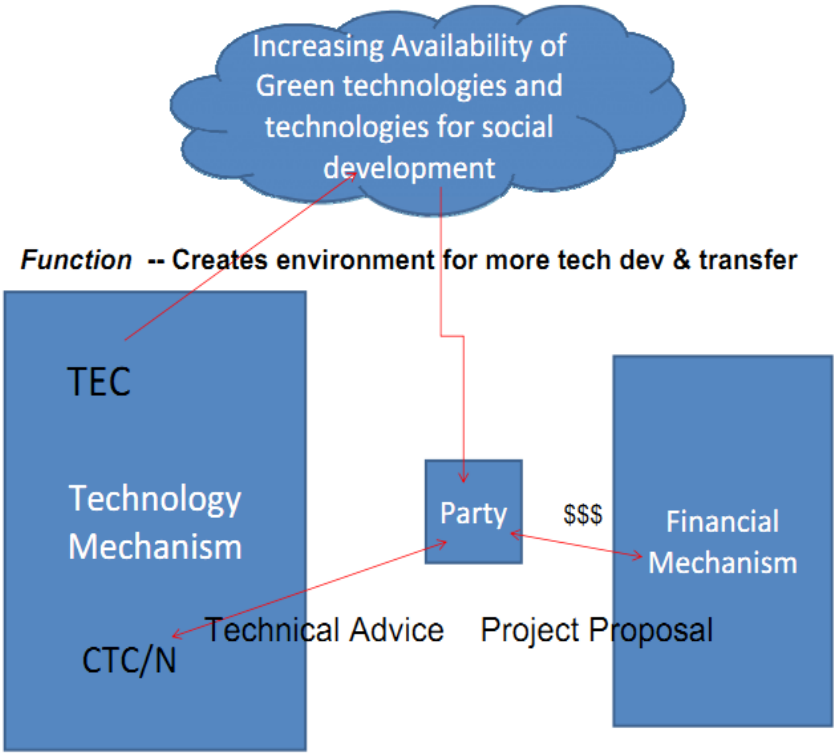
superior to the other. Concerning the reporting issue, the USA believed that the TEC should report to the SBSTA, because of its mandate to provide advice to the COP on technology transfer. Japan and Australia agreed with the USA, stating that the TEC and the CTCN should have close communication, but that they should stay mutually independent. Developing country Parties however had a completely different view on the Technology Mechanism's hierarchy. According to these Parties, the TEC should give guidance to the CTCN and because of this, should stand higher in the hierarchy than the CTCN and thus an assymetrical structure was favoured. Moreover, the TEC should report directly to the COP and not to the SBSTA. Argentina clarified by stating that the Technology Mechanism has to address developing countries' needs. Because of this, the TEC should align the activities of the CTCN with the actions of developing countries and therefore, should have a mandate over the CTCN. Moreover, it was up to the TEC to set priorities and to function as a contact point for developing countries. South-Africa pointed out that the TEC was to provide policy guidance to the CTCN, while the CTCN would ensure implementation. India followed its colleagues by stating that the TEC had to determine the CTCN's scope of activities. The CTCN would then report to the TEC and the TEC would then report to the COP (Third World Network, 2010).

Aosis, the Alliance of Small Island States, and the European Union made a working paper on how they see the Technology Mechanism (Alliance of Small Island States, 2011). By going through these working papers, one of a developing and one of a developed Party, the purpose is to get a fuller picture of how these Parties see the hierarchy and reporting lines of the Technology Mechanism, more in detail, and why. This will provide me with essential information and insights in order to present a possible hierarchy of the Technology Mechanism later.

Aosis agrees with its developing country colleagues that the TEC should guide the CTCN. In order to create a network, various "*Regional and National Regional Climate Technology Centres*" would have to be available. These Regional Climate Technology Centres would provide country Parties with technical support. This could be done by existing institutions, however, these existing centres would have to be

tailored to the needs and requests of developing country Parties. If these existing institutions show too many gaps in terms of their ability to deliver support for the development and transfer of technologies, new technical assistance programmes or Regional Climate Technology Centres should be established (Alliance of Small Island States, 2011). Whether an existing institution is suitable to become a Regional Climate Technology Centre would be determined by the TEC. The TEC is to establish criteria an institution has to meet to become such a Centre. Once these criteria are created, all institutions that meet these criteria can "*apply*" to become part of the Network. In this scenario, the TEC receives an extremely important and powerful role and basically, it is the TEC that determines whether the Technology Mechanism succeeds or fails. If the established criteria are not appropriate, then the wrong institutions may become Regional Climate Technology Centres and technology transfer may not be as effective as it would have been with different Regional Climate Technology Centres under different criteria. A possible reason why Aosis gives the TEC so much power could be because developing country Parties feel the need for some kind of "*watchdog*" that aligns the activities of the CTCN with the activities and needs of developing country Parties. And these needs are crucial. In the case of Aosis, it relies completely on other countries for the import of technologies, is highly dependent on larger countries for new technologies and has a private sector with very little involvement in the development and deployment of technology (Alliance of Small Island States, 2011).

This is how the Technology Mechanism would look like according to Aosis:



(Alliance of Small Island States, 2011)

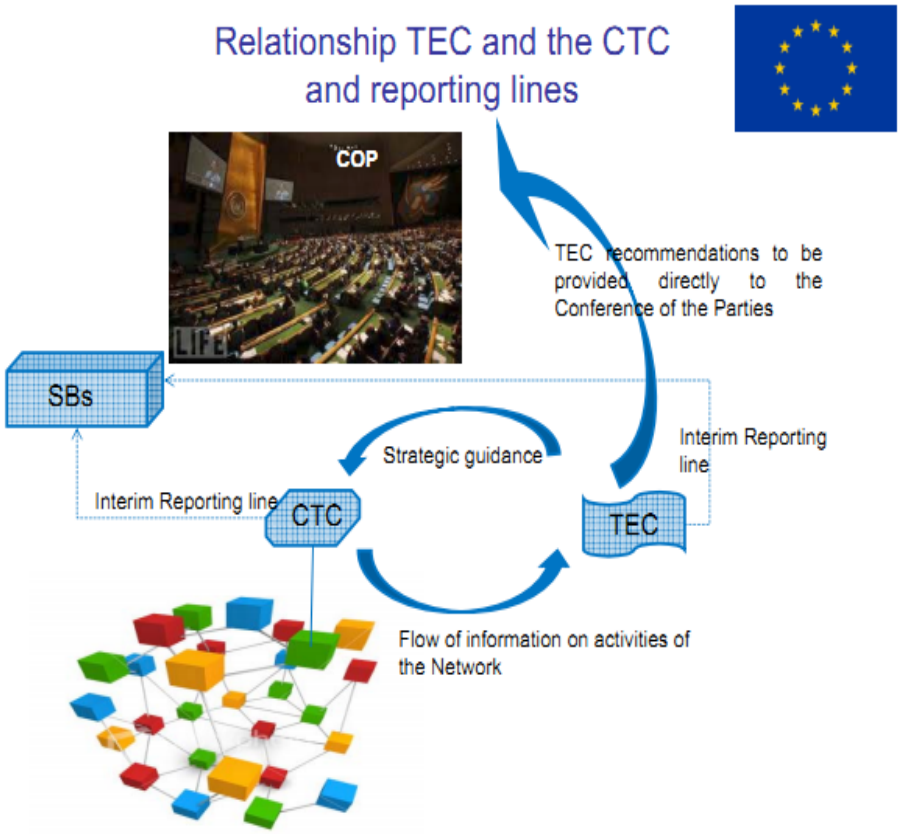
Figure 5: The Technology Mechanism's hierarchy according to Aosis

First of all, the Technology Mechanism exists out of the TEC and the CTCN in which the TEC stands higher in the hierarchy than the CTCN. Second of all, there is interaction between the CTCN and a Party as the CTCN provides this Party, when being requested for, with technical advice. There is no interaction between the TEC and a Party. The TEC's duty is to increase the availability of ESTs ("*green technologies*") and other technologies for social development. Third of all, the Technology Mechanism is not directly linked to a financial mechanism. However, the issue of the financial mechanism will be discussed in the course of this thesis. The reporting lines to the subsidiary bodies and the COP stay, in this model, unanswered.

The European Union also made a working paper on the Technology Mechanism and came up with an adapted, but not completely different model of how the Technology Mechanism could look like (European Union, 2011). The EU agrees with Aosis that

the TEC should provide strategic guidance to the CTCN, but that both organs should remain independent of each other.

This is how the Technology Mechanism would look like according to the European Union:



(European Union, 2011)

Figure 6: The Technology Mechanism's hierarchy according to the European Union

There is a flat hierarchy between the CTC and the TEC. The TEC provides the CTC with strategic guidance, while the CTC keeps the TEC updated by providing information on the activities of the Network. Both the CTC and the TEC report to the SBI and the SBSTA on an interim basis and it is the TEC that will provide the COP with recommendations, not one of the subsidiary bodies. This scenario is a consensus

between developed and developing country Parties' views on the Technology Mechanism. On the hand one, the TEC and CTC are equal to each other, which was proposed by developed country Parties. On the other, the TEC will report directly to the COP, which was proposed by developing country Parties.

This issue is being worked on by various Parties and in order to give my view on it, I will analyze some of the functions of the different organs and the relationships between each other, to the subsidiary bodies and to the COP, as laid down in decision 1 of the sixteenth session of the Conference of the Parties.

Annex I gives an overview of the functions of the TEC and the CTCN. The functions of the TEC were adapted over time as negotiations concerning the Technology Mechanism evolved. When comparing the functions of the TEC, as laid down in the negotiating text of the twelfth session of the AWG-LCA in Tianjin in October 2010 (United Nations Framework Convention on Climate Change, 2010a) to paragraph 121 of chapter B of decision 1 of the sixteenth session of the Conference of the Parties, one notices that differences in wording appear. In paragraph 7(g) of Chapter IV of the negotiating text of the twelfth session of the AWG-LCA in Tianjin in October 2010, one of he TEC's functions is laid down as: "[p]***rovide guidance*** *to the Climate Technology Centre and Network with a view to* ***aligning the activities*** *of the Climate Technology Centre and Network with country-driven actions* [...]". This paragraph proposed a TEC with a mandate over the CTCN and which stood higher in the hierarchy. First of all, the TEC "*provided*" the CTCN with guidance. Second of all, the TEC could "*align*" the CTCN's activities, so the TEC had the power to "*correct*" the CTCN's activities, if these did not correspond to actions undertaken by country Parties. In decision 1 of the sixteenth session of the Conference of the Parties, this paragraph had been removed. The fact that the above mentioned paragraph had been removed, means that there was a consensus among Parties that the paragraph should disappear and that its content was disapproved of, as the UNFCCC decision-making procedure is based on the multistakeholder process, which means that the views of all Parties are being heard and integrated through dialogue and consensus (United Nations Framework Convention on Climate Change,

2011e). There is, however, an paragraph that is closely related to the above mentioned one, namely paragraph 7(c) of Chapter IV of the negotiating text of the twelfth session of the AWG-LCA in Tianjin in October 2010: "[p]*repare guidance for adoption by the Conference of the Parties on policies, programme priorities and eligibility criteria related to technology development and transfer[,with special consideration given to least developed Parties* [...]". This paragraph was then changed to paragraph 121(c) of chapter B of decision 1 of the sixteenth session of the Conference of the Parties: "[r]*ecommend guidance on policies and programme priorities related to technology development and transfer with special consideration given to the least developed country Parties*". Both paragraphs do not state to which Party or organ the guidance is being directed. Guidance on policies could be directed to country Parties, while guidance on programme priorities could be directed to the CTCN, in order to align the activities of the Climate Technology Centre and Network with country-driven actions. The baseline, however, is that in this paragraph, it is not stated explicitely that the TEC directs its guidance to the CTCN to make sure the CTCN's activities match Parties' actions. From the understanding of this paragraph, the TEC does not determine the CTCN's activivities, nor has it the power and mandate to change or "*align*" them. Another important remark is that the verbs at the beginning of the related paragraphs have different connotations. In paragraph 7(g) of Chapter IV of the negotiating text of the twelfth session of the AWG-LCA in Tianjin in October 2010, which had been removed, the verb "*to provide*" was used. It thus meant that the TEC would have supplied the CTCN with guidance for sustenance or support (Merriam-Webster, 2011) to make sure the activities of the CTCN and countries corresponded to each other. The entire paragraph plus the use of the verb at the beginning of the paragraph suggested a Technology Mechanism where the TEC stood higher in the hierarchy than the CTCN. In paragraph 121(c) of chapter B of decision 1 of the sixteenth session of the Conference of the Parties, the TEC would *recommend* guidance, but it is not stated that this guidance would be adopted or enforced by the COP. The language that was being used in decision 1 of the sixteenth session of the Conference of the Parties was softer than the language in Chapter IV of the negotiating text of the twelfth session of the AWG-LCA in Tianjin in October

2010. Because of the removal of paragraph 7(g) of Chapter IV of the negotiating text of the twelfth session of the AWG-LCA in Tianjin in October 2010 and the evolution of the language between the negotiating text of the twelfth session of the AWG-LCA in Tianjin in October 2010 and decision 1 of the sixteenth session of the Conference of the Parties, the TEC does not necessarily stand higher in the Technology Mechanism's hierarchy anymore. In decision 1 of the sixteenth session of the Conference of the Parties, there is no paragraph that points at any relationship between the TEC and the CTCN. It does not say that the TEC will intervene in the CTCN's activities in any way, nor does it say that the CTCN will report to the TEC or that there will be a minimum of communication between the TEC and the CTCN at all. The way the official text is right now, there is no indication that any organ would stand higher in the hierarchy than another. Moreover, there has been fear that the TEC could become a "*politicized*" body intervening in technology transfer: "[w]*hile it was initially envisaged that the TEC would oversee the work of the Technology Centre and Network, apprehensions that the TEC could become a 'politicized' body which intervenes in technology matters has led to a reappraisal."* (Latif, 2010).

At this point, I consider the TEC and the CTCN to be equal to each other. This conclusion is based on four arguments:

first of all, paragraph 7(g) of Chapter IV of the negotiating text of the twelfth session of the AWG-LCA in Tianjin in October 2010, which suggested a TEC that stood above the CTCN, was completely removed, based on consensus among Parties, the decision-making procedure of the UNFCCC. By deleting the paragraph, this preliminary hierarchy was brought down.

Second of all, the only guidance coming from the TEC now is not directed anymore, which means it does not state to which Party it will go to, as being confirmed in paragraph 121(c) of chapter B of decision 1 of the sixteenth session of the Conference of the Parties: "[r]*ecommend guidance on policies and programme priorities related to technology development and transfer with special consideration given to the least developed country Parties*". The guidance might be directed

towards the CTCN, but also towards a country Party.

Third of all, the TEC's advice will not be adopted or enforced by the COP. Instead, the TEC will merely "*recommend*" this guidance. The language that was being used in decision 1 of the sixteenth session of the Conference of the Parties was softer than the language in Chapter IV of the negotiating text of the twelfth session of the AWG-LCA in Tianjin in October 2010. Because of this change in language, the TEC is being brought down in the hierarchy.

Fourth of all, the popping-up of statements as stated by Latif (2010) indicates that there is fear to make the TEC oversee the work of the CTCN and thus to place the TEC higher in the hierarchy than the CTCN.

Based on these arguments, my view is that, for the moment, the TEC and the CTCN are two bodies that stand on equal footing within the Technology Mechanism's hierarchy.

Besides the Technology Mechanism's hierarchy, the reporting lines between the TEC and the CTCN are unresolved issues as well, as laid down in paragraph 128(a) of chapter B of decision 1 of the sixteenth session of the Conference of the Parties: "[t]*he relationship between the Technology Executive Committee and the Climate Technology Centre and Network, and* ***their reporting lines*** [...]". Paragraph 126 of chapter B of decision 1 of the sixteenth session of the Conference of the Parties states: "[...] *the Technology Executive Committee and the Climate Technology Centre and Network shall* ***report****, on an interim basis and without prejudice to the relationship between the Technology Executive Committee and the Climate Technology Centre and Network as referred to in paragraph 128 (a) below* ***to the Conference of the Parties, through the subsidiary bodies****, on their respective activities and the performance of their respective functions*". Both the TEC and the CTCN have to report on their activities and their performance to the subsidiary bodies and the subsidiary bodies will then report to the COP. Under the UNFCCC, there are three subsidiary bodies: two permanent subsidiary bodies, being the SBI and the SBSTA, and one temporary subsidiary body, being the Ad Hoc Working Group on Long-term Cooperative Action under the Convention (AWG-LCA), which

mandate was extended in paragraph 143 of chapter VII of decision 1 of the sixteenth session of the Conference of the Parties: "[d]*ecides to extend the Ad Hoc Working Group on Long-term Cooperative Action under the Convention for one year, in order for it to continue its work with a view to carrying out the undertakings contained in this decision and present the results to the Conference of the Parties for consideration at its* ***seventeenth session*** [...]". As stated in paragraph 1(d) of decision 1 of the thirteenth session of the Conference of the Parties, technology development and transfer is part of the comprehensive process that is governed by the AWG-LCA. However, unless being extended, its mandate will seize to exist at the seventeenth session of the COP in 2011. It is thus not clear, whether the Technology Mechanism's organs will have to report through the AWG-LCA as well. On the one hand, technology development and transfer is part of the AWG-LCA's mandate, but on the other, it is not a permanent subsidiary body, with a mandate that will seize to exist. However, its mandate has already been extended twice in the fifteenth and sixteenth sessions of the COP, thus another extension is not impossible. To keep all possibilities open, I will include the AWG-LCA in the model of the Technology Mechanism's hierarchy.

Important for the reporting issue is the mandate of the two permanent subsidiary bodies. According to article 9.1 of the United Nations Framework Convention on Climate Change, the mandate of the SBSTA is to provide the COP and its other subsidiary bodies with scientific and technological information: "[a] *subsidiary body for scientific and technological* ***advice*** *is hereby established to provide the* ***Conference of the Parties*** *and […] its* ***other subsidiary bodies*** *with timely* ***information and advice on scientific and technological matters*** *relating to the Convention. […]. It shall comprise* ***government representatives competent*** *in the relevant field of expertise. It shall* ***report*** *regularly to the* ***Conference of the Parties*** *on all aspects of its work.*" The mandate of the SBI is to assist the COP in the assessment and review of the effective implementation of the Convention, as laid down in article 10.1 of the United Nations Framework Convention on Climate Change: "[a] *subsidiary body for implementation is hereby established to* ***assist*** *the*

Conference of the Parties *in the assessment and review of the effective implementation of the Convention. This body shall be open to participation by all Parties and comprise* ***government representatives*** *who are* ***experts*** *on matters related to climate change. It shall report regularly to the Conference of the Parties on all aspects of its work* [...]". These mandates are very important for the reporting issue. Based on paragraph 126 of chapter B of decision 1 of the sixteenth session of the Conference of the Parties, the TEC and the CTCN are obliged to report on their activities and performance to the subsidiary bodies. Thus, the subsidiary bodies can receive information and based on articles 9.1 and 10.1 of the United Nations Framework Convention on Climate Change, these subsidiary bodies can pass that information to the COP. However, it is not stated anywhere that they can act as information providers to Parties. Based on this knowledge, I created a model of how the hierarchy of the Technology Mechanism could look like:

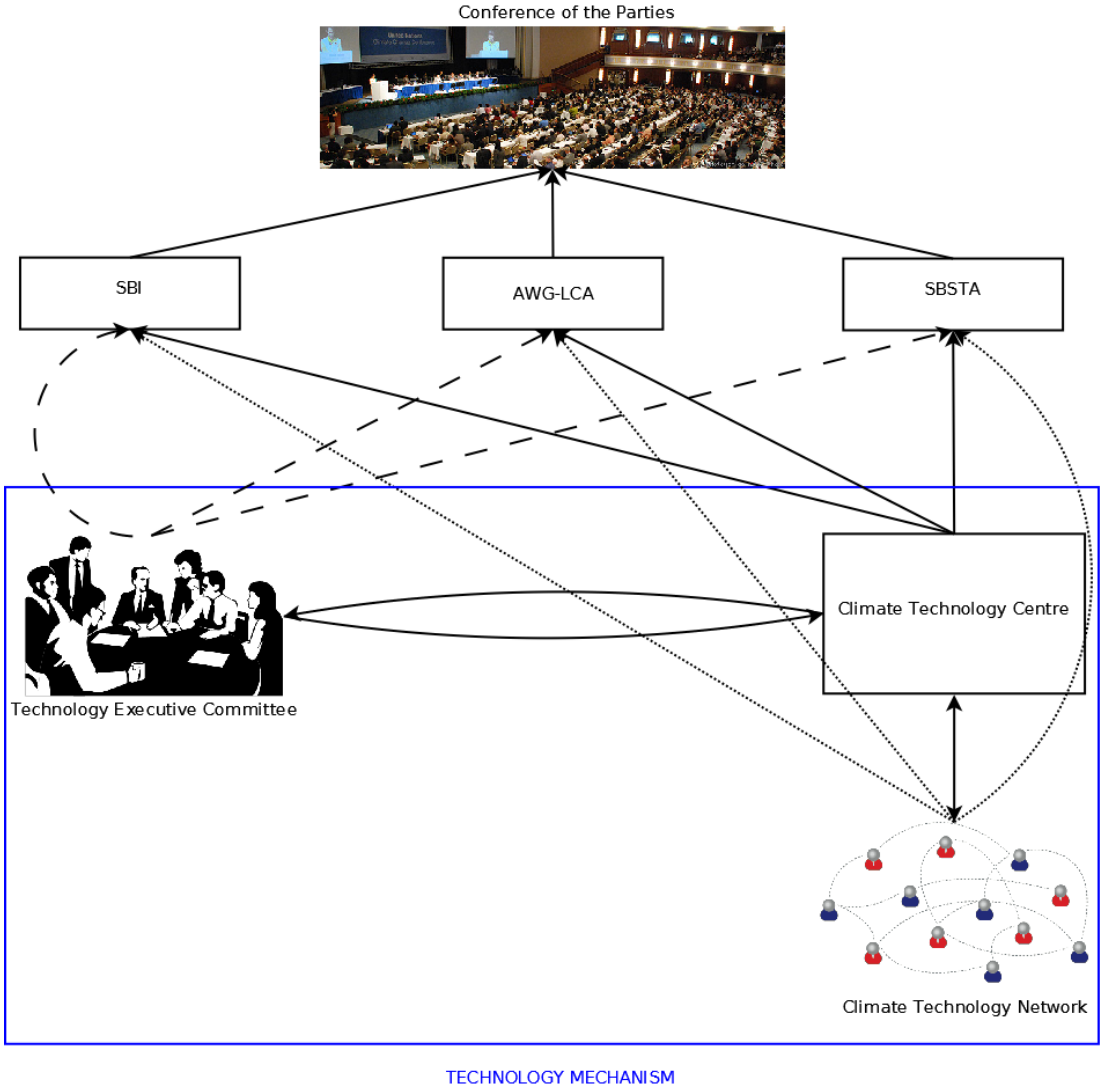


Figure 7: Own proposed hierarchy of the Technology Mechanism

On top is the Conference of the Parties (COP), which is the supreme body of the United Nations Framework Convention on Climate Change, as stated in article 7.2 of the United Nations Framework Convention on Climate Change: "[t]*he Conference of the Parties, as the supreme body of this Convention* [...]" and thus the highest decision-making authority (United Nations Framework Convention on Climate Change, 2011a). The objective of the COP is to review the implementation of the Convention and to adopt decisions to promote the effective implementation of the Convention, as laid down in article 7.2 of the United Nations Framework Convention on Climate Change: "[…] *shall keep under regular* ***review*** *the* ***implementation of the Convention*** *and any related legal instruments that the Conference of the Parties may adopt, and shall make, within its mandate,* ***the decisions necessary to promote the effective implementation of the Convention.***" The SBI, the SBSTA and the AWG-LCA are in the middle of the Technology Mechanism's hierarchy, that is, between the COP and the Technology Mechanism. According to paragraph 126 of chapter B of decision 1 of the sixteenth session of the Conference of the Parties, the TEC and the CTCN (the Centre and Network being discussed as one organ) will report on their activities and performances to the subsidiary bodies. These subsidiary bodies will then pass this information through to the COP. This procedure makes sense, when looking at the different organs' mandates, laid down in articles 9.1 and 10.1 of the United Nations Framework Convention on Climate Change, that state that both subsidiary bodies ought to assist and advise the COP. However, these subsidiary bodies can only execute their task, if they receive information on the activities and performances of the TEC and the CTCN, as laid down in paragraph 126 of chapter B of decision 1 of the sixteenth session of the Conference of the Parties. This three level hierarchy can be compared to the Council of the European Union. At the bottom, there are numerous working parties, the Technology Mechanism in this case, that deal with the day-to-day work and form the "*backbone*" of the organization. The Committee of Permanent Representatives (COREPER), here the subdidiary bodies, prepares the agenda for the ministerial meetings. The ministerial meetings, the COP in this case, then have the formal authority to make legally binding decisions (Häge, 2004). When the COP then makes a decision, the information flow will be top-down.

The COP will make a decision concerning, for example, technology transfer, which can influence the activities, scope of activities or mandate of the TEC and/or the CTCN.

After having discussed the hierarchy of the Technology Mechanism within the United Nations Framework Convention on Climate Change, I will now discuss the hierarchy within the Technology Mechanism that I propose:

first of all, the Centre and Network. The Network will be developed by the Centre, which will then exist out of numerous national, regional, sectoral and international technology networks, organizations and initiatives, as laid down in paragraph 123 of chapter B of decision 1 of the sixteenth session of the Conference of the Parties: "[d]*ecides that the Climate Technology Centre shall facilitate a network of national* [...]". The Centre and Network will thus be very closely related, as the Network organ flows out of the Centre organ. The United Nations Department of Economic and Social Affairs, 2009 describes the relationship within the CTCN as follows: "[t]*hese national Centres would be* ***independent****, but could be* ***supported*** *by an* ***umbrella organisation*** *which ensures that* ***lessons are shared between Centres*** *and with other* ***countries having similar characteristics***." (United Nations Department of Economic and Social Affairs, 2009). There would thus be a big interdependency between both organs, although they would remain independent at the same time. The supporting "*umbrella organisation*" could be the Technology Mechanism. The Network would flow out of the Centre and the Centre could ensure that lessons are shared between the various independent centres and among countries. The Committee (TEC) could then support the Centre and Network by providing an overview of technological needs and analysis of policy and technical issues related to the development and transfer of technologies for mitigation and adaptation (paragraph 121(a) of chapter B of decision 1 of the sixteenth session of the Conference of the Parties), by considering and recommending actions to promote technology development and transfer, in order to accelerate action on mitigation and adaptation (paragraph 121(b) of chapter B of decision 1 of the sixteenth session of the Conference of the Parties), by recommending guidance on policies and

programme priorities related to technology development and transfer […] (paragraph 121(c) of chapter B of decision 1 of the sixteenth session of the Conference of the Parties) etc. After having received the TEC's guidance, the CTCN could then report to the TEC on its activities and performances. The TEC would then again answer in terms of guidance. The relationship between the TEC and the CTCN would be based on a vicious circle and in terms of hierarchy, could stand on equal footing within the Technology Mechanism. The three organs of the Technology Mechanism would thus be closely interrelated and close interaction between them would serve to enhance the effectiveness of the Technology Mechanism.

This entire hierarchy and reporting issues are, without a doubt, very bureaucratic. A bureaucracy is being described as: "*an administrative system in which the need or inclination to follow complex procedures impedes effective action*." (Jones, 2005). Bureaucracy is characterized by a lot of paperwork, routine and a strict vertical structure that has to be followed (Alazzawi, 2011) as is the case with the Technology Mechanism, where the TEC and the CTCN would have to report to the subsidiary bodies and not to the COP directly or as an author puts it: "[i]*t's hard to imagine loving bureaucracy […]. It's a whole lot easier to imagine hating bureaucracy. Perhaps hate is a too strong word. Still, not an issue of Reader's Digest goes by without some gleeful bureaucracy bashing, and it isn't easy remembering the last time a prominent politician launched into a vigorous defense of career civil servants and the rules they write or the services they provide.*" (Riley, 1987). However, a bureaucratic structure is not always something we should dislike. It has its advantages, just as it has its disadvantages, with the difference that the disadvantages are being perceived faster by the public, while the advantages stay unnoticed. This is being argumented by Riley (1987): "[e]*very agency exists to fulfill some sort of promise and politicians made those promises because they were convinced some of us wanted to hear them. Each trip to the pharmacy remind me that the Food and Drug Administration has agreed that amoxycillin fights certain bacteria and is safe for a kid with an ear infection, and even promises that this particular batch is OK. I may not exactly love the FDA, but I'm glad it's there. Farmers probably feel the same*

way about the agricultural Stabilization and Conservation Service, frequent air travelers about the Federal Aviation Administration, and Great Lakes and coastal boaters about the Coast Guard." We thus might not favour the Convention secretariat's bureaucracy, but we are happy it is there to tackle climate change that threatens us all. When looking at the Convention secretariat's bureaucracy, we have to keep in mind that the participation within the UNFCCC is huge: 194 country Parties are member to the UNFCCC and there are numerous observers: 1 297 NGOs[4] and 83 IGOs[5] (United Nations Framework Convention on Climate Change, 2011f, 2011g). In an organisation with so many participants, there is a need for precision and clarity about which organ is doing what. This organ will do its duty and specialise in it thanks to routine and will thus create its competitive advantage through speed (Alazzawi, 2011), as is the case with the subsidiary bodies. There is a COP every year, so the UNFCCC's organs like the subsidiary bodies only have one year to analyze, for example, 194 national communications reporting on the implementation of the Convention, which are sent by country Parties. In order to be able to finish everything on time, it has to be clear which organ is doing what and that it is being done well and fast. In general and in case of the Convention secretariat, we want the organisation to respond to the needs of the public. All these organizations however exist out of human beings, who are tied to professional and public service ethics (Riley, 1987) and who know the needs of the public, as they are part of the public. In order to ensure that bureaucratic organizations like the UNFCCC stay democratic, as in responsive to the needs of poorer and smaller Parties, Riley (1987) proposes strong external controls on bureaucracy. So, a bureaucratic structure is, in contrary to the general public's opinion, not always a bad thing, as long as it is being externally controlled. In case of the Convention secretariat, speed will be created thanks to routine, which is extremely important for the well-functioning of the organization. The Conference of the Parties meets once

4 "*representatives from business and industry, environmental groups, farming and agriculture, indigenous populations, local governments and municipal authorities, research and academic institutes, labour unions, women and gender and youth groups*" (United Nations Framework Convention on Climate Change, 2011f).

5 OECD and International Energy Agency (United Nations Framework Convention on Climate Change, 2011f).

every year, as laid down in article 7.4 of the United Nations Framework Convention on Climate Change: “[...] *ordinary sessions of the Conference of the Parties shall be held every year* [...]” for two weeks. During those two weeks, the COP is being advised by the subsidiary bodies, that have been working on issues within their mandate for one year. Looking at the time limit, it would be impossible for the COP to make a decision on every issue, if it had to analyze all reports from, for example, the Technology Mechanism's organs by itself, without having been analyzed by a subsidiary body first. This is another reason why it would make more sense for the Technology Mechanism's organs to report to the subsidiary bodies instead of directly to the COP.

So far, an attempt was made to resolve the issue on the Technology Mechanism's hierarchy. This is, however, not the only possible solution and the Technology Mechanism's hierarchy will be that hierarchy all Parties agree on by consensus. The hierarchy proposed in this thesis is based on paragraphs of chapter B of decision 1 of the sixteenth session of the Conference of the Parties and previous negotiating texts by analyzing the wording and the mandates of the different organs.

2.3. Issue number two: the UNFCCC's Technology Mechanism and its operational modalities

In the previous issue, a possible hierarchy of the Technology Mechanism was proposed. When the hierarchy and the reporting lines are agreed upon, the Technology Mechanism needs to start working. Paragraphs 121 and 123 of chapter B of decision 1 of the sixteenth session of the Conference of the Parties laid down the functions of the TEC and the CTCN. Thus, the paragraphs did lay down what the Technology Mechanism's organs would have to be doing, however, the paragraphs did not lay down how they would have to be doing it (Latif, 2010). This section will thus explore how the functions of the TEC and the CTCN could be executed and give an overview of the possible operational modalities of the Technology Mechanism's organs. The term "operational modalities" is being defined as "*the instruments for delivering support to countries"* (Expert Group on Technology Transfer, 2010) and are thus the tools with which functions are being executed.

In the end, the goal is to achieve an integrated Technology Mechanism (Expert Group on Technology Transfer, 2010). Because of this integration, there will be an overlap between the operational modalities of the TEC and the CTCN (Expert Group on Technology Transfer, 2010). Moreover, the TEC's place in the hierarchy of the Technology Mechanism and thus its role is still a point of discussion in the climate change negotiations. Therefore, I will focus on the operational modalities of the Climate Technology Centre and Network and less on the Technology Executive Committee. Because of the numerous functions the Centre and Network have, I will restrict the number of operational modalities to two.

In general, there are three types of operational modalities (Expert Group on Technology Transfer, 2010). First of all, there are the products. These can be analytical tools, information tools or good practices used to execute a function (Expert Group on Technology Transfer, 2010). Second of all, there are the services like the offering of training, advisory services, expert teams and forums (Expert

Group on Technology Transfer, 2010). Third of all, an operational modality can be in the form of partnerships (Expert Group on Technology Transfer, 2010). In order to make these three types of operational modalities more concrete, I will go through the functions of the CTCN and provide each function with two operational modalities so that the CTCN can execute its functions and can become operational. As already stated in the first issue, the Network will be developed and facilitated by the Centre. Both organs would thus be very closely related, as the Network basically flows out of the Centre. Because of this strong relationship between both organs, their operational modalities will partly overlap.

The first function of the Climate Technology Centre is to "[p]*rovide advice and support related to the identification of technology needs and the implementation of environmentally sound technologies, practices and processes.*", as laid down in paragraph 123(a)(i) of chapter B of decision 1 of the sixteenth session of the Conference of the Parties.

A first operational modality can be in terms of expert teams. A team is being defined as "*a collection of individuals who are interdependent in their tasks, who share responsibilities for outcomes, who see themselves and who are seen by others as an intact social entity embedded in one or more larger social systems (for example, business unit or the corporation), and who manage their relationships across organizational boundaries. For example, in a project team, research and development engineers may work iteratively with manufacturing process engineers to make sure that the designs that are being developed can be manufactured* [...]" (Cohen & Bailey, 1997). There can be two forms of expert teams. The first option are the in country expert assistance teams. In country expert teams could be used at all stages of the innovation chain, going from R&D to the diffusion of new technologies (Carbon Trust, 2008). Expert teams could also assist when doing a Technology Needs Assessment (TNA) and beyond, going from identifying technology needs up to the planning and preparing of adaptation and/or mitigation actions (Carbon Trust, 2008). The formation of such teams, however, is an intensively studied topic as researchers

try to find the best match of experts (Dorn & Dustdar, 2010). When looking for experts, one has to take into account a variety of factors, such as the technical skills, cognitive properties and the personal motivation of a potential candidate (Dorn & Dustdar, 2010). According to Dorn and Dustdar (2010), complex cases require "*the complementary expertise of multiple experts that need to collaborate closely. A team of top experts will be most effective if they have interacted before and thus exhibit confidence in each other's expertise.*" In order to apply this theory, social network analysis is being applied to detect common interests and collaborations between experts. One can, for example, find out if the skill profiles of experts correspond by looking if they already had online discussions on websites like, for example, Slashdot or Yahoo! Answers (Dorn & Dustdar, 2010). The phenomenon of social network analysis and the sharing of knowledge is not only important when forming teams, but also to increase the performance of teams (Janhonen & Johanson, 2011): "[s]*haring knowledge is one of the key aspects of effective teamwork: to accomplish their mission, teams must integrate, synthesize, and share information throughout a performance episode."* In case of the Technology Mechanism, this role could be performed by the Centre, to make sure knowledge is being shared between various regional and national Centres of Excellence, which make up the Network, with the objective of enhancing technology development and transfer and accelerating action at different stages of the technology cycle, as laid down in paragraphs 117, 113 and 115 of chapter B of decision 1 of the sixteenth session of the Conference of the Parties: "[d]*ecides to establish a Technology Mechanism to facilitate the implementation of actions for achieving the objective referred to in paragraphs 113–115* [...]", "[d]*ecides that the objective of enhanced action on technology development and transfer is to support action on mitigation and adaptation in order to achieve the full implementation of the Convention* [...]" and "[f]*urther decides to accelerate action consistent with international obligations, at different stages of the technology cycle, including research and development, demonstration, deployment, diffusion and transfer of technology […] this decision as technology development and transfer) in support of action on mitigation and adaptation* [...]".

An example of such an in country expert team is the American East NTSC Technology Transfer and Assistance Team. The ENTSC Technology Transfer and Assistance Team is a core team, which is basically responsible for everything which has to do with technology development and transfer to the East service area States and the Caribbean area, which result in conservation solutions that benefit the land (United States Department of Agriculture: Natural Resources Conservation Service, 2011). First of all, the ENTSC Technology Transfer and Assistance Team provides technical assistance and technology transfer. Second of all, it acquires and develops new technologies. Third of all, it develops and maintains national technical standards and references. Fourthly, it is charged with the responsibility to build collaboration and partnerships that leads to an increased supply of technological support and training.

The second option are the virtual expert assistance teams, that adapt to the trend towards online knowledge creation and sharing, as observed by Dorn and Dustdar (2010): "[p]*eople increasingly apply their expertise online to answer other users' questions or provide additional information on topics under discussion […]. Exploration of online communities allows dynamic access to the top experts of the desired expertise* […]. A virtual team is being defined as "[...] *a team whose members (1) are geographically distributed, (2) interact electronically through the use of computer-mediated communication, (3) are functionally diverse, and (4) work in a temporary system.*" (Kanawattanachai & Yoo, 2002). In the case of the Climate Technology Centre, such virtual expert assistance teams could offer technical support by answering questions or providing advice when being requested to. An example of such a virtual expert team is the European IPR Helpdesk (European IPR Helpdesk, 2011). In case someone has a question concerning intellectual property rights, he or she can contact the helpdesk via registration, phone or fax. A team of laywers then answers the question within three working days for free. The same method can be applied within a Centre, where technical experts could answer questions concerning a Technology Needs Assessment or the installation and implementation of ESTs. Keeping the deadline of three working days and the zero cost will stimulate Parties to

contact the Centre because of its fast and cheap service. These virtual expert team provide quite some advantages over the "*normal*" or "*in country*" expert teams. They bridge time and space and offer better utilization of distributed human resources without physical relocation of employees (Kanawattanachai & Yoo, 2002). However, such virtual teams also face important obstacles. The most important obstacle is trust. Companies such as IBM, Sun Microsystems and Motorola indicate that the success of a virtual expert team is, in the first place, determined by the level of trust between the members of such a virtual team (Kanawattanachai & Yoo, 2002): "[...] *trust functions like the glue that holds and links virtual teams together. […] trust among team members played an important role in team performance. In addition, the lack of a shared work history, coupled with the absence of face-to-face communication, makes it harder for virtual team members to gather information and evaluate one another's behaviors. Further, the absence of face-to-face interaction creates a sense of both physical and psychological distances between team members.*" It is thus very important to overcome this trust obstacle to make the virtual expert teams work. (Rusman, van Bruggen, Sloep, & Koper, 2010) therefore developed a so-called "*TrustWorthiness ANtecedents (TWAN) schema*". This schema could be used in order to form a cognitive model of the trustworthiness of a colleague, which relies on the personal characteristics of a person, rather than to rely on stereotypes.

A second operational modality for a Centre could be to address a three stage approach (Carbon Trust, 2008). The purpose of the three stage approach is to "*identify projects with the greatest carbon and local economic development potential* […]." In the first step, technologies would be listed that have a high potential to make a difference in terms of CO_2 saving potential and to bring about other socio-economic benefits. Once the technologies with the highest potential have been identified, the second step will be taken. In the second step, one would try to understand the technology and its market barriers by analyzing the existing players on that specific market and the level of investment required to develop and deploy such a technology. By the third step, specific project proposals would lie on the table and key opportunities, together with the capabilities and resources of the Centre,

would be idenfied. The two goals of this third step would be to overcome the barriers, which were analyzed in the second step and to come to a cost-effective suite of activities. This three stage approach would be complementary to the Technology Needs Assessment, executed by country Parties. It would, however, be impossible for the Centre to perform a three stage approach for every single country Party. Instead of focusing on every single Party, it could perform a three stage approach for a group of countries with similar characteristics in terms of economic and environmental needs and geographic opportunities. The three stage approach distinguishes itself from the Technology Needs Assessment in that it actively involves the capabilities and resources of the Centre, as laid down in the third step, which can be crucial for the succesful installation and implementation of ESTs in developing country Parties.

The second function of the CTC is to "[f]*acilitate the provision of information, training and support for programmes to build or strengthen developing country capacity to identify technology options, make technology choices and operate, maintain and adapt technology.*", as laid down in paragraph 123(a)(ii) of chapter B of decision 1 of the sixteenth session of the Conference of the Parties.

The provision of information on ESTs and the support ESTs receive, go hand in hand. Chapter 34 of Agenda 21 already identified the lack of information as a barrier to technology transfer and underlined the importance of information in the technology development and transfer process: "*34.7. The availability of scientific and technological information and access to and transfer of environmentally sound technology are essential requirements for sustainable development. Providing adequate information on the environmental aspects of present technologies consists of two interrelated components: upgrading information on present and state-of-the art technologies, including their environmental risks, and improving access to environmentally sound technologies.*" (United Nations, 1992a). This information barrier is also addressed by (Williamson, 1998) by stating: "[...] *there is still a persistent gap in the information exchange of ESTs. Sectorial end users are not aware of the wealth of existing information on ESTs.*" One of the major

problems ESTs face is that they are being perceived as "*emerging*" and "*unproven*", because of the lack of information on ESTs towards the end-user (International Environmental Technology Centre, 2003). Because of this, there tends to be little confidence in their economic, commercial or technical potential. A way to get rid of this mistrust and to trigger support for ESTs is by Parties with sufficient, verified and independent information. A way to acquire such verified and independent information would be through performance assessments in accordance with internationally recognized methodologies or accepted protocols to ensure comparability and public acceptance (International Environmental Technology Centre, 2003). Such performance assessments would not only trigger support, but would also enable governments to make informed technology choices. A way to inform Parties about the results of such performance assessments is by the use of ecolabels (Hale, 1996; International Environmental Technology Centre, 2003). Ecolabels are able to provide a lot of complex information (Hale, 1996) and is one of the six identified areas by the OECD in which technical assistance to developing countries are needed (Organisation for Economic Co-operation and Development, 1994). Ecolabels guarantee the consumer that products have been manufactured in an environmentally friendly way by the use of, for example, ESTs or that the product is an environmentally friendly product when being used by the consumer. Consumers are then thought to choose the product that has such an ecolabel over a product that has not. This will then end in a vicious circle. On the one hand, consumers demand products that are produced in an environmentally friendly way or products that are environmentally friendly and thus carry such an ecolabel. Thanks to this attitude, a market is being created for ESTs. On the other, producers will be encouraged to produce environmentally sound products or products that are procued in an environmentally sound way to obtain ecolabels and gain a competitive advantage (Hale, 1996). Another way to inform a Party about the need for and performance of ESTs is by doing a number of trials in representative local sites (International Environmental Technology Centre, 2003). In case of, for example, wind power, the public could actually see energy being delivered without having to coal. The results could then be spread via reports, publications and/or paragraphs combined with

hosting and/or speaking at relevant workshops, conferences and seminars as well as one-to-one key stakeholder engagement. Maybe one of the most important sources to spread information is by using the World Wide Web: "[t]*he large distribution of users and the rapidity with which information can be disseminated on the WWW make it a prime information exchange system. However, with the explosion of information on the Web and the hyperlinking between systems, more precise search engines that can accurately locate appropriate ESTs are needed.*" (Williamson, 1998). An example of such a search engine could be UNFCCC's Technology Transfer Clearinghouse, established in decision 10 of the eighth session of the Conference of the Parties at New Delhi in 2002. This, however, may proove not to be enough. It would be wrong to assume people will trust you without them giving reason for it. This is being done by risk communication: by providing a Party with all available information, by listening to their concerns and by sharing information and understanding (International Environmental Technology Centre, 2003). This also includes that the ESTs should not be oversold and that errors and uncertainties should be acknowledged. Doing risk communication will also influence the willingness of potential key players, such as investors, to commit resources to technology development, transfer and uptake.

A second operational modality for this function is the provision of training. Training is being considered as: "*one of the* ***most important tools*** *to develop human resources and* ***facilitate the transition to a more sustainable world****. It should have a* ***job-specific focus****, aimed at filling gaps in knowledge and skill that would help individuals find employment and be involved in environmental and development work. At the same time,* ***training programmes should promote a greater awareness of environment and development issues*** *as a two-way learning process.*" (United Nations, 1992a). Unfortunately, training is, just like ecolabels, also considered as one of the six identified areas in which developing country Parties need technical assistance (Organisation for Economic Co-operation and Development, 1994) and is considered to be one of the failures during the technology transfer process (Ramanathan, 2002): "[t]*echnology transfer should not simply be a one-time process*

of just introducing a technology. It has to be an iterative process. Efforts should be made to adapt the technology to local conditions, develop local expertise in handling the technology by training the local people, and provide motivation for the local partner(s) to utilise the expertise available for their long-term objectives, such as self-upgradation of technology." Moreover, a lot of the technology training courses are not designed to teach people how to deal with real problems. Hale (1995) calls this "*training shortfalls*" as students spend most of their time solving carefully designed exercises, while real problems are not necessarily nicely packed as an exercise. This then results in a lack of expertise when it comes to recognizing and defining problems (Hale, 1995). Moreover, training is extremely important in the decision-making process when opting for ESTs. This process thus relies completely on the knowledge of the decision-makers: "[i]*t is essential that they have the appropriate knowledge and analytical skills to make informed choices. Education and training is therefore essential to this proces.*" (Hale, 1996). In the case of enterprises, larger enterprises developed so-called "*company manuals*" or "*practice notes*" on environmental issues. They clarify the enterprise's point of view on issues such as energy efficiency and environmentally friendly purchasing. Smaller enterprises that do not have the experts to create such manuals or notes rely on consultants to write these (Hale, 1995). Training is thus more than just making exercises at a desk. Hale (1995) states that training needs to be based on practical experience. Manuals and practice notes are definitely a step in the right direction, however, they are not enough as they do not focus on the installation and implementation of ESTs, but more on the environmental ethics of an enterprise. In case of small- and medium-scale industries in developing and emerging country Parties, energy efficiency and pollution control are not considered as priorities. These managers prove to be less motivated and interested to gather and share information on ESTs or on where to get financial support to install and implement ESTs, because of a lack of environmental legislation or the enforcement of it (Thiruchelvam, Kumar, & Visvanathan, 2003). A survey indicated that managers of small firms in Delhi rely on family or friends for advice on technological issues. This advice is mostly outdated and when new ESTs are being purchased, their maintenance

requirements are not well understood, which results in a lower effectiveness of the EST, because of a lack of formal education or training (Thiruchelvam, et al., 2003). A way to solve these problems is by the provision of actual training and education. This provision of training should have three objectives. First of all, it should change lifestyles and work practices. Second of all, it should improve the energy efficiency. Third of all, it should increase the use of ESTs (Ho, Dallas, Anda, & Mathew, 2001). Effective training can be given to all interested Parties by enabling visits, the return of qualified experts from developing country Parties, who gained their experience in developed country Parties (United Nations Department of Economic and Social Affairs, 2009) or by in country expert assistance teams. This operational modality will not only serve to provide a developing country with training, but to overcome an important barrier when it comes to using ESTs. The ability to put trust in ESTs may lack, because of existing traditions and values. The consequence is that there will be no social acceptance and therefore, the ESTs will not be implemented. A way to overcome this barrier is to recruit national experts. People who know the traditions and values on the one hand and the benefits and utilization of the ESTs on the other. The Murdoch University Environmental Technology Centre is an example of a Centre where training programmes are being offered in the field of ESTs (Ho, et al., 2001). The Murdoch Centre offers four training programmes. The first is the short course programme. These short course programmes are often held during weekends and is mostly about the presentation of ESTs (Ho, et al., 2001). The purpose of this short course programme is to increase the knowledge, awareness and skills of the community in general on ESTs, which are suitable for the individual, through direct, hands-on learning experiences (Ho, et al., 2001). The second training programme is called the "*industry training*". Such a course is held for one week during which the equipment is being supplied through industry. This theoretical and practical programme focuses on energy efficiency, low energy building techniques and renewables. This course is being offered to company employees, but also to secondary school and university students (Ho, et al., 2001). The third training programme is called "*undergraduate teaching*" and is thus being offered to undergraduate students. In this training programme, case studies or topics are offered

for student discussion (Ho, et al., 2001). The fourth training programme is the international programme. UNEP made the Murdoch Centre a Centre for the Asia-Pacific region. In this programme, the Murdoch Centre is thus being used for demonstration and research purposes to present industries and governments with the results of technology development (Ho, et al., 2001). This Murdoch Centre is, without a doubt, a very good example of the various training courses a Centre could offer to a variety of stakeholders, going from the individual up to industries and governments as a whole.

The third function of the CTC is to "[f]*acilitate prompt action on the deployment of existing technology in developing country Parties based on identified needs.*", as laid down in paragraph 123(a)(iii) of chapter B of decision 1 of the sixteenth session of the Conference of the Parties.

One operational modality would be the creation of a platform. The purpose of that platform would be to showcase "*technology or policy champions*". This would produce "*creative tension*" among Parties. If these cases of technology or policy champions are well published, it could lead to a replication effect, leading to faster deployment and implementation of ESTs (International Energy Agency, 2010). An example of such succesful platforms are the European Technology Platforms (ETPs) (Calleja & Delgado, 2008). These ETPs are actions, which are part of the European Environmental Technologies Action Plan, which consists out of 28 actions with the purpose of improving the development and uptake of ESTs at European, national, regional and local level by involving various stakeholders, including the industry (Calleja & Delgado, 2008). The European Technology Platforms (ETPs) are tools used to define research and development priorities by agreeing on long-term research agendas with concrete deliverables and bringing together the industry and the research and financial community (Calleja & Delgado, 2008). The amount of these Technology Platforms shows how succesful the initial concept was. The first Technology Platforms were created between 2002 and 2003. After four years, this amount had increased to 34. Some of these platforms bring more than 200

stakeholders together, including the European SMEs, which are considered as crucial players in European R&D (Calleja & Delgado, 2008).

A second operational modality would be to support and coordinate the creation of a policy and market framework for the benefit of the deployment of existing ESTs. A policy framework is needed, as politicians need policy instruments to realize political objectives (Böcher, 2011). Böcher (2011) lists four types of policy instruments. First of all, there are the informational instruments. By using informational instruments, politicians try to influence the public's behaviour by providing information. An example are the ecolabels, which were mentioned already before (Böcher, 2011). A second policy instrument is the cooperative instrument, which relies on negotiations between, for example, the public and private sector and which results in voluntary measures. The third policy instrument is the oldest of them all, going back to the 1970's and is called the regulatory instrument. With this instrument, one relies fully on the assymetric hierarchy between the government and the citizens and whereby the government will influence the public's behaviour through a "*command-and-control*" principle. An example of this policy instrument are the European air quality directives. The first EC Directive on ambient air quality, for example, dates from the 1980's and gave limit values and guide values for sulphur dioxide (SO_2) and suspended paragraphs to protect human health and the environment from adverse effects (Fenger, 2009). The fourth policy instrument is the economic one. This instrument uses the market and thus the prices to influence the public's behaviour (Böcher, 2011). An example of such policy instrument would be the creation of a market framework for ESTs. By providing subsidies to these existing and new markets, the production and deployment of ESTs would be stimulated. Moreover, by sustaining these markets and providing them with funding, the international community would show its support of ESTs, reduce the commercial and perceived risk and thus trigger private sector investment (Carbon Trust, 2008). However, which policy instrument will be used to accelerate the deployment of ESTs depends on the level of state intervention in a country Party. In a country Party where the level of state intervention is low, informational and cooperative instruments will be preferred.

If the level of state intervention is high, regulatory and economic instruments will be used (Böcher, 2011). The case of the Republic of Croatia, for example, shows how the adoption of legislation on the one hand and the establishment of a market framework on the other changed its energy market drastically (Loncar, Duic, & Bogdan, 2009). It used feed-in tarrifs, premiums for independent electricity sales, premiums for electricity use on site, tax exemption for gas prices and investment subsidies to make the national market more attractive for cogeneration technologies (Loncar, et al., 2009). Although the focus in this thesis lies on ESTs and not on heat engines or power stations, the case makes clear that both policy and market instruments are needed to make change come about. This is also being confirmed by (Stavins, 2003) by stating that market-based instruments or environmental regulations put in place by UNFCCC agreements (Morsink, Hofman, & Lovett, 2011) can result in any desired level of pollution cleanup at the lowest cost to society, by providing incentives for the greatest pollution reductions by those enterprises that can achieve these reductions cheaper than other enterprises (Stavins, 2003). The incentives based on this market framework will then trigger innovation, production and transfer of ESTs (Morsink, et al., 2011), as every enterprise will chase, for example, governmental subsidies for those enterprises that were able to cut their emissions most.

As functions of the CTCN overlap, so do the operational modalities. An operational modality that can be used here and which is linked to another function is the provision of information and the undertaking of risk communication. This will increase the support of ESTs and thus accelerate their deployment and implementation.

An institution specialized in the deployment of ESTs is the Clean Technology Fund (Climate Investment Funds, 2011), which "*promotes scaled-up financing for demonstration, deployment and transfer of low-carbon technologies with significant potential for long-term greenhouse gas emissions savings.*" Since developing country Parties are the ones that will be hit the hardest by the impacts of climate change and lack the financial means and technologies to tackle climate change, only the Least

Developed Countries (LDC) and poorer countries with a Gross National Income per capita up to $11.455 (in 2007) can receive funding (Climate Investment Funds, 2010) for, inter alia, the deployment and transfer of low-carbon technologies.

The fourth function of the CTC is to "[s]*timulate and encourage, through collaboration with the private sector, public institutions, academia and research institutions, the development and transfer of existing and emerging environmentally sound technologies, as well as opportunities for North-South, South-South and triangular technology cooperation.*", as laid down in paragraph 123(b) of decision 1 of the sixteenth session of the Conference of the Parties.

A first operational modality could be to support and coordinate the implementation of Public-Private Partnerships (PPP) (United Nations Department of Economic and Social Affairs, 2009), "*multi-stakeholder partnerships*" (Morsink, et al., 2011) or Cross-Sector Partnerships (CSPs) (Forsyth, 2007). Basically, these partnerships or collaborations are partnerships or collaborations "*between investors, state actors, and citizens (sometimes represented by NGOs) where di*ff*erent actors share in defining or carrying out the purposes of investment.*" and which can help reducing the transfer costs of ESTs (Morsink, et al., 2011). As Morsink et al. (2011) and Fortsyth (2007) pointed out, partnerships/collaborations have quite some advantages, but are also characterized by important disadvantages that should not be neglected. A partnership between, for example, local actors from the recipient developing country and foreign producers entering the developing country can be mutually beneficial. On the one hand, local actors acquire the needed technology and on the other, foreign producers get access to the local market as they receive information from the local actors about the legal and regulatory framework in that recipient developing country, the most important players on that local or national market and the culture, an aspect that proves to be very important when investing in and transferring of ESTs. Moreover, better decisions will be made on technology development and transfer, because of the varied input and expertise coming from different stakeholders, including minority groups, and thanks to the fact that various stakeholders are being

included in the process, commitment will come from all sides, because stakeholders can identify with the decisions that were taken (Morsink, et al., 2011). Fortsyth (2007) comes to the same conclusion by stating that partnerships/collaborations will increase the local deliberation about development benefits brought about by ESTs. However, both studies also warn for important disadvantages coupled to partnerships/collaborations. Some partners may get frustrated, because of the other partners having more resources and more political power they are trying to wield (Forsyth, 2007; Morsink, et al., 2011). Important to note is that partnerships may also be undermined by local beliefs and therefore the mistrust of ESTs and investing companies: "[i]*n Suphan Buri, in Central Thailand, [a] Thai investor […] encountered strong resistance to a rice-husk power plant because it was (falsely) linked to the political interests of a powerful local politician. In turn, opponents of the project then started rumors among local villagers that the generator would prevent rainfall, or even cause sterilization if people walked under power cables. The investor responded by withdrawing from this site, but continued to invest in other sites in the central plains of Thailand, and by providing careful public information about the technology.*" (Forsyth, 2007). In developed country Parties, partnerships and collaborations are pretty normal, especially at the beginning of the innovation chain, which is R&D, demonstration and early deployment (United Nations Department of Economic and Social Affairs, 2009). The private sector is very active when it comes to research, development, demonstration and the actual commercialization of new technologies, as already mentioned before. There is, however, a gap between the demonstration of a new technology and the actual commercialization of a new technology, which is called "*the valley of death*". This *"valley of death"* is being created by, inter alia, a lack of financing. By forming partnerships, public funds like grants could be used to overcome this "*valley of death*". On other occasions, it is the government that needs the private sector, because of the private sector's ability to provide infrastructure, services [and technologies] more efficiently than the government (Forsyth, 2007). Forming partnerships/collaborations can thus accelerate the development and transfer of ESTs and are characterized by significant advantages. However,

partnerships/collaborations can also end up as a failure, because there are snags in it that should be beared in mind.

A second operational modality would be the Centre making "*calls*" (Carbon Trust, 2008). This could either be an "*open call*" to encourage innovation in all sectors or a "*directed call*" that specifies areas or sectors of local technical strength or market opportunities. By making these "*calls*", the private sector would be actively involved in the technology development and transfer process. In order to make sure that innovation actually does take place, the public sector can provide financial support in terms of grants. To make sure that only those ideas that have a high potential to be commercialized are being executed, the funding should not cover all the costs of the project. Participants will be required to invest too in terms of time, material and human capital. If the private sector then decides to continue with the project, the assumption can be made that the technology will have a good chance to be commercialized. According to the authors, this activity may be most appropriate to emerging economies with established research communities like India, China and South America (Carbon Trust, 2008).

An institution specialized in this area is the Asia-Pacific Partnership on Clean Development & Climate. The Asia-Pacific Partnership on Clean Development & Climate is a partnership between Australia, Canada, China, India, Japan, Korea, and the United States and the private sector. The goal of the partnership is to accelerate the development and deployment of clean energy technologies by enhancing partnerships between the public and private sector, by promoting best practices and technologies and sharing experiences (Asia-Pacific Partnership on Clean Development and Climate, 2011).

Besides those functions, the Centre will also be responsible for establishing a Network.

Within the Technology Mechanism, the Network would fulfill a very important role, as more value could be provided in terms of technology development and transfer by building a network of connected centres: "[t]*his would allow centres to share learning, best practice and facilitate north-south and south-south technology*

transfer and collaboration." (The International Bank for Reconstruction and Development/The World Bank, 2010). Moreover, it is not the single enterprise or the single industry that stands in the focus of technology diffusion studies anymore, but the new units that are called "*networks*" or "*environments*" (Preißl, 1995).

The first function of the Climate Technology Network (CTN) is "[e]*nhancing cooperation with national, regional and international technology centres and relevant national institutions.*", as laid down in paragraph 123(c)(i) of chapter B of decision 1 of the sixteenth session of the Conference of the Parties, the second function of the CTN is "[f]*acilitating international partnerships among public and private stakeholders to accelerate the innovation and diffusion of environmentally sound technologies to developing country Parties.*", as laid down in paragraph 123(c)(ii) of chapter B of decision 1 of the sixteenth session of the Conference of the Parties and the fourth function of the CTN is "[s]*timulating the establishment of twinning centre arrangements to promote North-South, South-South and triangular partnerships with a view to encouraging cooperative research and development.*", as laid down in paragraph 123(c)(iv) of chapter B of decision 1 of the sixteenth session of the Conference of the Parties. These three functions will be analyzed together, as their operational modalities strongly overlap.

A first operational modality could be the set-up of a communication channel, like a forum, to exchange experience, innovation knowledge, best practice, information and the set-up of technology standards (Organisation for Economic Co-operation and Development, 2011). A forum is "*a place of public discussion*" (Oxford, 2010). This discussion can be face-to-face or virtual by using an online forum: "*a discussion group which is accessible online, as through a mailing list, a bulletin board system, a newsgroup, or the World Wide Web, esp. one dedicated to the exchange of information and opinions on a particular topic.*" (Oxford, 2010). We might not always realize it, but we use online fora daily to exchange information by using mail, Messenger, Skype and many more online fora. Online fora are charaterized by some important advantages. Research (Hammond, 2000) shows that small- and medium

sized groups had positive experiences with online fora, as members sensed some kind of community feeling and had the feeling that they had the chance to actually get to know each other through this online forum, because of the efforts members put in their messages, including personal messages, which triggered the motivation of the entire group. Another important advantage was that members of the online forum sensed an increased familiarity with the new technology they had signed up for. Such an online forum also proved to be useful for less verbal people, who found it easier to express themselves via chat than orally, as one member stated: "[i] *just feel uncomfortable, in a meeting I loathe doing the introductions and I say very little... at a meeting you have to gear yourself up in order to say anything. I get embarrassed, I go red and that makes me more embarrassed. I don't like people looking at me and I'm not much good at thinking on my feet so I don't like saying things....*" (Hammond, 2000). Some members also appreciated the permanent access to text as it gave them more time to think about what another member had written than if the conversation had been face-to-face. Moreover, the person, who had been writing the text had the sense she had been thinking more and deeper about her contribution than if the conversation had been face-to-face. By having to write the ideas or concepts down, it enabled people not to focus on one idea or concept only, but to link the various ideas and concepts to each other, creating a bigger picture: "[i] *did learn something by writing the message. I was trying to make sense of the ideas. This was quite genuine, and it did help me think through some of these things. None of this was new. I would have discussed all of this with colleagues but I found a sharper focus by writing it down. This stuff (points to a section of the text), I certainly had a certain `ping' of a thought here which I'm still exploring - little something clicking into place, bringing together two things in a different way, or looking at things from a new angle or finding the words to express them*." (Hammond, 2000). However, there were also some important disadvantages linked to such an online forum. The level of participation within groups was found to be disappointing as members had expected to receive more messages and therefore, had hoped to learn more. Moreover, the online forum proved to be very useful to get introduced to each other and sometimes to develop in a social chat, but for many members it proved to be harder to go further

and actually work with and learn from the online forum. Some members proved to be creative with the online forum and managed to acually work with it and learn from other members' input. However, they disliked the amount of labour the online forum demanded as texts had to be composed and written down, which they experienced as slower and physically more demanding, and the fact that they did not always get an immediate reaction, compared to a face-to-face conversation: "[t]*alking is not a discipline. I admire these who can talk in a way that sounds more like writing but I like the freedom of speech, you can make it come alive, it's ephemeral, you may pick something up, you are in a continual process of editing. Talk just flows.*" (Hammond, 2000). It is important to indicate that this study was performed with small- and medium sized groups going up to 30 people. When bigger groups use a virtual forum, the threshold to enter the discussion may be considerably high as your message will be read and maybe criticized by lots of people. Moreover, as the participation and thus the number of messages increases, it might prove to be difficult to make your message being actually read, as the possibility exists that it gets lost between all other numerous messages. On the other hand, members might get to know each other faster by an online forum, as it may be easier to introduce oneself to hundreds of people via chat than by doing it face-to-face. The advantage of reflecting on a text also holds for bigger groups, just as it holds for small- and medium sized groups. Online and face-to-face fora both have their advantages and disadvantages. It is, however, important to note that fora in general can contribute considerably to the development and transfer of technologies. First of all, this forum would encourage the cross-flow of information and communication, joint collaborations and efforts among technology centres and identify issues for collaborative work with the purpose of strengthening regional and country level activities (Organisation for Economic Co-operation and Development, 2011). Second of all, this communication channel would avoid duplication of work and efforts (North East London Community Engagement, 2010). Third of all, it would increase financial and human resources on issues of common interest (International Environmental Technology Centre, 2003).

A second operational modality could be to create a pool of complementary resources. When creating a pool of complementary resources, two or more independent Parties enter into a relationship, also called partnership or coalition, and share complementary resources to achieve an objective that is beyond the capability of a single Party (Baba, 1988). These resources could be natural resources like materials, infrastructure or human capital. The pool itself would be a strategic tool to explore new innovation opportunities at a lower risk (Organisation for Economic Co-operation and Development, 2008), because the pooling of complementary resources will increase the probability of the succesful development and transfer of technologies at lower costs (Mohanram & Nanda, 1998).

The third function of the CTN is "[p]*roviding, on request by a developing country Party, in-country technical assistance and training to support identified technology actions in developing country Parties*", as laid down in paragraph 123(c)(iii) of chapter B of decision 1 of the sixteenth session of the Conference of the Parties.

A first operational modality could be the in country expert assistance teams, which have already been identified as an operational modality of the first function of the Climate Technology Centre to "[p]*rovide advice and support related to the identification of technology needs and the implementation of environmentally sound technologies, practices and processes.*", as laid down in paragraph 123(a)(i) of chapter B of chapter B of decision 1 of the sixteenth session of the Conference of the Parties.

A second operational modality would be to offer training programmes, which also has already been identified as an operational modality of the second function of the CTC to "[f]*acilitate the provision of information, training and support for programmes to build or strengthen developing country capacity to identify technology options, make technology choices and operate, maintain and adapt technology.*", as laid down in paragraph 123(a)(ii) of chapter B of decision 1 of the sixteenth session of the Conference of the Parties.

Other possible operational modalities would be coupled to the provision of information as stated in the second function of the CTC to "[f]*acilitate the provision of information, training and support for programmes to build or strengthen developing country capacity to identify technology options, make technology choices and operate, maintain and adapt technology.*", as laid down in paragraph 123(a)(ii) of chapter B of decision 1 of the sixteenth session of the Conference of the Parties. In this case, it is important that the information would clarify which technologies are available, what their environmental risks are and what the terms are under which they can be acquired. The information would also include specific cases where ESTs were succesfully developed and implemented and the information would state where a Party can obtain more advice and where and how it can apply for a training programme or technical assistance (United Nations, 1992a).

The fifth function of the CTN is: "[i]*dentify, disseminate and assist with developing analytical tools, policies and best practices for country-driven planning to support the dissemination of environmentally sound technologies.*", as laid down in paragraph 123(c)(v) of chapter B of decision 1 of the sixteenth session of the Conference of the Parties. Note that this function used to be a function of the Centre, as laid down in paragraph 11(c) of chapter IV of the negotiating text of the twelfth session of the AWG-LCA in Tianjin in October 2010 (United Nations Framework Convention on Climate Change, 2010a): "[d]*evelop and customize analytical tools, policies and best practices for country-driven planning to support the dissemination of environmentally sound technologies* [...]". This example shows the speed at which things can change and makes clear that there is a push from Parties to make the Technology Mechanism operational.

The first operational modality could be the provision of funding. Funding has the ability to support various actions to enhance the dissemination of ESTs. In order for analytical tools and best practices to be developed and customized, training in environmental sciences among people from various countries is needed. However, this might prove to be a problem as funding lacks and therefore, specialist

approaches and training programmes in specific ecological sectors cannot take place (Cognetti, 1998). Funding can also be used as an economic policy instrument to influence parties' behaviour (Böcher, 2011). The various energy enterprises, for example, have one thing in common and that is the end product: electricity. Because the end product of the various energy enterprises is the same, it will have to compete on price, if we leave ecolabels and consumers' wish to buy products that were manufactured in an environmentally friendly way out of consideration. This means that clean technologies will be disseminated only when the cost and price of the so-called "*green electricity*[6]" is lower than of the polluting alternatives. At that point, the demand will increase and clean technologies will disseminate. ESTs tend to be more capital-intensive than the conventional technologies, but less fuel intensive and thus funding policies have to be in place to make "*green technologies*" cheaper and thus more attractive (Carbon Trust, 2008).

A second operational modality is an operlapping one, linked to the third function of the CTC to "[f]*acilitate prompt action on the deployment of existing technology in developing country Parties based on identified needs.*", as laid down in paragraph 123(a)(iii) of chapter B of decision 1 of the sixteenth session of the Conference of the Parties and would be to support and coordinate the creation of a policy and market framework for the benefit of the deployment of existing ESTs. A policy framework is needed, as politicians need policy instruments to realize political objectives (Böcher, 2011).

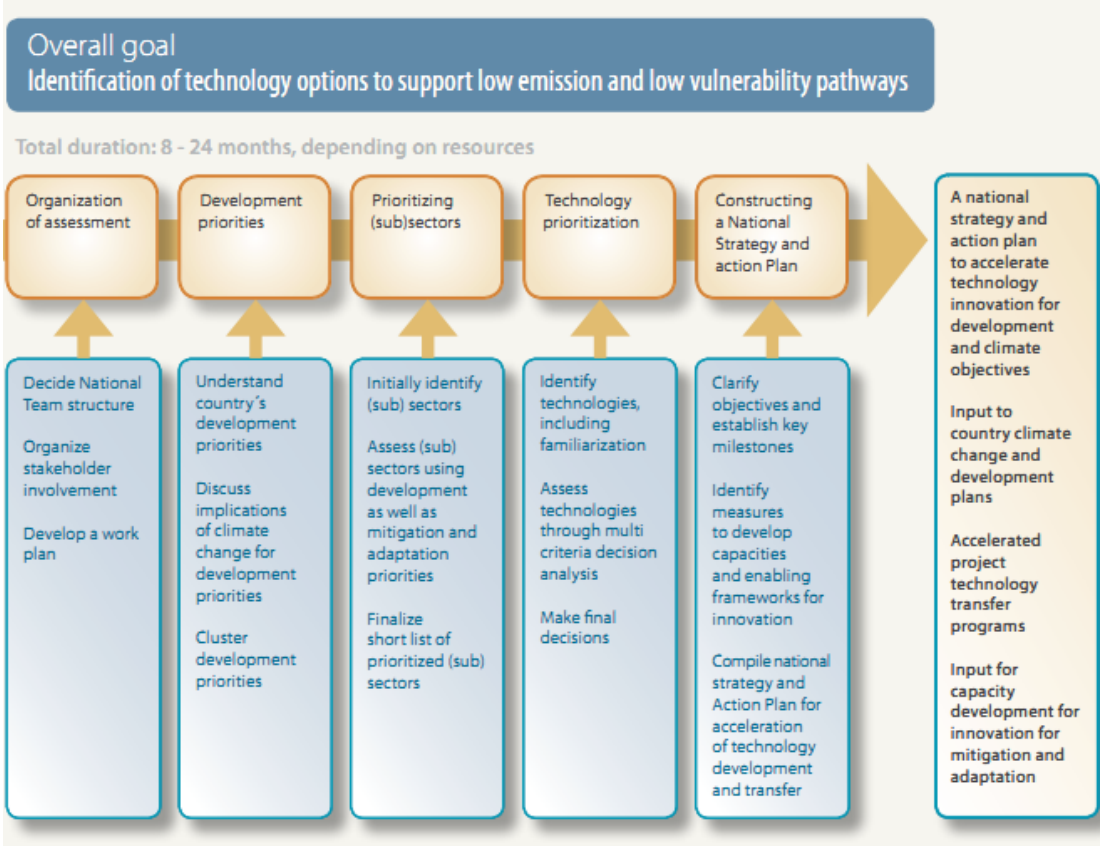
At this point, two issues have been discussed. First of all, an attempt was made to create a possible hierarchy of the Technology Mechanism. Second of all, in order to enable the Technology Mechanism's organs to execute their functions, operational modalities were linked to each function of the Centre and the Network, as the Committee's place in the Technology Mechanism's hierarchy and thus its role is still a point of discussion in the climate change negotiations.

6 "[...] *green electricity is electricity that is produced from renewable sources and that has been differentiated from other electricity products and marketed as being environmentally friendlier.*" (Salmela & Varho, 2006)

2.4. Issue number three: the UNFCCC's Technology Mechanism and its main sectors and ESTs

The third question that will be dealt with is: "*in which areas and sectors and by the use of which ESTs would the Technology Mechanism be most active?*" The Technology Mechanism should support the entire technology cycle from the point where a technology is being developed until the point it is being diffused in all sectors of the economy to support both adaptation and mitigation (Expert Group on Technology Transfer, 2010). However, based on the identified technology needs by developing country Parties, an overview can be given of which sectors and ESTs are more important than others (United Nations Framework Convention on Climate Change, 2009b) or as one author puts it: "[t]*echnologies are country and sector specific. There is no 'silver bullet' technology nor do 'one size fits all' measures work for all countries."* (Latif, 2010).

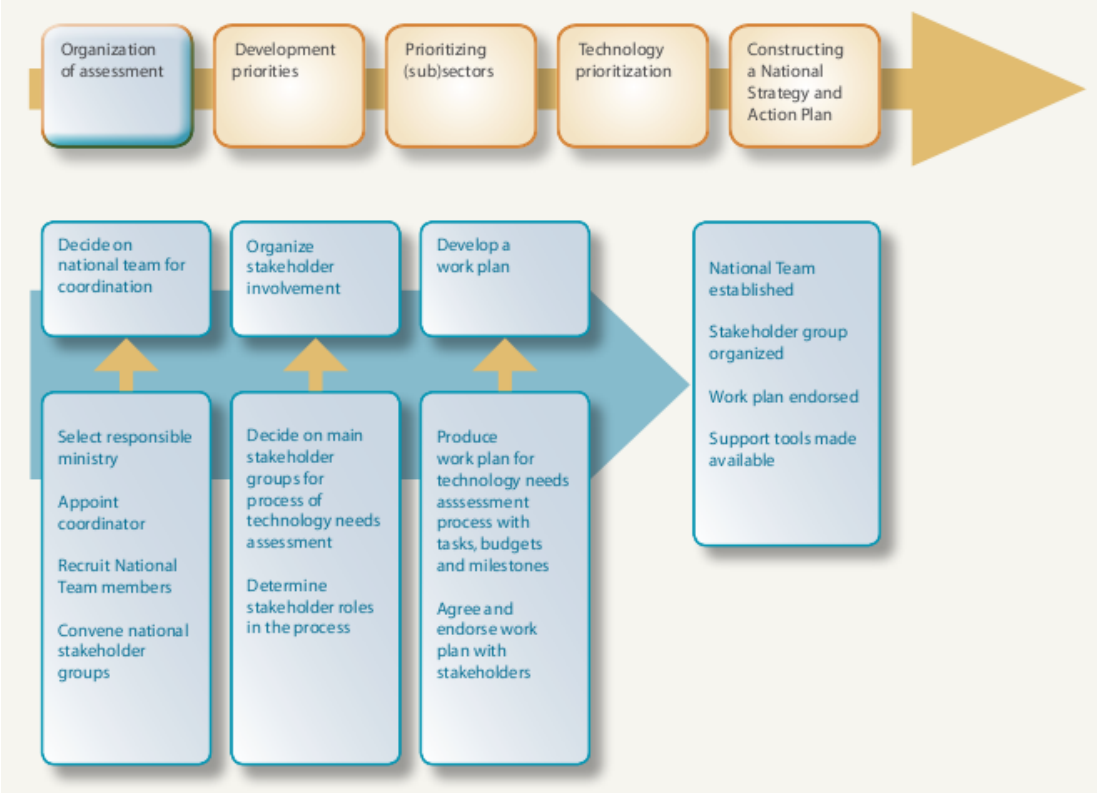
Country Parties' technology needs were identified by undertaking a Technology Needs Assessment (TNA), as laid down in paragraph 1 of the Executive Summary of the second synthesis report on technology needs identified by Parties not included in Annex I to the Convention (United Nations Framework Convention on Climate Change, 2009b). In 2004, the United Nations Development Programme made a handbook that explained how country Parties could undertake Technology Needs Assessments for climate change (United Nations Framework Convention on Climate Change, 2011j). The approach on how to conduct a Technology Needs Assessment is based on two points. First of all, as already mentioned by Latif (2010), the technology needs and resources of every country Parties are different (United Nations Development Programme, 2010). Second of all, a common approach of conduction a Technology Needs Assessment could be developed as many circumstances are common across country Parties (United Nations Development Programme, 2010). The figure below represents the various steps of a TNA, as laid down in the latest TNA-handbook:



(United Nations Development Programme, 2010)

Figure 8: The various steps within a Technology Needs Assessment

In order to clarify how each step of the Technology Needs Assessment could be executed, every step of the Technology Needs Assessment is divided again into steps, as shown in the drawing below:



(United Nations Development Programme, 2010)

Figure 9: The first step of the Technology Needs Assessment in detail

It becomes clear that undertaking a Technology Needs Assessment is a quite long and intensive process that, depending on a country Parties' resources, takes 8 to 24 months (United Nations Development Programme, 2010).

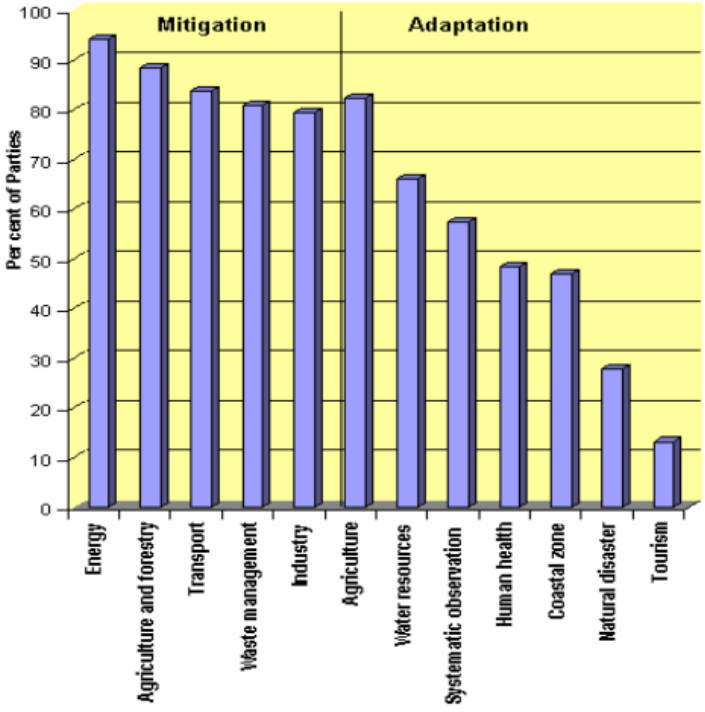
The second synthesis report on technology needs identified by Parties not included in Annex I to the Convention (2009) summarized the results of 70 TNA's. 69 of those TNA's were conducted by developing country Parties, while one was conducted by one developed country Party, as laid down in paragraph 2 of the Executive Summary of the second synthesis report on technology needs identified by Parties not included in Annex I to the Convention that were made available to the Convention secretariat by December 1st 2008 (United Nations Framework Convention on Climate Change, 2009b).

The key sectors and thus the key ESTs depend on whether mitigation or adaptation

was being analyzed. Moreover, different country Parties proved to have different priorities when it comes to sectors and ESTs, as already mentioned in the Technology Needs Assessment (2010) and by Latif (2010).

In case of mitigation, some Parties put emphasis on those sectors, which emit a lot and have a high potential to reduce the emissions by the use of ESTs. Adaptation proved to be more important for countries with large coastal zones and a high vulnerability to climate change in terms of water, agriculture, health, natural disasters and so on (United Nations Framework Convention on Climate Change, 2009b). It is, however, important to bear in mind that research showed that effective climate policy includes both adaptation and mitigation (van Vuuren, et al., 2011). Van Vuuren et al. (2011) show that adaptation and mitigation do not act as substitutes, but as supplements. In the case of sea-level rise, adaptation up to 2011 seems to be more effective from a purely monetary perspective. Mitigation however is needed to reduce damages and the costs of adaptation (van Vuuren, et al., 2011). In the case of agriculture, mitigation and adaptation are also both needed. Adaptation can limit adverse effects on crops caused by climate change, but it is also mitigation that has the ability to remove or limit those adverse effects from climate change (van Vuuren, et al., 2011).

In order to give an answer to this third issue, I will first start by giving an overview of the three most important sectors and ESTs in case of mitigation, which were identified by 69 developing country Parties and one developed country Party by conducting a Technology Needs Assessment (TNA). The sectors we speak of are energy generation, transmission and distribution; residential and commercial; industry; agriculture; transport; land use and forestry and waste management. The sectors agriculture and land use and forestry are being treated in this second synthesis report on technology needs (2009) as one sector (United Nations Framework Convention on Climate Change, 2009b).



(United Nations Framework Convention on Climate Change, 2009b)

Figure 10: The main sectors for mitigation and adaptation

As shown in the graph above, energy generation was identified as the most important sector for mitigation actions by 94% of the Parties. This means that, in general, the main technology needs were assessed to be in the energy sector. This makes sense, as more than 1,6 billion people have no access to electricity, the ability to generate electricity is a must. The importance of the energy sector in climate change was underlined by the International Energy Agency (2009) by stating: "[t]*he electricity sector plays a unique role in climate change. Power generation is the single largest, fastest growing source of electricity. The reasons are well known: electricity is an incredibly versatile energy, which provides unique services (light, appliances, heating, cooling) and is also in a position to compete with the final uses of fossil fuels (electric cars). The world consumes ever-growing quantities of electricity, and most regions rely on domestic, readily available resources to produce this electricity: predominantly coal, followed by gas, hydro, nuclear, oil and non-hydro renewables.*"

(International Energy Agency, 2009). Based on the percentages of the International Energy Agency (2009), I made a graph that shows on which resources is being relied when producing electricity:

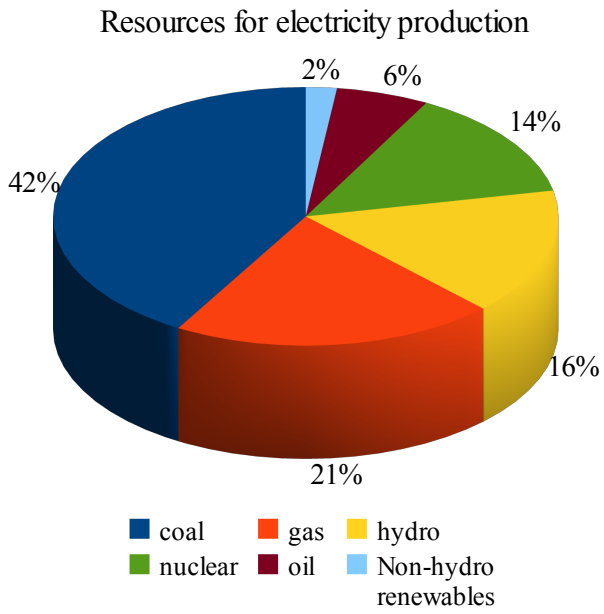


Figure 11: Resources for electricity production

Based on the 70 Technology Needs Assessments, the potential for renewable energy seemed to be there, however, the deployment is low. Therefore, renewable energy technologies were identified as a prioritized technology need for mitigation. Country groups putting the largest emphasis on the energy sector were Latin America and the Caribbean, Asia and the Pacific and Europe. Latin America and the Caribbean expressed the need for technology transfer and to foster clean-energy technologies like renewable energy technologies, lower carbon fuels and high-efficiency power generation. In the case of Asia and the Pacific, the speed of their economic development depends on technology transfer. In order to support their industrialization, the energy sector is crucial. Europe then put emphasis on the energy sector to secure energy supplies at affordable prices and to reduce the negative impacts of energy use on the environment. Assessed technology needs were the enhancement of current energy generation, the improvement of existing power grids

and the establishment of energy-efficiency measures in the residential sector. Some Parties highlighted the importance of technology transfer in the energy sector, because of the fact that their current energy technologies are outdated and result in large energy losses. China, for example, uses its large stock of coal for the production of electricity. However, it is also characterized by low energy efficiency, because of its outdated equipment. In this case, the potential for the transfer of ESTs is huge. Country Parties that put less emphasis on energy than the previous ones were the African Parties and the Least Developed Country Parties (LDCs). In Africa, the majority of the population lives in rural areas. Therefore, there is a need to increase the use of renewables in general and electrification of rural areas in particular. In case of the LDCs, energy was the second most important sector in case of mitigation actions after agriculture. These countries expressed the need for improved stoves for cooking and heating (United Nations Framework Convention on Climate Change, 2009b).

An important case-study concerning the mitigation potential in the electricity sector was performed by Cai et al. (2010), who focussed on China by stating that the electricity sector is considered as a top priority for global abatement, because of its high share in CO2 emissions. China's electricity sector generates the world's second highest amount of electricity and this amount grows rapidly. Moreover, emissions coming from China's electricity sector account for the biggest party, namely 27,8%, of the world's emissions coming from the electricity sector. Because of this, China's electricity sector has become the central focus of all countries, especially because research indicated that large emission reductions can be made in its electricity sector at low costs (Cai, Wang, & Chen, 2010). Important in this case-study are the findings of Cai et al. (2010) that state that China is among the world's leaders in power plants' generating efficiencies and that the potential for further efficiency improvements is low. This is contradictory to China's national communications and Technology Needs Assessments that state that its energy sector is characterized by outdated technologies. Cai et al. (2010) propose mitigation actions that have the potential to reduce China's emissions: demand side management, IGCC, CCS and renewables.

Another crucial sector in case of mitigation is the agricultural one, including land use and forestry. This sector was accorded importance by 88% of the Parties. The reason for this is that the majority of several Parties' populations live in rural areas where agriculture is the most important economic activity (United Nations Framework Convention on Climate Change, 2009b). Agriculture is estimated to account for 14% of the total global anthropogenic GHG-emissions. It accounts for 47% of the total global anthropogenic methane emissions, for 84% of the total global anthropogenic nitrogen dioxide emissions and for 15% of the total global anthropogenic carbon dioxide emissions (Smith, et al., 2007). Because of the fact that agriculture is an important economic activity in developing country Parties, these countries are responsible for 74% of the total agricultural emissions (Smith, et al., 2007). Therefore, country groups that considered technology needs in the agricultural sector as a priority were the African Parties, countries from Asia and the Pacific and the Least Developed Country Parties (LDCs). African Parties and LDCs want to be able to secure their food supply and support their main economic activity, while in case of Asia and the Pacific, the speed of industrialization depends upon the speed of technology transfer in the, inter alia, agricultural and forestry sector. Other country groups that perceived agriculture as important, but not as crucial as the African Parties, the LDCs and Asia and the Pacific were the Parties from Latin America and the Caribbean and Europe. Countries from Latin America and the Caribbean expressed the needs for agriculture and forestry technologies like carbon sequestration in soils, manure conversion to methane fuel, the increase of feed efficiency and the reduction of methane emissions from rice paddies (United Nations Framework Convention on Climate Change, 2009b). The agricultural sector, however, proves to be a hard sector for the introduction of mitigation actions, as it is characterized by large uncertainties and as it is difficult to assess the effectiveness of GHG mitigation measures under changing conditions in the future (Smith, et al., 2007). Because of these barriers, Smith et al. (2007) did not recommend GHG mitigation measures or technologies. However, they did recommend technology transfer by stating: "[g]***lobal sharing of innovative technologies*** *for efficient use of land resources and agricultural chemicals, to eliminate poverty and malnutrition,*

will ***significantly mitigate GHG emissions from agriculture.***" (Smith, et al., 2007).

The third most important sector within mitigation is the transportation sector, chosen by 84% of the Parties. Some Parties expressed the need to develop or upgrade their infrastructure, to introduce clean vehicles and to improve traffic management. Europe was the Party that ranked transportation, together with the energy sector, number one as the sector where the technology needs were the most urgent. The reason given is the same as with the energy sector, to secure their energy supplies at affordable prices and to reduce the negative impacts of energy use on the environment. Europe was followed by Latin America and the Carribean, which ranked the transportation sector as second most important one. Latin America's transportation sector depends, almost completely, on fossil fuels. For mitigation actions, there is a need for transport-related technologies to improve the quality of traditional fuels, to increase the use biofuels and to improve the transport infrastructure. In terms of global anthropogenic carbon dioxide emissions, the transport sector proves to be more important than the agricultural sector as it is being estimated to count for 22% of global anthropogenic carbon dioxide emissions and for 25% of 1990 world primary energy use. Moreover, these shares are growing in almost every country (Michaelis & Davidson, 1996). Just like the agricultural sector, the transport sector also seems to be a hard sector for the introduction of mitigation actions as it is likely to face opposition. First of all, the production of cars and the construction of roads are considered as indicators of economic and industrial health. Second of all, as the transport sector plays an important role in economic and social life, any mitigation action causing a change in transport patterns or transport technology will influence personal and commercial activities to a certain degree and this will not be highly appreaciated by the public. As Michaelis and Davidson (1996) put it: "[i]*t is important for policy to be developed with an appreciation of the complex relationships among transport systems, settlement patterns, industrial and commercial activity, personal psychology and culture.*" Because of this, it is hard to come to a consensus on the introduction of mitigation activities to the transport sector, because one has to look at the impacts on, inter alia, commercial and personal

life and culture on the one hand and at the GHG emissions coming from the transport sector on the other: "[a] *combination of reduced vehicle energy intensity (by over 50% for all modes, allowing for reductions in vehicle performance) and the widespread use of* ***altemative fuels, electric batteries or fuel cells****, could in theory lead to* ***90-95% reductions in the greenhouse gas emission intensity of transport by 2025****. However, these technical solutions involve* ***net economic costs*** *unless large, and seemingly unlikely, change occurred in consumer preferences or in technology. Changes that, according to existing analysis, incur no economic cost but require* ***new policies****, could lead to energy intensity reductions closer to* ***30%****, which probably would* ***not be sufficient to offset the effects of traffic growth on GHG emissions.***" (Michaelis & Davidson, 1996).

As showed just now, agriculture is perceived as one of those important sectors within mitigation where Parties' main technology needs lie. This continues when looking at adaptation. 82,4% of the Parties indicated that the main targeted sector for adaptation was agriculture and forestry. This is not surprising, as impacts due to climate change are expected to result in the degradation of critical natural resources and the economic activities that are based on them. The most important adaptation actions within agriculture are crop management, land management, efficient irrigation and improved livestock husbandry. For forestry, actions like forest rehabilitation and melioration technologies were identified. All Parties (the Latin American and Caribbean Parties, African Parties, Asia and the Pacific Parties, LDCs and Europe) indicated that their main adaptation technology needs were in the agricultural and forestry sector. The Latin American and Caribbean Parties and LDCs expressed their needs for agricultural technologies in more detail. Latin America and the Caribbean need changes in genetic stocks, improved and efficient irrigation practices, improved efficiency of nutrient use and production and risk management practices, while the LDCs stated the urgent need for the modernization of the agricultural and forestry sector (United Nations Framework Convention on Climate Change, 2009b). An interesting case-study that deals with adaptation to climate change in Africa's

agricultural sector comes from Conway and Schipper (2011). Adaptation activities are extremely important in Africa as it widely considered as a continent that is highly vulnerable to the impacts of climate change. Ethiopia is one of the most cited and studied places in Africa when it comes to adaptation to climate change, because its famines in the 1980's that resulted from anthropogenic climate change. Ethiopa's economies relies very heavily on its agricultural sector, as it accounts for about 42% of Ethiopia's GDP and for 85% of its employment (Conway & Schipper, 2011). Ethiopia's agriculture relies heavily on rainfall and makes the sector very sensitive to fluctuations in rainfall. Chronic food insecurity affects 10% of Ethiopia's population, even in times when the rainfall is average. These households thus rely on food assistance to meet their needs. Periods of drought caused by climate change will thus have a decrease of agricultural output as consequence and will increase the unemployment rate (Conway & Schipper, 2011). Good adaptation policies and activities in Ethiopia would thus have to take this problem into account. As a solution, Conway and Schipper (2011) propose that sectors that are dependent on rainfall should consider the recent rainfall variability of the last 20 to 30 years as a guide to planning and management. In cases, where long-term decisions are involved such as the establishment of a water infrastructure, greater ranges of variability would have to be considered to be prepared for periods with much more and much less rainfall to sustain its agricultural sector (Conway & Schipper, 2011). This study is linked to the second most important sector for adaptation actions where technology needs were addressed, namely the sector of water resources with 66,2. In the water sector, water transfer, recycling and conservation were seen as key priorities. This too is not surprising, as almost half of the African countries have water shortages (United Nations Framework Convention on Climate Change, 2009b). An example of a country that is put under heavy pressure, because of a shortage of water that will even increase because of climate change is South Africa (Mwenge Kahinda, Taigbenu, & Boroto, 2010). Water conditions in South Africa are characterized by low, erratic and poorly distributed rainfall, high evaporation and excessive runoff and soil losses. Because of its history that was based on the principle of "*apartheid*", the majority of people does not have access to resources such as water (Mwenge

Kahinda, et al., 2010). Climate change is considered as an extra burden on the water supply as Mwenge and Kahinda (2010) state: "[c]*limate change has the potential to impact very significantly on both the availability of and requirements for water in South Africa.*" In order to cope with future climate change impacts, Mwenge and Kahinda (2010) propose Rainwater Harvesting (RWH)[7] as an adaptation measure in general and Domestic Rainwater Harvesting (DRWH)[8] in particular.

The third most important sector for adaptation actions where technology needs were addressed was the sector of systematic observation and monitoring with 57,5% (United Nations Framework Convention on Climate Change, 2009b). In case of systematic observation and monitoring, Parties' main technology needs were the improvement of data collection, management and processing and the upgrading of existing hydrometeorological networks (United Nations Framework Convention on Climate Change, 2009b).

This overview showed that countries face different challenges when it comes to climate change. In case of mitigation, Parties have heterogeneous technology needs, because of a different level of economic development, a different population level and different living places. For the Technology Mechanism, this means that heterogeneous technologies will have to be developed and transferred and that the transfer of one technology will not solve the entire problem. For adaptation, the technology needs seem to be more homogeneous, because of the fact that the main targeted sectors for adaptation are more or less the same with all Parties. However, this has to be put into perspective. Although the main targeted sectors are the same, this does not necessarily mean that the technology needs are the same too. First of all, one has to look at the site where the EST would be operational: weather patters, soil quality, landscape, the availability of inland space to put the EST etc (United Nations Framework Convention on Climate Change, 2009b). Second of all, as mentioned before, Parties face different barriers to technology transfer

7 "*Rainwater harvesting (RWH) is a technology where surface runoff is effectively collected during yielding rain periods.*" (Helmreich & Horn, 2009)

8 "[...] *rainwater is collected from rooftops, courtyards and lowfrequented streets and can be stored close to these. The storage tanks can be built underground or aboveground.*" (Helmreich & Horn, 2009)

(Intergovernmental Panel on Climate Change, 2000b). Countries might not know which ESTs are available and which ones are more suitable than others. They may have a lack of money to keep the EST operational. National banks may be unwilling to invest money in ESTs or otherwise at a very high interest rate. Environmentally unsustainable technologies may be cheaper and thus more attractive for the private sector. There might be a lack of people having the expertise to keep the EST operational or the EST might not be accepted by the public because of traditions. In short, there are numerous barriers a Party faces. Before ESTs can actually be transferred and brought into operation, a Party has to deal with these barriers first and this shows that, once again, the Technology Mechanism can not rely on one EST only to solve the problem, but that it depends on a Party's local conditions.

2.5. Issue number four: the UNFCCC's Technology Mechanism and Intellectual Property Rights

Creativity and innovation are two things countries pursue as they might create new technologies, develop and strengthen a country's economy and create jobs (Takagi, 2010; Takagi & Sinjela, 2007). Moreover, innovation provides an answer to the global economic downturn and global challenges like, inter alia, climate change (Takagi, 2010). In order to promote and sustain innovation for economic growth, it is the World Intellectual Property Organization's (WIPO) task to ensure that the intellectual property system is being effectively used (Takagi, 2010). Intellectual Property Rights are being defined as: "*legal rights over ideas, creative processes and products. They include copyrights, trademarks, and patents—where holders can prevent the use of these technologies ; thus patents are likely the most important type of IPRs within this context.*" (Ockwell, Haum, Mallett, & Watson, 2010). The system of intellectual property rights has not always been in place as one author states: "[n]*ew tools, techniques and technologies were being invented for thousands of years before legal constructs awarded individuals and organizations limited ownership rights for the ideas they produced.*" (Sarkissian, 2008). However, the global economy in which we live today is characterized by knowledge-based industries that use the protection of ideas and technologies as a competitive advantage in international trade, by improvements in imitation techniques and by the shortening of product life cycles (Sarkissian, 2008; Takagi, 2010). Moreover, innovation is considered as one of the three fundamental drivers of an economy, together with labour and capital. The share of manufactured products in world exports produced by technology, however, is bigger than the shares of manufactured products in world exports produced by labour or capital (Takagi, 2010). The importance of IPRs in a country's economy becomes clear when comparing a country's Patent Cooperation Treaty (PCT) share to its GDP, as illustrated in the table below. The Patent Cooperation Treaty (PCT) was concluded in 1970 and is

administered by the World Intellectual Property Organization (WIPO). The PCT gives an inventor the possibility to file an international patent application. Thanks to this mechanism, the inventor can protect his or her invention in 143 countries simultaneously instead of applying for intellectual property protection to different countries seperately (World Intellectual Property Organization, 2011).

Country	PCT filings 2008	PCT filings 1998	GDP 2008	GDP 1998
USA	31,63	41,68	20,3	23,12
Japan	17,62	9,1	6,16	7,99
Germany	11,55	14,03	4,27	5,39
Republic of Korea	4,84	0,76	1,91	1,68
France	4,33	4,79	3,02	3,63
China	3,75	0,52	11,66	6,53

WIPO Statistics Database (World Intellectual Property Organization, 2010b)

Table 1: Comparison of countries' PCT share to GDP

For all country Parties, with the exception of Japan, there is a clear correlation between the PCT share and the GDP. In the cases of the Republic of Korea and especially China, their was a clear increase in both their PCT share as their GDP.

Realizing the importance of innovation and technology, there were considerable concerns about the piracy and counterfeiting of intellectual property held by enterprises from developed country Parties (Sarkissian, 2008), as the major part of IPRs is held by enterprises from developed country Parties. When looking at the patent filing statistics, we notice that there has been a strong increase of patent filings in the Republic of Korea and China, but that eight out of ten first listed countries in patent filings are still developed country Parties:

Country	Ranking	PCT filings 2009	PCT filings 2010	Change compared to 2009
USA	1	45.617	44.890	-1,60%
Japan	2	29.802	32.180	8,00%
Germany	3	16.797	17.558	4,50%
China	4	7.900	12.295	**55,60%**
Republic of Korea	5	8.035	9.668	**20,30%**
France	6	7.237	7.288	0,70%
UK	7	5.044	4.908	-2,70%
Netherlands	8	4.462	4.078	-8,60%
Switzerland	9	3.671	3.728	1,60%
Sweden	10	3.567	3.314	-7,10%

WIPO Statistics Database (World Intellectual Property Organization, 2010b)

Table 2: PCT filings statistics for 2009 and 2010

In 1994, negotiations led to the so-called TRIPS agreement, the Trade-Related Aspects of International Property Rights. The TRIPS agreement is legally binding to all 151 WTO members in granting patents for inventions in all fields of technology (Sarkissian, 2008). Complying with the TRIPS agreement meant for a lot of country Parties the intensification of IPRs protection. However, it is expected that a strong IPR regime will have severe consequences on, inter alia, technology transfer and the relationship between developed and developing country Parties in, inter alia, climage change negotiations (Ockwell, et al., 2010; Sarkissian, 2008).

During climate change negotiation sessions, the IPR debate generally exists out of two parties: the developed country Parties and the developing country Parties (Ockwell, et al., 2010). According to developing country Parties, ESTs are public goods, because of their mitigation potential, that should be freely available to all Parties. Moreover, a strong IPR regime would make imitation practices impossible that was/is used as a learning possibility and technological change by the USA,

South Korea and Japan. Moreover, developing country Parties blame the developed ones for the ongoing climate change as a result of 200 years industrial activity. Therefore, they feel in their right to prioritize economic developed and poverty alleviation (Ockwell, et al., 2010). The issue of poverty is extremely important in environmental negotiations, as it is considered as a threat to the environment, as laid down in paragraph 8 of the Brundtland Report (1987): "[...] *poverty itself pollutes the environment, creating environmental stress in a different way. Those who are poor and hungry will often destroy their immediate environment in order to survive: They will cut down forests; their livestock will overgraze grasslands; they will overuse marginal land; and in growing numbers they will crowd into congested cities. The cumulative effect of these changes is so far-reaching as to make poverty itself a major global scourge.*". The fact that developing country Parties lack economic development puts more stress on the environment, as poor people will destroy the environment to survive and use unfriendly environmental technologies, because they do not have access to ESTs developed in country Parties, as laid down in paragraph 9 of the Brundtland Report (1987): "[t]*hus today's environmental challenges arise both from the lack of development and from the unintended consequences of some forms of economic growth."*. According to the Brundtland Report, differences in technological capacities between developed and developing country Parties are partly the cause of poverty and the environmental problems that flow out of poverty, as laid down in paragraph 13 of the Brundtland Report (1987): " […] *inequalities represent great differences not merely in the quality of life today, but also in the capacity of societies to improve their quality of life in the future. Most of the world's poorest countries depend for increasing export earnings on tropical agricultural products that are vulnerable to fluctuating or declining terms of trade. Expansion can often only be achieved at the price of ecological stress. Yet diversification in ways that will* ***alleviate both poverty and ecological stress*** *is* ***hampered by disadvantageous terms of technology transfer****, by protectionism, and by declining financial flows to those countries that most need international finance.*" In order to tackle poverty and reduce environmental stress, sustainable development is needed that can be triggered, partly, by technology transfer, as laid down in

paragraph 52 of the Brundtland Report (1987): "[n]*o country can develop in isolation from others. Hence the pursuit of sustainable development requires a new orientation in international relations. Long term sustainable growth will requite far-reaching changes to produce trade, capital, and technology flows that are more equitable and better synchronized to environmental imperatives.*" Developed country Parties argue, however, that technology transfer would be facilitated if developing country Parties would enhance their IPR protection and its enforcement and that a weak IPR regime is a barrier to technology transfer created by developing country Parties. To developed country Parties, IPRs are a catalyst to innovation. Thanks to these IPRs, enterprises invest a remarkable amount of resources in risky projects, because they have legal clarity and certainty that once their technology is developed, IPRs will stop other producers from imitating. However, in case of weak IPR regimes in developing country Parties, enterprises will not be tempted to transfer their brand new, expensive technologies as they do not have the guarantee that it will receive proper IPR protection (Ockwell, et al., 2010).

The most important technology needs when it comes to mitigation actions lie in the energy sector, as already discussed in the third issue. The basic technologies in this sector are old and are not protected by patents anymore. Therefore, they can be used freely in the public domain. The technologies that are protected by patents, however, are the improvements to these technologies. These improvements are made by several enterprises. Because of this, there is a lot of competition and licensing costs and products prices are brought down (United Nations Department of Economic and Social Affairs, 2009). This will be illustrated by four examples out of the field. First of all, solar energy. In the case of solar energy, there are three core technologies: silicon-wafer based PV, thin-film PV and focused solar thermal power. This knowledge is public and thanks to this, the market of solar energy has quite some established players as well as new players coming from China and India, that already make up the top of this sector. Patents do not seem to be a problem in this sector, as there is no player having a monopoly. The second example is wind energy. Things are different within this sector, as patents are extremely important, because of the fact

that breakthroughs or the invention of a completely new technology are not likely to happen fast, because of the complexity of the technology. The third example are the bio-fuels. Just like solar energy, the basic techniques of bio-fuels are established and known. However, innovation is expected with, for example, new products like enzymes and catalysts. Because of this estimation, the number of patents and its importance will increase too. The fourth example are the climate-tolerant crops. These crops are essential for the agriculture in developing country Parties as they serve as an adaptation tool to climate change. These crops can be drought-resistant, flood-resistant and salt-resistant. In this case, a weaker IPR-regime is recommended, because of the fact that the technologies are emerging and that the development and transfer of these technologies has to be stimulated (United Nations Department of Economic and Social Affairs, 2009).

As shown just now, IPRs are an issue in every sector. In some cases, it is positive to see an increase in patents, which means innovations are happening. In others, it is positive to have a weaker IPR-regime to stimulate knowledge spillovers and R&D.

In case of the Technology Mechanism, the issue is not whether to opt for a stronger or a weaker IPR-regime within the international community, but to reach consensus on how the Technology Mechanism could deal with IPRs in order to enhance the development and transfer of ESTs.

A first possibility would be the creation of a fund or a funding mechanism. This funding mechanism would buy up IPRs. By doing this, ESTs would be made freely available to developing country Parties (Ockwell, et al., 2010; United Nations Department of Economic and Social Affairs, 2009). Opponents of such a multilateral fund, however, say that access to technologies alone would not be sufficient and that tacit knowledge and national networks of innovation are needed to support technological capabilities in developing country Parties (Ockwell, et al., 2010). This statement is being affirmed by paragraph 2 of the Briefing Paper of the Third World Network that states: “[t]*echnology transfer is not the mere purchase of machines etc.*

at commercial rates. Technology transfer is the building of local capacity so that local people, farmers, firms and governments can design and make technologies which can be diffused in the domestic economy." (Third World Network, 2008). Moreover, mechanisms, such as international/interngovernmental funds, that directly support access to technology are rarely proposed and tend to have a very limited role (Ockwell, et al., 2010), because of a lack of resources, whereas the private sector is a key player in technology development and transfer: "[i]*n general, government science agencies and universities do not have the resources to commercialise their research outcomes by themselves. Commercialisation of publicly funded research and development is often carried out by the private sector, which has a more appropriate understanding of the market place and the requisite marketing and financial resources. Technology development and diffusion are subsequently managed by the private sector.*" (United Nations Framework Convention on Climate Change, 1999a). Research also showed that public funds do not have any effect on technology transfer productivity, while private funds have the ability to increase the technology transfer productivity (Bolli & Somogyi, 2011). In case of the establishment of such a funding mechanism, three crucial points have to be clarified. First of all, who would be paying for this funding mechanism? Funding mechanisms receive money from Parties (United Nations Framework Convention on Climate Change, 2010d). Even the world's poorest Parties like Niue and Tuvalu (Central Intelligence Agency, 2011) contribute to the Convention secretariat. The question here is whether these poor country Parties would have to contribute to the funding mechanism, as the objective of the fund would be to make ESTs freely available to developing country Parties (Ockwell, et al., 2010; United Nations Department of Economic and Social Affairs, 2009). The answer will, high likely, be yes. First of all, developed country Parties will only be willing to contribute to this funding mechanism, if they see that developing country Parties also make efforts to make this funding mechanism and thus technology transfer work. The expression of these efforts will, most likely, be in terms of money. It is, of course, clear that poor country Parties such as Niue or Tuvalu will not be able to contribute to the funding mechanism as much as the United States of America, but the financial contribution

by poorer developing country Parties such as Niue and Tuvalu would express their support for this funding mechanism and technology transfer as a whole. The same question, however, can be asked for developed country Parties. The point of a funding mechanism is to buy up IPR's, which are mostly held by developed country Parties. But, does it make sense for developed country Parties to contribute to a funding mechanism to buy up their own IPRs? As all Parties would contribute to the funding mechanism, a country Party would not fully buy up its own IPRs, but the baseline is that developed country Parties, especially the USA, Japan and Germany contribute the most to the Convention secretariat (United Nations Framework Convention on Climate Change, 2010d). Most of the funding mechanism's money to buy up IPRs would thus come from developed country Parties, that are the same Parties to hold the majority of patents worldwide. This issue is, without a doubt, a huge obstacle to the establishment of a funding mechanism to buy up IPRs. However, let us assume that developed country Parties would agree on such a funding mechanism, the second crucial issue would then be: do Parties continue to pay their "*usual*" amount of money to the Convention secretariat and that this amount of money would be divided differently among the Convention secretariat's organs, for example that the funding mechanism receives more financial support, while another organ receives less, or would Parties be asked to provide more financial resources to fill this new funding mechanism? The three major contributing Parties to the Convention secretariat are the United States of America, Japan and Germany. In 2010, these three Parties contributed almost 42% to the total contributions the Convention secretariat receives, which was an amount of €13 million in 2010 (United Nations Framework Convention on Climate Change, 2010d). The United States of America, for example, contributed almost €3 million to the Convention secretariat in 2010. In order to be able to judge whether this is a high or a low amount, I have to look at the total US funding to the United Nations. However, the exact amounts of money the USA donates to the United Nations are hard to track accurately (Schaefer, 2010). The last year for which data concerning US donations to the United Nations are available is 2009 (Schaefer, 2011). In 2009, the USA contributed $6,347 billion to the United Nations and $3,4 million to the Convention

secretariat (United Nations Framework Convention on Climate Change, 2010d). Coming back to the core of this statement, the Convention secretariat thus receives only 0,05% of the total US donations to the United Nations. It is clear that this is a very low amount of money in order to tackle climate change, described by Christiana Figueres, the Convention secretariat's Executive Secretary, as "*one of the greatest challenges humanity has ever faced"* (Figueres). If, under these circumstances, Parties were asked to contribute more to the Convention secretariat in terms of money, two strategies could be applied. In case of the USA, it could opt for keeping its amount of contributions steady, but making a change in the distibution of its contributions. This means that the Convention secretariat would receive more financial resources, while another United Nations department would receive less. The second strategy would be to increase its amount of contributions to the United Nations and thus donate more to the Convention secretariat's funding mechanism. In case of the USA, which is "[t]*he* […] *largest contributor to the UN*" (Schaefer, 2011), the answer is no. Washington already announced that it will provide the United Nations with $377 million less in 2011 than it did in 2010 (Schaefer, 2011), for which no data on the exact amount of contributions is available yet. The baseline is that a funding mechanism, under the Technology Mechanism, could only buy up IPRs and make ESTs freely available for developing country Parties, if it has sufficient financial resources to do so. As I will show in the fifth and last issue, the relationship between the Technology Mechanism and a financial mechanism is a delicate, complex, but crucial one, as already proved here.

The third crucial point that needs to be addressed in order to make this funding mechanism work is: which ESTs would and could be made available by buying up IPRs? The first part of this question can be answered by returning to issue number 3: *the UNFCCC's Technology Mechanism and its main sectors and ESTs*, which clarifies which ESTs are needed to be made available based on Parties' needs. The third issue, however, also clarified that different country Parties have different technology needs. In case of mitigation, for example, all Parties pointed out that their major technology needs lie in the energy sector. However, this does not mean that their actual technology needs are the same too. As the UNFCCC's decision-making

procedure is based on consensus (United Nations Framework Convention on Climate Change, 2011e), it would be very hard, if not impossible, to come with 195 country Parties (United Nations Framework Convention on Climate Change, 2011f) to consensus on which IPRs to buy up. If consensus on this matter could be reached, the second step would then be to look at which ESTs can be made available for Parties. This depends on the costs of the IPRs and the financial resources available within the funding mechanism. As already mentioned before, the objective of the funding mechanism would be to make ESTs freely available to developing country Parties (Ockwell, et al., 2010; United Nations Department of Economic and Social Affairs, 2009). It is hard to judge how expensive it would be to buy up IPRs of ESTs. In 1995, the US manufacturing sector had an amount of $20 billion trade surplus in excess earned by royalties on industrial processes that were sold abroad. Research showed however that this example should not be seen as a standard example that is valid for all developed country Parties. In 1995, the UK had a small surplus of $1,71 billion while Japan and Germany both had deficits on license fees and royalties (Ockwell, et al., 2010). If, however, the license fees and royalties would be too expensive to make ESTs freely available to developing country Parties, an alternative solution could be to buy up IPRs partly. This would decrease the licence fees and royalties and thus the costs related to IPRs. It would then be up to developing country Parties to pay the rest of the license fees or royalties. In this way, developing country Parties would have access to ESTs at affordable prices (Third World Network, 2008).

A second possibility would be in the form of patent pools (Falvey & Foster, 2006; The Lancet, 2009; United Nations Department of Economic and Social Affairs, 2009). Patent pools are defined as pools that "*usually involve a combination of patents made available to third parties* [...]" (Kato, 2004). According to developing country Parties, ESTs are public goods, because of their mitigation character that will decrease future emissions and are being compared to HIV/AIDS drugs (Ockwell, et al., 2010). However, a similar problem is found back in the pharmaceutical sector, as pointed out by an editorial of The Lancet (2009). In both cases, a patent pool would

have the same objective, namely to make ESTs and drugs available to the world's poorest. A solution proposed by The Lancet (2009) is the creation of a patent pool. Unfortunately, the same debate is going on in the pharmaceutical sector as within the climate change negotiations. Pharmaceutical enterprises argue that patents are an important incentive for research and development. Other parties then argue that patents can also block further R&D. According to Lancet (2009) however, a patent pool could create win-win situations as patent holders would still be rewarded for their inventions by receiving a proportion of the royalties, while further research and development is enabled. Patent pools are thus not new and could offer a solution to the major IPR debate/obstacle in various sectors/industries. The issue, which is more of a problem, is that such patent pools have to be created by patent holders, which are the developed country Parties in this case. The ESTs which are within this patent pool can then be licensed (United Nations Department of Economic and Social Affairs, 2009). The question is, however, if developed country Parties would be willing to license their latest "*state-of-the-art*" technologies out of fear of imitation purposes by developing country Parties. Assume that developed country Parties would be willing to license their latest and most modern technologies, if and only if IPRs are being protected and that the actual protection is being enforced and imitation purposes therefore excluded. At this point, developing country Parties will still not be able to get access to these technologies, because of a lack of financial means. The licensing costs of these up-to-date ESTs will be too high for the poorer countries in the world and will block technology transfer seriously. In this case, a funding mechanism could offer a solution. It could buy up IPRs, so that the poorer countries would not have to bear these costs anymore or it could at least buy up the IPRs partly. This would mean that a part of the licensing costs are beared by the funding mechanism, thus the international community, and that another part of the costs are beared by the developing country Party itself (Falvey & Foster, 2006). Research showed that investing in licensing is a good strategy to accelerate productivity growth in developing country Parties and that expenditures on licensing have very high rates on return: "[t*]he acquisition of technology through licenses is a potentially important means of* ***accelerating productivity growth****, especially in "late*

starter" developing countries in the throes of "catch-up." […]. We find that expenditures on licensing showed ***exceptionally high rates on return****, on the order of twice those for investment in physical capital […]. We conclude that licensing can be an important instrument for* ***speeding catch-up in less-developed countries.***" (Álvarez, Crespi, & Ramos, 2002). This is an important statement, as I showed before that poverty and environmental pressure go hand in hand, as laid down in paragraph 8 of the Brundtland Report (1987): "[...] ***poverty*** *itself pollutes the environment, creating* ***environmental stress*** *in a different way. Those who are poor and hungry will often* ***destroy their immediate environment in order to survive****: They will cut down forests; their livestock will overgraze grasslands; they will overuse marginal land; and in growing numbers they will crowd into congested cities. The cumulative effect of these changes is so far-reaching as to make poverty itself a major global scourge.*". Increasing productivity growth would thus have two positive effects: first of all, poverty would be reduced. In general, there is a two-way relationship between productivity and growth (Centre for the Study of Living Standards, 2003). Low educational achievements lead people to low-skilled jobs, which are characterized by low wages. Because of these low wages, people are determined to stay poor. As the educational achievements of a country's citizens improve, the productivity of a country increases, which leads to a decrease in poverty: "*fighting poverty could improve productivity growth and improving productivity could help fight poverty*" (Centre for the Study of Living Standards, 2003). Second of all, thanks to this poverty reduction, the environmental stress will decrease, as poverty is a major cause of environmental destruction, as stated in paragraph 8 of the Brundtland Report (1987). The problem of IPRs within technology development and ESTs could thus be solved by the combination of a funding mechanism and a patent pool. If, however, political will lacks to actually establish such a patent pool, it will just stay a theoretical concept: "[a]*lthough the voice of the All-Parliamentary Group is a welcome addition to the fight for improved access [...], unless there is political clout behind the rhetoric, […] companies will continue to resist potential solutions, such as patent pools.*" (The Lancet, 2009). A third solution would be to create an international treaty or pact under the WTO to

ensure that TRIPS does not become a barrier to technology development and transfer. The objective of this international treaty would be to ensure that the access to science is not blocked and that there is a free flow of scientific and technological knowledge for the benefit of the public good. (Falvey & Foster, 2006; United Nations Department of Economic and Social Affairs, 2009). Of all proposed options, this is the one I favour less. To my opinion, it would be an unnecessary mission impossible. Basically, this treaty would envisage a world in which everyone has access to science and in which there are scientific and technological knowledge spillovers for the benefit of the society. This option sounds very nice in theory. However, if Parties really want such a world, why did they then agree on TRIPS in the first place? TRIPS is described as "*one of the more controversial international intellectual property agreements that have entered into force.*" (Yu, 2009). Developing country Parties have complained about the fact that developed country Parties continuously ask for protections of their intellectual property that are in excess of what they promised during the negotiation rounds. By doing this, developed country Parties would ignore developing country Parties' local needs (Yu, 2009). Although their application is limited, paragraphs seven and eight of TRIPS receive more and more attention, because of this ongoing dispute between developed and developing country Parties. paragraph seven, which lays down the TRIPS's objectives, states: "[t]*he 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*" (World Trade Organization, 1994a). paragraph eight lays down the TRIPS's principles: "*1. Members may, in formulating or amending their laws and regulations, adopt measures necessary to protect public health and nutrition, and* ***to promote*** *the public interest in sectors of vital importance to their socio-economic and* ***technological development****, provided that such measures are consistent with the provisions of this Agreement. 2. Appropriate measures, provided that they are consistent with the provisions of this Agreement, may be needed to prevent the abuse of intellectual property rights by right holders or*

the resort to practices which unreasonably restrain trade or adversely affect the international transfer of technology" (World Trade Organization, 1994b). Although it sounds a bit contradictory, these two paragraphs actually do promote technology development and transfer. They thus serve to balance the demands of both developed and developing country Parties. So, the conclusion can be made that TRIPS does not intentionally serve as a barrier to technology development and transfer. There is thus no need for another international treaty under the WTO, but a need for the effective use, and to the fullest possible extent, of these two paragraphs, as proposed by Yu (2009). Moreover, if Parties really want a completely free flow of scientific and technological knowledge, it would make more sense to cancel TRIPS than to make a new international treaty. Treaty-making is not a process of making a text today, sign and ratify it tomorrow and execute it already the day after or one author puts it: "[m]*eeting at a negotiation table* ***does not happen instantaneously****, and it comes from an admission by* **[all]** ***parties*** *that current relationships are not ideal*" (Shanks, 2003). The TRIPS-agreement, as would the new treaty, applies to all 153 WTO members (World Trade Organization, 2008a). This would mean that 153 Parties have to agree upon the fact that a new treaty is necessary in order to promote the free flow of scientific and technological knowledge, since decision-making within the WTO is based on consensus and this proves to be quite a challenge: "[g]*aining consensus among 153 countries* […] *is an immense undertaking.*" (World Trade Organization, 2008b). To conclude, I think it would make more sense to use the current paragraphs seven and eight of TRIPS more effectively in order to address IPRs and technology development and transfer than to make a new treaty.

A fourth solution could include fiscal policies (United Nations Department of Economic and Social Affairs, 2009). Developed country Parties stimulate domestic R&D activities by offering tax advantages to enterprises. By offering domestic enterprises the same tax advantages for R&D activities performed in developing country Parties, the development and transfer of ESTs would be enhanced without Intellectual Property Rights forming an obstacle. A second option could be to offer fiscal benefits to enterprises, that transfer ESTs to daughter companies in developing

country Parties (Falvey & Foster, 2006). To my opinion, these could well be secondary solutions, but not one of the main solutions a funding mechanism and/or a patent pool could offer. These solutions are national solutions, which would have to be implemented by governments of developed country Parties all over the world. There are, however, two issues that trouble me. First of all, fiscal policies differ in every country. Although the European Union, for example, has a Framework for Fiscal Policies, there is still fiscal policy independence among European country Parties (European Parliament, 2008). This means that country Parties will give different incentives for technology transfer as their fiscal policies differ. When this happens, enterprises will not be concerned about technology transfer in the first place, but of having their parent company in that country that offers the biggest fiscal benefits for technology transfer. The second issue that troubles me is the monitoring one. From the first chapter, we learnt that Parties do not always put a lot of effort in reporting and that the problem of heterogeneous reporting arises. In the end, it would thus be hard to chart the efforts and progress made by the international community in the field of technology transfer by the use of national and independent fiscal policies.

A fifth, more extreme solution, would be to ban IPRs on ESTs (Third World Network, 2008). In this case, there are three options. First of all, there is a ban on IPRs on ESTs in general. Second of all, there is an obligatory ban on IPRs on ESTs for enterprises in developing country Parties only, while IPRs on ESTs would still hold for enterprises of developed country Parties in terms of IPR protection and enforcement. Third of all, enterprises from developing country Parties would have the right to exclude IPRs on ESTs. The rationale behind this solution is the comparison between climate change and war-like conditions: "[i]*f climate change is truly the serious crisis threatening human survival, and there is only a few years left to start very strong action, then the situation is similar to war-like conditions. During war (eg the Second World War) individual commercial interests such as patents are suspended so that there can be concerted national action in the most effective way, to face the enemy. Developing countries require technologies at the*

cheapest possible prices. If they otain the needed technology at one quarter the price, they can increase the rate of change to put into effect mitigation and adaptation measures four times faster and four times more effectively." (Third World Network, 2008).

No doubt there are many more possibilities on how the Technology Mechanism could deal with IPRs. The GEF or other grant-providing institutions could provide grants to project proposals that involve research teams in developing country Parties and have a sufficient high potential to succeed (United Nations Department of Economic and Social Affairs, 2009). The possible solutions I analyzed, are solutions that often return in literature and during negotiations on the one hand and are different in nature on the other. Although these five possible solutions were analyzed seperately, this does not mean they should be used accordingly. As I stated earlier, a patent pool could offer a solution to the IPR-debate, but it would only work to its fullest extent, if it were supported financially through a funding mechanism.

2.6. Issue number five: the UNFCCC's Technology Mechanism and its financing

As already discussed earlier, the relationship between the Technology Mechanism and a financial mechanism is a delicate, complex, but crucial one. Unfortunately, it is also an unanswered one, as laid down in paragraph 128(d) of chapter B of decision 1 of the sixteenth Conference of the Parties: "[u]*nderlines the importance of continued dialogue among Parties in 2011 through the Ad Hoc Working Group on Long-term Cooperative Action under the Convention, including on the following matters, with a view to the Conference of the Parties taking a decision at its seventeenth session, in order to make the Technology Mechanism fully operational in 2012: [t]he potential links between the Technology Mechanism and the financial mechanism* [...]" and as stated by Latif (2010): "[f]*irst, it* [the Technology Mechanism] *needs to be endowed with sufficient resources if it is to play any meaningful role and make a 'real' difference. In this regard, neither the amount of resources it will dispose of nor its possible links with the Convention's* ***financial mechanisms*** *such as the* ***new Green Climate Fund*** *are clear.*"

One thing that characterizes the Convention secretariat are its numerous funds. First of all, there is the financial mechanism. The financial mechanism is as old as the UNFCCC and was also established at the Rio Convention in 1992. Article 11.1 of the United Nations Framework Convention on Climate Change states: "[a] *mechanism for the provision of financial resources on a grant or concessional basis, including for* ***the transfer of technology****, is hereby defined.*" According to article 21.3 of the United Nations Framework Convention on Climate Change, the Global Environment Facility (GEF) would be responsible for the operation and execution of the financial mechanism: "[t]*he Global Environment Facility of the United Nations Development Programme, the United Nations Environment Programme and the International Bank for Reconstruction and Development shall be the international entity entrusted*

with the operation of the financial mechanism referred to in article 11 on an interim basis." Already at the establishment of the United Nations Framework Convention on Climate Change in 1992, it was deciced upon that the financial mechanism was to cover, inter alia, activities in the field of technology transfer. There is, however, no paragraph within the United Nations Framework Convention on Climate Change that states which country Parties would contribute to the financial mechanism and which country Parties would receive financial assistance from it. The GEF itself is being funded by so called "*donor nations*". This is called "*replenishment*" and happens every four years (Global Environment Facility, 2010a). The fifth replenishment happened in 2010 during which 34 donour nations participated (Global Environment Facility, 2010c). 26 of those donour nations were developed country Parties to the UNFCCC. The other eight were Brazil, China, India, Korea, Mexico, Nigeria, Pakistan and South Africa. Six out of these eight Parties being Brazil, China, India, Mexico, Pakistan and South Africa are classified as emerging markets (FTSE, 2010; MasterCard, 2008). An emerging market or a country with an emerging economy is defined as: "[a] *country is deemed 'emerging' if its per capita GDP falls below a certain hurdle that changes through time. Of course, the basic idea behind the term is that these countries 'emerge' from less-developed status and join the group of developed countries. In development economics, this is known as convergence.*" (Bekaert & Harvey, 2002). These emerging markets are characterized by, inter alia, fast growing economies: "[b]*y 2020, the five biggest emerging markets' share of world output will double to 16.1 percent from 7.8 percent in 1992"* (Li). Not surprisingly, these six countries with emerging economies, together with South Korea, are in the 30 top of the world's richest nations (Central Intelligence Agency, 2011). Nigeria is the world's 32nd richest nation, coming right after Belgium and preceding several developed Parties such as Sweden, Austria and Switzerland. The point here is that Parties contributing to the GEF are mostly developed and emerging economies and always wealthy Parties, having the financial resources to contribute to the GEF and thus the financial mechanism. Moreover, article 4.3 of the United Nations Framework Convention on Climate Change stated: "[t]*he* ***developed country Parties*** [...] *shall provide new and additional* ***financial resources*** *to meet the agreed*

full costs incurred by developing country Parties [...]. *They shall also provide such* ***financial resources, including for the transfer of technology****, needed by the developing country Parties to meet the agreed full incremental costs of implementing measures* [...] *that are agreed between a developing country Party and the international entity or entities referred to in article 11*." Based on the GEF's fifth replenishment and this article, the conclusion can be made that developed country Parties[9] under the UNFCCC will be the ones to contribute to the UNFCCC's financial mechanism, while developing country Parties will be the ones to receive financial resources from the mechanism.

In addition to this financial mechanism, the UNFCCC has four other funds, namely the Special Climate Change Fund, the Least Developed Countries Fund, the Adaptation Fund and the Green Climate Fund.

The Special Climate Change Fund was established in paragraphs 2(a), (b), (c) and (d) of decision 7 of the seventh session of the Conference of the Parties with the purpose of financing activities, programmes and measures with are related to adaptation; technology transfer and capacity building; energy, transport, industry, agriculture, forestry and waste management and economic diversification: "[d]*ecides [...] that a special climate change fund shall be established to finance activities, programmes and measures, relating to climate change, that are complementary to those funded by the resources allocated to the climate change focal area of Global Environment Facility and by bilateral and multilateral funding, in the following areas: (a) Adaptation [...](b)* ***Transfer of technologies*** *[...] (c) Energy, transport, industry, agriculture, forestry and waste management; (d) Activities to assist developing country Parties [...] in diversifying their economies* [...]". The Special Climate Change fund receives financial support from the GEF and thus its donour nations, as laid down in paragraph 3 of decision 4 of the seventh session of the Conference of the Parties: [r]*equests the Global Environment Facility, as an operating entity of the financial mechanism of the Convention, to provide financial support for the [...] special climate change fund* [...]".

9 Under the UNFCCC, countries with economies in transition fall under the umbrella of developed country Parties.

The Least Developed Countries Fund was also established in paragraph 6 of decision 7 of the seventh session of the Conference of the Parties, with the purpose of supporting, inter alia, national adaptation programmes in Least Developed Country Parties: "[d]*ecides* [...] *that a least developed countries fund shall be established, which shall be operated by an entity entrusted with the operation of the financial mechanism* [the Global Environment Facility]*, under the guidance of the Conference of the Parties, to support* ***a work programme for the least developed countries***. *This work programme shall include, inter alia,* ***national adaptation programmes*** *of action* [...]".

Another fund that was established at the seventh session of the Conference of the Parties, was the Adaptation Fund with the purpose of supporting adaptation projects and programmes in developing country Parties, as laid down in paragraph 1 of decision 10 of the seventh session of the Conference of the Parties: "[d]*ecides that an adaptation fund shall be established to finance concrete adaptation projects* [...]".

At the latest sixteenth session of the Conference in 2010, a Green Climate Fund was established to support projects, programmes and policies in developing country Parties related to mitigation, adaptation, capacity-building and technology development and transfer, as laid down in paragraph 102 of decision 1 of the sixteenth session of the Conference of the Parties and clarified earlier in paragraph 10 of decision 2 of the fifteenth session of the Conference of the Parties: "[w]*e decide that the [...] Green Climate Fund shall be established as an operating entity of the financial mechanism of the Convention to support projects, programme, policies and other activities in developing countries related to mitigation including REDD-plus, adaptation, capacity-building,* ***technology development and transfer***."

So far, the funds that could support the Technology Mechanism in terms of finance are the financial mechanism, the Special Climate Change Fund and the new Green Climate Fund under the financial mechanism. These three funds provide financial resources for technology transfer and are thus possible funds to support the Technology Mechanism.

In the negotiating text of the twelfth session of the AWG-LCA in Tianjin in October 2010 (United Nations Framework Convention on Climate Change, 2010a), there was, in contrary to the decisions adopted during the sixteenth Conference of the Parties (United Nations Framework Convention on Climate Change, 2010c), a paragraph dedicated to the financing of the Technology Mechanism, as laid down in paragraph 6 of Chapter IV of the negotiating text of the twelfth session of the AWG-LCA in Tianjin in October 2010: "[a]*lso decides that the implementation of the Technology Mechanism [...] shall be funded by the financial arrangement, including the provision of new and additional financial resources to meet the agreed full incremental costs* [...]". The details about this financial arrangement, however, were not laid down. Moreover, the term "*financial arrangement*" was not used once in any paragraph of the decisions adopted during the sixteenth Conference of the Parties. Therefore, the need was expressed for proposals to identify potential links between the Technology Mechanism and the financial mechanism, as laid down in paragraph 128(d) of chapter B of decision 1 of the sixteenth session of the Conference of the Parties. During that same session of the Conference of the Parties, the Green Climate Fund was established as an operating entity of the financial mechanism, as laid down in paragraph 102 of decision 1 of the sixteenth session of the Conference of the Parties. According to the EGTT (Expert Group on Technology Transfer, 2010), the former term "*financial arrangement*" referred to the financial mechanism and the Green Climate Fund. These funds could be used to finance the Technology Mechanism's organs, namely to pay for the salaries of their employees, the costs of the infrastructure and buildings, the costs of executing their functions and delivering their operational modalities etc. (Expert Group on Technology Transfer, 2010). In this case, there is a direct link between a financial mechanism, this can either be the financial mechanism under the GEF or the new Green Climate Fund or the two funds together, and the Technology Mechanism's organs. At this point, this financial mechanism would support the Technology Mechanism in terms of money and this is then how the Technology Mechanism's hierarchy would look like:

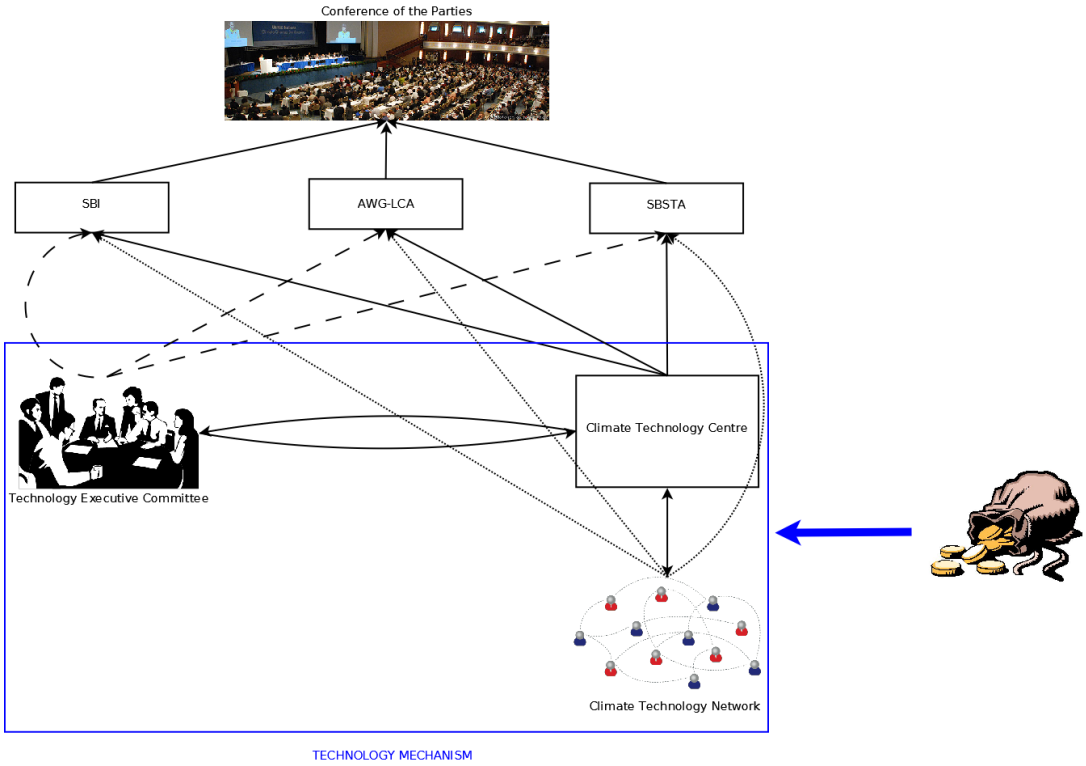


Figure 12: A direct financial mechanism to the Technology Mechanism

Another scenario would be that the financial mechanism provides developing country Parties with financial resources for the implementation of their actions: "[d]*uring the early stages of the support cycle, both prior to and during the preparation of actions, Parties may not have received direct support, unless this had been explicitly provided for either by the GEF or the new fund.* ***However, during the implementation phases, Parties may have obtained direct funding, and this funding may have been provided in part to enable the Party to obtain technological support from the Technology Mechanism.***" (Expert Group on Technology Transfer, 2010). According to my interpretation, this is how the hierarchy would look like: a financial mechanism provides developing country Parties with financial support. There is no direct link between this financial mechanism and the Technology Mechanism. Developing country Parties request support from the Technology Mechanism's organs. Since the Technology Mechanism has to cover its costs (the salaries of its employees, the costs of its infrastructure and buildings, the costs of executing its functions and delivering its operational modalities etc.) and that it does

not receive any money from the financial mechanism, it has to get its money from somewhere else: the country Parties. There would thus be a two-way relationship between the Technology Mechanism and the country Parties: the Technology Mechanism's organs provide country Parties with support, as laid down in their functions of paragraphs 121 and 123 of chapter B of decision 1 of the sixteenth session of the Conference of the Parties in return for money from developing country Parties, who have received these financial resources from the financial mechanism. According to this scenario, this is how the hierarchy would look like:

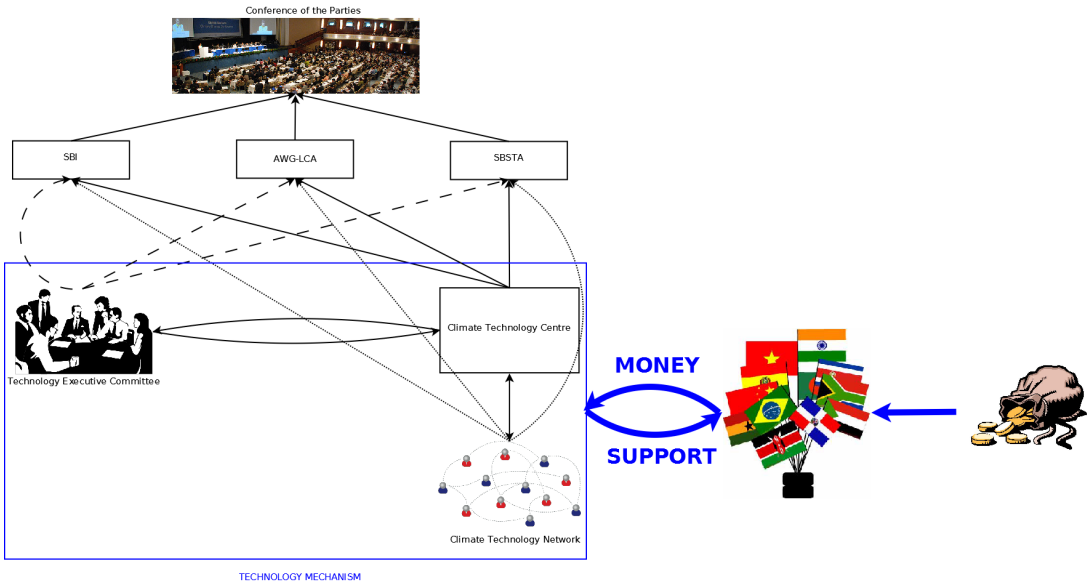


Figure 13: An indirect financial mechanism to the Technology Mechanism

When opting for a scenario, one has to keep the GEF's mandate in mind: "[a]*n independent financial organization, the GEF provides grants to* ***developing countries and countries with economies in transition*** [...]" (Global Environment Facility, 2010e). The GEF supports country Parties with financial resources, not institutions like committees, centres and networks. Based on the GEF's mandate, the second scenario thus seems to be the more plausible one.

Although the financial mechanism and/or the Green Climate Fund would support projects and programmes in developing country Parties related to, inter alia,

technology development and transfer, one has to keep in mind that those public funds will not enable and enhance technology development and transfer in one day. Based on Ockwell et al. (2010) and Bolli & Somogyi (2011), practice learned us that international/interngovernmental funds are rarely proposed and tend to have a very limited role, because of a lack of resources, whereas the private sector is a key player in technology development and transfer: "[i]*n general, government science agencies and universities do not have the resources to commercialise their research outcomes by themselves. Commercialisation of publicly funded research and development is often carried out by the private sector, which has a more appropriate understanding of the market place and the requisite marketing and financial resources. Technology development and diffusion are subsequently managed by the private sector.*" (United Nations Framework Convention on Climate Change, 1999a) and that public funds do not have any effect on technology transfer productivity, while private funds have the ability to increase the technology transfer productivity.

I can thus conclude that in order to optimally enable and enhance technology development and transfer to developing country Parties, both public funds, such as the financial mechanism and/or the Green Climate Fund and private funds have to be in place.

Chapter 3: Conclusion

The importance of technology development and transfer was already known long before 1995, but it was only until the world's first Earth Summit in Rio de Janeiro in 1992 that the international community legally recognized the importance of environmentally sound technologies. It was also the year in which the United Nations Framework Convention on Climate Change (UNFCCC) was established to tackle climate change. The first session of the Conference of the Parties, under the UNFCCC, took place in 1995. During each of those sessions, the importance of technology development and transfer became clear, which eventually led to the establishment of the Technology Mechanism as the latest sixteenth session of the Conference of the Parties in 2010 to enhance the technology development and transfer process.

Although the Technology Mechanism was officially established during the sixteenth session of the Conference of the Parties, there were still unresolved issues that needed to be given an answer to in order to make the Technology Mechanism operational in 2012.

The first issue was dedicated to the Technology Mechanism's hierarchy and its reporting lines. During the sixteenth session of the Conference of the Parties, it was clear that developed and developing country Parties had opposing views concerning this matter. By analysing the various points of view and the paragraphs of decision 1 of the sixteenth session of the Conference of the Parties, I created a possible hierarchy for the Technology Mechanism's organs, including its reporting lines. The hierarchy I propose in this thesis is based on a symmetrical structure, which means that no organ stands above the other and that the hierarchy is flat. The matter on the reporting lines was analysed by looking at the mandates of the subsidiary bodies. In my proposed hierarchy, the Technology Mechanism's organs would report to the

subsidiary bodies. These bodies would then pass this information on to the Conference of the Parties.

The second issue was dedicated to the Technology Mechanism's operational modalities. Paragraphs 121 and 123 of chapter B of decision 1 of the sixteenth session of the Conference of the Parties laid down the functions of the Technology Executive Committee (TEC) and the Climate Technology Centre and Network (CTCN). Thus, the paragraphs did lay down what the Technology Mechanism's organs would be doing, however, the paragraphs did not lay down how they would have to be doing it. In this second issue, I thus coupled two operational modalities to each function of the CTCN. As the TEC's place in the hierarchy of the Technology Mechanism and thus its role is still a point of discussion in the climate change negotiations, I did not consider the TEC's operational modalities.

The third issue was dedicated to the Technology Mechanism's main sectors and ESTs, based on the results of Technology Needs Assessments (TNAs) of country Parties. The Technology Needs Assessments make a distinction between mitigation and adaptation purposes and so did I in this third issue. In case of mitigation, country Parties' main technology needs lie in the energy sector, as identified as the most important sector for mitigation actions by 94% of the country Parties, followed by the agricultural and forestry sector identified by 88% of the country Parties and the transportation sector identified by 84% of the country Parties. However, when identifying key sectors for mitigation purposes, there were important regional differences, which means that country Parties' top priority sectors for mitigation actions differed. This was not the case for adaptation. All country Parties stated that, in case of adaptation, their main technology needs lied in the agricultural sector, as identified by 82,4% of the country Parties, followed by the sector of water resources identified by 66,2% of the country Parties and the sector of systematic observation and monitoring with 57,5%. It thus became clear that country Parties prioritize different sectors and ESTs and that there is no magical technology that will solve all environmental problems of all country Parties.

The fourth issue was dedicated to the Technology Mechanism and Intellectual Property Rights, which is probably the biggest obstacle the Technology Mechanism faces. In order to get rid of this obstacle, various options were analysed, including a funding mechanism, a patent pool, a new international treaty or pact, fiscal policies, a ban on Intellectual Property Rights on ESTs and the provision of grants by the Global Environment Facility (GEF).

The fifth and last issue was dedicated to the financing of the Technology Mechanism. In this issue, two scenarios were developed. In each scenario, the Global Environment Facility provides the financial mechanism with financial resources, coming from developed and emerging country Parties. In the first scenario, the financial mechanism would directly support the Technology Mechanism financially to cover its costs. In the second scenario, the financial mechanism would indirectly support the Technology Mechanism, by providing developing country Parties with financial resources. There would thus be a two-way relationship between developing country Parties and the Technology Mechanism. Developing country Parties would receive technical support from the Technology Mechanism's organs in return for money developing countries received from the financial mechanism. Based on the GEF's mandate to provide developing country Parties with financial support and not organs like a Committee, a Centre and a Network, the second scenario seems to be more plausible. However, as research already proved, there will be a need for a public and a private funds to make technology development and transfer really effective.

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Annex I: paragraphs 121 and 123 of chapter B of decision 1 of the sixteenth session of the Conference of the Parties

121. […] decides that the functions of the Technology Executive Committee shall be to:

(a) Provide an overview of technological needs and analysis of policy and technical issues related to the development and transfer of technologies for mitigation and adaptation;

(b) Consider and recommend actions to promote technology development and transfer, in order to accelerate action on mitigation and adaptation;

(c) Recommend guidance on policies and programme priorities related to technology development and transfer with special consideration given to the least developed country Parties;

(d) Promote and facilitate collaboration on the development and transfer of technologies for mitigation and adaptation between governments, the private sector, non-profit organizations and academic and research communities;

(e) Recommend actions to address the barriers to technology development and transfer in order to enable enhanced action on mitigation and adaptation;

(f) Seek cooperation with relevant international technology initiatives, stakeholders and organizations, and promote coherence and cooperation across technology activities, including activities under and outside of the Convention;

(g) Catalyse the development and use of technology road maps or action plans at the international, regional and national levels through cooperation between relevant stakeholders, particularly governments and relevant organizations or bodies, including the development of best practice guidelines as facilitative tools for action on mitigation and adaptation;

123. Decides that the Climate Technology Centre shall facilitate a network of national, regional, sectoral and international technology networks, organizations and initiatives with a view to engaging the participants of the Network effectively in the following functions:

(a) At the request of a developing country Party:

(i) Providing advice and support related to the identification of technology needs and the implementation of environmentally sound technologies, practices and processes;

(ii) Facilitating the provision of information, training and support for programmes to build or strengthen capacity of developing countries to identify technology options, make technology choices and operate, maintain and adapt technology;

(iii) Facilitating prompt action on the deployment of existing technology in developing country Parties based on identified needs;

(b) Stimulating and encouraging, through collaboration with the private sector, public institutions, academia and research institutions, the development and transfer of existing and emerging environmentally sound technologies, as well as opportunities for North–South, South–South and triangular technology cooperation;

(c) Facilitating a network of national, regional, sectoral and international technology centres, networks, organization and initiatives with a view to:

(i) Enhancing cooperation with national, regional and international technology centres and relevant national institutions;

(ii) Facilitating international partnerships among public and private stakeholders to accelerate the innovation and diffusion of environmentally sound technologies to developing country Parties;

(iii) Providing, at the request of a developing country Party, in-country technical assistance and training to support identified technology actions in developing country Parties;

(iv) Stimulating the establishment of twinning centre arrangements to promote North–South, South–South and triangular partnerships, with a view to encouraging cooperative research and development;

(v) Identifying, disseminating and assisting with developing analytical tools, policies and best practices for country-driven planning to support the dissemination of environmentally sound technologies;

(d) Performing other such activities as may be necessary to carry out its functions;