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Research Article

Decarbonizing Trade: Reconciling Economic Integration with Climate Governance in a Fragmented Legal Order

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Abstract: The accelerating decarbonization of the global economy is transforming the relationship between international trade and climate governance. Yet the legal frameworks governing these domains remain fragmented, producing tensions between economic integration, climate ambition, and regulatory sovereignty. This article examines how states can reconcile trade liberalization with decarbonization without assuming that a single regulatory model is universally transferable. Through a comparative analysis of the European Union, the United States, South Africa, and Saudi Arabia, it demonstrates that contemporary approaches to decarbonizing trade reflect distinct combinations of carbon regulation, industrial policy, trade measures, and institutional governance. The analysis shows that legal fragmentation is not merely an obstacle to climate action: under certain conditions, it can permit differentiated and context-sensitive regulatory experimentation, while under others it can generate regulatory conflict, competitive distortions, and implementation gaps. The article develops a framework of adaptive climate-trade governance, under which jurisdictions combine common principles of carbon accounting, transparency, and regulatory coordination with differentiated instruments reflecting their economic structures, institutional capacities, and political constraints. The comparative analysis further demonstrates the importance of sequencing. The European Union's emphasis on carbon accounting, monitoring, and border adjustment, the United States' use of targeted industrial incentives, and South Africa's experience with phased carbon regulation illustrate different pathways toward trade-compatible decarbonization. Saudi Arabia provides a particularly important case of selective adaptation, demonstrating how a hydrocarbon-dependent economy can pursue decarbonization through a functionally differentiated framework rather than institutional transplantation. The article argues that the future of decarbonizing trade lies not in eliminating legal diversity, but in governing it through interoperable rules, credible carbon measurement, coordinated institutions, and progressively aligned climate-trade policies.

Keywords: international trade law; climate governance; WTO law; carbon border adjustment mechanisms; energy transition; decarbonization; adaptive governance

1. Introduction and Methodology

The accelerating urgency of climate change has brought into sharp focus the structural tensions between international trade law and climate governance. On the one hand, the multilateral trading system (anchored in the rules of the World Trade Organization (WTO)) has historically prioritized market access, non-discrimination, and the reduction of trade barriers. On the other hand, the global transition toward decarbonization increasingly relies on regulatory measures, such as carbon pricing, border adjustment mechanisms, and industrial policies, that may disrupt established trade disciplines. This emerging friction reflects a deeper systemic challenge: how to reconcile the imperatives of economic integration with the demands of climate action in a fragmented legal order. Therefore, the issue is that climate-related trade measures, which refers to laws, regulations and policy instruments that affect trade while pursuing climate-mitigation or decarbonization objectives, including carbon pricing, border carbon adjustments, sustainability standards and green industrial subsidies, are fragmenting the trading system. The question this paper tries to answer is: How can Saudi Arabia design a climate–trade regulatory framework that preserves WTO compatibility while adapting to emerging decarbonization measures in major trading partners?

The central legal problem examined in this article is how Saudi Arabia can adapt its trade and investment framework to an emerging international regulatory environment in which climate-related measures increasingly affect market access, investment decisions, and competitiveness. Instruments such as carbon border adjustment mechanisms, sustainability-related trade requirements, green industrial subsidies, carbon-reporting obligations, and climate-related investment regulations may create both opportunities and challenges for Saudi exporters and investors. The question is not whether climate regulation will influence international trade, but how Saudi Arabia can respond in a manner consistent with its obligations under WTO law, regional economic commitments, and its broader economic diversification objectives.

Little scholarship examines how hydrocarbon-exporting economies like Saudi Arabia can adapt while remaining WTO-compatible. Moreover, despite a growing body of scholarship examining the trade–climate nexus, existing approaches remain insufficiently integrated. Much of the literature either focuses on the compatibility of specific climate measures with trade rules or treats climate governance as external to the trade regime. As a result, there is a persistent analytical gap in understanding how trade law can function as an instrument of climate governance, rather than merely as a constraint upon it. This gap is particularly evident in the absence of coherent frameworks capable of addressing asymmetries in regulatory capacity and development priorities, especially for resource-dependent economies navigating the pressures of decarbonization.

This article addresses this gap by adopting a combined doctrinal and comparative methodological approach. It analyzes the evolution of trade law principles through relevant jurisprudence and policy developments, while situating these developments within a broader comparative context. In particular, it examines how different regulatory environments (focusing on hydrocarbon-dependent economies such as Saudi Arabia) interact with emerging climate-related trade measures. By using Saudi Arabia as a case study, the article highlights the structural challenges faced by economies whose fiscal and developmental models remain closely tied to carbon-intensive sectors, thereby

illustrating the distributive implications of decarbonization-oriented trade policies, which refer to trade-related measures intended to facilitate the transition to a low-carbon economy by promoting emissions reductions, clean technologies and sustainable production practices. Saudi Arabia is analyzed as a representative case of a hydrocarbon-dependent economy facing external decarbonization pressures.

Saudi Arabia constitutes the primary case study because it occupies a distinctive position within the evolving climate–trade landscape. As a major energy exporter, a G20 member, a leading actor in global energy markets, and a country pursuing economic diversification under Vision 2030, Saudi Arabia faces increasing exposure to climate-related trade measures adopted by major trading partners. At the same time, the Kingdom has committed to achieving net-zero emissions by 2060 and has expanded investment in renewable energy, hydrogen, carbon-management technologies, and sustainable infrastructure. These developments make Saudi Arabia an especially relevant case through which to examine how trade governance and climate regulation increasingly interact in the international economic system.

The article makes three principal contributions. First, it reconceptualizes international trade law as a potential instrument of climate governance, demonstrating how existing legal principles can be interpreted to accommodate environmental objectives without undermining the integrity of the trading system. Second, it develops a structured analytical framework for evaluating climate-related trade measures, emphasizing the importance of proportionality, regulatory flexibility, and context-sensitive application. Third, it advances a comparative perspective that foregrounds the asymmetrical impacts of decarbonization policies, arguing for the incorporation of equity-based considerations into the design and assessment of such measures.

This article argues that Saudi Arabia should adopt a hybrid, multi-level, WTO-conscious climate-trade framework—the set of legal, regulatory and policy mechanisms through which a state seeks to reconcile decarbonization objectives with trade competitiveness and compliance with international economic law [1], rather than copy any single model. By placing trade law within the broader architecture of climate governance, this article seeks to move beyond binary accounts of conflict and compatibility. Instead, it argues for a more integrated and adaptive approach capable of aligning economic and environmental objectives in a manner that is both legally coherent and normatively defensible.

This article examines how emerging climate-related trade measures are reshaping the relationship between international economic law and decarbonization, and what implications these developments have for Saudi Arabia. Rather than providing a comprehensive analysis of all trade agreements or climate instruments, the paper focuses on the growing interaction between trade governance, investment protection, and climate regulation. The central broader research question is whether existing international trade and investment frameworks facilitate or constrain climate-transition policies and how Saudi Arabia can position itself within this evolving regulatory landscape.

Rather than an econometric assessment of climate-policy outcomes, this article adopts a combined qualitative, doctrinal, and comparative methodology to examine the interaction between climate governance, international trade law, and economic integration. The analysis is primarily qualitative and focuses on the legal and institutional dimensions of climate-related trade measures rather than their quantitative economic effects. The objective is to assess how different jurisdictions design and implement regulatory responses to climate change and to identify lessons relevant to Saudi Arabia's evolving climate–trade framework.

The doctrinal component of the study examines primary and secondary legal materials. Primary sources include international agreements, WTO instruments, regional trade arrangements, domestic legislation, regulatory measures, official policy documents, and governmental strategies relating to climate governance and trade regulation. Secondary sources include academic literature, policy reports, and institutional publications addressing climate-related trade measures, carbon pricing, industrial policy, and sustainable development. Through doctrinal analysis, the article evaluates the legal foundations, objectives, and implications of these measures within the broader framework of international economic law.

Rather than comparing legal systems in the abstract, the analysis focuses on how selected actors operationalize decarbonization through trade-related regulatory instruments and how these approaches interact with WTO disciplines and investment protections. The comparative inquiry is designed to identify regulatory strategies, legal vulnerabilities, and governance models that may offer relevant insights for Saudi Arabia as it navigates the growing intersection between climate policy and international economic law.

The objective is not to measure the precise impact of climate-related measures on trade flows, investment decisions, or competitiveness, but to evaluate how different jurisdictions design and implement climate-related trade and investment instruments and how these instruments interact with WTO disciplines and investment-law obligations. While the economic effects of measures such as carbon border adjustment mechanisms, industrial subsidies, and carbon taxes remain important areas for future research, the present analysis focuses on the legal architecture, regulatory design, and governance implications of these instruments. This approach is particularly appropriate given the evolving nature of many of the measures examined, several of which remain in early stages of implementation.

The comparative component of the study employs a structured comparison of three jurisdictions: the European Union, the United States, and South Africa. These jurisdictions were selected because they represent distinct approaches to the governance of climate-trade interactions and collectively provide a broad spectrum of regulatory responses relevant to Saudi Arabia. The European Union represents a regulatory and carbon-pricing model, including emissions trading and carbon border adjustment mechanisms. The United States represents an industrial-policy and subsidy-based approach that emphasizes domestic manufacturing, strategic supply chains, and investment incentives. South Africa provides the perspective of a carbon-intensive developing economy seeking to reconcile decarbonization objectives with economic development, industrial competitiveness, and social equity. Together, these cases capture different institutional structures, regulatory philosophies, and levels of economic development within the broader climate–trade landscape. The inclusion of these contrasting cases allows for a structured comparison of alternative pathways available to Saudi Arabia.

The purpose of the comparison is not to identify a universal regulatory model, nor to suggest that Saudi Arabia should replicate any single foreign framework. Rather, the analysis seeks to identify which institutional and regulatory features may be adaptable to Saudi Arabia's economic structure, fiscal capacity, and long-term objectives under Vision 2030. By comparing how different jurisdictions manage the tensions between decarbonization, trade competitiveness, and regulatory autonomy, the paper aims to develop a more nuanced framework for understanding Saudi Arabia's options within the evolving climate–trade order.

The comparative analysis focuses on four principal variables: (1) the regulatory instruments employed to support decarbonization; (2) the relationship between climate measures and international trade obligations; (3) the institutional

mechanisms used to implement climate-related policies; and (4) the implications of these measures for economic competitiveness and market access. These variables provide a common analytical framework through which the selected jurisdictions can be assessed and compared. Finally, the study incorporates elements of comparative institutional analysis by examining how different legal and regulatory institutions allocate authority between trade, climate, and industrial-policy objectives. The purpose is not to determine which model is superior, but rather to identify institutional features and policy tools that may assist Saudi Arabia in responding to the increasing integration of climate considerations into international trade governance.

Following this introduction, Section 2 examines the growing interaction between international trade law, investment governance, and climate-related regulatory measures, focusing on the legal tensions arising between decarbonization policies and WTO disciplines. Section 3 analyzes the principal areas of conflict relevant to Saudi Arabia, including climate-related subsidies, carbon border measures, technical standards, and investor–state dispute settlement risks. Section 4 adopts a comparative approach by examining the experiences of the European Union, the United States, and South Africa as three distinct models of climate-trade governance, comparing their regulatory tools, WTO vulnerabilities, governance structures, and implications for carbon-intensive economies. Building on these comparative findings, Section 4 then evaluates the regulatory implications for Saudi Arabia and argues that a hybrid and adaptive framework may offer the most effective approach for balancing decarbonization objectives, trade competitiveness, and regulatory autonomy. Section 5 analyzes the legal options and challenges for Saudi Arabia, whereas Section 6 offers reforms and policy recommendations. Section 7 concludes.

2. Conceptual and Theoretical Framework

Effective public policy analysis requires a clear conceptual understanding of the regimes that govern international trade, foreign investment, and climate action. These domains historically developed in isolation, each reflecting different normative assumptions and institutional priorities. As global climate ambition intensifies, these once-separate regimes increasingly overlap, creating legal and governance tensions that directly influence Saudi Arabia's economic transformation under Vision 2030 [2]. This framework outlines the structure of the three regimes, analyzes the core tensions between them, and demonstrates why alignment is essential for emerging low-carbon economies.

2.1. Trade and Investment Regimes

The international trade and investment regimes provide the foundational rules that govern cross-border economic activity [3], yet they were not designed with climate regulation in mind. The trade regime, centered on the WTO, emphasizes predictability, liberalization, and non-discrimination. Core principles such as Most-Favored-Nation (MFN) treatment [4] and National Treatment (NT) [5] prohibit discrimination between like products, requiring states to treat imports from different WTO members equally and to accord foreign goods treatment no less favorable than that given to domestic products, while disciplines on tariffs and non-tariff barriers aim to minimize state intervention in markets [4–6]. Although GATT Article XX allows limited exceptions for environmental measures, WTO jurisprudence applies a strict scrutiny test that obliges states to demonstrate that such measures are necessary, proportionate, and not disguised restrictions on trade [7–9]. As a result, climate-related regulations (whether emissions standards, carbon-intensity requirements or certification schemes) must be carefully designed to avoid legal challenges in multilateral fora.

The investment regime operates through a diffuse network of thousands of bilateral investment treaties (BITs) and investment chapters within free trade agreements (FTAs). These treaties provide foreign investors with substantive protections such as Fair and Equitable Treatment (FET), safeguards against direct and indirect expropriation, and the right to bring claims through Investor–State Dispute Settlement (ISDS) [10,11]. While these obligations were created to enhance investor confidence, they can constrain a state's regulatory autonomy when tribunals interpret treaty standards expansively. In particular, the doctrine of "legitimate expectations" under FET has been invoked to challenge environmental and energy reforms in several states, contributing to uncertainty over the scope of permissible climate regulation [12,13]. This challenge is particularly relevant for Saudi Arabia because most of its BITs were concluded before climate policy became integral to national planning. As the Kingdom of Saudi Arabia accelerates its shift toward renewable energy and low-carbon industrialization [14], outdated treaty language lacking climate safeguards increases the risk of investor disputes and narrows the state's regulatory space.

2.2. Climate Objectives

Climate objectives stem from a fundamentally different governance logic than trade and investment rules [15]. At the international level, the Paris Agreement obliges states to adopt measures that reduce greenhouse gas emissions, strengthen adaptation, and pursue long-term pathways compatible with limiting global temperature rise, as reflected in Articles 2(1)(a), 4 (mitigation), and 7 (adaptation) [16,17]. These commitments require substantial domestic policy interventions, including changes to energy systems, industrial structures, and investment incentives. Such shifts can directly affect trade flows and the profitability of existing investments, thereby increasing the potential for conflict with established economic regimes.

In Saudi Arabia's domestic context, climate ambition is inseparable from national development strategy. The Saudi Green Initiative (SGI) [18] outlines major commitments to renewable energy deployment, land restoration, and the expansion of carbon capture technologies [19]. Vision 2030 further embeds climate objectives within a broader economic transformation, positioning low-carbon industries (such as green hydrogen, clean fuels, low-carbon metals, and renewable-powered manufacturing) as engines of future growth [20]. These emerging sectors depend on competitive access to global markets and a stable investment environment. Their success, therefore, hinges not only on technological readiness and cost competitiveness, but also on the legal and regulatory compatibility between climate policy, on the one hand, and international trade and investment obligations, on the other. As global markets shift toward carbon-intensity benchmarks, lifecycle emissions reporting, and climate-aligned product standards, Saudi Arabia's ability to integrate climate goals into its economic governance architecture will shape its global competitiveness.

2.3. Theoretical Debates

The tensions between economic regimes and climate governance can be better understood through three major theoretical debates that illuminate the structural sources of conflict. The first concerns the divide between economic liberalism and sustainable development. Trade and investment rules emerged from a liberal economic philosophy that prioritizes open markets, competitive neutrality, and minimal regulatory disruption [6,21]. Climate governance, by contrast, is rooted in the principle of sustainable development, which allows states to intervene heavily in markets to reduce greenhouse gas emissions, direct investment flows, and restructure production systems [22].

Measures such as phasing out fossil-fuel subsidies, imposing emissions-intensity limits or supporting domestic clean-energy industries may therefore appear discriminatory or excessive under traditional economic norms, even when they pursue legitimate environmental goals.

A second debate revolves around the phenomenon of regulatory chill and the erosion of state sovereignty. Expansive interpretations of FET and indirect expropriation can deter governments from adopting ambitious climate measures out of concern that investors may initiate costly ISDS claims [13,23]. This dynamic shifts influence over domestic policy choices toward arbitral tribunals and introduces financial risks associated with regulatory change. For Saudi Arabia, which is simultaneously embarking on economic diversification, energy transformation, and industrial restructuring, uncertainty over the extent of permissible climate regulation may inhibit policy innovation and complicate long-term planning.

The third debate addresses the rise of green protectionism—the use of environmental or climate-related measures as a disguised form of trade protection, where the real effect, and sometimes the hidden intention, is to shield domestic industries from foreign competition rather than genuinely to protect the environment—a growing feature of international economic relations. Climate instruments adopted by major economies (such as carbon border adjustment mechanisms, emissions-based product standards, and mandatory supply-chain due-diligence requirements) blur the boundary between environmental policy and industrial strategy [24,25]. These measures may effectively reshape competitive conditions by imposing high compliance costs on exporters, particularly in carbon-intensive or energy-dependent economies. For Saudi Arabia, whose future competitiveness relies on the ability to certify low-carbon production processes and demonstrate equivalence with foreign climate standards, this debate is highly relevant. The extent to which importing economies recognize Saudi methodologies for emissions measurement, reporting, and verification (MRV) will materially affect the market access of emerging low-carbon industries.

Together, these conceptual and theoretical insights reveal that aligning trade and investment regimes with climate objectives is not a peripheral concern, but a structural requirement for Saudi Arabia's economic transition [26]. Because Vision 2030 positions climate-aligned industries at the center of the Kingdom's diversification strategy, the ability to regulate effectively, attract climate-aligned investment, and navigate evolving global climate-trade rules will determine the scope of future economic opportunities. The conceptual framework, therefore, demonstrates why legal and institutional reforms are essential to enable Saudi Arabia to pursue climate ambition while preserving competitiveness and regulatory sovereignty.

3. Key Legal Conflicts in WTO and Investment Law

As global efforts to mitigate climate change intensify, conflicts arise between international trade, investment rules, and climate policies and standards, creating barriers to achieving climate goals and implementing climate measures [27]. International trade and investment regulations emphasize non-discriminatory treatment, a stable environment, and market access for foreign investors [28–30]. However, climate measures such as emission caps and green energy incentives may conflict with existing binding trade agreements and regulations, including WTO rules that govern international trade and foreign investment. The conflict stems mainly from their differing principles and focus.

This section first discusses the principal legal conflicts that arise when aligning climate objectives with existing international trade and investment regimes under the WTO. These conflicts are:

- CBAM and the WTO legality of border carbon adjustments.
- Investor-State Dispute Settlement (ISDS) risks.
- Conflicts involving climate-related subsidies.
- Environmental and climate standards as potential trade barriers.

It then discusses how these conflicts could impact Saudi Arabia, including its Vision 2030, the trading system, and climate policy-making.

3.1. Carbon Border Adjustment Mechanism and WTO Issues

The WTO legality of climate-related trade measures must be assessed through a sequential analysis. The first question is whether the measure gives rise to a prima facie inconsistency with WTO obligations, including Most-Favored-Nation treatment, National Treatment, or other applicable disciplines. Only if such an inconsistency is established does the analysis proceed to Article XX of the GATT 1994, which provides general exceptions for certain policy objectives, including the protection of human, animal, or plant life or health and the conservation of exhaustible natural resources. Even where a measure falls within one of the Article XX exceptions, it must additionally satisfy the requirements of the Article XX chapeau by avoiding arbitrary or unjustifiable discrimination and disguised restrictions on international trade.

WTO jurisprudence has consistently interpreted National Treatment obligations through an examination of whether imported and domestic products are "like" and whether imported products receive less favorable treatment. The Appellate Body's decisions in EC–Asbestos and Japan–Alcoholic Beverages II remain central to the assessment of likeness and competitive relationships between products.

The EU Carbon Border Adjustment Mechanism (CBAM) was designed to balance climate goals with the international trade system [31,32]. It aims to reduce or prevent carbon leakage and to ensure fair prices for both domestic and foreign producers [33]. It imposes charges on high-carbon-intensive goods such as cement, steel, aluminum, fertilizers, and hydrogen, and requires a CBAM certificate that provides information on the embedded carbon content of imported products, based on the EU ETS's weekly average prices [33]. CBAM has two phases: a transitional phase from 2023 to 2025, followed by full implementation from 2026 [34]. Importers who do not comply with CBAM will be penalized [35]. Although CBAM is intended to address climate policy conflicts with international trade, it raises legal issues that could constitute violations of WTO rules. Section 3 examines the tension between CBAM and WTO rules, their legal implications, and the potential impact on Saudi Arabia.

The WTO compatibility of CBAM remains contested. While critics argue that CBAM may raise concerns under the principles of Most-Favored-Nation treatment, National Treatment, and the prohibition of discriminatory trade measures, supporters contend that carefully designed border adjustments may be justified under Article XX(b) or Article XX(g) of the GATT 1994. Ultimately, any assessment of WTO compatibility is likely to be highly fact-dependent and to turn on issues such as emissions-calculation methodologies, treatment of foreign producers, recognition of equivalent climate measures in exporting countries, and compliance with the requirements of the Article XX chapeau. In the absence of WTO adjudication directly addressing CBAM, definitive conclusions regarding its legality would be premature.

3.2. Product "Likeness" and Process-Based Distinctions under WTO Law

A particular challenge arises where climate-related measures distinguish between products on the basis of emissions generated during production rather than on the physical characteristics of the final product. WTO jurisprudence has not definitively resolved the treatment of all process and production method (PPM)-based distinctions. Consequently, the compatibility of carbon-related trade measures may depend on how regulators design emissions-accounting methodologies, verification procedures, and opportunities for foreign producers to demonstrate equivalent climate performance.

One of the central doctrinal questions raised by climate-related trade measures concerns whether products with different carbon intensities may nevertheless be considered "like products" under WTO law. Traditional WTO jurisprudence has generally approached likeness primarily through the physical characteristics, end uses, consumer preferences, and competitive relationships of products, rather than the PPMs through which they are produced. This creates significant tension for climate-related regulatory measures such as carbon border adjustment mechanisms, which seek to distinguish between products on the basis of embedded emissions rather than physical product differences.

The issue remains legally unsettled. WTO jurisprudence has historically been cautious toward non-product-related PPM distinctions, particularly where otherwise physically identical products are treated differently according to production methods occurring outside the importing state's territory. However, climate-related measures increasingly challenge the adequacy of purely product-based interpretations of likeness. A steel product produced using high-carbon energy sources may be physically identical to steel produced through lower-emission methods, yet climate-oriented regulation treats the embedded carbon content as economically and environmentally significant.

Consumer preferences may also play an increasingly important role in this analysis. In cases such as *EC–Asbestos*, WTO adjudicators recognized that consumer perceptions and health-related concerns may affect whether products are considered "like." By analogy, growing market preferences for low-carbon goods may gradually support broader interpretations of competitive differentiation based on carbon intensity. At the same time, extending likeness analysis to embedded emissions raises concerns regarding regulatory fragmentation, extraterritoriality, and the potential use of environmental standards as disguised restrictions on trade.

Climate change, therefore, places increasing pressure on traditional WTO interpretations of likeness. While existing jurisprudence does not conclusively authorize broad differentiation based on carbon intensity alone, evolving climate-related trade measures may encourage a gradual reinterpretation of WTO disciplines toward greater recognition of environmentally relevant production methods. Whether such an evolution occurs will likely become one of the defining doctrinal questions in the future relationship between international trade law and climate governance.

3.3. Tension between CBAM and the World Trade Organization

Whether climate measures violate WTO law depends on how adjudicators interpret likeness, necessity, and arbitrary discrimination under GATT Articles I, III, and XX. The first WTO rule that interacts with CBAM is GATT Article I, the Most-Favored Nation (MFN) clause, which requires that all WTO members be treated on a fair and non-discriminatory basis. GATT Article I.1 states that "any advantage, favour, privilege or immunity granted by any contracting party to any product originating in or destined for any other country shall be accorded immediately and unconditionally to the like product originating in or destined for the territories of all other contracting parties" [4]. However, CBAM risks breaching MFN if it treats imports of WTO countries differently based on their carbon prices [32]. Additionally, CBAM can be discriminatory toward developing countries that depend on natural resources that emit carbon, such as coal and natural gas, and thus must pay a carbon tax, compared with developed countries that have access to green energy [36]. This may also contravene the Common But Differentiated Responsibilities and Respective Capabilities (CBDR-RC) principle [37,38].

The second conflict concerns GATT Article III, i.e., the National Treatment (NT), which obligates equal treatment between domestic and foreign products [5]. However, EU CBAM applies a carbon tax only on imported products. The EU ETS is the EU's cap-and-trade carbon market, launched in 2005 and the first major carbon market in the world; it works by putting a price on greenhouse gas emissions. Countries linked to the EU emissions trading system (ETS) are exempt from the carbon tax, whereas countries not linked to the EU ETS are subject to it [32]. This means, for example, that India, a non-EU ETS country, pays the full price, whereas Switzerland pays none. Thus, CBAM may constitute de facto discrimination under GATT Articles I and III depending on how WTO adjudicators assess embedded-carbon differentiation and the relationship between domestic and imported products. It may also potentially violate the CBDR-RC principle, as it does not provide any differentiation for developing countries. The legal controversy, therefore, lies less in whether climate objectives fall within the scope of GATT Article XX, and more in whether differentiated treatment of trading partners satisfies the chapeau requirement of even-handed application and avoids arbitrary or unjustifiable discrimination.

The conflicts mentioned above have raised serious legal questions regarding discrimination, environmental exceptions, and emission calculations. Offering preferential treatment to certain countries can be discriminatory and may violate the environmental exceptions set out in Article XX. The EU CBAM exemption does not include least developed countries (LDCs). This could harm countries like Mozambique, which relies heavily on aluminum exports to the EU and faces high costs due to limited access to low-carbon production methods. Although LDCs have contributed the least to carbon emissions, the European Commission included the impact of CBAM on LDCs in its assessment, but it did not exempt them [39].

Another legal concern is that CBAM requires the use of its own methodology to assess carbon emissions. This makes products using other internationally recognized methods less favorable even if they are alike, which can constitute discrimination [40]. This also increases costs, as exporting countries must undergo the CBAM assessment for embedded emissions. These legal questions raise essential concerns about the MFN and NT principles and about LDCs, which are penalized by incurring high costs and sharing responsibility with rich countries, the main contributors to carbon emissions.

3.4. Justifying Climate Measures under GATT Article XX

Even where climate-related trade measures such as carbon border adjustment mechanisms are found to create prima facie inconsistencies with WTO obligations, they may nevertheless be justified under the general exceptions contained in Article XX of the GATT. In particular, paragraphs XX(b) and XX(g), concerning measures necessary to protect human, animal, or plant life or health and measures relating to the conservation of exhaustible natural resources, are likely to form the principal legal basis for defending climate-related regulation. However, the legality of such measures ultimately depends not only on their environmental

objectives, but also on whether they satisfy the chapeau requirements of Article XX, which prohibit arbitrary or unjustifiable discrimination and disguised restrictions on international trade.

This raises several unresolved doctrinal questions. One issue concerns the necessity and proportionality of unilateral climate measures adopted to address carbon leakage and preserve domestic climate objectives. While WTO jurisprudence has increasingly recognized environmental protection as a legitimate policy objective, disputes may arise regarding whether less trade-restrictive alternatives are reasonably available or whether importing states may impose climate-related conditions extraterritorially on foreign producers. The debate is particularly significant in the context of CBAMs, where importing states effectively assess the carbon intensity of production processes occurring outside their territory.

The requirement of even-handedness under the Article XX chapeau also presents significant challenges. Climate-related trade measures may face scrutiny where they apply differently to trading partners with comparable climate policies or fail to recognize equivalent foreign regulatory efforts. The question of what constitutes comparable effort remains especially controversial given the differing economic capacities, developmental priorities, and decarbonization pathways of states. A rigid or unilateral application of climate standards may therefore risk being characterized as arbitrary discrimination, particularly where developing or carbon-dependent economies are disproportionately affected.

Accordingly, the WTO compatibility of climate-related trade measures will likely depend less on whether climate change constitutes a legitimate policy objective, and more on how such measures are designed and implemented in practice. Future disputes are likely to focus on issues of flexibility, transparency, comparability, and procedural fairness, rather than on the legitimacy of climate governance itself.

3.5. Investor-State Dispute Settlement Risks

Investor-State Dispute Settlement (ISDS) is a dispute-resolution mechanism embedded as a dedicated chapter or section in bilateral investment treaties, in investment chapters in free trade agreements, and in investment protection laws through which states provide advance consent for foreign investors to bring claims against host governments [41]. Such claims are adjudicated through international arbitration mechanisms, rather than domestic courts. The inclusion of ISDS reflects a deliberate policy choice by states to enhance investor confidence and legal certainty. ISDS enables foreign investors to sue host states at international tribunals when a new law or regulation negatively affects their profits. Initially, the ISDS system was intended to protect foreign investors from expropriation, unfair treatment, or any discrimination [42]. However, the rapid advancement of climate policy and regulation has created a new form of dispute, as these regulations can affect or conflict with the interests of foreign investors [43].

The ISDS legal protection mandates (1) fair and equitable treatment (FET) to all foreign investors, (2) protection against direct and indirect expropriation, and (3) National Treatment (NT) and Most-Favored-Nation Treatment (MFN) [44]. Thus, governments now face challenges posed by ISDS that may hinder their progress in implementing climate change policies and measures, such as phasing out fossil-fuel energy to mitigate climate change, subsidizing renewable energy, or implementing Environmental Impact Assessments (EIA). ISDS could make governments reluctant to implement new climate regulations or measures, as these might affect the profitability of foreign investors, potentially leading to a dispute [45].

3.6. The Potential Role of Investment Protection in Supporting Climate Investment

The relationship between investment protection and climate governance is not necessarily adversarial. Although ISDS may expose governments to claims arising from climate-related regulatory changes, investment protection can also support decarbonization by providing legal security for the substantial, long-term investments required for renewable energy, green hydrogen, carbon capture and storage, and other low-carbon technologies. These projects frequently involve high upfront capital expenditure, long payback periods, regulatory dependence, and exposure to changes in energy, environmental, taxation, and infrastructure policy. The availability of investment protection may therefore reduce perceived political and regulatory risk and facilitate cross-border investment in sectors relevant to the energy transition.

This consideration is particularly relevant to Saudi Arabia. The Kingdom's economic transformation requires significant domestic and foreign investment in renewable electricity, hydrogen, carbon-management technologies, energy infrastructure, and low-carbon industrial production. Investment treaties can contribute to investor confidence by providing protection against certain forms of discriminatory or arbitrary government conduct and by establishing procedural mechanisms for resolving investment disputes. From this perspective, investment protection can complement rather than undermine climate governance.

The policy challenge is not whether Saudi Arabia should protect climate-related investment, but how investment protection can be designed so that it encourages low-carbon investment while preserving sufficient regulatory space to pursue legitimate climate objectives. This requires distinguishing between legitimate regulatory-risk protection and guarantees against ordinary regulatory change. Treaty provisions that protect investors against discrimination, arbitrary conduct, or uncompensated expropriation can coexist with carefully drafted provisions affirming the state's authority to adopt bona fide environmental and climate measures.

The comparative experience consequently suggests a more balanced approach to ISDS. Overly broad investment protections may generate regulatory chill where governments fear costly claims following environmental regulation. Conversely, excessively weak or uncertain investment protection may discourage precisely the long-term capital flows needed for decarbonization. The appropriate objective is calibrated investment protection: sufficient legal certainty to attract and retain climate-aligned investment, combined with explicit recognition of the state's right to regulate in pursuit of environmental protection, energy transition, and climate objectives.

3.7. Core legal issues under Investor-State Dispute Settlement

Although these climate measures aim to mitigate climate change, foreign investors may argue, under ISDS, that these climate measures constitute a breach of the treaty (whether a bilateral investment treaty or an investment chapter in a free trade agreement) from different legal perspectives because they require adjustments or additional steps for approval, thereby increasing investors' costs [46]. First, FET protects investors against any arbitrary, unexpected, or unfair treatment. Tribunals stated that FET should protect investors' "legitimate expectations" [45]. This phrase is ambiguous, as it lacks clarity about what is considered legitimate or illegitimate, especially given the rapid evolution of climate change and green energy. Investors can use this phrase to their advantage, alleging violations of their expectations, thereby

restricting a state's sovereignty without taking into consideration the state's right and rationales for such a policy [47].

The second issue concerns the standard for indirect expropriation. Government climate regulations and environmental protection measures can affect investors' profitability and are, therefore, considered an indirect form of expropriation [48]. For example, EIA assesses products for potential environmental impacts [49]. Therefore, EIA could trigger investment disputes, as delays in the assessment process may be perceived by foreign investors as indirect expropriation.

The third issue concerns a potential conflict over when climate regulations become compensable interference. Under ISDS, some governments become hesitant to adopt or enforce new regulations, fearing potential ISDS lawsuits against their states [45]. This can be risky, as it may hinder the state's progress on urgent climate issues [50]. All these conflicts challenge the state's sovereignty and may have adverse implications beyond trade and investment. For example, such conflicts can undermine states' regulatory autonomy or affect how they implement their regulatory measures.

3.8. Subsidies and Renewable Energy Disputes

Given the urgent need for climate mitigation, many countries are heavily subsidizing the energy sector [51], which could conflict with WTO rules established to protect trade, not climate [52]. This section explains what a "subsidy" is under the WTO, the types of subsidies, and how they can conflict with WTO rules in general and with Saudi Arabia in particular.

Under Article 1.1 of the Subsidies and Countervailing Measures Agreement (SCM), a subsidy is (1) a financial contribution provided by the government or a public entity, (2) a benefit conferred on the recipient, and (3) specific to certain businesses or industries [53]. The subsidy can be in different forms, such as price support, feed-in tariffs for renewable energy, grants, or loans for green manufacturers [54]. However, subsidizing climate can conflict with trade rules, as it can be a source of discrimination since it adds more value to the domestic products, where firms must meet the Local-Content Requirements (LCRs) to be qualified for a subsidy. LCRs compel firms to purchase domestic products, rather than purchasing better or cheaper foreign alternatives [55]. Both the incentive given to domestic producers and the feed-in tariffs are presumed to violate WTO rules that mandate equal treatment of all producers under the NT principle [5]. As a result, this could lead to a form of trade distortion, which can have negative effects on the market.

Another argument is that the Subsidies and Countervailing Measures (SCM) Agreement does not differentiate between subsidies by energy type, whether for fossil fuels or renewable energy [56]. This could raise questions about the legitimacy of the SCM Agreement with respect to climate subsidies and whether it should be treated differently or *identically.* Thus, it can be a strong argument for countries that are either in the energy transition phase or still dependent on—and continuing to subsidize—fossil fuels [52].

3.9. Environmental Standards and Trade

Although climate and environmental standards are established to regulate and encourage climate mitigation, they can be challenged under WTO rules because they each target distinct objectives [57]. This section examines these standards and explains how they conflict with WTO rules.

Environmental and climate standards focus on product standards, process and production method (PPM) standards [58], and climate labels and certifications. These standards not only address the product itself, but also how it is processed, manufactured, and the type of energy used. For example, PPM standards require maximum emission levels, energy efficiency, and toxicity controls to achieve carbon reduction [59]. This makes PPMs very controversial because the WTO treats products equally as long as they have the same characteristics, regardless of how they are made, while climate standards focus on the methods of production and processing [60], which means that like products can be treated differently under climate standards based on their carbon intensity, methane leakage, carbon capture and storage (CCS) deployment, and use of green versus fossil fuels. Thus, these standards can be considered a violation of WTO rules.

In addition to standards, the climate certification and labelling system mandates low-carbon labels, renewable energy certification, and embedded emissions reporting under the CBAM or supply-chain due diligence system [61], which can be a lengthy process that is not aligned with the WTO system. Hence, these standards and certifications could create tension with WTO law. Under the Technical Barriers to Trade (TBT) Agreement [62], the certification process can be perceived as a barrier and restrictive to trade. It might also violate NT and MFN principles when like products are treated differently, which would raise a question about the blurry definition of "likeness," as the meaning differs between trade and climate contexts.

The emerging WTO debate concerning climate-related trade measures is not whether environmental objectives are legitimate. WTO jurisprudence has long recognized environmental protection as a legitimate policy objective. Rather, the central legal question concerns how such measures are designed and implemented. Climate-related regulations are more likely to withstand WTO scrutiny where they are transparent, proportionate, based on objective criteria, provide procedural safeguards, and avoid arbitrary or unjustifiable discrimination between trading partners.

3.10. Key Conflicts for Saudi Arabia

The aforementioned conflict between WTO rules and climate measures could create tensions within Saudi Arabia's international trading system, given its extensive participation in bilateral and multilateral agreements and its status as one of the world's largest exporters of fossil fuels and oil [63], whose economy depends heavily on these products [64]. This section examines areas in which such conflicts are likely to arise in the Saudi market.

The first source of tension concerns the ISDS mechanism and climate-related subsidies. Saudi Arabia has been subsidizing fossil fuels for years: according to the International Monetary Fund (IMF), Saudi Arabia was one of the world's largest providers of energy (fossil fuel) subsidies, spending about $253 billion in 2022 on fuel subsidies—equivalent to about 27% of GDP—and among the highest per capita fossil fuel subsidy levels in the G20 [65]. When it reduces or stops these subsidies to pursue a climate transition agenda, foreign investors might claim under ISDS that it violates their rights or "legitimate expectation," which is a core principle of FET, as this unexpected change may affect their profitability and can be seen as a form of arbitrariness or discrimination. Keeping the fossil-fuel subsidies does not solve the problem either, as it can cause reputational and trade pressure or lead to CBAM penalties. However, as stated earlier, SCM legitimacy does not differentiate between green and fossil-fuel subsidies. Hence, Saudi Arabia can use this argument to support its position for fossil-fuel subsidies. For example, the neutrality of the SCM Agreement allows Saudi Arabia to subsidize steel, aluminum, and petrochemicals.

The SCM Agreement does not explicitly distinguish between environmentally beneficial and fossil-fuel-related subsidies. Rather, WTO legality depends on whether a measure satisfies the legal criteria governing prohibited or actionable subsidies, including specificity, adverse effects, and the existence of local-

content or export-contingent conditions. Consequently, the legality of green industrial support measures must be assessed through established SCM disciplines and relevant WTO jurisprudence, rather than through the environmental objectives of the subsidy alone.

Another aspect of the subsidy conflict concerns renewable energy. Saudi Arabia supports green initiatives through subsidies and incentives to accelerate its progress toward climate objectives and aims to reduce carbon emissions [66]. These subsidies and incentives may give rise to legal disputes, as subsidies with LCRs and incentives such as feed-in tariffs can clash with the NT principle, since both provide preferential treatment to local investors to support the Saudi market. In addition, any Saudi introduction of measures supporting emission reduction, such as carbon capture and storage or methane control, can be viewed as an indirect expropriation, as it may indirectly affect the economic value of current investments or impose additional compliance costs to foreign investors [67]. All these complex interrelated conflicts need to be addressed to prevent any regulatory chill effects on Saudi Arabia.

The second challenge facing Saudi Arabia stems from the EU CBAM, given that the country is a major exporter of carbon-intensive products to the EU. This puts pressure on Saudi Arabia to meet CBAM requirements and could impact its competitiveness. Therefore, CBAM may violate the MFN principle by discriminating among WTO members, and Saudi Arabia has been one since 2005 [68].

Another main CBAM risk is related to the NT principle, since Saudi Arabia might face higher carbon prices than EU ETS members. Even if CBAM justifies this preferential treatment for EU ETS members under the "environmental exception," it needs to clarify how this measure is neither arbitrary nor discriminatory. This is especially important for Saudi Arabia, which is working to align trade and climate policies through its own regulations [69]. Clarifying the arbitrary criteria for exceptions can help Saudi Arabia determine its legal standing. It will also aid in considering all legal factors when reforming policies or adopting new regulations, thereby providing a clearer vision and goals.

The third potential conflict could arise from the climate and WTO standards that may potentially contradict each other and, therefore, challenge Saudi Arabia. Although Saudi Arabia ensures adherence to the WTO and climate standards, the different requirements of product standards and PPMs place Saudi Arabia at risk, as each seeks different measures and characteristics for product likeness, which consequently could lead to heavy obligations and tariffs when exporting products like cement, steel or petrochemicals, even if they are identical to those of Europeans. In addition, green certification and reporting methods can constitute a disguised TBT for Saudi Arabia, as they may hinder export processes due to their costs and lengthy procedures [70]. Both may be unfair justifications and can be discriminatory toward Saudi Arabia under NT.

Overall, this section has explored the conflicting legal issues between climate change and WTO rules, which have ironically become obstacles, rather than effective tools, for harmonizing trade, investment, and climate policy. The following section examines three case studies from three actors across three continents: the European Union, the United States, and South Africa. Each of these actors has focused on different tools and has pursued distinct paths for addressing climate measures and international trade rules, collectively offering adaptable experiences for Saudi Arabia.

4. Case Studies and Comparative Insights for Saudi Arabia

This section builds on the previously mentioned legal conflicts and looks at three case studies (namely the European Union, the United States, and South Africa) to see how different systems try to connect trade and investment rules with climate goals. All three actors are members of the G20 and the selection is based on three main criteria: 1) their importance for Saudi Arabia in terms of trade, 2) their role in foreign direct investment and business links with the Kingdom, and 3) the fact that they have adopted different types of climate-related trade and investment instruments. The EU and the US are among Saudi Arabia's most important trading partners and home to many companies investing in Saudi energy and industrial sectors, so their climate policies now shape the rules under which Saudi exporters and investors operate. South Africa, while a smaller partner in absolute terms, is a coal-based [71], resource-exporting G20 country that faces structural constraints closer to those of many developing economies and has become an explicit target for deeper Saudi–South African business and investment cooperation [72].

Together, these three cases cover a wide spectrum of tools: the EU's emissions trading system, CBAM and supply-chain regulation, the US model of large-scale green industrial subsidies under the Inflation Reduction Act, and South Africa's phased carbon tax and Climate Change Act built around just-transition concerns. Our position is that Saudi Arabia does not need to copy any single model. As a major hydrocarbon exporter [63,73] with strong fiscal capacity [74], growing trade and investment links with these G20 partners [75], and ambitious programs under Vision 2030 [2], it is in a position to assemble a more integrated framework that combines targeted support for low-carbon investment, clearer domestic climate rules for export-exposed sectors, and active engagement with external measures such as CBAM. The case studies that follow are used to map out the main options and trade-offs that could allow Saudi Arabia not only to adapt to emerging climate–trade rules, but also to move toward a more leading role in shaping them.

4.1. Comparative Analytical Framework

The comparative analysis starts from the premise that climate-related trade measures cannot be evaluated solely by reference to their formal legal design. Their effects depend on the political economy in which they are adopted, the institutional capacity available to implement them, the degree of coordination among relevant authorities, and the ability of firms to comply with evolving regulatory requirements. Accordingly, each case is examined along six dimensions: (1) the policy rationale underlying the measure; (2) the political, economic, and institutional factors shaping its design; (3) implementation and administrative capacity; (4) practical experience and regulatory outcomes; (5) implications for trade, competitiveness, and international economic law; and (6) the extent to which particular features are transferable to Saudi Arabia.

This approach also allows a distinction between formal regulatory ambition and effective regulatory capacity. A jurisdiction may adopt ambitious climate legislation without generating equivalent changes in emissions, investment, or trade behavior where implementation is constrained by exemptions, fragmented authority, weak monitoring capacity, political opposition, or inadequate infrastructure. Conversely, a less comprehensive legal framework may generate significant industrial transformation where fiscal incentives, administrative institutions, and private investment reinforce one another.

Therefore, the comparison does not treat the European Union, United States, and South Africa as alternative models to be ranked. Rather, it treats them as different institutional responses to a common problem: how to reconcile decarbonization with competitiveness, economic development, and international trade. This distinction is particularly important for Saudi Arabia, whose

hydrocarbon dependence, fiscal capacity, centralized governance structure, and economic-diversification strategy differ materially from those of all three jurisdictions.

4.2. The European Union Approach to Climate and Trade

The European Union (EU) is a major global trading bloc with an integrated market that makes it a central actor in both international trade and climate policy. In 2023, total EU imports reached around US$2.48 trillion [76], with fossil fuels forming a significant share at a value exceeding €430 billion [77]. In 2024, crude petroleum oils and oils obtained from bituminous minerals alone accounted for about 11.6% of total imports, followed by medium oils and preparations at around 2.5%, while natural gas, both liquefied and in gaseous form, made up roughly 2.6% [76].

On the climate side, the EU aims to reach climate neutrality by 2050 [77,78]. To achieve this goal, it has set intermediate targets of reducing greenhouse gas emissions by at least 55% by 2030 and 90% by 2040 compared to 1990 levels; according to the latest EU-wide assessment, the EU is currently broadly on track, having already reduced emissions by about 37% by 2023, with a projected reduction of 54% by 2030 [77]. These results are closely linked to the European Green Deal [79] and the "Fit for 55" package [80], which introduced a series of interconnected reforms to EU climate laws and legislation [81]. Among the most important changes are reforms to the EU Emissions Trading System (EU ETS), which is the world's first international emissions trading system, under which an agreement was reached to reduce emissions from covered sectors by 62%, compared to the previous 43% target [82].

As outlined in the previous section, the adoption of CBAM represents another crucial step in the EU's evolving climate regime [83]. These reforms have reshaped the EU's internal climate regime and paved the way for new tools that explicitly link climate ambition to trade and supply-chain regulation [25]. The CBAM is the EU's new system for applying a carbon price to certain imported goods. Its purpose is to tackle carbon leakage, where production of emissions-intensive goods shifts to countries with weaker climate rules, and to keep competition fair between EU producers, who pay for their emissions under the EU ETS, and foreign producers who may not [83]. By putting a carbon cost on imports comparable to the cost faced inside the EU, CBAM links climate policy directly to trade flows.

The mechanism is being phased in gradually. Since 1 October 2023, a transitional period has required importers only to report embedded emissions in covered products, with no financial payment yet due [84]. This "learning phase" ran until the end of 2025 and was meant to give firms and authorities time to develop MRV systems [85]. From 2026, CBAM will apply in its definitive form. Importers will continue to report embedded emissions and, starting in 2027, will have to purchase and surrender CBAM certificates for emissions associated with their 2026 imports [83].

The price of CBAM certificates tracks the EU ETS allowance price, ensuring that imported goods face a carbon cost similar to that borne by domestic producers. Where a third-country producer can demonstrate that a carbon price has already been paid in the country of origin, the corresponding amount can be deducted to avoid double charging. Initially, CBAM covers a limited set of sectors considered to be at highest risk of carbon leakage: iron and steel, aluminum, cement, fertilizers, electricity, and hydrogen. These sectors are both emissions-intensive and heavily traded, so the mechanism has a transboundary effect, directly influencing supply chains in basic materials and energy [83]. The EU has signaled that, over time, the scope of CBAM could be expanded to additional EU ETS sectors exposed to leakage risk, implying a broader alignment between domestic carbon pricing and border measures [86].

CBAM is complemented by other regulatory instruments that tie market access to environmental and climate performance. Enacted in 2024, the Corporate Sustainability Due Diligence Directive (CSDDD) establishes mandatory due diligence obligations for large companies operating in the European Union, requiring them to identify, prevent, mitigate, and account for adverse human rights and environmental impacts across their operations, subsidiaries, and key business partners. In addition to these general due-diligence duties, in-scope companies must adopt and put into effect a climate transition plan that aligns their business model and strategy with EU climate targets and the broader goal of achieving climate neutrality by 2050, with time-bound targets and decarbonization measures across the chain of activities. The scope of the directive is defined through thresholds for employee numbers and global turnover, intended to capture companies whose activities have the greatest impact on the internal market. Implementation will be phased in three stages in 2027, 2028, and 2029. By the final phase in 2029, the rules will apply to companies with at least 1,000 employees and a global turnover of at least €450 million [87].

Unlike the United States' subsidy-based approach under the Inflation Reduction Act (IRA), the EU relies primarily on carbon pricing and border adjustment mechanisms. Together, CBAM and CSDDD show how the EU uses the size of its market as a form of "regulatory power". Instead of relying mainly on classic tariffs, the EU is now shaping trade through climate-related border charges, product standards, and supply-chain rules [79]. This approach has triggered strong political reactions, especially from developing and least-developed countries. Many trading partners argue that CBAM amounts to green protectionism, has extraterritorial effects, and sits uneasily with the principle of common but differentiated responsibilities under the UN climate regime [88]. Energy-exporting countries and several major emerging economies are especially critical of CBAM, seeing it as a unilateral carbon tax that shifts adjustment costs onto their producers and could hit carbon-intensive exports from developing countries hardest [89].

CSDDD has also been criticized for both its design and its impacts [90]. The main duties apply only to very large companies, while small and medium-sized enterprises are formally excluded but may still face heavy demands through contracts with bigger firms [91]. The directive also narrowed the idea of the "chain of activities" compared to an earlier, broader "value chain" concept, and it largely excludes downstream financial services [87]. As a result, some warn that complex requirements and liability risks may push big companies to simply cut off higher-risk suppliers, instead of working with them to improve standards [92]. Despite these weaknesses, CBAM and CSDDD represent an early step to limit carbon leakage and encourage deeper decarbonization across global value chains.

The EU approach cannot be understood solely through CBAM and internal climate legislation. Climate objectives are increasingly incorporated into the EU's external trade relations through sustainable-development chapters in free trade agreements, carbon-related regulatory cooperation, and environmental conditionality. This demonstrates how climate governance is progressively becoming embedded within trade governance, rather than operating as a separate regulatory sphere.

Moreover, the European experience with supply-chain regulation is relevant for Saudi Arabia. Instruments such as EU sustainability due-diligence rules link market access not only to carbon intensity, but also to environmental standards along the global chain of activity [87]. From a Saudi perspective, this fact does not operate only as a constraint. Because Saudi companies are subject to relatively stringent national regulations and oversight [93], they may be better placed to document strong safety and environmental practices and to present themselves as

low-risk suppliers, compared with producers in more fragile governance contexts [94].

4.3. The United States Approach to Climate and Trade

The United States is one of the world's largest trading powers [95] as well as greenhouse gas emitters [96], both historically and currently, which makes it a central case for understanding how international trade and climate policy intersect [15]. It is the world's second-largest exporter of goods, accounting for around 8% of global merchandise exports [97]. The US is heavily involved in fossil-fuel trade. In 2024, it exported about 30% of its total primary energy production, mainly in the form of crude oil, natural gas and coal, and more than half of its crude oil and natural gas liquids output was sold abroad as crude or refined products; it also exported roughly one-fifth of its dry natural gas production and about a quarter of its coal production [98]. At the same time, the US ships large volumes of energy-intensive manufactured goods, including iron and steel, chemicals, and other metal products [99]. This combination of substantial fossil-fuel exports and carbon-intensive industrial trade makes the United States deeply embedded in emissions-intensive global value chains.

The United States presents a particularly dynamic case study because its climate and trade policies have undergone significant political change. While the Inflation Reduction Act of 2022 represented the most ambitious climate-industrial policy package in US history, subsequent legislative and executive actions have altered portions of that framework. In particular, the One Big Beautiful Bill Act of 2025 curtailed or accelerated the termination of several clean-energy incentives, while the second Trump administration adopted a more skeptical approach toward multilateral climate governance, including renewed withdrawal from the Paris Agreement. Consequently, the United States should not be viewed as a stable model of climate governance, but rather as an example of the interaction between industrial policy, domestic political change, and international climate commitments.

The US climate-policy framework has increasingly combined technology-specific economic incentives with a retrenchment of federal climate regulation and international climate engagement. The IRA established a substantial system of tax incentives for clean electricity, clean fuels, clean-energy manufacturing, and clean vehicles. Although the One Big Beautiful Bill Act (OBBBA) subsequently curtailed or modified several of these incentives, significant federal tax credits remain available for qualifying clean-energy activities. At the same time, however, the federal government has moved away from regulatory and international dimensions of climate governance. In January 2026, the Administration directed the United States to withdraw from the UN Framework Convention on Climate Change (UNFCCC) [100], and the Treasury Department announced the country's immediate withdrawal from the Green Climate Fund [101]. In September 2026, the Environmental Protection Agency also finalized a partial repeal of federal greenhouse-gas standards for fossil-fuel-fired power plants and proposed rescinding the remaining greenhouse-gas standards applicable to the power sector [102]. The resulting framework is therefore better understood not simply as a model combining clean-energy incentives with regulatory and international retrenchment, but as a fragmented and evolving form of climate governance in which economic incentives for selected clean-energy technologies coexist with substantial regulatory and international retrenchment.

The US position on climate change and global agreements has fluctuated sharply over time. In the context of renewed climate leadership, the Biden administration submitted an updated Nationally Determined Contribution (NDC) under the Paris Agreement, pledging to reduce net greenhouse gas emissions by 61–66% below 2005 levels by 2035 and to achieve net-zero emissions around mid-century [103]. These targets have been undermined by political reversals. The US has now withdrawn from the Paris Agreement twice. The first withdrawal took effect on 4 November 2020. The second was announced and formally initiated on 20 January 2025, when Executive Order "Putting America First in International Environmental Agreements" instructed the US Ambassador to notify the UN; notification was received on 27 January 2025, and, in accordance with Article 28 of the Paris Agreement, the withdrawal took legal effect on 27 January 2026 [16,104].

In the period between these withdrawals, the federal government relied on a mix of regulatory measures and large subsidy programs, such as the Inflation Reduction Act and infrastructure spending, in an attempt to move toward the 2035 and 2050 goals [105]. Despite these swings at the federal level, several US states have adopted their own long-term climate targets: as of early 2025, 22 US states (plus the District of Columbia and Puerto Rico) have established binding greenhouse gas emissions reduction targets [106]. California, for example, has a goal of cutting emissions by at least 85% below 1990 levels and achieving carbon neutrality by 2045, supported by plans for 100% clean electricity and deep cuts in fossil fuel use [107]. Other states, such as New York, have also set aspirational net-zero or deep-reduction targets [108]. This patchwork means that, even as national climate commitments are reversed, subnational policies continue to drive decarbonization in parts of the US economy and shape expectations for future climate–trade interactions.

One of the principal attempts to link climate policy with trade and industrial strategy in the United States was the Inflation Reduction Act (IRA), adopted in 2022. Although the IRA remains in force, its clean-energy provisions have been substantially reshaped by subsequent legislation, particularly the OBBBA of 2025 [109], which repealed, accelerated the phase-out of, or significantly restricted a wide range of IRA clean-energy tax incentives. As a result, the US policy landscape differs materially from the climate and industrial-policy framework established by the IRA in 2022.

In the energy sector, the IRA initially supported low-carbon electricity generation [110], including wind and solar, as well as clean hydrogen [111] and low-carbon transport fuels [112]. In industry, it provided incentives for domestic manufacturing of key components for the energy transition, including batteries, solar modules, and other advanced energy equipment [113]. In the transport sector, it initially supported clean vehicles through tax credits available to private consumers and commercial users [114]. However, these provisions have subsequently been substantially modified. In particular, the OBBBA of 2025 accelerated the termination of the IRA's clean-vehicle credits for new, previously owned, and qualified commercial vehicles under §§30D, 25E, and 45W, which are no longer available for vehicles acquired after 30 September 2025 [115]. The IRA's energy and industrial incentives have likewise been subject to significant modification and, in some cases, accelerated termination [116]. Thus, while the IRA continues to provide part of the statutory foundation for US climate and industrial policy, the policy framework in operation today differs materially from the one enacted in 2022.

For residential consumers, the federal Residential Clean Energy Credit under §25D of the Internal Revenue Code provided a 30% tax credit for qualifying expenditures on clean-energy property, including solar electric property, small wind energy property, geothermal heat-pump property, and qualified battery storage technology. Following the enactment of the One Big Beautiful Bill Act in 2025, however, the credit is unavailable with respect to expenditures made after December 31, 2025 [117].

The OBBBA did not eliminate the technology-neutral Clean Electricity Production Credit under §45Y or the Clean Electricity Investment Credit under §48E [109,118,119]. It nevertheless

substantially shortened the effective policy horizon for new wind and solar projects. The legislation introduced an accelerated termination rule under which applicable wind and solar facilities whose construction begins after July 4, 2026 must be placed in service by December 31, 2027 to remain eligible for the relevant credits. Projects whose construction began on or before July 4, 2026 are not subject to this accelerated termination date [120]. This distinction is particularly significant as of September 2026: newly initiated wind and solar projects are now operating within the statutory December 31, 2027 deadline, making the availability of federal tax incentives increasingly dependent not merely on technology eligibility but also on project timing and construction execution [120].

These subsidies are delivered mainly through different types of tax credits, although their availability has been materially modified by the OBBBA. First, the IRA created the technology-neutral clean electricity production credit under section 45Y, which provides a credit for electricity generated from qualifying zero- or low-emission sources [121], and the clean electricity investment credit under section 48E, which provides an investment-based credit for qualifying clean-electricity facilities and energy storage technology [122]. The OBBBA retained both credits but introduced important restrictions, particularly for new wind and solar projects. For applicable wind and solar facilities whose construction begins after July 4, 2026, the credits are terminated for facilities placed in service after December 31, 2027 [120]. In addition, for purposes of determining whether construction began before the July 4, 2026 deadline, the IRS has generally removed the previously available five-percent safe harbor, requiring applicable wind and solar facilities to satisfy the Physical Work Test, subject to a limited exception for low-output solar facilities [120]. Second, the IRA established production-based credits for specific low-carbon outputs, including the clean hydrogen production credit and the clean fuel production credit, which provide specified amounts per unit of qualifying hydrogen or transportation fuel produced, with the amount of the credit generally linked to lifecycle emissions [123]. Third, the IRA created an advanced manufacturing production credit for the domestic production of eligible clean-energy components, as well as separate credits for qualifying clean vehicles [113]. The resulting framework combines continuing federal support for a range of clean-energy technologies with significantly more restrictive eligibility and timing rules for new wind and solar projects [109,120].

The design of these tax credits is also important. Many of them are long-term and can be increased if certain conditions are met, such as meeting wage and apprenticeship requirements [121]. In addition, the IRA introduced new rules that allow some entities to receive the value of these credits as a direct payment from the government, or to transfer credits to other taxpayers [124]. This makes the subsidies more flexible and attractive for investors, including foreign companies that decide to build clean-energy projects in the United States.

Another distinctive feature of these subsidies is that many of them are tied to where production takes place and where inputs come from. The advanced manufacturing production credit, for instance, is available only for components manufactured in the United States, directly rewarding firms that locate clean-energy supply chains on US territory [113]. The revised clean vehicle credit for passenger cars conditions eligibility on final assembly in North America and on rising shares of battery components and critical minerals that must be produced or processed in the United States or in countries with a US free-trade agreement, while excluding materials from certain "foreign entities of concern" [121]. Similar localization incentives appear in other credits that offer bonus rates when projects satisfy domestic-content rules or labor requirements [121]. In practice, this means that access to climate subsidies depends on meeting production and sourcing conditions that favor US-based and, to a lesser extent, FTA-partner producers over other exporters [125], resulting in conflicts, as described earlier.

The design of these subsidies has provoked strong reactions from trading partners, who broadly welcome the emission-reduction goals of the IRA, but argue that its local content and assembly rules distort competition and clash with WTO non-discrimination principles [126]. China has gone further and turned these concerns into a formal WTO dispute. In March 2024, it requested consultations with the United States over five IRA tax-credit schemes: the clean vehicle credit and four major clean-energy investment and production tax credits [127]. China argues that key conditions, such as North American final assembly, critical-minerals sourcing from the US or FTA partners, domestic-content bonuses, and exclusions for "foreign entities of concern" make the subsidies contingent on using domestic over imported inputs and discriminate in practice against Chinese goods, and claims that these measures breach the GATT Most-Favored-Nation (MFN) principle, describing them as discriminatory and protectionist, rather than climate-focused [127]. In parallel, the European Union has responded by negotiating with the US to soften the impact of the IRA through the EU-US IRA task force [128]. Taken together, the Chinese WTO dispute and the EU's push for FTA-equivalent status show how a climate-oriented subsidy package can generate serious trade tensions and force trading partners either to litigate or to negotiate special access to protect their industries.

Beyond domestic climate legislation, the United States has increasingly relied on trade-policy instruments to advance strategic climate and industrial objectives. Unlike the EU's regulatory approach based on carbon pricing and border adjustment measures, the United States has generally preferred a combination of industrial policy, targeted trade restrictions, and strategic supply-chain initiatives. Recent policies have emphasized the reshoring and friend-shoring of clean-energy supply chains, particularly in sectors such as electric vehicles, batteries, critical minerals, semiconductors, and renewable-energy technologies. The United States has also pursued climate-related objectives through trade partnerships and regulatory cooperation mechanisms, including arrangements addressing critical minerals, clean-energy manufacturing, and supply-chain resilience. These measures reflect a broader shift toward integrating trade policy, economic security, and decarbonization objectives. For Saudi Arabia, the US experience demonstrates that climate-related trade governance is increasingly shaped not only by environmental regulation but also by industrial competitiveness, strategic trade policy, and geopolitical considerations. This suggests that future climate–trade frameworks may be influenced as much by supply-chain security and industrial policy as by traditional environmental measures.

Together, the European Union and the United States illustrate two distinct approaches to climate-related trade governance: one centered on regulatory standards and carbon pricing, and the other on industrial policy and strategic supply-chain development. The South African experience provides a third perspective from a carbon-intensive developing economy confronting the challenges of balancing decarbonization with economic development and social equity.

From a Saudi perspective, the principal lesson of the US approach is not the specific design of any individual climate statute, but the strategic use of industrial policy to accelerate low-carbon investment and technological development. Unlike the European Union's reliance on carbon pricing and regulatory obligations, the United States has sought to mobilize private capital through tax incentives, subsidies, domestic-content requirements, and support for strategic supply chains. For Saudi

Arabia, this experience suggests that decarbonization need not depend exclusively on carbon-pricing mechanisms. Given the Kingdom's fiscal capacity and Vision 2030 objectives, targeted incentives for renewable energy, hydrogen production, carbon capture and storage, critical minerals processing, and low-carbon manufacturing could complement regulatory measures while supporting economic diversification. At the same time, the volatility of US climate policy highlights the importance of regulatory stability and long-term policy certainty in attracting investment and facilitating industrial transformation.

4.4. The South Africa Approach to Climate and Trade

The third actor is South Africa. South Africa is an upper-middle-income developing country, but remains an unequal, dual economy. Growth over the past decade has been weak, with real GDP expanding by less than 1% per year on average. The unemployment rate is still extremely high, with around 40% of the labor force jobless, and poverty affecting a large share (2/3) of the population [129]. These structural problems, together with chronic electricity shortages and governance issues, limit the fiscal and political space for ambitious climate policy.

In trade terms, South Africa is a relatively open economy. In 2024, it exported about US$109 billion of goods and imported around US$100 billion. The European Union is its largest trading partner, taking roughly 17% of South African exports and supplying more than 23% of its imports. China and the United States are other major South African trading partners. Exports are dominated by gold and other precious metals, coal, and motor vehicles, while imports include refined petroleum products, crude oil, vehicles and machinery [130]. This combination of dependence on coal-based power, energy-intensive exports, and close trade ties with the EU makes South Africa highly exposed to climate-related trade measures such as the EU's CBAM.

South Africa has gradually increased its national climate targets while insisting on a "just transition" approach. Its first NDC plan under the Paris Agreement, updated in 2021, committed the country to keep total greenhouse gas emissions within a range of 398–510 $MtCO_2$ equivalent in 2025 and 350–420 $MtCO_2$ equivalent in 2030 [131]. In 2025, South Africa submitted a second NDC that goes further by setting a tighter 2031–2035 range of 320–380 $MtCO_2$ equivalent and by confirming a long-term goal of reaching net-zero CO_2 emissions by 2050. The new NDC explicitly links mitigation with equity and development, arguing that emissions cuts must be pursued in a way that protects jobs, reduces poverty, and manages the social impacts of moving away from coal [132]. It also emphasizes that implementation depends heavily on stable international climate finance [132,133].

Whereas the EU externalizes decarbonization pressures through CBAM, South Africa adopts a more gradual domestic transition model designed to accommodate developmental constraints. Whereas the United States prioritizes rapid decarbonization through large-scale industrial subsidies and domestic manufacturing incentives, South Africa pursues a more gradual transition that seeks to balance climate objectives with developmental constraints, energy security, and socio-economic adjustment.

South Africa's carbon tax was introduced in 2019 as the first attempt to link trade and climate. The system was deliberately designed to protect the competitiveness of energy-intensive industries, especially during the first phase from 2019 until the end of 2025 [134]. First, to avoid sudden price shocks in the power sector, electricity generators could credit the existing electricity levy and the renewable-energy premium against their carbon-tax bills so that end-user electricity prices would remain roughly unchanged. Second, trade-exposed and hard-to-abate sectors were granted extra allowances to address competitiveness concerns [135]. In phase one, firms received a basic 60% tax-free allowance on their measured emissions and could add further relief through trade-exposure and performance allowances, so that in some cases up to 95% of emissions were effectively shielded from the tax. A performance allowance is granted to installations that emit less CO_2 per unit of output than an agreed benchmark; as a result, cleaner plants pay tax on a smaller share of their emissions. In addition, companies can use carbon offsets for up to 10% of their total emissions, by financing approved emissions-reduction projects elsewhere [134].

For phase two from 2026, National Treasury proposes to keep this general architecture, but make it gradually stricter [136]. The basic allowance would be cut by 10% in 2026 and by 2.5% per year thereafter until 2030, increasing the effective carbon price over time [134]. At the same time, the performance allowance would rise, up to 10%, to reward cleaner installations more strongly, and the offset cap would increase up to 25% to give hard-to-abate sectors more flexibility as the basic allowance shrinks [137]. The trade-exposure rule would be tightened so that only sectors with very high trade intensity qualify for the full allowance, and the electricity levy would be replaced entirely by the carbon tax from 2026. Finally, the package includes a tax incentive for green-hydrogen projects, extending the existing 100% depreciation allowance for solar photovoltaic to qualifying hydrogen investments to support the emergence of low-carbon export sectors [134].

The design of South Africa's carbon tax also reflects significant political-economy and institutional constraints. The gradual approach and extensive allowances were not simply technical choices intended to facilitate administrative implementation. They reflected the political difficulty of imposing substantial new costs on carbon-intensive industries in an economy heavily dependent on coal, mining and energy-intensive production. Organized labor, major industrial interests, and Eskom (the state-owned electricity utility) had strong incentives to resist measures that could increase production costs, threaten employment, or accelerate the restructuring of carbon-intensive assets. These pressures contributed to a policy design that sought to reconcile decarbonization with concerns about competitiveness, employment, energy security, and the financial position of carbon-intensive firms. The result was a carbon-pricing framework characterized by substantial transitional flexibility, rather than an immediate and economically stringent carbon constraint.

The South African experience illustrates a broader limitation of policy transplantation. A formally attractive carbon-pricing model may produce substantially different outcomes when implemented in an economy characterized by concentrated carbon-intensive industries, politically influential labor interests, state-owned energy infrastructure, and significant concerns about employment and electricity affordability. The extensive allowances that facilitated political acceptance also weakened the effective carbon-price signal, illustrating the trade-off between regulatory ambition and political feasibility. For Saudi Arabia, the lesson is not simply that carbon pricing should be introduced gradually, but that the design of transitional relief must be calibrated carefully. Excessive exemptions may improve political acceptability while reducing the incentive to invest in decarbonization; insufficient transitional protection may generate resistance from strategically important industries and undermine implementation.

This political-economy lesson is relevant to Saudi Arabia, although the institutional circumstances are different. Saudi Arabia likewise faces the challenge of decarbonizing an economy in which hydrocarbons and energy-intensive industries remain economically significant [138]. The appropriate lesson from South Africa is therefore one of sequencing and calibration, rather than

institutional replication. Saudi Arabia should build MRV capacity and sector-specific decarbonization benchmarks before imposing substantial carbon costs, while ensuring that any transitional allowances or exemptions are temporary, transparent, and linked to measurable emissions-reduction performance.

The Climate Change Act 22 of 2024 makes South Africa's mitigation targets more operational by introducing carbon budgets for major emitters [139]. The environment minister must allocate a quantified emissions budget to each large company in key sectors such as electricity, mining, iron, and steel over a defined period [136]. Firms that receive a budget are legally required to prepare mitigation plans, showing how they will stay within that ceiling, and the Act allows government to link these budgets to other instruments, including the carbon tax, by imposing much higher tax rates on emissions that exceed the allocated budget [136]. In practice, this means that large emitters face a gradually tighter combination of carbon tax and binding emissions caps [140], which is intended to push them toward cleaner technologies [141] while keeping the system legible for trading partners [142]. Over time, this framework could help South Africa argue that it is making an "equivalent effort" when negotiating how its exports should be treated under measures such as the EU's CBAM [134].

In parallel with these domestic climate measures, South Africa has also tried to reduce the legal risks that foreign investors could use to challenge its transition policies [143]. After facing investment arbitration in the Foresti case, in which European mining investors challenged changes to South Africa's mining and empowerment regime under old bilateral investment treaties, the government launched a review of its bilateral investment treaties (BITs) and terminated many of them [144]. These steps were followed by the Protection of Investment Act 22 of 2015, which brings most investment protection under domestic law and expresses a preference for resolving disputes in South African courts, rather than through automatic investor–state arbitration [145]. South Africa's decision to scale back its BIT commitments can be read as a preemptive move to protect regulatory space for instruments such as the carbon tax, carbon budgets, and future coal phase-down measures, and it offers an alternative model to countries that remain heavily exposed to investor–state disputes when they tighten climate regulation.

South Africa's climate-transition strategy must also be considered within the broader framework of regional economic integration under the African Continental Free Trade Area (AfCFTA). As the world's largest free trade area by number of participating states, the AfCFTA seeks to promote intra-African trade, industrialization, and economic diversification while supporting sustainable development objectives. The Agreement provides opportunities for South Africa to expand regional value chains in renewable energy technologies, green manufacturing, critical minerals, and low-carbon industrial products. At the same time, emerging climate-related trade measures, including carbon border adjustment mechanisms and sustainability standards adopted by major trading partners, may affect the competitiveness of African exports.

Therefore, South Africa faces the dual challenge of advancing domestic decarbonization while ensuring that regional integration under the AfCFTA contributes to economic resilience and industrial development. The South African experience demonstrates the importance of aligning climate policy, trade governance, and regional economic integration, a lesson that may also be relevant for Saudi Arabia as it seeks to balance decarbonization objectives with economic diversification and regional economic cooperation. More broadly, the AfCFTA illustrates how trade agreements can serve not merely as instruments of market integration, but also as platforms for coordinating climate-related standards, sustainable industrial policies, and green-investment frameworks across participating economies.

South Africa's experience offers particularly relevant lessons for Saudi Arabia because both economies face the challenge of pursuing decarbonization while remaining dependent on carbon-intensive sectors that contribute significantly to employment, exports, and public revenues. The gradual implementation of South Africa's carbon tax, combined with just-transition considerations and targeted support measures, illustrates the importance of sequencing climate reforms in a manner that preserves economic competitiveness and social stability. For Saudi Arabia, the South African case suggests that climate policy should be integrated with broader industrial, labor-market, and economic-diversification strategies. It also demonstrates the value of developing domestic carbon-accounting and reporting frameworks capable of responding to external measures such as CBAM while minimizing disruption to trade and investment flows.

4.5. Saudi Arabia: Transferability, Constraints, and Policy Choice

Saudi Arabia presents a distinct test of the comparative lessons identified above. Unlike the European Union, it does not operate a comprehensive carbon-pricing system; unlike the United States, it has not relied primarily on a large federal legislative package of climate-related industrial subsidies; and unlike South Africa, it has not adopted a mandatory economy-wide carbon tax. Instead, Saudi Arabia has pursued decarbonization through a combination of economic diversification under Vision 2030, renewable-energy deployment, energy-efficiency measures, carbon-management initiatives, voluntary carbon markets, and the Circular Carbon Economy framework. This approach reflects the Kingdom's particular political economy: a hydrocarbon-dependent economy with substantial fiscal and institutional capacity, significant state involvement in investment and infrastructure, and an economic strategy that seeks simultaneously to preserve the value of its energy sector and reduce the economy's carbon intensity.

The comparative evidence suggests that Saudi Arabia should not transplant any of the three models examined above. Rather, the relevant question is which institutional functions performed by those models can be adapted to Saudi circumstances. The EU experience demonstrates the importance of credible emissions accounting, carbon pricing, and regulatory preparedness for maintaining access to carbon-conscious markets. The US experience illustrates how fiscal capacity and industrial policy can accelerate investment in emerging low-carbon sectors, but also demonstrates the risks associated with politically unstable policy frameworks and trade-sensitive subsidy conditions. South Africa demonstrates both the value of phased carbon pricing and the limitations of a formal carbon tax where exemptions, competitiveness concerns, and implementation constraints substantially weaken the effective price signal. Therefore, for Saudi Arabia the most appropriate strategy is likely to be a sequenced and hybrid framework combining investment incentives, robust emissions measurement and verification, sector-specific regulatory requirements, and progressively stronger domestic carbon-cost signals.

4.5.1. Net-Zero 2060 and the Political Economy of Transition

Saudi Arabia's climate strategy is embedded within its broader economic-transformation agenda. The Kingdom announced its objective of reaching net-zero greenhouse-gas emissions by 2060 in 2021 and has linked that objective to the Saudi Green Initiative and the CCE approach. The Kingdom has also committed to reducing, avoiding, or removing 278 million tons of CO_2-equivalent annually by 2030 [146]. The significance of this framework is that climate policy is not being pursued as a

stand-alone environmental program. It is being integrated into a broader strategy of economic diversification, industrial development, energy transformation, and investment.

This political-economy context distinguishes Saudi Arabia from the three comparative jurisdictions. The EU's climate framework emerged principally from an established regulatory and environmental policy architecture; the United States has increasingly used climate policy as an instrument of industrial strategy; and South Africa has had to reconcile decarbonization with severe developmental, employment, and energy-security constraints. Saudi Arabia, by contrast, possesses considerable fiscal resources and centralized policy-making capacity, allowing climate-related investment to be incorporated into a state-led economic transformation strategy. The policy rationale is not simply emissions reduction. It also encompasses economic diversification, technological development, energy security, investment attraction, and the preservation of competitiveness in an increasingly carbon-conscious international economy.

That combination creates an important advantage but also a significant constraint. Saudi Arabia has the financial and institutional capacity to support large-scale low-carbon investment, but its economy remains heavily dependent on hydrocarbons. Consequently, rapid decarbonization of domestic production must be reconciled with the continued economic importance of oil and gas production and exports. Recent modeling illustrates the scale of this challenge. An analysis of Saudi Arabia's pathway to 2060 using the Global Change Analysis Model for Saudi Arabia (GCAM-KSA), a regionally customized version of the global GCAM framework [147], concludes that achieving net zero would require substantially greater emissions reductions in successive NDCs, rapid expansion of renewable electricity, major electricity-grid upgrades, and significant deployment of carbon capture and removal technologies [148]. A separate 2025 modeling study similarly finds that early implementation of energy-efficiency, renewable-energy, and fuel-displacement policies could reduce the long-term policy costs of achieving net zero by approximately 38–72% compared with delayed action [149].

The implication is important for climate–trade policy. Regulatory preparation cannot be postponed until external carbon measures become fully binding on Saudi exporters. The cost of complying with foreign carbon-accounting requirements will depend on the carbon intensity of Saudi production as well as on the Kingdom's ability to measure, verify, certify, and communicate that intensity. Therefore, early investment in regulatory and institutional capacity may reduce future trade costs even before Saudi Arabia introduces a comprehensive domestic carbon price.

4.5.2. Renewable Energy and Industrial Transformation

Renewable-energy deployment provides the clearest example of the potential for Saudi Arabia to adapt the investment-oriented elements of the US model. Saudi Arabia has substantially increased its renewable-energy ambitions [150]. The IMF reported in 2024 that renewable capacity had increased to 2.8 GW and that projects and tenders were under development, while the authorities had revised the 2030 renewable-energy target upward from 58.7 GW to approximately 100-130 GW to reflect continued economic expansion [74].

The significance of renewable deployment for trade policy extends beyond electricity generation. Lower-carbon electricity can reduce the emissions intensity of energy-intensive Saudi industries, including aluminum, steel, petrochemicals, fertilizers, and other export-oriented sectors. This creates a direct connection between domestic energy policy and external market access. In a trading environment increasingly characterized by carbon accounting and product-level emissions requirements, renewable deployment can become a trade-competitiveness policy, rather than merely an environmental policy.

Therefore, the US experience is relevant, but only selectively. Saudi Arabia's fiscal capacity and centralized investment institutions provide scope for large-scale support for renewable energy, hydrogen, carbon-management technologies, and industrial decarbonization. The objective, however, should not be to reproduce the IRA's most trade-sensitive features. As previously observed, subsidy design must be compatible with WTO disciplines, particularly where support is contingent upon domestic content or export performance. Saudi Arabia could instead emphasize technology-neutral or performance-based incentives tied to measurable emissions reductions, energy efficiency, renewable generation, or verified reductions in the carbon intensity of production. This approach would also reduce the risk of creating an industrial-policy system dependent upon political discretion. The central lesson of the US case is not simply that subsidies work. It is that predictable and credible incentives can mobilize private investment, but their durability and international legal design matter for their long-term effectiveness.

4.5.3. The Circular Carbon Economy: Opportunity and Limitation

The CCE provides the conceptual framework through which Saudi Arabia has sought to reconcile decarbonization with the continued importance of hydrocarbons. The framework organizes carbon-management strategies around reducing, reusing, recycling, and removing emissions and has been incorporated into the Kingdom's climate strategy. Saudi Arabia's first Biennial Transparency Report describes the CCE as integral to its net-zero strategy and emphasizes carbon capture, utilization, and storage as important components of the approach [151]. The CCE has several advantages from a Saudi perspective. It recognizes that hard-to-abate industrial sectors cannot necessarily be decarbonized through electrification alone and, therefore, creates a role for carbon capture, utilization and storage, hydrogen, efficiency improvements, and carbon removal. Earlier Saudi-specific research has likewise concluded that meaningful implementation of the CCE would require stronger CO_2 accounting and MRV systems, together with continued support for CCS, hydrogen, renewable energy, and energy efficiency [152].

At the same time, the CCE should not be treated as a substitute for emissions reduction. Recent assessments have questioned the transparency and comprehensiveness of the Kingdom's net-zero pathway, noting that the 2060 target has yet to be translated into a fully specified long-term emissions strategy with clear interim targets, underlying emissions pathways, and detailed sectoral measures [153]. The analytical lesson is that carbon-management technologies can complement but cannot replace a credible emissions-reduction architecture. For the purposes of this article, this distinction is particularly important. International trade partners increasingly require product-level evidence concerning actual emissions. Consequently, the commercial value of Saudi investments in CCS, hydrogen, renewables, and efficiency will depend partly on whether their emissions benefits can be measured and verified according to methodologies that foreign regulators recognize.

4.5.4. From Voluntary Carbon Markets to Credible Carbon Governance

Saudi Arabia has so far pursued carbon pricing primarily through voluntary rather than mandatory instruments. Unlike the EU, which operates a mandatory emissions-trading system, and South Africa, which has imposed a statutory carbon tax since 2019, Saudi Arabia has relied principally on voluntary carbon-credit markets. Although the Kingdom has indicated that a compliance carbon market may be introduced by 2027, binding economy-

wide carbon-pricing obligations have not yet been established [154]. Its development of voluntary carbon markets allows firms to finance mitigation projects and purchase credits without immediately imposing a comprehensive carbon price on an economy that remains heavily dependent on hydrocarbons. The approach can mobilize private capital and develop domestic expertise in carbon accounting and crediting.

Nevertheless, voluntary carbon markets have an important limitation when considered from a trade perspective. They demonstrate that firms are taking action, but they do not necessarily establish a mandatory and verifiable carbon price comparable to the EU ETS or South African carbon tax. As previously mentioned, this distinction matters for Saudi exporters exposed to CBAM-type measures because foreign regulators may distinguish between voluntary offsetting and reductions reflected in the emissions intensity of the exported product. Saudi Arabia should therefore treat voluntary carbon markets as a transitional and complementary mechanism, rather than the endpoint of climate–trade governance. Their most valuable contribution may be institutional: developing domestic expertise in carbon measurement, verification, certification, project development, and carbon-market infrastructure. Those capabilities can subsequently support more formal carbon-accounting and regulatory systems.

4.5.5. CBAM and the Need for Trade-Oriented Domestic Regulation

The EU's CBAM entered its definitive regime on 1 January 2026, replacing the transitional reporting phase that operated from 2023 to 2025. Under the definitive regime, covered importers must declare embedded emissions and surrender CBAM certificates corresponding to those emissions, with the certificate price linked to EU ETS allowance prices [155]. The significance for Saudi Arabia is not limited to the potential financial cost of CBAM certificates. It extends to the administrative infrastructure required to demonstrate the embedded emissions of exported products.

This makes CBAM qualitatively different from a conventional tariff. A Saudi exporter may face competitive disadvantages not simply because its product has a higher carbon intensity, but because it lacks sufficiently robust systems for calculating, documenting, verifying, and communicating that carbon intensity. The capacity to produce internationally credible emissions data is therefore becoming a component of market-access infrastructure. The EU framework also creates an opportunity. Where a carbon price has already been effectively paid in the country of production, CBAM allows that amount to be taken into account. Therefore, Saudi Arabia has a strategic choice. It can remain primarily reliant on voluntary mechanisms and require its exporters to absorb externally imposed carbon costs, or it can gradually develop domestic mechanisms that both reduce emissions and establish credible evidence of the carbon costs already borne by Saudi producers.

The latter approach would not necessarily require the immediate introduction of an economy-wide carbon tax. A more proportionate strategy would begin with mandatory emissions accounting and MRV for CBAM-exposed sectors, followed by sector-specific performance standards and, where economically and politically feasible, progressively stronger carbon-pricing mechanisms. Such sequencing would allow Saudi Arabia to develop regulatory capacity before imposing economy-wide carbon costs. This is where the EU experience is most transferable. Saudi Arabia does not need to reproduce the EU ETS or CBAM. It does, however, have a strong interest in developing the institutional infrastructure necessary to operate in a trading system in which carbon intensity increasingly affects market access.

4.5.6. Policy Choice: Selective Adaptation rather than Institutional Transplantation

The comparative analysis points toward a differentiated Saudi strategy. The EU demonstrates the importance of credible carbon accounting, MRV, and regulatory predictability; the United States demonstrates the potential of fiscal incentives and industrial policy to accelerate investment and technological transformation; and South Africa demonstrates both the potential and limitations of phased carbon pricing in a carbon-intensive developing economy. None of these models is directly transferable in its entirety.

For Saudi Arabia, the most appropriate approach would consist of five mutually reinforcing elements. First, Saudi Arabia should prioritize emissions measurement and verification before comprehensive carbon pricing. For export-exposed sectors, particularly those most directly affected by CBAM, reliable product-level emissions data should become a regulatory priority. Internationally compatible MRV standards would reduce compliance costs and improve the credibility of Saudi exporters.

Second, the Kingdom should continue using its fiscal and investment capacity to accelerate low-carbon industrial transformation. Renewable electricity, hydrogen, energy efficiency, CCS, Carbon Capture, Utilization and Storage (CCUS), and low-carbon industrial production should be treated as climate initiatives but also as instruments of long-term trade competitiveness. The available modeling suggests that earlier action can materially reduce the eventual cost of the transition [149].

Third, Saudi Arabia should progressively strengthen mandatory climate regulation for export-exposed sectors. Voluntary carbon markets can remain an important component of the transition, but they should complement, rather than substitute for, regulatory requirements where foreign market-access rules increasingly demand demonstrable emissions reductions.

Fourth, subsidy design should emphasize WTO-compatible performance criteria rather than local-content or export-contingent requirements. This would allow Saudi Arabia to use its fiscal capacity to support decarbonization while reducing exposure to disputes under the SCM Agreement and related non-discrimination disciplines. The legal analysis developed earlier in this article is therefore directly relevant to the design of domestic climate-industrial policy.

Fifth, Saudi Arabia should integrate climate policy more explicitly into trade policy. Climate regulation should not be developed solely by environmental or energy authorities. Trade, industry, finance, customs, standards, and investment institutions should participate in a coordinated framework for assessing the implications of foreign climate-related trade measures. This would enable Saudi Arabia to respond to measures such as CBAM proactively, rather than treating them as external regulatory shocks.

The broader lesson is that Saudi Arabia's comparative advantage may lie precisely in combining instruments that other jurisdictions have deployed separately. Its fiscal capacity creates greater scope for investment-led decarbonization than exists in South Africa; its centralized institutional structure allows faster coordination than the fragmented US system; and its hydrocarbon expertise and carbon-management capabilities provide a basis for pursuing the Circular Carbon Economy in ways that differ from the EU's more conventional carbon-pricing model. Yet these advantages will translate into trade competitiveness only if they are supported by credible emissions accounting, transparent regulatory standards, and measurable reductions in the carbon intensity of export production.

Accordingly, Saudi Arabia should pursue selective institutional adaptation rather than wholesale transplantation.

The objective should not be to replicate the EU ETS, the IRA, or the South African carbon tax. It should be to construct a domestic framework capable of performing the functions that these systems perform: creating incentives for decarbonization, mobilizing investment, generating credible emissions information, protecting competitiveness during the transition, and ensuring that Saudi exporters remain capable of meeting increasingly stringent foreign climate-related market-access requirements. Such an approach would allow climate policy to become not merely a response to external trade pressures, but an instrument of Saudi Arabia's broader economic-diversification and international trade strategy.

4.6. Comparative Assessment and Regulatory Implications for Saudi Arabia

As previously argued, Saudi Arabia should adopt a hybrid, multi-level, WTO-conscious climate-trade framework, rather than copy any single model. Looking across the three cases of the EU, the United States, and South Africa, several common patterns emerge in how governments try to connect trade and investment rules with their climate objectives. Each model reflects its trade and climate profile and falls into one of three broad strategies: (1) promoting clean investment and production, (2) reshaping domestic laws and carbon taxes, or (3) applying border measures to imports. Saudi Arabia sits in a different position since it is a major hydrocarbon exporter with substantial fiscal resources, exceptional solar potential, and a clear direction under Vision 2030 toward diversification in non-oil sectors. This gives Saudi Arabia scope to combine elements of all three strategies, instead of adopting any single model.

The current Saudi approach relies more on voluntary and incentivizing measures. On the "clean investment and production" side, Saudi Arabia already relies on incentives and industrial policy tools under Vision 2030 and the National Industrial Strategy to attract investment in renewables, hydrogen, and lower-carbon industry [156]. In this respect, it is closer to the US approach, which uses large-scale subsidies to pull capital into clean technologies [157], than to the EU's reliance on pricing and regulation. At the same time, experience with the Inflation Reduction Act shows how subsidy schemes that are tightly tied to local content can provoke trade tensions and WTO scrutiny [158]. For Saudi Arabia, strong fiscal capacity provides scope to deploy investment incentives as a central pillar of its climate strategy, thus reducing the need for tightly conditional subsidy designs that generated trade frictions in the IRA context.

By contrast, on carbon pricing, Saudi Arabia is closer to the starting point than to any of the three case-study countries. It has not introduced a carbon tax or a national emissions trading system yet. Instead, it has moved first on voluntary carbon markets [159], positioning itself as a regional hub where companies can purchase carbon credits to offset part of their emissions [160]. This approach channels finance into climate mitigation projects in the Kingdom and the region and allows firms to show that some carbon cost has been paid without immediately imposing a compulsory price on an economy that remains heavily reliant on hydrocarbons. In the case of South Africa, a binding but phased carbon tax has been introduced, with free allowances and a gradual tightening schedule to manage competitiveness concerns while still putting an explicit price on emissions [161]. Both South Africa and Saudi Arabia export in energy-intensive sectors such as aluminum, steel, fertilizers, and petrochemicals, which are likely to be exposed to CBAM-type measures in the EU and other global markets. In that context, a framework based only on voluntary markets is unlikely to carry the same weight as a clear and mandatory regime when trading partners assess whether producers are making an equivalent effort on climate change mitigation.

The comparative picture suggests that Saudi Arabia can assemble a more comprehensive framework that combines targeted support for clean investment, a more structured domestic climate-policy architecture for export-exposed sectors, continued use of voluntary carbon markets, and an active approach to foreign border and supply-chain measures. These three case studies clearly show that these choices are possible and that failing to make them early leaves countries more exposed to rules written by others. The comparative analysis further demonstrates that no single model adequately addresses the trade-offs between WTO compatibility, decarbonization, and energy-export dependence. Instead, each jurisdiction prioritizes different regulatory tools and governance assumptions. Moreover, the Saudi case illustrates the structural asymmetry between trade-integrated hydrocarbon economies and regulatory frameworks driven by decarbonization imperatives. The comparative evidence suggests that the effectiveness of climate-related trade governance depends less on the choice of a particular instrument than on the interaction between regulatory design, institutional capacity, political economy, and implementation. The detailed legal and institutional challenges and reforms needed to operationalize such a framework are developed in the following sections.

The EU demonstrates the capacity of a highly coordinated regulatory system to externalize domestic carbon costs through market-access requirements; the United States demonstrates the advantages and vulnerabilities of a decentralized and fragmented model of climate governance combining clean-energy incentives with regulatory and international retrenchment; and South Africa demonstrates the limitations of carbon pricing where exemptions, developmental constraints, and institutional capacity weaken the effective policy signal. Saudi Arabia differs from all three but can combine elements of each: the EU's emissions-accounting and market-access preparedness, the United States' use of fiscal capacity to accelerate low-carbon investment, and South Africa's attention to sequencing and competitiveness.

The preceding case studies demonstrate that there is no single model for integrating climate governance with international trade and investment law. Instead, the European Union, the United States, and South Africa represent three distinct approaches to decarbonization governance, each relying on different regulatory instruments, institutional structures, and economic assumptions. Their experiences reveal contrasting ways of balancing climate ambition, industrial competitiveness, and compliance with international economic law. For Saudi Arabia, these models provide important comparative insights, rather than templates for direct transplantation, as shown in Table 1.

Table 1. Comparative table.

Dimension	EU	United States	South Africa	Lesson for Saudi Arabia
Policy rationale	Carbon leakage + EU climate targets	Industrial competitiveness + energy security + supply chains	Decarbonization + just transition	Align climate policy with diversification
Core instrument	ETS + CBAM	Subsidies + tax incentives + state carbon markets	Carbon tax + carbon budgets	Combine incentives with gradual mandatory measures
Governance	Supranational	Federal + state + private	Centralized but capacity-constrained	Coordinated multi-agency governance
Political economy	Climate ambition + competitiveness	Highly polarized	Development + employment + coal dependence	Sequence reforms around economic diversification
Implementation capacity	High	High but fragmented	Constrained	Build MRV/verification capacity early
Practical outcome	Strong regulatory influence; CBAM operational in 2026	Investment mobilization but policy volatility	Weak effective carbon-price signal	Avoid overreliance on either subsidies or weak carbon pricing
Trade consequence	Foreign producers face carbon-compliance costs	Domestic production incentives	Export competitiveness concerns	Prepare exporters for carbon-accounting requirements
Transferability	Selective	Selective	High for sequencing	Hybrid rather than transplantation

A first point of comparison concerns the principal regulatory tools used to pursue decarbonization. The EU relies primarily on carbon pricing and market-corrective instruments, particularly the EU Emissions Trading System (EU ETS) and CBAM. The EU model seeks to internalize the carbon costs of production and extend these costs to imports through border adjustment measures. By contrast, the United States has largely adopted a subsidy-driven industrial policy approach centered on large-scale fiscal incentives, tax credits, and domestic manufacturing support under the Inflation Reduction Act (IRA). South Africa, meanwhile, has pursued a more gradual transition model based on a phased carbon tax combined with broader just-transition objectives designed to account for developmental and socio-economic constraints. These differences illustrate three distinct pathways to climate governance: market-based carbon adjustment, state-led green industrial policy, and phased transition regulation.

The three systems also differ significantly in their exposure to WTO-related legal challenges. The EU's CBAM and related climate standards raise questions under the principles of Most-Favored-Nation (MFN) treatment, National Treatment (NT), and the TBT Agreement, particularly regarding embedded emissions calculations, product "likeness," and the risk of de facto discrimination against foreign producers. The United States model faces a different set of vulnerabilities. The IRA's domestic-content requirements and localization incentives create potential tensions under the Agreement on Subsidies and Countervailing Measures (SCM Agreement), especially regarding local-content requirements (LCRs) and the preferential treatment of domestic manufacturing. South Africa's approach appears comparatively less vulnerable to direct WTO challenges because its measures are primarily domestic and phased gradually over time, rather than imposed extraterritorially. Nevertheless, even South Africa's carbon tax regime could eventually raise competitiveness concerns for export-oriented sectors.

From a governance perspective, the three jurisdictions also reflect different institutional structures. The EU operates through a supranational governance framework in which climate measures are coordinated centrally across member states through harmonized legislation and common regulatory objectives. This allows the EU to project regulatory influence externally through trade-related climate instruments. The United States adopts a more fragmented but strongly industrial-policy-oriented model, combining federal subsidy programs with state-level climate initiatives. This produces a hybrid system in which industrial competitiveness and supply-chain security are deeply integrated into climate governance. South Africa, by contrast, follows a phased transition approach that prioritizes flexibility, gradual implementation, and socio-economic adjustment in recognition of developmental realities and dependence on carbon-intensive sectors.

These differences generate distinct consequences for international trade and export competitiveness. The EU model externalizes decarbonization costs by requiring foreign producers to adapt to EU climate standards and carbon pricing mechanisms to maintain market access. This has major implications for exporters of emissions-intensive goods. The US approach, on the other hand, primarily seeks to attract investment and manufacturing capacity domestically through subsidies and incentives tied to production location and supply-chain restructuring. South Africa's model imposes lower immediate adjustment costs on trade, but may achieve slower decarbonization outcomes due to its gradual implementation strategy.

For Saudi Arabia, the comparative analysis suggests that no single foreign model can simply be replicated. Saudi Arabia's economic structure, fiscal capacity, and position as a major hydrocarbon exporter create unique regulatory challenges that differ substantially from those of the EU, the US, or South Africa. Nevertheless, important lessons emerge from each system. The EU experience demonstrates the growing importance of carbon-accounting systems, emissions reporting, and supply-chain transparency for maintaining access to export markets increasingly shaped by climate conditionality. The US model highlights the strategic role that targeted industrial subsidies and state support can play in accelerating low-carbon investment and technological development. South Africa's phased approach illustrates the importance of sequencing transition measures carefully in carbon-intensive economies where rapid regulatory shifts may generate economic and social disruption.

Altogether, these comparative findings indicate that Saudi Arabia would likely benefit from a hybrid and adaptive approach, rather than strict alignment with any single model. Such an approach could combine selective industrial subsidies for low-carbon sectors, gradual carbon-regulatory measures for export-

exposed industries, and enhanced monitoring and reporting systems capable of responding to external measures such as CBAM. At the same time, Saudi Arabia would need to remain attentive to WTO constraints, particularly regarding subsidy design, localization incentives, technical standards, and the treatment of imported and domestic products. Rather than viewing climate governance solely as an external pressure imposed by major trading partners, Saudi Arabia may increasingly need to treat decarbonization governance as a strategic component of long-term trade competitiveness and economic diversification under Vision 2030.

The comparative analysis demonstrates that contemporary climate governance is reshaping international trade through different combinations of carbon pricing, industrial policy, and regulatory conditionality. The EU, the United States, and South Africa each reflect distinct balances between environmental ambition, economic competitiveness, and regulatory autonomy. For Saudi Arabia, the central challenge is not whether to adapt to these emerging climate–trade dynamics, but how to do so in a manner that preserves economic flexibility, protects export competitiveness, and maintains sufficient regulatory autonomy within the evolving framework of international economic law.

Saudi Arabia's response to climate-related trade measures must also be assessed in light of its obligations under the WTO framework and its participation in regional economic integration through the Gulf Cooperation Council (GCC). Since acceding to the WTO in 2005, Saudi Arabia has committed to a rules-based international trading system founded on principles of non-discrimination, market access, and transparency. The emergence of climate-related trade measures, including carbon border adjustment mechanisms, sustainability standards, and environmental conditionalities, raises important questions regarding the compatibility of climate policies with WTO disciplines. As a major exporter of energy-intensive products, Saudi Arabia has a strong interest in ensuring that climate measures adopted by trading partners are implemented in a manner consistent with WTO obligations and do not constitute disguised restrictions on international trade.

At the regional level, the GCC provides an important platform for coordinating economic diversification, energy-transition policies, and climate-related trade responses among member states. The GCC customs union and common market framework facilitate regional economic integration and offer opportunities for greater cooperation on renewable energy deployment, hydrogen development, carbon-management technologies, emissions-accounting methodologies, and sustainable industrial policies. Enhanced regional coordination could also strengthen the capacity of GCC members to respond collectively to external climate-related trade measures and to promote common positions in international trade and climate negotiations.

More broadly, Saudi Arabia occupies a unique position at the intersection of global energy markets, international trade, and climate governance. As a G20 member, a leading energy producer, and an increasingly important investor in low-carbon technologies, the Kingdom is well placed not only to adapt to evolving climate-related trade rules, but also to contribute to their development.

Through active engagement within the WTO, the GCC, and other international economic fora, Saudi Arabia could move beyond participation in emerging climate–trade discussions to propose concrete mechanisms for greater regulatory interoperability and flexibility. For example, the Kingdom could advocate mutual recognition or interoperability of national carbon-accounting methodologies and conformity-assessment procedures, including recognition of Saudi standards where they are demonstrably consistent with internationally accepted methodologies. It could also promote the recognition of CCUS and other carbon-management technologies when calculating the embedded emissions of traded goods, where such technologies can be appropriately verified and their emissions effects reliably quantified. In negotiations concerning carbon border adjustment measures (CBAMs) [162], Saudi Arabia could advocate greater transparency regarding methodologies, default emissions values, verification requirements, exemptions, and the treatment of carbon prices paid in exporting countries.

The Kingdom could further support differentiated flexibilities for economies whose production and exports remain significantly dependent on hydrocarbons, including longer implementation periods, technical assistance, and recognition of nationally appropriate decarbonization pathways. Saudi Arabia could use the WTO Committee on Trade and Environment and the Committee on Technical Barriers to Trade as institutional venues for advancing these proposals, particularly given ongoing WTO discussions concerning carbon-measurement methodologies, interoperability [163], conformity assessment, and transparency [68]. Such engagement would allow Saudi Arabia to advocate climate–trade rules that combine environmental integrity with methodological interoperability, technological neutrality, regulatory transparency, and appropriate flexibility for economies at different stages of economic diversification.

The comparative analysis reveals that no single model can be transplanted directly to the Saudi context. Nevertheless, several common themes emerge. The European experience highlights the growing importance of carbon accounting and regulatory compliance; the US experience demonstrates the strategic role of industrial policy and supply-chain development; and the South African experience illustrates the challenges faced by carbon-intensive economies undergoing transition. These insights provide the basis for a Saudi framework that seeks to reconcile climate commitments, trade competitiveness, economic diversification, and compliance with international economic law. The recommendations later in the paper build upon these comparative lessons.

5. Saudi Arabia's Legal Options and Institutional Constraints

This section will identify and analyze the institutional and legal challenges linked with the international trade and investment regimes that will impact climate objectives. The aim is to clarify the obstacles in achieving climate objectives due to legal and standards constraints from trade and investment.

5.1. Revising Fair and Equitable Treatment

Fair and Equitable Treatment (FET) is a substantive obligation embedded as an individual article in bilateral investment treaties, rather than in a dispute settlement mechanism. In free trade agreements, FET is typically included as an article within the investment chapter of that given free trade agreement alongside other investor-protection standards. The FET standard requires that foreign investors be treated in a manner that is reasonable, transparent, non-arbitrary, and consistent with basic principles of fairness [164]. However, due to its broad and often indeterminate formulation, FET has been interpreted expansively in some cases, enabling investors to challenge regulatory changes that affect their investments [11]. In the context of climate policy, such expansive interpretations may constrain governments' ability to adopt or adjust climate-related regulations. Consequently, states may consider clarifying the scope and application of FET within bilateral investment treaties and trade agreements to ensure alignment with climate objectives and to mitigate the risk of misuse in future disputes [10]. In the Saudi Arabian context, such clarification should be in alignment with national objectives for both investment policies and climate policies.

5.2. Climate Carve-Outs

There is no clear definition of climate carve-outs [165]; however, climate carve-outs could refer to explicit treaty provisions that exclude climate-related regulatory measures from the scope of certain investor protections or from the reach of investor–state arbitration [166]. Climate carve-outs represent a protection mechanism for the state to introduce climate policies that protect the sector and limit investors' right to object [167]. Although the climate carve-outs are not yet included in international investment law, their use would support states in framing international investment agreements (IIAs).

In the Saudi Arabian context, the relevance of climate carve-outs could be vital in supporting the Vision 2030 objectives and the National Investment Strategy [168]. Of the 28 BITs that Saudi Arabia had concluded as of early 2026 [169], 23 predated the launch of Vision 2030 in 2016 [170] and 21 were in force as of February 2026, according to UNCTAD's international investment agreements database. Therefore, climate policy has become a prominent national priority [16], but the current treaty framework does not contain explicit safeguards for climate-related regulation [171]. As Saudi Arabia expands climate-aligned policies and industrial strategies, the absence of climate carve-outs may create legal uncertainty when implementing new regulatory frameworks in sectors such as energy, logistics, and heavy industry [172]. As a protective measure, Saudi Arabia should consider including climate-related carve-outs in its international investment agreements [165]. With such clauses, there will be more protection and flexibility in designing and implementing climate policies that consider investment objectives and support FDI.

5.3. Multilateral Coordination

At the international level, states commonly rely on international investment agreements (IIAs) to facilitate and regulate cross-border investment activities [3,173,174]. These agreements form part of the treaty obligations binding two or more states and may take bilateral, plurilateral, or multilateral form. While international investment law does not distinguish formally between bilateral, trilateral, or multilateral treaties, Article 2(1)(a) of the Vienna Convention on the Law of Treaties (VCLT) defines a treaty as: "'treaty' means an international agreement concluded between States in written form and governed by international law, whether embodied in a single instrument or in two or more related instruments and whatever its particular designation [175]." Such instruments provide an important legal and policy framework through which states align economic objectives, establish common rules, and promote regulatory transparency across borders.

From a policy perspective, IIAs and other multilateral agreements can serve as tools for coordinating trade and investment practices to support broader public policy goals, including climate and environmental objectives. Effective multilateral coordination can help clarify how investment protection rules interact with climate-related regulations, reduce fragmentation across overlapping legal regimes [138,176], and enhance predictability for both governments and investors. Without such coordination, unilateral climate measures may generate legal uncertainty or tensions across trade and investment frameworks, potentially undermining climate ambitions.

In the Saudi Arabian context, multilateral coordination is particularly relevant given the Kingdom's commitment to environmental and climate objectives alongside economic diversification under Vision 2030 [2]. Saudi Arabia is party to numerous international environmental agreements, including the Convention on Biological Diversity (CBD), the UNFCCC, and the United Nations Convention to Combat Desertification (UNCCD) [177]. However, climate commitments under environmental treaties remain largely separate from trade and investment-protection obligations, highlighting the need to better bridge these policy domains at the multilateral level.

Greater alignment could be pursued through coordinated regional and multilateral initiatives that integrate climate considerations into trade and investment governance. Saudi Arabia could use future trade agreements and WTO negotiations to advocate a more concrete set of rules addressing the interaction between trade and climate policy. These could include provisions promoting interoperability or mutual recognition of carbon-accounting methodologies, technical standards, and conformity-assessment procedures; commitments to reduce tariff and non-tariff barriers affecting trade in environmental goods and services, including renewable-energy, energy-efficiency, and carbon-management technologies; and cooperation on the development and implementation of compatible carbon-measurement and reporting frameworks. Trade agreements could also establish mechanisms for consultation and information-sharing concerning carbon-pricing and carbon-border measures, including greater transparency regarding methodologies for calculating embedded emissions, verification procedures, default values, and the treatment of carbon prices paid in exporting countries. Where appropriate, agreements could facilitate cooperation in the development and use of high-integrity carbon markets and internationally transferable mitigation outcomes, while ensuring robust accounting and avoiding double counting.

For Saudi Arabia in particular, such arrangements could also recognize the role of CCUS and other verified carbon-management technologies in reducing the emissions intensity of traded products. Provisions could encourage the mutual recognition of appropriately verified emissions reductions and establish common methodologies for accounting for such technologies when determining embedded emissions. Regional and multilateral agreements could further provide technical assistance, capacity-building, and appropriate implementation flexibility for economies at different stages of economic diversification, including economies that remain significantly dependent on hydrocarbons. Rather than seeking a permanent exemption from climate-related trade disciplines, Saudi Arabia could advocate rules that combine environmental integrity with technological neutrality, transparency, interoperability, and differentiated implementation.

The EU-Singapore Free Trade Agreement illustrates how such objectives can be incorporated into modern trade agreements. Its Trade and Sustainable Development chapter (Chapter 12) contains binding commitments concerning environmental protection and sustainable development [178], while the agreement separately addresses non-tariff barriers affecting trade and investment in renewable-energy generation (Chapter 7) [178]. More broadly, contemporary EU trade agreements seek to liberalize trade in environmental goods and services, facilitate trade and investment in renewable energy, and strengthen cooperation on climate and sustainable development. Saudi Arabia could draw on these precedents while adapting them to the circumstances of GCC economies and the particular challenges associated with energy-system transformation in hydrocarbon-dependent economies. In this regard, cooperation within regional groupings such as the GCC may offer a strategic entry point, as shared economic structures and policy priorities can facilitate consensus. Multilateral and regional coordination can also enhance implementation and enforcement by promoting consistency across jurisdictions, reducing regulatory arbitrage—that is, exploiting differences between legal or regulatory systems—and supporting collective approaches to climate-related trade and investment challenges [1].

5.4. Political Economy Constraints

Aligning trade and investment frameworks with climate objectives involves more than legal reform; it is also shaped by political-economy factors that influence how policies are designed and implemented. These obstacles arise from the interaction between economic interests, institutional mandates, and political incentives. Climate-related reforms may affect existing industries, investment patterns, or employment, leading to resistance from stakeholders who benefit from the current regulatory and economic environment. As a result, even well-designed legal reforms may face delays or compromises during implementation.

From a policy perspective, climate-aligned investment reforms require balancing long-term environmental objectives with short-term economic considerations [179]. Governments may encounter pressure to maintain competitiveness, attract foreign investment, and ensure economic stability. In addition, fragmented institutional responsibilities (such as separate agencies overseeing investment, trade, energy, and environmental policy) can further complicate coordination and slow decision-making. In the Saudi Arabian context, political economy considerations play a significant role as Vision 2030 seeks to advance economic diversification while supporting climate and environmental goals [2]. Policymakers must manage the transition of established sectors alongside the development of new low-carbon industries, ensuring social and economic stability throughout the process. Addressing these obstacles requires careful sequencing of reforms, strengthening inter-agency coordination, and positioning climate-aligned trade and investment policies as enablers of long-term growth and competitiveness, rather than regulatory constraints.

5.5. Enforcement and Compliance Gaps

Aligning trade and investment regimes with climate objectives depends not only on treaty design, but also on effective enforcement and compliance mechanisms. Even where legal provisions exist to support climate-aligned policies, gaps in implementation can limit their practical impact. These gaps arise when commitments remain largely aspirational, enforcement mechanisms are weak, or institutions lack the capacity and tools needed to monitor compliance and resolve disputes effectively [180]. As a result, the credibility and effectiveness of climate-related obligations within trade and investment frameworks may be undermined.

From a policy perspective, enforcement challenges are particularly evident in the climate domain, where obligations are often framed as cooperation-based, rather than sanction-based [181]. In addition, limited transparency, fragmented oversight responsibilities, and unclear accountability can reduce or limit governments' ability to detect non-compliance or respond on time. In the Saudi Arabian context, enforcement and compliance gaps may emerge as climate objectives increasingly intersect with complex trade and investment arrangements under Vision 2030. While Saudi Arabia has made progress in strengthening institutional frameworks and regulatory capacity, effective alignment requires continued investment in monitoring systems, inter-agency coordination, and data sharing. Therefore, addressing enforcement and compliance challenges involves complementing legal reform with institutional strengthening to ensure that climate-aligned commitments are translated into consistent and credible practice within trade and investment governance.

5.6. Saudi Arabia's Exposure to Climate-Related Trade Measures

The case for a hybrid WTO-conscious climate-trade framework derives from the intersection of three realities. First, Saudi Arabia remains economically linked to carbon-intensive export sectors that are increasingly affected by foreign climate regulations. Second, the Kingdom is pursuing ambitious decarbonization, renewable-energy, and hydrogen-development strategies under Vision 2030. Third, Saudi Arabia's policy options remain constrained and enabled by its obligations under WTO law, regional economic integration arrangements, and international investment agreements. Together, these factors create a strong rationale for a climate-trade framework that simultaneously supports decarbonization, preserves international competitiveness, and maintains compliance with international economic law.

Saudi Arabia's exposure to climate-related trade measures is not merely hypothetical. As shown in Table 2, the Kingdom remains a major exporter of energy products, petrochemicals, metals, and industrial goods, several of which fall within sectors directly or indirectly affected by emerging climate-related trade regulations. The European Union is among Saudi Arabia's principal trading partners, making developments such as CBAM particularly relevant for Saudi exporters seeking continued access to European markets.

Table 2. Saudi Arabia's trade exposure, decarbonization objectives, and international economic commitments.

Indicator	Relevance
EU–Saudi trade	Exposure to EU climate regulations
Aluminum exports	Direct CBAM relevance
Steel exports	Direct CBAM relevance
Hydrogen strategy	Future low-carbon opportunities
Petrochemicals	Possible future CBAM expansion

Although Saudi Arabia's export profile remains dominated by crude oil and petroleum products, the Kingdom also exports products that either fall within or are closely linked to CBAM-covered sectors, including aluminum, steel, fertilizers, and hydrogen-related value chains. As CBAM moves beyond its initial implementation phase and potentially expands in scope, the regulatory implications for Saudi industrial exports are likely to increase. Moreover, Saudi Arabia's industrial structure remains closely linked to carbon-intensive sectors, including oil and gas production, refining, petrochemicals, cement, steel, and metals processing. These industries play a significant role in exports, industrial output, and employment. Consequently, international climate-related trade measures have implications not only for environmental policy but also for industrial competitiveness and economic diversification.

At the same time, Saudi Arabia has adopted ambitious decarbonization and diversification objectives. Vision 2030, the Saudi Green Initiative, major renewable-energy projects, and investments in green and blue hydrogen indicate a strategic effort to position the Kingdom within emerging low-carbon value chains. These developments create incentives for greater alignment between domestic climate governance and evolving international trade requirements. Moreover, Saudi Arabia has also undertaken significant energy-price reforms in recent years, gradually reducing certain fuel and electricity subsidies and introducing measures aimed at improving energy efficiency and fiscal sustainability. While these reforms do not constitute a carbon-pricing system, they illustrate an ongoing transition toward a more market-oriented energy framework.

Saudi Arabia's policy choices are further shaped by its obligations under WTO law, its participation in the GCC customs union and common market framework, and its network of bilateral investment treaties. Any future climate-related trade measures adopted by the Kingdom must, therefore, balance environmental objectives with commitments concerning non-

discrimination, market access, investment protection, and regional economic integration.

Saudi Arabia's policy space is therefore not unconstrained. Climate-related regulatory reform must operate within a pre-existing network of international economic commitments, investor expectations, and diplomatic relationships. The Kingdom cannot unilaterally rewrite the substantive protections contained in its existing investment treaties without regard to the legal procedures applicable to amendment, termination, or replacement. Nor would treaty reform necessarily eliminate the expectations created by existing investments made under those agreements. Therefore, regulatory changes must be designed with attention to the continuing application of existing treaty obligations, the potential for investor-state claims, and the diplomatic consequences of altering established investment relationships. The relevant policy question is consequently not whether Saudi Arabia can maximize regulatory discretion, but how it can progressively expand and clarify regulatory space while maintaining sufficient legal certainty to preserve investment confidence and international economic relationships.

Investor expectations are particularly relevant where foreign investors have committed capital on the basis of specific regulatory representations, contractual arrangements, or stabilization commitments; however, the existence of an investment expectation should not be equated with a general guarantee that the regulatory framework will remain unchanged throughout the life of an investment.

6. Proposed Reforms and Policy Recommendations

Section 5 identified the principal legal and institutional constraints within which Saudi Arabia must develop its climate-trade framework. These constraints do not preclude regulatory action; rather, they shape the form, sequencing, and institutional design of feasible reforms. Building on the comparative findings in Section 4 and the legal analysis in Section 5, this section develops a set of policy recommendations and implementation pathways for Saudi Arabia. The recommendations do not represent a generic catalogue of climate-policy objectives. Each responds to a specific finding from the comparative analysis and is assessed against Saudi Arabia's legal, institutional, political-economy, and trade constraints.

Section 4's comparative analysis demonstrates that the policy challenge facing Saudi Arabia is not simply to identify desirable climate measures, but to determine which regulatory functions can be transferred from foreign experience without reproducing the institutional weaknesses, trade tensions, or political constraints observed elsewhere. The European Union demonstrates the importance of carbon pricing, emissions accounting, monitoring and verification, and regulatory preparedness for carbon-related market-access requirements. The United States demonstrates the capacity of targeted fiscal incentives and industrial policy to mobilize private investment and restructure low-carbon supply chains but also illustrates the trade tensions and policy uncertainty that may arise from localization requirements and politically unstable climate policy. South Africa demonstrates the value of sequencing carbon regulation in a carbon-intensive economy, while simultaneously illustrating how extensive exemptions and limited implementation capacity can weaken the effectiveness of a formal carbon price.

These findings support neither wholesale regulatory transplantation nor continued reliance on voluntary measures alone. Instead, they support a sequenced, hybrid, and WTO-conscious framework for Saudi Arabia. The immediate priority should be to establish the institutional infrastructure necessary to measure and verify emissions and prepare export-oriented industries for increasingly carbon-sensitive market-access requirements. This should be followed by targeted incentives for low-carbon investment, sector-specific regulatory measures, and progressively stronger domestic carbon-cost signals where economic and political conditions permit. At the same time, Saudi Arabia should modernize its investment treaties and strengthen institutional coordination so that climate regulation can develop without generating unnecessary uncertainty for investors or conflicts with international economic obligations.

The recommendations below distinguish between what should be done immediately, what requires institutional development, and what should be considered only after the necessary administrative and technical capacity has been established.

6.1. Building a National Carbon-Accounting and MRV Architecture

The first and most immediate reform should be the development of a national carbon-accounting, monitoring, reporting and verification (MRV) framework capable of generating reliable, sector-specific, and internationally comparable emissions data. This recommendation follows directly from the EU case. The effectiveness of CBAM does not depend solely on the existence of a carbon price; it also depends on the ability of producers and regulators to quantify embedded emissions according to recognized methodologies. The South African experience similarly demonstrates that carbon taxation and emissions budgets require reliable measurement and reporting systems to translate formal regulatory commitments into enforceable obligations.

For Saudi Arabia, MRV should initially prioritize sectors with the greatest exposure to climate-related trade measures, including aluminum, steel, fertilizers, and other energy-intensive industrial products. Rather than attempting to establish an economy-wide system immediately, the Kingdom could adopt a sectoral approach under which standardized methodologies are first developed for CBAM-exposed products and subsequently extended to other industrial sectors. Implementation would require clearly allocated institutional responsibilities for methodology development, data collection, verification, accreditation, and enforcement. The system should establish common rules for emissions boundaries, electricity-related emissions, direct and indirect emissions, verification procedures, data retention, and third-party assurance. It should also provide firms with standardized reporting templates and sufficient transition periods to develop internal compliance capacity.

The legal challenge is to ensure that reporting requirements are sufficiently robust to produce credible data without imposing disproportionate administrative burdens on smaller firms. The regulatory framework should therefore differentiate between large export-oriented installations and smaller producers, while preserving the integrity of the underlying emissions data. Over time, the resulting system could provide the evidentiary foundation for Saudi Arabia to demonstrate the carbon performance of its exports to foreign regulators and to negotiate recognition of domestic mitigation efforts.

6.2. Establishing a CBAM Readiness and Low-Carbon Export Program

The second recommendation is to move from general awareness of CBAM toward a dedicated national export-readiness program. The EU case demonstrates that climate-related market access increasingly depends not only on the environmental characteristics of products, but also on the ability of foreign producers to demonstrate those characteristics through recognized reporting and verification systems. For Saudi Arabia, this is particularly relevant to aluminum, steel, and fertilizers, which are directly exposed to the current CBAM framework. Saudi

Arabia should therefore establish a coordinated mechanism through which export-oriented firms receive technical guidance on embedded-emissions accounting, verification, documentation, and interaction with EU importers. This could include sector-specific methodologies, accredited verification providers, model reporting templates, and regulatory guidance for exporters. The objective would not be to subsidize compliance indefinitely, but to reduce the initial information and institutional costs associated with adapting to external carbon regulation.

A second component should involve the development of certification frameworks for low-carbon Saudi products. Where Saudi producers can demonstrate lower embedded emissions through renewable electricity, energy efficiency, CCS, hydrogen or other recognized mitigation technologies, standardized certification could help translate those investments into commercially meaningful evidence of lower-carbon production. This recommendation also follows from the US and South African cases. The US experience demonstrates the importance of linking industrial policy to emerging low-carbon supply chains, while South Africa illustrates the competitiveness risks faced by carbon-intensive exporters whose domestic regulatory systems do not provide a sufficiently credible basis for demonstrating mitigation efforts.

The principal legal constraint is that Saudi certification should be designed around objective, transparent, and internationally recognizable criteria. If certification becomes a condition for domestic market access or preferential treatment, its compatibility with WTO disciplines, particularly the TBT Agreement and non-discrimination principles, would require careful assessment.

6.3. Deploying Targeted and WTO-Compatible Green Industrial Policy

The third recommendation is to use Saudi Arabia's fiscal and investment capacity to accelerate low-carbon industrial transformation through targeted incentives. The US case demonstrates that large-scale fiscal support can mobilize private capital, accelerate clean-technology deployment, and restructure industrial supply chains. At the same time, the controversy surrounding domestic-content and localization conditions demonstrates that climate-oriented subsidies can generate significant trade tensions where eligibility depends on the use of domestic rather than imported inputs. Saudi Arabia should emphasize performance-based rather than nationality-based incentives. Support could be linked to measurable reductions in emissions intensity, renewable-energy generation, energy efficiency, carbon capture, hydrogen production, or other objectively verifiable environmental outcomes. This would allow the Kingdom to use industrial policy to support Vision 2030 while reducing the legal vulnerabilities associated with local-content requirements and export-contingent subsidies.

Implementation should occur through existing investment and industrial-policy structures, rather than through a single omnibus climate statute. Eligibility criteria should be published in advance, technologically neutral where feasible, and subject to periodic review against measurable environmental and economic outcomes. Incentives should also contain sunset or review provisions so that support does not become permanently embedded in sectors that no longer require assistance.

The principal legal constraint is the WTO SCM Agreement. The environmental objective of a subsidy does not itself determine its legality; rather, the design of the measure must be assessed against the applicable rules governing prohibited and actionable subsidies, specificity, adverse effects, and local-content or export-contingency conditions. This makes subsidy design, rather than subsidy volume alone, critical to the legal sustainability of Saudi green industrial policy.

6.4. Sequencing Domestic Carbon Regulation

The fourth recommendation concerns the gradual development of domestic carbon regulation. The comparative evidence does not support the immediate adoption of a comprehensive economy-wide carbon tax in Saudi Arabia. South Africa demonstrates both the potential of phased carbon pricing and the risk that extensive allowances may reduce the effective carbon-price signal. Its experience therefore supports sequencing, rather than immediate replication.

Saudi Arabia could initially introduce sector-specific emissions benchmarks and performance standards for major export-oriented installations. Once MRV systems are established and firms have developed the capacity to measure emissions reliably, these standards could be supplemented by gradually increasing carbon costs in sectors where alternatives to high-carbon production are commercially available. Such sequencing would serve two purposes. Domestically, it would reduce the risk of imposing abrupt costs on carbon-intensive industries and allow firms time to invest in cleaner technologies. Internationally, it would create a more credible basis for demonstrating that Saudi producers are subject to meaningful domestic climate regulation. The policy should therefore be viewed not primarily as a mechanism for raising fiscal revenue, but as part of a broader strategy for reducing emissions intensity and preserving export competitiveness.

The principal constraints are political economy and competitiveness. Carbon-intensive sectors remain economically important, and rapid increases in carbon costs could affect investment, production, and employment. The South African experience suggests that transitional relief may be necessary, but excessive exemptions can undermine effectiveness. Saudi Arabia should therefore adopt any allowances on a declining and transparent basis, linked to measurable decarbonization performance.

6.5. Investor–State Dispute Settlement

International policy institutions, including the United Nations Conference on Trade and Development (UNCTAD) and the Organization for Economic Co-operation and Development (OECD), play an influential role in shaping global investment governance frameworks, within which ISDS functions as a central component for balancing investor protection with the regulatory authority of states [44]. In the Saudi Arabian context, there is a wide range of bilateral agreements covering different sectors for trade and investment purposes. Based on UNCTAD data, there are 14 Treaties with Investment Provisions (TIPs) [170] and 28 BITs published, such as the BIT in 2025 signed with the Syrian Arab Republic and the BIT with Japan in 2013 [169].

A remaining challenge arises when governments adopt climate-protection laws that may be perceived as unfavorable by foreign investors, who may then initiate claims against the state through Investor–State Dispute Settlement mechanisms included in investment treaties [182]. Governments face a spectrum of policy choices regarding ISDS, ranging from retaining existing arbitration-based arrangements to fundamentally restructuring treaty-based dispute resolution mechanisms. One path is constraining the scope of ISDS by excluding climate-related regulations from arbitral review and requiring the exhaustion of local remedies before international arbitration can be initiated [183–185]. Such measures preserve investor protection while safeguarding regulatory space for climate policy. Alternatively, governments may pursue more structural changes by replacing traditional ISDS with alternative enforcement models, such as

standing investment courts or enhanced domestic dispute resolution mechanisms. In this context, Saudi Arabia's recent efforts to strengthen administrative and investment-related judicial frameworks signal a growing policy interest in anchoring investor–state disputes within domestic institutions, which could inform future treaty design and investment governance under Vision 2030 [186].

The objective of investment-treaty reform should therefore not be to reduce investment protection as such. Rather, Saudi Arabia should recalibrate investment protection so that it provides credible protection for climate-aligned investment while preserving regulatory autonomy. New and modernized agreements could expressly recognize renewable energy, green hydrogen, carbon-management technologies, and other low-carbon investments as protected investments, while clarifying that bona fide, non-discriminatory climate and environmental regulation does not ordinarily constitute indirect expropriation or a breach of fair and equitable treatment. Because existing treaty commitments cannot simply be displaced by domestic legislation, treaty modernization should be understood as a gradual process rather than an immediate exercise of unilateral regulatory discretion. Saudi Arabia should prioritize treaties approaching renewal or renegotiation and use new investment agreements to establish clearer climate-related protections. Where existing treaties remain in force, domestic climate regulation should be designed with their continuing obligations in mind, while the government should assess the legal and diplomatic consequences of proposed reforms before implementation.

Treaty reform also has a diplomatic dimension. Investment agreements form part of Saudi Arabia's broader economic relationships with trading and investment partners, and their renegotiation may affect perceptions of the Kingdom's commitment to investment protection and regulatory stability. Climate-related treaty reform should therefore be pursued through dialogue with treaty partners rather than presented solely as an exercise in domestic regulatory autonomy. This is particularly important where Saudi Arabia seeks to attract foreign investment into renewable energy, green hydrogen, carbon management, and other capital-intensive sectors that depend upon long-term investor confidence.

6.6. Institutionalizing Climate-Trade Coordination

The comparative cases demonstrate that climate-trade policy cannot be implemented effectively where responsibility is divided among institutions without mechanisms for systematic coordination. The EU's experience illustrates the benefits of centralized regulatory coordination; the US demonstrates the consequences of fragmented authority across federal and state levels; and South Africa illustrates the importance of coordinating carbon taxation, emissions budgets, and industrial transition measures.

Saudi Arabia should establish a permanent inter-agency climate-trade coordination mechanism involving the authorities responsible for energy, environment, trade, investment, industry, finance, and customs. Its mandate should include: (1) assessing proposed climate-related trade measures; (2) monitoring foreign measures such as CBAM; (3) coordinating Saudi responses to WTO and other international consultations; (4) assessing the climate implications of investment incentives and industrial policies; (5) overseeing the development of emissions-accounting standards; and (6) identifying sectors requiring targeted transition assistance. The mechanism should also conduct ex ante regulatory-impact assessments for major climate-related trade and investment measures. This would shift Saudi governance from responding to legal disputes after regulation has been adopted toward identifying WTO, investment, and competitiveness risks during policy design.

The principal institutional constraint is not necessarily the absence of government bodies capable of performing these functions, but the risk of overlapping mandates and fragmented information. The reform should therefore prioritize coordination, common data systems, and clearly allocated responsibility, rather than simply creating additional administrative structures.

6.7. Using GCC Coordination to Reduce Regulatory Fragmentation

The GCC should be used as an implementation platform for climate-trade coordination rather than simply as a forum for political consultation. Priority areas could include common or mutually recognized methodologies for carbon accounting, emissions verification, low-carbon hydrogen certification, carbon-credit standards, and environmental product declarations. Harmonization in these areas would reduce compliance costs for firms operating across GCC markets and strengthen the collective ability of GCC states to respond to external climate-related trade measures. Such cooperation would also reduce the risk of regulatory fragmentation within the Gulf. A common technical approach to emissions accounting could allow GCC producers to generate data that are more readily recognized by external markets while preserving the ability of individual states to adopt different substantive climate policies.

6.8. A Phased Implementation Roadmap

The comparative evidence suggests that sequencing is as important as substantive policy choice. Saudi Arabia should avoid attempting to introduce a comprehensive climate-trade regime simultaneously. The EU's highly institutionalized framework, the United States' politically volatile industrial-policy model, and South Africa's phased carbon-tax approach all demonstrate that regulatory effectiveness depends on the relationship between policy ambition and implementation capacity. As shown in Table 3, a staged approach would allow Saudi Arabia to build the administrative and technical infrastructure necessary for progressively more demanding climate regulation while limiting disruption to carbon-intensive sectors.

Table 3. Phased implementation roadmap for Saudi Arabia's climate-trade policy framework.

Phase	Priority	Principal Actions	Institutional Requirement
Phase I: 2026–2028	Measurement and preparedness	National MRV; CBAM-readiness; sector mapping; certification methodologies	Inter-agency coordination + technical capacity
Phase II: 2028–2030	Regulatory development	Sectoral benchmarks; low-carbon standards; targeted incentives; declining transitional support	Regulatory agencies + verification infrastructure
Phase III: 2030–2035	Carbon-cost internalization	Consider sectoral carbon pricing/ETS mechanisms; expand certification; strengthen GCC coordination	Mature MRV + market oversight
Phase IV: 2035 onward	International integration	Wider carbon pricing; mutual recognition; climate-trade agreements; rule-shaping	Strong domestic and international institutional capacity

6.9. The Interaction of the Hybrid Framework

The proposed hybrid framework should not be understood as the simple aggregation of EU, US, and South African policy instruments. Its distinctive feature is the interaction and sequencing of those instruments within Saudi Arabia's particular economic and institutional structure. The comparative analysis suggests a functional division among the three models: the EU provides the strongest template for emissions measurement, verification, carbon accounting, and preparation for carbon-related market-access requirements; the United States provides a model for using fiscal capacity and industrial policy to accelerate investment in low-carbon technologies and industries; and South Africa provides lessons concerning the sequencing of carbon regulation in a carbon-intensive developing economy and the risks associated with excessive exemptions.

These components would operate sequentially and cumulatively, rather than independently. A strengthened MRV system would first generate the information necessary to establish credible emissions benchmarks for Saudi industries. Those benchmarks could then be used both to demonstrate compliance with foreign market-access requirements and to determine eligibility for domestic low-carbon investment incentives. As firms acquire greater capacity to reduce emissions and as lower-carbon technologies become commercially viable, sector-specific performance standards could progressively be strengthened. Carbon-pricing mechanisms could subsequently be introduced or expanded where the necessary administrative capacity and technological alternatives exist. In this architecture, fiscal incentives would facilitate the transition, MRV would provide the measurement infrastructure, and progressively stronger regulatory requirements would create the longer-term incentive to reduce emissions.

The resulting framework would combine the EU's information and regulatory functions, the US emphasis on investment mobilization, and selected elements of South Africa's phased approach to carbon regulation. The objective is not to reproduce any of these systems institutionally. Rather, it is to assign different policy instruments complementary functions within a single Saudi framework.

This combination is particularly suited to Saudi Arabia because the Kingdom's economic structure differs materially from those of the three comparator jurisdictions. Its substantial hydrocarbon revenues and centralized investment capacity create greater scope for state-supported investment in renewable energy, hydrogen, carbon management, and low-carbon industrial production than is available in many developing economies. At the same time, the continued importance of hydrocarbons and energy-intensive industries makes an immediate economy-wide carbon price potentially disruptive. A framework that begins with measurement and investment, and only subsequently introduces stronger carbon-cost signals, is more consistent with Saudi Arabia's economic transition than either immediate economy-wide carbon pricing or reliance exclusively on subsidies, as explained in Table 4.

Table 4. Functional integration of the proposed hybrid climate-trade framework.

Component	Principal Comparative Source	Function in Saudi Arabia	Interaction with Other Components
MRV and carbon accounting	EU	Establish credible product-level emissions data	Provides basis for certification, incentives and future carbon pricing
Low-carbon certification	EU	Demonstrate carbon performance of Saudi exports	Converts MRV data into market-access value
Targeted green industrial incentives	US	Mobilize investment in renewables, hydrogen, CCS/CCUS and low-carbon industry	Uses MRV/performance data to target support
Sectoral emissions standards	EU/South Africa	Create progressively stronger regulatory incentives	Establishes benchmarks for incentives and eventual carbon pricing
Phased carbon pricing	South Africa, with lessons from EU	Gradually internalize carbon costs	Becomes more feasible once MRV and low-carbon alternatives are established
WTO-conscious subsidy design	US comparative lesson	Preserve policy space while reducing trade-law risks	Ensures industrial policy supports rather than conflicts with trade obligations
Investment-treaty reform	Comparative investment-law analysis	Protect regulatory space for climate measures	Reduces risk that domestic reforms generate investment disputes
Institutional coordination	All three cases	Coordinate trade, energy, industry, investment and climate policy	Integrates the individual instruments into a coherent system

The proposed hybrid is therefore functionally differentiated rather than institutionally imitative. Each component addresses a different regulatory problem, and the components are mutually reinforcing rather than substitutes.

7. Conclusions

This article does not merely recommend that Saudi Arabia adopt a hybrid model; it explains why a hybrid model follows from the comparative evidence and how that model could be implemented within Saudi Arabia's legal and institutional constraints.

This paper has argued that Saudi Arabia should adopt a hybrid, multi-level, and WTO-conscious climate-trade framework, rather than replicate any single foreign model. The analysis demonstrates that aligning trade, investment, and climate governance is no longer a peripheral policy consideration for the Kingdom; it is a structural requirement for the successful implementation of Vision 2030. Saudi Arabia's long-term economic diversification strategy depends increasingly on the development of competitive low-carbon sectors, including green hydrogen, ammonia, renewable-powered manufacturing, and advanced industrial technologies. Yet these sectors will emerge within international legal and institutional frameworks that were largely constructed before climate governance became a central organizing principle of the global economy. Unless those frameworks are adapted, they may constrain, rather than facilitate, the regulatory flexibility required for economic transformation.

A limitation of this study is that it focuses primarily on the legal and regulatory architecture of climate-related trade

measures, rather than their quantified economic effects. Future research could complement the present analysis through empirical examination of the impact of carbon pricing, border adjustment mechanisms, industrial subsidies, and carbon taxes on trade flows, foreign direct investment, export competitiveness, and sectoral decarbonization outcomes.

The paper identified four principal areas of legal tension within the evolving climate–trade landscape. First, the international investment regime, particularly through expansive interpretations of fair and equitable treatment and indirect expropriation in ISDS proceedings, may expose domestic climate measures to regulatory challenge. Second, external climate-related trade measures such as the EU's Carbon Border Adjustment Mechanism generate new compliance burdens and legal uncertainty for export-oriented sectors within carbon-intensive economies. Third, the WTO subsidy regime remains poorly adapted to the realities of the energy transition, as existing SCM disciplines do not clearly differentiate between environmentally harmful subsidies and strategically targeted green industrial support. Fourth, evolving climate-related product standards, certification schemes, and process-based regulatory requirements increasingly challenge traditional WTO concepts of "likeness" and non-discrimination. Collectively, these tensions demonstrate that climate governance is no longer confined to environmental policy alone but increasingly shapes the operation of international trade and investment law itself.

The comparative analysis of the European Union, the United States, and South Africa further demonstrates that climate governance is producing increasingly fragmented and asymmetrical regulatory landscapes. The EU has pursued a highly institutionalized supranational model centered on carbon pricing, emissions trading, and border adjustment measures that effectively externalize decarbonization pressures onto trading partners. The United States has instead relied on large-scale industrial subsidies and domestic manufacturing incentives designed to attract investment and restructure supply chains around national economic priorities. South Africa, by contrast, illustrates a more gradual and development-oriented transition model that seeks to balance climate commitments with energy security, fiscal limitations, and socio-economic adjustment. These models reflect fundamentally different distributions of regulatory capacity, fiscal resources, and institutional power within the global economy.

This asymmetry has important governance implications for hydrocarbon-exporting and developing economies such as Saudi Arabia. Emerging climate–trade rules are increasingly being shaped by major economic powers with greater institutional leverage and regulatory reach, while export-dependent economies face growing pressure to adapt to standards they played only a limited role in designing. In this context, climate governance risks reinforcing existing inequalities within the international economic order by shifting adjustment costs disproportionately onto carbon-intensive developing economies. The challenge for Saudi Arabia is, therefore, not simply one of compliance, but of maintaining sufficient policy space and regulatory autonomy within a rapidly evolving system of climate conditionality.

For this reason, the paper argued for a reform agenda centered on governance coordination, strategic policy design, and institutional adaptability. Legal reforms should focus on modernizing legacy bilateral investment treaties by clarifying the scope of fair and equitable treatment, narrowing indirect expropriation standards, and incorporating explicit climate-related carve-outs where appropriate. At the policy level, climate objectives must be integrated more systematically into industrial strategy, investment promotion, trade negotiations, and export planning, rather than treated as isolated environmental concerns. Institutional reforms should strengthen coordination among ministries responsible for trade, energy, industry, finance, investment, and environmental governance to reduce regulatory fragmentation and improve long-term policy coherence. Equally important is the development of domestic regulatory capacity capable of responding to increasingly technical climate-related trade requirements, including carbon accounting systems, certification mechanisms, and emissions reporting frameworks.

At the regional and multilateral levels, Saudi Arabia's role should evolve from reactive adaptation toward more active participation in shaping emerging climate–trade norms. Greater coordination within the GCC and deeper engagement in WTO and international climate negotiations may help preserve policy flexibility while ensuring that the interests of energy-exporting and developing economies are more effectively represented within global regulatory debates. This is particularly important, given that future trade competitiveness may increasingly depend not only on production costs and market access, but also on the ability to demonstrate regulatory credibility within low-carbon supply chains.

Moreover, Saudi Arabia should not view itself merely as a rule-taker responding to external initiatives such as CBAM. As a G20 member, major energy producer, significant investor in renewable energy, and leading voice among hydrocarbon-exporting economies, Saudi Arabia is positioned to play a rule-shaping role in the evolution of climate-related trade governance. This includes advocating greater compatibility between WTO disciplines and climate measures, promoting international recognition of carbon-management technologies such as carbon capture and storage, supporting transparent methodologies for embedded-carbon accounting, and encouraging climate-transition frameworks that accommodate differing development pathways.

The policy implications of the comparative analysis are therefore sequential, rather than merely additive. In the immediate term, Saudi Arabia should prioritize carbon accounting, MRV, CBAM preparedness, and low-carbon product certification. These measures require relatively limited disruption to existing industrial structures while creating the information and institutional infrastructure necessary for subsequent regulatory development. In the medium term, Saudi Arabia should strengthen sector-specific emissions standards and deploy targeted, WTO-compatible incentives to accelerate investment in renewable energy, hydrogen, carbon management, and low-carbon manufacturing. In parallel, the Kingdom should modernize its investment-treaty framework to preserve regulatory space for climate action and institutionalize inter-agency coordination across trade, investment, energy, industry, and environmental policy.

Only after these institutional foundations are established should Saudi Arabia consider progressively stronger domestic carbon-pricing mechanisms. The South African experience suggests that premature or heavily exempted carbon pricing may generate a formal regulatory framework without an equivalent effective price signal, while the EU experience demonstrates the increasing importance of credible domestic carbon regulation for exporters subject to external border measures. The appropriate Saudi approach is therefore one of sequenced carbon-cost internalization, calibrated to sectoral competitiveness and technological alternatives. Moreover, Saudi Arabia should use the GCC and multilateral trade institutions not simply to respond to external climate measures but to shape emerging rules concerning carbon accounting, product certification, carbon-management technologies, and climate-related subsidies. This would transform the policy response from defensive compliance into strategic participation in the development of the emerging climate-trade regime.

Ultimately, the paper demonstrates that the decarbonization of trade is simultaneously a legal, economic, and governance transformation. The central issue is no longer whether climate considerations will reshape international economic law, but how states with differing levels of economic power and institutional capacity will navigate that transition. For Saudi Arabia, the path forward lies neither in resisting climate governance nor in uncritically adopting external regulatory models. Rather, it requires the construction of an adaptive and strategically coherent framework capable of reconciling economic diversification, regulatory autonomy, and international competitiveness within an increasingly asymmetrical global climate–trade order. Without such reforms, Vision 2030 risks becoming constrained by inherited legal commitments and externally driven regulatory standards. With them, however, Saudi Arabia may be able to reposition itself not merely as a participant in the low-carbon transition, but as an active architect of its regional and international governance structures.

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