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Korea's Green Economy Agreement Roadmap: A Strategy for Climate Action and Economic Growth

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I. Introduction

The global trade environment is rapidly shifting due to the deepening climate crisis and escalating protectionism, characterized by major nations implementing unilateral trade measures—such as the EU's Carbon Border Adjustment Mechanism (CBAM) and the U.S.'s Inflation Reduction Act (IRA)—that prioritize domestic economic interests. In response to this trend, international cooperation is evolving into new forms, notably the Green Economy Agreement (GEA), which seeks to pursue both climate crisis response and economic growth simultaneously.

This study confirms the necessity of establishing a Korean-style GEA roadmap to effectively manage the evolving nexus of global climate-trade measures. Korea, with its large manufacturing sector, faces the critical dual challenge of achieving carbon neutrality while securing industrial competitiveness. GEAs serve as a crucial mechanism for enhancing strategic cooperation, ensuring climate policy continuity against domestic political volatility (acting as a "policy anchor"), and generating new market opportunities. The key objectives of this study are: first, to systematically analyze the definition, status, and features of existing GEAs globally and in Korea; second, empirically evaluate the economic impact of GEA elements on Korean exports and the macroeconomy; and third, propose a comprehensive, phased roadmap and implementation strategy (short, medium, and long term) based on a strategic modular GEA model.

II. GEAs: Context and Core Features

1. Characteristics of GEAs

GEAs represent an evolution in international

trade cooperation, shifting from purely market-opening FTAs toward comprehensive agreements that integrate climate and economic policy.

Green Economy Agreements differentiate themselves by expanding their scope. They build upon environmental chapters within existing FTAs but add new clauses essential for tackling climate change, such as those related to the rapid implementation of the Paris Agreement.

Furthermore, they focus on climate integration. They address contemporary issues like decarbonization, ESG-related investment, subsidy issues, and carbon tax harmonization, which were traditionally excluded from comprehensive trade agreements.

Lastly, GEAs feature flexibility and modularity. Commitments can be structured with varying degrees of legal bindingness (FTA-type, bilateral treaty, partnership, or MOU). This flexibility allows for tailored approaches based on the partner country's specific readiness and needs.

2. Components of GEAs

The key components of global GEAs are as follows: based on an analysis of global GEAs (such as the IPEF, EU-NZ FTA, AUS-SGP GEA) and Korea's related agreements (like the Korea-Australia Green Economy Partnership and the Korea-EU Green Partnership), five core domains emerge.

1. Energy transition: Focused on clean energy (renewables, hydrogen) development and sector-specific decarbonization challenges (transport, industry, agriculture).

2. Environmental goods & services (EGS): Addresses trade facilitation through list compilation, reduction of non-tariff barriers, government procurement expansion, and establishing standards/certification systems.

3. Technological cooperation: Centers on R&D and commercialization of core technologies, particularly carbon capture, utilization, and storage (CCUS).

4. Market mechanisms: Includes participation in international carbon markets (Article 6 of Paris Agreement/ITMOs), Measurement, Reporting, and Verification (MRV) system establishment, and promotion of ESG investment.

5. Implementation support: Defines governance systems for capacity building, just transition, stakeholder engagement, and dispute resolution.

3. Comparison of Key Models

Global GEA initiatives can be categorized into comprehensive transition agreements and specialized climate response agreements. Several key models illustrate these approaches:

IPEF Clean Economy Agreement

The Indo Pacific Economic Framework (IPEF) Clean Economy Pillar represents a significant multilateral effort (IPEF Pillar 3). It is the first multilateral treaty designed to link climate response with large-scale investment goals, including $120 billion for clean energy storage and $20 billion for regional renewables by

2030. The agreement focuses heavily on industrial decarbonization, CCUS measures, and overall energy security and transition. It also includes specific cooperation on Small Modular Reactors (SMRs) and the harmonization of emission calculation methodologies.

EU-New Zealand FTA

The EU-New Zealand FTA exemplifies the EU's new approach to trade policy by integrating robust environmental provisions within a comprehensive free trade agreement. Its environment chapter includes significantly enhanced provisions for climate change mitigation and adaptation, the reform of fossil fuel subsidies, and explicit mechanisms to ensure the effective implementation of multilateral environmental agreements. Notably, this FTA applies general dispute settlement procedures, which could potentially lead to trade sanctions for severe breaches of core ILO conventions or Paris Agreement objectives.

Australia-Singapore GEA

The Australia-Singapore GEA is an advanced model for a bilateral Green Economy Agreement. It explicitly defines 372 environmental goods and 155 environmental services. This agreement emphasizes cooperation in green finance, digital verification platforms, and clean energy technology R&D. A key focus is the strengthening of practical public-private partnerships.

Japan's JCM Bilateral MOUs

In the specialized climate response category, Japan's Joint Crediting Mechanism (JCM) bilateral MOUs focus on securing internationally transferred mitigation outcomes (ITMOs) to help achieve Nationally Determined Contribution (NDC) targets. This model uniquely incorporates the objective of promoting the export and dissemination of Japanese low-carbon technologies, products, and infrastructure to its partner countries.

Switzerland's Implementation Agreements

Similarly, Switzerland's Implementation Agreements are specialized bilateral treaties designed for climate response. These agreements, such as the one with Peru, are highly specific. They detail precise criteria for environmental integrity, approvals, transfer certification, and the corresponding adjustments for ITMOs based on Article 6.2 of the Paris Agreement.

III. Economic Significance

1. Environmental Goods Trade

To understand the economic significance of GEAs for Korea, the study analyzed trade flows and exporter characteristics based on existing GEA-defined environmental goods.

An analysis of 2022 trade data shows that environmental goods already constitute a considerable portion of Korea’s total exports. The AUS-SGP GEA list accounted for $272.3 billion or 39.8% of total exports. The UK-NZ FTA list represented $118.3 billion (17.3%) and the EU-NZ FTA list covered $20.1 billion (2.9%). This indicates that EGs are already significant trade items for Korea.

The analysis also highlights the dominance of key industries. Korea's major industries, specifically the electrical electronic and transport sectors (HS Chapter 8), account for the overwhelming majority of environmental goods exports. These sectors comprise 74% to 84% of EG exports under the broadest GEA definitions. This highlights the importance of leveraging existing industrial strengths in future GEA negotiations.

Furthermore, an analysis of Korean environmental goods exporting firms (from 2013-2021 data under UK-NZ/EU-NZ FTA' EGs definitions) reveals distinct characteristics compared to non-EG exporters in similar HS 4-digit categories. EG exporting firms showed significantly higher total sales and higher sales per employee suggesting greater labor productivity. These firms also demonstrated a tendency to spend more on R&D. Regarding market dynamics, while the total number of EG exporters remained relatively stable at around 30,000 firms, annually certain detailed segments such as plastic sheets (HS 39) and electrical equipment (HS 85) saw an increase in exporter numbers suggesting ongoing market entry.

These findings suggest that GEA implementation which fosters environmental trade is likely to positively influence innovation and efficiency within the Korean export sector.

2. Empirical Effects and Simulation

The study employed two rigorous analytical methods to quantify the potential economic impacts of GEAs: a quasi-experimental approach using the Paris Agreement as a proxy and a general equilibrium simulation using the GTAP E-Power model.

Empirical Analysis

To indirectly estimate the impact of GEA-type environmental policies the study utilized the 2015 adoption of the Paris Agreement and the subsequent national legalization of net-zero targets as an exogenous policy shock.

The methodology applied a Triple Difference (Difference in Differences in Differences) estimation. This compared (1) exports before and after 2015, (2) environmental goods versus non-environmental goods, and (3) exports to countries that legislated the Paris Agreement implementation (the treatment group) versus those that did not (the control group).

Korea's export partners totaled 225 countries, and the analysis period was set from 2012 to 2021. HS code revisions occurred three times recently in 2012, 2017, and 2022. Due to the relatively numerous changes made in the 2022 HS code revision, the analysis was restricted up to 2021 to minimize potential errors arising from the HS code conversion process for the environmental goods lists of the UK-New Zealand FTA and the EU-New Zealand FTA, which were drafted based on HS 2017. Furthermore, to mitigate sample selection bias in the product data, not all HS 6-digit items were utilized. Instead, the study focused only on HS 6-digit items belonging to the higher HS 4-digit categories of the environmental goods (EGs) defined at the HS 6-digit level. The treatment group was composed of countries that explicitly legislated net-zero targets.

The estimation utilized the Poisson Pseudo Maximum Likelihood (PPML) technique and incorporated Country-Product (HS 6-digit) fixed effects and year fixed effects to ensure robust results. The major finding, derived from the coefficient of the triple interaction term (Country*Environmental Goods*Post) presented in Table 1, showed a positive and statistically significant increase in Korea's environmental goods exports to countries that legislated the Paris Agreement implementation. Specifically, the coefficient was estimated at 0.791*** in Model 1 and 1.015*** in Model 3, strongly suggesting that formalizing and implementing high-level climate policies, as intended under GEAs, successfully creates market incentives that lead to quantifiable positive effects on Korean environmental goods exports.

Table 1. Export Effects of the Paris Agreement

Variable Name	Model 1	Model 2	Model 3
log(GDP)		1.506***	1.479***
		(0.215)	(0.217)
FTA Dummy		-0.210	0.232
		(0.197)	(0.212)
Country*Post	-0.452***	-0.124	-0.394
	(0.163)	(0.154)	(0.248)
Environmental Goods*Post	-0.334*	-0.398**	-0.479***
	(0.197)	(0.195)	(0.148)
Country*Environmental Goods*Post	0.791***	0.797***	1.015***
	(0.265)	(0.277)	(0.319)
Country*Post*FTA			0.349
			(0.244)
Environmental Goods*Post*FTA			0.104
			(0.190)
Country*Environmental Goods*Post*FTA			-0.260
			(0.435)
Country*Product Fixed Effects	O	O	O
Year Fixed Effects	O	O	O
Number of Observations	574,990	542,050	542,050

Following this empirical confirmation that past implementation of the Paris Agreement had a positive effect on environmental goods exports, the study next conducted a simulation using the GTAP E-Power model to forecast the macroeconomic impact of concluding future GEAs.

Simulation

This study employed the GTAP E-Power model, a standard framework for quantitatively analyzing the general equilibrium of the global economy, to assess the economic impact of concluding a Green Economy Agreement. The GTAP E-Power model is particularly suitable because it allows for detailed modeling of the energy sector, differentiating power generation into 12 specific methods, making it appropriate for analyzing scenarios related to energy transition and decarbonization—core components of the net-zero policy.

To maximize analytical efficiency, potential partner countries were categorized based on their institutionalization level of carbon neutrality implementation and their economic cooperation intensity with Korea. This resulted in groupings such as Enacted (legislated net-zero targets), Policy (policy-stage), Pledge (declaration stage), and No NDC (no national commitment) groups, with some groups further subdivided into Priority A based on high trade volume or existing economic ties. The findings derived from this grouping informed the negotiation priorities outlined in the subsequent phases of the GEA roadmap.

Three distinct scenarios (S1, S2, S3) were structured to reflect key GEA elements,

aligning closely with the proposed Korean GEA's modular approach.

Scenario S1*: Liberalization of Environmental Goods (EGS) Trade (Trade Module)*. Simulated the full elimination of tariffs on EGs and reduced non-tariff barriers for environmental services to quantify new market opportunities.

Scenario S2: *Technology Cooperation and Investment (Technology Module)*. Modeled bilateral technology transfer resulting in 1-5% efficiency improvements in power generation and energy-intensive industries to accelerate the energy transition.

Scenario S3: *International Mitigation (Investment Module)*. Simulated carbon market linkages by permitting cross-border credit trading (equivalent to 10% of total emissions) to secure efficient emission reductions.

The simulation results highlighted differentiated economic effects across partner country groups, offering a critical quantitative foundation for setting future GEA negotiation priorities.

For S1 (**EGS Liberalization**), Korea's tariff reduction effects were comparatively largest when partnering with **Policy-stage** countries, where existing FTA coverage is limited.

Regarding S2 (**Technology Cooperation**), cooperation with **Enacted Countries** is expected to yield high effects by creating synergy that strengthens Korea's technological capacity. Separately, cooperation with **No NDC** countries provides significant economic benefits to the partner nation (approx. 250% external effect). This suggests that while advanced countries offer the highest technical synergy, cooperation with No NDC countries presents substantial long-term potential for market creation, thus requiring strategic consideration in the GEA roadmap.

For S3 (**International Mitigation**), linking carbon credit trading with **Enacted Countries**—which have mature carbon markets—generates the largest welfare increase. Meaningful synergistic effects are also expected from cooperation with **Pledge-stage** countries.

These specific quantitative outcomes were directly integrated into the proposed modular GEA model to ensure tailored and effective bilateral negotiations.

IV. Sector-Specific Cooperation Strategies for a Green Economy Agreement

The GEA has emerged as a critical strategic instrument for Korea to navigate the shifting global trade landscape, representing a new international cooperation framework to simultaneously pursue climate change response and sustainable economic growth. To establish a clear direction for the roadmap, it is essential to conduct an in-depth comparative analysis of Korea's green cooperation policies, grounded in global GEA trends, across core sectors that align with the modular GEA structure.

1. Technology Cooperation Strategy

Korea's current climate technology competitiveness, estimated at 76.7% of leading nations with a technology gap exceeding five years, necessitates robust international cooperation in critical areas such as hydrogen, CCUS, and fuel cells. A differentiated strategic approach is required. With advanced nations serving as technology leaders, cooperation should focus on securing core technologies, harmonizing standards, and participating in large-scale demonstration projects. Conversely, engagement with developing nations, or technology followers, should prioritize market entry, support for human resources and infrastructure, and linkages with Official Development Assistance (ODA).

The GEA roadmap must therefore explicitly define channels for climate technology cooperation, including joint R&D, mutual recognition of standards, and public-private investment matching. Furthermore, strategies must be formulated to enhance technological competitiveness and secure market leadership in Korea's established areas of strength, such as batteries and smart grids.

2. Green Supply Chain Cooperation Strategy

The acceleration of the green transition makes a stable supply of critical minerals, which are essential for clean energy, a paramount concern. Korea currently faces significant supply chain vulnerabilities due to its high external dependency on key minerals like lithium, cobalt, and rare earths, coupled with the concentration of production and processing in specific countries, notably China.

Consequently, the roadmap must incorporate a dedicated "International Cooperation Strategy for Green Supply Chains," rather than merely appending environmental factors to existing policies. This specialized strategy should encompass several key cooperation elements, including joint investment in mineral exploration and development, infrastructure cooperation to enhance connectivity, regulatory harmonization, cooperation on standards and certifications, the utilization of green finance, and collaboration on ESG compliance.

3. Investment Cooperation Strategy

Apart from the battery sector, Korea's overseas investment in the broader low-carbon industry has been on a declining trend. The GEA must address this by strengthening investment cooperation. This cooperation should be linked to the overseas expansion of Korean firms, serving the dual purpose of contributing to partner countries' carbon neutrality goals while simultaneously creating market opportunities for domestic companies involved in carbon reduction projects.

To support this, the roadmap must include institutional mechanisms to enhance investment cooperation. It should also specify detailed collaborative activities for developing sustainable finance, fostering innovative financial mechanisms, and actively promoting the use of Transition Finance.

4. International Mitigation Cooperation Strategy

Korea plans to achieve 13% of its 2030 Nationally Determined Contribution, equivalent

to 37.5 million tons, through international mitigation projects. Progress is already underway through bilateral Framework Agreements on Climate Change Cooperation, which have been concluded with seven nations and are under negotiation with over twenty others, as well as through new provisions in FTAs like the Korea-Philippines FTA.

The roadmap must adopt a comprehensive approach that extends beyond the achievement of NDC targets to include the overseas expansion of Korean firms and the dissemination of Korea's climate technologies. It should also draw on international precedents, such as Switzerland's detailed mitigation-focused agreements and Japan's Joint Crediting Mechanism (JCM), which links mitigation projects to technology exports. Finally, strengthening linkages is essential. The roadmap should include provisions that connect climate cooperation activities with existing FTAs and ODA-funded green transition projects.

V. GEA Roadmap and Implementation Strategy

1. Structure of the Korean-Style GEA: A Modular Approach

The current global climate policy environment is in a state of "carbon-neutral stagnation," characterized by rising "green nationalism" and weakening international solidarity. However, in the long term, a shift toward international cooperation and accelerated mitigation is inevitable.

Considering this challenging environment, the vision for the K-GEA roadmap is set as "Achieving Efficient Carbon Neutrality and Securing Economic Growth Engines." This vision aligns with the direction of major domestic policies, including the Framework Act on Carbon Neutrality and Green Growth and the 2025 Trade Policy Roadmap. It represents a strategic approach to minimize the costs of the green transition while capturing new growth opportunities.

This study proposes a modular structure for the Korean-style GEA, based on four core pillars: (1) Trade, (2) Technology and Supply Chains, (3) Investment and International Mitigation, and (4) a Just Transition. This approach allows for the selection and combination of components tailored to the specific situation and readiness of a partner country.

The advantages of this modularity are significant. It enhances negotiation efficiency, enables a phased implementation process, and allows for customized cooperation proposals. For example, negotiations with advanced nations can prioritize technology and mitigation modules, while engagement with developing nations can center on infrastructure and ODA-linked modules.

Trade: Market access for environmental goods and services, mitigation of non-tariff barriers, mutual recognition of standards and certification.

Technology & Supply Chains: R&D cooperation, mutual recognition of standards/certification, stabilization of critical mineral supply chains, professional human resource exchange,

and demonstration project cooperation.

Investment & International Mitigation: Green finance and transition finance, ESG investment, carbon market linkage, trading of Internationally Transferred Mitigation Outcomes (ITMOs), and MRV system establishment.

Just Transition: Capacity building, expanding stakeholder participation, and including provisions for quality job creation.

2. Phased Implementation Strategy

A long-term, phased implementation strategy is proposed to guide the K-GEA's development.

The Short-Term Phase (–2028), corresponding to a period of potential carbon neutral stagnation, will focus on establishing a foundational GEA network and a coherent Korean-style GEA model. Key tasks include developing a basic K-GEA text for use in platforms, expanding the network through low-difficulty economic partnerships such as critical minerals exploration, and securing domestic stakeholder buy-in.

The Mid-Term Phase (–2035), envisioned as a "carbon-neutral re-transition" period, will aim for the quantitative expansion and qualitative deepening of the agreement network. This includes introducing a "K-Green Solution Package" that integrates technology, human resources, and financial support. It will also involve developing comprehensive lists for environmental goods and services, expanding market access, and initiating attempts at regional carbon market linkage.

The Long-Term Phase (–2050), or the "green transition maturity" period, will focus on establishing an independent climate trade agreement system and securing a robust international mitigation cooperation regime. The ultimate goal is to build a comprehensive Asia-Pacific climate trade governance structure based on the K-GEA model (K-GEA 2.0) and to actively lead the formation of multilateral environmental norms such as WTO.

3. Detailed Strategies and Domestic Policy Complementation

To maximize the GEA's effectiveness, the roadmap must ensure implementation flexibility and be supported by complementary domestic policies.

First, implementation flexibility is essential to manage risk. This can be achieved through a phased negotiation process that progresses from non-binding MOUs to pilot agreements and eventually to comprehensive, binding treaties.

Second, private sector participation must be expanded. As innovation and capital financing are primarily corporate-led, the GEA must systematically incorporate incentives and financial mechanisms to encourage and facilitate stake holder involvement.

Third, synergies must be actively and practically pursued. This involves improving the environmental chapters of existing FTAs and strategically linking ODA-funded green transition projects or investment with international mitigation efforts.

Finally, strengthening domestic capacity is a prerequisite for success. This requires substantial supplementation of internal systems and infrastructure related to transition finance, carbon market operations, core R&D, and specialized human resource development. KIEP

Appendix Table 1. Achieving Efficient Carbon Neutrality and Securing Economic Growth Engines

Category	–2028 Carbon Neutral Stagnation Period	–2035 Carbon Neutral Re-transition Period	–2050 Green Transition Maturity Period
Objective	Establish GEA Foundation	Expand and Deepen Network	Lead International Cooperation
Core Task	Economic Cooperation	Market Access	Investment, International Mitigation
Implementation Strategy	Utilize Strategic Partnerships	Promote Market Development, Utilize FTAs	Utilize Independent Climate-Trade Agreements
Detailed Tasks	• Develop GEA Model Text • Green Test Bed • Link Tech Cooperation with Carbon Reduction	• Quantitative Expansion of GEA • K-Green Solution Package • Link Investment with International Mitigation	• Multilateralization of GEA 2.0 • Establish Green Supply Chains • Link Carbon Markets
Primary Counterparts	Enacted	Enacted	Policy
Target Countries for Support (Partner Benefit)	No NDC	No NDC	Enacted A
Detailed Strategy	Clean Technology, International Standards	Secure Overseas Resources, Advance Environmental Goods/Tech	Lead New Trade Norms
Domestic Policy Complementation	Establish MOU Implementation Monitoring System	Reform Trade Adjustment Assistance System	Revise Trade Procedure Act, Carbon Market

Source: Authors

Appendix Table 2. Structure of the Korean-style GEA

Category	Trade	Technology & Supply Chains (or Decarbonization & Tech)	Investment & International Mitigation	Just Transition (or Sustainable Development)
Core Pillar	Trade	Technology & Supply Chains	Investment & International Mitigation	Just Transition
Objective	Create Economic Opportunities via Market Access	Secure Energy/Industrial Transition & Tech Leadership	Secure Efficient Mitigation Measures	Ensure Inclusive Transition & Sustainability
Key Elements	Market Access (Env. Goods & Services)	Energy & Industrial/Sectoral Decarbonization	Sustainable Finance & Investment Cooperation	Capacity Building
	Mitigation of Non-Tariff Barriers	Green Supply Chains	International Mitigation	Stakeholder Engagement
	Mutual Recognition (Standards & Cert.)	Technological Cooperation	Emissions Trading Scheme	Creation of Quality Jobs

Source: Authors