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What Leads to the Success of Climate Technology Centre and Network Pro Bono Technical Assistance?

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ABSTRACT

Recently, there has been increasing interest from the Conference of the Parties of the United Nations Framework Convention on Climate Change (UNFCCC) and the Climate Technology Centre and Network (CTCN) advisory board on receiving pro bono support, additional financing, material, and expert support that may be provided by donors and other partners. However, there are no specific guidelines or procedures on pro bono support that may be referenced by interested parties. The Republic of Korea is one of the most active participants of pro bono support, providing up to 13 Technical Assistance (TA) as of 2020. This research is aimed at identifying the critical success factors (CSFs) of CTCN TA based on its project life cycle to derive the best practices for future references. This was undertaken using a pair-wise comparison of the analytic hierarchy process to responses from relevant stakeholders with experience in conducting CTCN TA. Then, we observed the causal mechanism of the most important factors by tracing the process of the previous two pro bono TAs provided by the Korean National Designated Entity (NDE). This analysis showed that effective stakeholder consultation and project substantiality was the most important success factor throughout the project life cycle. Additionally, evidence from the two pro bono TA cases was retrieved to identify the causal mechanisms underpinning these factors.

Key words: *Climate Technology Cooperation, Technology Mechanism, CTCN, Technical Assistance, Critical Success Factor, Analytic Hierarchy Process, Process Tracing*

1. Introduction

Over the last couple of years, interest in pro bono support for the Climate Technology Center and Network (CTCN) has grown considerably. The 25th Conference of the Parties (COP) of the United Nations Framework Convention on Climate Change (UNFCCC) requested the CTCN to analyze the experience and lessons learned from pro bono and in-kind contributions and to present to COP the following year (UNFCCC, 2019a). The CTCN has reported in its Joint Annual Report with the Technology Executive Committee (TEC) to extract the best practices associated with the provision of pro bono support (UNFCCC, 2019b). Despite this interest, there has been limited information and research on pro bono support and how it should be implemented. Moreover, specific guidelines or procedures on CTCN pro bono support that may be referenced by interested parties is missing. This study is designed to bridge this gap and evaluate case studies to elucidate the best practices.

The CTCN was established as the operational arm of the Technology Mechanism under the UNFCCC. The 16th

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COP mandated the CTCN to accelerate the development and transfer of environmentally sound technologies to developing countries (UNFCCC, 2010). Since its operation in 2014, CTCN has received 204 technical assistance (TA) requests from developing countries, 89 of which have been completed (CTCN, 2020a). However, it continues to confront challenges in securing financial resources. Since 2017, the CTCN has been mobilizing voluntary contributions from network members, including the National Designated Entities (NDE), in the form of in-kind contributions or pro bono support (CTCN, 2018). The Ministry of Science and Information and Communications Technology (MSIT) of the Republic of Korea (i.e., the Korean NDE), first provided pro bono support of 440 million KRW in 2018 to implement three TAs and 750 million KRW in 2019 for four TAs (Table 1). The objective was to provide additional financial support and technical expertise from Korea for the implementation of pending TA requests.

During the first phase of the implementation of the Korea pro bono support, the need for a clear and stepwise guideline was identified. In order to develop this guideline, there is a need for an in-depth analysis of the CTCN TA and pro bono TA beforehand to identify what is the success factors that will decide the successful completion of the project and sustainability of its outcomes. Then, the findings from this research can be aligned with the newly developed Korea's CTCN pro bono program guideline. Furthermore, to the best of our knowledge, this is the first study to investigate the critical success factors of a CTCN pro bono TA. The results of this research can guide related decisions for promoting CTCN pro bono support.

2. Existing Success Factors in the Literature

There are many research studies that have focused on the success factors of projects. Abdullah et al. (2010) classified the success factors from previous research according to focus areas of traditional and non-traditional success factors, type of industry, phase in the project life cycle, level of success, the country of research, and the models of success. This implies that project success factors listed in the existing literature are not universal and vary between projects (Shenhar et al., 2002). Some studies have highlighted different characteristics of international development projects in their objectives with less tangible, visible, and measurable deliverables and the involvement of various and separate stakeholders such as the funding agency, implementer, and target beneficiaries (Khang and Moe, 2008; Ika et al., 2012).

Consideration should be given to involving all stakeholders throughout project management in order to observe the success factors in a development project with various stakeholders. Successful projects are dependent on the way in which the project has been managed and controlled (Zarina Alias et al., 2014). Therefore, to manage projects successfully, project managers may consider

Table 1. List of TAs supported by the Korean NDE

Year	Countries	Pro bono TA Title	Phase
2018	Ethiopia	Financing strategy for Addis Ababa Light Rail Transit	Completed
	Serbia	Modernization of the district heating system and improvements of energy efficiency of buildings in Belgrade	
2019	Sri Lanka	Development of Kurunegala as a climate smart city (Adaptation element)	Implementation
	Sri Lanka	Development of Kurunegala as a climate smart city (Mitigation element)	
	Cambodia	Development of low-emission mobility policies and financing proposal	
	Togo	Deployment of solar energy technology in Togo's rural areas	
	Tanzania	Sustainable domestic water pumping using solar photovoltaic cells	

utilizing project management tools and techniques that match the characteristics of phases and are significant contributors to success measures in each phase of the project life cycle (Patanakul et al., 2010). The life cycle of most projects may be divided into sequential phases, with each containing different activities, key actors, deliverables, different approaches to how deliverables are controlled and approved (PMI, 2013). The life cycle provides the basic framework for managing the project, regardless of the specific work involved.

This study builds on previous research on the critical success factors (CSFs) of international development projects carried out by Ika et al., (2012), Khan and Spang (2011), and Khang and Moe (2008). Ika et al., (2012) summarized the project success criteria for international development project management as relevance, efficiency, effectiveness, impact, and sustainability. Relevance relates to whether the project is compatible with the priorities of the recipient and the donor. Efficiency means achieving the desired results using the least amount of resources possible. Effectiveness relates to whether the project meets its objectives and impact is based on any positive or negative changes as a result of the project. Lastly, sustainability relates to when the benefits of the project continue after it has been completed. The CSFs from this research were organized into five factors: monitoring, coordination, design, training, and institutional environment. These CSFs reflect the project success criteria.

Khan and Spang (2011) deduced CSFs from the literature into four factors: organizational, project, people, and national. Organizational factors include risk management, communication, sufficient resources, and senior management support. Project factors include factors such as project size, project duration, and clear and realistic objectives. Stakeholder influence, project manager, and commitment are part of the people factor. Lastly, factors such as political, legal, environmental, and technical factors were grouped as national factors. Khang and Moe (2008) adopted a life cycle-based framework in which the success in each phase provides favorable pre-conditions to implement the remainder of the project. They summarized the success criteria and factors for the four life cycle phases of international development projects; conceptualizing, planning, implementing, and closing. The success criteria for one phase becomes part of the success factors for the subsequent phase. Martens and Carvalho (2016) considered sustainability in project management; although there is a gap in considering sustainability in the literature and in practice, they considered sustainability in terms of economy, environment, social and the interaction between different stakeholders and tradeoffs.

CTCN presented the TA success factors for designing and developing a TA response plan. In the design stage, the four success factors included (1) identification of a specific area of intervention; (2) providing a missing component leveraging existing resources and capacity; (3) commitment and interest of requested proponent, stakeholders and beneficiaries; and (4) identification of expected results and specific plans to use deliverables. The five success factors in the response plan include (1) the commitment of the expert; (2) engagement of key actors; (3) plans to use the results; (4) autonomy of the results; and (5) the timeliness of the work (CTCN, 2015).

3. Methods

This research is designed to reflect factors from previous literature with universal criteria and factors of project success to the CTCN TA. The CTCN TA process was classified into its project life cycle, and the CSFs were organized according to each life cycle. Each phase of the life cycle and project CSFs were defined based on the activities, entities, and deliverables of the CTCN TA. Then, CSFs were evaluated using the analytic hierarchy process (AHP) to list the factors according to perceived level of importance. The most important CSFs were used to formulate a causal mechanism underpinning a successful CTCN TA. To observe the causal mechanism between the CTCN TA and its success, two Korean CTCN pro bono TA cases were analyzed using a process tracing method.

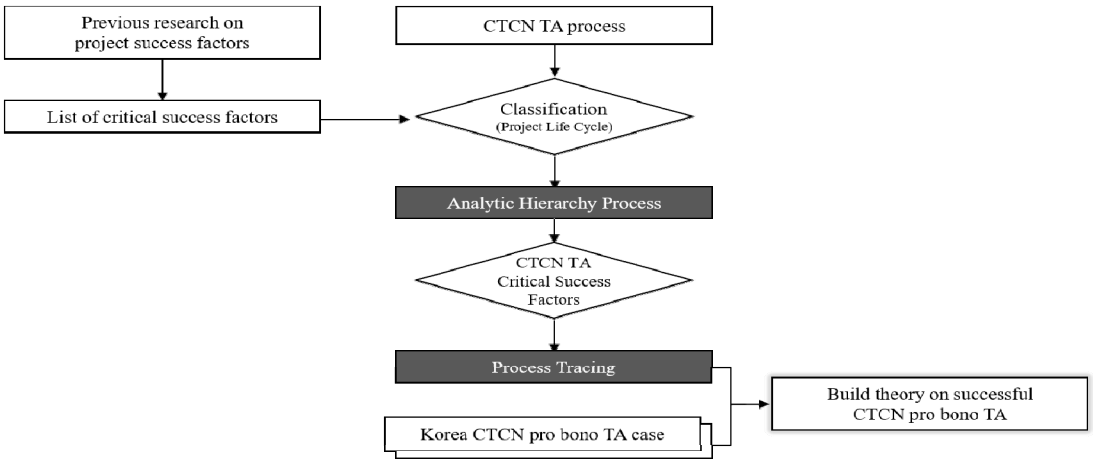

Fig. 1. Research flowchart

3.1 Analytic Hierarchy Process

This method reflects the thought process involved in decision-making, hierarchical thinking, relative importance, and logical consistency (Saaty, 2008). Thus, a successful CTCN TA sits at the top of the hierarchy, followed by the four stages of a CTCN TA life cycle and the success factors of CTCN TA.

Fifteen people with relevant expertise or experience on the CTCN TA were selected for pair-wise comparison through an online survey. These people consisted of three climate technology researchers who have participated in a CTCN TA, two CTCN secretariat staff responsible for monitoring and evaluation (M&E) and Asia region adaptation, four NDEs from Cambodia, Tanzania, Serbia, and Sri Lanka, three experts with experience in implementing the CTCN TA, one development expert who was a former regional manager at the CTCN secretariat, and two experts from a multilateral development bank. The questionnaire was designed in two levels; the first level inquired regarding the most important phase in the four stages of the project life cycle, whilst the second level requests the most important success factors for each project life cycle. The inconsistency ratio of each response was controlled under 0.1 to ensure consistency in the responses.

3.2 Process Tracing

After establishing a theory based on the findings of the AHP, a process tracing method was used to test the theory. Process tracing explains how the decision is made, its sequence, and the interactions made between different variables in a causal mechanism; a complex system where processes bind the causes and outcomes together (Glennan, 1996). This method was applicable in this research as it deals with the success factors that affect the life cycle of a CTCN TA. A CTCN TA involves various stakeholders and lacks tangible outcomes, similar to characteristics of other international development projects. In addition, the life cycle of a project is process oriented, where pre-conditions of one stage impact the next phase in the cycle. This logic, linking one cycle to the next, resulting in a successful CTCN pro bono TA may be observed using process tracing.

By tracing the process of Korea's two CTCN pro bono TA cases, this study specifies the intervening causal process between the CTCN pro bono TA and the outcomes of success factors from each life cycle (George and Bennett, 2005). All activities in each phase were empirically assessed using the traces left behind. This research utilizes the theory-building process tracing to observe a plausible hypothetical causal mechanism whereby X, a CTCN pro bono TA, is linked with Y,

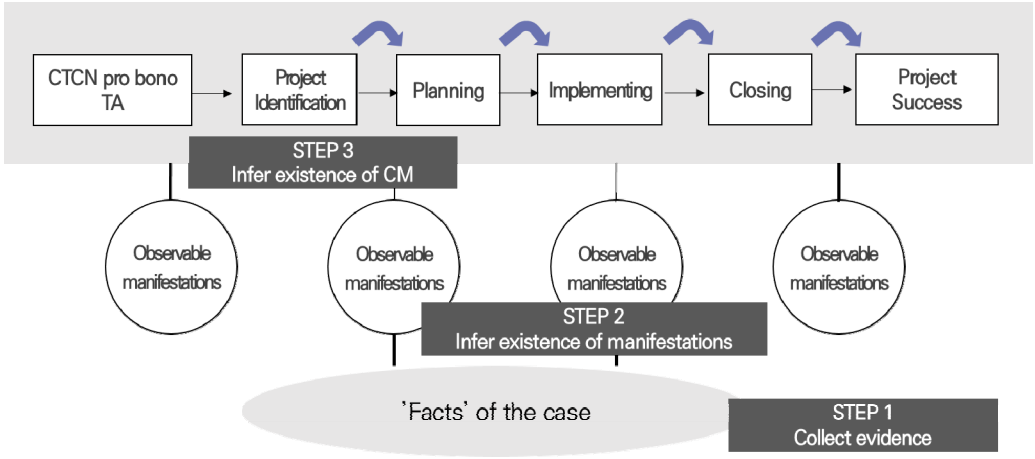

Fig. 2. Theory-building process tracing framework from Beach and Pedersen (2013) redesigned to reflect the case study

project success (Beach and Pedersen, 2013). To observe the underlying causal mechanism of the CSFs of the CTCN TA, the research applied a three-step process (Fig. 2). First, evidence was collected by searching through an empirical record. For this case study, evidence was gathered through the TA request form, the response plan, the deliverables submitted to the CTCN (available from its official webpage), and an in-depth interview (IDI) with the relevant personnel of each pro bono TA case. In the second step, the observable empirical evidence was inferred to reflect the selected CSFs. During the last step, the observable manifestations were again inferred to reflect the most important CSFs drawn from the AHP, an underlying causal mechanism.

4. Results

4.1 Classification and Definition of Success Factors of the CTCN TA

The overall process of the CTCN TA was classified into four stages: project identification, planning, implementation, and closing/completion. Each stage was defined according to the activities according to the activities involved, stakeholders, and the deliverables generated. The project identification stage is when the academic, government, non-government organizations (NGOs), and/or private sector representatives work with their NDE to identify the type of technical assistance they require to implement their technology-related climate plans (CTCN, 2020b). Then, the NDE submits the TA request to the CTCN, and the CTCN secretariat evaluates eligibility and undertakes prioritization (CTCN, 2015). The planning stage is the design of a response plan. Once a TA request is selected, the secretariat forms a team to design the plan and the terms of reference based on the response plan for network members to apply for a bidding process to be evaluated and selected for contract. The implementation stage is where the implementer delivers TA as per the response plan. The final stage is the closing/completion phase where implementers deliver all products and reporting requirements. They also monitor project impacts based on the impact monitoring plan, whilst the CTCN secretariat shares and disseminate the results from the TA.

The success factors retrieved from the literature were listed and defined under each life cycle of the CTCN TA. The success factors of the project identification phase included having a clear understanding of the CTCN, competencies of project designers, effective consultation with primary stakeholders, and innovative technology.

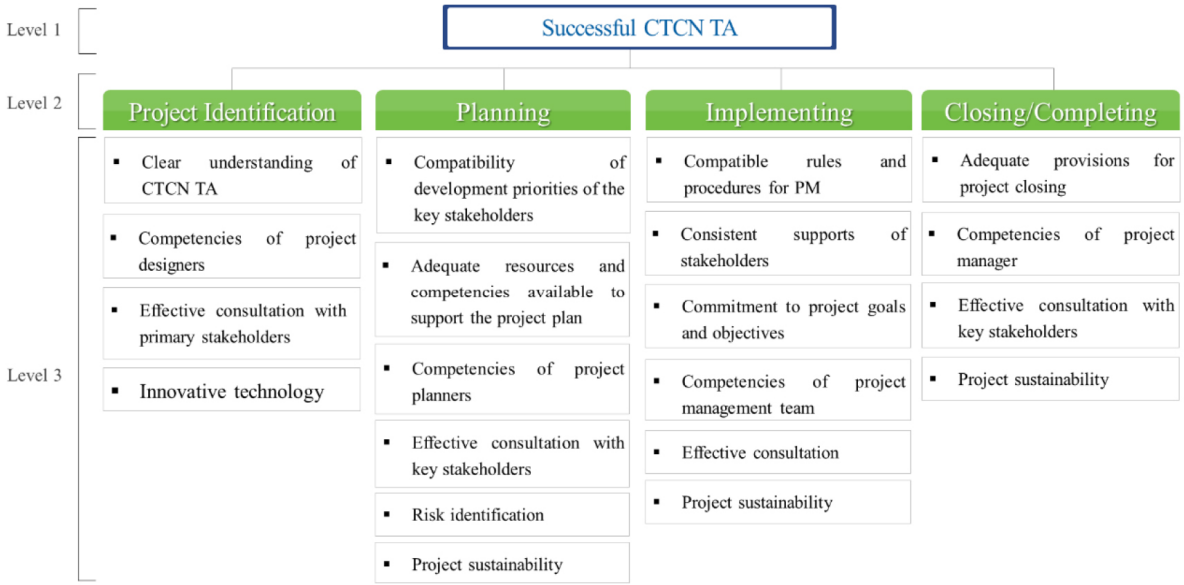

Fig. 3. The hierarchical structure of the model

The success factors during the planning phase include the compatibility of development priorities of key stakeholders, availability of adequate resources and competencies to support the project plan, competencies of project planners, effective consultation with key stakeholders, risk identification, and project sustainability. The success factors during the implementation phase included compatible rules and procedures for Project Manager (PM), consistent support of stakeholders, commitment to project goals and objectives, competencies of the project management team, effective consultation, and project sustainability. The success factors for the closing phase included adequate provisions for project closing, project manager competence, effective consultation with key stakeholders, and project sustainability.

4.2 Analytic Hierarchy Process

The results of the pair-wise comparison of the CSFs from each CTCN TA's life cycle show that relevant experts were considered the most important CSFs in each stage. During the project identification stage, effective consultation with the primary stakeholders was considered the most important. This CSF was also the most important for the planning phase. In the implementing and closing phases, project sustainability was considered the most important CSF (Fig. 4). The two CSFs recognized as the most important, effective consultation and project sustainability, overlap throughout the life cycle. This finding was used to build a theory of a successful CTCN TA; effective consultation being the most important during the project identification/planning phase, and project sustainability being the most important during the implementing/closing phase. The inconsistency rates of each phase were 0.038 for project identification, 0.01 for planning, 0.015 for implementation, and 0.001 for closing/completion, well below 0.1, respectively.

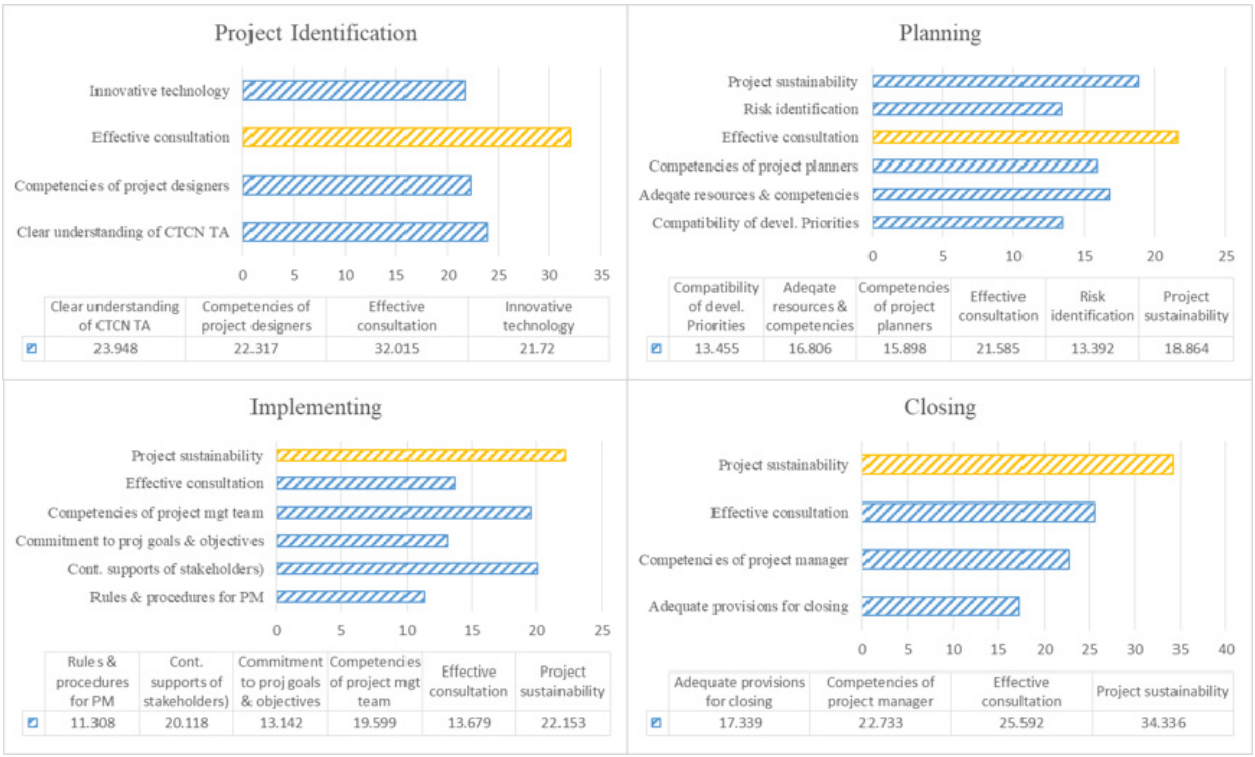

Fig. 4. Results from the AHP pair-wise comparison

4.3 Process Tracing

The process associated with Korea's two CTCN pro bono TAs were sorted into activities and entities involved based on a thorough review of the submitted deliverables and IDI. All CSFs were considered to observe the significance of the most important CSFs as per the AHP survey. The success factors considered the most important for each stage shared similar levels of importance. The entities involved were a distinct feature of Korea's CTCN pro bono TAs (Tables 2 and 3).

4.3.1 Serbia

Although it was the first time that Serbia had received TA from the CTCN, the Serbian NDE had a clear understanding of its role and the expected outcome from the TA. This was because he had considerable experience with UNFCCC negotiations and was already aware of the Technology Mechanism and the CTCN. In terms of the competencies of project designers, the involved entities were the CTCN secretariat and its staff, the Proponent, the Serbian NDE, and responsible personnel from the District Energy in Cities Initiative. The latter entity is a multi-stakeholder partnership that had already developed an action plan for district energy in Belgrade. They initiated the project because they captured an opportunity to carry out the action plan to study available renewable energy sources to connect to the existing district network. They spoke with the Proponent and the Serbian NDE and participated in developing the TA request form. In the TA request form, the development of the request was described as 'A delegation from the City of Belgrade participated in a joint workshop … organized by the IFC and the District Energy in Cities Initiative… where they were informed about CTCN and met with the UNEP delegations to discuss potential opportunities … to benefit from the CTCN …' (CTCN, 2020c). Moreover, the response plan explained that the TA 'builds on

components 1 and 2 of the project … adding the renewable and waste heat sources component is not covered by the previous project' (CTCN, 2020d). The Initiative, which has already achieved effective consultation with the primary stakeholders, was able to provide an identified and detailed demand for TA. The technologies under consideration included renewable energy such as solar, geothermal, biogas, biomass, and heat pumps. The distinct feature during this stage was the role of the Initiative and the responsible personnel, an intermediary, linking the deliverable to a different funding source (i.e., the CTCN TA), and consulting with stakeholders to develop this project.

In the planning stage, the relevance of TA to the development priorities of key stakeholders was clearly identified in the response plan. Usually, it takes approximately 40 working days for the CTCN secretariat to form a team to develop a response plan (CTCN, 2015). For this pro bono TA, the response plan was developed by CTCN together with the Serbia NDE and the UNEP District Energy in Cities Initiative. However, after this TA was selected for the pro bono support, the response plan needed revision and adjustments since the scope was to large for the budget the Korean pro bono support initially allocated.. A new intermediary, the Green Technology Center (GTC), a CTCN network member that supports the Korean NDE and its activities, participated in developing the response plan. After this TA was selected for pro bono support, the requested budget of the project alongside the activities of the TA had to be adjusted. According to the GTC researcher involved in the discussions, "GTC participated in the consultations with the Serbian NDE in the adjustment process." As for risk identification, the CTCN TA had not yet considered risk identification in developing the response plan. The sustainability of the project was considered in the response plan to align with the Initiative. In this phase, the intermediary agent such as the GTC for the Korean NDE was able to reach a plausible agreement by actively participating in the discussion of response plan development.

In the implementation phase, CTCN did not provide rules and procedures for the PM other than what had been stated in the contract. For this pro bono TA, the GTC, a third party that supports its country's NDE, monitored and provided recommendations to the implementing agency throughout the entire TA process. However, these recommendations had not been documented. Stakeholders such as the Serbian NDE and GTC had an interest in the TA and continued their support. The implementing agency was committed to the project goals and objectives, and they assisted in conducting internal monitoring meetings once a month to check on progress. The project management team had substantial experience in international projects. All stakeholders, the implementing agency, GTC, related ministries, city government, the Proponent, and the Serbian NDE participated in the consultation. However, there were times when discussions did not reach an agreement. For example, retrieving the waste heat from the nearby power plant was outside the jurisdiction of stakeholders who had requested the TA; discussions with the central government were required. Therefore, the waste heat was excluded from the list of assessable renewable energy options. Project sustainability required additional consultation with all relevant stakeholders. Although biomass was one of the renewable options considered in this TA, its application was limited by law. In the final report, it was stated that the 'national level has extremely limited competencies in regulating district heating' (CTCN, 2020k). For the TA's results to continue, law and institutional arrangements need to be examined and relevant in-country stakeholders should be included in discussions. For this TA, "the European Bank for Reconstruction and Development (EBRD) participated in meetings from the very first mission and discussed on the deliverable of the TA in order to scale up as an EBRD project", as described by an implementer. In the final TA report submitted to the CTCN, an annex was included with other possible supporting schemes to develop renewable heat projects.

In the closing phase, CTCN did not provide provisions for closing, although the implementer was expected to submit a closure report to the CTCN. According to a technical expert from the implementing group, all deliverables, including the closure report, were distributed

Table 2. Conceptualization of the causal mechanism in the Serbia pro bono TA

	Project Identification Effective consultation	Planning Effective consultation	Implementing Project sustainability	Closing Project sustainability
Activity	Identified the need to bridge the financial gap in the previous project and consulted the NDE and Proponent to develop a CTCN TA with a goal.	Participated in the development of the response plan and in consultation with the Serbian NDE, to accordingly adjust the budget of the TA and the activities	Advised the deliverables from the TA to reflect the requirements to qualify for EBRD funding	Developed an ROK ODA funding proposal (submitted and approved; currently under financial screening)
Entity	District Energy in Cities Initiative	GTC	EBRD	GTC

on time as initially planned in the detailed work plan." Consultation occurred between all relevant stakeholders at the last mission to Serbia. To secure project sustainability, GTC developed an Official Development Aid project proposal of Republic of Korea with one of the implementing teams. This was entitled 'Incorporation of Smart Monitoring System using IoT Technology for District Heating and Establishment of Renewable Energy Integration Network Plan in the District Heating system of Belgrade', and had a duration of 24 months and a budget of $550 000 USD.

4.3.2 Sri Lanka

During the identifying the project phase, the Sri Lankan NDE did not have a sufficient understanding of the CTCN TA and its areas of support, despite their experience with the UNFCCC. This was because this was the first time the Sri Lankan NDE had experience with a TA. The Sri Lankan NDE, as the country's focal point of the UNFCCC, was responsible for all climate change-related issues in the country. The NDE had intended to make a climate smart city model in Kurunegala and disseminate this model to other cities. According to the request form, there was a 'CTCN workshop held in Sri Lanka in August 2016,' and the CTCN website describes that a 'CTCN Network and Capacity Building Manager introduced CTCN ⋯ shared good examples on CTCN request (CTCN 2020d; CTCN, 2020j).' This led to the development of the request form.

During the planning phase of the CTCN TA, the priorities of the recipient country are considered when developing a response plan. To develop this particular plan, the participants included the Korea Environment Institute, implementer, GTC, an intermediary organization representing the Korean NDE, the CTCN secretariat, and the Sri Lankan NDE. Effective consultation was a key issue during this phase of the project, as stakeholders had different demands and needs. For example, the manager from the CTCN secretariat wanted to add activities using the geographic information system (GIS). The Sri Lankan NDE requested that the adaptation and mitigation aspects of smart city development be considered in a single TA, which would exceed the estimated budget. This is stated in the request form submitted by the Sri Lankan NDE where it indicates the 'development of a framework and a comprehensive master plan for establishing a "Climate Smart City" for Kurunegala' (CTCN, 2020e). According to a researcher at GTC, "GTC discussed with the NDE whether they need the GIS component to be added to the TA and requested to share with the CTCN secretariat, there are GIS experts but lack quality data to run the program. As per Sri Lanka's request for both the mitigation and adaptation to be included in the TA, the regional manager of the CTCN secretariat managed to persuade the Sri Lanka and Korea NDE to develop two separate TAs." This meant that a more urgent need was then reflected in the response plan. To minimize the risk, a local consultant was contracted to collect and produce local data. Project sustainability was not considered at this stage.

During the implementation stage, the GTC monitored and provided recommendations to the implementing

agency throughout the entire TA process; this was similar to the Serbian case. While the GTC supported the implementer, the Sri Lankan NDE also actively participated in the TA by assisting with communication and arranging logistics during mission trips. The implementing agency was committed to the TA and submitted all planned deliverables according to schedule. It had sufficient expertise to carry out the TA and actively hired international and local experts; this is described in the inception workshop report, deliverable 2. The GTC assisted the implementing agency in understanding the process and the distinct features of the CTCN TA throughout project implementation. All relevant stakeholders were available for effective consultation utilizing assistance from the Sri Lankan NDE and the local consultant embedded in the project team. The local consultant was hired from the beginning of the implementation phase to gather and generate data and coordinate meetings. In deliverable 2, the inception workshop report, the candidates of the local consultancy team were the Ministry of Mahaweli Development and an Environment member. The local consultancy team were to undertake tasks such as data collection, literature review, survey conduction, review of indicators, and capacity building gap reporting. Efforts to attain project sustainability were focused on installing a unit inside the municipality to continue the outcomes from the TA. In deliverable 5.1, it is indicated as '…establishing a 'Climate Cell' in the Province and to develop their own Provincial Adaptation Plan.'

During the closing of the TA, the provisions for closing and the competencies of the implementer were similar to the Serbian case. However, for this TA, the Sri Lankan NDE requested that a roadmap for a smart city was established, which had not been agreed in the planning phase. To best meet the requests of the recipient and secure project sustainability, the implementer developed a manual and an excel template for city officers to directly conduct vulnerability and risk assessments. The climate change adaptation planning manual, in deliverable 6.1, indicates that 'the manual is intended for local planning officials' (CTCN, 2020f). To scale-up the project, GTC utilized the pre-feasibility study on water purification technology, as identified from the vulnerability assessment from the TA in deliverable 4.1, to develop a Korean ODA funding proposal entitled the 'Climate-resilient drinking water supply using a gravity-driven membrane (GDM) in Kurunegala' with a duration of 24 months and a budget of $850 000 USD.

5. Discussion

During the process tracing analysis of the two pro bono TA cases, the role of two different entities was newly identified to be critical throughout the project cycle.. The intermediary institution, a distinct role in the pro bono case, advised the NDE to clearly identify the request for a TA, aided the project implementer to communicate with its key stakeholders and scaled-up the project. The active engagement of the NDE enabled identification of the TA according to its national plans and priorities and ensured that sustainability was secured in its implementation.

Table 3. Conceptualization of the causal mechanism in the Sri Lanka pro bono TA

	Project Identification Effective consultation	Planning Effective consultation	Implementing Project sustainability	Closing Project sustainability
Activity	NDE controlled all climate related agenda and discussions in the country. CTCN held a workshop to help develop a request form.	Engaged in discussions with the NDE and the CTCN secretariat to adjust the scope and budget of the TA	Installed a unit inside the municipality to continue building on outcomes from the TA.	Developed manual and template for vulnerability and risk assessment and developed an ROK ODA funding proposal (to be submitted in 2021)
Entity	NDE, CTCN	GTC, CTCN secretariat	NDE	Implementer, GTC

Moreover, some critical success factors such as project sustainability, risk identification, and rules and procedure for the project manager that were not considered in the CTCN TA were identified in developing the Korea's CTCN pro bono guidelines.

5.1 Role of the Intermediary

The intermediary institutions were the distinct features of pro bono TA. In the field of technology innovation systems research, intermediaries are third parties, bridging institutions, and brokers between inter-organizational relations (Howells, 2006). For example, Zeng et al., (2010) states that the innovative performance of SMEs has a positive relationship with intermediaries such as inter-firm cooperation, cooperation with intermediary institutions, and cooperation with research organizations. As the NDE that provides the pro bono support becomes an additional stakeholder for pro bono TA, it allows the involvement of the intermediary institution to provide support for the implementing agency and control the project quality of the pro bono TA. This intermediary was a government-affiliated research organization under the Korean NDE, which analyzed strategies in utilizing the CTCN as a platform for international technology development and transfer. As part of this research, the intermediary organization has been assisting Korean implementing agencies with limited experience in international projects throughout the entire project life cycle. Most interventions were made to create a solid communication line to engage key stakeholders, the NDE, the CTCN secretariat, the implementer, such that they have a clear understanding of the TA. In the Serbian case, the Initiative had already defined the situation and a gap in its own project and recommended that the Proponent utilize CTCN. This created synergies and helped secure sustainability in the project by linking with other financial options to scale-up. In terms of the Sri Lankan case, a consulting group was established and played the role of the intermediary in arranging meetings and communications, providing primary and secondary data. Such intermediaries play a role that enables better management of the TA.

5.2 Role of the NDE

The NDEs are the window for all CTCN-related communications. The three roles of the NDE identified by the CTCN are to facilitate CTCN success and development by promoting synergies and partnerships with their home country, facilitate linkages between their country's development assistance and CTCN activities in developing countries, and facilitate regional and global networking, peer learning, and collaboration efforts within the CTCN (CTCN, 2020g). Therefore, the high level of understanding of their roles and active participation permits the facilitation of the CTCN and, consequently, the Technology Mechanism. The Serbian NDE played an active role in communicating with relevant Serbian government agencies to apply for the ODA to scale-up the project. Although the Sri Lankan NDE had little experience with a CTCN TA, it played the core communicating role in all climate change-related matters throughout the country. It encouraged the municipality to create its own climate cell to secure sustainability of the assistance received.

The Korean NDE has been actively participating in pro bono support since 2018. As part of creating inter-country partnerships and providing development assistance in technology, it has adopted a programmatic approach to set up an institutional arrangement known as the 'Korean CTCN pro bono Committee' (hereafter the 'Committee') which is aimed to facilitate the participation of Korean CTCN network members in providing pro bono support. The Committee functions as a national platform where Korean network members willing to provide their financial resources and/or technical expertise would join and discuss their possible pro bono activities under the direction of the Korean NDE. Based on the discussion, the Korean NDE developed an annual pro bono work program and finalized it with the CTCN secretariat. Since the establishment of the Committee, four Korean Network members provided pro bono support for four TAs and one non-TA, with a total contribution amounting to $450 000

USD.

5.3 Project Tools

Among the CSFs selected in this study, a few were not considered in the life cycle of the CTCN. For example, risk was not identified in the project identification stage. Sustainability was considered as 'anticipated follow up activities after this technical assistance is completed' during the planning phase, although it was not checked in the implementation phase. There are no specific rules and procedures, other than the response plan's logical framework and the detailed response plan submitted as a reference for the PM. This may allow the PM to gain a certain level of independence and flexibility, although some rules and procedures may be helpful for those who are new to the system. Milosevic and Patanakul (2005) observed a significant relationship between three factors: standardized PM tools, leadership, process, and project success.

In the case of Korea's CTCN pro bono support, after completing three cases and implementing four pro bono TAs, there is a need to identify challenges and barriers in the pro bono TA. The CSFs were identified and bottleneck problems shared by the implementers were collected to create a Korean CTCN pro bono TA guideline. The guideline provides information on governance, roles, and responsibilities of the stakeholders involved, the process of the pro bono TA, the required actions for each step of the TA, indicators for selecting a pro bono TA, and an implementing agency. Such standardized guidelines are expected to contribute to higher project success.

5.4 Limitations and Next Steps

In this study, only two pro bono cases from 2018 were evaluated. Of the total thirteen Korean CTCN pro bono cases from 2018 to 2020, only two cases in 2018, Serbia and Sri Lanka, were analyzed in this study as they had the most accessible deliverables and stakeholders available for an IDI. The four Korean CTCN pro bono cases from 2019 are still ongoing alongside the four new projects in 2020. With the completion of each pro bono TA, a thorough evaluation should be conducted. This should be undertaken by gathering all relevant documents from the project and engaging with implementing agencies, the recipient country NDEs, and the CTCN.

Given that this is an initial exercise to observe the CSFs in pro bono TA, additional work is required to gather a greater volume of evidence on the cases and update the cases studied. This is because the number of pro bono TAs is increasing along with the relevant stakeholders who are able to share their experience with pro bono TA. Additionally, the CSFs of CTCN TA is another area of research that best fits the purpose, process, and goal of the CTCN TA, and may be utilized as an indicator for monitoring and evaluation.

6. Conclusion

This research shares two CTCN pro bono TA cases in an effort to identify the causal mechanisms underpinning the CSFs of project management leading to project success. It was derived from previous research on CSFs for the four stages of the life cycle; four for project identification, six for planning, six for implementing, and four for closing. A pair-wise comparison was carried out on these categorized CSFs to identify the most important CSFs in CTCN TA through an AHP. To observe the causal mechanism underpinning CTCN pro bono support and its success, process tracing was conducted to collect evidence based on the inference that the CSFs considered the most important were manifested in the causal mechanism.

The CSFs to be present in the causal mechanism for success of pro bono TAs were effective consultation for project identification, the planning phase, and project sustainability during the implementing and closing phase. In each phase, the activities of the entities such as the intermediaries and the NDEs were prominent in building the causal mechanism.

After two years of providing and implementing pro bono support in the ROK, several benefits for the stakeholders involved were identified. Through pro bono

support, developing countries received the requested TA without delaying budget allocation. They acquired partnerships and built a network with Korean stakeholders for follow-up activities. For Korean stakeholders with climate technology and related technical expertise and know-how, Korea's CTCN pro bono program provided opportunities to cooperate with developing countries seeking climate technology solutions. For CTCN, pro bono support was a channel in which to mobilize additional financial resources and technical expertise. Overall, pro bono support is becoming a catalyst to enhance the voluntary efforts of network members for technology development and transfer through CTCN.

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