Blended Finance for State-led Decarbonization: How Public Interventions Direct Private Finance towards Green Investments

*Working Paper*

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# Table of Contents

Abstract ................................................................................................................................. 3

1. Introduction ......................................................................................................................... 4

2. State-led decarbonization: features, characteristics, and priorities ........................................ 7
   2.1 Overview of Korea’s climate-related economics and policies ............................................. 7
   2.2 Mobilizing investment capital for inclusive and sustainable economic growth ..................... 8
   2.3 First wave of green finance, as one part of the grand LCGG scheme .................................. 10
   2.4 Second wave of green finance, with a focused approach to blending .................................. 13

3. Discussion, implications, and policy recommendations ....................................................... 17

4. Conclusion .......................................................................................................................... 23

References ................................................................................................................................ 24
Abstract

Blended finance has gained traction in recent years as a promising solution to bridge the funding gap in transitioning to a decarbonized economy. Yet, there exists little guidance and knowledge on the “how,” especially in the specific country contexts. This paper examines the Republic of Korea as a case study and the government’s efforts to trigger the introduction and institutionalization of green finance for decarbonizing its economy. Focusing on the design of incentives and institutions by the public sector to manage risks and catalyze private capital, we draw necessary conditions for successful application of blended finance. First, consensus building between public and private investors can facilitate harmonizing and internalizing the concept and practice of green finance. Second, designating a dedicated coordinating agency for green finance activities can reduce fragmentation and promote the efficient allocation of capital in the economy. Third, instituting stringent reporting standards and monitoring and evaluation framework can ensure climate finance is allocated to impactful projects and sectors. Lastly, climate-related sectors, such as energy, should be structurally conducive to private investment and activities. State-led approach may be rapid in execution, but it should also be accompanied by these measures to direct private finance towards green investments and scale the impact.
1. **INTRODUCTION**

Annual investments in low-carbon energy need to supply US$1.6 to 3.8 trillion per year globally to 2050 to meet 1.5°C pathways, overtaking fossil investments globally by around 2025 (McCollum et al. 2018). Yet the flows of mitigation finance have averaged US$537 billion (Buchner et al. 2019). Effectively decarbonizing the global economy and putting it on a sustainable growth path would therefore require a major shift in investment patterns, and a focus on catalyzing diverse sources for investment to mobilize capital at scale. Accordingly, there is a noticeable shift in the traditional roles of public and private sector in addressing climate change and supporting clean energy transition. In et al. (2021) highlight that companies are increasingly deploying corporate capital to catalyze system-wide transition. Choi and Seiger (2020) and Peterman et al. (2014) identify increasing roles of governments and philanthropies that are increasingly facilitating organizational networks among public and private sectors, beyond simply making direct investment for energy projects.

The question of how public interventions – through policies and finance – can help direct private finance towards green investments has become central in the current climate policy debate (Corrocher and Cappa 2020; Meckling 2019; Polzin et al. 2015; Rodríguez et al. 2014). This is because public actors play a significant role as enablers for new technologies and systems because they are willing to accept a higher degree of risk than private investors (Mazzucato and Semieniuk 2018; IRENA and CPI 2020). In this context, blended finance, a structuring mechanism that strategically uses public and/or philanthropic capital to catalyze additional private capital and increase private investment, has emerged as a promising solution to help deliver the goals of the Paris Agreement and achieve the Sustainable Development Goals (SDGs) (African Development Bank et al. 2015; OECD 2018). Public and philanthropic investors can improve an investment’s risk-return profile by lowering perceived and real risks associated with climate technologies and projects. Blended finance pursues both development and commercial objectives, underlining its hybrid character and operating between public and private spheres (Andersen et al. 2019).

Despite the traction and diverse applications of blended finance for climate and sustainable development (Tonkonogy et al. 2018; Asian Development Bank 2017; OECD 2019; OECD and UNCDF 2019), there remains a certain level of ambiguity around the practice of blended finance. This ambiguity is derived from several factors, including: (1) the multitude of actors, forms of financing, and objectives that make it difficult to measure effectiveness, (2) complex governance structures that discourage private and local actors from participating; (3) monitoring and evaluation (M&E) is rarely conducted in a transparent and effective manner; (4) the implications and value for money of investing public capital in blended finance are not fully understood; and (5) many blended finance operations do not take local context and dynamics enough into consideration. Above all, despite the significant improvement in the collective understanding of the concept and principles of blended finance in recent years, there remains a lack of systematic guidance on the approach and strategies for blended finance in specific contexts.

Furthermore, studies on blended finance have thus far largely been on the specific entities such as multilateral development banks, development finance institutions, national development banks, and individual blended finance vehicles (African Development Bank et al. 2015; International Finance Corporation (IFC) et al. 2018; Beal, Dhar, and Young 2018; Whitley, Trujillo, and Norman 2014; Choi and Seiger 2020; Griffith-Jones and Attridge 2020; Negreiros, Tonkonogy, and Yang 2020) and sectors (OECD 2019; Tonkonogy et al. 2018; Fulton and Capalino 2014; Monk and Provaggi 2013). In the midst of these globally situated reports and assessments, a locally situated assessment can provide a critical complementary lens to examine blended finance. Yet, there are few...
country-specific case studies, with a number of studies on institutional architecture and policy development that promotes green finance and ESG in developed countries (e.g., Belgium, Japan, EU, USA). There are a limited number of cases on developing and emerging countries (e.g., Mongolia, Indonesia, South Africa) where official development assistance (ODA) from abroad plays a significant role and local investors remain largely untapped despite their connection to the local economy and lower level of certain risks (e.g., currency, political, foreign exchange). This is problematic because the purpose of using blended finance is to achieve a transformative impact in the locally targeted sector; without the buy-in and proper institutionalization at the local level, the sustainability of any intervention becomes fragile.

Against this backdrop, we consider blended finance as an effective financing scheme for countries undertaking a transition towards a more sustainable and low-carbon economy. In designing and implementing blended finance mechanisms, it is important "to understand the restrictions and market failures and the sectoral and country context, and to articulate how blended finance is supporting the creation of markets or is helping them move toward commercial sustainability" (IFC 2018, p.2). Hence, this paper reviews debates centered around blended finance and discusses roles that the public sector should play to mobilize private capital for climate impact. It does so through a qualitative case study because the nature of the research topic requires an in-depth understanding of the dynamics and context of the country-specific landscape, with an emphasis on the interpretation and application of blended finance and relevant policies, frameworks, and major actors. Case selection was based on the purposive mode of sampling, which selects the most appropriate case for given research objectives and strategy. By setting a geographical and jurisdictional boundary, this assessment can shed light on how and where blended finance has been deployed for what impact, as well as the role of public actors in facilitating sector transformation for decarbonization. Especially in the post-COVID period, reassessing the role of public finance and public financial institutions will be critical in “building back better.”

The Republic of Korea (henceforth Korea) has conditions for blended finance because institutional and market failures are preventing active involvement of the private sector in climate projects (IFC et al. 2018). While Korea’s exposure to physical climate change is relatively low given its geographical conditions (In and Park 2020), the Korean economy is highly exposed to transition risks of climate change. Korea is the seventh largest national CO2 emitter and one of the OECD countries with the fastest-growing greenhouse gas (GHG) emissions. Since the Korean economy relies heavily on manufacturing exports, it is vulnerable to exogenous shocks that result from the global transition to a low-carbon economy. Despite these externalities, the private sector remains reluctant to make significant changes to its business- and investment-as usual.

Korea’s development history and trajectory offers a complementary lens to understand the role of the public sector in leading economic and social development. Like other “developmental states” in East Asia, where the practice of the policymaking elite strategically intervening in the economy in pursuit of national goals is accepted as necessary and desirable, Korea has instituted export-led growth strategies that relied far more heavily on state direction than on the more market-oriented approach taken by the Western countries (Haggard 2018; Fukuyama, Bennon, and Bataineh 2019; Kim and Thurborn 2015). Strong state leadership with centralized bureaucratic structures played a crucial role in achieving rapid industrialization and catching up in spite of limited capabilities and social infrastructure. With the increasing technological sophistication of Korean firms, there has been a shift towards a more decentralized governance structure, but the government remains the leader in driving industrial restructuring and technological upgrading.
Similarly, Korea’s climate goals and agenda have also been set and driven by the government. The most notable initiatives are the Low Carbon, Green Growth (LCGG) agenda (2008-2013) pursued by the former conservative party and more recently through the Green New Deal (2020-2025), a KRW 73.4 trillion stimulus announced by the current liberal party (2017-2022) as part of the Korean New Deal (KND). There have been many academic and policy research efforts on Korea’s green growth (M. Lee, Lee, and Shin 2020; Kamal-Chaoui et al. 2011; Ha and Byrne 2019), but most focus on the legal, policy, and social implications of government initiatives. This paper focuses specifically on the finance aspect of government-led decarbonization efforts, providing a complementary assessment to the existing body of research.

The objective of this paper is therefore to outline the landscape of blended finance in Korea for climate impact and to look at the way blended finance has been mobilized for decarbonization. In particular, this study examines the policy and legal structures, notable government initiatives on climate finance, and modalities for mobilizing private capital for decarbonization. It does so by exploring the two waves of green finance, the first one initiated by the LCGG agenda and the second one currently forming under the KND. Both waves represent major top-down attempts by the government to trigger a “fundamental transformation” and change the basic economic model based on fossil fuels. They, however, display notable differences in their approach to finance in terms of the level of public sector involvement, the emphasis on private financing, and the degree of institutionalization. While the LCGG era put its emphasis on state-led investment and public institutionalization, the KND shows a marked shift towards long-term private involvement for green financing. This paper identifies major actors and financial mechanisms for the country’s decarbonization and determine whether the public sector demonstrates learning, innovation, and/or systemic evolution for blended finance.

The goal of this study is neither to provide comprehensive evaluations of the Korean government’s initiatives nor to provide a complete overview of Korea’s green finance landscape, which are beyond the scope of this paper. Rather, it is to investigate how blended finance has been deployed and utilized for decarbonization and sustainable growth in the specific country context, identify factors that should be considered, and draw implications for other economies with similar political structure and climate ambition. By conducting in-depth study on Korea and its sustainable growth trajectory, this study yields several insights that contribute to the knowledge and practice of climate and blended finance. First, it sheds light on the structure, incentives, and empirical behavior of the state-driven finance regimes in Asia. While most attention has been on Europe and US, whose markets are characterized as competitive and decentralized, there has been a continued lack of attention to Asia, where markets are largely controlled and centralized. In Asia, the state-driven finance regimes provide the bulk of resources to infrastructure and renewable energy and play a critical role in building and transforming the national energy infrastructure. The lack of understanding of this context-dependent variable will hamper the quest for sustainability given the region’s size and trajectory (Heller and Seiger 2018). Therefore, a detailed assessment of how the Korean government initiates, facilitates, and implements climate and blended finance can expand the understanding of the use of blended finance. Second, blended finance transactions typically span national borders, originating from the developed and flowing to the developing as part of the former’s development and climate strategy. By focusing on domestic activities and transactions, this study provides a complementary assessment for the internal, or local, practice of blended finance. Lastly, the Korean case provides answers to the “how” question, as the country is undergoing the second wave of significant institutional and financial innovations with the state-led green initiative. Assessing how the government strategizes and deploys its capital to mobilize private investment for climate impact can provide important lessons to those with similar political and financial structure and climate ambitions.
2. STATE-LED DECARBONIZATION: FEATURES, CHARACTERISTICS, AND PRIORITIES

2.1 Overview of Korea’s climate-related economics and policies

Before delving into Korea’s blended finance landscape for decarbonization, it is necessary to understand the context and overview of the economy. In particular, there are several interconnected reasons for the Korean government to advance the country’s energy transition and push towards decarbonization. Korea continues to be driven by an extreme version of the fossil fuel dependent industrial economy. The country’s economy was built from the ashes of civil war to produce the most rapid economic growth in modern history, until China’s rise in the late 1990s (Kong, 2013). Severe energy poverty was regarded as a key domestic obstacle to the industrialization of the economy, as such, the 1960s and 1970s saw a major effort to secure reliable energy for industry (Yeo, 2015). As a catch-up country with meager market share and weak technical infrastructure, cheap energy was believed to be vital to creating price competitiveness of Korean products in the international market (Jung & Park, 2010; Kim, 2016; Kim & Ko, 2013; Lee, 2018; Yun, 2012). The government aggressively facilitated the building of large-scale energy facilities centered on oil refineries, coal, and nuclear power plants by authorizing massive finance measures including foreign loans, grants, and tax incentives (Boo, Kim, & Park, 2013; Yeo, 2015). Policy and regulatory framework also enforced low electricity prices that made centralized energy appear to be cheap (Korea Institute of Public Finance, 2012; Park, 2011). In turn, this cheap energy strategy encouraged rapid growth in energy demand while preventing unsubsidized energy options from entering the market (Boo et al., 2013; Park, 2011; The Korean Government, 2008a; Yun, 2012). Under these circumstances, Korean energy-intensive development skyrocketed. Korea went from one of the lowest energy-using countries to rank as the eighth largest energy consumer in the world (in 2016, it used 288Mtoe) (Enerdata, 2017).

Korea is extremely dependent on imports for its energy supply. The country produces neither oil nor high-quality coal and only 1.5% of the natural gas it requires, importing over 95% of its energy supply (Mah et al. 2012). Given the country’s geographic location, Korea has no inter-country electricity and gas connections, which is an added challenge for ensuring energy security. Therefore, securing a stable energy supply has been a primary national energy policy goal (Mah et al. 2012; IEA 2020), and the energy security and reduced import costs serve as important co-benefits of climate mitigation (IEA 2020; Sonnenschein and Mundaca 2015). Nonetheless, the share of renewable energy supply remains significantly low. By the time the first green agenda was launched in 2008, renewable energies accounted for only 1.4% of energy inputs (Mathews 2012). By multiple accounts, Korea had the lowest share of energy from renewable sources in energy supply among all IEA countries (IEA 2020) and far below average for OECD members (+9.3%) as well as for the Asian countries studied (+8.7%) (Enerdata 2020).

As a result of its industrial structure, energy demand, and energy mix, Korea is the seventh largest national CO2 emitter and one of the OECD countries with the fastest-growing GHG emissions. Korea had its GHG emissions increased by 143% from 1990s levels in 2008 (IEA 2020), with most of the increase coming from the energy sector. Korea’s Nationally Determined Contribution (NDC) proposes an economy-wide target to reduce GHG emissions by 37% below business-as-usual emissions of 857 MtCO2e/year in 2030. In 2017, emissions were at 709 Mt CO2-eq, 30% higher than the 2020 target of 543 Mt CO2-eq. Based on the revised 2030 GHG roadmap adopted in 2018, South Korea intends to achieve a 32.5% emissions reduction below BAU domestically. The remaining 4.5% is to be achieved through international market mechanisms.
There is also a disconnect between government-driven initiatives and financial incentives on mitigation and the country's GHG emissions and energy targets. Korea's energy policy has traditionally focused on subsidizing the energy-intensive heavy and chemical industries with low retail electricity prices, maintained through state-led investment in nuclear and coal-fired power stations (Song et al. 2018). As a result, Korea's energy system heavily depends on fossil fuel and nuclear industries, which the country will need to manage as it looks to decrease its dependency. The Renewable Portfolio Standard (RPS), which replaced a feed-in-tariff (FIT) scheme and has been in place since 2012, is the main policy instrument to promote renewable energy. The RPS scheme requires major electric utilities to increase their renewable and “new energy” share in the electricity mix to 10% by 2023. Through the third Energy Master Plan adopted in June 2019, together with the 2017 power sector plan, the government aims to increase the share of renewable electricity to 20% by 2030 and to 30-35% by 2040, up from 3% in 2017. The current government also aims to gradually phase-out coal and nuclear from the energy mix while significantly improving energy efficiency, and by fostering the country’s nascent hydrogen industry. Reaching these ambitious targets will require Korea to substantially enhance decarbonization efforts across all energy sectors, address regulatory and institutional barriers, make use of the country’s advanced technologies and innovative capacity, and introduce a resilient and flexible electricity system that is capable of accommodating the growing share of variable and decentralized renewables (IEA 2020).

Finance is needed to achieve these goals. In the next subsection, we examine the evolution and status of green finance in Korea, where it’s been, where it’s heading, and the financial and structural barriers at the intersection between public and private finance.

### 2.2 Mobilizing investment capital for inclusive and sustainable economic growth

Korea has been an astute user of finance in its decades-long industrial development trajectory, utilizing debt finance to a much greater degree than other countries in catch-up mode. In the 1960s and 1970s, the period of Korean industrialization, the banking sector with substantial government control played a central role in providing stable capital at an affordable rate and thus serving the real sector. Since the country had low income and low domestic savings, the Korean government established state-owned banks like such as Korea Development Bank (KDB), Export-Import Bank of Korea (KEXIM), and the Industrial Bank of Korea (IBK), through which domestic companies could secure investment capital at low-interest rates. To expedite the industrialization, the government created and relied heavily on state-owned enterprises (e.g., Korea Electric Power Corporation, Korea Gas Corporation) and chaebols (e.g., Samsung, Hyundai, Daewoo, LG), and promoted capital-intensive industries like steels, shipbuilding, manufacturing (Lim 2013). The Korean government has strong and almost direct control over private sectors through its control of credit (Lee 2017).

Korea’s green growth plan capitalizes on its state-led regime. It also looks to engage the private sector, which has matured since the industrialization era. The government aims to address market failure by internalizing externalities and incentivizing investment in infrastructure (e.g., renewable energy, water, transport, and waste) and innovation (e.g., R&D funds, early-stage equity). There is not enough consensus in the private sector to specify the impacts of climate change on the market and to recognize financial materiality of those impacts. As a result, the public sector has been driving green growth through deploying required investment capital, building infrastructure, and getting the private sector involved. In this regard, blended finance can serve as an effective means to mobilize public and
private funds and achieve policy goals. Notably, the low-carbon transition requires both long-term capital to scale and sustain energy projects and risk capital to seed innovative energy projects. Hence, the public sector should consider various financial instruments that meet investors’ needs to provide required capital that facilitates private-sector participation in areas where the market failed. Financial instruments include debts (including bonds), equity funds, guarantee products, and other risk-sharing facilities.

To structure blended finance for optimal impact, it is essential to identify financial and structural barriers specific to a country, industry, and market. In Korea, raising investment capital for low-carbon transition is challenging, particularly due to (1) a lack of buy-side investors, (2) absence of financial intermediation and relevant infrastructure, and (3) regulations in the capital market. These challenges exist for several reasons. First, the Korean capital market is dominated by institutional investors whose investment strategies are relatively conservative. They remain reluctant to diversify their revenue stream even though new energy policies and planning have forced them to do so. Second, there are only a few private financial institutions specializing in climate or green finance and there is no public platform to share information about transactions and investors. And significantly there are only a handful of financial intermediaries focused on early-stage equity investment. The new financial vehicle should lower the barrier to investors by de-risking clean energy projects and normalizing perceived risks, and bridge the knowledge and information gap. And finally, the Korean financial services industry is highly regulated at the state level. Financial innovations have the potential to provide for a more efficient allocation of capital and thereby a higher level of investment performance and economic growth. Regulatory issues may hinder the financial intermediation process and diversifying investment instruments that can encourage capital mobilization.

To address these challenges, the Korean government has established multiple state-led financial institutions to address diverse capital needs. As shown in Figure 1, a wide array of financial institutions and financial instruments are designed to accelerate the transition to a green economy in Korea, and they are affiliated with various ministries. The Financial Services Commission (FSC) controls KDB and IBK, which provide full commercial banking services (e.g., loans, interest subsidy financing, securities, guarantee, securitization of credit risk, financial advisory) to support national economic growth. The Ministry of Economy and Finance controls KEXIM, an official export credit agency that provides loans and guarantees to exporters and importers. The Korea Trade Insurance Corporation (K-Sure) is also an official export credit agency that provides loans and guarantees to exporters and importers. The Korea Trade Insurance Corporation (K-Sure) is also an official export credit agency under control by the Ministry of Trade, Industry, and Energy, which provides Overseas Investment Insurance to the banks that provide loans to Korean overseas developers. There are two more financial institutions providing credit guarantees: the Korea Credit Guarantee Fund, under the control of FSC, covers the liabilities of promising SMEs which lack tangible collateral, and the Korea Technology Finance Corporation, under the control of the Ministry of Trade, Industry and Energy, provides credit guarantees based on technology appraisals. There are financial institutions that are specialized in early-stage equity investing. The Korea Growth Investment Corporation (K-Growth) is an independent fund-of-funds (FoFs) investment firm, under the supervision of FSC, specializing in stage-specific VC and PE investments. The Korea SMEs & Startups Agency (KOSME) is a non-profit, government-funded organization, under the control of the Ministry of SMEs and Startups, which provides financing and other advisory services (e.g., consulting, training, marketing etc.) for domestic SMEs and startups. The Ministry of SMEs and Startups also controls the Korea Venture Investment Corporations, which is also a FoF investment firm promoting the development of Korean venture capital and private equity fund industry.
These institutions often have duplicative roles in the capital market, raising concerns about fragmentation, ineffective use of public resources, and potentially crowding out the private sector. The Korean government has attempted to privatize some of these institutions to minimize the duplication of efforts and consequential inefficient use of public capital. For instance, the Korean government announced in 2009 the full privatization of KDB and created the Korea Finance Corporation (KoFC) to transfer KDB’s policy-related financial services. But, in 2013, the government scrapped the privatization plan and remerged KDB and KoFC. IBK faced a similar institutional chaos when it was announced to be privatized in 2014 only to have the plan scrapped; 76% of its share is still owned by the Korean government. The Korean government is also considering the merger of some financial institutions whose coverage is most duplicated, such as KEXIM and K-Sure. Lee (2021) argues that competitions across government entities have forced financial institutions to expand their business scopes. Furthermore, there is no control tower with authority to reform the institutional arrangements. As a result, investment capital is inefficiently allocated: the selective sectors or companies receive excessive investments while others have extremely limited investments. This issue persists in how the government should manage the Korean New Deal Fund and the Green Finance Corporation, as to be explored in section 2.4.

2.3 First wave of green finance, as one part of the grand LCGG scheme

In 2008, the LCGG agenda was announced by the Korean government in a presidential speech celebrating the 60th anniversary of the founding of the Korean Republic. The first sixty years of Korea’s development that saw spectacular improvements in per capita income powered by fossil fuels were contrasted with the next sixty years with ‘low carbon, green growth’ as a new vision for the economy. While Korea’s strategy is not the only attempt to foster greener growth worldwide, it certainly represents the first, largest and most organized policy approach to green growth thus far (Kamal-Chaoui et al. 2011). It was also unexpected, because prior to 2008, efforts towards “greening” at home and abroad were lackluster, with limited attempts by the Korean government to address environmental issues in regional forums in the 2000s (Kim and Thurborn 2015). The focused efforts by the top leadership and the political elite at the executive level enabled rapid legal and policy measures for green growth,
Blended Finance for State-led Decarbonization

including those for green finance. This section examines how the top-down approach of the LCGG triggered various legal and policy measures that serve as a basis for state-driven actions, with a particular focus on the first Green New Deal and blended finance vehicles in the form of state-backed green funds.

In January 2009, the first green stimulus package was introduced to Korea in the form of a Green New Deal to respond to the 2008 Global Financial Crisis and to advance the LCGG agenda. The Financial Crisis significantly affected the export-market oriented Korean economy (OECD 2011). A green stimulus could be implemented quickly, and its aim was to specifically respond to economic shocks while also contributing to environmental benefits (ILO 2016). Korea’s Green New Deal was the largest package among the OECD member countries adopting explicit crisis-driven stimulus programs (Barbier 2010; OECD 2011). Eighty percent of the total amount – US$30.7 billion – was allocated to green measures, renewable energies, energy efficient buildings, low carbon vehicles, rails, and water and waste management from 2009 to 2012 (UNEP 2009; (Mundaca and Damen 2015). Green stimulus like the Green New Deal implies the targeting of multiple economic and environmental policy objectives. Performance may vary across these dimensions and over different time horizons, with possible trade-offs (Agrawala, Dussaux, and Monti 2020). Still, compared to business-as-usual stimulus measures, green stimulus has proven to provide both short-term economic gains and build national wealth in the long-term (OECD 2020).

As part of the Green New Deal, the government also focused on encouraging private investment, although the scope was largely limited to infrastructure investments such as road and railway construction and river restoration (OECD 2011, 142-143). The Korean government introduced a number of incentives for private sector partners to form public private partnerships to support Green New Deal programs and other stimulus measures. The incentives include simplified public procurement procedures (with the length of the procurement period shortened from 79-90 days to 20-38 days), increased liquidity offered to the private sector, private investors receiving loans at the interest rate of government bonds, and accelerated evaluation of the traffic and environmental impact of projects (OECD 2011).

In July 2009, the Korean government expanded the Green New Deal into a comprehensive mid-term plan called the Five-Year Plan for Green Growth, which was the centerpiece of the government’s development strategy (Mathews 2012). Under this plan (2009-2013), public expenditure of US$83.6 billion was committed in the area of climate change and energy, sustainable transportation, and the development of green technologies (UNEP 2010). The Five-Year Plan, which also served as a means to turn the National Strategy for Green Growth (2009-2050) into a concrete and operational policy initiative, had designs to trigger private investment from chaebols and lift involvement of SMEs in the green tech sector (Mathews 2012). A year after the release of the Five-Year plan, the Korean corporates committed themselves to investments in green sectors amounting to KRW 22.4 trillion (or around US$20 billion) – not as large as anticipated, but substantial nonetheless (Mathews 2012).

The term “green finance” was also introduced to Korea under LCGG. In particular, the Plan for Facilitating the Inflow of Funds to Promote Green Investment announced in July 2009 presented a specific roadmap for green finance and investment. The long-term goal of this measure was to expand private capital for green industries through green finance products and establish a long-term investment mechanism by utilizing private capital for sustained support for green industries at the growth stage. In order to achieve this goal, the government’s policy directions aimed to expand voluntary participation of individual investors in green finance products through tax incentives and to implement measures and institutions within the green finance infrastructure so that green growth could be achieved within the framework of market economy. Furthermore, Article 28 of the Framework Act on Low
Blended Finance for State-led Decarbonization

Carbon, Green Growth (FALCGG), enacted in June 2010 to lay the foundation to implement the National Strategy, provides legal basis for government support for green finance, including raising financial resources to support green industries, developing new green financial products, encouraging private investment in green projects, reinforcing the public disclosure system for green management, and establishing a carbon market (Office of Government Policy Coordination 2010).

There was some level of high-level institutionalization for green finance among practitioners as well. The Green Finance Council, launched by the Financial Services Commission and the Financial Supervisory Service in 2009, includes 50 representatives from the government and major actors in the banking, brokerage, and insurance industries, including the Korea Federation of Banks, the Korea Financial Investment Association, the General Insurance Association of Korea, the Korea Life Insurance Association, and the Credit Finance Association. The Council’s task was to develop a key finance agenda and establish a network linking businesses and finance. An array of green funds subsequently emerged, contributing to the establishment of the “green growth fund” as a theme in the investment community. Most performed well in the first few years, with 42 products (KRW 300 billion) in 2012. Today, only 6 small ones (under 1 billion) remain with a dwindling balance. After some initial success, issuance of green funds stopped April 2014.

Green investment products were also launched by various government agencies in the form of policy funds, or state-controlled funds, to implement the national agenda. These funds used public finances to guarantee the principle and offer returns higher than the market rates. There was, however, no systematic way to account for the past and current green fund transactions, and a recent survey conducted by a member of the National Assembly was the first attempt to quantify the size of the financial market’s responsible investing and green finance. The survey shows that the 23 green-related funds managed from 2009 to 2017 by different government ministries and agencies amount to KRW 4.08 trillion, with KRW 3.6 trillion as the actual disbursement (79% invested out of the total fundraising amount). Public investments by the government amounted to KRW 2.6 trillion, while private investments were KRW 1.47 trillion. Out of the total fundraising amount, only 36.2% came from the private sector, with the leverage ratio of 1:0.57. The leveraged amount of private investment varied significantly across the examined funds, ranging from 1:3 to 1:0.06. None of these blended funds had ex-post evaluations, yet private management firms received a commission of KRW 233 billion despite the incomplete investment.

We can observe two major developments that took place under LCGG with respect to green finance for blending. First, the efficient top-down approach facilitated rapid disbursement of public funds, but the partnerships with the private investors were limited to one-off infrastructure projects lacking scalability. Whole-of-government coordination, with efficient top-down governance as shown in the case of Korea, allowed the government to quickly set up and implement a debt-financed stimulus package (Agrawala, Dussaux, and Monti 2020; Pollitt 2011). The distribution of the green stimulus was especially speedy – almost 20 percent of the funds were disbursed by mid-2009, compared to only 3 percent for most countries (Strand and Toman 2010). The stimulus was successful in terms of quickly infusing public funds into the private sector, but whether blending of public and private capital was effective remains questionable because public incentives for private sector partners were offered on a case-by-case basis, and these infrastructure PPPs did not lead to sector development or transformation as blended finance strives to achieve. Furthermore, in the process of rapid disbursement of public capital, the plans of some projects were not reviewed sufficiently and the focus was on short-term projects directed by central government ministries (OECD 2011). The lack of involvement of sub-national governments in the
Second, the investment community received a strong signal from the government for the first time about green finance and financial products but the signal remained rather one-way, resulting in a weak form of institutionalization for green finance with limited governance function and passive embrace by private investors. On one hand, the Korean government successfully set up legal, institutional, and international foundations in the form of the FALCGG, the Presidential Committee on Green Growth (PCGG), and the Global Green Growth Institute (GGGI) in order to rapidly yield tangible outcomes to legitimize the by-then unfamiliar concept of green growth and trigger path dependency of institutions. Green finance, on the other hand, received relatively little attention and the interface between the public and private investors was short-lived. The LCGG era introduced the term green finance, established the Green Finance Council to serve as a legitimate channel for cooperation between private and public investors, and launched state-driven “green” funds. Yet, the government’s attempt to engage and mobilize private capital for green industries was limited to state-driven funds, voluntary commitments from chaebols, and a handful of green funds in the investment community that altogether did not create a self-sufficient market for private investors. The private sector remained largely reactive to government initiatives and the hype quickly died with the administrative change. Therefore, the government’s efforts to utilize the lock-in effects of institutionalization to shape and reinforce the preferences of the incumbents have yielded mixed results, partly due to the limited effectiveness of green finance and blended finance. Korea’s top-down approach for green growth and green finance did not generate enough collective understanding and support from the private sector and the general public.

Therefore, the government’s attempt to transform the economy from brown to green had mixed results. In particular, it was successful in setting up the foundation of green finance and blended finance, with the introduction of relevant concepts, targets, and institutions. However, the lack of strong domestic support and a coalition around green finance resulted in a fragile domestic foundation, which quickly dissolved after the change in administration. Legal and institutional measures remained largely in place, but the political rhetoric, power, and interests dissipated. The Green Finance Council’s 7th and last meeting was held in April 2012 and exists only in name. The state-controlled green funds and financial products quickly lost their profitability mainly due to their politicized nature. As one interviewee described, LCGG was successfully institutionalized, internationalized, but it failed to be internalized (Choi 2018). Green finance, particularly blended finance for decarbonization, was successfully triggered but failed to be institutionalized and internalized to sustain its activities and performance.

These developments, in turn, led to limited climate impact. An ex-post assessment of the Green New Deal found that while the green stimulus program was successful in creating jobs and boosting economic growth, climate-related indicators such as the energy intensity of GDP, the CO$_2$ intensity of energy, and the share of renewable energy were not significantly improved (Mundaca and Damen 2015; Sonnenschein and Mundaca 2015).

### 2.4 Second wave of green finance, with a focused approach to blending

The second wave of green finance was initiated in the midst of the COVID-19 pandemic. In July 2020, the Korean government announced an economic stimulus package called the Korean New Deal (KND) to invest US$ 133 billion (KRW 160 trillion) by 2025. The KND focused on creating 1.9 million jobs and invigorating the pandemic-hit economy through economic, environmental and social reforms to “fundamentally change” Korea. The KND has
three key objectives – (a) creating jobs in both traditional and newly emerging digital and green sectors, (b) building necessary infrastructures that will facilitate a transition to a digital and green economy and (c) transforming the Korean economy from a fast follower to a first mover economy in the post-COVID-19 era. Accordingly, it has three main themes: (1) the Digital New Deal to transition towards a digital economy with investments focusing on the integration of data, network, and artificial intelligence, (2) the Green New Deal for climate change, green infrastructure, renewable energy, and (3) green industries, and the overarching theme of strengthening the employment and social safety net to increase resilience against economic uncertainties. Of the total KRW 160 trillion, KRW 73.4 trillion (KRW 42.7 trillion as government expenditure and the remaining KRW 30.7 trillion from local governments and the private sector) is allocated to the Green New Deal, which has three focus areas: Green Transition of Infrastructures, Low-Carbon and Decentralized Energy Supply, and Innovation in the Green Industry (Table 1).

There are many differences between the first and second Green New Deals, including the context, timing, scope, and allocated budget. Yet, one of the most distinctive characteristics about the second Green New Deal is that there is a much more explicit and strategic focus on finance and mobilizing private capital, with recognition that in order to maintain the investment impact led by the government, it is necessary to build an "autonomous and self-sustaining New Deal ecosystem" driven by private investment. President Moon has also emphasized that the success of the Korean New Deal will only come with the support and active participation of the private sector and investors, a rhetoric that was not explicit in the previous Green New Deal under LCGG. The government has also expressed its expectation that around 10% of the KRW 160 trillion Korean New Deal would come from the private sector.
Accordingly, there are notable institutional developments to materialize the government’s revamped focus on green finance. The Korean New Deal Fund announced in September 2020 is to serve as the main financing mechanism to invest in digital and green industries. The Fund consists of three tiers: the Policy Fund, the Infrastructure Fund, and the Civilian Fund (Figure 2). The Policy Fund, which will have a catalytic capital from the government and state-owned financial institutions to attract private investment, is essentially a blended finance vehicle and hence the focus of this section. The government’s rationale is that investing in the New Deal areas involves a high level of uncertainty and a long investment horizon, making it difficult for private capital and investment to come in without the involvement of public investment lowering the risk.

Figure 2. Overview of the Korean New Deal Fund, consisting of three types of funds: a policy fund, an infrastructure fund, and private sector funds

The KRW 20 trillion Policy Fund blends diverse sources of capital to create a fund-of-funds structure for New Deal industries and projects (Figure 3). More specifically, the Policy Fund will consist of 35% public contributions and 65% private investment. The KRW 7 trillion master fund is to be made first with contributions from the government (KRW 3 trillion) and state-owned financial institutions (KRW 4 trillion from institutions such as the Korea Development Bank and the Growth Ladder Fund). Once the master fund is established, an asset manager will be selected to run the Policy Fund. A unique aspect of the Policy Fund that distinguishes it from other state-controlled funds is that this asset manager can propose key fund-related elements such as investment areas, size of the funds, proportion of public contributions, and hurdle rate depending on investment strategy. Feeder funds under the master fund will then be formed, with additional matching contributions of KRW 13 trillion mostly from private financial institutions and pension funds as well as from the public (max 1 trillion expected) (Financial Services Commission 2020a). The feeder funds, in turn, will invest in New Deal-related businesses and projects. The Policy Fund plans to allocate 10-30% of its funding to infrastructure projects and the rest to New Deal-related firms.
There are several notable incentives that the New Deal Fund has instituted to attract private capital. First, funds that invest in immature industries with a long-term return horizon, the Fund allows a longer operating period of 10 to maximum of 20 years, compared to the average period of 7-8 years. Second, in the feeder funds, contributions from the public sector take a subordinated position to absorb losses first (max 20%), lessening investment risks of private investors. The investment-return structure also offers private investors priority on reflows, with private investors getting repaid first in the case of excess revenue. Private investors also have a choice of the call option to purchase a portion of public contributions during the investment period. Third, there is a preferential treatment for fund managers that propose and attempt to invest in New Deal areas with high investment risk. By assessing investment needs and risk, the Policy Fund can increase the public portion of the stack to maximum of 45% thereby increasing the buffer for private investors and lower the hurdle rate from the average of 7% to 4-6% for high risk areas. The government plans to allow diverse forms of investment, including equity investment, debt financing, mezzanine securities, and loans. In order to guarantee effective funding supply, investments will take the form of both project-based and blind-pool funds, and the feeder funds’ structures will be diversified according to expected investment risks (Financial Services Commission 2020b). The Policy Fund will be established in early 2021 and financed over the next five years (2021-2025).

Another significant institutional development for green and blended finance in Korea is a proposal for the Green Finance Corporation as a state-run financial institution to manage the Green New Deal. In November 2020, the ruling party tabled the Bill for the Special Act on the Promotion of Green Finance in Response to Climate Crises, which proposes the definition of green finance and the establishment of an efficient institutional base where the public sector leads and the private sector actively participates. Article 11 of the Bill proposes the establishment of the Korea Green Finance Corporation with an initial capitalization of KRW 5 trillion (USD 4.5 billion) to promote green finance.

Under this proposal, the Green Finance Corporation would be established under the Financial Services Commission, the government’s top financial regulator. The central government, local government, financial institutions, Korea Development Bank, Export-Import Bank of Korea, Bank of Korea, and international organizations would provide initial capital. This public corporation would essentially act as the country’s first green bank, with functions such as identifying demand, providing funding, mitigating credit risks related to green industries, among
others and providing services such as loans, interest subsidy financing, securities, guarantee, securitization of credit risk, financial advisory, insurance, etc. for green industry firms. Therefore, in addition to legal and policy measures (Green New Deal Basic Act and Special Act to Support Green Finance tabled in Nov 2020), dedicated institutional measures such as the New Deal Policy Fund and the Green Finance Corporation are actively taking place, displaying a marked departure from the previous wave of green finance.

3. Discussion, implications, and policy recommendations

Among newly industrialized countries, Korea became a vocal champion of green growth and green growth initiatives (Jones & Yoo, 2011; Sonnenschein & Mundaca, 2016). Korea’s green growth initiatives stand out for their ambition, investment scale, speed of deployment, and systematic design and execution, embodying the modality that has defined Korea’s approach to techno-industrial transformation since the 1960s (Kim and Thurborn 2015). The achievements under LCGG, in particular, point to the power of a government that is committed to actually effect the changes proposed, in a way that most would think is beyond the capacities of a democratic government (Mathews 2012). The fact that many country leaders in Africa, Asia, and Latin America expressed their hope to emulate Korea’s success, made its leadership of the green growth movement particularly important (Asongu, 2017; Jwa, 2017; Schneidewind, Schneidewind, & Schneidewind, 2016). Notably, Korea’s approach to green and blended finance provides useful insights on the design of incentives and institutions to manage risks and to catalyze additional private capital for domestic decarbonization.

Korea demonstrates two major state-led initiatives, LCGG and the Green New Deal as part of the KND, characterized in this paper as distinct waves to “fundamentally change” the country into a decarbonized green economy rather than tinkering at the margins. Korea’s prioritization of green growth in 2008 reflects the reimagining of the relationship between the economy and the environment on the part of the policymaking elite (Kim and Thurborn 2015). The Green New Deal launched in 2020 embodies the revival of this relationship in response to a major exogenous shock, which helped reopen old decisions and realign interest groups and choices related to policy design.

The essential characteristic of Korea’s approach is that it views – regardless of the party affiliation – climate change as not a cost but as a growth opportunity. Korea has formulated its green growth strategy in terms of investments and their anticipated economic benefits – new engines of growth, job creation, exports – rather than in terms of costs and internalizing negative externalities. The debate in Korea on green growth and the Green New Deal has focused on whether the benefits will be as real as envisaged, and not so much on its purported costs. Therefore, although climate objectives are mentioned prominently, the Korean government did not design its green policies as a response to climate change. The idea that economic growth will not be compromised by the goal of environmental protection remains firmly entrenched. Rather, green measures were always viewed through the lens of economic growth and national interest, and policymakers now perceive “growing” and “greening” the economy as complementary goals that can be simultaneously advanced by developing, commercializing, producing, and exporting green technologies, products, and processes. Therefore, Korea’s focus on green growth and the Green New Deal is fundamentally an industrial upgrading strategy, framed around the promotion of key technologies and industries that are viewed as providing the growth engine for the next stage of Korea’s development, as export platforms, and means to reduce carbon emissions (Mathews 2012). Perhaps this explains why there was no specific roadmap for decarbonization or plans for significant GHG emission reduction for both initiatives. Still, in a world where many countries are being held back in their efforts to adopt green strategies because of the focus
on the costs and the need to regulate the negative effects of fossil fuel production and consumption (Meckling 2019; Cullenward and Victor 2020, 2), Korea represents a unique example of emphasizing the benefits of economic benefits of transitioning into green economy.

At the core of both first and second green waves, a stimulus package that emerged as a direct response to the economic disruptions from the Global Financial Crisis and the COVID-19 pandemic. These stimulus packages themselves underwent a major makeover, the first one into a systematic Five-Year Plan that focused on state-led planning and implementation, and part of the second one into a Korea New Deal Fund that aims to stimulate and sustain private investments into the identified areas of Green and Digital New Deals. In particular, LCGG’s emphases were on setting the targets and laying legal foundations to trigger institutional path dependency and utilize the “stickiness” of institutions. Initial policy choices constrain what is possible in the future because major policies and commitments are hard to unwind once in place. For example, the FALCGG and GHG emissions reduction commitments were deliberately designed to ensure the endurance of green growth following a change in political leadership. Korea’s first major state-led decarbonization effort illustrates the public sector’s firm acknowledgement for the stickiness of institutions – be it legal, policy, or organizational.

The second green wave also shows a continued inclination for, and dedication to, the traditional top-down institutionalist approach that relies on legal and policy measures, which in turn create vested interests and lock-in effects. Where the second wave shows a significant departure is in its focused efforts on institutionalizing green finance, particularly with the goal of engaging and mobilizing private capital to sustain momentum and impact. In the first wave, blended finance was not widely adopted and utilized to the scale needed to materialize the goal and ambition. Previous green finance activities were limited to laying the legal foundation for green finance and issuing relevant financial products. The combination of a relatively weak level of institutionalization for finance and the lack of a strong coalition of domestic actors around green finance, particularly among the private investors, led to limited momentum and impact. With a renewed recognition that only the proper engagement of private capital and investors can create self-sustaining markets, the second wave marks the beginning of a proper legal and institutional developments that can facilitate durable deployment of blended finance, notably through the New Deal Fund and the proposed Green Finance Corporation. Investors are increasingly embracing green finance, as the Korean financial supervisory system proceeds with integrating green finance through its consideration of an NGFS membership and TCFD. Therefore, while remaining faithful to the top-down and institutionalist approach, the Korean government’s approach shows evidence of lessons learned and an evolved approach towards private investment to achieve climate goals, instituting incentives for private interests and market opportunities and acknowledging stakeholders’ heterogeneous needs.

Despite these major government initiatives, there remain several significant barriers to the effective deployment and application of blended finance for decarbonization in Korea. Some are addressed by the current second wave, while some remain to be seen. First, climate or green finance is associated with political risks due to its close connection with state-driven initiatives. National priorities change every five years with the administrative change. The term “green” was essentially removed from all government initiatives and programs when the administration changed in 2013. The political nature of state-driven green funds meant that the funds lived and died with the administration, and this in turn cultivated a sense of doubt and distrust from the private sector. The top-down approach may be effective in its speed and efficiency, but with limited involvement and understanding from the private sector and the general public, the lack of internalization and strong coalition remains a key hurdle to
sustaining the effort. Whether the design and operation of the New Deal Fund and the Green Finance Corporation overcomes this hurdle remains to be seen.

Second, there has been a lack of a central coordinating agency responsible for overseeing green finance activities, resulting in a fragmented and scattered administrative approach to managing green finance despite the strong state-driven agenda. For example, the Ministry of Economy and Finance, Ministry of Environment, Ministry of Trade, Industry and Energy, and Financial Services Commission are responsible for different aspects of managing green finance and supporting green industries, often limited to one department per ministry. This fragmentation also signals a disconnect between the ambition of the government’s policy agenda and the institutional and administrative support necessary to materialize the efforts. Furthermore, with this fragmentation, no agency is responsible for systematically accounting for the past and current green finance transactions, and properly monitoring and evaluating the stock and flow. Some point to the striking absence of a green bank, a specialist financial institution that would be responsible for blending and monitoring for green initiatives (Mathews 2012). In response, active movement is taking place towards institutionalizing green and blended finance through the establishment of legal and policy measures and green taxonomy, as well as a central coordinating agency in the form of a green bank.

Third, despite the highly politicized yet bipartisan public-driven climate initiatives that emerged more than a decade ago, the principles and practice of green finance have just begun to take off in Korea, with the lack of agreed definition, taxonomy, and assessment framework posing significant barriers to effective M&E and integrity of green finance. The terms “green finance” and “climate finance” have not been officially defined or adopted by the investor community in a consistent manner. The term “blended finance” has not penetrated the policy and financial circles in Korea, with its usage limited to application to ODA and overseas strategy (Jung et al. 2018; KIEP). The practice of blended finance is more commonly known as a “pump-primer,” often used as a vague concept where the government’s expenditure is used to prime the flow of private capital. State-controlled funds, which are essentially blended finance funds, almost automatically imply that limited public expenditure is being used to crowd out private capital or the government is spending taxpayers’ money to make up for the loss. Establishing a more concrete definition and understanding of what blending implies would facilitate forming partnerships and encouraging the involvement of institutional and commercial investors. Furthermore, the lack of an assessment framework for green finance also means that financial products and initiatives are prone to greenwashing. For example, the size of the “green finance” products in Korea amounted to KRW 51.6 trillion, with 28 trillion in the banking industry, 12 trillion in insurance, and 8.8 trillion in the stock market. However, they all have different definitions and inconsistent taxonomy to determine what counts as green finance.

Fourth, while the green waves provided renewable energy elevated recognition and importance for the first time in the Korean energy development, the highly controlled, centralized, and monopolized energy market poses significant challenges when considering mobilizing private capital for renewable energy projects. The electricity market in Korea is characterized by regulated low electricity prices, insufficient, and support to coal power generation (OECD 2017). Korea’s electricity sector is operated as a mandatory pool with a single buyer; wholesale and retail prices are not set by the market, but by the government. These low retail rates were achieved by maintaining low generation costs through state-led investment in baseload units such as nuclear and coal-fired power stations (Song et al. 2018). State-owned KEPCO controls more than 90% of power generation, and the wholesale market is tightly regulated with little real competition and different prices being paid to different generator types.
Renewable energy policy in Korea shifted to RPS in 2011 with an intention to attract larger-scale projects in a short period. The LCGG strategy sought large and quick additions of renewable capacity, and the utility sector responded by promoting the development of mega-scale renewable energy projects. Significant growth was expected, particularly in wind and ocean power, through utility-scale wind farms and offshore sites (Ha and Byrne 2019). Yet, the status quo remains as the government backed the development of mega-green projects, which would be designed, built and operated by KEPCO and its subsidiaries. The growth of utility-scale green power plants had little contribution to increases of the renewable energy share in the national energy mix. The share of renewable energy is still significantly below the target, with coal still being the dominant source of energy (IEA 2020). The continued reliance on mega projects, or “green titans” with solar, wind, and other sources simply inserted into the centralized grid to retain the energy status quo (Byrne et al., 2009, 86). As a result, consumers in the energy market have limited, and non-diversified energy options, and it would further prevent private investors from entering the renewable energy market. This behavior continues under KND, where public owned utility firms plan to invest KRW 35 trillion in renewables until 2030 in response to the government’s commitment to go net-zero.

Korea’s green measures were not accompanied by broader structural reforms in the energy market that could have incentivized a long-term low-carbon transition. Whether the Green New Deal and Korea’s green initiatives succeed in reaching the climate and energy targets and significantly transforming its energy supply profile will depend on how the government approaches renewables public-private partnership and blending with private investors. In particular, to expand the private sector’s investments in renewable energy, it is necessary that measures take into account electricity prices and renewable energy generation costs in Korea. In the long run, enabling direct power purchasing agreements between private companies is necessary to stimulate proactive corporate participation, which requires a fundamental change in Korea’s electricity market design (IEA 2020). The rigidity of Korea’s current electricity market is making it difficult to accommodate the growing share of decentralized and variable renewable electricity. Failure to open the electricity sector and introduce true competition and independent regulation along the electricity value chain can become major impediments for Korea’s energy transition (IEA 2020). The government is mulling over the recurrent suggestions to reform the electricity market design and recalibrate the support schemes accordingly. For example, an amendment (known as the Purchasing Power Agreement Act) has been tabled in 2020 for the Electricity Business Act so that direct transaction between renewable energy producers and electricity consumer becomes possible, without going through KEPCO.

This paper explored the state’s leading role – based on growth-oriented political leadership and elite bureaucracy – in the green transition process, with a particular focus on how blended finance was introduced and operationalized across the two waves of green initiatives. Transformation into a low-carbon, green economy initiated in 2008 did not go as planned, with limited buy-in and institutionalization of partnership from the investor community. For the KND, the public sector has shifted its priorities for private sector engagement. Private companies and the general public are also evolving as government and external environments change (H. Lee, Jung, and Lee 2019). With strong institutionalization and focus on blended finance, ESG, and green finance, the Korean case shows a promising direction for a successful state-led transition that prioritizes policy learning and broad public-private sector co-evolution.
Key Policy Recommendations

1. **Streamlining Green Finance into Policy Design, Consensus Building, and Stakeholder Engagement.** In the absence of mandatory requirements/taxonomy, there are ad hoc initiatives, announcements, and commitments in the private sector. Given that green transition by Korea (and most other Asian countries) is much less reliant on bottom-up action from the private sector compared to the US and Europe, policy and institutional arrangements have an important role to play (J. Choi and Li 2021). Explicitly incorporating, streamlining, and implementing “climate” or “green” finance into the policy objective or national agenda can provide strong signal to the investment community and support its green finance activities, particularly at the intersection between private and public investments. Relatedly, it is crucial to build a strong consensus with the private sector on low-carbon transition, and thus to mobilize private investors in this area. Stimulus alone cannot set a country or the world on a trajectory for a net-zero emissions economy. It should be accompanied by other policies and fiscal and regulatory reforms, such as phasing out fossil fuel subsidies and use, introducing carbon pricing, measuring and understanding Scope I, II, and III emissions, and setting appropriate emissions target and standards. The government should identify where the market fails and provide adequate public interventions to internalize externalities such as the implementation of carbon tax and green certificate programs.

2. **Requiring a Stringent Monitoring and Evaluation, Plan for Ex-post Assessments, and Negative Incentives for High-emission Sectors.** Governments should implement a stringent monitoring and evaluation framework that takes into account the specific characteristics of decarbonization efforts, such as the long-term horizon and direct/indirect investment needs. Planning for ex-post assessments is also critical to understand the economic and environmental impacts of stimulus measures. Thus far, evaluation of public finance has been heavily quant-based (e.g., amount of investment deployed, multiplier effect, the number of jobs created). Yet, other non-quantifiable effect such as the demonstration effect and/or the environmental and social impact that public finance can generate might not be explicitly defined in the extant evaluation framework. The government, therefore, should establish a comprehensive framework that can assess the role and impact that the public sector plays in the green finance arena. The evaluation of public finance thus far remains short-sighted, which ought to contradict the long-term nature of decarbonization efforts. The aligned evaluation time horizon and comprehensive evaluation criteria will also decrease the duplicated roles of and excessive competition among public financial institutions. Setting the target itself is insufficient, and without robust tracking and impact reporting standards, it will be difficult to ensure that climate finance is being effectively allocated to impactful projects and sectors. Data needs to be made transparent and available and detailed planning is necessary for meeting the goals.

When creating and implementing the M&E framework and ex-post assessment, it is also important to consider negative incentives for high-emission sectors and projects. Decarbonization is not synonymous with massive investment in renewable technologies. It also has to include and enact the destabilization and decline of fossil fuel-based systems (E. Choi and Seiger 2020). Over the past 20 years, Asia has accounted for 90 percent of all coal-fired capacity built worldwide, and in developing economies in Asia, existing coal-fired plants are just 12 years old on average and capable of operating for decades to come (IEA 2019). Therefore, the effectiveness of climate investments would be drastically compromised unless carbon-intensive investments are also significantly reduced and phased out, perverse fossil fuel subsidies are removed, and environmental externalities arising from fossil fuel use are internalized. In Korea, initial steps towards decreasing support...
for high-emission sectors and projects are taking place domestically and for its export strategies, but only after backlash from environmental and social activists and on voluntary measures. The government needs to actively identify and disincentivize activities that compromise its green ambition, while also be prepared to deal with the risks associated with stranded assets, such as fossil fuel and nuclear power generation and supply infrastructure.

3. **Diversification of Financial Instruments.** Green bonds can help attract institutional investors and channel considerable additional private capital in the renewable energy sector to contribute to filling the significant outstanding investment gap. Some recommended actions for policy makers and public finance providers to further increase green bond issuances include the adoption of green bonds standards in line with international climate objectives, the provision of technical assistance and economic incentives for green bond market development, and the creation of bankable project pipelines (IRENA, 2020e). Relatedly, the development and deployment of green fintech can greatly expedite and potentially revolutionize the way financial transactions take place. This is particularly relevant to the Korean New Deal, which encompasses both green and digital aspects. Climate finance and green investment have been identified as the best ground on which to apply financial technologies, or fintech, to combine technology and finance (Marke and Sylvester 2018; UNEP Inquiry 2018). In particular, blockchain can be used for record keeping, automation of processes and transactions, and transferring value without requiring a central entity to validate transactions (OECD, World Bank, and UNEP 2018), enabling and facilitating decentralized finance. Although the carbon intensity of sustaining the blockchain network is being debated, blockchain can significantly transform how climate finance transactions work by contributing to greater contractual and financial standardization during the bidding and procurement stages of projects, facilitating the comparability of projects, and helping financial allocations by investors. Coupled with Artificial Intelligence (AI) technologies, blockchain can provide global visibility over climate actions, help track climate financing flows, and encourage greater alignment of these flows (OECD, World Bank, and UNEP 2018). Therefore, the potential and utilization of fintech should be further explored to transform the way climate finance transactions originate, match, and execute.

4. **Collaborative Policies.** From the perspective of systemic change, climate policy that only incentivizes incremental and process improvements within the existing energy system, such as low-level carbon pricing, is unlikely to unleash the political dynamics needed for transformation. “Unlocking” the potential to transform the fossil fuel energy system calls for policies that create economic winners and, thus, support reform coalitions and mitigate backlash from economic losers or weaken them (Meckling 2019). Therefore, policymakers face two primary challenges in building long-term political support for climate policy: developing policy that expands economic opportunities for decarbonization and, thus, creates supportive coalitions—across firms, workers, and citizens—and formulating policy that mitigates potential backlash from economic losers or weakens incumbent industries. Furthermore, domestic industrial policy and foreign policy must go hand-in-hand for coherent implementation and market building, which in turn contribute to sustainability of state-led interventions. International coordination can enlarge the pool of consumers for new technologies, creating more experience and learning, better performance, and politically stronger interest groups (Cullenward and Víctor 2020). Korea’s heavy reliance on exports and position as a middle power that bridges between the developed and developing countries make the effective linkage and consistency between domestic industrial policy and foreign policy/exports ever more important.
**Areas for Further Research**

This paper has offered an empirical contribution to enhance our understanding of the prospects and limitations of state-led transitions. The national context needs to be emphasized since some of the most substantial decisions for transforming financial and energy systems to cope with climate change will be made by the nation states (H. Lee, Jung, and Lee 2019; Bhandary, Gallagher, and Zhang 2021). The effectiveness of climate finance policies often varies from country by country and also depends on the criteria used. The impact of climate finance initiatives depends on the detail of design, characteristics of the local market, country conditions (e.g., macroeconomic conditions, institutional structures, the maturity of the country’s financial system), and the cost of and familiarity with the green technologies (Bhandary, Gallagher, and Zhang 2021).

- This paper assessed how blended finance is being approached, institutionalized and operationalized by the public sector. It would also be equally important to determine the effectiveness of Korea’s approach – whether government interventions are actually crowding in or crowding out private capital, or clarify which areas concessional climate finance is still needed. How and when to remove public support for certain technologies or interventions is also a key question deserve more research.

- Finance is only a half part of the picture. The other half consists of projects and industries that are, and should be, financed. The key is to channel resources into the sectors that are critical for deep decarbonization. While the focus of this paper was on the role of the public sector in designing and disbursing finance, where the flows of capital are directed warrants further research.

- The Korean case study also contributes to improving the understanding of the role of political systems in shaping climate finance policy adoption. While this paper focuses on analyzing the initiatives that already took place or being implemented, there is scope for further work in understanding how the differences in political systems shape the adoption and design of climate finance policies. For example, liberal market, coordinated, and state-led economies may display varying levels of appetite for similar initiatives (Bhandary, Gallagher, and Zhang 2021).

- Korea’s green initiatives almost exclusively focus on climate mitigation and clean technologies. Adaptation measures were limited to few mega-scale infrastructure projects and seem entirely absent in KND’s Green New Deal. Given the geographical location and sensitivity to the changing climate, and the nature of adaptation projects historically being not too attractive to private investments, the public sector needs to deliberate on its role in adaptation. Literature on climate finance policy for adaptation and resilience measures is almost non-existent so there are few known examples of how private finance was mobilized through policies other than the emerging evidence of weather indexed insurance (Bhandary, Gallagher, and Zhang 2021).

4. **Conclusion**

One of the hardest challenges of decarbonizing the economy involve redirecting investment toward technologies and businesses that are ridden with risks for first movers. This endeavor requires a policy strategy, or industrial policy, that is focused on the problem at hand, rather than inducing marginal changes in behavior with known technologies and production methods (Cullenward and Victor 2020; Meckling, Sterner, and Wagner 2017). The COVID pandemic and the resultant economic downturn has led to rethinking the role of the public sector in building a healthier and greener economy and strategies for effective fiscal measures. This paper discussed the importance of the various roles of the public sector – including rule-setting, public commitment, creating long-term incentives for the private sector, and setting an institutional and legal base – for a state-led transition to a greener economy.
Lessons from Korea’s green finance waves point to the importance of focused efforts on blended finance and the co-evolution of public and private sector interactions. The public sector, in particular, demonstrates an evolving position and learning towards the private sector, with flexibility and prioritization of private capital mobilization. Policy and fiscal measures are necessary to enhance profitability of green businesses and projects and redirect investment towards them. This paper has highlighted some of the actions that the state-led economy has implemented, and conditions that are needed for successful blended finance application.

Blended finance is not a silver bullet for decarbonization. Multiple financial and non-financial barriers impeding the mobilization of private finance to address climate change mean that a comprehensive set of diverse climate finance policies and measures are required. Climate finance policies work best when they are nested in a coherent and aligned set of measures aimed at the achievement of climate goals (Bhandary, Gallagher, and Zhang 2021), and state-led efforts can facilitate the design and implementation of these policies. With the necessary measures and sustained buy-in from private and public actors, blended finance has significant potential to mobilize additional private capital and engage investors in a strategic and productive way to deepen understandings of each other. These transactions, in turn, can contribute to the sustainability and scalability of climate interventions. Effective deployment and operationalization of blended finance requires challenging measures and reforms, but under the right circumstances, meaningful decarbonization can be achieved at the scale of transformation needed.

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