

# Climate Technology as Soft Power: Bridging Global RD&D and Public Diplomacy

Jaeryoung Song \*

**Abstract** Climate technology (CT) is increasingly used as a strategic tool in diplomacy. Nevertheless, existing research treats it primarily as technology transfer or aid and fails to explain how it generates national influence. This study proposes Market-Driven Climate Technology Diplomacy (MCTD) as a mechanism through which CT progresses from R&D outcomes to diplomatic capital by building trust, institutional legitimacy, and market acceptance. A sequential mixed-method design combined expert FGIs across five Asian countries and validation by international practitioners and policy experts. The effectiveness of CT-based diplomacy depends on three aligned conditions: local demand, verified performance, and financial feasibility. The MCTD framework illustrates how technical credibility transforms into policy legitimacy and Soft Power, providing a scalable pathway to leverage climate innovation in diplomacy.

**Keywords** Market-Driven Climate Technology Diplomacy, Blended Finance, Public–Private Partnerships, Technology Demonstration and Certification, Soft Power

## I. Introduction

### 1. Background

The Climate Crisis confronting humanity in the 21st century is no longer confined to environmental issues; it has evolved into a strategic structural problem involving complex interdependencies across technology, economy, diplomacy, and security. Consequently, nations worldwide have leveraged technological superiority to achieve carbon neutrality goals following the Paris Agreement (Foley et al., 2017; Krause, 2018; Li et al., 2024; Rimmer, 2018). This strategic shift has fueled national efforts to link this technological prowess to external influence and Soft Power (Li, 2016).

In this emerging geopolitical landscape, Climate Technology (CT) is positioned as a primary tool for achieving decarbonization and enhancing global

---

Submitted, October 27, 2025; Accepted, November 4, 2025

\* Senior Researcher, Center for Global Strategy, National Institute of Green Technology (NIGT), The Republic of Korea; [makingbetterworld@nigt.re.kr](mailto:makingbetterworld@nigt.re.kr)



This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License.

influence. However, the efficacy of this strategy hinges entirely on the successful diffusion and adoption of these technologies. For instance, South Korea possesses numerous innovative CTs, including 17 key carbon-neutral technologies. Nevertheless, the success rate of the Commercialization of these technologies remains consistently inadequate (Cho & Jeong, 2023). This outcome underscores a critical and widespread failure to translate Research and Development (R&D) competence into tangible international impact, pointing to a significant lacuna in existing policy and academic frameworks.

A literature review reveals that discussions and policies related to CT predominantly suffer from two fundamental bottlenecks (Choi et al., 2024; Yoon & Kim, 2022; Song, 2022). First, the focus is predominantly on the initial R&D stage or merely on 'technology support' via Official Development Assistance (ODA). This emphasis fails to account for the dynamic transition where technology creates economic value and is simultaneously converted into a diplomatic asset. Second, there has been a strong tendency to rely on technology lists (e.g., the existing 17 key carbon-neutral technologies) centered on developed countries/suppliers, without considering the specific market and institutional environments of developing countries—the technology recipients—or the conditions required for establishing trust. This approach creates a fundamental limitation, leading technologies to fail to take root in local markets and often ending as one-off aid projects (Jeong et al., 2022).

Accordingly, this study seeks to expand the paradigm of CT commercialization from 'profit generation' to 'building diplomatic trust and national image assets.' For CT to be successfully introduced to developing countries or the international community and function as Soft Power, it must move beyond mere technological superiority. Instead, it requires the integrated design of three elements: (1) Diplomatic legitimacy based on trust, (2) an economic structure capable of attracting private capital, and (3) A governance mechanism that ensures tangible market diffusion. Against this backdrop, this study aims to explore the complex interaction structure among CT commercialization, Soft Power, and the global cooperation mechanism.

## **2. Differentiation and Academic Contribution**

This study differentiates itself from existing research in the following three aspects:

First, conceptual framework expansion. While existing Soft Power research has focused on non-material domains such as culture, diplomacy, and media, this study explores the Transition Conditions for how the concrete, material economic activity of 'CT commercialization' transforms into Soft Power assets like 'diplomatic trust' and 'policy acceptance.'

Second, the utilization of a Mixed-Method Approach. To address this interdisciplinary area with limited prior research, this study adopts a Sequential Exploratory Design. The first to third rounds of in-depth Focus Group Interviews (FGIs) were used to exploratively derive (Discovery) the core conditions and structural components (elements of RQ1, RQ2, and RQ3). Based on this discovery, the fourth-stage international expert survey was designed to exploratively verify the practical validity and preference of the derived mechanisms. This provides methodological justification for securing 'field applicability' beyond simple quantitative validation.

Third, this study proposes a Market-driven Climate Technology Diplomacy (MCTD) model. Moving away from the ODA-centric approach, it proposes a new governance model combining Public–Private Partnerships (PPPs), Blended Finance, and a three-stage sequence of Demonstration, International Certification, and Procurement Market Entry. This contributes to solidifying academic discussions into practical policy strategies (RQ4).

### **3. Research Objectives and Key Questions**

The ultimate goal of this study is to lay the theoretical and practical foundation that can contribute to building a strategy for expanding South Korea's Soft Power through CT commercialization. To achieve this, the following four key Research Questions (RQs) have been established:

- RQ1. What are the core conditions (trust, marketability, diplomatic legitimacy) required for CT commercialization to function as diplomatic influence and Soft Power beyond mere profit?
- RQ2. How should the core data, institutions, and financial structures be designed to secure the economic feasibility of CT commercialization and justify investment attraction?
- RQ3. What are the sequential governance and implementation mechanisms required for the global diffusion of CT, linking 'demonstration–certification–market entry'?
- RQ4. Based on the above exploratory and empirical analysis, how should the MCTD strategy model for the expansion of CT Soft Power be constructed?

### **4. Logical Framework and Flow of the Argument**

This thesis is organized into seven chapters. Chapter 2 reviews the literature on Soft Power, Public Diplomacy (PD), and technology acceptance and diffusion. Chapter 3 details the Sequential Exploratory Design methodology, which involves exploring concepts through FGIs and verifying their validity through an international survey. Chapter 4 performs a qualitative analysis

focusing on the 1st and 2nd FGIs results to explore the conditions and structural factors for the Soft Power transition (RQ1 and RQ2). Chapter 5 explores and structures the governance and mechanisms for RQ3 based on the 3rd FGI and 4th international survey results, supplemented by in-depth opinions from international experts. Finally, Chapter 6 synthesizes the research findings, proposes the MCTD strategy model (RQ4) as a policy recommendation, and discusses the study's limitations in Chapter 7.

## **II. Theoretical Backgrounds**

This chapter reviews the theoretical discussions necessary to clarify how CT commercialization transitions into Soft Power, focusing on three core axes. First, it re-examines the concepts of Soft Power and PD to establish the academic foundation for 'technology-based diplomacy.' Second, it derives the concepts of 'trust' and 'legitimacy,' which form the basis for RQ1 (transition conditions) and RQ2 (structure), through technology commercialization and acceptance/diffusion theories. Third, it reviews international cooperation and financing models that support RQ3 (governance and mechanism).

### **1. Soft Power Revisited: Technology, Diplomacy, and Influence**

Soft Power, a concept introduced by Joseph Nye (Gomichon, 2013), refers to the ability to influence the preferences of other countries and indirectly exercise influence through the appeal of culture, political values, and foreign policy, rather than through coercive means such as military force or economic sanctions (Hard Power) (Nye Jr, 2004, 2008, 2015). Traditionally, Soft Power emphasized non-material elements (cultural content, democratic values, etc.), but more recently, 'technological capability' and 'problem-solving capacity' have emerged as key assets for enhancing a nation's image and building trust. In particular, CT, which contributes to solving global challenges such as the Climate Crisis, inherently possesses a public good nature. Successfully transferring and commercializing CT maximizes 'policy acceptance' and 'trust' in the beneficiary country, thus serving as a practical driver of Soft Power (Song, 2025).

PD is a long-term activity where a government builds trust and understanding of its country through direct communication with foreign publics, businesses, and policymakers (Nedopil, 2022). The academic community recently focused on diplomatic methods that combine technological innovation and market mechanisms—the MCTD—moving beyond traditional state-led PD. This approach strengthens diplomatic influence based on technology

commercialization, investment, and entrepreneurship, rather than simple ODA or technology transfer.

Mungalova (2025) analyzes that entrepreneurs in emerging markets function as "entrepreneurial diplomatic agents," converting market penetration and technology transfer into diplomatic assets. This suggests that when CT companies contribute to the local economy, creating employment and innovation, they can be recognized as core actors in Economic Diplomacy, rather than mere aid providers. The study by Lin et al. (2025) on Chinese AI startups similarly explains that the Triple Helix Synergy Model among the state, corporations, and research institutions constitutes "Technology Diplomacy," demonstrating a structure where technological capability translates directly into diplomatic influence. This aligns with the flow of the MCTD model proposed in this study.

Simultaneously, diplomatic strategy competition is intensifying in the digital and AI sectors between regulatory-centric and market-driven models surrounding technology norms and platforms (Moskalyk & Revera, 2025). They point out that AI plays a dual role as "both a subject of regulation and a diplomatic tool" in digital and tech diplomacy, asserting that Technology Diplomacy no longer operates purely on moral justification or aid but on market logic, data sovereignty, and competition over technological norms.

These discussions reinforce the academic basis for the statement raised in the 1st FGI that "technology support must expand beyond simple ODA to become a diplomatic asset of trust and national brand." In other words, CT commercialization provides tangible benefits to the public and policymakers by contributing to the solution of the recipient country's economic and environmental problems. This, in turn, creates a virtuous cycle of diplomatic cooperation, market entry, and trust-building. Therefore, the MCTD proposed in this study can be understood as a new diplomatic paradigm connecting PD, technological innovation, Economic Diplomacy, and entrepreneurial diplomatic roles.

While public diplomacy literature has increasingly acknowledged climate change as a diplomatic agenda, most studies have remained policy-centric rather than technology- or market-oriented. For example, Choi, Song, and Lee (2020) analyzed how South Korea employed Nationally Determined Contributions (NDCs), International Emissions Trading (ETS), and overseas mitigation projects as instruments of climate public diplomacy in the post-Paris era. Their work was one of the first to demonstrate that climate policy functions not only as environmental governance but also as a strategic tool for international legitimacy and national branding.

However, such research primarily focused on governmental policy coordination and diplomatic narratives, without explaining how climate technologies acquire diplomatic value through commercial deployment, joint

demonstration, international certification, or blended finance mechanisms. By contrast, this study bridges that gap by conceptualizing and empirically examining a techno-economic Soft Power pathway, in which climate technologies move from domestic R&D to global deployment—via demonstration, certification, financial structuring, and procurement market entry—and in doing so, evolve into sustained diplomatic influence.

## **2. Technology Commercialization and Diffusion Theory**

Diffusion of Innovation (DOI) Theory explains that a technology's relative advantage, complexity, and compatibility influence its adoption (Rogers, 2003; Sahin, 2006). Particularly in developing country environments, the success of technology commercialization heavily depends not only on the intrinsic excellence of the technology but also on the organizational and institutional environment surrounding it (Madaki et al., 2023; Okoisama & Bagshaw, 2023; Tornatzky & Fleischer, 1990). The Technology Acceptance Model (TAM) and Technology-Organization-Environment (TOE) framework, mentioned in the 1st FGI, theoretically underpin RQ1 and RQ2.

Regarding Trust, for technology to be accepted, the beneficiary country seeks Certification that the technology has been proven in a real environment (joint demonstration) and satisfies international standards (international certification). This links to policy trust in the transferring entity (nation, company) and becomes a core condition for Soft Power transition. Regarding Legitimacy, for technology to operate sustainably in the local market, its environmental and social benefits must be substantiated by quantitative data like Life Cycle Assessment (LCA) and CO<sub>2</sub> reduction amounts, in addition to economic profitability (Return on Investment (ROI)). The emphasis on "verified numbers and data" in the 2nd FGI is precisely the theoretical demand for securing the technology's 'objective legitimacy'.

Technology commercialization is the process of introducing technology derived from public R&D to the market to generate cash flow (Hong & Park, 2022). As presented in the 2nd FGI, from the perspective of private investment and finance, the success of CT hinges not merely on technological innovation but on risk-sharing structures and predictable profitability models. Therefore, securing the data (ROI, CO<sub>2</sub> reduction amount) to justify economic feasibility and having an institutional platform to utilize this data are considered essential prerequisites for successful commercialization.

Song and Kim (2022) emphasize that national carbon neutrality cannot be achieved without restructuring public R&D systems to align technological innovation with long-term policy, infrastructure, and international cooperation. Their study highlights that Korea's climate R&D strategies increasingly demand commercialization pathways and global collaboration, rather than purely

technology-push models. This reinforces the premise of the present study that CT becomes soft power only when R&D is connected to market deployment, diplomatic legitimacy, and international governance structures.

### **3. Global Cooperation and Governance Mechanism**

The operationalization of RQ3 and RQ4 is grounded in two key theoretical frameworks—Blended Finance and PPP—constituting the institutional and financial foundation for scalable CT diffusion. However, the effectiveness of such governance frameworks is fundamentally dependent on robust Research, Development, and Demonstration (RD&D) capabilities. RD&D is widely recognized as a policy–technology cycle essential to achieving the Paris Agreement goals, as it identifies both current and future decarbonization needs and translates them into deployable technologies (Hatzirygiou et al., 2007). Despite a generally favorable global RD&D environment, both developed and developing countries face structural barriers in scaling high-impact technologies; notably, energy storage technologies consistently emerge as the highest RD&D priority across regions, reflecting their systemic role in renewable energy integration and grid stability (Future Cleantech Architects & UNFCCC TEC, 2024).

Nevertheless, RD&D alone cannot drive international diffusion without complementary financial structuring. Blended Finance, defined as the strategic use of concessional public resources such as ODA, the Green Climate Fund (GCF), and Multilateral Development Banks (MDBs) to de-risk private capital, enables investment mobilization in sectors characterized by market failure (Choritz et al., 2018). In parallel, PPP functions as a governance model that aligns public objectives—including climate mitigation and the cultivation of Soft Power—with private-sector efficiency, innovation, and capital deployment (ADB et al., 2014; Amighini et al., 2022). Accordingly, this study contends that CT diplomacy becomes operationally meaningful only when RD&D-generated technologies are embedded within a governance architecture that integrates blended finance and PPP-based implementation mechanisms.

Empirical evidence from South Korea’s CT cooperation confirms this need for integration. As Song and Baek (2023) demonstrate, technology transfer efforts not accompanied by MDB engagement and financial bankability mechanisms rarely result in sustained adoption or commercialization. Their findings indicate that linking public-sector climate technologies with MDB financing requires technological readiness and institutional mechanisms for risk-sharing, revenue structuring, and procedural transparency. This supports the argument that CT diplomacy must evolve from a technology-centric model to a financially structured and institutionally governed process.

Insights from the third Focus Group Interview further emphasized that an effective diffusion mechanism requires an integrated triad: region-led RD&D, international partnership formation, and structured financing mechanisms. This can be operationalized through a Programmatic Approach in which local governments initiate demonstration projects, international actors facilitate certification and regulatory alignment, and financial institutions provide blended and scalable capital structures.

Moreover, technology diffusion is not completed at the transfer point but requires institutional embedding within local regulations and compliance with international standards (Kim, 2025). The three-stage pathway derived from the 3rd FGI—local demonstration → international certification → entry into ODA and multilateral procurement markets—reflects this requirement.

Demonstration generates empirical evidence such as LCA results and verified emission reductions; certification converts this evidence into official credibility; and such credibility becomes a prerequisite for accessing climate finance from the GCF, MDBs, or bilateral ODA mechanisms (Song, 2025b). This sequential and circular structure mitigates political and financial risks and transforms climate technologies into assets of diplomatic legitimacy and sustainable Soft Power.

### **III. Research Design and Methodology**

This study aims to clarify how CT commercialization transitions into Soft Power. Given the interdisciplinary and convergent nature of this research area, which is insufficiently covered by existing studies, a single methodology was deemed insufficient to achieve the research objectives. Therefore, a Mixed-Method Approach was adopted to provide an in-depth and comprehensive understanding of this complex, unexplored subject (Nesher Shoshan & Wehrt, 2022; Nanthagopan, 2021).

Specifically, this research utilizes a Sequential Exploratory Design for a two-stage approach: first, exploratively investigating the theoretical basis, and second, verifying the practical validity of the derived concepts and structure. This design allows for the exploration of the conditions and structural elements of Soft Power transition through qualitative research (FGI), followed by the design of quantitative research (international survey) to verify and structure the governance and mechanisms (Hidayat-ur-Rehman & Ibrahim, 2024). This approach effectively maps a new domain (Meena et al., 2025) and achieves the research objectives.

#### **1. Research Design Logic**

The Sequential Exploratory Design is most suitable when qualitative research is conducted first to derive new concepts and measurement items inductively, and quantitative research is subsequently used to verify the validity of the derived structure exploratively. This methodology prioritizes discovery and concept generation through in-depth qualitative data, which is then tested for its relevance and acceptance in a practical context using quantitative methods.

**Table 1 Research Design Overview**

Stage	Methodology	Purpose & Role	Academic Contribution
Stage 1 (Qualitative Research)	1st–3rd FGIs	Inductively explore the core conditions of Soft Power transition (RQ <sub>1</sub> ), economic justification structure (RQ <sub>2</sub> ), and governance mechanism (RQ <sub>3</sub> ) to derive conceptual components.	Development of a conceptual model and theoretical grounding (Inductive Theory Building)
Stage 2 (Exploratory Validation)	4th International Expert Survey and Written Interviews	Verify the practical feasibility, acceptance, and applicability of the mechanism derived in Stage 1; explore validity for the final strategic framework (RQ <sub>4</sub> ).	Provision of empirical and exploratory evidence (Exploratory Validation)

## 2. Stage 1 Qualitative Research

Qualitative research was conducted through three rounds of FGIs, each with a distinct purpose aligned with the research's logical flow, to comprehensively reflect the attributes of CT, as well as diplomatic, financial, and practical perspectives.

The collected FGI transcripts and result reports were analyzed through Thematic Analysis. First, all statements were converted into a text database. Second, keywords, phrases, and sentences related to the research topic were extracted, and Conceptual Coding was performed. Third, the coded concepts were classified, and Categorization was performed according to the three analytical frameworks of RQ<sub>1</sub>, RQ<sub>2</sub>, and RQ<sub>3</sub>. This systematic process allowed for the objective identification of the core variables and mechanisms of the research, based on expert consensus, going beyond simple opinion gathering.

**Table 2 FGI Structure and Key Findings**

FGI Round	Core Objective	Participants (Examples)	Key Findings
<b>1st FGI</b>	Conceptual exploration of Soft Power transition conditions (RQ <sub>1</sub> ), and foundations of economic justification (RQ <sub>2</sub> ).	Technology commercialization experts, technology adoption scholars (TAM & TOE), policy experts (6 participants)	Defined core concepts: “ <i>market-oriented technology diplomacy,</i> ” “ <i>social trust,</i> ” and “ <i>policy credibility</i> ” as key conditions for Soft Power transition.
<b>2nd FGI</b>	Identification of economic structures and feasibility for commercialization (RQ <sub>1</sub> & RQ <sub>2</sub> ).	Private investors, financial experts, international R&D cooperation specialists, and global market analysts (6 participants)	Derived requirements: joint demonstration, international certification, data-based validity (LCA, CO <sub>2</sub> reduction, ROI), and financing mechanisms.
<b>3rd FGI</b>	Structuring governance and expansion mechanisms (RQ <sub>3</sub> ).	Representatives from international organizations, local governments, diplomats, research institutes, and startup ecosystem stakeholders (8 participants)	Derived a <i>three-stage mechanism</i> of Demonstration–Certification–Market Entry; emphasized PPPs and Blended Finance as essential tools.

### 3. Stage 2 Exploratory Validation

To confirm the practical acceptability and validity of the Soft Power transition mechanism derived from the 1st stage qualitative research, a 4th-stage international expert survey and written interviews were conducted.

The target population for the fourth survey was set as staff of international organizations and policymakers in Developing Countries (DCs) with expertise in CT demand and international cooperation. The sample consisted of seven individuals (six from international organizations, one from a DC embassy). Due to the sample size constraint, it is explicitly stated that the results of this 4th-stage research cannot be interpreted as Statistical Hypothesis Testing aimed at External Generalization. Instead, this research stage focuses on expert elicitation and exploratively confirms the conceptual model's practical validity (Conceptual validation) derived from the preceding qualitative research (FGI). Thus, it serves as a complementary step to conceptually verify whether the qualitative findings are acceptable to key stakeholders in the real world.

The survey items were primarily based on a 5-point Likert Scale and were constructed to measure the core themes derived from the 1st to 3rd FGIs. The main measurement contents are as follows:

- RQ1 & RQ2 Measurement: Measured the necessity and importance of core conditions for Soft Power transition: joint demonstration, international certification, policy trust, and economic feasibility justification data (CO<sub>2</sub> reduction amount, LCA, ROI).
- RQ3 Measurement: Measured the acceptance validity of the three-stage linked structure of 'demonstration–certification–procurement market entry' and the acceptance validity of the Blended Finance approach.

The analysis of the collected data primarily centered on Descriptive Statistics. Descriptive Statistics is an essential methodology for understanding the overall characteristics and patterns of the collected database (Candal-Pedreira et al., 2022; Dou & Toth, 2021). In this study, the mean (M) and standard deviation (SD) for each response item of the international expert survey were calculated to clearly confirm the tendency of relative importance or preference assigned by the expert group to each component.

This quantitative approach, while considering the limitation of the sample size, quantifies the general perception of experts regarding the core factors constituting the research model and establishes a foundation for academic reporting (Almansour et al., 2021; Kaur et al., 2021). Furthermore, the descriptive statistics served as basic data for subsequent interpretation, contributing to understanding each variable's position and dispersion within the overall group.

Moreover, to maximize this study's exploratory nature, quantitative data analysis was conducted in parallel with the qualitative interpretation of data. The detailed responses from the written interviews and the international expert survey were classified as in-depth qualitative data through Thematic Analysis. This was primarily used to discuss the underlying context and policy implications that are difficult to explain with simple numerical trends (mean values).

For instance, a detailed analysis of the feedback from a Vietnamese expert regarding supplier-centric technology criticism complemented the regional and situational context hidden beneath the quantitative mean values, thereby enriching the structural understanding of the Soft Power transition mechanism. This integrated approach of descriptive statistical analysis and qualitative interpretation offers multi-faceted and in-depth answers to the research questions, enhancing the study's completeness and practical value (Yaron et al., 2022).

## **IV. Qualitative Analysis: Exploring Soft Power Transition Conditions and Structure (RQ1, RQ2)**

### **1. Qualitative Analysis Overview and Derivation of Core Categories**

This chapter presents the in-depth analysis of the 1st and 2nd FGI data, which were conducted to explore academic and practical answers to the research questions (RQ1: Soft Power transition conditions, RQ2: economic feasibility structure). The data collected through the FGI sessions underwent detailed Thematic Analysis, specifically encompassing open coding, axial coding, and selective coding processes. This led to the inductive categorization of the findings into two final core categories: 'Conceptual Conditions for Soft Power Functionality' and 'Economic Feasibility and Investment Justification Structure.' The primary objective of this section is to inductively derive novel conceptual variables and relationships, previously not fully covered in existing literature, within the interdisciplinary realm of technology, diplomacy, and finance, leveraging the practical insights of experts.

### **2. Exploring the Conceptual Conditions for Soft Power Functionality (RQ1)**

RQ1 explored the core conditions required for CT commercialization to function as diplomatic influence and Soft Power beyond simple economic returns. The analysis concluded that a shift toward demand-centric diplomacy and establishing Trust and Legitimacy are essential, moving away from the traditional focus on technological superiority.

#### **2.1 Paradigm Shift in Technology Diplomacy: Demand-Centricity and Social Trust**

Experts emphasized that Soft Power is based on the ability to shape the recipient country's preferences and stressed that the method of technology provision itself must focus on empowering the recipient's internal capacity. Fundamental limitations were diagnosed in the existing Korean ODA and technical cooperation model.

**The Risk of Supplier-Centric Approaches:** In the 1st FGI, a representative from the commercial sector pointed out that *"cooperation with developing countries should go beyond simple ODA and move toward a Market-based Diplomacy,"* warning of the risk that the existing method could be perceived as

a supplier-centric approach unilaterally presenting a 'list of technologies Korea possesses.' This aligns with the concern raised by the expert from the Vietnamese Embassy in the fourth survey, who noted that the technologies presented are *"advanced technologies focused on developed nations, maintaining a distance from immediate application in developing nations."* Soft Power is manifested through the 'attractiveness' of technology; technology that is impractical from the recipient's perspective loses this attractiveness.

**Establishing Social Trust:** An expert academic who introduced the theoretical perspectives on technology acceptance (TAM/TOE) emphasized that 'Social Trust'—the belief in the sustainability and predictability of the entity providing the technology—is as important as the technology's utility (technological superiority). This trust is founded on the belief that the technology will operate stably over time in the local context (sustainability) and that the Korean government and companies will sustain support as promised when technical issues arise (predictability). Therefore, a successful transition to Soft Power requires the accumulation of trust capital through policy partnerships and continuous maintenance commitments before the actual technology transfer.

## **2.2. Specific Conditions for Securing Trust and Diplomatic Legitimacy**

Experts' specific conditions for accumulating trust capital and securing diplomatic persuasive power are summarized as Joint Demonstration, International Certification, and Diplomatic Storytelling.

**Academic Significance of Joint Demonstration:** In the 2nd FGI, the Secretary-General of a global cooperation institution stressed that *"the proven number of 'how much has been saved with this technology' is more important than the technical principle."* This is the most substantial evidence of technological reliability, justifying the recipient country to assume the risk and adopt the technology. Joint Demonstration goes beyond simple technology showcasing, serving as a prerequisite for a joint R&D model where risks are shared and benefits are mutually gained with the recipient, thereby elevating technology cooperation to a 'joint project' that reinforces Soft Power partnership between nations.

**Objective Legitimacy through International Certification:** Verifying data secured through Joint Demonstration against internationally accepted certification standards (e.g., ISO, international climate certification) confers 'Objective Legitimacy' to the technology. This signifies that the technology's excellence is not merely a Korean claim but has been validated by an objective third party, forming the basis of diplomatic credibility required for Soft Power to function. If this process is omitted, even outstanding technology risks will fail to secure policy acceptance within the recipient country.

Integrated Diplomatic Persuasion Structure (Narrative): The Secretary-General of a global cooperation institution also pointed out that for CT to function as Soft Power, economic feasibility and diplomatic legitimacy must be secured simultaneously. It requires a geopolitical persuasion structure—*"Why should our nation cooperate with Korea?"*—beyond simple environmental logic. This structure is completed by integrated storytelling that encompasses 'carbon reduction effect + institutional suitability + public value,' becoming the ultimate diplomatic asset that maximizes the preference (Soft Power) of other nations.

### **3. Analysis of Economic Feasibility and Investment Justification Structure (RQ2)**

RQ2 investigated the fundamental structural conditions required for CT to secure economic viability and justify large-scale investment, thereby ensuring the sustainability necessary for Soft Power. Analysis revealed that the primary challenge lies in the high initial investment cost and uncertainty of the ROI in developing countries. This uncertainty, driven by political, regulatory, and market risks, must be systematically mitigated through financial mechanisms to bridge the gap between initial RD&D and commercial success. Experts unanimously identified Blended Finance as the core institutional structure for achieving this.

The Necessity of Risk Mitigation: Experts agreed that typical developing country markets present inherent risks (e.g., sovereign risk, lack of long-term power purchase agreements, limited creditworthiness of local partners) that deter private capital participation. Due to their long payback periods and novelty, CT projects exacerbate this risk. Therefore, the justification for investment is not secured by the technology's technical superiority alone, but by a demonstrable reduction in financial risk.

The strategic role of Public Funds: The manager of a multilateral development bank strongly emphasized that *"the investment decision for CT is a question of who bears the risk. Therefore, a Blended Finance structure where public funds (ODA, GCF) mitigate the private sector's risk is essential."* This means that public funds must go beyond simple financing, performing a Catalytic Role by assuming risk ahead of private capital, such as through first-loss or subordinated loans. This Catalytic Capital acts as a critical institutional guarantee, enabling the CT project to move from the technically feasible to the financially viable stage, which is the prerequisite for Soft Power transition.

## **V. Exploratory Validation: Structuring the Global Diffusion Mechanism (RQ3)**

### **1. Overview of Exploratory Study and Practical Legitimacy**

This chapter conducts an Exploratory Validation of the concepts and structural conditions derived from the qualitative analysis. The validation utilizes a 4th-round expert survey and written interviews, targeting seven international experts from institutions such as multilateral development banks, international CT organizations (UN Climate Technology Centre & Networks (CTCN), Global Green Growth Institute (GGGI)), and developing country embassies. The primary goal is to structure a practical, governance-linked diffusion mechanism (RQ3) for CT based on the international community's real-world preferences and feasibility assessments. The practical justification for this study lies in confirming the operational mechanism that converts the conceptual conditions (Trust and Legitimacy) into a tangible, scalable model, thereby establishing the MCTD framework.

### **2. Analysis of Core Preference and Feasibility of the Diffusion Mechanism**

RQ3 explored the linked governance and implementation mechanisms (Demonstration → Certification → Market Entry) required for the global diffusion of CT. The analysis of written interviews and survey responses from international experts converged on demand-based joint participation and digitally-driven quantitative diffusion as key to successful Soft Power transition.

Experts emphasized that for Korean CT to transition into Soft Power, a structure that moves away from supplier-centric technological superiority and combines local participation with capacity building is essential.

Importance of Local Context: The Vietnamese Embassy expert indicated that Korea's technology comprises "advanced technologies focused on developed nations, maintaining a distance from immediate application in developing nations," confirming that only Joint Demonstration, which ensures the recipient country's autonomous participation, can build the Social Trust that forms the basis of Soft Power. The Water-Energy-Food (WEF) expert from the UN also stressed that "combining local demonstration with system operation training is essential, rather than simple technology introduction," clarifying that building human capacity is the critical factor determining the technology's sustainability and diplomatic ripple effect.

Anchor Role of AI and Digital Technology: Vietnam, in particular, was specified as having high public and private sector demand for commercializing

AI, Big Data, and digital transformation technologies. This suggests that the CT diffusion mechanism can maximize local policy acceptance when constructed on an intelligent platform that uses Digital CT as an Anchor to collect, analyze, and share demonstration data, going beyond the simple construction of physical infrastructure. International finance and CT network experts cited securing legitimacy based on quantitative data and multi-sector integrated governance as key factors for accelerating the speed of technological diffusion and the possibility of financial attraction.

**Foundation for Quantitative Evidence Diffusion:** The GGGI expert mentioned the need for "*developing an AI-based GHG reduction evaluation system and its diffusion through an online platform.*" This shows that international experts clearly recognize that 'Data-Driven Legitimacy', such as LCA and CO<sub>2</sub> reduction quantities derived in Chapter 4, is an institutional foundation for technological diffusion, extending beyond simple investment attraction. International certification and platform-based data sharing ensure the reproducibility of the technology, acting as core factors that expand Soft Power's ripple effect.

**Multi-Sector Integrated Governance:** The CTCN expert raised the necessity of integrated solutions based on the WEF Nexus. This response supports the idea that Soft Power can transition into long-term policy influence by institutionalizing local personnel training and community benefit sharing through multi-sector integrated governance rather than a single technology.

### **3. Final Structuring of the MCTD Mechanism (RQ3 Synthesis)**

The exploratory validation confirms the necessity of a three-stage, sequential governance mechanism to convert CT into a Soft Power asset. This mechanism is structured to systematically fulfill the conditions of Trust and Legitimacy (RQ1) and the requirement for Financial Feasibility (RQ2) before market scaling. The resulting model, termed the MCTD Mechanism, is defined by the following sequential and interlocking stages: Stage 1. Joint Demonstration, focused on building operational trust through shared risk; Stage 2. Joint Certification, focused on securing objective, data-driven legitimacy through international certification and policy acceptance, and Stage 3. Joint Market Entry, focused on utilizing Blended Finance and PPP to ensure long-term sustainability and scalability. This three-stage process, validated by international experts, serves as the operational foundation for the overall MCTD strategic model.

**Table 3 MCTD Mechanism for Climate Technology Soft Power Diffusion**

Stage	Key Actors	Key Activities	Resulting Asset
Stage 1: Joint Demonstration	Korea (Supplier, Tech/Finance), Developing Countries (Recipient, Demand/Implementation)	Local demonstration project and securing real-world operating data	Securing Technical Trust
Stage 2: Joint Certification	International Organizations/MDBs (Intermediary, Legitimacy/Finance), Korea, Developing Countries	Acquiring international standards and certification based on quantified data (LCA, CO <sub>2</sub> Reduction Amount)	Securing Policy Legitimacy
Stage 3: Joint Market Entry (Procurement Market)	International Organizations/MDBs (Intermediary, Legitimacy/Finance), Korea, Developing Countries	Entry into international procurement markets through PPP/Blended Finance linkage	Maximizing Soft Power and Global Diffusion

## **VI. Synthesis and Proposed Model**

### **1. Synthesis of Analytical Findings**

The synthesis of the qualitative analysis (RQ1, RQ2) and exploratory validation (RQ3) confirms that the mere possession of superior CT is insufficient for generating diplomatic Soft Power. The transition is governed by a structural and sequential process that addresses the recipient country's critical risk and legitimacy gaps. Specifically, the analysis reveals a functional convergence where: 1) Trust and Legitimacy (RQ1) are the conceptual prerequisites for Soft Power; 2) Blended Finance (RQ2) is the institutional prerequisite for economic sustainability; and 3) the 3-Stage Mechanism (RQ3) serves as the operational prerequisite that bridges the gap between the two. The ultimate Soft Power is generated only when the economic model (Blended Finance) is activated, institutionalized, and governed by the 3-Stage Mechanism, thereby maximizing the recipient's preference for the Korean solution.

### **2. Proposed Strategic Framework: The MCTD Model**

The MCTD Model is formally proposed as the consolidated strategic framework (RQ4) derived from synthesizing all research findings. The MCTD model conceptualizes CT diplomacy as a closed-loop, market-driven process

where RD&D outcomes are rigorously converted into Soft Power through managed governance and financial risk mitigation.

## **2.1. Core Components and Nexus of the MCTD Model**

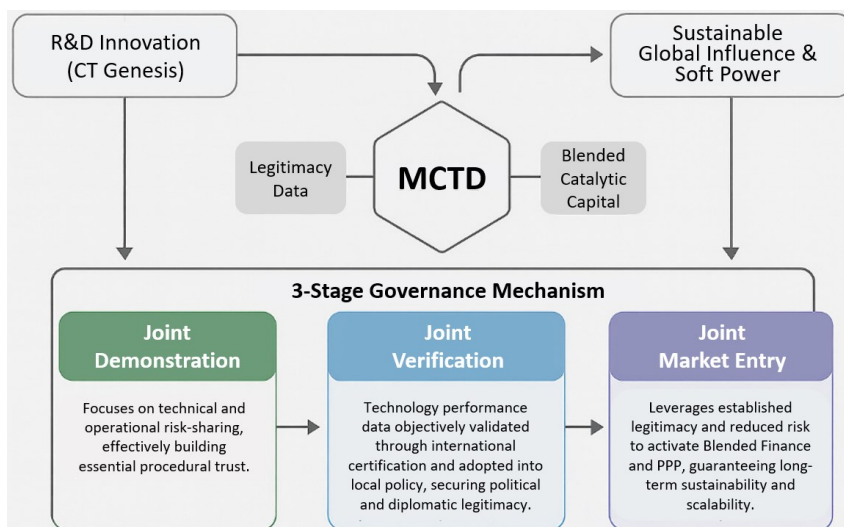
The model is anchored by three structural pillars that function as operational nexuses:

- ① **Demand-Centricity:** The entire process is initiated by and sustained through the recipient country's specific needs and local policy priorities, ensuring the technology is perceived as a shared solution, not a donor commodity.
- ② **Legitimacy Data:** Data generated from the Joint Demonstration (e.g., CO<sub>2</sub> reduction metrics, LCA, ROI projections) are quantified, digitally monitored, and externally verified. This objective evidence of effectiveness becomes the foundation for securing policy legitimacy and credibility in international forums, with Digital CT is a crucial Anchor for data integrity.
- ③ **Blended Catalytic Capital:** Public funds (ODA, GCF) are strategically deployed to mitigate the financial risks associated with the initial deployment of novel CT, acting as a 'catalyst' that attracts and leverages significantly larger private investment for large-scale market entry.

## **2.2. Policy Operationalization of MCTD**

The MCTD model can only be activated when climate technologies move beyond laboratory development and are embedded within a policy and financial structure that reduces uncertainty for both the host country and investing actors. Unlike conventional technology transfer, which assumes that supplying advanced technology is sufficient, MCTD frames diffusion as a diplomatic process that requires local trust-building, performance Certification, and market integration supported by financial legitimacy. This section explains how MCTD is operationalized in practice, based on findings from the 3rd FGI and cross-validation through international expert surveys. The overall mechanism of this framework is summarized in Figure 1 below.

First, the operationalization begins with a demand-driven logic rather than a supplier-driven approach. Technology deployment must start from local needs—such as WEF security, waste management, or air pollution—not from a catalog of available technologies. Participants from Vietnam, Indonesia, and Kenya repeatedly emphasized during the FGI that projects fail when they are introduced as “finished solutions,” rather than being co-designed with local utilities, municipalities, or small enterprises. Thus, MCTD treats climate technologies as negotiated assets that must adapt to local regulatory, cultural, and financial contexts.



Note: This figure illustrates how climate technologies originate from R&D (Source) and are transformed into diplomatic assets (Process) through a three-stage pathway—Joint Demonstration, Joint Certification, and Joint Market Entry—enabled by legitimacy data and blended catalytic capital, and ultimately generate sustainable global influence and Soft Power (Outcome).

**Figure 1. Overall Structure and Research Flow of the Dissertation**

Second, transforming technology into a diplomatic asset follows a three-stage governance pathway.

- In Stage 1 (Joint Demonstration), the purpose is not commercial return but procedural trust. Technologies are piloted in real operating environments with shared risks between the provider and the host country. This stage produces operational data such as energy output, system reliability, cost of maintenance, and user acceptance. Without this stage, technologies remain “foreign prototypes,” not locally validated solutions.
- In Stage 2 (Joint Certification), the demonstration data is quantified, standardized, and subject to international certification (e.g., ISO, IEC, UNFCCC methodologies). This transforms technical feasibility into policy legitimacy. Several policy experts in the FGI noted that “what convinces ministries is not innovation itself, but certified evidence that can be inserted into national standards, procurement rules, or NDC implementation plans.” This stage turns data into a diplomatic asset—what this study calls legitimacy data.
- In Stage 3 (Joint Market Entry), climate technologies enter procurement markets, ODA pipelines, or blended finance platforms using the legitimacy

secured in Stage 2. At this stage, public funds such as ODA, GCF readiness financing, or MDB concessional loans are used to de-risk private investment. Without this financial architecture, even successful pilots remain isolated cases. The study confirms that PPP and blended finance are not optional incentives but structural enablers of diplomacy, as they provide continuity and sovereign ownership beyond initial grants.

Third, two enabling nexuses connect these stages: legitimacy data and blended catalytic capital. Legitimacy data—generated in Stage 1 and validated in Stage 2—acts as the “diplomatic currency” that enables financial institutions, export credit agencies, and development banks to justify investment. Blended capital—composed of concessional finance, private equity, and public guarantees—allows host countries to scale up technology adoption without incurring excessive sovereign debt—the absence of either element results in stalled projects or politically unsupported technologies.

Finally, the model operates as a cyclical rather than a linear pathway. Once technologies successfully enter markets and generate diplomatic influence, this outcome feeds into the Source stage by attracting further R&D investment, new partnerships, and upgraded standards. This cyclical interaction explains why some countries maintain long-term influence in green technology diplomacy while others remain confined to demonstration-only projects.

In sum, the operationalization of MCTD demonstrates that climate technology becomes a diplomatic asset only when scientific credibility, institutional legitimacy, and financial feasibility are linked within a governed sequence of demonstration, Certification, and market entry. It offers a pathway to move beyond fragmented aid-based cooperation and toward reproducible, financially bankable, and politically legitimate technology diplomacy.

## **VII. Conclusion**

This study investigated the structural conditions and mechanisms required for CT, developed through national RD&D efforts, to successfully transition into a national Soft Power asset, thereby advancing global climate goals while expanding national influence. Through a rigorous analysis encompassing FGIs and exploratory validation with international experts, the study derived the MCTD Model as a consolidated strategic framework.

The central finding is that the efficacy of CT as Soft Power is not determined by its technical superiority but by the recipient country's willingness to adopt and sustain the technology—a 'Preference' that must be structurally manufactured. This manufacturing process requires overcoming two critical market failures: the trust-legitimacy gap and the Financial Risk Gap.

The MCTD model proposes a three-stage sequential governance mechanism to bridge these gaps. This mechanism systematically converts operational trust (Stage 1) into political legitimacy (Stage 2) and finally into commercial sustainability (Stage 3). The key to this transition is the strategic utilization of Blended Catalytic Capital and the objective proof provided by Legitimacy Data.

The key policy implication is the necessity of a systemic shift from a traditional ODA approach, characterized by one-time technology transfer, to a market-linked, co-governed mechanism. Governments must prioritize the strategic use of public funds as a donation and as a catalyst for private investment in the verified Stage 3. Furthermore, integrating Digital CT as an Anchor for data collection and monitoring is essential for building the 'Legitimacy Data' that underpins the entire framework.

In conclusion, the MCTD model offers a robust theoretical and operational roadmap, demonstrating that the future of technology diplomacy lies in the systematic convergence of technology, governance, and finance. It reframes CT from a mere environmental solution into a powerful diplomatic asset capable of generating sustainable national Soft Power. Further research should empirically test the causal relationship between the three stages and the subsequent generation of Soft Power metrics.

## **Acknowledgment**

This work was supported by the National Institute of Green Technology (NIGT) through the “Research on Project Development and Facilitating Global RD&D for Korea’s Carbon-neutral Technologies” (No. C2520201), grant funded by the Ministry of Science and ICT (MSIT) of the Republic of Korea.

## References

- ADB, IADB & WB. (2014). Public-Private Partnerships Reference Guide (Version 2.0). The World Bank Group, Washington, DC 20433, USA. Available at [https://www.ppiaf.org/sites/default/files/documents/2014-01/PPPrefGuide\\_Policy\\_Pages72-78.pdf](https://www.ppiaf.org/sites/default/files/documents/2014-01/PPPrefGuide_Policy_Pages72-78.pdf).
- Almansour, A. Y., ALZOUBI, H. M., ALMANSOUR, B. Y., & ALMANSOUR, Y. M. (2021). The effect of inflation on performance: an empirical investigation on the banking sector in Jordan. *The Journal of Asian Finance, Economics and Business*, 8(6), 97-102.
- Amighini, A., Giudici, P., & Ruet, J. (2022). Green finance: An empirical analysis of the Green Climate Fund portfolio structure. *Journal of Cleaner Production*, 350, 131383.
- Candal-Pedreira, C., Ross, J. S., Ruano-Ravina, A., Egilman, D. S., Fernández, E., & Pérez-Ríos, M. (2022). Retracted papers originating from paper mills: cross sectional study. *Bmj*, 379.
- Cho, J., & Jeong, S. (2023, December 13). Innovation technologies for carbon neutrality [Conference presentation]. 01-05, KISTEP-SNU Joint Forum on Future Strategy, Seoul, South Korea.
- Choi, G. Y., Song, J., & Lee, E. (2020). Policy Implementation Process of Korean Government's Public Diplomacy on Climate Change. *Asian Journal of Innovation & Policy*, 9(1). <http://dx.doi.org/10.7545/ajip.2020.9.1.001>
- Choi, Y., Ahn, S., Kim, A. & Yom, S. (2024). A study analyzing the network of participating countries in the APEC Partnership for Science, Technology, and Innovation (PPSTI) and their major projects, aiming to strengthen strategic technical cooperation. 27(3), 477-502. <https://doi.org/10.35978/jktis.2024.6.27.3.477>
- Choritz, S., Lorenzato, G., & Santoro, S. (2018). Blended Finance in the Least Developed Countries.
- Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319-340. <https://doi.org/10.2307/249008>
- Dou, Z., & Toth, J. D. (2021). Global primary data on consumer food waste: Rate and characteristics—A review. *Resources, Conservation and Recycling*, 168, 105332.
- Foley, A., Smyth, B. M., Pukšec, T., Markovska, N., & Duić, N. (2017). A review of developments in technologies and research that have had a direct measurable impact on sustainability considering the Paris agreement on climate change. *Renewable and Sustainable Energy Reviews*, 68, 835-839.
- Future Cleantech Architects & UNFCCC Technology Executive Committee. (2024). Future needs in research, development and demonstration (RD&D) report: Future RD&D needs survey results. Remscheid, Germany. Available at <https://fcarchitects.org/wp-content/uploads/2024/03/20240226-RDD-Report.pdf>
- Gomichon, M. (2013). Joseph Nye on soft power. *E-international Relations*, 8.
- Hatzirygiourou, N., Asano, H., Iravani, R., & Marnay, C. (2007). An overview of ongoing research, development, and demonstration projects. *IEEE power & energy magazine*, 5(4), 79-94.

- Hidayat-ur-Rehman, I., & Ibrahim, Y. (2024). Exploring factors influencing educators' adoption of ChatGPT: A mixed method approach. *Interactive Technology and Smart Education*, 21(4), 499-534.
- Hong, H-J, & Park, S-Y. (2022-08-16). R&D Expenditure and Funding Sources. In *Proceedings of the Korean Academy of Management Convergence Conference* (pp. 613-636), Jeollanam-do, South Korea.
- Jeet Kaur, R., Dutta, S., Charan, J., Bhardwaj, P., Tandon, A., Yadav, D., ... & Haque, M. (2021). Cardiovascular adverse events reported from COVID-19 vaccines: a study based on WHO database. *International journal of general medicine*, 3909-3927.
- Jeong, H., Kim, T., & Cho, M. (2022). Effective Governance Structure of Science and Technology ODA for Technology Innovation and Commercialization. *International Development and Cooperation Review*, 14(1), 71-98.
- Kim, N-R. (2025). Comparative Legal Analysis and Research on Improvement Measures to Promote Technology Transfer and Industrialization. *Journal of Legislative Studies*, 22(2), 171-212.
- Krause, K. (2018). Technology and the Paris Agreement: From means of implementation to climate innovation to transformation. In *EU Climate Diplomacy* (pp. 129-141). Routledge.
- Li, L. (2016). *Soft Power for Solar Power: Germany's New Climate Foreign Policy*. Germanwatch. Germanwatch eV Germany, Bonn.
- Li, T., Yue, X. G., Qin, M., & Norena-Chavez, D. (2024). Towards Paris Climate Agreement goals: The essential role of green finance and green technology. *Energy Economics*, 129, 107273.
- Lin, Y., Lin, Y., Liu, J., Tan, Z., & Han, W. (2025). Triple Helix Synergy Model in China's new technology diplomacy: Perspectives from AI startups. *Telecommunications Policy*, 103079.
- Madaki, A. S. A., Ahmad, K., Singh, D., & Abdullah, A. A. R. A. (2023, October). Unleashing the impact of IT integration implementation in public sector organizations through the lens of TOE: a review. In *2023 International Conference on Electrical Engineering and Informatics (ICEEI)* (pp. 1-6). IEEE.
- Meena, R., Mishra, A. K., & Raut, R. K. (2025). Strategic insights: mapping the terrain of artificial intelligence (AI) in banking through mixed method approach. *VINE Journal of Information and Knowledge Management Systems*, 55(5), 1192-1222.
- Moskalyk, L., & Revera, Y. (2025). THE DUAL ROLE OF ARTIFICIAL INTELLIGENCE IN DIGITAL DIPLOMACY AND TECH DIPLOMACY: GLOBAL IMPLICATIONS. *Green, Blue and Digital Economy Journal*, 6(2), 32-44.
- Mungalova, Z. (2025). *Entrepreneurship and Economic Diplomacy in Emerging Markets*. Available at SSRN 5452754.
- Nanthagopan, Y. (2021). Review and comparison of multi-method and mixed method application in research studies. *Journal of Advanced Research*, 2(3), 55-78.
- Nedopil, C. (2022). Green finance for soft power: An analysis of China's green policy signals and investments in the Belt and Road Initiative. *Environmental Policy and Governance*, 32(2), 85-97.
- Nesher Shoshan, H., & Wehrt, W. (2022). Understanding "Zoom fatigue": A mixed-method approach. *Applied Psychology*, 71(3), 827-852.

- Nye Jr, J. S. (2004). Soft power and American foreign policy. *Political science quarterly*, 119(2), 255-270.
- Nye Jr, J. S. (2008). Public diplomacy and soft power. *The annals of the American academy of political and social science*, 616(1), 94-109.
- Nye, J. S. (2015). The decline of America's soft power. In *Paradoxes of Power* (pp. 27-32). Routledge.
- Okoisama, T. C., & Bagshaw, K. B. (2023). Information Technology Infrastructure and Organisational Sustainability of Petroleum Tank Farms in South-South, Nigeria. *International Journal of Science and Business*, 25(1), 210-228.
- Rimmer, M. (2018). The Paris agreement: Intellectual property, technology transfer, and climate change. In *Intellectual property and clean energy: The Paris Agreement and climate justice* (pp. 33-67). Singapore: Springer Singapore.
- Rogers, E.M. (2003). *Diffusion of innovations* (5th ed.). New York: Free Press.
- Sahin, I. (2006). Detailed review of Rogers' diffusion of innovations theory and educational technology-related studies based on Rogers' theory. *Turkish Online Journal of Educational Technology-TOJET*, 5(2), 14-23.
- Song, J. (2022). The Perception of Public Diplomacy for Science and Technology in Response to Climate Change through Diplomats in Korea. *Journal of Korea Technology Innovation Society*, 25(5), 1025-1050. <https://doi.org/10.35978/jktis.2022.10.25.5.1025>
- Song, J. (2025a). The intersection of climate technology and public diplomacy: Insights into policy and implementation. *Sustainable Futures*, 9, 100465. <https://doi.org/10.1016/j.sifr.2025.100465>
- Song, J. (2025b). Climate Technology Public Diplomacy: Strategies for Global Commercialization and National Interest Expansion. *Science, Korea Institute of S&T Evaluation and Planning (KISTEP), ICT Policy and Technology Trends*, 293. 1-15.
- Song, J., & Kim, C. (2022). A Study on Strategies of Public R&D to Achieve National Carbon Neutrality: Focusing on the Implications of the Republic of Korea. *Asian Journal of Innovation & Policy*, 11(1). <https://doi.org/10.7545/ajip.2022.11.1.001>
- Song, J., & Baek, Y. J. (2023). Key to Success: Measures to Promote Climate Technology-Finance Linkage between South Korea and MDBs. *Asian Journal of Innovation & Policy*, 12(2). <https://doi.org/10.7545/ajip.2023.12.2.268>
- Tornatzky, L., & Fleischer, M. (1990). *The process of technology innovation*. Lexington Books.
- Yaron, I., Melloni, L., Pitts, M., & Mudrik, L. (2022). The ConTraSt database for analysing and comparing empirical studies of consciousness theories. *Nature Human Behaviour*, 6(4), 593-604.
- Yoon, S., & Kim, S. (2022). A Conceptual Renewal of New Public Diplomacy: Constructing Climate Governance between Korea and Africa. *Journal of the Korea Academia-Industrial cooperation Society*, 23(8), 403-412. <https://doi.org/10.5762/KAIS.2022.23.8.403>