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THE CLIMATE TECHNOLOGY CENTRE & NETWORK UNDER THE UNFCCC

An operational effectiveness and stakeholder perception analysis

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Preface

This Master thesis has been developed under the Master of Science program *Sustainable Cities* at the Aalborg University, Campus Copenhagen, Denmark, in the period from February 1st to August 4th in 2016.

The thesis has been conducted in cooperation with the Climate Technology Centre & Network (CTCN). My intention was to produce an outcome with value for an institution within the United Nations. My inspiration has come from an internship at the United Nations Industrial Development Organization (UNIDO) previous to the Master thesis and has only been intensified during the period in which I worked with the CTCN. In addition to its value for my personal academic education, I understand this thesis as an example for my admiration for the highly relevant and hard work of the United Nations, its multiple institutions and staff.

Acknowledgments

I would like to thank the CTCN and its staff members for their support in the last months. The provision of crucial information, the critical and constructive feedback, the supportive and sociable work environment as well as the warm welcome helped me strongly to write this thesis. In this matter, I would like to thank Jukka Uosukainen, the Director of the CTCN, for his support and interest in the thesis as well as its results and facilitating this cooperation. Further, I would like to specifically thank Emma-Liisa Hannula not only for being my central contact in the CTCN, but also for her enormous efforts, the constant support and the huge share she has in making this thesis possible.

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Last, but absolutely not least, I especially thank my girlfriend Mie for truly always being there for me. Without your patience and your constant, encouraging as well as loving support, this thesis would not have been possible. Therefore, this thesis is dedicated to you.

Copenhagen, 02.08.2016   _____

Tim Meinert

Abstract

The Climate Technology Centre & Network (CTCN) as the operational arm of the Technology Mechanism under the United Nations Framework Convention on Climate Change (UNFCCC) has the mission to foster technology transfer in developing countries. This Master thesis evaluates the operational effectiveness of the CTCN being in its third year of operation and reflects on implications for the future development of the CTCN. It includes the three objectives of reviewing the current operations in reflection to the CTCN's political mandate, analyzing the stakeholders' perception in terms of operations as well as effectiveness and formulating policy recommendations.

As the necessary background information, the thesis describes how climate change is addressed in the CTCN context. Therefore, the framework the CTCN originated from is presented and critical reflections on the UNFCCC within the contemporary literature are embedded, the special role of developing countries in relation to climate change is elaborated to emphasize the CTCN's focus on these actors, characteristics of technology transfer are pointed out and the benefits of the network approach, as chosen by the CTCN, are highlighted. The CTCN itself is described thoroughly in terms of its mission, political mandate, organizational structure and targets. The research methodology to fulfil the purpose of the thesis is threefold. First, a quantitative and qualitative target analysis investigates the current status of the CTCN's operation and in reflection to the responsibilities and targets set in the political mandate. Second, a sector and regional coverage analysis investigates the CTC Network. Third, two stakeholder surveys directed at the receivers, the national focal points for the CTCN within developing countries, and suppliers, the CTC Network members, of the assistance in technology transfer are conducted.

The research results are comprehensively evaluated and show that the CTCN is indeed operationally effective given the predominant circumstances, as a result of the complex climate negotiations under the UNFCCC, and being a relatively young institution with an ambitious task at hand. However, the thesis reveals several matters that require improvement and the attention of the CTCN. These are translated into policy recommendations that can further increase the operational effectiveness. It is emphasized that several achievements since its establishment are evident, but the CTCN faces further challenges in its development. Nevertheless, the CTCN has the advantage of basing future progress on already successful and promising structures.

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Abbreviations

CTCN: Climate Technology Centre & Network

COP: Conference of the Parties (in the UNFCCC)

CP: Consortium Partners

FM: Financial Mechanism (under the UNFCCC)

GCF: Global Climate Fund

GEF: Global Environment Facility

IPCC: International Panel on Climate Change

LDC: Least developing country

NDE: National Designated Entity (in the CTCN)

SDIS: Small developing island state

TA: Technical Assistance (service of the CTCN)

TEC: Technology Executive Committee (of the TM)

TM: Technology Mechanism (under the UNFCCC)

TRP: Technical Resource Pool of the CTCN

UNEP: United Nations Environmental Program

UNIDO: United Nations Industrial Development Organisation

UNFCCC: United Nations Framework Convention on Climate Change

1. Introduction

"Climate change is the defining challenge of our time"

Ban-Ki Moon

Secretary-General of the United Nations

With this statement, Ban-Ki Moon, the eighth Secretary-General of the United Nations, underlined the importance of climate change to the world's economies, nation's securities and most of all environmental and human survival on this planet (Moon 2009; Moon 2015). The impacts are multifold, extremely severe and can already be witnessed (Bunn, 2009; Melillo, Richmond, & Yohe, 2014; Ranger, Harvey, & Garbett-Shiels, 2014; Viola, Franchini, & Ribeiro, 2012). Past and future measures to cope with the man-made phenomena define how united humanity stands in this challenge and within a globalized framework of differing cultures, economies, policies and politics. Since Moon (2015) acknowledges climate change as "one of the most complex issues ever to confront humanity", he welcomed the outcome of the recent 21st Conference of the Parties (COP) of the United Nations Framework Convention on Climate Change (UNFCCC) in Paris in December 2015 as a "triumph for people, the planet, and for multilateralism" (Moon, 2015). Indeed, the Paris Agreement represents a new chapter in climate change governance regime of the UNFCCC, but it has been a long and complex process to reach such a mutual understanding. Admittedly, since a focus started to be set on environmental degradation issues in the global political arena in the 1970s, climate change has been a fundamental part of numerous wide-ranging and effortful approaches as well as responses on the global political and development aid level (Bunn 2009; Schipper and Pelling 2006). But at the same time various obstacles like, among others, scientific uncertainty at the very start of the climate change debates, significantly differing opinions between the world's nations on future approaches as well as failed conferences and absent commitment to create global climate agreements turned the climate change governance into a complex, slow and sometimes even frustrating endeavour with questionable efficiency and results (Palmujoki, 2013; Viola et al., 2012). In this sense, Pacheco et al. (2014, p. 573) even criticise that the pre-Paris Agreement efforts have "added up to a (now) long list of unsuccessful attempts to solve the climate change problem". Interestingly, climate change governance on the global level has struggled with these obstacles despite the constant growth of accumulated evidence of several reports and studies blaming the human species to be to a high extent responsible for the climate change (Viola, Franchini and Ribeiro 2012, p. 9; Pacheco, Vasconcelos and Santos 2014, p. 573).

However, with the Paris Agreement hope arose that the awareness of the severe danger as well as the urgency for action had reached a point, where the obstacles have been overcome and a mutual understanding of the profound necessity for a unified contribution from all countries to the fight against climate change is secured. This agreement represents the latest –and probably

most promising– outcome in the long and complicated history of the global climate governance regime, the UNFCCC. It followed numerous, previous measures and efforts that have been undertaken by the UNFCCC since its establishment and that despite all criticism somehow benefitted humanity's fight against climate change. Core elements in the past and future negotiations as well as actions were and will be mitigation (GHG emission reduction) and adaption (strengthening climate resilience) measures (Bunn 2009; Savaresi 2016). Their implementation is based on the aspects of capacity-building, financing and technology or knowledge transfer, which are crucial resources for the world's countries in terms of fighting climate change (Savaresi, 2016). Environmental sound technologies play a fundamental role in achieving mitigation and adaption targets. The transfer of these technologies is both an essential facilitator of progress but also a choke point (Ghaleigh, 2011). It requires knowledge and expertise, suitable and enabling local capacities as well as secured funding to carry out the aimed implementation. Due to its importance, technology transfer is considered as "a cornerstone in the realm of the UNFCCC" (Nussbaumer et al. 2015, p. 2). Further, only joint efforts in cooperation of governments, the private sector, research and development facilities as well as both suppliers and recipients of technology transfer result in the needed progress in this issue (United Nations, 1992). A target group in particular are developing countries due to their relatively higher absence of technology related experience, local capacities and access to mitigation and adaption technologies, but also due to greater vulnerability towards climate change impacts as well as growing amounts of GHG emitted by themselves (OECD 2009; Mertz et al. 2009; Reid and Goldemberg 1998).

It is the field of technology transfer, which this thesis focuses on. Ghaleigh (2011, p.220) acknowledges that "amidst the many disappointments in the ongoing climate change negotiations, technology transfer [...] [*is*] an area in which substantive progress has been made". One of the most important and recent examples is the establishment of the Technology Mechanism (TM) in 2010, which includes two institutions with the aim to address technology transfer; the Technology Executive Committee (TEC) and the Climate Technology Centre & Network (CTCN). These two bodies work together but differ in their explicit purposes. The TEC as a group of leading experts in the relevant disciplines addresses world-wide "technology issues and identifies policies that countries may use to enhance climate technology development and transfer" (UNFCCC, 2016d), while the CTCN is the operational arm of the Technology Framework in regards of enhancing technology transfer and its deployment on the ground (CTCN, 2013).

The CTCN is the key focus of this thesis. Being operational since 2014, the institution's purpose is to foster the development and transfer of environmentally sound technologies in order to reach an "energy-efficient, low-carbon and climate-resilient development" (CTCN 2015, p. 6).

The CTCN pursues the latter explicitly at the request of developing countries and therefore supports the deployment of climate technologies within regions of a specific need. The three core areas of CTCN's services are (1) Technical Assistance, (2) Knowledge Sharing and (3) Collaboration & Networking. These in turn contain several sectors of mitigation and adaption activities. In its mission, the CTCN aims to draw on a "wide and diverse network of regional and national institutions" (CTCN, 2013, p. 16) in order to have the expertise to work across the numerous sectors, diverse technologies and heterogeneous regions in the world. This network is the essential part, which allows the CTCN to address technology-related issues and requests from developing countries in a tailor-made approach. The strength and benefits of a network tackling climate change has already been proven by several examples especially on the urban level. National and international municipal networks "facilitate cooperation as well as the exchange of information and experience among their members, and provide outside expertise and funding" (Hakelberg 2014, p. 109). The CTCN aims to leverage on these strengths and benefits in order to fulfil its mission.

Due to its essential importance for climate change mitigation and adaption as well as its endorsement by and role within the Paris Agreement (UNFCCC, 2015a), it is crucial to regularly monitor, evaluate and –if necessary- improve the CTCN's development and activities (CTCN, 2013). The CTCN has a clear political mandate given by the UNFCCC to foster technology transfer, capacity building and knowledge provision in developing countries as well as to increase networking activities among the relevant stakeholders. Being in its third year of operation, containing a consequently growing network and representing an increasingly frequented institution for technology transfer needs of developing countries, the opportunity presents itself to critically analyse the CTCN's performance in terms of its mission, the initially formulated targets and its perception among the requesting (developing countries) and delivering (CTC Network members) stakeholders. Therefore, this thesis aims to **evaluate the operational effectiveness of the CTCN in its initial years and develop reflections on the ways in which its operation could be developed in the future.** The central objectives of this aim are**:**

- to critically review CTCN's operations in reflection on its political mandate
- to analyse stakeholders' perceptions on the CTCN's operations and effectiveness
- to formulate policy recommendations for the CTCN that will increase the effectiveness of the institution and the transfer of climate technologies in developing countries

In order to answer the research question it is important to comprehensively understand how climate change is addressed in the context of the CTCN. Chapter 2 provides the necessary

background information in this matter. Initially, the climate change governance regime of the United Nations from which the CTCN originated is addressed. Through a historical perspective, milestones in the fight against climate change are highlighted and the steps towards the establishment of the CTCN as well as the Paris Agreement are presented. This is followed by sub-chapters introducing the central issues of the developing countries' role in regards to climate change, providing general information on characteristics and obstacles of technology transfer and highlighting the importance of knowledge and networking for humanity's actions against climate change from a governance perspective. Chapter 3 then addresses the CTCN itself. The political mandate, the mission and targets as well as its organization and are presented. Chapter 4 lays out the methodology that is used to fulfil the research aim. The three different analyses are introduced in detail and their purpose is further explained. Chapter 5 presents the findings of the latter, before Chapter 6 evaluates and discusses these results in a combined approach and compared to background information provided in Chapter 2 and 3. Further, this chapter identifies matters of success as well as areas of improvement in order to allow the formulation of policy recommendations for the future development of the CTCN. Finally, Chapter 7 concludes this thesis by summarizing the thesis, pointing out the central elements of the evaluation and elaborates on their relation to the research aim and objectives.

2. Addressing climate change in the CTCN context

The world surrounding us is changing. The physical environment and our resources are threatened by climate change that impacts environmental areas "from the top of the atmosphere to the depths of the oceans" (Melillo, Richmond, and Yohe, 2014, p. 4). That means, among others, a loss of habitat and species, diminishing glaciers, decreasing forest composition and health, raising ocean acidity, etc. (Bunn, 2009; Melillo et al., 2014). It has already "transcended the typical limits of international environmental problems, usually limited in reach" (Viola et al., 2012) and possesses an existential threat to humanity's health, safety and survival (Bunn, 2009; Melillo et al., 2014). In addition, climate change strongly influences energy security as well as the global economy and has a devastating and disproportionate impact on the already poor and vulnerable (Ranger, Harvey, and Garbett-Shiels 2014). Further, climate change interacts with other global developments like population growth, urbanisation and development aid. For the latter, decades of development aid's achievements by numerous actors are jeopardized by the impacts of climate change (Ranger et al., 2014). In other words, "[climate change] is at the core of nearly all the major challenges we face today" (Moon, 2009). Therefore, Viola et al. (2012, p. 9) refers to climate change as a "key civilizational driver of our time".

These issues indicate the global dimension of the topic and clearly demand mitigation and adaption actions. It seems obvious that a 'civilizational driver' such as climate change cannot be addressed by single actors. Rather, this challenge requires profound cooperation on all administrative levels and between all relevant stakeholders (Moon, 2009, Viola et al., 2012) with enormous efforts and multilateral responses. Simply put, global problems need global solutions (Bunn, 2009). As the leading international organization in terms of size, outreach, prestige, influence and with over decades accumulated expertise on multiple issues confronting humanity, the United Nations (UN) have been a pioneer and catalyst in the fight against climate change and are likely an arena that should deal with this challenge.

However, the UN's central climate governance arena, the UNFCCC, is characterized by a complexity that impedes the progress and influences the outcomes. It is this framework that the Climate Technology Centre & Network (CTCN) originated from and is now embedded in. Thus, it is needed to understand this framework. Further, the CTCN addresses climate change in three additional aspects that are crucial for the institution's purpose. Therefore, this Chapter examines the essential contextual information on these aspects. Section 2.1 approaches the global climate governance regime in a historical perspective on the relation between the United Nations and climate change including the recent Paris Agreement, before the special role of developing countries in regards of climate change is highlighted in section 2.2. The characteristics of technology transfer are briefly described in section 2.3. Finally, section 2.4 analyses the importance of networking.

2.1. The United Nations climate governance regime

This Chapter contains an overview of the UN climate governance regime. It is divided into two parts. First, a historical approach clarifies the early stages of the global recognition of climate change and explains the most important milestones and outcomes in climate governance until 2015. In addition, critical evaluations among the contemporary literature on some of these milestones and outcomes as well as the climate governance regime itself shape a better picture of the topic and its characteristics. Second, the most recent outcome of the climate governance regime, the Paris Agreement, adopted at the COP21 in Paris, France in 2015 is presented and also evaluated based on the literature.

2.1.1. The UN climate governance regime in a historical perspective

As mentioned earlier, global problems require global solutions. Bunn (2009) identifies environmental degradation as one of the leading examples of these global problems. It was in this field where one of the "early landmarks in the environmental arena" (Bunn, 2009) was set. In 1972, Stockholm, Sweden, hosted the *United Nations Conference on the Human Environment.* It resulted in the creation of the United Nations Environment Program (UNEP) with its task to coordinate the global efforts to protect the environment. Today, "UNEP is the leading organization within the United Nations system in the field of environment" (UNFCCC, 2015b) and has a clear and multifold mandate to tackle climate change. It is also the host of the CTCN in the first five year term of operation (see Chapter 3). In the 1980s and early 1990s, three additional climate relevant institutions were founded. These are the World Commission on Environment and Development in 1983 -also known as the *Brundtland Commission* and for the introduction of the term sustainable development-, the International Panel on Climate Change (IPCC) in 1988 and the climate fund Global Environment Facility (GEF) in 1991 (Bunn, 2009; GEF, 2016b; United Nations, 2007). As the UNEP, these institutions should become essential elements of the global climate governance regime. Especially the GEF is of great importance when addressing issues such as technology transfer or other kind of development work since the climate fund provides needed financial resources. The fund further has a "mandate from the UNFCCC to finance the transfer of Environmentally Sound Technologies" (GEF, 2016a).

The UNFCCC, the Kyoto Protocol and the road to Paris

In 1992, at the *United Nations Conference on Environment and Development* (UNCED) in Rio de Janeiro, Brazil, the so-called *Earth Summit* established the United Nations Framework Convention on Climate Change (UNFCCC). The UNFCCC officially came into operation in March 1994 and enjoys today nearly universal ratification by 197 parties (196 nation states and 1 regional economic integration organization) (Bunn, 2009; UNFCCC, 2016b). Palmujoki (2013, p. 189) refers to the UNFCCC as the "starting-point for comprehensive, extensive and integrated

climate change governance architecture". It is fostering international cooperation and recognizing the world's climate system as a shared resource and promotes as well as fosters the need for action to fight climate change (Bunn, 2009). Today, the framework is the "key international treaty to reduce global warming and cope with the consequences of climate change" (IPCC, 2016).

The most important body of the UNFCCC is the annual Conference of the Parties (COP) as the supreme decision-making organ that includes all member states. The duties are to foster and review the implementation process of the Convention as well as any other legal body or instrument that is created by the COP such as the Technology Mechanism and the CTCN (UNFCCC, 2016a).

The UNFCCC can be associated with three dominant principles influencing the institution and its development: the 'precautionary principle', the principle of 'state sovereignty and equity', the principle of 'climate justice' also known as the 'Common but Differentiated Responsibilities' (CBDR) principle and emerged market mechanisms (Palmujoki, 2013). The first plays a key role in defining the UNFCCCs policy that aims to „prevent global warming caused by human activities at a level that ensures human life and social development in different parts of the world" (Palmujoki, 2013, p. 189). This pioneering principle states that a lack of full scientific certainty shall not be used as a reason to postpone action against environmental degradation (Bunn, 2009). Bunn (2009, p. 63) stresses the legacy of it in pointing out that the principle is until today present in "virtually in all international instruments related to environmental protection, and serves as a key element of climate change policy". It is a principle that is widely accepted within the international community (Palmujoki, 2013) and therefore tends rather not to be a significant reason to cause the introductorily mentioned obstacles the climate governance regime struggled with in the past. Instead, evidence can be found in the literature that the 'climate justice' principle fulfills that role (Bunn, 2009; Palmujoki, 2013). This principle puts emphasis on the differentiated roles of developing and developed countries in causing climate change and their resulting responsibilities for the fight against it. Together with the principle of 'state sovereignty/equity' and an incorporation of market mechanisms into the climate negotiations under the UNFCCC, the 'climate justice' principle forms a norm complex, that Palmujoki (2013) indentifies as highly influential on the UNFCCC and the climate governance regime. This led to the intensive complexity that regime suffers from today (Viola et al., 2012).

This norm complex strongly impacted on one of the most prominent outcomes of the UNFCCC, the Kyoto Protocol. It was adopted in 1997 by the COP3 in Kyoto, Japan, and entered into force in 2005. It was the first outcome of the climate governance regime that legally bound industrialized nations to limit and reduce their GHG emissions. Within the first commitment period (2008-2012) the industrialized nations assured to lower their emission by around 5% compared to

their GHG emissions in 1990. Three mechanisms allowed the industrialized nations to undertake this challenge: International Emissions Trading, the Clean Development Mechanism (CDM) and Joint Implementation (JI)[1]. The CDM can be seen as a first step in terms of technology transfer. Until today, 191 nations have ratified the protocol. (German Federal Ministry for the Environment, 2015)

Even though it can be seen as an important milestone with many achievements (UNFCCC, 2016g), limitations of and criticism towards the Kyoto-Protocol can be found within the literature that have strong ties to the dominating principles. With the United States of America (USA), one of the most important industrial nations has not ratified the protocol and Canada left it in 2013. Both facts limited the effectiveness of the protocol according to Bunn (2009). Further, Palmujoki (2013) states that the agreed GHG reductions measures are insufficient. Indeed, from the point of view of today, the content of the protocol with rather small percentage of agreed GHG reduction (5%) and restrictions only for industrialized countries seems unsatisfactory. This content of the protocol can be seen as an outcome of the above mentioned and (in the global climate governance regime) highly influential norm complex containing the principles of 'climate justice' 'state sovereignty' and market mechanisms. The first two are strongly supported by developing countries (Palmujoki, 2013). This is not surprising since especially the less developed, economically-weaker or in the international community rather marginalized countries have presumably a strong interest that their voices are heard. Developing countries use the sovereignty principle therefore to "ensure their equal representation in climate negotiations" (Palmujoki, 2013, p. 190) as well as in other UN organs. But as stated above, this particular principle seems not to be an issue and can rather be seen as a self-evident necessity in a process of an international and joint fight against climate change. Admittedly, 'state sovereignty and equity' also means the right for every country to refuse and oppose targeted outcomes of the climate governance regime and therefore impede climate negotiations, as it happened several times in the history of the UNFCCC, but the idea of equity is and should be the deeply anchored in the UN system (Palmujoki, 2013).

The 'climate justice' principle is in its core twofold: On the one hand, the developing countries use it to pursue a fair burden-sharing among them and the developed countries. In this sense 'fair' means that the outcomes of the UNFCCC do not impede their own development goals (Palmujoki, 2013). This is a delicate and complex issue since stronger (industrial) development of developing countries leads most likely to a higher extent of GHG emitted into the atmosphere. But at the same time, a climate agreement should not prevent them from beneficial growth as well as increasing prosperity and standard of living as happened for the developed countries in the past (Palmujoki, 2013). In this matter, the climate justice principle is strongly linked to the

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[1] For further information see UNFCCC (2016f).

principle of 'state sovereignty and equity'. On the other hand, there are historical arguments in the light of climate justice stating that a fair burden-sharing should be defined according to the historically emitted GHG of a country during its process of industrialization (Palmujoki, 2013). In other words, the polluter pays the price and is responsible for tackling climate change. This would have lead to far higher emissions reductions than agreed upon in the Kyoto-Protocol and demands specifically from the developed countries more responsibilities. This was not supported by the developed countries since it would mean to "limit their consumption and standard of living" (Palmujoki, 2013, p. 190). However, in the UNFCCC context the 'climate justice' principle is officially referred to as the 'CBDR principle' and stands for the differentiated treatment of UNFCCCs members states including higher responsibilities for developed countries. In particular it means for these countries to be active in the mitigation of their own GHG as well as to support adaption measures within developing countries and it had become "an established practice in the UNFCCC" (Palmujoki, 2013, p. 190). In this sense, the 'climate justice' principle found its way into the UNFCCC.

However, reluctance towards the 'climate justice' principle is strongly evident within the UNFCCC. Resistance in the issue of GHG emission reductions solely for developed countries and the idea of higher percentages in limitations in the Kyoto-Protocol was primarily dominant among the so-called Umbrella Group (USA, Canada, Australia, Japan, Russia, Ukraine, New Zealand). This opposition led to the emergence of market mechanisms within the global climate governance regime (Palmujoki, 2013). Especially the USA opposed permanent emission limits and rather promoted emission trading and accounting systems as it has been the base for their domestic climate policy. Palmujoki (2013, p. 191) identified private carbon markets as the "backbone of climate change policies" for the USA. Even though the European Union (EU), some developing countries and environmental movements fought against it, also the market mechanisms found their way into the climate governance regime. Even some developing countries supported this, based on the prospects for opportunities to sell their emission rights. In the end the EU stopped its resistance and implemented these mechanisms into their policies as well. As Palmujoki (2013) pointed out, this development created an interesting contradiction between the justice principle and the market norms. The climate justice principle with the idea of emission limits for industrialized countries and support for the developing countries in adaption stands for the acknowledged responsibility of a 'the polluter pays the price' perception, whereas emission trading through market mechanisms represents emission rights. This means responsibilities due to former actions and current capabilities vs. the right to further emit based on carbon market activities. Or in other words: Restriction of consumption and living standards, when following the 'climate justice' principle, against the opportunity to not limit emissions and consumption, when pursuing the market mechanisms. The result in form of the Kyoto-Protocol was some kind of compromise aiming indeed only at developed member states, but with

(relatively low) GHG reduction targets (Palmujoki, 2013) and market mechanisms that allow a high amount of flexibility in GHG limitations and created a global 'carbon market' (UNFCCC, 2016g). However, with the USA not having ratified the Kyoto-Protocol, it was left weakened by the absence of a major stakeholder and emitter (Palmujoki, 2013).

Further, the norm complex impacted the global climate governance regime in general by creating a fragmented structure of groups either in favor of 'climate justice' (e.g. rather smaller and politically less dominant developing countries) or of the market mechanisms and negligence of complete acknowledgement of a 'the polluter pays the price' perception (e.g. the Umbrella Group) (Palmujoki, 2013). This surely slowed down decision making processes within the UNFCCC due to the heterogeneous interests of and actions undertaken by the member states. The triumph of the market mechanisms, while somehow undermining a strict pursuit of the 'climate justice' principle, is also described in Palmujoki (2010), in which the author presents evidence of a dominance of economic rhetoric within the climate governance regime and that comprehensive measures against climate change completely based on 'state sovereignty' and 'climate justice' cannot be achieved in the UNFCCC context.

This fragmented structure in the pre-Paris Agreement phase led to the enormous complexity and represents the introductorily mentioned obstacles the global climate governance regime struggled with. Due to these circumstances, Palmujoki (2013) criticizes the UNFCCC process before Paris by characterizing the international society formed by the UNFCCC as 'thin'. The negative peak in this matter was reached at the COP15 in Copenhagen, Denmark in 2009. Ciplet (2015) and the International Institute for Sustainable Development(2009) paint a highly fragmented picture in terms of interests and demands among the member states to the UNFCCC that resulted in what Palmujoki (2013) calls a "wreckage" in the climate governance and negotiations. As agreed at COP13 on Bali, Indonesia, in 2007, the COP15 was supposed to give birth to a new, legally binding climate agreement that shall be heir to the in 2012 expiring Kyoto-Protocol. Across the globe hope arose that this conference will result in a turning point in the fight against climate change. But in the eyes of many the conference could not live up to these expectations (International Institute for Sustainable Development, 2009). After two years of intensive work and negotiations within the UNFCCC, that were supposed to pave the way towards a new agreement, the climate governance regime found itself in a position in which strongly opposing expectations, highly fragmented structures within the negotiations and in part ill will to forge a new agreement were present (Ciplet, 2015; International Institute for Sustainable Development, 2009). Further, several "dramatic events" (International Institute for Sustainable Development, 2009, p. 2) characterized the Conference in Copenhagen itself. Ciplet (2015) and the International Institute for Sustainable Development (2009) provide an interesting overview in these different events such as the so-called "Danish Text" as well as

partly over-ambitious demands from the formed interests groups within the UNFCCC. In a last-minute approach by only a handful of countries the so-called Copenhagen Accord was forged, but strongly criticized due to its backroom-deal nature. As an outcome of the criticism, the Copenhagen Accord was only adopted as a 'decision' and is not legally-binding (Ciplet, 2015). However, the accord did indeed achieve important results according to the International Institute for Sustainable Development (2009). While still recognizing the disappointment by some stakeholders, the institute points out that the COP15 "covered a full range of formerly 'unmentionable' issues, such as adaptation and mitigation by developing countries" (International Institute for Sustainable Development, 2009, p. 6) as well as financial promises for climate change adaption and mitigation in developing countries. This can be seen at least as a partial breakthrough in terms of the above described norm complex. The Copenhagen Accord also proposed the establishment of the Green Climate Fund (GCF), which -officially established at COP16 in Cancun, Mexico, in 2010- initiates funding for low-emission and climate resilience projects in developing countries since 2015 (Green Climate Fund, 2016). Further, the accord laid the groundwork for the Technology Mechanism of the UNFCCC, which was then officially decided to be established to strengthen innovation and deployment of environmentally sound technologies (UNFCCC, 2016f) at the COP16 in Cancun, Mexico in 2010. The Decision 1/CP.16, IV B, paragraph 113-129 of the Cancun Agreement is the birth certificate of the mechanism including its two bodies, the Technology Executive Committee and the CTCN (UNFCCC, 2015b). Further details of the establishment are given in Chapter 3.

COP 17 until COP 20 were mostly characterized of discussions on several issues such as a second commitment period of the Kyoto-Protocol, a 'loss and damage mechanism' to provide compensation for countries being hit by extreme weather disasters, which was strongly demanded by developing countries (Ciplet, 2015) and the implementation of the 'intended nationally determined commitments' (INDC), which later act as the basis for the mitigation decisions in the Paris Agreement (Climate & Development Knowledge Network, 2016). With the INDCs, countries determine their contributions towards mitigation action in accordance with their national circumstances, priorities and capabilities. Further, it allowed all countries to globally communicate the ambitions and steps they will take to tackle climate change (World Research Institute, 2016). The INDCs were officially established at COP 20 and were supposed to be handed in to the UNFCCC previous to the Paris Conference in 2015. Several countries followed that request. Nevertheless, the outcomes of these conferences have still been controversially discussed by the member states and a strong division between developed and developing countries was still evident. Especially, in terms of commitments as well as details on the funding mechanisms for developing countries no agreement could be reached (Ciplet, 2015).

In conclusion, from its emergence and through its development the global climate governance regime under the UNFCCC has been characterized by an enormous complexity that caused several obstacles impeding the process towards a truly joint approach to tackle climate change. The reasons were the three above mentioned principles and market mechanisms. However, while there is undoubtedly room for criticism, the important achievements and milestones towards the joint fight by humanity against climate change should not be forgotten. They paved the way towards the recently adopted Paris Agreement and incorporated important milestones such as the Kyoto-Protocol and the decision to establish the Technology Mechanism including the CTCN.

2.1.2. The Paris Agreement

As described above, the global climate governance regime reached a point previous to the COP 21, where the sheer size of the challenge together with gasping differences in the visions and commitments of the member countries resulted in complexity. Together with several disappointing outcomes in the past, the situation before the COP21 in Paris, France, seemed again after Copenhagen politically hopeless for a new legally-binding agreement since the negotiations were still impeded by several controversially discussed subjects (Savaresi, 2016). The most crucial of these subjects is the question of differentiation. The Kyoto-Protocol acknowledged the differences between the world's countries in terms of capacities to cope with the projected impacts of climate change by incorporating the "static differentiation between developed and developing countries" (Savaresi, 2016, p. 16) and legally-binding emission reduction measures only for the developed countries. With rising emissions especially in emerging countries like China or India, this approach seems vastly unsuitable. But the opinions on how to distribute mitigation responsibilities and the provision of financing and capacity-building mechanisms as well as technology transfer were still differently perceived among the countries(Savaresi, 2016). An alliance between developed and some developing countries was, however, in favour to break through this static differentiation in the preparation for the COP21, despite some other developing countries were still strongly opposing the idea of loosening the existing structure (Savaresi, 2016) and therefore the 'climate justice' principle. In a remarkable diplomatic effort with smart management during the negotiations by the French presidency, the COP21 was able to be concluded on the 12th of December in 2015 with the adoption of a new legally-binding treaty, the Paris Agreement. Savaresi (2016) also puts emphasis on the important assistance in the negotiations by an improved political will to find a compromise. This will was driven by an unexpected coalition including over 100 developed and developing countries such as the USA, small developing island states and the EU (Savaresi, 2016).

The content of the Paris Agreement

The Paris Agreement contains the 11 page treaty covering the important issues of mitigation, adaption and means of implementation for capacity-building, financing and technology transfer. The agreement is legally binding after the ratification taking place in 2016, but it has to be mentioned that some formulations leave room for interpretation on the actual obligations, while others have a rather enabling character and mostly aim to facilitate specific action in the future instead of specifically demanding it. However, the Paris Agreement is the first outcome that incorporates worldwide commitment to tackle climate change and to target the 2 degrees Celsius goal, while making references to the aspirational target of even only 1,5 degrees Celsius. (Savaresi, 2016)

While the Kyoto-Protocol was a 'top-down' approach based on specific targets and timetables, the Paris Agreement is a 'bottom-up' approach based on pledges and reviews. This paradigm shift started after the unfortunate Copenhagen conference, while the political support for the Kyoto approach was further fading. Now, each member state announce in form of their INDCs what action they are willing and/or capable of to undertake. Then the "UNFCCC machinery works as a 'notary' collecting and enabling the review of Parties' pledged action" (Savaresi, 2016, p. 21). Every Party will submit their INDCs in a five year period and the Paris Agreement established a process to constantly review as well as assess the adequacy of the undertaken measures from a scientific perspective with the possibility to adjust the required efforts. With this, "durability, flexibility and alignment [*of the undertaken actions*] with the evolution of scientific knowledge" (Savaresi, 2016, p. 21) can be guaranteed. Together with a clause that prevents backsliding in terms of the pledged contributions, it is ensured that the level of ambition and commitment can only be increased. Both of these elements of the treaty have not been part of the Kyoto-Protocol. In addition, the Paris Agreement does not only take specific action of mitigation and adaption of the member states within their own countries into account, but also the support given to and received by other countries in form of development aid or similar. (Savaresi, 2016)

The widely known differentiation between developing and developed countries was based on membership within the Organisation for Economic Co-operation and Development (OECD) in the year 1992 and has constantly been present within the UNFCCC. It strongly supported the complexity given by the dominant principles in the UNFCCC. However, the delegates managed to overcome this obstacle, which led to a historical change in the global climate governance arena. For the first time, all Parties of the UNFCCC "undertake and communicate 'ambitious efforts' to achieve the purpose of the agreement" (Savaresi, 2016, p. 22). This softens the formerly clear distinction ,even though it is only a partial breakthrough. While all member states are obligated to participate in climate change mitigation efforts, the agreement still distinguishes between expectations and duties between developed and developing countries. The former is still

expected to take the lead in the global fight against climate change and has relatively higher duties, the latter is in some duties rather 'encouraged' instead of specifically bound to concrete action. Further, the least developed countries and small islands developing states have less strict obligations for the participation due to their extraordinary circumstances in terms of capacities to adapt to climate change and to mitigate global GHG emissions. (Savaresi, 2016)

The Paris Agreement also addresses the important issues of means of implementation in regards to capacity-building, financing and technology transfer. These are the central elements of the CTCN. The treaty puts additional emphasis on the importance of the elements since it makes 23 references to the Technology Mechanism as well as CTCN, called for enhanced action and engagement of these institutions and stronger collaboration between the technology and financial related measures of the UNFCCC (CTCN, 2016h). Further details in this matter are presented in Chapter 3 and discussed in Chapter 6.

In terms of 'climate justice', the Paris Agreement made no clear decision in terms of 'climate justice' and rather "tiptoed around this complex and contentious issue" (Savaresi, 2016, p. 24). As from developing countries demanded, the 'loss and damage' issue was officially addressed for the first time in a COP outcome. However, little more than acknowledging the matter was done and no right for liability and compensation claims by countries exposed to climate change impacts towards developed countries was implemented. Similarly, the topic of adaption and implementation (capacity-building, finance and technology transfer) support for developing countries by developed countries is referenced to, but no conclusively and clear responsibilities are given. Thus, the controversial 'climate justice' principle remains an uncertainty and potential obstacle to overcome for the future in global climate governance. (Savaresi, 2016)

In addition, non-state actors and their important role have been addressed for the first time. Especially for institutions like the CTCN this is an important issue since they heavily rely on these stakeholders to foster and support the desired development to fight climate change. (Savaresi, 2016)

Based on the important new elements in the Paris Agreement, Savaresi (2016, p. 26) points out that it "marks a new season in international climate diplomacy, with the emergence of a cooperative spirit that will hopefully continue in the years to come". After continuing disagreement and intense negotiations over years within the climate governance arena, the Paris Agreement brought back hope that the worlds' countries can indeed work hand-in-hand to tackle climate change and set the basis for more important work in the future. Even though not all controversial issues are explicitly addressed and solved, the outcome of COP21 is a "fairly balanced compromise" (Savaresi, 2016, p. 26). However, a lot of work still remains to do since the Paris Agreement is not the final solution.

2.2.The role of developing countries

This chapter presents the developing countries in regards to climate change. This is undertaken since these stakeholders have an eminent role and are the target group of the CTCN. Five characteristics in the relation between developing countries and climate change are initially presented and then act as a framework to highlight these stakeholders special position in the global climate governance regime.

Schipper and Pelling (2006) investigated the theoretical and policy linkages between climate change and global development. Within their research they identified central issues on climate change and development questions that also characterise the relation between climate change and developing countries. These issues are extended by the author of this thesis with another characteristic based on the findings in the literature.

1. Developing countries have relatively fewer resources and capacities to fight climate change compared to wealthier and countries with a higher degree of industrialization.[2]
2. Developing countries suffer from an inequitable impact of climate change effects.
3. Developing countries' development strongly interacts with climate change.
4. Developing countries' responsibility in climate change action is subject of highly controversial negotiations since the beginning of the global climate governance.

(1) It is acknowledged in the literature that developing countries have relatively fewer resources and capacities to mitigate GHG emissions and to adapt to the impacts of climate change (Ciplet, 2015; OECD 2009; Mertz et al. 2009; Schipper & Pelling 2006; Reid and Goldemberg 1998). Schipper and Pelling (2006, p. 27) identify "limited capacity […] and […] a lack of appropriate technologies and assessment of impacts and response options", and, in accordance, Ciplet (2015, p. 254) generally points out "structural disadvatanges" for developing countries. Aggregated and generalized, these disadvantages are evident in finances, administrative capacities and structures, possession of the necessary knowledge and technology as well as suitable access to knowledge and technology (Ciplet, 2015; OECD 2009; Mertz et al. 2009; Schipper and Pelling 2006; Reid and Goldemberg 1998).

(2) In addition, while climate change effects are evident all over the world, these impacts are unequally severe in developing countries (Ciplet, 2015; Mertz et al., 2009; Schipper and Pelling, 2006). Physical climate change impacts are expected to contribute and exacerbate to an "already long list of existing problems" (Mertz et al., 2009, p. 744). Many developing countries also rely profoundly on the agricultural sector, which is already and will further suffer to a great extent

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[2] Characteristic number 1 is created based on Ciplet (2015); OECD (2009); Mertz et al. (2009);Schipper & Pelling (2006); Reid and Goldemberg (1998).

from climate change (Mertz et al., 2009). This is a rigorous threat to the basis of existence in several countries. In addition, poor societies in these countries are already heavily exposed to disasters caused by climate change and their vulnerability as well as poverty can be even more increased after these disasters occur. Ranger et al.(2014, p. 468) call this a "vicious cycle" created by climate change if not interfered.

(3) The desires of developing countries in terms of economic development as well as increasing wealth while reducing poverty and hunger strongly interacts with climate change and international policies. In this matter, Schipper and Pelling (2006, p. 27) mentioned that the "conflict between developed and developing countries over the right to develop is therefore a standard element of the climate negotiations under the UNFCCC". Ramakrishna (2000) states that in the early days of the UNFCCC developing countries were concerned about the aimed environmental goals of the UNFCCC since they feared less attention on their economic situation and strict rules or obligation that would impede with their own development targets. Mertz et al. (2009, p. 744) present this issue in arguing around a decade later that "many developing countries – for good reasons – do not consider climatic change as one of their greatest concerns". This matter results in a delicate situation in which developing countries have the right to develop themselves, but need to find a suitable balance between growth and rising prosperity while obeying sustainability in their actions.

(4) In addition to their perception of the 'right to develop', developing countries mainly based their position in the negotiations on their historical innocence in terms of GHG emissions. Expressed in the principle of 'climate justice' and the strong support for it, developing countries insisted on higher obligations for developed countries due to their historical (industrialization) and current (relatively stronger capacities to mitigate, adapt and provide support) responsibility for GHG emissions (Palmujoki, 2013). As stated above, the 'climate justice' principle has been a central part in the UNFCCC (Savaresi, 2016). However, due to the sometimes deadlocked negotiations over justice issues, strongly varying development stages among the group of developing countries as well as developing countries' emissions combined being higher than the ones from developed countries, the strict adherence of the distinction between the two country groups seemed to be not suitable for finding a final, common ground to fight climate change (Savaresi, 2016). Therefore, the Paris Agreement is considered a success since it softened this static differentiation. In this sense, the developing countries moved away from a strict pursuit of the 'climate justice' principle. However, even though this structure was softened, the differentiation still remains a crucial element in the climate governance regime. Developed countries are still expected to take the lead in the global fight against climate change (Savaresi, 2016). In this matter, Savaresi (2016, p. 23) points out that numerous experts came to the conclusion that tackling climate change is supported by addressing some justice considerations, "most notably, those concerning the transfer of capacity, finance and technologies".

2.3. Technology transfer in the light of climate change

The transfer of environmentally sound technologies is an essential issue in the global fight against climate change (GEF, 2016a). It is a cornerstone of the UNFCCC due to its importance for mitigation and adaption and further the central target of the CTCN (Ghaleigh, 2011; Nussbaumer et al., 2015). The IPCC describes technology transfer generically as "[...]a broad set of processes covering the flows of know-how, experience and equipment for mitigating and adapting to climate change amongst different stakeholders such as governments, private sector entities, financial institutions, non-governmental organizations (NGOs) and research/education institutions[...]" (GEF, 2016a). Further, a lot of progress has been made in this issue even though it has been a controversial topic among the Parties of the UNFCCC (Ghaleigh, 2011).

Ghaleigh (2011) provides an interesting overview on technology transfer issues throughout the history of the UNFCCC, while he also points out that in the early days of the climate governance regime this presence is best seen in the CDM mechanism under the Kyoto-Protocol. This was followed by further negotiations and the establishment of the Technology Mechanism (TM) including the TEC and the CTCN. In addition, emphasis on the importance of technology transfer and the TM was also further embedded within the Paris Agreement (UNFCCC, 2015a). Despite all progress, once more the climate governance regime can be considered as divide. Ockwell et al. (2010) state that technology transfer comes with a series of barriers, challenges and opportunities, while the most prominent and controversial issue in regards of technology transfer are the international property rights (IPR). IPRs are legal rights in possession of a specific stakeholder to protect its own ideas, processes and products, whereas these rights in turn contain copyrights, trademarks and, most importantly, patents (Ockwell et al., 2010). Overall, these IPRs can impede or even deny other stakeholders to access specific technologies. The debate in this matter is dominated by two opposing perceptions among the UNFCCC Parties. On the one side, some countries support the claim that IPRs are a barrier to technology transfer into developing countries and technologies should be available to all countries as a public good (Ghaleigh, 2011; Ockwell et al., 2010). On the other side, some countries rather perceive policy and economics within developing countries as barriers for technology transfer and state that IPRs are an essential element to foster innovation, to encourage diffusion of technologies while clarifying and securing the legal status (Ockwell et al., 2010). Ockwell et al. (2010, p. 733) further identify developing countries tending to be rather opponents of IPRs as well as developed countries to be proponents and turned technology transfer into "a symbol of the longstanding resentments" between these groups. Even though the recent progresses in form of the TM, the CTCN explicitly and the support for technology transfer in the Paris Agreement are clearly positive milestones, differing positions between developed and developing countries still played a central role in the CTCN founding process (Uosukainen, 2016). This issue is further discussed in Chapter 6.

2.4. The importance of networks and knowledge

With the increased importance of non-state actors such as NGOs, the private sector, scientific networks and international institutions the focus in the global decision-making processes shifted away from purely state-driven 'governing' towards more complex but also flexible forms of 'governance' (Boyd and Juhola, 2014). Most recently, the strong emphasis put on these actors is embedded in the Paris Agreement by the UNFCCC (Savaresi, 2016). These 'new' stakeholders add specific knowledge and expertise on a broad range of essential topics into the decision-making process. Together they form a kind of governance network that relatively stronger benefit the targeted purpose (Dedeurwaerdere, 2005; Sørensen and Torfing, 2005). These networks "aim [...] to create a synergy between different competences and sources of knowledge in order to deal with complex and interlinked problems" (Dedeurwaerdere, 2005, p. 2). Further, Dedeurwaerdere (2005) references in his work that a typical network combines the energy and legitimacy of the public sector and financial possibilities as well as interests of the private sector with the legislative and executive power as well as the coordination and capacity-building skills of the state and international organisations. But networks can take many differing forms (Sørensen and Torfing, 2005). They are also essential issues when looking at the global fight against climate change in general and environmentally sound technology transfer in particular. The CTCN targets to leverage the knowledge and expertise of their network members in order to fulfil its mandate. This makes the two aspects central elements of CTCN.

As examples of the benefits of the network approach, this Chapter refers to the success of 'transnational municipal networks' (TMN). Hakelberg (2014) underlined their importance when he points out that today these networks represent 15 percent of the global CO2 emissions and cities from all over the world. Further, his research counts that the number of European cities involved in these networks increased from only six in 1992 to 113 in 2009, while this growth is not only seen in membership but also in actual climate policy adoption. This is indeed a significant development since urban areas are highly important for the global climate change fight since they hold strong potential but also urgencies to act (Hakelberg, 2014; United Nations, 2014). In terms of the latter, cities can become active in many areas. Boyd & Juhola (2014) mentioned that the key challenges lay in the urban adoption of environmental sound technologies and the sustainable development of infrastructure and services. However, not all cities have access to the relevant innovations/technologies, can base their development decisions on relevant knowledge and have expertise or even willingness to implement specific projects. These are the areas in which networking can be supportive not only for urban areas but also in the case of the CTCN. In his research, Hakelberg (2014) investigated four TMNs across the globe: The Climate Alliance, Cities for Climate Protection (CCP), Energy Cities and C40. The actual performance of these networks is not part of the analysis of this thesis, however,

Hakelberg's (2014) research gave an interesting insight in the advantages for the member in the TMNs, which can be projected on networks in general. Hakelberg concluded that networks can support its members in several important issues such as information provision, diffusion of knowledge and exchange of experience, facilitation of learning processes, fostering of cooperation, reduction of costs for the envisaged targets while improving the communication through established channels, enhancement of legitimacy and awareness of the respective activities that can lead to funding and growth possibilities and foster policy, technical as well as institutional innovation.

In addition to these potential, positive outcomes for the members of a network, Sørensen and Torfing (2005) identified a few characteristics of networks. First, networks have the ability to create flexible solutions. Second, networks are important vehicles for resource gathering. The accumulated knowledge of the members often represents a qualified and important basis for the decision-making process. Third, the risk of implementation resistance is reduced. Members involved in certain activities of the network tend to develop a feeling of ownership and responsibility that ensures the support of the activity. (Sørensen and Torfing, 2005)

However, networks gain their full efficiency only if well-functioning. Changes in the network member selection, conflicts between the members, ineffective leadership, a lack of visible results and other aspects that can impede the efficiency and the targeted beneficial nature of networks have the potential to "turn them into malfunctioning talk shops" (Sørensen and Torfing, 2005, p. 199). Therefore, it is a difficult task to maintain and improve a network and it requires careful management. But if effectively steered, climate relevant networks such as the TMNs or the CTCN can become examples of new, flexible and polycentric forms of governance required to overcome the challenge climate change (Boyd and Juhola, 2014; Hakelberg, 2014). Therefore, the CTCN stakeholders' perception analysis is an interesting approach to analyze the operational effectiveness from a governance perspective .

3. The Climate Technology Centre & Network

While the past chapters focussed on the complex landscape the CTCN is embedded in, this chapter introdcues the CTCN itself and its characteristics. The institution is part of the Technology Mechanism (TM) of the UNFCCC that conists of the CTCN and the Technology Executive Committee (TEC). As mentioned int he introduction, the TEC is a group of leading experts in climate technology-relevant disciplines that identifies world-wide technology issues and provides policy/programme advice as well as guidance to enhance climate technology development and transfer (UNFCCC, 2016d). The TEC constitutes as the policy arm, while the CTCN is the operational arm of the TM and fosters technology transfer and deployment on the ground (CTCN, 2015).

As stated in the introdcution, the aim of this thesis is to evaluate the operational effectiveness of the CTCN and its services. Therefore, this Chapter introduces the CTCN from a perspective that aims to provide the necessary information to undertake the evaluation. The chapter starts with the presentation of the CTCN's mission and political mandate in order to understand the purpose of the institution. It is followed by an overview of the organizational structure and the stakeholders involved since the latter play a crucial role within the evaluation of the CTCN. Next, the key services and organizational activities of the CTCN are presented, which are the basis for the development of targets and indicators to evaluate the institution. It starts with the description of the services provided by the CTCN as well as the targets given by the mandate. Then, the budget and funding plan is adressed, before the chapter concludes with the presentation of critical success factors highlighted by the CTCN itself.

3.1. Mission and political mandate

The vision of the CTCN is as follows: *"Developing country parties to the UNFCCC have acquired the capacity, tools, and know-how to develop and upscale technology for climate change mitigation and adaptation."* (CTCN, 2013, p. 6)

This vision was developed to emphasize what the institution wants to achieve. The ambitious vision is supposed to become reality through (1) enhancement of the development and transfer of environmentally sound technologies; (2) building and strengthening the necessary capacities in developing countries; and (3) pursuing the preparation and implementation of technology-related projects and strategies that benefits climate change mitigation and adaption purposes (CTCN, 2013). As pointed out in the vision, the focus is explicitly set on developing countries. They are able to directly request technical assistance from the CTCN in terms of "low emission and climate resilience development" (CTCN, 2013, p. 6). In the case of a request by a developing country the CTCN aims to extract the necessary resources, expertise and knowledge from

members of their extensive CTC network. This network is supposed to allow tailor-made assistance for a climate technology project that is requested by developing countries. In addition, the wide range of stakeholders within the CTC network is intended to cover all relevant sectors that are required in order to plan and implement the desired project (CTCN, 2013). It has to be mentioned though that it is not the explicit task of the CTCN to finance these projects itself. Rather, the CTCN "supports the provision of technical assistance provided by experts on specific climate technology sectors" (CTCN, 2016l) for mitigation and adaption in developing countries. These project proposals can be funded or invested in by other institutions or actors (Uosukainen, 2016). This means that developing countries can apply for assistance in climate technology-related projects and, if accepted, the CTCN will use its CTC Network to "design and deliver a customized solution tailored to local needs" (CTCN, 2015, p. 6). This process is financed by the CTCN and aims to enhance opportunities for and to remove barriers to accessing funding and investment from financial stakeholders such as UNFCCC Finance Mechanisms, Development banks and private actors (CTCN, 2015). Thus, the CTCN can also be seen as a bridging institution between the developing countries and funding opportunities. The countries want technology transfer and deployment, need funding to undertake the latter and ask the CTCN for support to access the funding sources. The CTCN wants to support countries in technology transfer, needs to offer relevant services for the latter and asks for targeted technical assistance requests that can be turned into fundable projects. The financial sources want investment opportunities, need robust projects with valuable outcome and ask for projects in the pipeline ready to invest (CTCN Advisory Board, 2016). However, follow-up funding is not necessarily needed in all requests. The CTCN also delivers smaller projects with a more consultant nature such as policy formulation or technology training (CTCN, 2016l).

Through this request-based, tailor-made approach the CTCN intends to provide necessary assistance for developing countries in the issues of pursuing technology transfer activities and capacity-building, while taking the national capabilities, priorities and circumstances into account. In addition, the CTCN seeks to set up and accelerate collaboration, networking and partnerships between the CTCN stakeholders and to create a platform to share experiences, provide the necessary knowledge and to learn from each other. (CTCN, 2013)

The political landscape this mission emerged from is described in Chapter 2. The political mandate is a direct outcome of the climate governance regime under the UNFCCC. Technology transfer is one of the corner stone's of the convention and has been acknowledged as an important aspect since the early days of the global fight against climate change (Nussbaumer et al., 2015; United Nations, 1992). The TM and the CTCN have been intensely negotiated and developed during several COPs. The COP16 in Cancun, Mexico, in 2010 officially confirmed and emphasised the importance of technology transfer and therefore decided the establishment of

the TM, the Technology Executive Committee (TEC) and the CTCN[3]. The specific functions of the CTCN are listed in UNFCCC Decision 1/CP.16, IV B, paragraph 123. The following COP17 in Durban, South Africa, clarified further details of the CTCN in term of its mission, architecture, roles and responsibilities, governance within the institution, organizational structure, reporting and review obligations. Further, it was decided that for the first five years the CTCN will be hosted by a United Nations organisation with the possibility of two four-year renewal periods for this organization. The CTCN was given an initial operational period until 2026 with the chance of extension[4]. Annex VII of the UNFCCC Decision 2/CP.17 V further sets the criteria that a potential host organization needs to fulfill in several issues such as capabilities, management structures, future plan for CTCN, budget proposal, etc. Decision 14/CP.18 in Doha, Qatar in 2012 then elected the United Nations Environmental Programme (UNEP) as the host of the CTCN. Further, Decision 25/CP.19 in Warsaw, Poland, in 2013 and especially Annex I, I-VII conclusively aggregated all modalities and procedures of the CTCN. (UNFCCC, 2015b)

Besides the complicated negotiations resulting in a compromise, the CTCN establishment by the Parties of the Conference represents a call for action in terms of technology transfer to developing countries and to fulfill the mission of the UNFCCC. The CTCN has a clear operational and political mandate (CTCN, 2013). Its mandate can be translated into the following value propositions, which stand for what is expected from the CTCN:

- "The CTCN will be demand-driven and based on local and national ownership and country driven needs, with a focus on building and strengthening developing country capacity.

- The CTCN will engage a broad ranging Network to build upon existing experience and knowledge.

- The CTCN will implement a comprehensive Knowledge Management System to ensure the efficiency and cost-effectiveness of the CTC.

- The CTCN will provide highly qualified support to countries along all stages of the technology cycle, from identification of technology needs, through assessment, selection and piloting of technological solutions, to their customization and deployment.

- The CTCN will play an important role in creating the enabling environment for investments in technology development and transfer.

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[3] Decision 1/CP.16, IV B, paragraph 113-129 (UNFCCC, 2015b).
[4] Decision 2/CP.17, V, Annex VII, I-VIII (UNFCCC, 2015b).

- The CTCN will provide training and networking for the National Designated Entities in order to ensure that they are in a position to make optimal use of the CTCN services. " (CTCN, 2013, p. 7)

In January 2014 the CTCN became officially operational, started the continuing process of setting up the needed internal as well as external infrastructure to fulfill the mandate and opened for developing countries requests. In 2015 the Paris Agreement of the COP21 in Paris, France, put further emphasis on the institution. In UNFCCC Decision 1/CP.21 Paragraph 66ff and starting from Article 10 in the Paris Agreement, the UNFCCC decided to strengthen the TM and with it the TEC and the CTCN, as well as requesting that these institutions continue their work (UNFCCC, 2015a). The Parties emphasized the importance of climate technologies, their transfer and the urgent need for strengthened cooperative action in this issue. Further, the TM shall play an important role in the future and serve the Paris Agreement (UNFCCC, 2015a). In order to enhance effectiveness and to fulfill its role in the future, the Paris Agreement also put emphasis on the necessity of a collaboration and cooperation between the TM and the Financial Mechanisms (FM) of the UNFCCC. In this matter, the Advisory Board requested that the CTCN aligns its aims with the funding criteria for each of the respective financial institutions within the FM in order to set a base for future cooperation and collaboration (CTCN Advisory Board, 2016). In addition, the COP pointed out the similarities and overlaps between the targets of the CTCN's and financial institutions such as the Global Environmental Facility (GEF) and the Global Climate Fund (GCF) (CTCN Advisory Board, 2016).

3.2. Organizational structure and stakeholders

Figure 1 summarises CTCN's organisation and the relevant stakeholders are presented in the following. It highlights the structure and dynamics of climate change governance in the case of the CTCN. As Knieling and Filho (2013) described, climate change governance can be described as cooperation and collaboration between governmental and non-governmental actors that tries to tackle climate change and its challenges. For this purpose it is essential to effectively manage the efforts for mitigation and adaption action while being aware of the interests and motivations of relevant stakeholders (Knieling and Filho, 2013). For this thesis it is crucial since the CTCN relies on the requests from developing countries and on a network that provides the necessary expertise and knowledge. Therefore, it is one of the objectives of this thesis to evaluate the CTCN stakeholders' perception of the institution, its services and operational performance.

The CTCN is built around the Climate Technology Centre (CTC), which consists of the CTC Core Centre and the Technical Resource Pool (TRP). As mentioned above, it is managed by the UNEP, but in cooperation with the United Nations Industrial Development Organization (UNIDO), and is located in Copenhagen, Denmark. In the CTC Core Centre a small team of recruited UN staff

members and consultants assists the Director of the CTCN in operating the institution. Among others, they receive and respond to the country's requests, are active in outreach, branding and fundraising, provide the contact point for the developing countries, manage and administrate the knowledge management system, the financial/budget programme as well as the capacity-building and network activities including workshops, seminars or other forms of collaborative work and learning. The CTC Core Centre (as the whole of the CTCN) works under the guidance and assessment of an Advisory Board (AB) that, among others, reviews and approves the institution's reports, evaluates CTCN's performance and supports the internal prioritization of requests from developing countries. (CTCN, 2013)
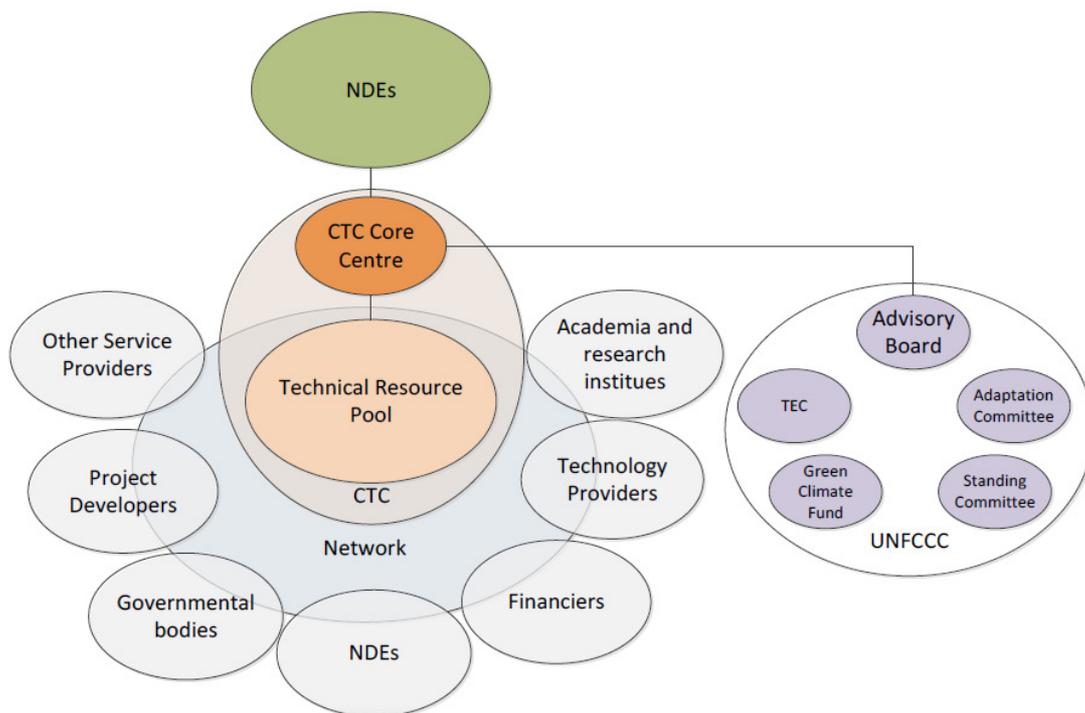

Figure 1: The CTCN stakeholders (CTCN, 2013)

The TRP includes the so-called Consortium Partners, which support the CTCN and its activities as the main strategic partners besides the AB. These stakeholders are highly relevant institutions and organizations of experts from across the globe[5]. Especially in the early stages of the CTCN's operations, they are supposed to be active: "The Technical Resource Pool will mainly be engaged in the initial appraisal, refinement, and technical support for requests received through NDEs [the developing countries], and contribute to Knowledge Management and enhancement" (CTCN, 2013, p. 15). The CTC Core Centre can ask for their support (e.g. in form of a respond to a project request by a developing country) if the network cannot yet, or in general deliver the needed services. In addition and based on their profound experiences and knowledge, the Consortium Partners engage in the development of the necessary infrastructure

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[5] A list of the Consortium Partners can be found at CTCN (2016a).

for networking, learning and experience sharing and offering valuable perspectives on the issue of technology transfer. (CTCN, 2013, 2015)

These stakeholders are located at the heart of the institution and have both a dominant focus on providing the necessary infrastructure and procedures. CTCN internally, they are the most relevant actors. From a more external perspective, the following two stakeholders are the most relevant since they determine the utilization and success of the CTCN. Therefore, they are chosen as the addresses of the surveys aiming to achieve results for the second objective of this thesis. They aim to identify the stakeholders' perception of the CTCN and help to analyse the institution from a governance perspective.

The National Designated Entity (NDE) acts as the focal point to the CTCN and is an intermediary between the national actors and the CTCN. NDEs are to be determined by the national governments. The can be located in varying (existing) offices with relevance to the targets of CTCN[6]. In this case the political mandate by the UNFCCC asks all Parties to determine an NDE, even though the CTCN services are intended for developing countries. However, each member state is supposed to have a public focal point to the CTCN. In terms of the NDEs from developing countries, they are, among others, responsible for submitting the requests for CTCN's services, managing the articulation and prioritization of these requests, identifying technology and capacity-building needs in accordance with the national circumstances and priorities, should enhancing the national coordination and collaboration between the public and private sector for mitigation and adaption efforts and providing the CTCN with feedback on the institution's performance. These are the most important tasks in relation to the CTCN. Nevertheless, the CTCN (2013, p. 12) points out that "all NDEs can play a crucial role in identifying and supporting opportunities for enhanced south-south-north collaboration" and should participate in the establishment and update of national development and climate strategies. (CTCN, 2013)

The CTC network provides the pool of expertise, knowledge and resources that are supposed to respond to the requests of the developing countries. This network needs to encompass a broad range of skills and expertise to support the mission of the CTCN. "Considering the wide range of adaptation and mitigation expertise required across sectors, regions and sub-regions and technologies, a wide and diverse Network of regional and national institutions is required as a delivery mechanism that can respond effectively and efficiently" (CTCN, 2013, p. 16). Therefore, the members ideally include varying stakeholders such as regional climate technology centres, international and regional organizations, (private) technology and other service providers, project developer, research/academic institutions as well as financial institutions and non-governmental organizations. The selection of network members follows certain criteria and each

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[6] A list of the NDEs is listed at UNFCCC (2016).

potential member is screened by the CTC Core Centre before the membership is approved[7]. The CTC Network is supposed to be developed in a "gradual expansion and increasingly sophisticated structuring of the Network, reflecting the expected build-up of demand and underlying financing for activities as well as experience and learning within the CTCN" (CTCN, 2013, p. 17). In addition, the CTCN aims to foster North-South, South-South or South-South-North cooperation and partnerships in their mission, which requires a network that is not solely populated by institutions from Europe or North America. Overall, the ideal CTC Network is geographically and sectorally distributed and balanced. (CTCN, 2013)

3.3. Targets and services

As given by its mandate, the CTCN pursues seven targets, which are divided into three key services and four organizational activities. These targets are the basis for the analytical approach of this thesis. While the mission and vision have a rather descriptive and generic nature that exacerbates the aim of this thesis, these targets allow the quantitative and qualitative measurement as well as evaluation of the CTCN's operational effectiveness. They represent the tools and outputs to achieve the mission. The key services focus on the central outputs of the CTCN's operations and the organizational activities are the measures that needed to be pursued in order to achieve an institution as desired by the political mandate. Therefore, analyzing the following targets and services covers not only external results and benefits for stakeholders, but also the internal structure in which the CTCN operates. In the following, each of the key services is described separately, before the organizational activities are presented.

Figure 2: CTCN key service 1 (CTCN, 2013)

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[7] The criteria for a CTC Network membership are listed in (CTCN, 2013).

Key Service 1: Technical Assistance in response to requests from developing countries

Figure 2 elaborates on this service. The situation at present is generally unsatisfying in terms of potential for and pursuit of climate technology transfer and deployment in developing countries. In cooperation with national/local implementation partners, a NDE of a developing country can request Technical Assistance (TA) from the CTCN. In the first step the CTCN assesses if the request matches the criteria for eligible projects at the CTCN. If that is the case, the request is handled either in a 'quick response' for smaller projects (up to 50.000 USD) or in a larger 'response projects' (50.000-250.000 USD). The former can be addressed by the CTC Core Centre staff or by the TRP, while the latter is supposed to be tendered among the CTC Network members in a bidding process. The request management process is summarized in CTCN (2013) and includes several stages of assessment and if necessary further queries to the NDEs. The CTC Network members are allowed to submit proposals in the bidding process on how they would approach the project and among the proposals the most suitable is chosen. The outcome is supposed to be a tailor-made, state-of-the-art solution from climate technology experts that supports the needs of the countries requesting assistance. A response should be delivered within 12 months after the request is being received. (CTCN, 2013)

Table 1: CTCN technology sectors and service areas

Adaption Sector	Mitigation Sector	Cross-cutting	Service areas
Early Warning & Environmental Assessment	Energy supply	Ecosystems & biodiversity	Policy & Planning
Agriculture/Forestry	Energy use	Gender	Capacity-building
Water	Transport	Disaster risk reduction	Knowledge management
Marine & Fisheries	Industry	Community based	Collaboration in innovation
Coastal Zones	Agriculture		Investments
Human Health	Forestry		Technology development/transfer
Infrastructure, Transport & Urban Design	Waste Management		

Source: Edited based on CTCN (2016b)

The content of the TA requests can be located in all stages of the technology cycle[8]. Further, the service is free of charge, but the maximum value of the CTCN's services is not allowed to exceed 250.000 USD (whereas the CTCN external cost for the subsequent implementation of a project can be higher). As mentioned above, the TA of the CTCN is not supposed to directly finance the requesting countries, "but instead supports the provision of technical assistance provided by experts" (CTCN, 2015, p. 22). The technical assistance includes five main topics as follows: technical assessment (technical expertise and recommendations for specific technology needs, identification of technologies/barriers/technology efficiency, piloting and deployment of technologies), technical support for policy and planning documents (strategies, policies, road maps, etc.), technology trainings, tools and methodologies and implementation plans (CTCN, 2016l). The TA is further available for a variety of mitigation and adaption technologies. Currently, the CTCN has a set of acknowledged technology sectors which each contain several technology types. Table 1 shows the sectors for mitigation, adaption and cross-cutting approaches. These sectors in turn can be approached from varying angles. The CTCN distinguishes therefore between the services that a CTC Network member can offer within a climate technology sector. Examples for a 'quick response' project could be, for example, to assist the requesting country in a national feed-in tariff structure for renewable energy projects, while a 'response project' is characterized by larger measures such as the development of an integrated water resource management plan. (CTCN, 2013, 2015)

Key Service 2: Outreach, networking and stakeholder engagement

Figure 3 shows the service of outreach, networking and stakeholder management. The generalized starting point is a lack of networks, collaboration and knowledge that could benefit mitigation and adaption efforts. Therefore, this service aims at the CTC Network members and the NDEs in order to set up such an arena for collaboration and networking as well as to provide the knowledge on possibilities in these issues. The intended services are (1) international events and forums, (2) public-private sector workshops and (3) regional (NDE) network forums. With the first service the CTCN tries to profile itself, gather information and foster its own outreach as well as recruiting new network members. The second aims to foster public-private partnerships that are expected to be the foundation for climate technology projects. The third service fosters networking activities within the CTCN and its stakeholders such as twinning arrangements between NDEs from developing and/or developed countries or between NDEs and other CTC Network members and can be hosted for one of the main world regions or their associated sub-regions. (CTCN, 2013)

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[8] For further information on the technology cycle see Climate Technology Centre & Network (2013, 2015).
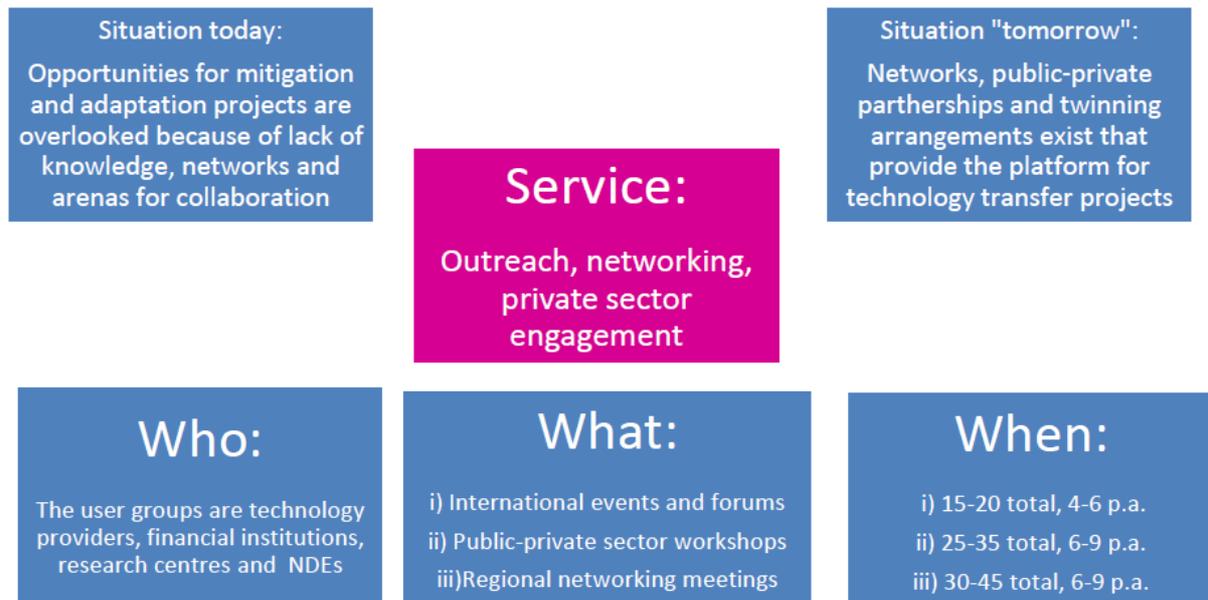
Figure 3: CTCN key service 2 (CTCN, 2013)

Key Service 3: Knowledge management, peer learning and capacity building

The service of knowledge management, peer learning and capacity building is pictured in Figure 4. Due to the generalized situation today wherein developing countries lack knowledge of the development, assessment and transfer of environmentally sound technologies, this service tries to reach a status in which developing countries are aware of the technology possibilities, experiences from peer countries and have the necessary training. A comprehensive Knowledge Management System (KMS) is supposed to be built and maintained by the CTCN that "disseminates and captures information on technologies and best practices and supports the management of requests to the CTCN" (CTCN, 2013, p. 21). This knowledge portal contains a technology library with relevant information for technologies, their advantages and disadvantages as well as implementation and feasibility issues based on the same technology sectors as presented in the TA service above. In addition, it aims to include a pool of resource information relevant to climate change (e.g. a worldwide water atlas/glacier inventory, etc.), events (e.g. workshop on biodiversity and climate change in South-East-Asia, etc.) and country-specific information (e.g. options for climate finance in Vietnam, etc.).. Further, the 'remote technical advisory service' functions as a helpdesk that deals with specific queries from the stakeholders. The CTC Core Centre coordinates this helpdesk but can ask for support (especially technical) from the TRP. Regional or global capacity building workshops are to be held on topics that present themselves relevant to the NDEs and other network stakeholders. In addition, NDEs can ask for specific training on, for example, how to develop fundable projects or certain technologies (e.g. solar energy) as well as topics (e.g. flood prevention). (CTCN, 2013)

Situation today:
Developing country does not have the necessary knowledge about technology development, assessment and transfer options

Service:
Knowledge management, peer learning, capacity building

Situation "tomorrow":
Developing country is aware of technologies and peer countries' experiences and have acquired appropriate training

Who:
The user groups are local project developers, NDEs/government institutions,research centres, local technology providers

What:
i) Knowledge Management System
ii) Capacity building workshops
iii) Remote Technical Advice/ helpdesk

When:
i) Realisation of KMS in 2014
ii) 30-40 total
iii) 210-280 total, increasing annually up to 80 p.a.

Figure 4: CTCN key service 3 (CTCN, 2013)

In addition in terms of the here presented services, the CTCN provides other programs that aim to build capacities within the NDEs and to learn about the CTCN and how it can support developing countries. The first is called the Request Incubator Programme that allows NDEs from Least Developed Countries (LDCs) to apply for an on-site training by the consortium partners in the topics of how "to access CTCN technical assistance, strengthen institutional capacities related to climate technologies, and reinforce efforts on technology transfer" (CTCN, 2016k). Further, the CTCN Secondment Programme offer representatives of NDEs (but also CTC Network members, Consortium Partners and donor institutions) to work for a term of four to six months at the CTC Core Centre in order to deepening their knowledge about the CTCN, its services and operation (CTCN, 2016e). As a third service for learning and capacity-building, the CTCN aims to conduct internet-based webinars, which are online tutorials on relevant technology issues for interested stakeholders. They are organized by the Consortium Partners or CTC Network members and cover a broad range of topics. Further, they are recorded and publicly available at the CTCN website.

The key services one to three provide the core of the CTCN and are the direct outputs of its activities. Clear and quantitative targets are set by the mandate for the CTCN, but are presented in the figures above only accumulated for the first five year term. Detailed targets for each of the five years and for the three key services are listed in CTCN (2013). These detailed numbers are also used for the analysis in this thesis due to their more precise nature.

3.4. Organizational activities

As mentioned above, besides the three key services the CTCN is required to fulfil organizational activities. They are aggregated in four additional targets for the CTCN and they are listed in the following:

4. "Establish and sustain an effective, efficient and responsive CTC.
5. Establish transparent procedures for assessing proposals, monitoring implementation, and measuring results.
6. Build and manage a Network that covers a broad scope of areas.
7. Develop and utilize a comprehensive Knowledge Management System that will substantially contribute to the efficiency and cost-effectiveness of the CTC." (CTCN, 2013, p. 8)

In addition, the given mandate intends further characteristics of the CTCN that can be added to the above presented organizational activities. Due to the enormous tasks at hand and the variety of differing stakeholders involved, the CTCN aims to create a landscape of **trust and confidence** among all stakeholders, to act as an institution that is **capable** in its service provision as well as to ensure **flexibility** and **transparency** in its activities. Further, a comprehensive **communication strategy** is implemented that is supposed to ensure consistency in their communication between all stakeholders and to ensure that the CTCN and its services are **visible** and **known** among the CTC Network members and NDEs. (CTCN, 2013)

These targets are only generically formulated, but a comprehensive roadmap for these targets is published in (CTCN, 2013), which detailed steps that are necessary to achieve the targets. However, the four organizational targets are evaluated on a broader level. To pursue an evaluation of each of the administrative and organizational steps in the roadmap is beyond the capacity and purpose of this thesis. Nevertheless, the broadly formulated targets 4 – 7 are essential elements of the CTCN's mode of operations and are therefore still implemented and evaluated in this report.

In conclusion, Figure 5 combines the above mentioned information on the mission, services and activities as well as the inputs and how it builds up to achieving the vision as formulated above. Given a clear political mandate, becoming active through a demand-driven request process, being based on the CTC Core Centre, the TRP, the CTC Network and the necessary funding as well as leveraging on the resources and potential of the KMS, the CTCN pursues the implementation of the organizational activities, provides the three important key services so that the latter's output leads to the achievement of the mission targets, which in turn helps to fulfil the envisioned future of a low-emission, climate resilient world and the strengthening of the role of developing countries in the issue of climate technology transfer and deployment.
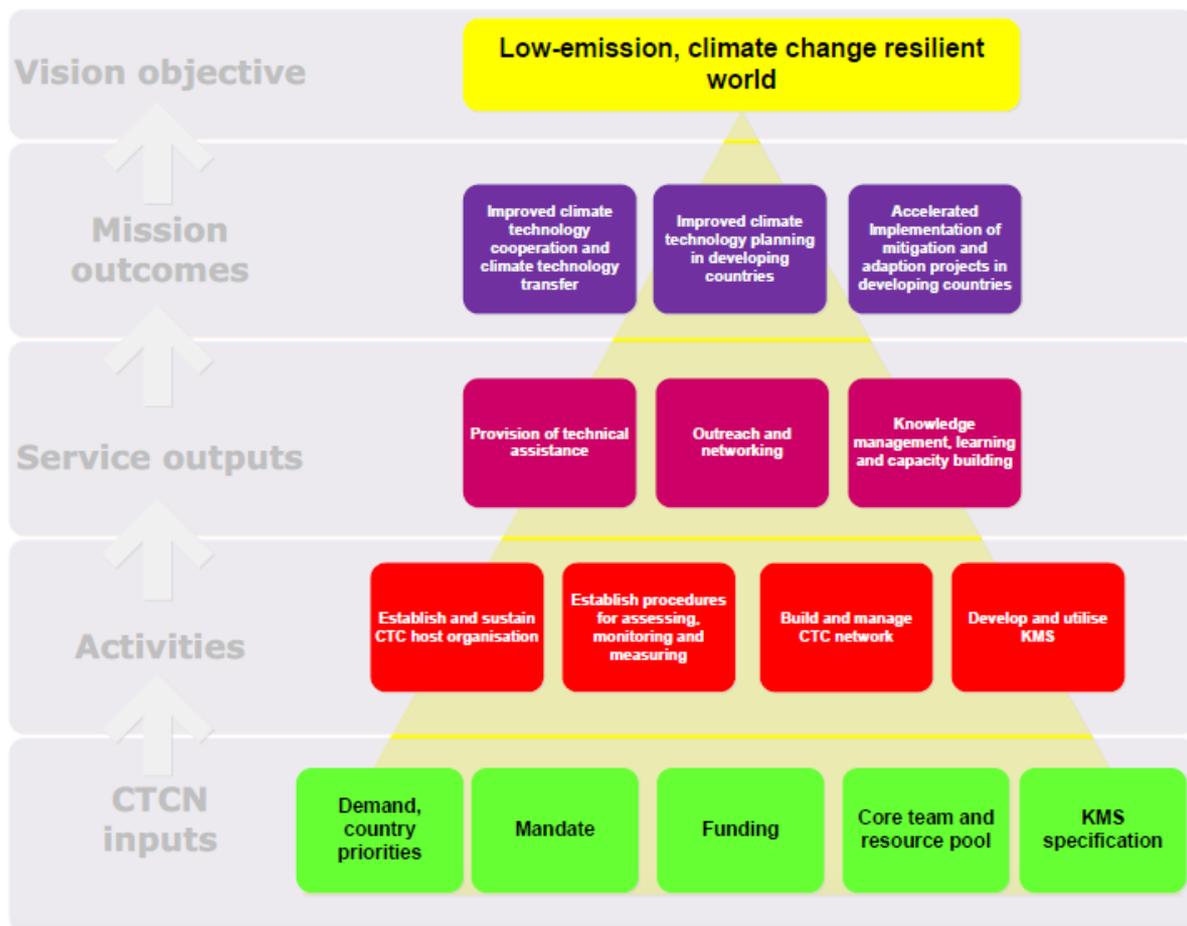
Figure 5: Visual summary of the CTCN (CTCN, 2013)

3.5. Budget and funding

The financial resources play a crucial role within the CTCN. The institution depends on continued funding in order to conduct its services. In this matter, the CTCN cannot compete with other institutions such as for example the German Gesellschaft für internationale Zusammenarbeit (GIZ), which can rely on their own financial resources (Uosukainen, 2016). At the same time, shortages in funding can be an obstacle in pursuing the services and targets. It can lead to prioritization process or even complete negligence of services and can provide a measurable indicator of support, confidence and trust in the institution. Therefore, the budget and funding aspect is added to the evaluation of the operational effectiveness.

The CTCN budget plan is set for the first five years and estimates needed monetary resources that accumulate to approx. 100 million USD. This includes the three key services and the costs for the establishment and operations of the CTCN. However, the final budget strongly depends on donor contributions and the demand of the CTCN's services. The costs for the operation of CTCN are fixed, while the volume of activities in the key services is supposed to determine the variable costs. But the large majority (around 75%) of the costs is designated for the TA service. Slightly more than 5% are supposed to be used for the other two services and around 13% for the CTC Core Centre operations. (CTCN, 2013)

Table 2: CTCN budget plan

Source of Funding	USD
European Commission	6,200,000
Denmark	5,700,000
Canada	2,500,000
U.S.A.	1,000,000
Switzerland	400,000
Japan	80,000
Direct donor contributions sub-total	15,880,000
UNEP	3,900,000
UNIDO	1,950,000
Direct and Co-financing sub-total	5,850,000
Total	21,730,000

Source: Edited based on CTCN (2013)

The CTCN budget plan is set for the first five years and estimates needed monetary resources that accumulate to approx. 100 million USD for this period. This includes the three key services and the costs for the establishment and operations of the CTCN including the four organizational targets. However, the final budget strongly depends on donor contributions and the demand of the CTCN's services. The costs for the operation of CTCN are fixed, while the volume of activities in the key services is supposed to determine the variable costs. But the large majority (around 75%) of the costs is designated for the TA service. Slightly more than 5% are supposed to be used for the other two services and around 13% for the CTC Core Centre operations. (CTCN, 2013)

According to the funding plan, the CTCN should have an annually increasing amount of financial resources. In year three after implementation (which would be 2016) a budget of around 22 million USD should be available and for the three years of operations it should be accumulated approx. 38,3 million USD. As of September 2013, the year of publishing the Work Programme and shortly before the functional start of CTCN's operations in January 2014 the budget amounted to 21,7 million USD as seen in **Fejl! Henvisningskilde ikke fundet.**. Thus, the soliciting and securing of funding to reach the envisaged amount of 100 million USD in the first five years play a central role in the CTC Core Centre activities. (CTCN, 2013; Uosukainen, 2016)

3.6. Critical success factors

This thesis evaluates CTCN's performance for each of the above mentioned targets and therefore CTCN's mode of operations since its establishment. The targets are measurable in a quantitative or qualitative way and are further described in Chapter 5. In addition to these, the CTCN itself presents the most critical success factors which determine the perception of the CTCN and its work as well as its durability. Even though these factors are partially already mentioned in the targets or organizational activities mentioned above, they still benefit this thesis by further shaping the list of measurable targets and putting explicit emphasis on some key elements for the evaluation of the CTCN's operational effectiveness.

The first factor is adequate **long-term funding**. As mentioned above, this is an essential element of establishing the CTCN in its purpose and fulfilling the mission. So far, bilateral donors dominate the funding plan as seen in **Fejl! Henvisningskilde ikke fundet.**. Therefore it is crucial to get multilateral and other sources involved. Second, there needs to be a **demand for the CTCN's services**. A lack of awareness of and information on CTCN's services as well as preferences for other, more familiar funding sources (e.g. World Bank) are a potential obstacle. Outreach and communication are critical in this issue. Third, the **NDEs need the ability to carry out their designated functions**. Understaffed, unaware or capacity-lacking NDEs can impede the CTCN's operation. Appropriateness of the NDE hosting public office as well as sufficient training and capacities are needed. Fourth, **communication within the CTCN and among its network members** is also crucial. Disagreements in roles and responsibilities and insufficient cooperation can impede the functionality of the CTCN and therefore its impacts on climate change. Again, strong emphasis needs to put on the communication and its channels besides sticking to agreed principles (e.g. code of conduct) if being part of the CTCN. Last, the efforts of the CTCN only have limited impact if **follow-up actions/projects** are not pursued. Investments in projects developed under the CTCN services are essential. Therefore, engagement of the relevant stakeholders such as financial institute or the private sector and the identification of valuable possibilities for these are important for the CTCN's future. (CTCN, 2013)

4. Methodology

The research purpose of this thesis is characterized in a threefold approach. In accordance with the aim and objectives presented in the introduction, the methodology can be divided into (1) an reflection of the CTCN's current status against its political mandate, (2) an analysis of stakeholders' perception of the CTCN's operations and effectiveness and (3) a formulation of policy recommendations based on the former two objectives.

CTCN target analysis

For the first objective, quantitative and qualitative targets that indicate the operational performance are extracted from the services and activities as presented in Chapter 3 and they are summarized in Table 3 and Table 4. In a target analysis the current status of the CTCN is compared to these targets in order to identify whether the CTCN is meeting its initially set aims. The quantitative targets are extracted from the three key services and the budget/funding plan. The roadmap at CTCN (2013) provides self-imposed numbers in terms of outputs/achievements for each of the first five years of operation. These numbers are the indicators in the analysis of the quantitative targets and determine if the CTCN meets these targets. The specific indicators are presented in Chapter 5.1. For the comparison with these indicators the current status of the CTCN in each of the targets is measured. The sources for determining the current status are presented in Table 3. While the majority of the quantitative indicators can be measured based on publicly available information on the CTCN's website, the remaining information have been obtained in several face-to-face talks with the CTCN staff over a period of three months in which the author had a guest access to the CTCN. Further, the Progress Development Report[9] of the CTCN provides additional information on the institutions performance, although limited since it only covers the time frame between January 2014 and September 2015. The results of the target analysis in terms of the quantitative indicators are presented in a descriptive analysis in Chapter 5.2.

The qualitative targets are gathered based on the organizational goals and critical success factors. Unlike the quantitative targets there are no clearly formulated indicators that can help to evaluate the CTCN in these matters. Further, the qualitative targets cannot be answered adequately by the above used CTCN sources or obtained information and require different research approaches. Therefore, the evaluation of these targets is mostly based on the results of the CTCN stakeholders' perception analysis as envisaged in the second objective in this thesis. Relevant questions in regards of the qualitative targets are embedded within the surveys directed at the NDEs and the CTC Network members. The surveys and their content are

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[9] See CTCN (2015).

Table 3: CTCN quantitative targets and sources for the analysis

Quantitative targets	Sources for current status
Service 1: **Technical Assistance**	
Quick responses	Website CTCN; Face-to-face talks
Response projects	Website CTCN; Face-to-face talks
Service 2: **Outreach, networking and private sector engagement**	
International technology events/forums	Face-to-face talks
Public-private-sector workshops	Face-to-face talks
Regional NDE network forums	Website CTCN, Face-to-face talks
CTC Network members	Website CTCN
Service 3: **Knowledge Management, learning and capacity building**	
Responses through helpdesk	Face-to-face talks
Capacity-building/training workshops	Website CTCN
Trained NDEs	Face-to-face talks
Tools & information resources on the website	Website CTCN
Unique KMS users	CTCN Progress Report 2015
CTCN Budget	
Key service 1	CTCN Progress Report 2015
Key Service 2	CTCN Progress Report 2015
Key Service 3	CTCN Progress Report 2015
CTCN establishment & operational costs	CTCN Progress Report 2015
Total budget	CTCN Progress Report 2015

Source: Targets based on Chapter 3 and CTCN (2013)

Table 4: CTCN qualitative targets and sources for the analysis

Qualitative targets	Main sources* of current status
Efficient and capable CTC CC	Stakeholder surveys; Director interview
Visibility/knowledge of the CTCN/services	Stakeholder surveys
Broad and balanced CTC Network	Sector and regional coverage analysis; Stakeholder surveys; Director interview
Sufficient communication	Stakeholder surveys
Sufficient demand for CTCN's services	Stakeholder surveys
Trust/confidence in the CTCN	Stakeholder surveys

* In some cases quantitative targets are used to support the analysis of the qualitative targets (see Chapter 5.1). For them the sources are as described in Table 3

Source: Targets based on Chapter 3 and CTCN (2013)

thoroughly presented in the next section of this chapter. In addition, a sector and regional coverage analysis of the CTC Network as well as a semi-structured, qualitative interview with the CTCN Director provide further information on some of the targets. The former is conducted based on CTC Network data obtained by the author directly from the CTCN staff at the Core Centre. Due to the importance of a balanced network for the CTCN with a broad range of experts from across the globe and technology sectors, this analysis investigates how the CTC Network is structured. This includes the numeric and percental coverage of the technology sectors as described in Chapter 3 as well as the regional distribution in the world (according to the regional categorizations in CTCN (2016b)). Further, the regional coverage is approached from the perspective of registration (physical location in the regions) and reach (possible activity in the regions). This ensures a detailed and comprehensive coverage analysis, which is based on data obtained from the CTC Core Centre. The raw data are extracted and in many cases further used for calculations to describe the coverage. These calculations contain percental and numeric distribution for regions and sectors as well as density for and balance between regional coverage by reach and registration. The results are summarized in a descriptive analysis with the visual support of graphs and figures in Chapter 5.3. The interview with the Director is used to incorporate a self-assessment of the highest-ranked staff member within the CTC Core Centre in addition to the stakeholders' perception (further information on the Director interview and its purpose is provided later in this chapter). The sources for each of the qualitative targets are presented in Table 4. Besides these sources, a few of the qualitative targets incorporate some of the quantitative targets and can partially be analyzed with the clear indicators mentioned above (Chapter 5.1 elaborates further on this issue). The results of the qualitative target analysis are first presented in the qualitative evaluation in Chapter 6 and an explanation on the reasons is given later in this chapter.

CTCN stakeholder surveys

In order to pursue the second approach of the thesis, two surveys directed at crucial stakeholders of the CTCN are conducted. The addressees are the recipients of the CTCN services, the NDEs, and the suppliers of the necessary knowledge and expertise, the CTC Network members. The results of this approach are intended to serve two purposes. First, it is aimed to paint a picture of the stakeholders' perception of the CTCN and its services. Second, the surveys are also used to evaluate the qualitative targets set for the CTCN as described above.

The two stakeholders chosen for these surveys are essential members of the construct CTCN and without them the intended purpose of the institution would be meaningless. As described in Chapter 3.2, the NDEs, as the national representation of their respective countries within the CTCN, need to actively request assistance from the CTCN. They need to fully understand its services and procedures as well as the value that an institution like the CTCN can offer them. At the same time, they are the central recipients of the outcomes from CTCN's activities. Therefore, no other stakeholder can provide a better feedback in terms of direct outcomes of CTCN's mission. The second stakeholders chosen for the surveys are the CTC Network members. The CTCN has ambitious goals and aims to fulfill them based on a broad and expertise-rich network. But since the network is ideally very diverse in terms of institutional types and accompanying interests as well as motivations in the membership, it is crucial to understand their overall perception of and expectations at the CTCN. Without being beneficial and attractive for the members, the institution would not be able to operate. Overall, the CTCN can be seen as a facilitator between suppliers of climate technology-relevant services and the receiving developing countries. Thus, the two stakeholders are chosen for the surveys.

As a type of survey this thesis conducts a web-based questionnaire. The reasons for choosing this type are based on several aspects found in literature on survey design. Another common type used for surveys is the interview. While this type has clear advantages, it is still neglected for this analysis. This is due to the time-consuming nature of interviews. The CTCN surveys are addressing -for each of the two stakeholder groups- over 150 actors from across the globe with different time zones, work schedules, motivations, etc. Face-to-face-interviews are not possible due to the geographical distribution, while telephone interviews are time-intensive and require extensive planning due to the time zone differences and differing schedules and motivations of the contact persons (Research Methods Knowledge Base, 2016b; Neuman, 2012). Thus, the web-based questionnaire is chosen. Several strengths influenced this decision as pointed out by the Research Methods Knowledge Base (2016a, 2016b): Due to the relatively high amount of respondents across the world and the strongly varying types of institutions, the web-based questionnaire enhances the range of the survey. Further, the questionnaires can be send out via email and minimize the resource expenditure needed to reach out to all respondents. Furthermore, this approach allows the respondents to fill out the survey at their own

convenience according to their schedules and motivation. In addition, due to the limit resources of this thesis it is relatively inexpensive except the costs for the online program that is used to design the survey. Besides the advantages found in the literature, the visual display of the questions and the user-friendly interface make the survey also easy to handle for the respondents. Another aspect in favor for the web-based questionnaire is the fact that the survey can be responded to anonymously. This is a clear purpose of this thesis and aims at enhancing the critical and valuable feedback in terms of the CTCN perception. Despite the advantages, the author is aware of the limitations that occur with this research method. Lost/undelivered emails with the link for the survey, slow response rates due to varying circumstances and the absence of possibilities to do follow-up clarification interviews as well as the absence of flexibility and direct human contact to react towards responses, while they are given, are possible disadvantages (Manzo & Burke, 2012; Neuman, 2012). However, it is believed that the web-based questionnaire is the most suitable choice for analyzing the CTCN stakeholders' perception.

The aim of the surveys is to identify the CTCN stakeholders' perception in terms of the institutions and its services from a governance perspective. According to Gideon (2012), survey aims can differ in the meaning for different people. Therefore, a conceptual definition is needed that clarifies what is meant by the research aim. Generically spoken, the stakeholders' perception represents in this thesis the awareness (for the NDEs), the motivation (for the CTC Network) and the satisfaction and expectations (for both addresses) in regards to the CTCN and its services. Following Gideon (2012) and his seven steps for creating a survey questionnaire, this conceptual definition is transformed into several survey items (questions) that aim to address these issues. The surveys design is described in the following.

For the survey design the online program SurveyMonkey is chosen. The program offers a wide range of question types, a skip-logic function and a user-friendly interface for the surveys. The questions and question types are chosen in accordance with the assembly of targets for the operational effectiveness and extended with additional questions of interest pertaining to the evaluation of the CTCN's performance. These additional questions were selected in close consultation with the CTC Core Centre staff. In this way it was made sure that the gained information and results are actually new and beneficial for this research and policy relevant. All survey items, questions types and formulations are examined using the seven steps manual for designing a survey questionnaire as described by Gideon (2012). This includes that the main topics are relevant towards the main research topic and the other survey items, the logical flow of the survey and the avoidance unnecessary repetitiveness as well as leading questions. Further, questions are supposed to use a simple and direct language in short and clear structure. In addition, the author aims to use the most suitable question types for each of the items and implements all responses relevant to his best knowledge.

The surveys are attached in Annex 1 and 2. Both start with an introduction page that briefly describes the intentions of the survey and the relation to the CTCN. In a disclaimer, it is clearly stated that this research is conducted in cooperation with the CTCN, but is not conducted by the CTCN itself. However, it is mentioned that the CTCN has an interest in the results and may use them for their own purposes. The first survey item asks for general information on the respondent, which is the location within the regions (the regions defined after CTCN (2016b)). The CTC Network member further are supposed to answer what types of organization they are (the list of institutional types is set by CTCN (2016b)). After the general information, the surveys differ in their structure and are therefore described separately.

The NDE survey focuses on a few central topics that are presented in the following. At first the respondents are asked about their awareness of the CTCN services. For each of the three key services the central elements (service outputs) are supposed to be rated in terms of their awareness. This aims to identify how well the CTCN is communicating its services and how familiar the NDEs are with what the CTCN offers. The next section aims at identifying the level of satisfaction of CTCN events as the main output from the second key service. Since networking is a central element of the CTCN, this topic supports the operational effectiveness analysis and helps to understand how the CTCN is perceived in this matter. Further, future expectations towards the type and participants of CTCN events are asked for and contribute to the formulation of policy recommendations. This is followed by the topic dealing with the level of satisfaction in terms of the TA service, which includes the overall goal of technology transfer projects. Therefore, it is a crucial element of the operational effectiveness analysis how the TA is perceived by the actual recipients of the service. Afterwards, the NDEs are questioned about their own capacities, which are strongly influenced by the training activities and information provision of the CTCN. In addition, future expectations towards the CTCN in this matter are thematized. These aspects are relevant since they give a direct feedback if the NDEs have been prepared adequately by the CTCN to fulfill their duties as an NDE and what the CTCN can further do to support them. Thus, this topic influences the operational effectiveness analysis and the policy recommendations. Towards the end of the survey, it is aimed to identify if the CTCN meets the expectations of the NDEs and to gather more information on what the NDEs expect from the CTCN in terms of operational improvement. This is supposed to give a statement on what is in the current situation and to influence the third objective of the thesis, the formulation of policy recommendations. The survey for the NDEs is concluded by asking the respondents about their level of agreement for three theses that are developed in accordance with the three key services of the CTCN. The results are intended to shape a picture of the overall performance of the CTCN and if the NDEs have the confidence and trust that the CTCN can be beneficial in terms of its targets. Therefore, it benefits the operational effectiveness analysis and can be a relevant indicator for the policy recommendation.

The CTC Network survey's first main topic is supposed to reveal what motivations and expectations were the driver for joining the CTC Network. Therefore, they are asked to rate the level of importance of five potential benefits. These benefits are selected in cooperation with the CTCN and include commercial opportunities, networking, visibility, experience sharing and outreach. Next, the satisfaction with their involvement in TA projects (in terms of selected, generalized elements of the process) is asked for. As for the NDEs, this is crucial since the network members are a central part of the CTCN's overall goal to foster technology transfer. The provided feedback is therefore useful for the aim of this thesis. Further, like the NDEs the CTC Network members are supposed to rate their level of satisfaction with the CTCN events and express their expectations in the future events in terms of event type and desired participants. This impacts the formulation of policy recommendations. The next two topics conclude the survey. First, the network members are asked about their level of satisfaction with the potential benefits. A comparison of the responses from the latter with the responses from the initially asked level of importance is envisaged in order to understand how satisfying the membership within the CTC Network is for these essential stakeholders in terms of the potential benefits. Further, these results are supposed to give valuable input to the formulation of policy recommendation objective. Second, the CTC Network members are asked about their future expectations by expressing suggestions for the improvement of the CTCN. Again, this is supposed to benefit the third objective in this thesis.

Both of the surveys contain several types of question. It is tried, in accordance with Gideon (2012), to formulate all questions simple and clear. The selection of answer choices are also tried to be formulated precisely and generalized. This is undertaken to reduce complexity of the questions and confusion for the respondents. The majority of the main topics and their central questions are covered by a rating scale question (e.g. Annex 1 Question 2) that typically includes a scale of five answer choices[10] (and in some cases an N/A-answer choice if the possibility exists that a respondent has no experiences in the answer choice). This question types allows the usage of a weighting method to combine the results of all respondents and to achieve an average ranking on the scale. The latter helps to express summarized results for the main topics that include all respondents' answers. In order to identify the eligibility of the respondents to answer the main topic questions, screening questions (e.g. Annex 1 Question 5 or 15) are used in several stages of the surveys. These questions in combination with the skip logic function allow steering the respondents only to the questions they are eligible to answer. Further, several times open-ended questions (e.g. Annex1 Question 9) follow the main topic questions in order to provide the opportunity to elaborate on the respondents' experiences in this issue. This is necessary due to the simplified and generalized question formulation and answer choices and to gain more open

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[10] The individual answer choices for this question type are presented in the analysis in Chapter 5.4.

answers. In addition, multiple choice questions were used in suitable occasions since some questions can be answered with more than one answer. It was further mentioned in the question formulation, if a multiple choice question is present in order to make the respondent aware. Similarly, information on specific formulations is given as well for clarifying reasons (e.g. Annex 1 Question 17). Furthermore, for the case that the given answer choices are not sufficient and a broad range of answers could be expected, the respondents have in several occasions the choice to choose 'other' as an answer and elaborate further in a comment field. In addition, it also has to be mentioned that not all the questions belonging to one of the main topics are addressed here. In some topics, further question are asked in order to clarify on certain issues that can be valuable for the analysis of this report.

The two surveys have not been piloted by a representative of the two stakeholder groups mostly due to the long-lasting negotiations with the CTCN about the type of cooperation in general and the content of the surveys, which overall resulted in temporal pressure towards the thesis deadline. However, after the surveys were designed, they were examined by several staff members of the CTCN, including the Director of the CTCN, the Network Director as well as communication and public relations specialists. The comments provided valuable information on how to improve the survey.

The stakeholders were approached through email by the author based on the information provided by the CTC Core Centre (full list of CTC Network members and contact persons) as well as found publically at the CTCN[11] and UNFCCC[12] homepage (the list of all determined NDEs and contact persons). It was chosen though, that for the NDEs only the ones in developing countries are contacted due to the mandate of the CTCN and the subordinate role NDEs from developed countries play at this stage of the CTCN's operation. Therefore, the survey for the NDEs was sent out only to Non-Annex I countries[13] with established NDEs. The survey for the CTC Network members in turn was sent out to all members[14]. On the 27th of April 2016 the surveys went online and the respondents received an email with the invitation and link to fill out the survey. Similar to the introduction page at the beginning of the survey, the email contained a cover text briefly explaining the purpose of the surveys. It has to be mentioned that several emails could not be delivered due to varying circumstances (respondent out of office for a longer period, failed delivery, etc.). The final count of delivered emails was 125 to NDEs from Non-Annex I countries and 152 emails to CTC Network members. At first, the surveys were available for a two-week period. After 10 days of differing amounts of responses a reminder email was sent out.

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[11] See CTCN (2016c).
[12] See UNFCCC (2016h).
[13] List of Non-Annex I countries at UNFCCC (2016c).
[14] Current member count of 152 CTC Network members in April 2016.

Manzo and Burke (2012) describe also additional measures to increase the amount of responses to online surveys. But due to the lack of legitimacy compared to surveys conducted officially by UN bodies and the absence of a possibility for material-incentives by the author of this thesis, the reminder measure was chosen. In addition, the CTCN considered implementing the invitation and link to the surveys in their newsletter addressed to the NDEs and CTC Network members in order to increase the response rate. But policy and legal uncertainties on how to conduct such a measure were evident since the CTCN and any other UN bodies are not the conductor of the survey. However, the response rates increased strongly after the reminder email was released. It was therefore neglected to further discuss support by the CTCN in this matter. The surveys were then available for another three-week period in order to obtain more results. After the closing of the surveys, a situation was evident in which complete and incomplete responses were present since some stakeholders did not complete the surveys. For the analysis of this report the survey responses were therefore 'cleaned up' and the incomplete responses were deleted. The final response rate of complete responses is 25% (31 responses) from the NDEs and 28% (43 responses) from the CTC Network members.

The results of the surveys are analyzed as follows: In first approach the data are screened for anomalies, problematic or contradicting results and similar issues. With the exception of two minor cases, the survey results were deemed as useable. They are presented in a descriptive analysis including the most important results in Chapter 5.4. They contain summaries of both of the surveys and visual support in form of graphs. In the case of the ranking questions, a weighting measure is used to adequately present the findings. This is undertaken for each of the given elements and in some cases also for an averaged total for the main topic (e.g. overall satisfaction of a CTCN key service). For the multiple choice question it was decided to concentrate on the most important trends and results in order to keep the analysis concise. In many other cases the results are presented in percental and numerical ways. The qualitative results from the open-ended question throughout the surveys are addressed as additional information after the presentation of the other questions' results. This is undertaken by direct or indirect quotes from the survey results. Further, the open-ended responses are categorized according to their content if suitable. This results into a clearer and concise presentation and allows better understanding of the trends and value of the responses.

The results of both surveys are further presented to the CTCN including the Director, the CTC Core Centre staff and representatives from UNEP in Paris, France and UNIDO in Vienna, Austria, in order to understand the value and relevance of the survey results for the institution and its activities. In addition, the results' validity is supposed to be tested by comparing the findings with the CTCN staffs' knowledge and perception about the surveyed stakeholders. The

comments from the staff members and the central issues from the discussions after the presentation are further implemented in the evaluation of the survey results in Chapter 6.

Evaluation and policy recommendation

In a next step of the methodology, the results of the above described analyses are evaluated and discussed in Chapter 6. The results of the target, sector and regional coverage and survey analysis are jointly evaluated and put in relation to shape a comprehensive picture of the operational effectiveness of the CTCN. While the quantitative targets are already compared to the current status of the CTCN in Chapter 5.2, the qualitative targets are compared to the current status in Chapter 6. The reasons are as follows: The qualitative targets lack clearly formulated and measurable indicators and need to be evaluated on a qualitative basis. This is based on the sources as presented in this Chapter. However, the survey and sector/regional coverage results, which are the central part to investigate the current status for the qualitative targets, are to a high extent also of a quantitative nature and additionally some quantitative targets are also needed to comprehensively evaluate the qualitative targets (further elaborated on in Chapter 5.1). Therefore, the evaluation chapter aims to combine the findings from all the necessary sources (qualitative and quantitative results from the surveys, the sector and regional coverage and, if needed, the results of the quantitative target analysis) and to create a qualitative picture on regards of the qualitative targets.

This part of the methodology is further supported by a semi-structured, qualitative interview with the CTCN Director Jukka Uosukainen. The aim of this interview is to get answers to some questions that cannot be obtained by another of the above presented sources or approaches. The topics of this interview are the role of the CTCN within the global climate governance arena, the establishment of the institution, the funding situation, CTCN internal processes as well as future expectations and envisioned development (see question catalogue in Annex 3). These findings are implemented in the evaluation of the CTCN and its operational effectiveness whenever suitable. In order to obtain official and resilient information in these issues, the interview was taken with the highest ranked staff member, the Director of the CTCN. In addition and as mentioned above, the outcomes and comments of the result presentation to the CTCN staff are included in the evaluation.

Overall, the evaluation sets the base for the third objective of this report, the formulation of policy recommendations, which aims to foster the operational effectiveness of the CTCN. This includes the identification of matters of improvement in the evaluation, their translation into recommendations of needed actions and, if present, suggestions on how to achieve these improvements.

5. Findings

This chapter highlights the findings gathered in the research as described in Chapter 4. But first, the chosen qualitative and quantitative indicators for each target group are presented. These indicators are the basis for the aim of this report, the evaluation of the operational effectiveness of the CTCN. It is followed by the CTCN target analysis in which the current status is compared with the indicators of the quantitative targets. Next, the results of the sector and regional coverage analysis of the CTC Network are highlighted. Subsequently, the results of the two surveys directed to the stakeholders of the CTCN are summarized and presented. As mentioned in Chapter 4 and in contrast to the quantitative targets, the qualitative targets are evaluated in Chapter 6 based on the entirety of the results presented in this chapter. All findings in this chapter are presented in a descriptive analysis with the support of tables and graphs.

5.1. Indicators for the operational performance analysis

For the operational performance analysis of the CTCN a set of qualitative and quantitative targets are collected based on Chapter 3 and the initial *Programme of Work* of the CTCN (cf. CTCN, 2013). The latter has been approved by the Advisory Board in September 2013 only shortly before the CTCN's start of operation in January 2014. The quantitative targets are presented first, followed by the qualitative ones. In addition, overlaps between both types of targets are highlighted as well since some of them require quantitative and qualitative indicators.

The quantitative targets in form of a roadmap for the CTCN are shown in Table 5. For the three key services as well as for the budget plan the mandate of the CTCN envisaged clear, quantifiable indicators for each of the first five years of operation. The third year is highlighted in Table 5 since it equals the year 2016. The indicators represent the specific outputs for the particular years and the last column shows the aggregated total for the first term of operation. In nearly all of the targets the outputs are supposed to annually increase in accordance with CTCN's growing effectiveness, infrastructure and ability of operation.

For the Technical Assistance (TA) service, the CTCN should aim to be active in 70-100 'quick responses' in 2016 resp. an aggregated total of 126-190 for the first-three years. The relatively larger 'response projects' should be set at 50-70 for 2016 with a first-three year total of 70-95. The services in outreach, networking and private sector engagement target specific amounts of events hosted and a minimum amount of CTC Network members. While in the first year of operation no international technology events/forums as well as public-private-sector workshops are envisaged, four to six of the former and six to nine for the latter are supposed to be annually hosted in the following four years with a total of 8-12 resp. 12-18 by the end of 2016. In contrast to the first two types of events, the regional network meetings were supposed

to start from the very beginning of CTCN's operation with six to nine events annually and an aggregated total of 18-27 in 2016. The CTC Network is supposed to be leveraging from a consequently growing amount of members. After a relatively small start of at least ten members in the first year of operation, the network aims for at least 50 in year two and already 140 in 2016. By the end of the first five year term the CTC Network is supposed to have 1.000 members. For the third key service group, 50-70 responses through the helpdesk should be carried out in 2016 and an aggregated total of 90-120 after the first three years. The amount of capacity-building and training workshops should increase annually to 8-11 in this year and a three-year total of 16-22. At least 130 NDEs are supposed to be trained for the duties and current obligations resulting of being the focal point to the CTCN through training sessions in 2016. It has to be mentioned here that NDEs might need to be trained more than once in regards of upcoming and relevant issues that revealed themselves from the lessons-learned in CTCN's operation or to maintain the capacities as an NDE. Thus, in 2015, 2016 and 2017 a relatively high amount of NDEs are supposed to have received training in order to set the basis for an effective operation. The amount of trained NDEs is supposed to decrease starting in 2018, which can be based on an envisaged basis of trained NDEs at that time. Further, by the end of 2016 a minimum of 2.000 new material and information resources should be made available online at CTCN's knowledge portal. In an aggregated total for the first-three years that means 3.500 resources online. As a last of this key service group, the Knowledge Management System (KMS) should have at least 5.000 unique users in 2016 and an aggregated total of 8.000 since 2014. (CTCN, 2013)

As another quantitative target acts the budget plan of the CTCN, which is also a critical success factor. By the end of 2016, the institution is supposed to have received financial resources of 38.3 million USD with around 22 million made available in this year. All budget amounts are supposed to stay steady or increase annually with the exception of the third key service group, which is based on an aimed decrease in cost for a fully functional KMS. This is probably the case since it requires most of the work in its establishment and significantly less in following maintenance. As mentioned in Chapter 3, the majority of the budget is reserved for the TA services. By the end of the first five years, the CTCN is supposed be funded with an aggregated amount of 100 million USD. (CTCN, 2013)

The qualitative targets are gathered based on the organizational activities, the additional characteristics of the CTCN and the critical success factors (see Chapter 3.3 and 3.5). Table 6 lists the qualitative targets for the evaluation of CTCN's operational performance. There are no clear, expected indicators as for the quantitative. Therefore, in the second column of Table 6

Table 5: Quantitative targets and indicators

Quantitative targets	Indicators*					
	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Service 1: Technical Assistance						
Quick responses	6-10	50-80	**70-100**	80-130	90-140	300-480
Response projects	0	20-25	**50-70**	80-100	90-110	250-300
Service 2: Outreach, networking and private sector engagement						
International technology events/forums	0	4-6	**4-6**	4-6	4-6	15-20
Public-private-sector workshops	0	6-9	**6-9**	6-9	6-9	25-35
Regional NDE network forums	6-9	6-9	**6-9**	6-9	6-9	30-45
CTC Network members	10	50	**140**	300	500	1.000
Service 3: Knowledge Management, learning and capacity building						
Responses through helpdesk	0	40-50	**50-70**	60-80	60-80	210-280
Capacity-building/training workshops	3-4	5-7	**8-11**	8-11	7-9	30-40
Trained NDEs	30	100	**130**	130	100	-
Tools & information resources on the website	500	1.000	**2.000**	2.500	3.000	9.000
Unique KMS users	500	2.500	**5.000**	7.000	10.000	25.000
CTCN Budget**						
Key service 1	0.4	7.1	**17**	24	27	75
Key Service 2	0.6	1.6	**1.6**	1.6	1.6	7
Key Service 3	1.3	1.5	**1.6**	1.5	1.3	7.2
CTCN establishment & operational costs	2	1.8	**1.8**	2.1	2.5	10.25
Total budget	4.3	12	**22**	29.3	32.4	100

* outputs per year

**in million US-Dollars

Source: Targets and indicators based on Chapter 3 and CTCN (2013)

indicators developed by the author of this report that are believed to provide a sufficient evaluation of these targets are shown. Since some of the latter can be addressed in both qualitative and quantitative approaches, the third column refers to the above described quantitative indicators that are needed to sufficiently evaluate the qualitative target.

The CTC Core Centre is supposed to become efficient and capable in terms of their duties. In order to evaluate the operational performance of the CTCN in this target, the stakeholders' perception is gained through the stakeholder surveys as one of the indicators. The perception refers here to the overall tendency of the responses in regards of this target. Further, information in this issue is obtained through a semi-structured, qualitative interview with the Director of the CTCN. Both indicators aim to investigate of the target is met. As a second target, the CTCN and its services need to be visible and known among potential users (developing countries and their NDEs) as well as potential network members. The stakeholders' awareness of the institution and its services gained through the surveys is the indicator here as well as the amount of network members. Furthermore, the CTCN requires a broad and balanced network that aims to cover all relevant technology sectors as well as services, as presented in Chapter 3.3, and includes members from all regions in the world. Here, the indicators are the sector and regional coverage analysis as well as the amount of network members. In addition, the CTC Network members' satisfaction in terms of potential benefits has an impact on this target since unsatisfying members are unlikely to promote the network, probably tend to not engage in activities or might even resign from the membership. Further, the staff evaluation based on the Director interview is included. As emphasized in CTCN (2013), the CTCN requires sufficient communication in order to function effectively. This target is covered by the indicator of stakeholders' awareness on its services. In addition, the communication between the stakeholders and the CTCN during conducted services such as TA requests needs to be adequate. Here, the indicator is the stakeholders' perception in terms of satisfaction. The CTCN further needs sufficient demand from the developing countries for its services to justify the establishment, funding and operation of the institution. This target is covered quantitatively by the amount of TAs, events, workshops and trainings as well as users of the services. Since demand for the latter not only depends on the simple supply, but also on the awareness among potential users, the first indicator of this target is therefore the stakeholders' awareness and satisfaction of the services. As the last target, the CTCN aims to establish trust and confidence among its stakeholders that it can deliver the envisaged outcomes. This is again covered by the overall stakeholders' perception gained in the surveys plus the agreement towards the three theses of the CTCN's activities. In addition, the current budget situation can be seen as quantitative indicator. Donating monetary resources to the CTCN is here seen as an indicator for trust and confidence in the institutions purpose. (CTCN, 2013)

Table 6: Qualitative targets and indicators

Qualitative targets	Indicators	
	First	**Second** *(from quantitative targets)*
Efficient and capable CTC CC	Stakeholders' perception; staff evaluation	-
Visibility/knowledge of the CTCN/services	Stakeholders' awareness	Amount of network members
Broad and balanced CTC Network	Sector/ regional coverage; stakeholders' satisfaction; staff evaluation	Amount of network members
Sufficient communication	Stakeholders' awareness & satisfaction	-
Sufficient demand for CTCNs services	Stakeholders' awareness & satisfaction	Users/amount of all services
Trust/confidence in the CTCN	Stakeholders' perception & agreement	budget

Source: Targets based on Chapter 3 and CTCN (2013)

5.2. CTCN quantitative target analysis

This Chapter analyzes the current status of the CTCN in relation to the indicators given for the quantitative targets as seen in Table 5. As stated in Chapter 4, the data for the current status is based on the information available online at the CTCN website, several face-to-face-talks with CTC Core Centre staff members as well as the CTCN Progress Report 2015 (cf. CTCN, 2015). In some cases the latest data are available only in the Progress Report for the time frame from January 2014 until September 2015. If that applies, it is mentioned in the following descriptive analysis. Further, since the current status from June/July 2016 is taken into account for this analysis, the indicators are in some cases divided in half.

Key service 1: Technical Assistance

Between January 2014 and July 2016 the CTCN received 128 TA requests as seen in Figure 6. 54 of them are currently under review, while 74 are deemed eligible. Out of the latter, 46 are at this time in the project design phase, 25 are being implemented and three TA projects are completed (CTCN, 2016d). Unfortunately, the distribution of 'quick response' and 'request projects' cannot be answered precisely. While there is no information on the TA types for the request under
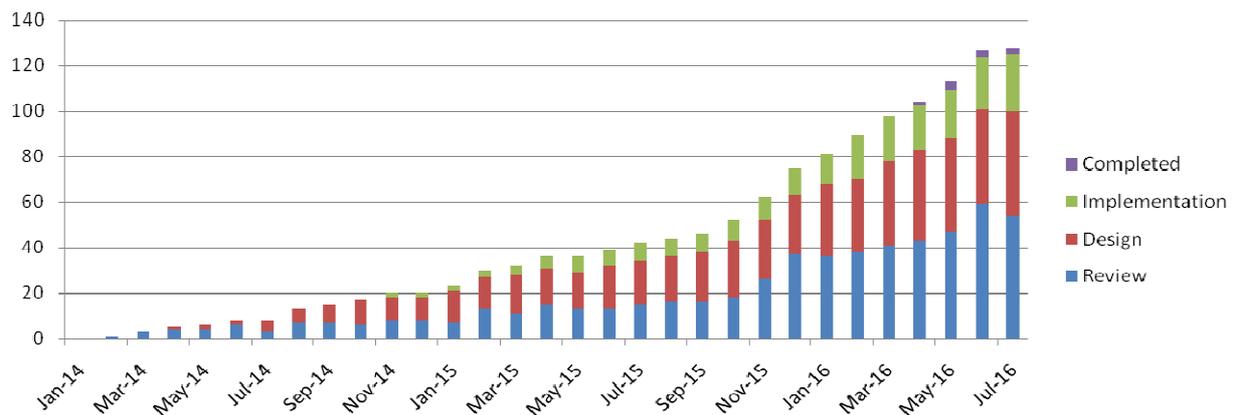
Figure 6: TA requests submitted and their status (CTCN, 2016b)**.**

review, the project descriptions of the 74 requests at the CTCN website provide the budget information for some of them. This indicates that nine of these TA requests are designed as 'quick responses' and 17 as 'response projects' (CTCN, 2016m). For the remaining 48 projects no information is available, but he CTC Core Centre staff estimate that the 74 requests are going to be half 'quick responses' and half 'response projects' (CTCN, 2016g). Thus, for the analysis both types of request are combined. With a total of 74 TA requests the CTCN has not reached its target of combined 136-200 TA requests (by mid-2016; 91-140 'quick responses' and 45-60 'response projects'). However, the amount of received TA request strongly accelerated between October 2015 and July 2016 (see Figure 6). In this time frame 76 requests have been submitted, while it was in the significantly longer period between January 2014 and October 2015 only 52. Thus, the numbers have been increasing drastically during the last 8 months. Further, Figure 6 shows how the requests move from stage to stage, while further requests are submitted. From the 128 received requests, 30,5% (39 out of 128) are focused on adaption measures, 39,8% (51) in mitigation and 29,7% (38) include elements of both. The strongest focus in terms of technology sectors are agriculture and forestry (37,5%) followed by cross-sectoral projects (20%) and early-warning/environmental assessment as well as water (each 12.5%) in terms of adaption. For mitigation, the majority is set on energy supply (39.2%) and energy use (27.5%).
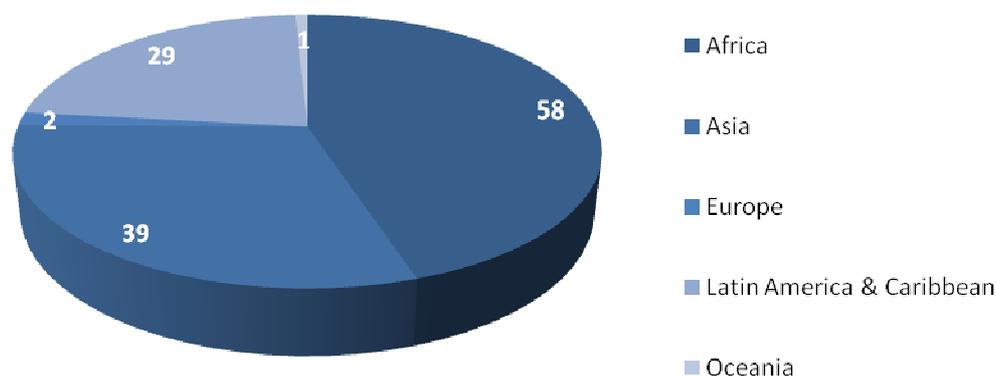
Figure 7: Geographical distribution of submitted TA requests (CTCN, 2016b)**.**

Further, Figure 7 shows the geographical distribution of the requests origin. The majority is coming from Africa (58 requests), followed by Asia (38), Latin America & Caribbean (29), Europe (2) and Oceania (1) (CTCN, 2016d). In terms of the national, geographical scope, the vast majority of TA requests addresses the national level (64,6%), while the least address the municipal level (6,2%) (CTCN, 2016d).

Key service 2: Outreach, networking and private sector engagement

The first two targets in this service group include technology-specific events/forums as well as public-private-sector workshops that focus on bringing these two stakeholders together. There is no available data that state the exact amount of events conduct in these topics. The author of this report reached out to the CTC Core staff in this matter and was referred to a strategic partner of the CTCN, the Norwegian company DNV GL, which facilitates the engagement of the private sector in the CTC Network. The DNV GL is currently working on a list of events with private sector engagement. However, by the completion of this thesis the list has not been available for the author. While to the best of the author's knowledge there has not been any technology-specific event, it can at least be said for the NDEs and the private sector that these stakeholders meet at other occasions within the CTCN's services. Here it is referred to the regional NDE forums as well as the CTCN webinars, which are conducted by the TRP or CTC Network members. Both examples offer possibilities for outreach and networking for the NDEs as well as CTC Network members and they facilitate private sector engagement. Further, as revealed by the CTC Network survey, some of the respondents have participated in private sector events/stakeholder engagement (see Chapter 5.4). Even though the exact nature of these events has not been asked in the survey and does therefore not give any further details, this shows that in terms of the public-private-sector target, some activities have been conducted by the CTCN. However, the limited information available do not allow an adequate analysis if these two targets are met.

In terms of regional NDE network forums the CTCN meets the target, even though just in 2015 and 2016 the targets are actually met. In the former, six forums have been conducted and eight in the latter (five have been conducted and three are scheduled for the rest of 2016). In 2014 the target is not fulfilled, but the CTCN's operations in this matter are aligned with the current annual targets. The conducted forums have further been located in and for a broad range of regions. With the exception of one (CTCN Regional Forum for NDEs from Developed Countries), all forums had and will have NDEs from developing countries included. (CTCN, 2016j)

The target of members in the CTC Network is also fulfilled. 140 members were envisaged by the end of 2016 and currently the CTC Network contains 159 members from across the globe and from varying professional backgrounds such as type of organization, sector coverage, etc (CTCN, 2016i). Further information is given in the network coverage analysis in Chapter 5.3.

Key service 3: Knowledge management, learning and capacity building

The target in terms of responses through the envisaged helpdesk is not achieved. According to CTC Core Centre staff, the helpdesk is not established yet. The development of other key aspects, such as the TA service and knowledge management efforts enjoys prioritization. It still under consideration whether and when the helpdesk is supposed to be realized. However, the CTCN gets occasionally confronted with brief questions from its stakeholders in varying issues. In these cases the CTC Core Centre staff tries to provide simple answers in order to direct the enquirer in the right direction. (CTCN, 2016g)

In terms of capacity building/training workshops the CTCN meets its target. Three to four workshops were envisioned in 2014, but the CTCN conducted seven. In 2015 and 2016 ten workshops took place, which is indeed slightly under the minimum of 13 (accumulated from 2015 and 2016). But since last year the capacity-building/training workshops were included in ten of the eleven regional NDE forums conducted in 2015 and 2016 and continue to be a part of this event type. Therefore, the scheduled three regional forums probably raise the amount of conducted workshops to 13. In total this means that 17 workshops are hosted in the first three years, which is meeting the accumulated target of 16-22. (CTCN, 2016g)

Further in terms of capacity-building/training, the CTCN probably meets its target for trained NDEs. While in 2015 and 2016 119 NDEs were trained, which is below the accumulated target of 230[15] for these years, the CTCN managed to train also 119 NDEs in 2013 and 2014, which strongly exceeds the target of 30 NDEs in 2014 and the non-existing targets for 2013. Even though the accumulated total of 260 trained NDEs is not achieved yet, the CTCN has trained an accumulated total of 238 NDEs and has three additional NDE regional forums scheduled for this year. Therefore, it is assumed that the CTCN fulfils this target. (CTCN, 2016g)

The tools and information resources available online at the CTCN knowledge portal currently amount to 9.739. This clearly exceeds the envisaged accumulated total of 3.500 resources within the first three years. In addition, in this matter it fulfils the total five year term target already two years in advance. Therefore, this target is achieved. (CTCN, 2016c)

The fulfilment of the unique KMS user target cannot conclusively be analyzed. Despite the unavailability of the technology library for potential users, the available data in the Progress Report 2015 state that the knowledge portal had over 105.000 users by September 2015. The majority of these users is based in developed countries with a share of 68.5%, while 31.5% come from developing countries (CTCN, 2015). However, by the completion of this thesis no further information could be obtained by the author, if these users are also unique users. If so, the numbers strongly exceed the aimed 8.000 users for the first three years. Further, the numbers are present despite an availability of the technology library, which was supposed to be fully

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[15] As stated in Chapter 5.1, the NDEs are trained multiple times and the numbers are therefore accumulated.

functional by mid-2016, but has not been launched before the completion of this thesis. To the best knowledge of the author of the latter, the technology library is envisaged to be operational within this year (CTCN, 2016g).

CTCN Budget

The most recent data for the CTCN budget are gathered in the progress report. As on September 2015, the CTCN has received financial resources of 30.166.235 USD (see Figure 8). The highest donations come from Norway, European Union and Denmark. Several other countries added further contributions, which reach a subtotal of 28,3million USD. Further, 1,8 million USD are contributed by the Global Environment Facility (GEF). In terms of the target, by the end of 2015 the CTCN is supposed to leverage 16,3 million USD. In this matter the target is fulfilled. However, the by the end of 2016 the CTCN is already aiming for a budget of 38,3 million USD, which is according to the data more than the actual financial basis of the institution, and for the following years the budget further increases. In terms of expenditure, 52% of the CTCN's budget (including projections until December 2015) in 2014 and 2015 is used for TA services, 17% for key service 3, 16% for CTCN operations and 15% for key service three.

8,499,850	Norway
6,784,261	European Union
5,361,461	Denmark
2,451,461	Canada
2,092,000	United States of America
1,856,708	Japan
586,207	Germany
400,000	Switzerland
216,640	Finland
117,647	Ireland
28,366,235	Subtotal
1,800,000	Global Environment Facility
30,166,235	Total
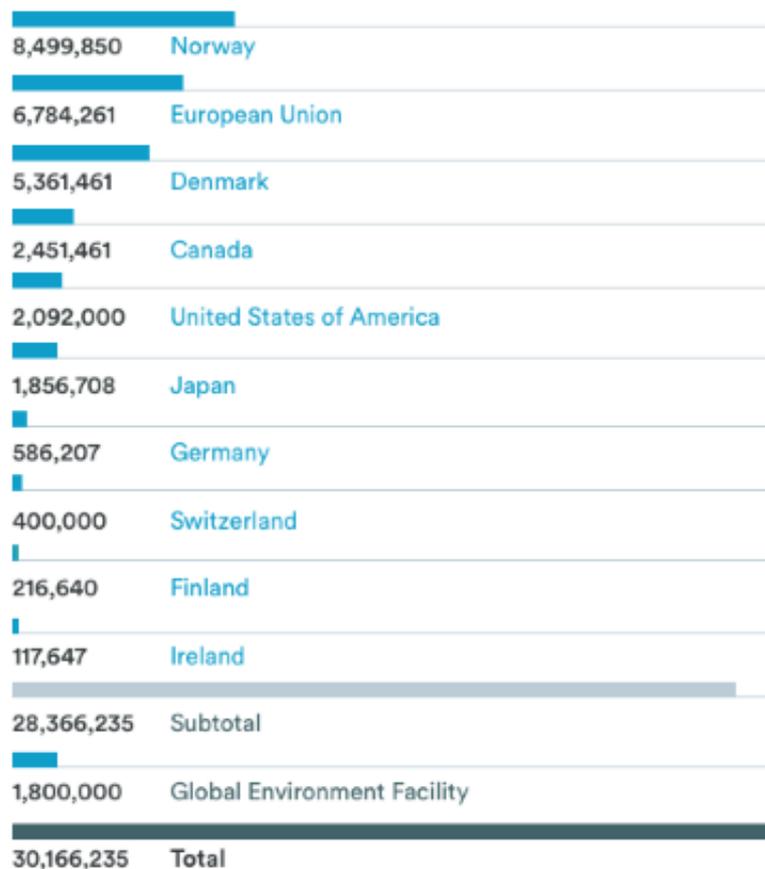
Figure 8: CTCN budget as on September 2015 (CTCN, 2015).

5.3. Sector and regional coverage analysis

The CTC Network is addressed not only in terms of the quantitative target of total network members, but also in the qualitative target of having a broad and balanced network. The latter requires a detailed look at the structure. Thus, this chapter analyzes the sector and regional coverage of the CTC Network as described in Chapter 4. The data for the following calculations are based on internal CTC Core Centre data (cf. CTCN, 2016b). For the purpose of completeness and to reduce complexity in the calculations, all regions are addressed and presented in this chapter regardless of their amount of associated developing countries.

Since the start of operations in January 2014 and until July 2016, a total of 191 applications were received by the CTCN (see Annex 4). The major progress in the amount of applications started one year after being operational. While around 20% of the applications were submitted in 2014, around 80% of the applications were submitted in 2015 and 2016. Currently, the CTC Network consists of 159 assessed and approved members plus one applicant being accepted for assessment (CTCN, 2016b). In the statistics of the CTCN the latter is already included and is therefore incorporated in the following analysis. Further, the CTC Network members do not have a single focus and location, but offer services from multiple sectors as well as for multiple world regions and their sub-regions. Therefore, the reader has to be aware that, if the amount of network members covering the regions and sectors is accumulated in some of the following descriptions, it can exceed the number 160 members.

Sector coverage

Out these 160 CTC Network institutions, the majority is based in the private sector (55 members), followed by research and academic institutions (36) and non-governmental institutions (27). By far the least represented are regional organizations and financial institutions (one each). Relatively under-represented are also not for profit organizations (14), public sector (12) and intergovernmental organizations (6). In terms of their sector coverage, 130 members out of the 160 state to have expertise in climate change mitigation measures, and 77 in climate change adaption activities. Further, 58 members describe themselves as being active in cross-cutting approaches[16] between the two fields of climate action. This shows that a high amount of members are active in two or even all three approaches. (CTCN, 2016b)

As seen in Table 1 in Chapter 3.3, the mitigation and adaption efforts contain several technology sectors. Figure 9 shows the members' distribution on the sectors for mitigation. Out of the 160 members, 130 institutions are involved with energy use, 88 in energy supply and 67 in industry related mitigation efforts. This followed by waste management (50) and agriculture (44). The

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[16] The obtained sector and regional data do not contain further information on the sector coverage within the cross-cutting approaches as well as types of services in this approach. It is therefore neglected in the following.

least represented are the sectors transport (36) and forestry (30). That results in a total of 445 services in the associated sectors in mitigation efforts. In terms of adaption measures, the number of members with expertise is lower as already shown above. Figure 10 points out that the majority adaption expertise is located in the agriculture and forestry sector (61) followed by water (56). While marine and fisheries (17) as well as human health (14) are the least represented, early-warning and environmental assessment (37), infrastructure, transport and urban design (35) as well as coastal zones (26) are placed between the former and most represented sectors. In total for adaption efforts, the CTC Network members offer 246 services in the associated sectors. (CTCN, 2016b)

The CTCN distinguishes in several types of services for each of the mitigation and adaption activities (see Table 1 in Chapter 3.3). The most represented types of services are policy and planning (130), capacity building (128), knowledge management (124) as well as technology development and transfer (111). By far lower is the amount of offered services in terms of collaboration in innovation (58) and investments (46). (CTCN, 2016b)
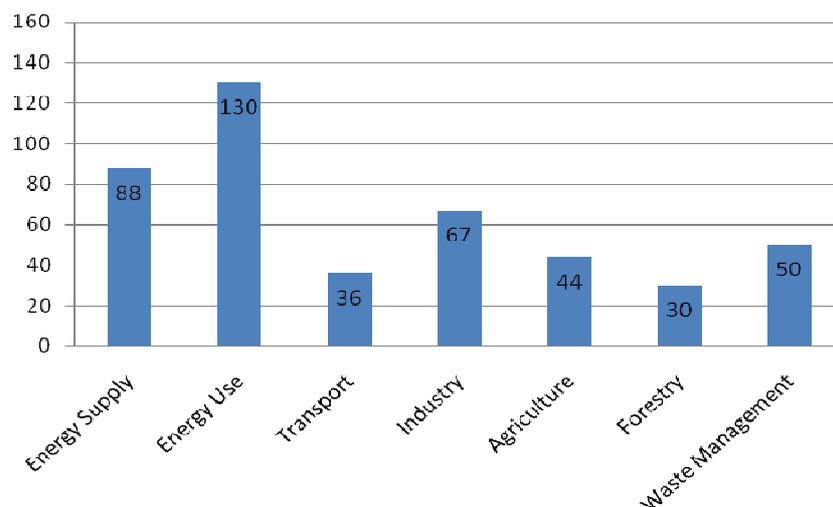
Figure 9: Coverage of mitigation technology sectors (CTCN, 2016b)**.**
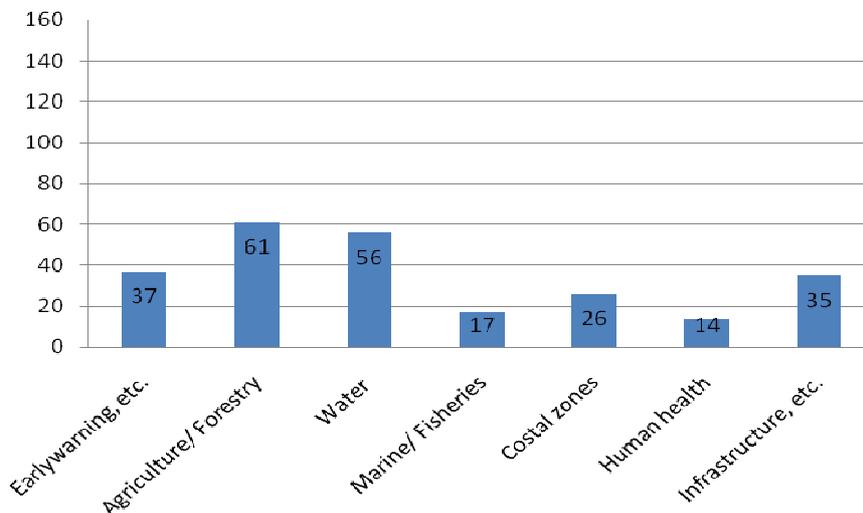
Figure 10: Coverage of adaption technology sectors (CTCN, 2016b)**.**

Regional coverage

Out of the 160 members, around 52% (84 members) are located in Annex I countries and 40% (65) in Non-Annex I countries. In addition, 7% (11) of the members are so-called 'international' members and are located in several countries (CTCN, 2016b). In terms of the regional coverage two approaches are implemented in the analysis. The member allocation is analyzed according to their regional distribution by (1) registration and by (2) reach. This is a profound difference since an institution can, for example, be registered and located in a European Annex I country, but active solely in African countries. Thus, both distributions are highlighted in the following.

In terms of regional distribution by registration, Annex 5 visualizes the location of the CTC Network members by region and respective sub-regions. The majority of the members (32%; 52 members) are located in Europe, followed by Asia (30%; 48) and North America (13%; 21). Latin America & the Caribbean (8%; 13) and Africa (7%; 11) have relatively lower and similar levels of representation, while Oceania (3%; 4) is ranked last in this matter. Further, 11 international institutions (7%) are present that do not restrict themselves to one country in terms of registration. In relation to the amount of associated countries, the thinnest regional coverage by registration is encountered in Latin America & the Caribbean (0.39 members per country[17]), Oceania (0.28) and Africa (0.2), while the most dense regional coverage by registration is calculated for North America (10.5), Europe (1.06) and Asia (1.02). (CTCN, 2016b)

As stated above, the regional distribution by reach is another relevant indicator. Annex 6 shows the coverage in this matter and paints a different picture than above. The coverage balance shifts from this perspective clearly towards the regions of Asia (82 potentially active members for the whole region or an associated sub-region), Africa (56) and Latin America & the Caribbean (46). This is followed by Europe (27), North America (19) and Oceania (10). Compared to the coverage by registration, a positive balance can be attributed to Africa (45 members from outside the region), Asia (34) Latin America & the Caribbean (33) and Oceania (6), which means that more members are potentially active in these regions than being located in them. For North America (-2) and Europe (-25) the balance is negative since fewer members are potentially active in these regions than being located there. It has to be stated though, that the last calculations are based on the generalized assumption that the members located in the regions (besides North America and Europe) are all active in their own regions. The shift in coverage is also seen within the density that from this perspective results in 1.74 members per country for Asia, 1.03 for Africa and 0.71 for Latin America & the Caribbean and for Oceania. Europe calculates 0.55 for Europe, while Oceania has 0.71 and North America 9.5. However, the last two

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[17] Formula: Amount of members/Amount of associated countries by official UN recognition=Member per country; regional classification based on United Nations (2016).

regions are not as significant due to the relatively low amount of countries (North America) or CTC Network members (Oceania). (CTCN, 2016b)

In addition to the CTC Network members incorporated in the calculations above, 51 members state to have an international reach with no geographical restrictions (CTCN, 2016b). Therefore, they can be added to each of the regions as potentially active CTC Network members.

Combination of sector and regional coverage

Combining the results of the sector and regional coverage, Table 7 shows the representation of each mitigation and adaption technology sectors in the regions. The numbers stand for the amount of potentially active CTC Network members for each sector and region in percent of the total amount of potentially active CTC Network members. This means that, for example, in terms of energy supply in Africa, 55,4% of the total of potentially active CTC Network members (56 for Africa) offer their services in this sector and in this region. Further, the colored circles on the left side of the numbers are supposed to enhance the visibility of the overall trends for each region and sectors. Green stands for 60% or higher coverage, yellow for 30-59% and red marks coverage of 29% or lower. In this thesis, the categorization is translated into high coverage (=green), medium coverage (=yellow) and low coverage (=red). In the above mentioned example, the energy supply sector in Africa is located in the top half of medium coverage.

As pointed out above, the coverage of the mitigation sectors is in total higher than for the adaption sectors. This is also the case for the regions. For each of them, between 60-70% of all offered services from the CTC Network members are within the mitigation sectors. Table 7 reveals that all regions are located in high coverage for the energy use sector. Latin America & Caribbean is the only region with absence of low coverage in the mitigation sectors. All other regions have at least two sectors with low coverage. However, in average North America is slightly better covered. Both regions are closely followed by Europe, Asia and then Africa, while Oceania is relatively lower covered. However, in average are all regions located in the botton half of the medium coverage category (that is 30-45%). In addition, Oceania, Europe and Africa have three resp. four sectors with low coverage. The lowest coverage is located in transport, agriculture and waste management in Oceania, closely followed by the transport sector in Africa and forestry in North America and Europe. (CTCN, 2016b)

In terms of adaption, all regions are similarly structured. Table 7 shows an absence of high coverage in any of the sectors for all regions. Further, all of the latter have a maximum of one or two sectors with medium coverage. The majority of the sectors for all regions are below

Table 7: CTC Network sector and regional coverage

	Africa	Asia	Europe	Latin America & Caribbean	North America	Oceania	International
Mitigation							
Energy supply	55.4	57.3	48.1	43.5	52.6	50.0	49.0
Energy use	78.6	79.3	85.2	76.1	73.7	90.0	88.2
Transport	14.3	20.7	25.9	30.4	26.3	10.0	31.4
Industry	32.1	43.9	48.1	32.6	42.1	60.0	52.9
Agriculture	35.7	32.9	25.9	39.1	47.4	10.0	17.6
Forestry	25.0	22.0	18.5	34.8	15.8	20.0	13.7
Waste management	25.0	32.9	29.6	37.0	36.8	10.0	29.4
Average	38.0	41.3	40.2	41.9	42.1	35.7	40.3
Adaption							
Early warning/ Environmental assess.	19.6	18.3	22.2	21.7	10.5	20.0	33.3
Agriculture/ Forestry	48.2	35.4	37.0	50.0	47.4	30.0	37.3
Water	30.4	28.0	37.0	39.1	31.6	20.0	35.3
Marine/ Fisheries	7.1	9.8	14.8	13.0	5.3	20.0	11.8
Costal zones	12.5	15.9	25.9	23.9	15.8	10.0	19.6
Human health	12.5	6.1	14.8	15.2	15.8	0.0	11.8
Infrastructure, transport, urban design	17.9	28.0	25.9	23.9	15.8	0.0	25.5
Average	21.2	20.2	25.4	26.7	20.3	14.3	24.9
CTC Network members	56	82	27	46	19	10	51
Allocation of services							
Mitigation	64.2	67.1	61.3	61.1	67.5	71.4	61.8
Adaption	35.8	32.9	38.7	38.9	32.5	28.6	38.2

Source: Edited based on (CTCN, 2016b)

25% of coverage. Absence of coverage is found in terms of human health as well as infrastructure, transport and urban design in Oceania, while the next lowest coverage is located in marine and fisheries in North America and Africa as well as in human health in Asia. Relatively best situated in average is Latin America & Caribbean, directly followed by Europe. Africa, North America and Asia follow, while Oceania is further behind. However, all regions have an average of coverage between only 14-27% and are therefore all located in low coverage. The highest amounts of coverage are found for agriculture and forestry for Latin America & Caribbean, Africa as well as North America. (CTCN, 2016b)

As pointed out in Table 7, there are additional 51 CTC Network members that state to be active internationally without geographical limitation (CTCN, 2016b). Therefore, the services offered from these members can be added to the available coverage for each world region. Nevertheless, the structure of coverage from these institutions matches to a great extent the one for each sector as described above. Therefore, the identified balances and shortages remain.

5.4. CTCN stakeholder survey analysis

This chapter presents the results of the two anonymously conducted surveys addressed to the National Designated Entities (NDEs) and CTC Network members. Both surveys start with the regional distribution of the received responses (as well as sector allocation for the CTC Network members). As described in Chapter 4, the following questions in both surveys pursue a similar structure that includes questions regarding their awareness, experiences and expectations of the CTCN as well as its services. In addition, several open-end questions at different stages in the surveys give the possibility to elaborate on matters of success or matters with potential for improvement and to gain further qualitative feedback.

CTCN National Designated Entity survey

As described in Chapter 4, the National Designated Entity survey was directed solely at Non-Annex I countries due to the central focus of the CTCN on developing countries. It received 31 responses with 42% (in numbers: 13) of the NDEs coming from Africa, 29% (9) from Latin America & Caribbean, 16% (5) from Asia and 6,5% (2) each from Oceania and Europe.

The first thematic questions intend to evaluate the awareness[18] of the CTCN and its services. As seen in Figure 11, the NDEs are the most aware of the Technical Assistance (TA) services (Ø 3.38), followed by knowledge and learning activities (Ø 3.04) and the least aware of Networking/Capacity-building services (Ø 2.7). The specific services of the three key topics were chosen by the author of this report since it is believed they represent the most essential ones.

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[18] The scale on the x-axis of Figure 11 equals the level of awareness as followed: 1= Not at all aware; 2=Slightly aware; 3=Moderately aware; 4=Very aware; 5=Extremely aware.

More detailed questions as well as further services were neglected in order to simplify the survey. In terms of the TA services, the NDEs are mostly aware of the application process, followed by the CTCN response procedures and the least of the implementation of the projects. It has to be mentioned that in terms of the latter, eight NDEs responded they are 'not at all aware' and 'slightly aware' and another eight responded they are 'very aware' and 'extremely aware'. This shows strongly differing levels of awareness on the actual implementation of projects. All in all, the level of awareness is decreasing alongside the steps of a TA process and the average is allocated between 'moderately aware' and 'very aware'. The CTCN website services (information on the CTCN, its services and operations; the knowledge portal with resource information, etc.) enjoy the highest level of awareness in the knowledge and learning services, followed by the CTCN webinars. The technology library service (intended and under construction) is the least known service. In terms of networking and capacity-building services the NDE regional forums have the highest level of awareness, followed by the sector and regional coverage of the CTC Network[19] and the incubator and secondment programs. The by far lowest level of awareness is present for private sector events of the CTCN.
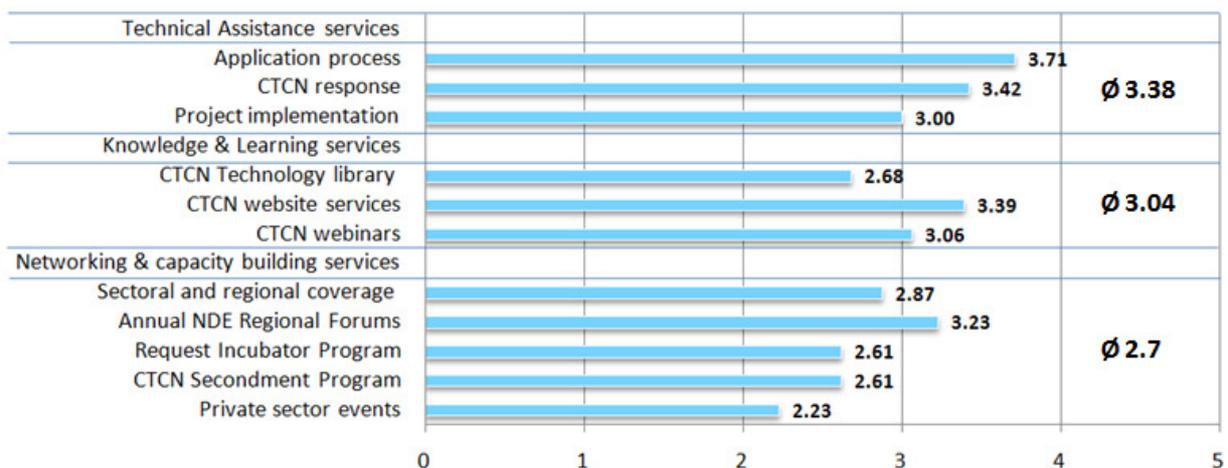
Figure 11: NDE awareness of CTCN's services

The next section dealt with CTCN events. 58% (18) of the NDEs state that they have been part of at least one event of the CTCN, while 89% (16) have participated in one to three and one NDE each in four to five and six or more events. The NDEs mostly participated in the NDE regional forums (12 NDEs) and the training sessions (11), followed by webinars (6). Asked about their satisfaction[20] of the attended CTCN events, the NDE regional forum is perceived as 'very satisfying' (Ø 3.85), closely followed by the NDE training sessions (Ø 3.67), while the Webinars tend rather towards 'moderately satisfying' (Ø 3.25). Critical feedback on CTCN events given as answers to an open-end question focuses mainly on the lack of financial resources for the NDEs

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[19] In the survey the CTC Network coverage is considered as a service.
[20] The level of satisfaction: 1= Not at all satisfied; 2=Slightly satisfied; 3=Moderately satisfied; 4=Very satisfied; 5=Completely satisfied.

to attend these events. It is criticized that the financial capacities provide obstacles for some NDEs to travel to the event locations and are unable to cover the costs. According to the responses (multiple answers possible), the absence in CTCN events is mostly based on unawareness of scheduled events (8 out of 15) followed by being only recently appointed as NDE (4) as well as reasons of own capacities/resources (3). Not one NDE mentions an absence of interest as a reason. In addition, a strong statement is sent by the NDEs when asked if they are planning to attend CTCN events. All NDEs intend to participate in future events. In this matter, they are asked what kind of events they would describe as useful (voluntary, open-end question) and what the most desired participants are. Some answers show dissatisfaction with the earlier received training. This is supported by the fact that the NDEs mostly ask for (more) training and capacity-building workshops (12 times mentioned) in the future and then followed by technology specific events (6), NDE regional forums, experience sharing (each 4), events on financial issues and interregional/global events (each 3). Further, it is mentioned that some NDEs are interested in participating in events outside of their region in the world in order to improve the learning and experience sharing process and that some are interested in attending key meetings of the global climate change arena such as the COP of the UNFCCC. For the question of the most desired participants in future events, the NDEs can choose multiple types of participants[21] are other NDEs (28 votes), research and academic institution as well as financial institutions (each 27 votes). Interestingly, private sector organizations are ranked 5th with 22 votes closely behind public sector institutions (23). The least interest is shown in not-for-profit organizations (4).

The next section of the survey deals with the Technical Assistance (TA) of the CTCN. While slightly over 80% (25) of the NDEs state that they are aware of the technology needs within their country, only 55% (17) have applied for a TA project. The reasons (multiple answers possible) of the other 45% (14) for not applying are based on multiple issues: Insufficient knowledge of the CTCN services and application process (6), absence/unawareness of suitable projects for this service (3) and other capacity-related reasons such as only being recently determined as a NDE or currently undertaking studies to indentify technology needs (4). Only one NDE states that it has received assistance from another institution besides the CTCN. Further, seven of the NDEs are currently in the process of applying for TA. From those who have applied, ten NDEs have received some level of TA[22]. Even though limited in statistical significance, the experiences state that the TA is perceived rather positive by these ten NDEs, with the application process (Ø 4.0), first response (Ø 3.8) and communication with CTCN (Ø 3.9) being 'very satisfying'. The communication with other CTC Network members as well as the

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[21] The list of answer choices equals the list of types of institution of the CTC Network plus the NDEs.
[22] It has been made clear in the survey that this is regardless of the stage of received TA.

project implementation in contrast are allocated or tend towards 'moderately satisfying' (Ø 3.22) with some NDEs voting for 'not at all satisfied' and 'slightly satisfied' (Ø 3.0).

In terms of the capacities, nearly 40% (12) of the NDEs state that they do not feel they have the necessary capacities to fulfill the tasks as national focal point to the CTCN with all its tasks and duties and only 51% mention that their expectations towards the CTCN have been met yet. Asked about what the CTCN can do to improve the situations, nine NDEs want (additional) training and eight need further information on the CTCN's services.

Asked about matters of success and room for improvement, the NDEs feedback can be aggregated into 3 groups. The first deals with financial issues. It is mentioned that the lack of financial support impedes the NDEs to adequately perform according to its duties and tasks as well as to promote the CTCN and its services within their country. Further, an absence of motivation is attested due to the perception that the NDE shows "a lot of effort to promote the activities of [the] CTCN [for] free, when they should be assumed as a representative of CTCN" (CTCN NDE survey response). As mentioned earlier, NDEs ask for financial resources to attend events and workshops that are relevant for their duties as CTCN focal point. But not only for the operations and organizational issues of the NDE matter the financial aspects. A loss of interest in the CTCN and its services is mentioned due to the absence of direct project funding for the NDEs and the need for follow-up funding. Therefore, the incorporation of funding mechanism that could ensure follow-up and direct funding is wished for. The second feedback group contains capacity-related issues. It is asked to motivate, empower and assist the NDEs in their activities to promote CTCN and its services as well as possibilities in their respective countries. According to the respondents, this could be conducted through CTCN assistance in hosting national/local seminars, workshops and communication material such as posters, etc. In terms of equipment some NDEs wish for more resources from simple communication tools such as internet access or telephone towards the provision of vehicles (for monitoring activities of TA projects) and even human resources. Further, it is suggested that CTCN staff and NDE staff are visiting each other in order to give in-person, on-the-ground advice to the NDEs or to learn in the Core Centre of the CTCN. In accordance to the latter, some NDE asks for internship opportunities and training on project design and CTCN procedures. Further, it becomes clear that not all NDEs feel or have been sufficiently trained for their responsibilities yet. Specifically mentioned is "assistance in the project planning stage and in identification on how to best access CTCN's services" (CTCN NDE survey response). Particularly the Pacific, including the Small Developing Island States (SDIS), and the Sub-Saharan Region are mentioned in terms of a special need for capacity–building measures as well as participation in CTCN events. According to the survey, capacity-building assistance can also mention the empowerment of the NDE not only in terms of equipment and knowledge, but also in "high level national buy-in and support" (CTCN NDE survey response) from their country, so that the NDE and its activities are nationally prioritized. As a last aspect of

this feedback group, one of the NDEs looks ahead and asks for guidance how to prepare for the requirements that come out of the Paris Agreement in 2015. As the third group is organizational matters identified. First of all, the TA application process, the response time from the CTCN and especially from the Consortium Partners (as described in Chapter 3.2 especially responsible for 'quick responses' and also 'response projects' in the early stages of the CTCN) and the general progress of the institution CTCN is asked to be accelerated. In addition, the response time of some of the CTC Network members is apparently too long in the eyes of a respondent. The reason is believed to be their remote location in relation to the requesting NDE. In another response it is further mentioned that the remote location not only affects the response time but also leads to an absence of appropriate knowledge of the target region (in this case the Pacific Region). In this light of regionally and locally leveraged expertise, an African NDE asked for the recruitment of local/regional stakeholders to fulfill crucial tasks such as monitoring of project implementations. Further, one NDE suggest the appointment of a leading NDE in sub-regions, which would be in charge of stimulating the submission of TA requests as well as capacity-building measures for the sub-regions' countries. It is also asked for additional contact points within a country since the responding NDE states to have too many duties and responsibilities besides being appointed as NDE. It particular mentions that already the distribution of CTCN notifications within its country and to the relevant actors represents a time-consuming task.
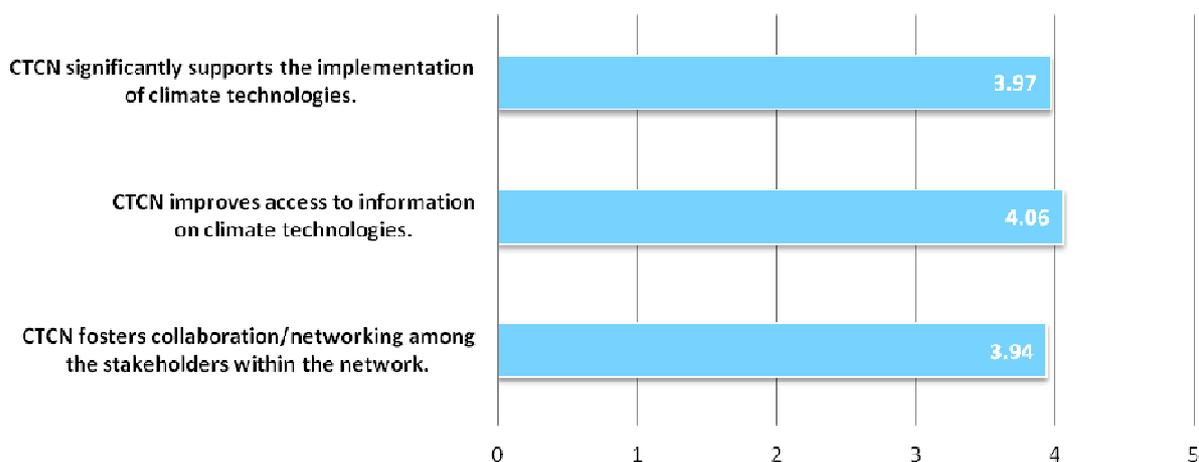
Figure 12: Level of NDE agreement[23]

Despite the numerous suggestions on how to improve the CTCN, the overall perception of the institution and its services is positive as seen in Figure 12. All NDEs agree[23] that the CTCN significantly supports the implementation of climate technologies (Ø 3.97), improves access to information on climate technologies (Ø 4.06) and fosters collaboration/networking among all stakeholders (Ø 3.94). In addition, some of the responses to the open-end questions particularly praise the CTCN and its services. It is emphasized that the CTCN has been "responsive and

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[23] The level of agreement: 1=Completely disagree; 2=Disagree; 3=Neither agree nor disagree; 4=Agree; 5=Completely agree.

technically sound" (CTCN NDE survey responses) and that it should "continue to scale up the good work" (CTCN NDE survey responses), while one NDE staff member particularly points out the knowledge resources on the CTCN webpage as a source of learning and another is convinced that once the respective NDE starts requesting TAs, the expectations are met.

CTC Network member survey

The CTC Network survey received 43 responses with 37% (16) of the network members being located in Europe, 30% (13) in Asia, 17% (7) in North America, 7% (3) in Africa, 7% (3) in Latin America & Caribbean and 2% (1) in Oceania. Most of the responses (42%; 18) come from private sector organizations, followed by NGOs (28%; 12), not for profit organizations and research & academic institutions (19%; 8) and others. Not one of the responding network members is a financial institution.

Unfortunately, only 14% (6) are currently or have been part of a TA project. Even though limited in their significance, the experiences[24] paint a very positive picture (Ø 4.01) of the following elements within TA: Communication with CTCN (4.17), project formulation (content, targets, etc.) (3.75), cooperation with other CTC Network members (4.5) and cooperation with NDEs (4.0).

44% (19) have participated in a CTCN event yet, while the majority (16) has participated in one to three events. It has been mostly webinars (10), followed by private sector events (9) and the NDE regional forums (6) as well as others (7), which were not further described by the institutions. Their level of satisfaction with the events is shown in Figure 13. The satisfaction is the highest for other events/meetings (Ø 3.43) and for the webinars (Ø 3.4). The highest room for improvement is evident for the private sector events (Ø 3.11), while the NDE regional forums (Ø 3.29) are placed between the other types. Reasons for absence in events (multiple answers possible) are based mostly on own capacities (13), regional coverage of the events (9) and unawareness of the events (7). Further, four network members have only recently been accepted in the network and have not had the possibility to attend. In addition, three respondents state that there is an absence of interest in the CTCN events, while one member explicitly criticized an absence of commercial opportunities within the CTC Network what in this case lead to the absence of participation in CTCN events. However, 90% (39) of the institutions intend to participate in future events. The four members intending to be absent in the future base this on own resources/capacities (3) and absence of interest (1). Future events should ideally contain technology specific (8 times mentioned) and networking events with NDEs and other CTC Network members (5). Further, information on participation in TA projects and capacity-building activities (4) as well as learning/experience sharing and events on financing

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[24] In terms of satisfaction: 1= Not at all satisfied; 2=Slightly satisfied; 3=Moderately satisfied; 4=Very satisfied; 5=Completely satisfied.

matters (each 3) are mentioned. Furthermore, CTC Network members are interested in linkages between them and the NDEs in terms of the INDCs and the Paris Agreement, how to overcome barriers in technology transfer as well as cross-fertilization of projects and, as in the case for the NDEs, to participate in key events such as the COP of the UNFCCC. Most desired participants are financial institutions (33), private sector organizations (30) and NDEs (28). The least desired participants are not for profit organizations, but they still have been mentioned by 15 members.
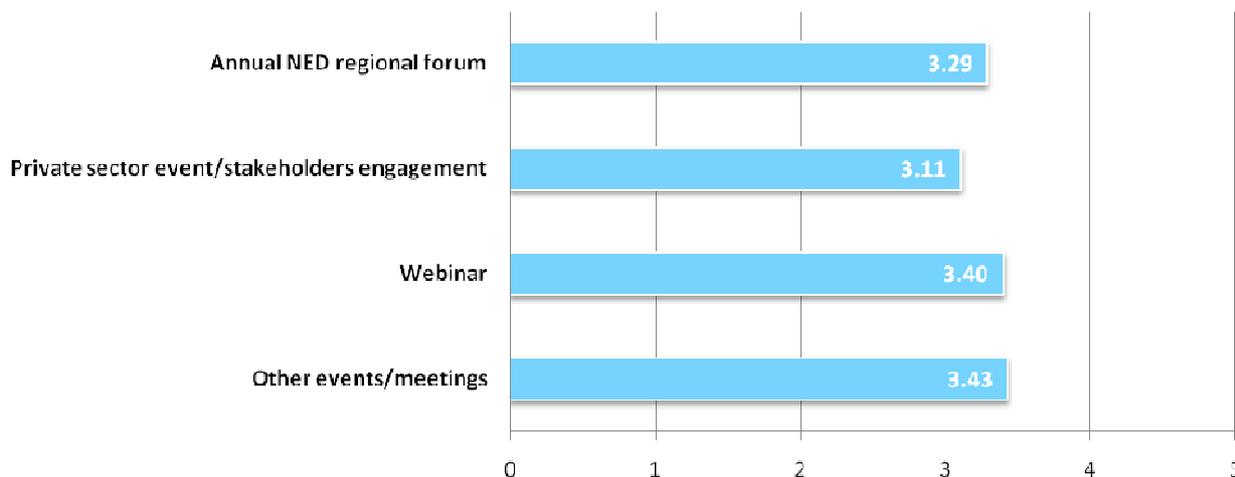
Figure 13: CTC Network members' satisfaction of CTCN events

A central part of the survey is the level of importance[25] and satisfaction in terms of potential benefits resulting from being a CTC Network member. Figure 14 shows overall a relatively low level of satisfaction (total Ø 2.67) compared to the importance (total Ø 3.79) of the benefits for the institutions. The biggest disparity is present for the benefit of partnerships, collaboration and networking. While in average the network members find this potential benefit 'very important' with a clear tendency towards 'extremely important' (Ø 4.28), it is only ranked fourth in terms of satisfaction with being set at 'moderately satisfied' with a tendency towards 'slightly satisfied' (Ø 2.71). In addition, there are smaller but still significant disparities in terms of international visibility, experience sharing and outreach. Commercial opportunities have the lowest level of importance, but also by far the lowest level of satisfaction, which leaves them with the second highest disparity.

The feedback in terms of room for improvement centers on organizational matters and stronger engagement. It is asked to accelerate the membership application process, to open more TA projects for the bidding process, enhance the transparency of the latter as well as to be more flexible in giving (even quick response) projects to the CTC Network members since "almost all the TA requests have been addressed by the Consortium Partners" (CTCN NDE survey response). In addition, absence of either positive or negative feedback in regards of submitted

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[25] The level of importance: 1=Not at all important; 2=Slightly important; 3=Moderately important; 4=Very important; 5=Extremely important.

proposals in the bidding process is criticized. Further, inflexibility by the CTC Core Centre in terms of changes in project design and budget allocation is mentioned by a network member. Financial matters are present through the wish to connect the CTCN to large climate funds such as the GCF. Another aspect is given by asking for personal contact with the CTCN to better understand how the CTC Network members can engage and contribute in the CTCN since the current perception in one response is that the "CTCN [is] at the moment only seen as [a] platform to acquire projects" (CTCN NDE survey response).
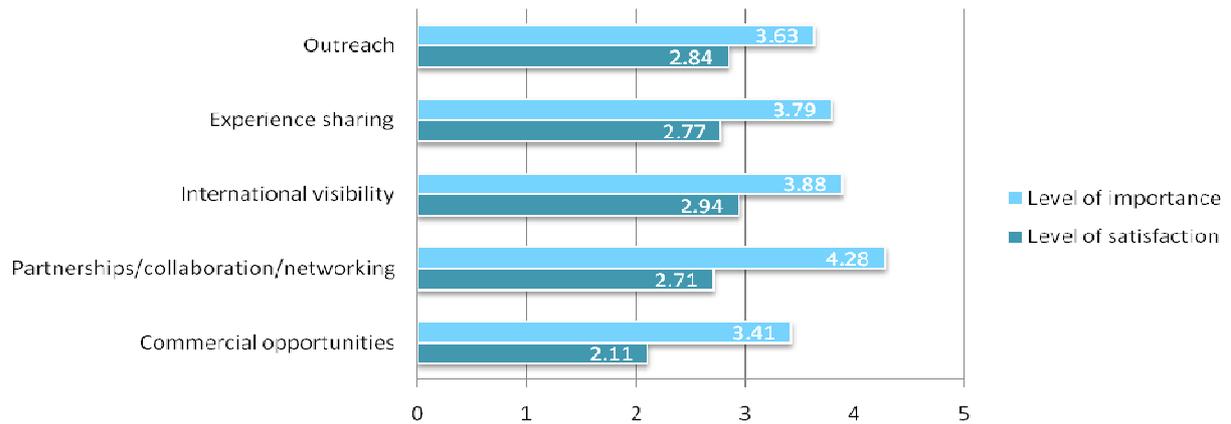
Figure 14: Level of importance and satisfaction of potential benefits

6. Evaluation and discussion

This chapter focuses on the evaluation and discussion of the CTCN's operational effectiveness based on the three analyses. Further, the qualitative evaluation of these results allows comparing the current status of the CTCN to the qualitative targets presented in Chapter 5.1. In addition, the results of the semi-structured, qualitative interview with the CTCN Director support the results and deliver additional information about the CTCN that could not be obtained through the three analyses. Overall, this approach aims to shape a comprehensive picture of the CTCN and its current operational effectiveness that allows the formulation of policy recommendations for the future development of the institution.

The chapter is structured as follows: It starts with an evaluation of the establishment process as well as the purpose of the CTCN in comparison to the background information presented in Chapter 2 and 3. Afterwards, the three analyses' results are evaluated and it is investigated if the qualitative targets are met. Next, the third objective is met by the formulation of policy recommendations based on the undertaken evaluation. A consecutive section presents and elaborates on the limitations of this thesis, its methodology and results.

The CTCN's establishment and purpose

The CTCN emerged out of a highly complex framework that has been influenced by some of the most dominant drivers and principles within the global climate governance regime. This norm complex also played an important role in the CTCN establishment process. Difficult negotiations with strongly differing opinions between developing and developed country Parties in regards of the structure and purpose of technology transfer measures were present according to Uosukainen (2016). In a generalized perspective he points out, developed countries rather pleaded for the creation of adequate market structures in developing countries and to let market forces take care of technology transfer and investments instead of an UNFCCC approach such as the CTCN. The developing countries on the other side claimed to be unable to buy the technology on the market and that subsidies as well as support are required. Further, they complained about their lack of necessary capacities and referred to their historically-based absence of responsibility towards mitigation and adaption actions today. Direct financial opportunities in order to foster technology transfer have been the central motivation of these countries (Uosukainen, 2016). As described in Chapter 2, the principle of 'climate justice', the market norms and the issue of technology transfer barriers such as IPRs can clearly be located in these aspects. Even though both initial positions of the country groups tend to be not in favor for an institution in terms of technology transfer, according to Uosukainen (2016), the above described problems resulted in a political compromise. In the Cancun Agreement the establishment of the CTCN was decided, but a huge, cost-intensive centre was neglected in favor for a small centre with the mandate to create and facilitate a sectoral and regional diverse network that helps the

developing countries to foster technology transfer (Uosukainen, 2016). But it also means institutionalized rather than plain monetary opportunities for developing countries in this issue, while neglecting a major intervention by the UNFCCC.

Hence, the Parties to UNFCCC established the CTCN with relatively small capacities, but with a huge political mandate that results in high expectations towards the CTCN and to facilitate technology transfer activities (Uosukainen, 2016). It is the CTCN that conducts the operational work in terms of the latter and that makes this institution so highly relevant. However, currently the CTCN "can be characterized as extremely small when looking at all technology activities ongoing in the world" (Uosukainen, 2016). In addition, the current budget and financing situation seems to undermine the importance of its mission. "One percent of the whole finance of the convention [*the UNFCCC*] is used by the Technology Mechanism, while 99% is managed by the Financing Mechanism" (Uosukainen, 2016). Further, other institutions have significantly more resources at hand and can offer comprehensive service packages in technology transfer (including for example follow-up funding) (Uosukainen, 2016). Interestingly, while being inflicted by these obstacles, the CTCN is supposed to fulfill an important mission addressing multiple crucial and challenging aspects. The following evaluates the latter.

Developing countries have a special role in terms of climate change, as pointed out in Chapter 2.2. That the focus of the CTCN is set explicitly on them shows the acknowledgment within the UNFCCC of the structural disadvantages and lack of capacities allocated in these countries, which are as well most likely to suffer the most from the impacts of climate change. Technology transfer into these stakeholders is a crucial and highly necessary step since it can reduce vulnerability as well as increase resilience towards climate change impacts and represents also opportunities for further growth and sustainable development (e.g. job creation through renewable energy production, energy supply for remote human settlements, commercial opportunities and foreign investments, etc.). The geographical scope can vary for the CTCN TA services, but so far the vast majority of the requests focus on the national level. But as pointed out in Chapter 2.4, the urban level should not be forgotten since municipalities hold a huge potential and necessity to be developed sustainably. The CTCN can also here deliver essential assistance in mitigation and adaption efforts for human settlements that are especially in developing countries vulnerable. Through the CTCN it is also possible to further overcome the obstacle of a strict pursuit of the 'climate justice' principle since by usage of the offered services also developing countries take over an active and responsible role in terms of mitigation and adaption. At the same time, contributing with financial donations or other support to the CTCN gives developed countries the chance to support developing countries in their efforts through an institutionalized channel that ensures adequate usage of the resources. This can also be incorporated into efforts in relation to the INDCs for the Paris Agreement climate actions, as

stated in Chapter 2.1. Further, the CTCN and its network have the potential to implement projects in developing countries that might not have been pursued outside of the CTCN due to a lack of support to carry it out. Overall, Uosukainen (2016) states that it is valuable to know that there is an institution with the CTCN that aims to never let down the developing countries in their requests for help.

With technology transfer the CTCN is focussed on a topic that is a key measure in the fight against climate change. The huge amount of available technologies for mitigation and adaption[26] needs to be made available at the request of those countries with impeded and limited access. The CTCN can deliver technical assistance for technology transfer purposes, but focuses rather on assistance in knowledge, expertise and guidance than on material equipment. Further, the CTCN can act as a unified voice for the developing countries to overcome barriers in technology transfer. The CTCN can support countries in need with information and capacity-building as well as training in specific barrier issues and has the chance to articulate the accumulated perceptions and problems of this topic towards other, relevant organs such as the TEC or even the COP of the UNFCCC. However, the mentioned IPRs are not considered a crucial barrier for the CTCN in terms of technology transfer yet. As Uosukainen (2016) points out, IPRs have been embedded in a political debate within the UNFCCC for years, but in reality it is "not really an issue for the customers of technological solutions". He further states that out of the submitted TA requests not a single one struggles with IPR problems and that the reason lies in the often standardized patents that are not of great costs. However, the CTCN has not been asked to deal with cutting-edge technology yet, which could result at some point in more difficult situations. But the CTCN is open for the challenge and ready to solve potential issues (Uosukainen, 2016).

A central part of the institution is its network of stakeholders relevant to climate technology transfer. The choice of a network instead of, for example, a single, high-capacity centre that deals with all requests and services results in a flexible and polycentric structure when dealing with world-wide technology projects, but also leaves challenges in terms of governance. The analyses evaluation gives more insight in the latter issue. However, the accumulated knowledge, expertise and strengths of a network allow tailor-made approaches that bring together several heterogeneous stakeholders that might have been working together outside of the CTCN (e.g. due to absence of project awareness or interest among the experts, lack of capacities to communicate and adequately formulate a project by the countries, etc.). Further, the CTCN and its stakeholders can leverage the benefits of networking as presented in Chapter 2.4, which is an enormous advantage in the ambitious and long-lasting fight to tackle climate change. Especially the possibilities for cooperation and networking (e.g. TA projects, forums, events, etc.) as well as learning experience sharing possibilities (e.g. CTCN knowledge portal including the Technology

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[26] As seen for example in Asian Development Bank (2014).

Library and resource materials, webinars, incubator and secondment program, etc.) have to be mentioned when pointing out how thoroughly the CTCN aims to leverage from the network concept. In addition, a membership in the network fosters stronger stakeholder engagement and the creation of ownership feelings towards the activities. Together with political willingness, Nussbaumer et al. (2015) mention these aspects as key success factors for facilitation of technology transfer.

The analyses results and qualitative targets

In terms of key service 1, the results show that the CTCN does not fulfill the target for the two types of TA. This can be explained by several reasons. As stated above, the CTCN has relatively limited resources (budget situation, relatively small CTC Core Centre, etc.) in relation to the task the institutions is fulfilling (Uosukainen, 2016). Further, the CTCN is a relatively young institution. It is therefore legitimate to not fulfill the ambitious target, especially since the number of TA projects is still relatively high. In addition and as the NDE survey shows, several NDEs expressed a need for (additional) information and training on how to access the CTCN services, which results in absence of submitted requests. However, several requests are currently produced according to the survey and overall the number of submitted requests strongly increased in the recent past. Thus, despite not fulfilling the target in this matter, it cannot be complained about missing demand in this service.

The TA projects currently undertaken have a slightly higher focus on mitigation measures, but overall -and including the projects that address both mitigation and adaption- a strong demand for both types is given. This puts emphasis on the requirement of having a broad and balanced network. Therefore, as stated in the Chapter 5.3, the current coverage of adaption and its sectors does not equal the demand shown in the TA results and needs expansion. In addition, the highest demand is based in Africa, Asia and Latin America & Caribbean. Especially the case of Africa is interesting since more requests (58) have been submitted than countries (54) are located in this region. In general, it is a good sign that three regions with relatively high amounts of developing countries seem to understand the potential of the CTCN and leverage the offered service. Further, it fits well that the amount of potentially active members is also the highest for these three regions since it enhances possibilities for the projects to be intercepted by the network.

Some of the services in group two are difficult to be conclusively analyzed. Even though non or only few events specifically on technology types and public-private-sector relations have been conducted, the CTCN can show success in the NDE regional forums, whose several, globally spread events have been perceived relatively well by the attendants according to the surveys. This equals the CTCN staff's perception for this event type and supports the plan to continue this service (CTCN, 2016f). Indeed, the NDE regional forum with the NDEs and also CTC Network members as participants is a crucial service in terms of network and learning. Fostering these

events and the attendance from NDEs and network stakeholders is also in line with the wish of the CTC Network members for stronger engagement and having NDEs as one of the most important event attendants. The focus on the NDE regional forums might have rather neglected the above mentioned other types of event, but again, the limited resources of the CTCN as well as being a young institution make it an appropriate prioritization. Especially since the regional forums took over the responsibility to train NDEs.

The absence of a helpdesk in key services 3 can also be accepted due to the prioritization of other services within the CTCN. Simply put, there are more urgent services such as the TAs, network establishment and promotion/expansion or NDE training through training workshops, webinars, etc. However, once in place the helpdesk could be a great asset not only for technology transfer related questions, but especially also for questions in regards of the CTCN procedures. It could strongly benefit the issue mentioned in the surveys that some NDEs need additional information or training on how to access the CTCN's services. It could be a fast and cost-effective way to answer questions and queries that impede engagement in the CTCN and therefore benefit the demand for the services.

In terms of capacity-building and training the CTCN is aligned with its own target and an impressive amount of training has already been conducted. This should also be a mandatory core activity of the institution since only adequately trained and empowered NDEs keep up the demand for the CTCN's services. Nevertheless, besides the work that has been done, more efforts are required in order to solve the issue of unsatisfied NDEs in terms of their training. It is stated from one respondent, that the NDE received information on what the CTCN offers, but that they "were never adequately explained the way [...] to process a request" (CTCN NDE survey response). Thus, future training opportunities and clarifications on the information provided in the trainings as well as how to use them must be given.

The knowledge resources are well covered and provide a diverse and interesting selection of information. Further, the knowledge portal allows filtering a search among relevant types of action and sectors, which makes the interface user-friendly and easy to navigate. In addition, an abstract of each resource helps to identify the key aspects of the resources and provides information on the origin of the resource. This is a fast way for all interested stakeholders to get access to highly valuable information provided from numerous experts across the globe. The supply ranges from highly specialized topics until even generic issues in regards of climate change and impacts. This might be a first source of information for NDEs or other actors to understand the challenge and what opportunities and solutions are available. As mentioned in the CTC Network member survey, a NDE positively points out the possibility to learn on the CTCN's website.

A clear evaluation is not possible in terms of unique knowledge portal users, but the presented numbers in Chapter 5.1 show a high amount of website users. Interestingly, this is the case even though the technology library is not even online yet. The latter will be a great asset due to its targeted, comprehensive character covering all technology sectors and providing necessary information for potential users (CTCN, 2016g). It will be a great tool for pre-assessing and selecting suitable technologies for a desired purpose and can save valuable resources (e.g. time, money, etc.) for the user.

It seems that the CTCN is not aligned with its own targets in terms of the budget. According to Uosukainen (2016), the budget was still around 30 million USD in April this year. Without any further financial resources the budget plan will be not fulfilled in 2016 and the following years. Therefore, the monetary aspect remains an obstacle and is a crucial factor for the future. Constant efforts to gain new funding opportunities are therefore needed. The financial resources are not only crucial to further ensure the operationality of the CTCN, but also to allow more TA projects to be addressed through the CTC Network members. In addition, to use the own budget to solve the NDEs' complain about lacking resources to attend the CTCN events could at least partially be conducted. Participation of NDEs from, for example, LDCs at some of CTCN's events (and in particular any training session) could be subsidized. Even though that to the best knowledge of the author of the thesis there has recently been an absence of new, bilateral donors, the Paris Agreement and the FM of the UNFCCC hold potential in this matter. As stated in Chapter 3.1, linkages and target overlaps between the TM and the FM are existent. The CTCN is further requested to align its activities with the funding criteria established by the FM and enable developing countries to deliver high-quality project proposals that are suitable for funding under the FM funds such as the GCF and GEF. While this is rather a major factor for securing follow-up funding of projects, it will be interesting what importance the FM acknowledges to the CTCN in the future and especially after the Paris Agreement. Since the CTCN is expected to support the developing countries to achieve their INDCs, the core elements of the agreement (Uosukainen, 2016), and since it is the aim of the funds to invest in environmental/climate related efforts, it could be a potential scenario that the funds under the FM provide financial resources for the CTCN to fulfill their budget targets. This has already happened with the 1,8 million USD provided to the CTCN by the GEF, which is as a pilot project for this cooperation (CTCN Advisory Board, 2016). Admittedly, when comparing the targeted budget for the first five years and the monetary value that these funds are dealing with[27], it is obvious that already a small amount would have a huge impact on the CTCN. However, no matter what source the financial resources are coming from, according to Uosukainen (2016), it

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[27] The GEF, for example, has provided $14.5 billion in grants and mobilized $75.4 billion in additional financing for around 4,000 projects since its establishment in 1992 (GEF, 2016b).

is a tricky task to balance between the expectations as well as conditions given by the donors and the ones from the UNFCCC and TM. This is a complex endeavor for the CTCN and it is important to find a balance that enables further effectiveness.

In terms of sector coverage most represented are private sector and research/academic institutions. This is positive for the network since it ensures the dynamics and expertise from the former plus the knowledge and guidance from the latter. A clear disadvantage is that financial institutions are heavily underrepresented. As pointed out before, these actors are crucial in order to secure follow-up funding. Further, both the NDEs and CTC Network members explicitly asked for them as participants in CTCN events. In terms of technology sectors, mitigation is covered the most, which equals the distribution of ongoing TA projects as mentioned above. This could mean that either the supply and demand on mitigation measures are simply higher than adaption, that the TA requests have been chosen and prioritized according to the network availability or that the CTCN had a focus on applicants for the network with a focus on mitigation efforts. The former is basically disproved at least in demand terms by the distribution of request types between mitigation and adaption. The second and the third can probably be neglected as well since the numbers of submitted requests and numbers of application for the CTC Network (see Annex 4) accelerated simultaneously. It seems unlikely that the CTCN pursues some kind of selection process according to the available requests or (applying) members, when they are in the early stages of their operationality and need the demand to justify their (future) existence. Therefore, the coverage of adaption should be a focus for the future in order to balance the network and ensure availability of adequate CTC Network members to successfully pursue all kinds of TA projects. The types of services for adaption and mitigation are strongly covered in terms of policy and planning, capacity building, knowledge management as well as technology development and transfer. This is a highly beneficial basis for the network and secures the availability of needed expertise on differing but crucial inputs and stages to fight climate change. But in terms of investment, the network is relatively uncovered, which fits to the absence of financial institutions. Due to the several reasons elaborated on above, this is a highly relevant type of service that is strongly needed.

The regional coverage by reach has the highest presence and density in Africa, Asia and Latin American & Caribbean, which is preferable due to their relatively high amount of developing countries. But only Asia manages to have also a high coverage in terms of registration. Admittedly, Asia is a huge continent with numerous countries associated and most of the registered members are in East and South Asia, but it shows that numerous potentially active members are also located in the region. This is not the case in turn for Africa, Oceania and Latin America & Caribbean, where the coverage by registration is the thinnest. It is in so far relevant since the NDE survey reveals the issue of proximity between support receiving countries and

solution-providing CTC Network members. Local ownership and knowledge as well as impeded communication play a role in this matter. It leaves the potential to further expand the network with members from developing countries. Further, this would also increase the possibility for the aimed south-north, south-south and south-south-north-cooperation and work against a potential paradigm that developed country's need to intervene with developing country's' development. Furthermore, the survey includes the wish for a stronger focus on the Pacific region including the SDISs. Currently, the coverage of Oceania seems rather neglected even though several high-need countries are located there and will probably be hit as one of the hardest by climate change. Admittedly, the 51 international members can improve the coverage for all regions including the SIDSs in the Pacific, but it does not necessarily solve the issue of local ownership and knowledge as well as the communication. Especially the latter can be a challenge due to the in some case absence of basic material resources such as, among others, internet access or telephones, as stated in the survey in relation to NDE capacities.

The combined approach in Table 7 points out the regional-sector-specific needs. It can help to actively search for necessary additions to the network and to expand it punctually. According to the data, this is needed for all regions in several sectors, but has a general focus on adaption sectors worldwide. An approach like this with active promotion for specific sectors and service suppliers within the lacking region would strongly enhance the potential, effectiveness and value of the CTC Network.

In terms of the stakeholder perception both surveys provide interesting insight. The strongest interest in the NDE survey is shown in Africa and Latin America & Caribbean. This mostly aligns with geographical distribution of TA request, while only Asia is relatively underrepresented in the survey compared to the TA submission. The level of participation in these two regions could be interpreted as signal of strong interest in the CTCN and its services, as specific need for these regions to engage in climate-related activities or even as dissatisfaction of the current operationality and progress. Further research could clarify this matter.

That the highest awareness rates are present for the TA service is not surprising due to the service prioritization process of the CTCN in order to cope with the limited resources and being in its initial steps of operationality. It is principally of value that the CTCN is most known for its core service and it shows adequate usage of resources as well as communication. This is followed by the knowledge sharing activities and then by the networking and capacity-building services. The technology library can be expected to have a high amount of awareness when fully functional since the website services awareness shows that the NDEs are familiar with the already offered online content. But in terms of the webinars the awareness should be enhanced. This service is a flexible, time- and cost-efficient method of knowledge distribution and learning since the topics can be chosen according to the needs of NDEs as well as the network expertise,

the webinars are not taking over a whole working day and all participants do not need to be at the same location. Further, all webinars are available online after their conduct. This needs to be made aware since it allows further knowledge provision after the event. That the NDE regional forum is the most known in terms of networking services aligns with target analysis. Interestingly, the NDEs are rather unaware of the network itself. This is surprising since the network and its members are the key actors that deliver the expertise and solutions to the requesting NDEs. Knowledge of the coverage could help to highlight the potential the CTCN has for developing countries and should therefore be actively promoted. However, that the amount of TAs being implemented is currently relatively low and therefore results in absence of close contact between the NDEs and the network could be an explanation for this result. The two capacity-building programs 'request incubator' and 'secondment program' have very low awareness levels, but could be a great asset for developing countries to better understand how to leverage the CTCN and its services. It is also pointed out in the survey responses that some NDEs asked for internship-similar opportunities to learn from the CTCN and in-person training on how to use the institution. Both programs are aiming at these aspects and pursue a rather personal approach of capacity-building that can also benefit the demand and identification of NDEs with being part of the CTCN. Thus, they should be stronger promoted.

In terms of events it is most obvious that the NDE regional forums and training sessions are the most visited, but still less than half of the respondents have been present in one of these events. In addition to all the aforementioned aspects on training, this requires more action to increase the number of participants. Especially since the level of satisfaction for both event types is relatively high, which means the established procedures and contents to conduct this event are given, even though it might need improvement to more thoroughly inform the NDEs. This is supported by training and capacity-related events being the most desired type for the NDEs. But events also require attendance. In this case the highest obstacle for NDEs is a lack of financial capital for event attendance. Here the CTCN needs to find a solution since these event types and events in general are desired by the NDEs and thus necessary for maintaining the interest and demand towards the CTCN. In addition, the NDEs are interested in technology-specific events. The CTCN staff brings in this matter the 'thematic dialogues' conducted within the TEC into the discussion and marks them as an option for the future (CTCN, 2016f). This could be a helpful event to foster the knowledge of specifically-needed technologies in several countries and their regional circumstances. It is therefore a possibility to investigate what types of technology could be approached by an event like this. Further, the webinars could be an additional approach to provide cost-efficient information on technologies. It is also stated in the survey that some NDEs are interested in attending events outside of their region. This obviously enhances networking and experience-sharing, but it could work against the formulated wish to involve more stakeholders from the own region. In terms of participants, the chosen stakeholders can be

translated into the wish for collaboration, networking, as well as experience sharing with other NDEs, the expertise/knowledge provision as well as guidance from legitimate institutions such as academic and research ones and the relevant knowledge and financial capital to realize projects through follow-up funding.

Even though limited in amount of responses and therefore representativity, the level of satisfaction with the received TAs are high in average. It shows that the CTCN is using its resources accordingly to their central mission. The relatively lower amount of satisfaction in implementation can be explained by the relatively small experience in actual implemented projects as well as being in its early days in this process. In terms of reasons for not having applied yet, the answers align with the wish for (more) training and capacity-building activities. However, this issue is of a vital nature for the CTCN and does not allow a decrease in efforts.

As one of the two most dominant matters within the survey act the financial aspects. Not only that the lack of monetary resources impedes the participation of CTCN events for some countries and the adequate promotion of the CTCN in the NDE's respective countries, but it also is represented in terms of access to follow-up funding and investment in TA projects. The NDEs mention a loss of interested within some focal points due to the absence of direct funding. The connection to the funds under the FM, as described above, is therefore a crucial target for the future. This would clearly enhance the interest in the CTCN since it ensures that the institution truly acts as the bridging institution between powerful financial sources and the countries in need as aimed for in the political mandate. This is also relevant in the light of the CTCN being a compromise between the two differing opinions on how to tackle climate change since the developing countries specifically asked for financial help to access climate technologies. In addition, the issue of follow-up funding opportunities can also be seen as improvable due to the absence of financial institutions in the network and investment services. Further, the financial issue reveals an interesting perception in terms of the dynamics between the NDEs and the CTCN. As mentioned in the survey, an absence of motivation is present within the NDEs, which "provide a lot of effort to promote the activities of CTCN [*for*] free, when they should be assumed as a representative of CTCN" (CTCN NDE survey response). This reveals that it is not clearly understood in some cases that the NDEs are not providing services to the CTCN, but the CTCN to the NDEs. The CTCN staff supports this evaluation and further interprets this as another example for the existing perception among some NDEs that the CTCN is rather seen a burden than an advantage (CTCN, 2016f). The central questions that arise out of these issues are focused on how to spread the awareness of the duties and potential advantages for the NDEs as part of the CTCN and how to make the NDEs more active in pursuing their intended purposes as focal point. It is highly crucial to mediate that the CTCN is an opportunity and is there to help, but own efforts from the NDEs are needed in order to leverage it.

The second dominant matter is the capacity/training-related issues expressed in several occasions in the survey. This is also clearly stated in 40% of the NDEs not having the necessary capacities to fulfill their duty. The material resource provision is of course a strong obstacle. Communication tools and other equipment are needed to function as a NDE and the resources to promote the CTCN nationally are also crucial. However, this should rather not be a responsibility of the CTCN. Instead, these issues impact the also in the survey mentioned matter of empowerment and support by their respective country. It is stated that this is missing in some cases. The CTCN staff argues in this matter that some developing countries are simply not yet as strongly focused on climate change as in other countries and that the UNFCCC in general is rather seen as a burden, which impedes national empowerment and support (CTCN, 2016f). This equals the description of the relation between developing countries and climate change in Chapter 2.2, which states that the interests are rather aimed at, for example, economic development than at climate change. A chance in this matter could be the Paris Agreement. Since Uosukainen (2016) points out the important role of the CTCN in achieving the INDCs, the NDEs could benefit in terms of empowerment and support in the future. But in this matter the CTCN also has to provide the necessary information and guidance on how the NDEs can best be aligned with the respective national targets, as also wished for in the surveys. Further, the NDEs need to be enabled in their capacities to promote the CTCN and its services to all relevant national stakeholders and on all administrative levels. The distribution of TA requests in geographical terms shows a strong focus on the national level and only a small focus on the municipal level. But the latter contains a high amount of potential and necessity to be developed sustainably. Technology transfer is a highly beneficial opportunity in this matter.

Overall, the CTCN and its mission are well perceived. Several positive comments praise the CTCN and its operations, which should be considered as a motivator for the CTCN to continue their mission. In addition, a strong level of agreement in terms of the tree theses representing the purposes of the CTCN is present. This can be translated into trust and confidence that this institution is operationally focused and effective. Admittedly, since around 30% of the NDEs claim that their expectations have not been met so far, the agreement with the theses could also be interpreted as an expectation for the future. But even if that is the case, it shows the wish for an institution that pursues these targets and the confidence that the CTCN can deliver its goals.

The responses of the CTC Network member survey have a similar structure as the regional coverage by registration (Europe, Asia, etc.) and sector coverage (mostly private institutions, no financial institutions). The relatively high amount of not-for-profit organizations is interesting for a later discussed aspect.

Unfortunately, the vast majority has not been part of a TA what limits the significance of the satisfaction analysis. However, the few received responses result in a very positive feedback for

all four elements. As for the satisfaction of the NDEs with the TA projects, it shows an effective usage of resources in accordance with the central mission of the CTCN. These two aspects can be accounted as a success and need to be pursued with constant efforts. The TA projects are central elements also for the CTC Network members since it allows their engagement in technology transfer and allows cooperation, networking and the chance of commercial opportunities. All of these benefits are crucial for the members according to the survey responses.

The members' event participation is lower than for the NDEs, but the overall level of satisfaction shows tendencies towards 'very satisfied' and can be taken into account as a success. The reasons for not attending (own capacities, regional coverage, unawareness of events and absence of interest) should be of interest for the CTCN. All of them are crucial to keep the interest in the network alive. Admittedly, the eight not-for-profit organizations can be responsible for a high amount of the 'own capacities' answers, but nevertheless it could raise the question of the cost-benefit-ratio for the events. The coverage means a lack of regionally balanced events. Indeed, the NDE regional forums have been well balanced in geographically distribution, but according to the member application data several members have not been a part of the CTCN during the time some events of this type were hosted. Together with the need to expand the member-related, private sector events the continuation of the balanced regional forums can help to overcome this issue. Unawareness of events (if an event was conducted during the time of membership of the responses) is an issue of communication that would indicate room for improvement. Attendance of these stakeholders in CTCN events is highly beneficial for the network and should be fostered. The relatively low, but still present, absence of interest should be closely monitored by the CTCN in order to prevent extensive disappointment among the members and even withdrawal from the membership. The results could be unique perceptions, but the author of this thesis believes that at least some kind of interest should be given from all stakeholders since the events strongly benefit in multiple issues (networking, visibility, etc.). If this interest is not given, the general membership of the stakeholders with an absence of interest could be questioned. But it might also just be a lack of attractiveness in the offered type of event so far. In this case, tailor-made and more specific events for technologies and the private sector, as mentioned before, can be a solution to create interest. This is supported by 90% of the respondents intending to participate in future events. That is not unanimous as for the NDEs and makes the author question the membership of the 10 % again, but it is still a highly promising basis for participation and shows interest in the CTCN and its services by a majority. The most desired participants are financial institutions, private sector organizations and NDEs. This can be explained by the wish for securing financial support for projects that allow orders for the members' services, leveraging the dynamics and expertise of the private sector and networking with potential close project partners/customers. Overall, this can be summarized as project finding and networking. The responses show further that the CTC

Network members are mostly interested in technology specific events such as the NDEs and events regarding networking and information on how better to participate in the CTCN's activities. The former could, for example, be interpreted as due to (technology) specializations among some respondents. However, here is a clear potential for synergy effects between the NDEs and the members for the two types of events that has been mentioned in the targets, but lacked availability of data for the analysis. The latter shows the wish for stronger engagement in the CTCN's activities. This is an interesting issue that has only recently been enriched since the Paris Agreement mentioned the role of non-state actors for the first time in their COP outcomes. This opens up opportunities for the CTC Network members and it is a crucial question for the institutions such as CTCN on how to engage them in the climate action (CTCN, 2016f). Further, after reviewing the results of the survey, the CTCN (2016) staff supports the evaluation that these stakeholders desire a higher level of engagement and that they need to pursue this issue. A possible, mentioned approach is to involve them earlier in the TA processes (CTCN, 2016f).

In terms of potential benefits the members are rather unsatisfied in relation to their importance. It has to be stated though that only a limited amount of the respondents has been active in a TA process or attended a CTCN event yet. The more projects are conducted and the more engagement of the members is present, the level of satisfaction may rise. Nevertheless, the present results show the highest level of importance is in partnerships, collaboration and networking, but also that the disparity is here the strongest. This is not necessarily achieved by the conduct of more TA projects. The other services can also provide this benefit that is not satisfactorily covered in their eyes. Therefore, the CTCN needs to set their focus on this benefit in order to align it with the level of importance. There results support the above mentioned wish for networking enabling events as well as participants and overall engagement in the CTCN's activities. This disparity between importance and satisfaction occurs further for international visibility, experience sharing and outreach. Another interesting outcome is focused on commercial opportunities and leaves this potential benefit in the centre of a valuable discussion among the CTCN staff. This benefit has the lowest amount in both importance and satisfaction, but it also has the second strongest disparity. Admittedly, the eight not-for-profit organizations could have impacted the level of importance ranking, which includes exactly eight answers for the least two levels of importance, and make it seem less important. But then they are probably also present in the 15 'N/A' responses, which were available for the respondents as an answer representing the possibility that no experience is present to evaluate this benefit. Further, ten responses each are still given to 'not at all satisfied' and 'slightly satisfied'. This shows that, if assumed that the 'unimportant' answers were given by the not-for-profit organizations and if these answers are neglected for the comparison of the satisfaction and importance, the disparity for commercial opportunities could be even higher. Overall, the results reveal a strong focus on

commercial opportunities due to a relatively high amount of high importance rankings and since it is also supported by several comments during the survey that indicate dissatisfaction with the CTCN since it does not provide enough commercial benefits. The CTCN staff acknowledges this indeed as a critical issue, when pointing out that the CTCN is apparently seen as a simple accelerator of business opportunity. But commercial opportunities are far away from the core service ideas of the CTCN (CTCN, 2016f). Similarly as to the role of the NDEs, this indicates conflicting perceptions between the CTCN and some of the CTC Network members in terms of their relation and dynamics. But it is also crucial to understand what exactly commercial opportunities mean. It does not necessarily represent only direct monetary return from the CTCN or TA projects. It can also be value-added and future opportunities that come out of relationships forged under CTCN or even from policies in a country that are developed with CTCN that opens up possibilities for companies. Therefore, it is of course relevant from CTCN's perspective to point out that it is not supposed to be a direct, monetary profit supplier, but there are strong interests in gaining financial value out of the membership and the CTCN needs to incorporate that. However, one specific statement shows impressively that not all members are only commercially oriented. It is said that the member wishes for closer cooperation with the CTCN in order to better understand how to engage beyond the mission, since the CTCN is at the moment "only seen as a platform to acquire projects" (CTCN NDE survey response). This indicates interests beyond the direct commercial opportunities.

Further, room for improvement in terms of organizational matters is identified by the CTC Network members. The wish for higher flexibility in the distribution process of projects can be seen as a result of the decision that in the beginning of the operations the CPs were supposed to take over the majority of the projects in order to assure a fast start. However, Uosukainen (2016) points out that in the long run the distribution should shift in favor for the CTC Network members and that it should start during 2016. This is supported by the CTCN staff by stating that the CPs are indeed core partners, but not the absolute future (CTCN, 2016f). This is indeed a crucial aspect to maintain a satisfied and occupied network, while in addition more expertise is actually accumulated in the network than in the TRP. Overall, this criticism is another proof for the wish to stronger contribute and to use the membership actively. In regards of the TA project availability, further feedback complains about the transparency and absence of feedback on proposals for projects. The CTCN is aware of this issue and understands that the members need to be informed also in the case of being neglected for the project. But the current resources have not allowed to answer all proposals (CTCN, 2016f). However, it is essential for a member to understand for what reasons they have been neglected and in order to evaluate if they have been even qualified for the project. Otherwise this could develop into a dangerous direction with CTC Network members losing interest and stopping to apply for projects due to frustration and

absence of knowledge on why they are putting effort into an engagement attempt when there is no clarification in response. Thus, the CTCN has to become active in this issue (CTCN, 2016f).

This chapter also aims to evaluate the qualitative targets of the CTCN as presented in Chapter 5.1. It is here not as simple as for the quantitative targets to conclusively say if the targets are achieved, due to the lack of clear indicators. However, it tried to briefly wrap up the results as evaluated above for each target in order to paint a qualitative picture.

In terms of being an **efficient and capable CTC Core Centre** that steers the CTCN, it has to be pointed out that five out of twelve quantitative targets have been fully achieved and the surveys revealed several issues with room for improvement. However, the CTCN under the efforts of the Core Centre managed to accelerate its activities in several crucial aspects such as network membership, submitted and ongoing TA projects and NDE regional forums including training. Further, the CTC Core Centre set up an operational institution that is available for developing countries to engage. That there are still obstacles to overcome can be seen as a natural process for an institution that has to deal with limited resources and is still young in its existence. The establishment and operation of an approach such as the CTCN takes time and requires careful and skillful management. Therefore, under the current circumstances the CTC Core Centre can be evaluated as efficient and capable. The author has no doubt that it will further grow with its task and continuously improve the CTCN.

An adequate level of awareness within the NDEs of the CTCN's services is given for most of currently conducted services, most certainly for the services such as TAs, NDE forums, webinars and website services. Since Uosukainen (2016) points out the existence of prioritization processes within the CTCN in its initial years due to the limited resources, it explains the lower level of awareness of other services. Undoubtedly, there is room for improvement to foster the **visibility and knowledge of these services**. The most important aspect is probably the continuing wish for more information on CTCN's services, even though the awareness is high. It just shows that knowledge provision needs to be fostered further and might have been ineffective in some aspects. However, in terms of the network the quantitative target is met and 191 members were aware of the CTC Network, which led to applying for it. Overall, this target is still considered to be only partially achieved mostly to the expressed wish for (more) knowledge provision.

The **CTC Network** is outbalanced in favour for mitigation measures, but it still features a broad range of institutions covering most of the sectors and all regions. However, the coverage for both is differently dense leaving a lot of work to be done to achieve a completely balanced network that entails all sectors equally and a broad range of institutions from all regions. The satisfaction of the members is relatively low with the potential benefits of being a member in CTCN and criticism is mentioned. These are crucial aspects that can impact the network in terms of

broadness and balance negatively if member lose interest. In the amount of memberships the network achieved its target, but Uosukainen (2016) points out that still hundreds of members are needed to achieve a truly effective network. Overall, it is a valuable and broad network for a time period of 2 and half years. The network manages to cover all requests so far to the best knowledge of the author, even though several projects have been taken care of by the CPs. But the CTC Network requires further attention in terms of management as well as keeping it attractive, punctual expansion as seen in the analysis in Chapter 5.3 and has in general still a long expansion process ahead. However, the target is achieved under the current circumstances.

Awareness of the currently most important and conducted services is given. In addition, the communication with the CTCN is considered as satisfying by the NDEs and CTC Network members. Some aspects such as the absence of communicated feedback to proposals and the reasons 'absence of awareness' for some events in the member survey carry negative weight for this target. In addition, the information provision within the training has been criticized and further training is needed. This could indicate ineffective communication. However, the CTCN is active in terms of training and needs to learn from experiences how to effectively communicate all relevant aspects and what the most crucial topics are. Of course the communication processes can be appropriate, but the unique receivers are not all capable of fully understanding the communicated information. The CTCN staff states in this matter, that this is a personal issue that can vary from NDE to NDE that might not be suitably addressed in a broad way, but rather in personal contact (CTCN, 2016f). This requires further research. Overall, the **sufficient communication** target is still only partially fulfilled due to urgent fields of required improvement.

In terms of **sufficient demand for the CTCN services** the target is achieved. In comparison with the current circumstances the awareness and satisfaction of the conducted services paint a positive picture. Further, the strongly rising amount of TA requests in the recent past shows the increasing demand. Further, the amount of users is high for the website, numerous NDEs wanted to be trained and the NDE regional forums have been a success. In addition, both the NDEs and CTC Network members intend unanimously or with a vast majority to participate in future events.

The NDEs strongly agree to the three theses representing the core services of the CTCN. This is the case even though not all NDEs have submitted a request and not all who have are in the implementation phase yet. This implies **trust and confidence in the CTCN** among the NDEs to fulfil its mission. Indeed, the current outputs and activities of the CTCN show that the institution serves its purpose already, despite the several rooms for improvement. But in terms of the budget, trust and confidence is only partially present. Admittedly, there have been several bilateral donors contributing to the CTCN and its purpose in the past, but the current funding

situation does not show a long line of additional, willing donors. If it is simple absence of interest, negligence of the structure of the CTCN as a compromise from the UNFCCC negotiations or another reason cannot be clarified in this thesis and requires further research. However, the target is achieved since the recipients of the services express their strong agreement to the CTCN fulfilling its mission and the suppliers wish for a stronger engagement, which they would not in the case of absence of trust and confidence that the CTCN can benefit them.

Policy recommendation

The results of the analyses in combination with their evaluation allow the formulation of policy recommendations for the CTCN. The following points out the most important issues that need to be in the focus of the CTCN and its future development.

One of the major issues is the provision of (additional) training and capacities for the NDEs. It needs to be clearly understood what information is missing and how effective the training communication is. Therefore, more training sessions in general need to be provided and the CTCN should undertake follow-up research to clarify the specific lacks of information and training in order to deliver more tailor-made approaches. It could further identify in which issues the previously conducted trainings and their communication methods are lacking quality and therefore enhance the effectiveness of given trainings. The helpdesk, easy-access information materials such as video manuals or print manuals can further deliver individual and thematic approaches. In terms of capacity issues, the CTCN cannot provide material resources per se. This should be on the agenda of the national states of the NDEs. But national empowerment and support are issues that can be channeled by the CTCN into other and higher arenas such as the UNFCCC. This is especially relevant in the light of the Paris Agreement and the INDC's. The CTCN needs to incorporate these matters into their strategic profile and actively promote the role of NDEs within their countries. Further, current geographical scope of the TA requests clearly lacks focus on the urban level. The NDEs need to be empowered in order to approach relevant, urban level-related stakeholders in addition to nation-wide acting benefiters of the CTCN services. This can help the fight against climate change due to the potential and urgencies the cities on this planet have for sustainable development. The here presented measures in training and capacity-issues could also work against the perception of seeing the CTCN and the UNFCCC as a burden and highlight the potential and advantages of the CTCN. This in turn could change the controversial perception of the dynamics and responsibilities between the CTCN and the NDEs.

In terms of the financial situation the CTCN needs to be active in two major fronts. First, possibilities of subsidies for developing countries (or at least LDCs) in order to, for example, enable them to attend CTCN events need to be discussed and if possible implemented. In general, the issue of financial obstacles to fulfill the duties as an NDE needs to be brought to the attention

on a broad level (e.g. the UNFCCC). As an alternative to the CTCN subsidies, the encouragement of public funding for the NDEs from within their countries could also be a possible way to solve the issue. Just a little amount could already help to support the NDE's work. Second, continuing and strong efforts must be shown in the matter of closing the budget gap and for follow-up funding as well as investment opportunities for the TA projects. Here the CTCN can use the synergies between the institution and the FM as well as the potential resulting out of the Paris Agreement (e.g. INDCs) and the possibilities by expanding the network with financial institutions.

The CTC Network members' engagement needs to be fostered as wished by these stakeholders and in accordance with the development in the Paris Agreement. Stronger engagement can create long-lasting attractiveness of the membership, creates ownerships perceptions highly beneficial for the TA projects and can close the disparities between importance and current satisfaction in terms of the potential benefits. It can also tackle the -by the CTCN- controversially perceived stakeholders' perception in regards of the commercial opportunities. In this matter a balance between providing this potential benefit while not losing the focus on the central mission and idea of the CTCN is needed. This is the case since commercial opportunities, in whatever form expressed, will play an important role for the members. The engagement can be enhanced by first of all immediately offering more TAs to the network and reducing the amount taken over by the CPs. In addition, the members could be integrated in even earlier stages in the TA process. In addition, the CTCN staff discussed a possibility of increasing the budget for the CPs that enables them to include network members even in a project taken over by a CP (CTCN, 2016f). This could also be seen as a transition measure for the immediate future. A specific focus in any action in the engagement matter should further be set on the benefit of networking, partnerships and collaboration. Besides the TAs, the CTCN should continue and enhance webinars conducted by network members, communicate and promote them strongly and host attractive events (e.g. private sector events, technology-specific events and the NDE regional forum, etc.) in all regions of the world in order to also reach out to those members with limited resources or doubts in cost-benefit-ratio. Furthermore, transparency and feedback provision for the TA bidding process needs to be given. It could help to communicate the selection and evaluation criteria to the members. In addition, personal contact seems inevitable to help each member to understand for what reason they have or not have been selected. In this way the proposal quality is enhanced and satisfaction among the members can be increased.

Attractive events are mentioned above, but it can be added that tailor-made events according to the desired types and participants of the NDEs and CTC Network members can strongly benefit the perception and attractiveness of the CTCN. This approach can further avoid widespread absence of interest in CTCN events and the simple focus on winning TA bidding processes as well as commercial opportunities Obviously, the NDE regional forums need to be continued as

they are, but they can be improved by incorporating the results of the above mentioned, possible follow-up research in terms of training methods quality and improvements.

The CTC Network requires two overlapping aspects for improvement. First, the network requires constant and strong expansion in the future, as pointed out by the CTCN Director. Second, the network needs a steered, punctual expansion in order to fill the identified shortages. In terms of sector coverage, the inclusion of more adaption focused members and financial institutions should be pursued. Further, the network in the Oceania region (especially in terms of the SDISs) needs to be strengthened. Also, enhancing the coverage of members from developing countries creates possibilities for north-south, south-south and south-south-north member cooperation and enhances the in some cases desired involvement of local actors as well as local ownership. A potential first step could be to leverage the contacts and networks of the NDEs from develop countries[28] and the CPs. Their expertise and project history has probably accumulated a diverse and broad set of contacts. In addition, the CTC Network members can be approached and invited to share information based on their experiences on potential new members with the CTCN. In any case, the recommendations in this matter require a rather proactive approach by the CTCN in reaching out to potential members.

Further, the CTCN needs to maintain and increase the demand for its services. In this matter, enhancement of the awareness of the offered services is crucial. A special focus needs to be set on the services that are already conducted, but also on the services that have been pursued less due to the prioritization process. In addition, the conduct of TAs might be able to be accelerated in order to involve more members in the short-term and to implement more projects in the long-term. This increases the attractiveness for NDEs to request assistance and the network members gain satisfying advantage from their membership. In addition, more successful projects can help to solve several important matters such as the budget situation as well as national support for the NDEs (for both: e.g. increased positive results enhance the importance, visibility and support for the CTCN) and foster the perception that the CTCN is a not burden but a chance (e.g. valuable outcomes of projects in terms of mitigation, adaption, job opportunities, foreign investment or other development related matters). These positive outcomes of TAs in turn need to be communicated sufficiently in order to further attract demand for the services. It can also be helpful to communicate and promote the CTC Network and its benefits and potential among possible new members (e.g. in relevant events outside of the CTCN) and the NDEs. A good basis is already given by the member profiles on the CTCN website. However, these information can be further used by presenting selected members in, for example, a monthly newsletter, CTCN events or similar. In general, the CTCN should focus on the clear promotion of itself in order to tackle the misunderstandings, knowledge deficits among the relevant and potential stakeholders

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[28] In this matter it has to be kept in mind that the NDEs are determined by the national states and are mostly located in already existing offices that deal with climate (technology) related issues.

and to clarify the dynamics and relation between itself and its involved actors. The self-promotion can be undertaken by translating the own success and potentials into 'stories' with clear indicators/outputs, which sets the international focus on the CTCN and increases its value. In this matter, Uosukainen (2016) states that instead of detailed technology and deployment information, these 'stories' need to answer, for example, how many people they have protected from climate change related disasters, how many human settlements are sheltered, how many power lines are installed for how many households, etc. "We have to be able to envision and aim at these outcomes" (Uosukainen, 2016). In other words, the CTCN needs highlight what they are doing for the planet and humanity in terms of climate change.

Methodology and limitations

The chosen methodology produces multiple results for this thesis and the evaluation of operational effectiveness of the CTCN. While the target analysis and the network coverage primarily benefit this thesis, the results of the two stakeholder surveys' have been presented and made available to the CTC Core Centre. The overall evaluation in this matter is positive. The surveys are perceived as highly successful and as professional work that is very useful to the CTCN (CTCN, 2016f). In addition, the CTCN staff points out the value of the results since it represents on the one hand support for in some cases already suspected circumstances and perceptions and provides on the other hand formerly unknown information. The former helps to put emphasis on known issues such as the lack of financial resources for being an NDE and the latter provides insights on matters revealing crucial characteristics such as the perception of commercial opportunities. The results of the surveys are further presented at the CTCN Advisory Board meeting in August 2016 and therefore might be incorporated in future policy development and activities.

In addition, the overall amount of results paints an adequate picture to fulfill the aim of this thesis. The quantitative target and the coverage analysis allow clear identification of operational effectiveness, while the survey helps to investigate the qualitative targets for the operational effectiveness and indicates the stakeholders' perception of the CTCN. All results are coherent as well as complementary and deliver in some cases potential and mutual explanations for why they turned out the way they did. However, limitations in this thesis occur.

First, the target analysis and its value can be critically discussed since in the case of the previously set, quantitative targets it is hard to predict how the CTCN will develop in its initial years. The process of establishment of such an institution also requires flexibility and prioritization processes, which in turn would impact the targets. In terms of the qualitative targets the limitations are set on the challenge to clearly formulate and evaluate them. The author also admits that there are other probably ways to define indicators for these targets. Further, the current situation of the CTCN with limited resources influenced the evaluation of

both target types. Overall, the target analysis approach aims and also succeeds in pointing out matters of success and matters for improvement in a broad but comprehensive way.

Second, the sector and regional coverage analysis is conducted on a broad level, which means only for the main groups of technology sectors and services as well as regions. No attention is spent on detailed sector and region classification as well as on stages of the technology cycle and the coverage in relation to the five main technical assistance forms of the CTCN. In addition, the qualification based on experience and expertise of the network members covering the sectors and regions is not investigated. This could strongly influence the evaluation since a low coverage does not necessarily mean absence of highly qualified institutions or high coverage presence of the latter. These approaches are simply not possible in the given scope and resources of the thesis. Further, the author of this thesis is aware of the necessity of adequate institutions that are actually located within the regions lacking some sort of coverage when recommending a punctual expansion of the CTC Network. The resources and scope of this thesis do not allow further investigation in terms of potential members' availability in the appropriate regions for punctual expansion. Nevertheless, the punctual deficits of the CTC Network need to be gathered and displayed as undertaken in this thesis.

Third, the survey results are not statistically representative for the population since the response rates are relatively low. As a result of the latter, the surveys do not paint a generally applicable picture of the stakeholders' perception. They are further influenced by the specific distribution of respondents. A different distribution can not only change the stakeholders' perception, but also impacts the evaluation of the qualitative targets. In addition, the surveys are only conducted in English, but have been targeted at developing countries and institutions across the world and at regions with differing language structures. Therefore, a translation of the surveys into Spanish and French would probably be helpful to increase the response rates. However, the results are valuable for the thesis and as it turned out for an official UN institution. It has also to be kept in mind that this thesis is conducted with as part of a Masters program and not by an official UN body. In this sense, the response rates are considered as a sufficient by the author of this thesis.

Overall, the results require further research and investigation in several issues, and especially in the light of the surveys not being representative for the statistical population. This would clearly enhance the value of the results for the operational effectiveness of the CTCN. But it highlights in a first step the strengths and weaknesses of the CTCN's operational effectiveness. In addition, this thesis provides an interesting selection of policy recommendation as a direct outcome of the analyses. Even though the recommendations have been presented without taking detailed information on the resource limitations of the CTCN into account, it lists a comprehensive overview of aspects that should be incorporated in the strategic development of the CTCN.

7. Conclusion

The aim of this thesis has been to evaluate the operational effectiveness of the CTCN in its initial years and develop reflections on the ways in which its operation could be developed in the future. The three objectives resulting out of this aim are to critically review CTCN's operations in reflection on its political mandate, to analyze stakeholders' perceptions and to formulate policy recommendations for the CTCN that will increase the effectiveness of the institution. In order to pursue this purpose the thesis has presented the global climate governance regime with its core milestones towards as well as the dominant principles that created the complex framework from which the CTCN emerged. The presented special role of developing countries in terms of climate change substantiates the need for targeted action to support the vulnerable countries in need. Technology transfer has been introduced as a crucial part of the solution to fight climate change and to help the developing countries to develop in accordance with the climate goals of the UNFCCC. Further, it has been pointed out that the CTCN aims to benefit from a network of globally distributed institutions with varying focuses that is needed to provide technical assistance in technology transfer. The overall mission of the CTCN determined by the political mandate has been clarified and thoroughly described. It paints a picture of an ambitious institution with several service areas that support their vision of developing countries having "acquired the capacity, tools, and know-how to develop and upscale technology for climate change mitigation and adaptation" (CTCN, 2013, p. 6). Together, the first chapters have highlighted the enormous but highly important task at hand and have justified the existence of the CTCN.

The comprehensive analyses in this thesis have been threefold and have revealed numerous results beneficial for the research aim. These results determine several policy recommendations that CTCN should pursue in the future. Further, the analyses provide potential to several opportunities for further research in order to fully understand the impact in terms of the here initiated review and evaluation of the CTCN's operational effectiveness.

The major outcomes and the core value of the thesis can be summarized as followed. The CTCN is a crucial actor in the global fight against climate change, but is impeded in its operational effectiveness by limited resources, which can be related to the complexity and the principles in the global climate governance regime, and in being a relatively young institution that needs to meet high expectations in facing a formidable challenge. In terms of the first objective, when reflecting the current operations and activities on the political mandate, the CTCN is well positioned. Admittedly, only five out of twelve quantitative and four out of six qualitative targets are fully achieved. Thus, the institution is not comprehensively active in all initially envisaged services and organizational activities. But given the circumstances impeding the CTCN, the current operations of the CTCN are adequate and successful. The most important and at the

moment prioritized services are conducted and the relevant stakeholders are aware of them, even though matters that require improvement in the future are present. The central aim of delivering TA projects is admittedly behind the envisaged target, but shows impressive acceleration in demand and execution in the recent past. In terms of capacity-building, the CTCN conducts key actions such as training for the NDEs. Overall, the current focus on service provision is adequate due to the prioritization.

The CTC Network is outbalanced in favour for the mitigation technology sectors and includes an unequal distribution of members in the world's region. The thesis reveals the need for a general and punctual expansion, whereas the latter can be guided by the exposed sectoral and regional deficits. However, the CTC Network represents an impressive selection of members for a relatively short period of being operational. It is now necessary to ensure sufficient engagement of the members in CTCN's activities in order to keep the network attractive and growing.

In terms of the second objective, the surveys' results paints an overall positive picture, but also reveals several critical issues that need to be put on the agenda of the CTCN. The NDEs perceive the CTCN relatively well, but point out matters of improvement concerning financial resources, capacity-building and information provision. Further, the results indicate a potential misperception in terms of the dynamics and responsibilities between some NDEs and the CTCN. However, overall the NDEs agree that the CTCN is addressing its three core services. The CTC Network members express a strong wish for (stronger) engagement in CTCN's activities, which shows willingness and interest, but also criticism towards mostly organizational structures and procedures. Currently, relatively strong disparities exist between the importance and actual satisfaction in terms of the benefits as drivers for the membership. From a governance perspective, the network requires the CTCN's attention and careful management. However, the CTC Network members represent strong potential to further develop the CTCN.

The limitations of the results for all three analyses are described in the evaluation and discussion chapter of this thesis. Indeed, the results are influenced by several issues that determine their validity. However, all results are coherent as well as complementary and in some cases they deliver potential, mutual explanations for each other. In addition, the results of the stakeholders' perception analysis have been presented to the CTCN and evaluated as valuable and beneficial for the institution by its staff members. Further, the results continue to be leveraged internally. Overall, they provide a comprehensive and significant overview of the CTCN and its current operational effectiveness. Therefore, the results of this thesis are deemed to be valid. In addition, they allow the formulation of policy recommendations for the CTCN. They focus on training and capacity-related issue for the NDEs, the financial situation of the CTCN, CTC Network member engagement, general and punctual expansion of the CTC Network and maintaining and increasing the demands for the CTCN's services.

Given the current resources and the mission at hand, the results in this theses show that the CTCN is well situated. It is not a surprise that several matters contain room for improvement. However, the many successes the CTCN as achieved should be noted. Their accomplishments in the short time of operations are adequate and promising since the CTCN is providing major services, will continue to deliver as well as improve these services and can also be expected to expand their operations towards so far rather neglected services and activities. In relation to the aim of this thesis, the CTCN is therefore considered as being operationally effective. However, besides all achievements and milestones in the process of fostering technology transfer through such an institution, it is clear that more work lies ahead. The development of the CTCN is far from being completed and it has not reached its limit of performance yet. Thus, it is necessary to continuously review and evaluate the operational effectiveness, as undertaken in this thesis, and to incorporate the results into the CTCN's policies to tailor the institution effectively and to improve the outcomes.

The CTCN is a vital puzzle piece in the global fight against climate change and aligns with the only recently gained hope for tackling climate change after the Paris Agreement, since it ties several, relevant stakeholders together while following its ambitious mission. The developing countries can become active in the challenge and leverage from the offered services, the diverse and numerous CTC Network members including the private sector can support and engage in the climate fight, as acknowledged in the Paris Agreement, while the developed countries can offer support in form of guidance through their own NDEs or with monetary donations that supports CTCN's mission. Possible cooperation's between the TM and the FM promise additional, highly relevant actors to be incorporated in this endeavor. Therefore, the CTCN is an institution that can truly help to achieve a joint fight against the "defining challenge of our times" (Moon, 2015).

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Annex

Annex 1: NDE Survey

Introduction page

 5%

Dear National Designated Entity,

Thank you very much for participating in this anonymous survey.

The survey is part of a Master thesis in the program Sustainable Cities at Aalborg University (Campus Copenhagen) in Denmark and is conducted in cooperation with the **Climate Technology Centre CTC** at UN City, Copenhagen, Denmark.

The aim of the project is to critically analyse and evaluate the previous and current activities as well as services of the **Climate Technology Centre & Network**. The purpose of this survey is to identify CTC Network institution's initial expectations, experiences and perceptions of the CTCN and its services. The results will greatly contribute to this Master thesis.
Further, the CTCN would be interested in the results and may use the them for the prospective development of the Climate Technology Centre & Network.

The survey is not commissioned or conducted by the Climate Technology Centre & Network (CTCN).

The survey will take approx. 5 min.

Kind regards,

Tim Meinert

Disclaimer:

The survey and the Master's thesis are conducted by Tim Meinert. They are an independent work of Tim Meinert and Aalborg University (Copenhagen). The survey and the Master's thesis are not commissioned by the Climate Technology Centre & Network CTCN. The survey and the Master's thesis do not reflect the expressions or any opinion of the part of the CTCN, UNFCCC, UNEP, UNIDO, the Secretariat of the United Nations or United Nations Member States.

*Questions marked with an * require an answer. Further, the progress line told the respondent how much of the survey is completed (in %). However, due to reasons of visibility the progress line is neglected in the following.*

Q1: General information

* 1. Where are you located?

○ Africa

○ Asia

○ Europe

○ Latin America & Caribbean

○ North America

○ Oceania

Q2-4: Awareness of CTCN's services

* 2. How would you rate your awareness of CTCNs *Technical Assistance (TA)* service?

	Not aware	Slightly aware	Moderately aware	Very aware	Extremely aware
Application process	○	○	○	○	○
CTCN response	○	○	○	○	○
Project implementation	○	○	○	○	○

* 3. How would you rate your awareness of CTCNs *Knowledge Sharing* services?

	Not at all aware	Slightly aware	Moderately aware	Very aware	Extremely aware
CTCN Technology library (expected to be fully functional in mid-2016)	○	○	○	○	○
CTCN website services	○	○	○	○	○
CTCN webinars	○	○	○	○	○

* 4. How would you rate your awareness of CTCNs *Networking and Capacity Building* services?

	Not at all aware	Slightly aware	Moderately aware	Very aware	Extremely aware
Sectoral and regional coverage of CTC network members	○	○	○	○	○
Annual NDE Regional Forums (incl. training offered for NDEs)	○	○	○	○	○
Request Incubator Program	○	○	○	○	○
CTCN Secondment Program	○	○	○	○	○
Private sector events	○	○	○	○	○

Q5: Participation in CTCN events

* 5. In how many events (e.g. annual NDE regional forums, private sector events, etc.) of the CTCN have you participated ?

○ 0

○ 1-3

○ 4-5

○ 6 and more

Skip logic: If the answer is '0', the survey continues at Q6. If the answer is '1-3', '4-5' or '6 or more', the survey continues at Q7.

Q6: Participation in CTCN events

* 6. What was the reason for not attending? *Multiple answers possible.*

☐ Unawareness of the events

☐ Absence of interest

☐ Regional coverage (no event close by)

☐ Own capacities (financial resources, time, staff, etc.)

☐ Other (please specify)

[ ]

Skip logic: The survey continues at Q10.

Q7-9: Participation in CTCN events

* 6. In what kind of events have you been participating? *Multiple answers possible.*

☐ Annual NDE regional forum

☐ Private sector event/stakeholders engagement

☐ Training for NDEs

☐ Webinar

☐ Other events/meetings

* 7. How satisfied were you with the event(s)?

	Not at all satisfied	Slightly satisfied	Moderately satisfied	Very satisfied	Completely satisfied	N/A
Annual NDE regional forum	○	○	○	○	○	○
Private sector event	○	○	○	○	○	○
Training for NDEs	○	○	○	○	○	○
Webinar	○	○	○	○	○	○
Other events/meetings	○	○	○	○	○	○

8. If you wish, please elaborate on matters of success and/or matters that require improvement in CTCNs events.

[ ]

Q10: Participation in CTCN events

* 9. Do you intend to participate in CTCN events in the future?

○ Yes

○ No

Skip logic: If the answer is 'no', the survey continues at Q10. If 'yes', the survey continues at Q12.

Q11: Participation in CTCN events

* 10. What are the reasons for not participaing in future CTCN events? *Multiple answers possible.*

☐ Absence of interest

☐ Own capacities (financial resources, time, staff, etc.)

☐ Other (please specify)

[_____]

Skip logic: The survey continues at Q14.

Q12-13: Participation in CTCN events

10. What kind of event would you describe as useful? *Please describe.*

[_____]

* 11. What kind of participants would you want to have in the events? *Multiple answers possible.*

☐ Financial institution

☐ Initiatives

☐ Intergovernmental organization

☐ National designated entities

☐ Non-governmental organizations

☐ Not for profit organizations

☐ Partnerships

☐ Private sector organizations

☐ Regional organization

☐ Research and academic institutions

☐ Public sector organizations

☐ Other (please specify)

[_____]

Q14-15: CTCN Technical Assistance (TA)

11. Are you aware of the technology needs and priorities in your country?

○ Yes

○ No

* 12. Have you applied for CTCN Technical assistance (TA) so far?

○ Yes

○ No

Skip logic for Q15: If the answer is 'no', the survey continues at Q16. If the answer is 'yes', the survey continues at Q17.

VIII

Q16: CTCN Technical Assistance (TA)

* 13. What are the reasons for not having applied for CTCN Technical Assistance (TA) yet? *Multiple answers possible.*

☐ Currently preparing an application for CTCN Technical Assistance (TA)

☐ Insufficient knowledge of the CTCN services

☐ Insufficient knowledge on the application process

☐ Complex application process

☐ Lack of capacities to write applications

☐ Absence/Unawareness of projects suitable for CTCN technical assistance

☐ Received assistance from other organizations

☐ Other (please specify)

[   ]

Skip logic: The survey continues at Q22.

Q17: CTCN Technical Assistance (TA)

* 13. Have you already or are you currently receiving CTCN Technical Assitance (TA)? *Regardless of the stage (first respond received, scheduled or currently ongoing implementation, etc.) of CTCNs Technical Assistance (TA).*

○ Yes

○ No

Skip logic: If the answer is 'no', the survey continues at Q18. If the answer is 'yes', the survey continues at Q20.

Q18-19: CTCN Technical Assistance (TA)

* 14. How satisfied were you with the following aspects of the CTCN Technical Assistance (TA) process? *If you don't have any experiences with one of the aspects please click on N/A.*

	Not at all satisfied	Slightly satisfied	Moderately satisfied	Very satisfied	Completely satisfied	N/A
Application process	○	○	○	○	○	○
Communication with the CTCN	○	○	○	○	○	○

15. If you wish, please elaborate on matters of success and/or matters that require improvement.

[   ]

Skip logic: The survey continues at Q22.

Q20-21: CTCN Technical Assistance (TA)

* 14. How satisfied were you with the following aspects of the CTCN Technical Assistance (TA) process? *If you don't have any experiences with one of the aspects please click on N/A.*

	Not at all satisfied	Slightly satisfied	Moderately satisfied	Very satisfied	Completely satisfied	N/A
Application process	○	○	○	○	○	○
First Response (time and content)	○	○	○	○	○	○
Communication with the CTCN	○	○	○	○	○	○
Cooperation with other CTC network members	○	○	○	○	○	○
Technical assistance implementation (so far)	○	○	○	○	○	○

15. If you wish, please elaborate on matters of success and/or matters that require improvement.

Q22: NDE capacities

* 16. Do you feel you have the necessary capacities (resources, knowledge, etc.) to fulfill the tasks within the CTCN as NDE (coordination, application process, communication, etc.)?

○ Yes

○ No

Skip logic: If the answer is 'no', the survey continues at Q23. If the answer is 'yes', the survey continues at Q24.

Q23: NDE capacities

* 17. What can the CTCN do to help? *Multiple answers possible.*

☐ Provide additional training

☐ Provide additional information on CTCN services

☐ Other (please specify)

Q24-25: Expectations, suggestions & perception

* 18. Have your expectations of the CTCN been met so far?

○ Yes

○ No

○ Absence of specific epexctations

X

19. If you wish, please elaborate on your answer to the previous question. Why have your expectations not been met so far or why have your expectations not been met so far?

20. Do you have any suggestions to improve the CTCN services?

Q24: Expectations, suggestions & perception

* 21. How strong do you agree to the following statements?

	Completely disagree	Disagree	Neither agree nor disagree	Agree	Completely agree
CTCN significantly supports the implementation of climate technologies.	○	○	○	○	○
CTCN improves access to information on climate technologies.	○	○	○	○	○
CTCN fosters collaboration/networking among the stakeholders within the network.	○	○	○	○	○

End page NDE survey

Dear CTCN National Designated Entity,

thank you very much for participating in this survey.

Sincerely,

Tim Meinert

Annex XX: CTC Network institution survey

7%

Dear CTC Network Institution,

Thank you very much for participating in this anonymous survey.

The survey is part of a Master thesis in the program Sustainable Cities at Aalborg University (Campus Copenhagen) in Denmark and is conducted in cooperation with the **Climate Technology Centre CTC** at UN City, Copenhagen, Denmark.

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Further, the CTCN would be interested in the results and may use the them for the prospective development of the **Climate Technology Centre & Network**.

The survey is not commissioned or conducted by the Climate Technology Centre & Network (CTCN).

The survey will take approx. 5 min.

Kind regards,

Tim Meinert

Disclaimer:

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*Questions marked with an * require an answer. Further, the progress line told the respondent how much of the survey is completed (in %). However, due to reasons of visibility the progress line is neglected in the following.*

Q1: General information

* 1. Where are you located?

○ Africa

○ Asia

○ Europe

○ Latin America & Caribbean

○ North America

○ Oceania

Q2: General information

* 2. What kind of organization are you? *Multiple answers possible.*

- [ ] Financial institution
- [ ] Initiative
- [ ] Intergovernmental organization
- [ ] Non-governmental organization
- [ ] Not for profit organization
- [ ] Partnership
- [ ] Private sector organization
- [ ] Regional organization
- [ ] Research and academic institution
- [ ] Public sector organization
- [ ] Other (please specify)

Q3: Initial expectations

* 3. How important were the following potential benefits for your organization in deciding to join the CTC Network?

	Not at all important	Slightly important	Moderately important	Very important	Extremely important
Commercial opportunities	○	○	○	○	○
Partnerships/collaboration/networking	○	○	○	○	○
International visibility	○	○	○	○	○
Experience sharing	○	○	○	○	○
Outreach	○	○	○	○	○

Other potential benefits (please specify)

Q4: CTCN Technical Assistance (TA)

* 5. Have you been or are you currently part of a CTCN Technical Assistance (TA) project?

- ○ Yes
- ○ No

Skip logic: If the answer is 'no', the survey continues at Q8. If the answer is 'yes', the survey continues at Q5.

Q5: CTCN Technical Assistance (TA)

6. What Technical Assistance (TA) project was/is it? *Please describe briefly.*

[   ]

Q6: CTCN Technical Assistance (TA)

* 7. How satisfied are you with the following elements of the project?

	Not at all satisfied	Slightly satisfied	Moderately satisfied	Very satisfied	Completely satisfied	N/A
Communication with CTCN	○	○	○	○	○	○
Project formulation (content, targets, etc.)	○	○	○	○	○	○
Cooperation with other CTC Network institutions	○	○	○	○	○	○
Cooperation with the National Designated Entities (NDE)	○	○	○	○	○	○

Q7: CTCN Technical Assistance (TA)

8. If you wish, please elaborate on matters of success and/or matters that require improvement.

[   ]

Q8: Participation in CTCN events

* 9. In how many events (e.g. annual NDE regional forums, private sector events, etc.) of the CTCN have you participated?

○ 0

○ 1-3

○ 4-5

○ 6 and more

Skip logic: If the answer is '0', the survey continues at Q9. If the answer is '1-3', '4-5' or '6 or more', the survey continues at Q10.

Q9: Participation in CTCN events

* 10. What was the reason for not attending? *Multiple answers possible.*

☐ Unawareness of the events

☐ Absence of interest

☐ Regional coverage (no event close by)

☐ Own capacities (financial resources, time, staff, etc.)

☐ Other (please specify)

Skip logic: The survey continues at Q13.

Q10: Participation in CTCN events

* 10. In what kind of event(s) have you been participating? *Multiple answers possible.*

☐ Annual NDE regional forum

☐ Private sector event/stakeholder engagement

☐ Training for NDEs

☐ Webinar

☐ Other events/meetings

Q11: Participation in CTCN events

* 11. How satisfied are you with the event(s)? *If you haven't attended the type of event please click on N/A.*

	Not at all satisfied	Slightly satisfied	Moderately satisfied	Very satisfied	Completely satisfied	N/A
Annual NDE regional forum	○	○	○	○	○	○
Private sector event/stakeholder engagement	○	○	○	○	○	○
Training for NDEs	○	○	○	○	○	○
Webinar	○	○	○	○	○	○
Other events/meetings	○	○	○	○	○	○

Q12: Participation in CTCN events

12. If you wish, please elaborate on matters of success and/or matters that require improvement in CTCNs events.

Q13: Participation in CTCN events

* 13. Do you intend to participate in CTCN events in the future?

○ Yes

○ No

Skip logic: If the answer is 'no', the survey continues at Q14. If the answer is 'yes', the survey continues at Q15.

Q14: Participation in CTCN events

* 14. What are the reasons for not participaing in future CTCN events? *Multiple answers possible.*

☐ Absence of interest

☐ Own capacities (financial resources, time, staff, etc.)

☐ Other (please specify)

[ ]

Skip logic: The survey continues at Q17.

Q15: Participation in CTCN events

14. What kind of event would you describe as useful? *Please describe reasons.*

[ ]

Q16: Participation in CTCN events

* 15. What kind of participants would you want to have in the events? *Multiple answers possible.*

☐ Financial institution

☐ Initiatives

☐ Intergovernmental organization

☐ National designated entities

☐ Non-governmental organizations

☐ Not for profit organizations

☐ Partnerships

☐ Private sector organizations

☐ Regional organization

☐ Research and academic institutions

☐ Public sector organizations

☐ Other (please specify)

[ ]

Q17: Satisfaction & suggestions

* 16. How satisfied are you with the CTCN services in terms of the following benefits?

	Not at all satisfied	Slightly satisfied	Moderately satisfied	Very satisfied	Completely satisfied	N/A
Commercial opportunities	○	○	○	○	○	○
Partnerships/collaboration/networking	○	○	○	○	○	○
International visibility	○	○	○	○	○	○
Experience sharing	○	○	○	○	○	○
Outreach	○	○	○	○	○	○

Q18: Satisfaction & suggestions

17. Do you have any suggestions to improve the CTCN services?

End page NDE survey

Dear CTC Network Institution,

thank you very much for participating in this survey.

Sincerely,

Tim Meinert

Annex 3: Question catalogue for interview with CTCN Director

The following represents the general question catalogue developed for the interview. In addition, several smaller and detailed questions have been asked for clarification and during the discussion initiated by the questions.

1. **How does CTCN fit into the global governance regime under the UNFCCC?**
2. **How would you describe the process of CTCN establishment?**
3. **What role do intellectual property rights play in technology transfer at CTCN?**
4. **How do you evaluate the current funding situation?**
5. **How would you evaluate the current coverage of the network?**
6. **What is CTCN doing in terms of follow-up funding?**
7. **Could you elaborate on the procurement/bidding process?**
8. **Could you elaborate on the responsibilities of the Consortium Partners and the CTC Network members?**
9. **Where do you see CTCN's future/what does the institution want to be?**
10. **Do you have additional information you want to share?**

## Annex 4: Applications for membership in CTC Network
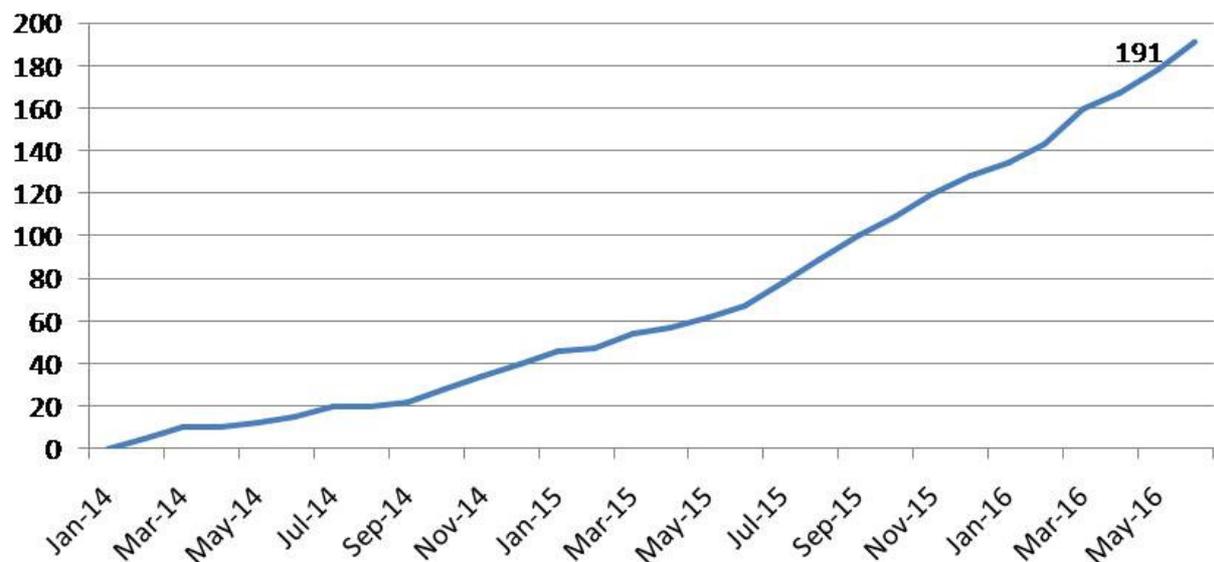
Source: Edited based on CTCN (2016b).

Annex 5: CTC Network regional coverage by registration
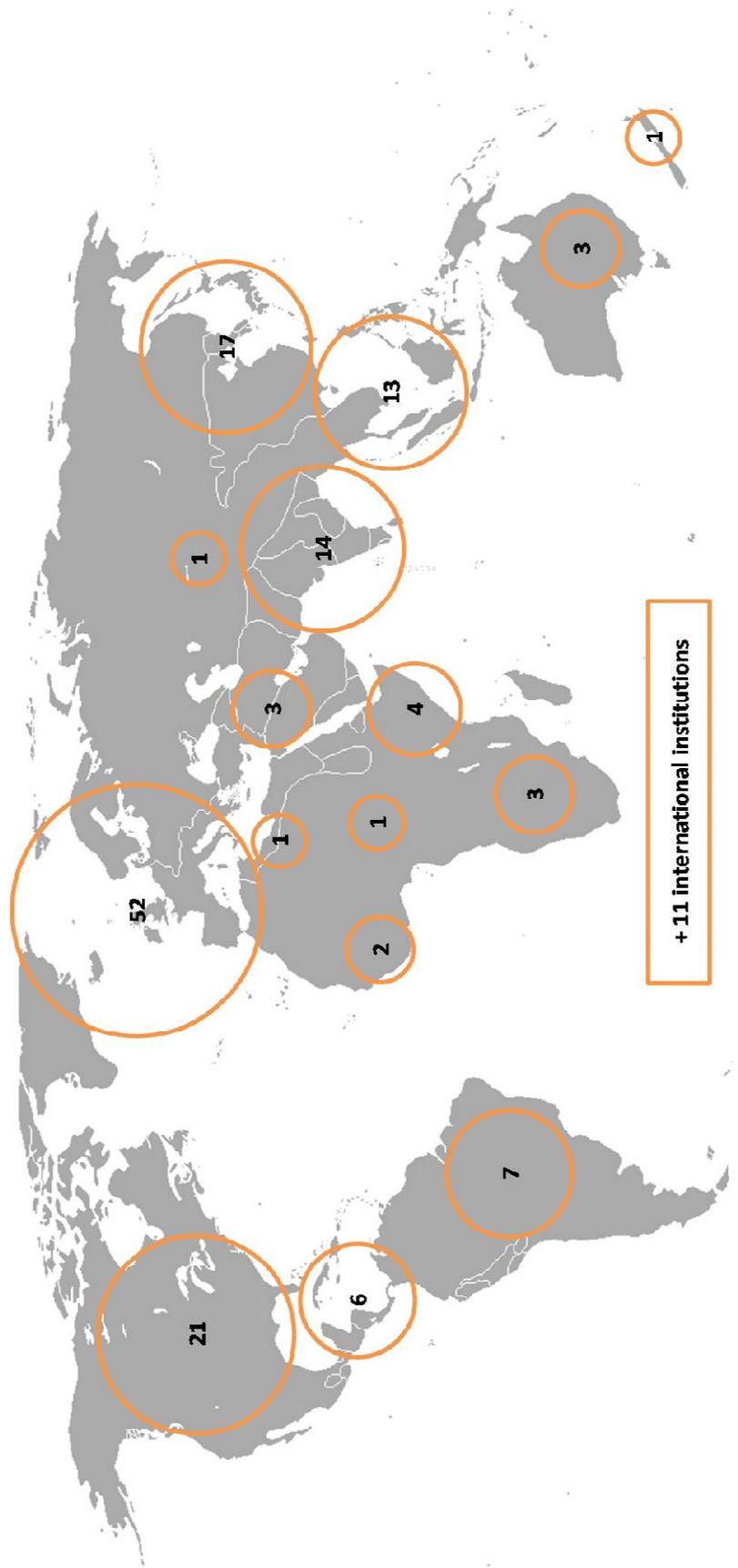
Source: Edited based on CTCN (2016b).

Annex 6: CTC Network regional coverage by reach

XX