

# A Strategic Approach for Gulf Cooperation Council Countries Toward International Carbon Markets Under Article 6

Axel Michaelowa<sup>a,b</sup> and Mari Luomi<sup>c</sup>

<sup>a</sup> University of Zurich, Switzerland

<sup>b</sup> Perspectives Climate Research, Freiburg, Germany

<sup>c</sup> King Abdullah Petroleum Studies and Research Center, Riyadh, Saudi Arabia

May 2026 | DOI: 10.30573/KS--2026-DP19



# About KAPSARC

KAPSARC is an advisory think tank within global energy economics and sustainability providing advisory services to entities and authorities in the Saudi energy sector to advance Saudi Arabia's energy sector and inform global policies through evidence-based advice and applied research.

This publication is also available in Arabic.



# Legal Notice

© Copyright 2026 King Abdullah Petroleum Studies and Research Center ("KAPSARC"). This Document (and any information, data or materials contained therein) (the "Document") shall not be used without the proper attribution to KAPSARC. The Document shall not be reproduced, in whole or in part, without the written permission of KAPSARC. KAPSARC makes no warranty, representation or undertaking whether expressed or implied, nor does it assume any legal liability, whether direct or indirect, or responsibility for the accuracy, completeness, or usefulness of any information that is contained in the Document. Nothing in the Document constitutes or shall be implied to constitute advice, recommendation or opinion. The views and opinions expressed in this publication are those of the authors and do not necessarily reflect the official views or position of KAPSARC.

# Key Points

- Article 6 carbon markets can enhance cost-effective mitigation and support GCC net-zero strategies.
- Strategic Article 6 participation can align climate goals with economic diversification objectives.
- GCC countries may hold comparative advantages in high-value carbon removal technologies and carbon market services.
- International credits are critical to manage high-cost residual emissions in GCC economies.
- GCC engagement could evolve from mixed strategies toward net ITMO purchasing over time.

# Executive Summary

International carbon markets have the potential to enable effective greenhouse gas mitigation both globally and efficiently. If designed rigorously and implemented effectively, they can play an important role in supporting global net-zero transitions as they provide a means to channel resources to mitigation in places where such resources are absent. Article 6 of the Paris Agreement provides a regulatory framework that sets a standard for high-quality emission credits and thus enables cost-effective mitigation across national boundaries.

This paper constitutes the first analysis of the potential role of the generation and trade of internationally transferred mitigation outcomes (ITMOs) and related benefits for domestic climate policy strategies of the Gulf Cooperation Council (GCC) countries in the context of emerging domestic carbon pricing systems and net-zero strategies.

While domestic mitigation remains the foundation of the implementation of nationally determined contributions (NDCs), Article 6 cooperation can complement it by providing a cost-effective means to manage residual emissions, supporting mitigation in the region's hard-to-abate sectors and enabling higher ambition as marginal abatement costs rise.

Looking at different time horizons (2026, 2035, and 2050), this paper explores the rationale for GCC countries to engage in Article 6 markets as part of their net-zero strategies, answering the following questions:

- Which drivers could underpin GCC countries' Article 6 engagement going forward?
- What are the main types of approaches for GCC countries to engage with Article 6 markets?
- How might GCC countries combine these approaches over time in support of cost-effective net-zero pathways?
- What are the broad contours of this overall strategic approach with regards to credit types, partner countries, and international removal credit requirements in the long term?

As of 2025, all GCC countries have either been actively engaging with, or are exploring the use of, Article 6 to support their NDCs under the Paris Agreement, and five GCC countries have taken up net-zero emission targets.

In the short term, an external motivator for many emerging economies to generate ITMOs could be to try to get ITMOs accepted against the European border carbon adjustment mechanism. In the long term, given the projected high costs to abate residual emissions, access to international emission credits will be an important part of cost-effective net-zero strategies in the GCC. Some niches also exist where GCC countries could seek to sell high-value credits to targeted international trade partners or use them to reduce compliance costs in border carbon adjustment regimes. Furthermore, Article 6 engagement could be an important component of strengthening the environmental and financial service sector, which is a shared aim of all GCC countries in the context of diversifying their economies.

In terms of possible strategic approaches, in the Paris Agreement era, any government can use Article 6 to buy ITMOs to help meet their NDC achievement if it thinks that domestic mitigation is either too costly or too politically difficult. Alternatively, governments can pursue an ITMO sales strategy if their aim is to generate revenues for mitigation. A mixed strategy of both buying and selling is also possible if a government wants to optimize its mitigation approach by buying ITMOs – for example, from forestry activities – at prices that are lower than the costs for domestic mitigation. At the same time, it can generate net revenues for the state by selling

ITMOs – for example, from technical removals – where prices exceed domestic mitigation costs, with the help of carbon market service providers.

GCC countries' strategic approaches to Article 6 are likely to develop at different speeds and in different directions. In the short term, a mixed strategy looks attractive, particularly for the trade- and service-oriented GCC members. As GCC countries

move toward their respective net-zero target years, they would shift toward a buyer strategy. In this context, the harnessing of the last remaining sources of relatively low-cost ITMOs from emission reductions, including through international collaboration, will be critical. In a scenario in which the GCC region opts for offsetting its domestic residual emissions fully with ITMOs, an initial quantitative estimate places this need at 470 million tCO<sub>2</sub>e per year in 2050.

**Keywords:** Carbon Markets, Carbon Credits, Article 6, Internationally Transferred Mitigation Outcomes (ITMOs), Net-Zero Emissions, Gulf Cooperation Council



Global warming is proceeding apace. In 2024, the global temperature increase exceeded 1.5°C for the first time compared to pre-industrial levels. At the same time, global greenhouse gas (GHG) emissions continue to increase, showing the challenge of mitigating GHG emissions at the global level. Therefore, in order to achieve the ambitious goal of the Paris Agreement to limit global temperature increase to “well below” 2°C, it is imperative to design and implement climate policy instruments that enable global mitigation in an efficient manner.

International carbon markets have the promise to become such an instrument. If designed rigorously and implemented effectively, they can play an important role in supporting global net-zero transitions as they provide a means to channel resources to mitigation in places where such resources are absent. Article 6 of the Paris Agreement provides a regulatory framework that sets a standard for high-quality emission credits, and thus enables cost-effective mitigation across national boundaries.

## 1.1 The Checkered History of International Carbon Markets and their Resurrection

International markets for GHG emission credits have been active for over two decades under the UN Framework Convention on Climate Change (UNFCCC) (see Michaelowa, Shishlov, and Brescia 2019 for a comprehensive history). These markets need to be differentiated from emissions trading systems where

emissions allowances are issued for entities subject to an emission cap. Emission credits, in contrast, are generated by distinct mitigation projects or programs and calculated against a baseline (i.e., a counterfactual situation that would exist in the absence of the activity). Indirect emissions, so-called leakage, need to be deducted from the difference between baseline and activity emissions in order to calculate the volume of emission credits.

The Clean Development Mechanism (CDM) of the Kyoto Protocol from 2005 onwards led to the implementation of several thousand projects in more than 100 developing countries, and has generated over 2 billion emission credits to date. At a smaller scale, Joint Implementation (JI) enabled crediting for projects in countries with emission targets under the Kyoto Protocol.

The CDM initially was hugely successful and showed that substantial mitigation can be achieved in a short time through private sector action. However, it eventually failed due to the lack of trust fueled by shortcomings regarding the additionality – that is, proof that the activity is only happening due to the

revenue generated by the emissions credits (Michaelowa, Shishlov, and Brescia 2019) – as well as doubts about the sustainable development benefits of projects and the stringency of crediting baselines. Betz et al. (2022) further highlight conflicts of interest between project developers, verifiers, and emission credit buyers that need to be addressed by stringent regulation.

Further challenges encountered by the CDM included political economy concerns in major buyer countries (particularly in the EU) around funding mitigation in other countries and how the availability of low-cost offsetting options would weaken the incentives for major emitters to invest in higher-cost mitigation technologies at home.

Under the Paris Agreement, countries sought to improve international carbon markets by reflecting on these lessons. Articles 6.2 and 6.4 of the Paris Agreement define two forms of international carbon markets whose purpose is to help countries increase the ambition of their nationally determined contributions (NDCs) as well as to reduce mitigation costs (see Michaelowa et al. 2022 for a detailed explanation of the Article 6 rules).

Cooperative approaches under Article 6.2 are based on a set of guiding principles and rules that allow countries to generate emissions credits through a formal government authorization called Internationally Transferred Mitigation Outcomes (ITMOs). ITMOs can be used against the mitigation targets in countries' NDCs for the international aviation offsetting scheme CORSIA (Carbon Offsetting and Reduction Scheme for International Aviation) or for voluntary offsetting by private or public entities.

Countries participating in an Article 6.2 cooperation can decide freely how to calculate the volume of ITMOs, provided that they fulfil the reporting requirements specified at the 29<sup>th</sup> session of the UNFCCC Conference of the Parties (COP29) in Baku in November 2024 (UNFCCC 2024).<sup>1</sup> In contrast to the situation

under the CDM, ITMOs issued by a country need to be taken into account in the emissions balance of that country having issued the credits through a so-called “corresponding adjustment” (see Müller and Michaelowa 2019 and UNFCCC 2025c for an explanation). This prevents double-counting or claiming of ITMOs.

Since 2020, approximately 90 bilateral Article 6.2 cooperation agreements have been signed, led by Switzerland, Singapore, Japan and Sweden. Reported prices for forward ITMO transactions reach US\$30-\$40 per ITMO (Klik Foundation 2024, 2025; UNEP-CCC 2025). However, the volume of ITMOs actually issued remains minuscule to date.

The Paris Agreement Crediting Mechanism (PACM) under Article 6.4 requires credited activities to fulfil internationally defined rules finalized at COP29. It builds directly on the experiences with the CDM. Activities need to be registered, and credit issuance approved by the UNFCCC-governed Supervisory Body (SBM). At the time of writing, the SBM had approved standards on additionality determination, baseline setting, and calculation of leakage that are much stricter than any approaches used previously in international carbon markets.

Emission credits generated under Article 6.4 (emission reductions, known as A6.4ERs) can be either authorized as ITMOs, triggering a corresponding adjustment, or be used for domestic mitigation in the form of Mitigation Contribution Units (MCUs). Under certain conditions and time limits, CDM projects can be transitioned into Article 6.4, with the first A6.4ERs from such projects having been issued in 2025.

In parallel to the above-described mechanisms that are regulated and overseen by governments, there has also been a thriving international trade in emission credits from the voluntary carbon market (VCM). As its name implies, VCM credits are generally used for voluntary corporate claims. The market is not regulated by governments and is operated

<sup>1</sup> The reporting requirements include specification of the following elements, inter alia (UNFCCC 2025c): How is it ensured that there is no net increase in global emissions within and between NDC implementation periods? How are robust, transparent governance and the quality of mitigation outcomes ensured, including through conservative reference levels and baselines set in a conservative way and below “business-as-usual” emission projections (including taking into account all existing policies and addressing uncertainties in quantification and potential leakage). How has the risk of non-permanence of mitigation across several NDC periods been minimized? How, when reversals of emission reductions or removals occur, will the cooperative approach ensure that these are addressed in full? How is it ensured that the cooperative approach avoids locking in emission levels, technologies, or practices that are inconsistent with achieving the long-term goals of the Paris Agreement? How are mitigation outcomes shared between the participating Parties? How is it ensured that decision-making processes and relevant activities are transparent and inclusive, and whether they include opportunities for public participation and scrutiny? How does participation in the cooperative approach and the combination of all cooperative approaches contribute to the implementation of the Party’s NDC and long-term low-emission development strategies (LT-LEDS)? How are baseline and reference levels established to ensure that they are conservative and below “business-as-usual” emission projections, and which assumptions have been made? What methodological approaches have been used for quantifying the mitigation outcomes derived from the cooperative approach? How have baseline or reference levels been established, including how NDCs and LT-LEDS have been taken into account, as well as any relevant climate policies, laws, regulations, or targets? How are uncertainties in the quantification of emission reductions and removals assessed, and how have such uncertainties been taken into account? How is the risk of leakage assessed, and prevented or minimized, and how will any remaining leakage be quantified and deducted in the quantification of mitigation outcomes? How are reversals monitored and quantified, and how are they addressed in full when they occur, including which methodological approaches are used to address reversals, how the responsibility for addressing reversals is assigned, the duration and frequency of monitoring for reversals, and the measures envisaged in case of failures in monitoring?

privately. Private entities define baseline and monitoring methodologies, register activities, issue emissions credits, run registries for the credits issued, and accredit eligible third-party auditors.

The VCM developed and thrived in the late 2010s, when the CDM and JI – government-managed – markets were languishing for the reasons described above. Many private programs registering activities and issuing credits emerged in this period. In terms of credit volumes issued, the U.S.-based Verra and the Switzerland-based Gold Standard have dominated the market, but a plethora of smaller programs exists, particularly in the field of carbon dioxide removal (CDR).<sup>2</sup>

These privately managed crediting programs finance themselves through fees on issued credits, which generates a perverse incentive to over-credit. Since 2022, credit prices and traded volumes have collapsed due to a series of highly mediatized scandals related to lack of additionality of projects as well as over-crediting (see, for example, Greenfield 2023, 2024; Yi 2024). As of April 2025, there were close to 1 billion unretired VCM credits, two-thirds of which were from pre-2022 vintages (World Bank 2025).

Attempts to self-regulate the market through initiatives like the Integrity Council for the Voluntary Carbon Market (ICVCM) have so far not led to a rebuilding of trust. In order to survive, a number of programs have started lobbying developing country governments for their credits to be issued as ITMOs under Article 6.2 (see Verra 2024 for a clear statement of this strategy).

The Paris Agreement era of carbon markets is set to be a non-centralized one. In principle, there are multiple possible sources of both ITMOs and domestic MCUs: the PACM, private crediting programs (i.e., the VCM), and domestic government-led crediting standards, alongside the more theoretical non-GHG-metric-based credits.<sup>3</sup>

Yet, Article 6 will remain central for the integrity of international carbon market cooperation. Article 6.2 sets the quality parameters for ITMOs, while the PACM under Article 6.4 is expected to emerge as the benchmark for high-integrity

crediting methodologies for different types of reduction and removal projects. At the same time, governments will continue to have a decisive role in laying the ground for international carbon markets to support their NDCs and net-zero trajectories in the most effective way.

## 1.2 The Strategic Importance of International Carbon Markets for Gulf Cooperation Council Countries

This paper explores the rationale for Gulf Cooperation Council (GCC) countries to engage in international carbon markets as part of their net-zero strategies. Specifically, it addresses the following questions:

- Which drivers could underpin GCC countries' Article 6 engagement going forward?
- What main types of approaches are there for GCC countries to engage with Article 6 markets? Approaches may include (i) buying high-quality, lower-cost ITMOs to prevent the need for mobilizing high-cost domestic mitigation to achieve NDCs, particularly for managing residual emissions and containing costs as marginal abatement costs rise over time; (ii) selling higher-cost ITMOs from activity types where the GCC may have a comparative advantage and where international willingness to pay exists, such as durable carbon removals; or (iii) a mixed strategy where the selling of higher-priced ITMOs and the acquisition of lower-priced ITMOs are combined with market service development.
- How might GCC countries combine these approaches over time in support of cost-effective net-zero pathways?
- What are the broad contours of this overall strategic approach with regards to credit types, partner countries, and international removal credit requirements in the long term?

<sup>2</sup> Such removal standards include Absolute Carbon Standard, Global Biochar C-Sink Standard, Isometric, Moorfutures, Nori, ONCRA, Puro.earth, Rainbow, and TERO Carbon, inter alia. Some of them are large organizations, while others are "garage companies." See Tracecdr (2025) for a list, which is, however, not complete, and which does not consistently differentiate between standards and generic initiatives.

<sup>3</sup> Non-GHG metrics have long been supported by the Arab Group in the UNFCCC negotiations, and they were formally recognized at COP24 in Katowice 2018 (UNFCCC 2018). Under Article 6, ITMOs denominated in non-GHG metrics are accounted against a balance of the respective NDC target indicator. For example, for renewable energy capacity, the balance would show the amount of installed renewable energy capacity in the country for each year (Michaelowa et al. 2022, p. 25f).

Literature on this topic is scarce. Brief contextual accounts by Luomi (2022), Al-Sarihi (2024), and Shafi (2025) provide an overview of the current status of domestic and international carbon markets in the Gulf, but they do not analyze engagement options in detail. This paper constitutes the first analysis on the topic to assess the potential role of the generation and trade of ITMOs and related benefits for domestic climate policy strategies, including emerging domestic carbon pricing system and markets looking at short-, medium-, and long-term time horizons.

The NDCs submitted by the GCC countries by the time of writing (November 2025) indicated that they were either actively engaging with Article 6 (Oman's NDC from 2023) or considered it as either playing a role (Saudi Arabia's NDC from 2021) or a possible role (Bahrain's and Kuwait's updated NDCs from 2021, the United Arab Emirates's (UAE's) NDC from 2024, and Qatar's NDC from 2025) in supporting their NDC achievement (UNFCCC 2025b).

In the short term, an external motivator for many emerging economies to develop domestic carbon markets, and, in this context, to engage in ITMO transfers, could be the EU's carbon border adjustment mechanism (CBAM). This is especially relevant if the EU or UK accept ITMOs toward compliance under their respective CBAMs, which are envisaged to charge a levy on imported products. In the long term, international carbon markets become even more important for the GCC countries as the world moves toward net-zero emissions. As of early 2026, all GCC countries except Qatar have announced net-zero emissions

targets for years ranging from 2050 to 2060. Given the high GHG emissions intensity of the region's key economic sectors and the projected high costs to abate residual emissions in view of the lack of low-cost domestic CDR options through nature-based solutions (NBS), access to international emission credits will be an important part of cost-effective GCC country strategies to reach net zero. Some niches also exist where GCC countries could seek to sell high-value credits to targeted international trade partners or use them toward compliance costs in border carbon adjustment regimes.

Furthermore, all GCC countries have a strong focus on diversifying their economies, and the service sector is an important target in this regard. Singapore has developed a comprehensive strategy to develop as a carbon market service hub (South Pole 2021). This could be emulated by the key trading economies in the region, such as the UAE, Bahrain, or even Saudi Arabia.

The remainder of the paper is structured as follows: Section 2 describes GCC countries' experiences with international carbon markets and identifies drivers for future action. Section 3 defines the three types of high-level approaches for engaging in the Article 6 cooperation outlined above in more detail. Section 4 sets these on a timeline and provides initial assessments on the cost savings that could be achieved to reach GCC NDCs and net-zero targets, and the revenue potential achievable through the sale of ITMOs and MCUs and related services. Section 5 concludes and summarizes why Article 6 is a relevant international climate policy instrument for the GCC.

# The Experiences of GCC Countries With Carbon Markets to Date

# 02

This section provides an overview of the GCC countries' past engagements with international carbon markets. It also unpacks the various international and domestic drivers that have emerged more recently that could underpin a strategic engagement by the GCC countries in international carbon markets under Article 6 going forward.

## 2.1 Overview of the GCC's CDM and VCM Participation

In the pre-Paris era, GCC involvement in international carbon markets was relatively limited (Luomi, Bosse, and Sergeeva 2025). With regard to the CDM, GCC countries were initially slow to grasp the opportunity. MEED (2007) provides an early discussion stressing these opportunities, which then did not really materialize. Michaelowa et al. (2014) assessed the GCC's engagement during the boom period of the CDM in 2005-2011: from 2008 onwards, the UAE became a frontrunner in CDM action in the entire region. The first UAE-based project developers played a role in building government capacity, including the establishment of a designated national authority (DNA) to approve UAE-based projects. Masdar, a company pushing renewable energy and low-carbon technologies, built the largest CDM portfolio in the UAE, involving both its own projects and other companies (Luomi 2018). Masdar underwrote the first approved CDM baseline methodology for energy efficiency in the buildings sector,<sup>4</sup> and even began developing a project pipeline in Central Asia.

In Saudi Arabia, a DNA was set up from 2009 onwards, and a strong CDM capacity-building program for public and private entities was spearheaded by the Ministry of Petroleum in 2010-2013. The Saudi Ministry of Water and Electricity prepared a nationwide program of activities for wind power (CDM 2025a). The Saudi private company Xenel-Balderrie developed a large scale CDM project in Pakistan for municipal solid waste composting (CDM 2025b; MEED 2008).

However, the built capacity did not translate into a sizeable project portfolio as the crash of the CDM market started exactly at the time in late-2012. Emission credit prices fell from over US\$10 to less than US\$0.3 in 2013, when the capacity of Saudi entities was sufficiently advanced to engage in activities (Michaelowa et al. 2014).

In the VCM context, participation has also been extremely limited, as there are only a few Verra and no Gold Standard or Global Carbon Council projects in the entire GCC (see Table 1). The latter is particularly striking given that the Global Carbon Council was set up in Qatar in 2016 with the explicit aim to serve as VCM program for the region, and it continues to place "special emphasis on low-carbon development in the MENA region, which has largely remained underrepresented in carbon markets" (Global Carbon Council 2025).

**Table 1. Participation of GCC Countries in International Carbon Markets as of November 2025.**

Country	Registered CDM projects / PoAs*	Volume of issued CERs (million)	Registered VCM projects	Volume of issued VERs (million)
Bahrain	0/0	0	1	0
Kuwait	2/0	0.16	0	0
Oman	3/2	1.26	2	1.48
Qatar	1/0	14.47	0	0
Saudi Arabia	6/2	0.22	0	0
United Arab Emirates	16/1	0.59	3	0.06
<b>Total</b>	<b>28/3</b>	<b>16.7</b>	<b>6</b>	<b>1.54</b>

Data source: UNFCCC (2025a); Verra (2025).

Note: PoA (program of activities) is a coordinated implementation of mitigation activities, usually at a smaller scale.

Luomi, Bosse, and Sergeeva (2025) provide an ex post evaluation of why CDM failed to take off at a larger scale in the GCC, based on stakeholder interviews. As stressed by the authors, driven by the CDM price crash of the early 2010s, most actors in the GCC saw the revenues from international carbon markets as insufficiently interesting to engage. Governments did not see value in participating in this context, which also led to a deprioritization of international crediting markets in the business agendas of major Gulf corporates. Moreover, before 2021, net-zero targets were uncommon and climate

action in general was perceived as a lower priority than at present. Furthermore, in the pre-Paris era, GCC countries perceived their role primarily as hosts of carbon crediting projects, rather than as buyers.

This is also reflected in the low levels and *ad hoc* nature of CDM and VCM credit purchases by GCC corporates pre-2020 (Luomi, Bosse, and Sergeeva 2025). Major changes in this regard have been taking place since 2021, as will be discussed in the following subsections.

### Box 1. The Al Shaheen Gas Flaring Reduction Project: A Success Case of International Carbon Market Engagement in the GCC

The Al Shaheen gas flaring reduction project in Qatar was registered under the CDM in May 2007 and generated 14.5 million emission credits between 2007 and the end of 2018 via five issuances. Al Shaheen oilfield had been flaring 97% of its associated gas since it started operations in 1994, and the CDM project reduced flaring by 90%. At the time of registration, Energy Intelligence (2007) stressed that “the event was allowed to pass virtually unnoticed by the Qataris and generated no comment from their oil exporting neighbors”. Much later, at a workshop in 2012 in the run-up to COP18, which was hosted in Doha, the government highlighted the importance of the CDM as a vital project that supports the pillars of the country’s development vision and strategy (Gulf Times 2012). However, the NGO Carbon Market Watch (2012, p. 6) publicly questioned the additionality of the project, arguing that no robust proof of prior consideration of CDM revenues had been provided by Qatar Petroleum when submitting the request for registration. Regardless of the different views on the project, it remains by far the largest international carbon market project in the GCC and was highly successful regarding credit issuance. Nevertheless, it remained a “singleton,” and did not lead to a dedicated CDM strategy in Qatar.

## 2.2 International Drivers of GCC Participation

Diplomatic efforts in the run-up to COP26 in Glasgow, spearheaded by the United Kingdom and the United States,<sup>5</sup> led to a large number of net-zero target declarations from countries worldwide, including by most of the GCC countries (Luomi 2021). After a flurry of high-level engagements, including participation by Saudi and UAE leaderships in President Joe Biden's Leaders Summit in April 2021, the two countries announced net-zero targets for 2060 and 2050, respectively, in October of 2021. Oman followed with a 2050 target year and Kuwait with 2060. Bahrain declared its 2060 target during COP26. Qatar has not declared a net-zero target to date.

COP28, hosted by the UAE in 2023, was a catalytic event for climate ambition in the UAE. It also prompted the emergence of an understanding that for effective mitigation, access to Article 6 credits will be important, as well as the realization that the carbon market industry can be an integral element of a service-oriented economic diversification strategy.

Besides the emergence of one of the largest global private sector Article 6 project developers (see Box 2), COP28 triggered the setup of the UAE Independent Climate Change Accelerators (UICCA) group of private companies, which include the Mubadala sovereign wealth fund, the clean energy company

Masdar, and the UAE's largest lender, First Abu Dhabi Bank. Abu Dhabi's financial center, the Abu Dhabi Global Market, also embarked on the development of a carbon-market trading platform with Singapore-based AirCarbon Exchange (ACX) (The National 2023).

The UAE approach, which culminated in the UAE's sponsoring of the Africa Climate Summit in Nairobi, Kenya, in September 2023 bears the trademark of Singapore's carbon market services hub strategy. At the summit, UICCA indicated its intention to buy US\$450 million worth of emission credits generated in Africa by 2030, but did not specify whether these would be ITMOs or voluntary credits (Emirati News Agency 2023).

The UAE also signed an MoU with Paraguay regarding ITMO acquisition during COP28, but information is only available in specialized news portals (Quantum Commodity Intelligence 2023) and was not shared proactively with a broader set of stakeholders.

However, the UAE's strong push to engage in international carbon markets appears to have lost some momentum after COP28. In a sign of a loss of investor confidence in this specific pocket of carbon markets, reflecting the broader state of the VCM that the Abu Dhabi carbon credit exchange was primarily geared toward, and in the absence of compliance-based demand from the region, the Abu Dhabi Global Market closed its carbon credit exchange in October 2024 (ACX 2024).

### Box 2. Dubai's Blue Carbon – Securing Large Shares of Forestland for Carbon Credits.

The Dubai-run carbon market project developer Blue Carbon was set up in October 2022. In the run-up to COP28, the company scouted intensively for huge forestry projects, mostly in large lower-income African countries. At the time of writing, it has signed memoranda of understanding (MoUs) with 13 countries and sub-national entities, including the Bahamas, Comoros, Dominica, Kenya, Liberia, St. Lucia, Tanzania, Zambia, and Zimbabwe (Kiernan 2023; Padin-Dujon 2023). Reportedly, the area of forestland covered by the MoUs reaches over 15 million ha, including approximately 20% of the area of Zimbabwe, 10% of Liberia and Zambia, and 8% of Tanzania (Greenfield and Tondo 2023). According to reports, Blue Carbon will have the exclusive rights to sell carbon credits from the forests included in its 30-year deal with Liberia and will get 70% of the sale price of carbon credits, with 30% allocated for Liberia. Blue Carbon has partnered with Singapore's ACX to sell its credits on that exchange. In early 2024, Blue Carbon issued a call for support in monitoring its projects (Padin-Dujon 2024) and offered investments in the generation of Art 6.2 ITMOs from projects in Zimbabwe, but since then, no new announcements have been made. Pandey et al. (2025) have discussed growing indications that "Blue Carbon" has ceased operations and that none of the forestland deals has been followed up.

<sup>5</sup> COP26, held in Glasgow in November 2021, was a critical moment in international climate policy. After a failed COP25 in Madrid 2019 and a one-year hiatus due to the COVID-19 pandemic, UK prime minister Boris Johnson was determined to make his home COP a success. His government thus engaged in a painstaking multi-year diplomatic exercise, with over 50 climate change specialists attached to British embassies around the world in order to push an "ambition agenda" for climate change mitigation. In parallel, the Biden administration in the U.S., together with climate envoy John Kerry, also engaged in active diplomacy worldwide, in support of net-zero emission targets and higher climate ambition.

Yet, the UAE's bold foray into the international carbon market triggered peer interest among some fellow GCC states. For example, Kuwait signed an MoU for ITMO transactions with Rwanda at COP28 (Rwanda Ministry of Environment 2023).

Besides international climate diplomacy under the UNFCCC, developments in the intersection of global trade and climate change mitigation have been driving interest in carbon markets across the developing world. The EU CBAM, first announced in 2019 and formalized in the European Commission's "Fit for 55" legislative package, which is expected to become fully operational from January 2026 with a staggered phase-in of pricing rising slowly from 2.5% in 2026 to 10% in 2028 and then more rapidly to reach 100% in 2034 (EPRS 2023). This has attracted criticism from the EU's major trade partners and also accelerated discussions on domestic carbon pricing schemes, including potential CBAMs, worldwide.

The EU CBAM levy will be calculated as the GHG content of imports multiplied by the price of EU emissions allowances. The EU has consistently stated that a carbon price paid in exporting countries would lead to a deduction of the carbon price from the CBAM certificate fee to be paid by the importer – for example, if the CBAM fee is US\$80 and the carbon price in the exporting country is US\$20, the CBAM fee would only amount to US\$60.

Domestic carbon pricing schemes could therefore, in principle, help make countries' export products more competitive in CBAM jurisdictions while allowing revenues to be retained domestically. A number of the EU's key trade partners are developing emissions trading systems (ETS), including India, Turkey, Brazil, and various Southeast Asian countries, even if the allowance prices of these systems are unlikely to initially match those of the EU.

Given countries' exposure to both CBAM and non-CBAM jurisdictions, theoretically at least, the logical next step after establishing a carbon compliance scheme would be the establishment of a CBAM. A number of industrialized countries are already exploring such mechanisms.<sup>6</sup> While the EU CBAM exposure of many GCC industries is currently relatively low, the prospect of possible future CBAMs being set up in the GCC's other major trade partner countries has raised the attractiveness of carbon pricing instruments as not only a climate change mitigation tool but also one of future trade competitiveness.

In the GCC, the UAE, which has a highly EU CBAM-exposed aluminum sector, has been studying the feasibility of an ETS (Rahman and Benny 2023; Benny 2024). Bahrain, which hosts the large aluminum producer Aluminium Bahrain (Alba), with a high percentage of exports to Europe, is highly exposed to the current form of CBAM.

Globally, major exporters to the EU have begun discussing how to reduce the CBAM burden through alternative routes. Article 6 markets come in here as an option: if submission of an ITMO would avoid paying the CBAM fee for 1 tonne of CO<sub>2</sub>e, the exporting countries could save money by generating ITMOs at costs lower than the CBAM fee or by reselling ITMOs that they have bought from other countries.

While the EU to date has been skeptical regarding the direct use of emission credits against the CBAM, in 2025, European Commission officials began discussing how Article 6 could be considered in the context of CBAM. It remains unclear at the time of writing whether the EU would just consider the monetary value of an ITMO or accept it "in kind" – namely, on a tonne-for-tonne basis. Also, it would be likely that minimum quality standards would apply for ITMOs, as envisaged in the EU Commission's (2025) proposal on the use of ITMOs toward the EU's 2040 emissions target.

A further international driver for engagement with the international carbon markets in the near term is the strong concentration of large airlines in GCC countries. Saudia, Emirates, Etihad, and Qatar Airways, among others, are subject to the CORSIA offset scheme, and they will need access to CORSIA-compliant credits from 2027 onwards at the latest (see para 94e in Resolution A41-22 – ICAO Assembly 2022). Such credits need a corresponding adjustment and will thus be ITMOs.

## 2.3 Domestic Drivers of GCC Participation

The prioritization of carbon markets within national policy agendas and by high-level leadership have constituted critical drivers for domestic developments in this field. Another characteristic has been the use of important events held in the broader region as platforms to announce and promote carbon

market-related activities. These patterns were already visible in the CDM period, and, in the cases of Saudi Arabia and the UAE, there are also important continuities in leadership that explain why these two countries are seeing the most active developments at present.

In Saudi Arabia, both the VCM and domestic crediting have attracted the attention of domestic institutions. In September 2021, the Public Investment Fund (PIF) and the Saudi Tadawul Group (the parent company of the Saudi exchange) launched a VCM initiative, which in 2022 was formally established as the Regional Voluntary Carbon Market Company (RVCMC). The company held its first auction of VCM credits in October 2022, and by end of 2024, it had orchestrated the trade of more than 6.1 million credits among PIF-affiliated and other primarily Saudi-headquartered companies (VCM Company 2025). Most of the credits were renewable and clean-energy based Verra credits, originating from various developing regions, including some from the Middle East and North Africa (MENA) region (Zakkour, Gasim, and Luomi 2025).

While not primarily geared at incentivizing project development in Saudi Arabia or the GCC region, the RVCMC has developed interesting concepts and tools of relevance for the region, such as a Fatwa supporting carbon credits as an underlying commodity for Islamic finance, and the development of a digital trading platform.

In 2022, Saudi Arabia's Ministry of Energy announced the region's first domestic carbon crediting mechanism, the Greenhouse Gas Crediting and Offset Mechanism (GCOM), which was formally unveiled in October 2023 at the 2023 MENA Climate Week in Riyadh and presented as a key Saudi climate action initiative at COP27 in Egypt (Zakkour, Gasim, and Luomi 2025).

This mechanism allows the generation of domestic emission credits, which can in principle be used for various purposes, ranging from purely voluntary use by companies to use for offsetting under a potential future domestic compliance scheme. Such credits could also principally be authorized as ITMOs, if the government wished to do so (Saudi CDM DNA 2023). To date, five baseline methodologies have been made public, which cover fuel switching from oil to gas for electricity production, renewable electricity, use of hydrogen in iron and steel production, electric vehicles, and carbon capture, utilization, and storage (CCUS) (Saudi CDM DNA 2025).

In the UAE, climate action and ambition have been largely personified by former Masdar CEO and the country's long-term climate envoy Sultan Al Jaber, who in the mid-2010s also assumed the positions of the CEO of the Abu Dhabi National Oil Company (ADNOC) and the Minister of Industry and Advanced Technology (for a detailed account of the role of agency in the UAE's climate policy, see Luomi 2014).

Stakeholders have observed how carbon markets rose on the UAE's policy agenda in the run-up to the COP28, which Al Jaber presided over, and how the COP28 Presidency included carbon markets into its narrative to advance modernization of the UAE more broadly. In July 2023, in the run-up to COP28, ADNOC announced its interest in selling carbon credits internationally (Straits Times 2023). At the UN Climate Ambition Summit in September 2023 in New York, Al Jaber explicitly called for "better-functioning carbon markets," saying that they were necessary to unlock the trillions needed from private capital for climate change mitigation action. At the African Climate Summit in the same month, he stressed that carbon markets were an important tool, but "a lack of commonly agreed standards was undermining their integrity and diminishing their value" (Miriri 2023).<sup>7</sup>

In an indication of longer-term leadership commitment to carbon markets, in mid-2024, the UAE's government passed Cabinet Resolution No. 67 of 2024 Concerning the National Register for Carbon Credits (UAE Cabinet 2024). The resolution entered into force in December 2024 and set up a mandatory emissions monitoring, reporting, and verification (MRV) system for large entities, along with a national registry for carbon credits, which, however, was not operationalized as of late 2025. The UAE's third NDC also references plans to operationalize a national carbon credit registry to "manage and report transactions involving national credits and ITMOs under the cooperative approaches outlined in Article 6" (UAE Government 2024).

At the subnational level, the emirate of Abu Dhabi has had in place a MRV program since late 2024 for the industry and energy sectors, implemented and administered by the Environment Agency – Abu Dhabi (EAD). The EAD has also been studying the feasibility of an emirate or a federal-level carbon pricing mechanism, for which the MRV program is designed to lay the groundwork (EAD 2024).

<sup>7</sup> At COP27, Al Jaber hosted a High-Level Roundtable on Unlocking High-Integrity Carbon Markets, with the President of the World Bank and private bank representatives of the Glasgow Financial Alliance for Net-Zero (World Bank 2023).

Despite the lack of an explicit expression of interest in international carbon markets by the Qatari government, the Qatar-based Global Carbon Council, established in 2016 on the initiative of the semi-private Gulf Organisation for Research and Development (GORD), continues its expansion to generate VCM credits in emerging Asian economies. The Council has developed a market niche in the field of renewable electricity credits, as the leading programs Verra and Gold Standard have long stopped accepting projects of this type due to a series of concerns regarding their additionality. The GORD has also launched the Climate Action Center of Excellence, which will focus on capacity building for Article 6, and which intends to run ITMO auctions (CACE 2025).

Oman has recently provided its Article 6.4 approach to the UNFCCC (Oman Government 2025). However, a Carbon Market Policy Framework, originally scheduled to be announced at COP29 in November 2024 (Oman News Agency 2024), had not been made public by late 2025. A key driving force for Article 6 engagement in Oman is the discovery of a significant potential

for CDR through the crushing of peridotite, a mineral with particularly good properties to permanently remove CO<sub>2</sub>, with Oman hosting the largest resources of that mineral in the world. In 2020, a group of Omani entrepreneurs founded the company "44.01" and have started to collaborate with world leaders in direct air capture (DAC) of CO<sub>2</sub>, including the Swiss company Climeworks (Adams 2021). Based on press reports, Oman's Environment Authority and the MSA Green Projects Company have been working on a large-scale mangrove reforestation project on 20,000 hectares in the Al Wusta governorate aiming at generating 14 million credits over 27 years. The government would receive 30% of the credits in the first 10 years, 70% in the following nine years, and 90% in the last six years (Al Abri 2023). A lively discussion has taken place in Omani media regarding the country's opportunities in international carbon markets, especially from geological and nature-based CDR, including their challenges and limitations (Al Busaidi 2025; Prabhu 2024). In this respect, Oman is different from other GCC countries, where general media have not actively taken up issues related to international carbon market participation.

# Outlining Strategic Approaches to Article 6 Over Time – Buying, Selling and Mixed Approaches

# 03



In general, any government can use Article 6 to buy ITMOs for their NDC achievement, as a complement to domestic mitigation. For example, ITMO purchases can help manage rising marginal abatement costs while maintaining or enhancing ambition, and in the longer term, manage residual emissions.

Alternatively, governments can pursue an ITMO sales strategy if their aim is to generate revenues for mitigation. A mixed strategy of both buying and selling is also possible if a government wants to optimize its mitigation approach and generate net revenues for the state with the help of carbon market service providers, provided that domestic mitigation remains the backbone of NDC implementation and environmental integrity safeguards are maintained.

The latter strategy involves selling high-priced ITMOs generated from costly mitigation technologies, such as technical removals, while acquiring lower-cost, high-integrity ITMOs from abroad (e.g., from forestry activities) to support the country's NDC and net-zero target. This mixed approach is particularly attractive if the government finds it difficult to set highly ambitious medium-term NDC targets but desires to ensure it can still pursue a net-zero emissions pathway.

A necessary condition for any of these three strategic approaches is sufficient consideration of Article 6 in the revised NDCs of GCC countries. All strategies should also be grounded in a national net-zero roadmap to inform understanding of the mitigation technology mix most suited to the country's circumstances and the expected levels of residual emissions in the net-zero target year. Furthermore, the type of activities from which ITMOs are to be bought or generated should be identified,

especially when domestic emissions trading or carbon pricing systems could act as the demand source for domestic or international credits, including from voluntary markets.

The following subsections describe in detail the three possible types of strategic approach toward Article 6 ITMO trade, illustrate each with concrete examples, and situate them within the GCC context and its experience in international carbon markets, as discussed above.

## 3.1 Buying – Complementing Domestic Mitigation Efforts and Managing Residual Emissions

An ITMO buying strategy can aim at closing a mitigation gap to reach the NDC target or at increasing NDC ambition, particularly where lower-cost abatement options have been exhausted. Similar to the selling strategy, a buying strategy utilizes ITMOs as a complement to, rather than a substitute for, domestic mitigation. Implementing this strategy requires government

willingness to either directly spend resources on ITMO acquisition or to introduce policy instruments that can drive ITMO demand by domestic entities.

A good example of the former is Japan, which acquires ITMOs through its Joint Crediting Mechanism (JCM), or Sweden, which buys ITMOs through the Swedish Energy Agency. A precedent in the GCC regarding government acquisition of emission credits (although they did not constitute acquisitions under Article 6) is the Government of Qatar's acquisition of 1.85 million international carbon credits registered under the Global Carbon Council (9 projects), the CDM (7 projects), Verra (4 projects), and Gold Standard (1 project), which were used to help it meet its World Cup 2022 carbon neutrality pledge (Inside FIFA 2022).

The classical approach to the latter – namely, introducing policy instruments to drive ITMO demand – is to set up ETS or a carbon tax, which allows the use of ITMOs toward compliance, usually up to a certain percentage of the participants' compliance obligation. The EU ETS accepted CDM credits for over a decade. The Korean ETS has accepted CDM credits and now allows for ITMOs, and Japan's upcoming ETS will similarly accept ITMOs (IETA 2025). Carbon tax systems in Chile, Colombia, and South Africa accept emission credits from various sources. Singapore, in turn, allows the use of ITMOs against its carbon tax. A particularly elaborate system exists in Switzerland, where the government mandates transport fuel importers to offset a share of the emissions from the use of these fuels. This offsetting can be done through domestic credits or ITMOs, with a minimum threshold prescribed for the former (for a detailed description of the approach, see KliK 2024).

Among GCC countries, the UAE has studied the feasibility of an ETS (EAD 2024), while Saudi Arabia has announced plans to assess the feasibility of an emission compliance system (FII Institute 2024). Both initiatives, if confirmed and operationalized, could in principle at least recognize ITMOs. Bahrain has announced a government action plan for the 2025/2026 budget formalized in March 2025 that foresees the introduction of a carbon tax, but tax levels and the instrument's scope remain unclear at the time of writing (Bahrain News Agency 2025; Zawya 2025).

Governments may also look toward the private sector to buy ITMOs under voluntary targets and pass them on to the governments. This behavior may be incentivized by governments giving preferential treatment to companies that engage in such ITMO purchases.

An example of such a system is the voluntary offsetting scheme by Swiss transport fuel importers between 2005 and 2012 through the establishment of a foundation that would purchase CDM credits and then pass them to the government (for the contract that the foundation concluded with the government, see UVEK and Stiftung Klimarappen 2005). In total, 15.5 million credits were bought at a total cost of US\$196 million. The funding for the credit acquisition was generated by a voluntary fee on transport fuel sales of 5 Swiss cents (~US\$0.06) per liter (Climate Cent Foundation 2014).

In Japan, voluntary private sector mitigation action has been organized through the GX-League, with GX standing for "green transformation," which was founded in April 2022. Its membership consists of 550 companies, which account for over 50% of Japan's GHG emissions. In April 2023, Japan launched the GX-ETS, a voluntary trading scheme in which ITMOs acquired through the JCM can be used. The GX-ETS will transition into a compliance scheme from 2026 onwards, although the most critical details of this transition have not yet been defined (Mavandad and Friedmann 2025). In May 2025, Japan revised its GX Promotion Act, and in July that same year, the first meeting of Subcommittee on the Emissions Trading met, discussing a maximum threshold for the use of ITMOs from the JCM (Offset8Capital 2025).

A specific instance of private sector demand for ITMOs from the GCC is the UAE Carbon Alliance's September 2023 pledge to spend US\$450 million on the acquisition of African carbon credits by 2030. However, this pledge was worded in very loose terms under the title of a "non-binding letter of intent" of an "indicative intended purchase" (Emirati News Agency 2023).

Corporate demand within the GCC has to date only materialized through the RVCMC auctions that featured VCM credits from outside the GCC and saw large-scale purchases by major regional companies. For example, in 2024 alone, Saudi Aramco acquired 1.1 million credits and retired 0.51 million credits toward offsetting claims (Aramco 2025). Many large GCC-based companies have also been exposed to compliance carbon markets and prices overseas and built up the related capacity to engage quickly if desired.

If a buying strategy is intended for the very long term, buying a reserve of credits that can be used in the future would make sense. However, the Article 6 rules specify that ITMOs cannot be banked beyond the period in which they are generated, and, thus, such a strategy is limited to 10-year periods.

## 3.2 Selling – Generating Revenues

Most countries under the Paris Agreement are eager to sell ITMOs in order to generate revenues for funding of mitigation action under the conditional parts of their NDCs. Currently, all African and Latin American countries active in Article 6 apply a pure seller strategy, alongside many Asian ones. Leading seller countries, which include Ghana and Kenya, have developed a detailed Article 6 regulatory approach (see UNEP-CCC 2025 for an overview and Hoch et al. 2023 for detailed descriptions of the leading countries).

In a continuation of their role on the supply side of the Kyoto CDM market, many countries that are classified as developing countries under the UNFCCC continue to perceive selling as their “default” strategy. To date, this has applied to the GCC countries as well, with the possible exception of the UAE. Selling, however, remains a valid strategy even in the Paris Agreement era, and it could focus on sectors with high attractiveness for potential international buyers and, thus, a high willingness to pay.

This could be the case to some extent for blue carbon – mainly mangroves, where the GCC countries have some potential (Haddad 2024) – and other nature-based CDR projects, but in particular for technological CDR (direct air capture with carbon capture and storage – DACCS), along with some bioenergy with CCS – BECCS) from the use of biogenic waste in waste to energy plants. Here, the GCC boasts a competitive advantage compared to many other regions due to its relatively low CCS costs (Rowaihy 2024).

In the medium to long term, CDR ITMOs could become a highly sought-after commodity. In some cases, this is already happening: Switzerland has already bought ITMOs from Norway generated through geological storage of CO<sub>2</sub> captured from biogenic waste and the air (ClimeFi 2025). Also, mangrove-related CDR credits have had consistently high prices on the VCM, exceeding US\$20 per tonne.

Notably, it is important to differentiate between removals and reductions in the context of geological CO<sub>2</sub> storage. Any capture of concentrated emissions streams from point sources for geological storage constitutes an emission reduction, whereas DACCS and nature-based solutions (e.g., BECCS), among other

methods that capture CO<sub>2</sub> from the atmosphere, result in negative emissions and therefore constitute a removal. Whether it is possible to harness international buyers for CCUS-based reduction credits – from, for example, blue hydrogen projects – remains to be seen.

Selling strategies could also be linked to goods exports. There is already a precedent for “carbon neutral” liquid natural gas (LNG) sales, where emissions credits covering the emissions from the end-use of an LNG cargo are coupled to the LNG sale. The first such transaction was done in June 2019 (Butler and Miles 2021), and the generalization of the practice is recommended by Suzuki (2025).

The GCC countries could offer buyers of their fossil fuels a package of ITMOs, in the form of a price premium, to cover the emissions. However, in order for the GCC countries to be able to leverage their CCS capacities in this line of trade, the buyers would need to be willing to pay an additional premium for offsetting related emissions from within the industry’s value chain, rather than using cheaper credits from, for example, NBS-based projects, which GCC countries would not be able to supply at the required scale.

Buyers of GCC ITMOs can include both governments and private sector entities. Japan is already present in the GCC through the JCM, with Saudi Arabia and the UAE having signed up. So far, however, only one small project in Saudi Arabia has been registered. With regard to companies, it should be noted that the private sector in developed countries has been disillusioned regarding the negative reputational impacts of buying emissions credits.

This development could lead to two alternative future outcomes: If the VCM suffers from further scandals, companies may increasingly look toward buying ITMOs or, at a minimum, MCUs, thereby bolstering the demand for Article 6 credits. In a more pessimistic scenario, companies would withdraw from the market for international credits altogether, as they feel they cannot communicate differences in credit quality to their clients, which would be detrimental to ITMO demand.

Under the positive scenario of significant ITMO demand by private companies, the geographic source of ITMOs will clearly still play a role in buyer decisions. Actors in some regions, such as Europe, can be expected to prioritize other regions for their ITMO purchases, as they perceive the GCC as a high-income region with sufficient resources to finance its net-zero

transition. Companies in East Asia and North America, however, might be more open to buying credits from the GCC.

In any case, credits generated by innovative or appealing activity types, such as mangrove reforestation projects, would make them appealing to a broader pool of potential buyers.

Until October 2025, about 40 million technical CDR credits had been sold through forward contracts on the VCM at an average price of US\$250 per tonne. Prices vary widely by technology, ranging from US\$65 for biomass burial to US\$1,300 for ocean CDR. The key category DACCS, which is expected, to deliver a large share of negative emissions globally in many net-zero scenarios, reached US\$490 (CDRfyi 2025). However, only about 2.5% of the sold credits have been issued to date.

It remains to be seen whether the demand for technical CDR credits at the current high prices is going to persist. A correction could occur once the US-based tech companies have filled their portfolios, which could happen in the second half of the 2020s. Sellers need to carefully assess how to hedge against such a strategy, including by identifying governments willing to buy CDR ITMOs at a premium, like Switzerland.

### 3.3 Mixed Approach – Combining Selling, Buying and Market Services

No country has stated to date that it would both buy and sell ITMOs as part of a broader mitigation strategy or target. However, such a strategy looks promising for economies that have a lot of experience in trading goods and services. In the medium and long term, a mixed strategy could be more relevant for the GCC than other regions given the long-standing tradition of GCC countries being a global trade and services hub.

Under such a strategy, ITMO sales would target high-cost mitigation activity types, such as durable carbon removals, where GCC countries hold a comparative advantage and where international willingness to pay exists, while purchases would focus on high-integrity ITMOs for managing residual emissions and containing costs as marginal abatement expenses rise. Such a strategy would also require a clear articulation of targets and quality criteria, as well as alignment with domestic net-zero roadmaps to avoid perceptions of over-reliance on international credits.

DAC and geological storage in depleted oil fields, as well as mangrove reforestation, would be candidates for ITMO sales, while the strategy of the UAE company Blue Carbon described above would illustrate ITMO acquisition. The latter approach would even combine elements of ITMO buying and selling, as the sheer volume of forestland covered by Blue Carbon's MoUs would exceed any possible demand from GCC countries.

In 2025, Enowa, the energy and water subsidiary of the Saudi giga-project NEOM, announced an agreement with the RVCMC under which Enowa would purchase over 30 million VCM credits by 2030 to offset the company's carbon footprint (SPA 2025). It has been speculated that Enowa, which has in the past set a carbon neutrality target for 2030, might seek to become a net supplier of carbon credits from this point onwards.

If GCC countries were to choose an approach to sell packages of fossil fuels and ITMOs, it would be commercially attractive to try to acquire these ITMOs at lowest costs in order to be competitive for buyers of emissions-neutral oil on the global market in a global net-zero scenario.

Finally, on the market services side, financial service providers like Kuwait Finance House, Bahrain Mumtalakat, and Abu Dhabi's Offset8 Capital that have created voluntary carbon offset platforms (Al-Sarihi 2024; Shafi 2025) seem like obvious candidates for providing transaction services for ITMOs as well.

# Role of the Strategic Approaches for GCC Countries Over Time

# 04



GCC countries' Article 6 approaches are likely to develop at different speeds and in different directions. On a high level, a mixed approach looks attractive in the short term, particularly for the trade- and service-oriented GCC members. As GCC countries move toward their respective net-zero target years, they would shift toward a buyer approach.

This section presents an analysis of how such an approach could be implemented over time across the GCC, and it identifies differences in availability of project types between countries. The section also develops initial quantitative estimates on ITMO volumes that could be made available from the GCC, taking into account the possible demand for ITMOs and volumes that might need to be purchased given expected GCC net-zero target residual emissions levels.

## 4.1 Short Term: 2026

While Article 6.4 rules have only recently been finalized, countries and activity developers are already beginning to position themselves. The GCC region should ensure that it does not lose track of the leaders in Article 6 transactions in order to secure access to low-cost sources of ITMOs, as well as to be seen as a competitive actor in the provision of Article 6 support services. With the 2025 round of NDC revisions still ongoing in most countries of the region, the role of Article 6 would ideally be considered in new submissions in sufficiently flexible terms to allow for a mixed approach, if desired. The countries most likely to benefit from a mixed approach and able to implement it are those that are highly trade- and service-oriented and large enough to offer a range of domestic mitigation options, such as the UAE and Oman.

Governments that wish to pursue private sector engagement should also embark on capacity-building exercises for their large private and public companies. Governments should furthermore consider funding Article 6.4 methodology submissions for key project types relevant for the GCC, as discussed below.

Afforestation and reforestation have been highlighted in the Saudi Green Initiative, aiming at planting 450 million trees by 2030 (Abdelraouf and Nagasawa 2023). More specifically, the potential for mangrove protection and restoration is widespread in the GCC, but related volumes are bound to be small given the low biomass density of mangroves. Protection of mangroves is preferable to reforestation due to their slow growth rates (Michaelowa and Neger 2013). Mitigation costs are likely to be below US\$20/t CO<sub>2</sub>.

Accelerated replacement of inefficient multi-stage flash desalination plants before the end of their technical lifetime by plants using reverse osmosis technology could represent a major near-term opportunity, as the GHG emissions intensity of desalination could thereby be reduced by a factor of three to four. According to Al-Mutaz (2020), there is significant potential across all GCC countries, but particularly in Saudi Arabia and the UAE, given the high number of multi-stage flash plants with significant remaining technical lifetimes.

The Saudi Water Authority (2025) has provided insight into the specific potential in Saudi Arabia, and UNFCCC (2019) also discusses the treatment of this activity type under the CDM. Mitigation costs can be expected to be relatively low and positively correlated with the remaining lifetime of the multi-stage plants that are to be replaced. Additionality can be credibly shown if multi-stage plants are shut down well before the end of their technical lifetimes.

This option could be harnessed in the short term, when it is not yet needed for NDC implementation. The governments could clearly communicate that ITMO generation would be limited to the period until 2035, as the underlying mitigation can be expected to be required for achievement of the NDCs thereafter, or, alternatively, governments should seek to ensure that ITMO sales do not raise the cost of achieving NDC targets.

CCUS in the oil industry has a massive potential in all GCC countries, with large point sources and exhausted oil reservoirs. Rowaihy (2024) estimates mitigation costs within a range of US\$39-US\$66/tCO<sub>2</sub> for 2035 for Saudi Arabia.

DAC coupled with mineralization in peridotite rocks is a further technology that is currently very costly but that could benefit from very cheap renewable electricity generation. Matter et al. (2025) show for a pilot project in Oman that mineralization is extremely fast, taking only a few months to ensure the CO<sub>2</sub> is fully bound in the rock. The technical potential in Oman and the UAE is virtually unlimited. Prabhu (2025) discusses the first 300 tonne per year prototype currently under implementation in Oman. This activity type will not have a short-term demand, but it could become attractive if buyers limit their purchases to permanent removal credits with low levels of reversal risk.

Given that GCC-based airlines are expected to give preference to domestic sources of CORSIA-compliant ITMOs, a rapid development of Article 6.4 methodologies should be undertaken for the project types described above. This would enable the generation of CORSIA-compliant credits, ideally before the deadline for airlines to submit credits for the first phase, which is at the end of January 2028. To enable such an approach, GCC countries could express support within the ICAO to accelerate its acceptance of the PACM as a general source of CORSIA-eligible ITMOs.

## 4.2 Medium Term: 2027-2035

Given that CORSIA obligations begin from 2027 onwards, requiring all the major airlines of signatory countries to offset any emissions above their 2019 baseline levels, ITMO demand from international aviation is expected to increase significantly. Mangrove CDR methodologies can be expected to become eligible under CORSIA. GCC governments could help accelerate this by rapidly authorizing ITMOs from CORSIA-compliant projects.

Setting up a GCC-wide technical working group could also be explored, which would be tasked with identifying key higher-cost mitigation activity types attractive to ITMO buyers worldwide. The analysis should focus on project types in which the GCC would have a comparative advantage over activity developers in other regions. For example, point-source capture with storage in saline aquifers in parts of the GCC is likely to be among the lower-cost opportunities globally (Rowaihy 2024). Also, the generation of blue hydrogen for ammonia with geological CO<sub>2</sub> storage could be considered if it is commercially more attractive than using the low-carbon ammonia directly for CBAM compliance

Table 2 shows an initial mapping of the cumulative potential for ITMO generation from the GCC over the next decade. It assumes that none of these activity types will be covered by domestic compliance carbon market schemes before 2035. Desalination efficiency and point-source CCS, in particular, would be candidates for such coverage in the medium term.

Through 2035, afforestation, multi-country CCS hubs in the GCC, and highly efficient and renewables-driven desalination would provide the lower-cost end of ITMO supply, while DAC with mineralization or geological storage would be situated at the high end and could probably not compete with other options, unless there is price-differentiated demand.

Qatar could concentrate on CCUS linked to LNG-related gas processing to produce carbon neutral LNG, and other GCC countries could focus on carbon neutral oil. Such a strategy would only be viable if fossil fuel buyers were willing to pay a substantial premium for mitigation in the fossil fuel value chain. If this was not the case, a strategy focusing on buying lower-cost, high-integrity ITMOs from other countries and

**Table 2. Indicative estimates on the cumulative mitigation potential classes for promising activity types under Article 6 in the GCC for the period until 2035.**

Activity type/ Country	Desalination efficiency	Afforestation and reforestation	DACCS with mineralization	DACCS in geological reservoirs	Point-source CCS	BECCS from biogenic waste
Bahrain	Yellow	Red	Red	Red	Yellow	Red
Kuwait	Yellow	Red	Red	Yellow	Yellow	Red
Oman	Yellow	Red	Green	Yellow	Yellow	Red
Qatar	Yellow	Red	Red	Yellow	Green	Red
Saudi Arabia	Green	Yellow	Yellow	Green	Green	Yellow
UAE	Green	Red	Green	Green	Green	Red
<b>GCC</b>	Green	Yellow	Green	Green	Green	Yellow

Notes: Green ca. >25 million t CO<sub>2</sub>e, yellow: ca. 5 – 25 million t, red: ca. <5 million t

Sources: Authors, based on activity type-specific references used in Section 4.1 above, Zakkour, Gasim, and Luomi (2025), and expert judgement.

using these for carbon neutral fossil fuel would be preferable. Such strategies should not replace domestic decarbonization of production processes and energy systems, but they could serve as transitional mechanisms in specific trade-exposed sectors.

By 2030, the fourth NDCs will be elaborated, which will provide GCC countries with the opportunity to send a signal to both buyers and sellers that the region is open for Article 6 business. As the ambition of the NDCs increases toward 2035, GCC members would likely begin shifting strategies. The UAE’s ambitious 2035 NDC may mean that the country embarks on a pure buyer strategy before the end of this period. In a more likely scenario, however, the UAE – and possibly Saudi Arabia – will engage in a mixed strategy, selling CDR credits to its Asian trade partners, such as Japan, Korea or even China, or more broadly to its Northern trade partners, and to the U.S. in particular. At the same time, it would buy lower-priced NBS credits from development partners in Africa.

The GCC countries could collectively support a regional institution, such as the Islamic Development Bank, to set up carbon market design functions and an outreach tool for the Middle East and Africa regions, comparable to the World Bank. The bank could finance lighthouse projects as examples for projects that could then be replicated and scaled up by GCC governments or GCC-based entities for ITMO generation. Supporting the development of a large long-term portfolio of activities in Africa can both support the continent’s low-carbon development aspirations and help GCC countries in their transition to their long-term ITMO buyer strategies.

Given their relatively low levels of development and the likelihood of national net-zero strategies extending well into the 2100s, many countries in Africa are expected to remain attractive sources of emission reduction credits under Article 6 for much of the century, due to their baseline emissions remaining at a relatively high level. A promising project type, which is linked to an existing policy initiative of Saudi Arabia called Forward7, could be the replacement of biomass cookstoves by LPG-fueled stoves. Such replacement programs have successfully been undertaken on a large scale in India under the Ujjwala programme (Asharaf and Tol 2024). While it may be challenging to secure acceptance for this activity type covered under the PACM, due to its rule that lock-in of fossil fuel is to be avoided, LPG cookstoves could be a promising candidate for Article 6.2 collaboration. Forward7 has already launched a pilot project for 50,000 households in Rwanda (Taarifa 2025), which could easily be expanded to become an Article 6.2 project given that Rwanda is one of the African leaders on Article 6.2.

By 2035, the downward adjustment of baselines for emission reduction crediting projects are expected to start to have an impact on credit sales by GCC actors and the availability of domestic emission reductions. As the adjustment applies to all competitors selling ITMOs, there will not be a loss of relative competitiveness. However, CDR options will gain competitiveness compared to emissions reductions.

### 4.3 Long Term: 2036-2050

If net-zero targets are actively pursued by GCC governments, domestic emission compliance markets will be required to drive emissions trajectories accordingly. The entire GCC in this scenario will move toward a full buyer strategy, and the harnessing of the last remaining sources of relatively low-cost ITMOs from emission reductions, including through strong collaboration with African countries, will be critical.

Below, we provide an initial estimate of ITMO demand of relevance for the GCC in 2050 in a global net-zero scenario, assuming that the GCC decides to offset all domestic residual emissions accruing within the GCC with ITMO imports.

Given that there is no official government GCC-level estimate for domestic residual emissions for the year 2050, we need to resort to heuristics combining various published estimates. A modeled net-zero scenario by Kamboj et al. (2023) estimates residual Saudi Arabian emissions in the net-zero target year of 2060 at 371 million tCO<sub>2</sub>e, while a scenario by Durand-Lasserve (2023) estimates total CO<sub>2</sub>-only at 250 million tCO<sub>2</sub>. With Saudi emissions reaching 709 million tCO<sub>2</sub> in 2021 (Kingdom of Saudi Arabia 2024), 2060 residual emissions would stand at ~50% of today's value. Assuming a hypothetical linear path between 2021 and 2060, Saudi emissions in 2050 would reach 430 million tCO<sub>2</sub>, which is 60% of today's level. The UAE, with its 2021 GHG emissions level of 244 million tCO<sub>2</sub>e, wants to limit its 2050 residual emissions to only 13 million tCO<sub>2</sub>e (Climate Watch 2025; UAE MOCCA 2024), which is just 5% of today's level.

Assuming the mean of the two values applies to the entirety of the GCC, we would see 2050 residual emissions at one-third of 2021 emissions. The GCC countries' total GHG emissions were estimated to have reached 1,403 million tCO<sub>2</sub>e in 2021 (Climate Watch 2025), and, thus, the region's residual emissions in 2050 are roughly estimated at 470 million tCO<sub>2</sub>e, for which ITMOs might consequently be acquired.

Given that by 2050 only a few countries would still be able to export ITMOs based on emission reductions (i.e., likely limited to the least developed countries and small island states), the bulk of these ITMOs would need to come from removals. At projected DACCS costs of well over US\$200 per tonne of CO<sub>2</sub> (Sievert, Schmidt, and Steffen 2024), the price tag would reach a substantive US\$94 billion per year for coverage of residual emissions if ITMOs were to only come from this technology. This means that ITMOs from nature-based removals would have to be procured internationally. Even there, though, cost estimates for an ITMO would reach close to US\$100 in 2050 (Bloomberg 2025), meaning that costs would still reach US\$47 billion.

This means that Article 6 will not be able to provide a "safety valve" to keep mitigation costs very low forever. It will, however, be crucial to buy time and ramp up investment in costly mitigation options within the GCC over time.

# The Reasons for Article 6 to Play a Significant Role in the GCC Countries' Net-Zero Strategies

# 05



International carbon markets can enable governments to access low-cost mitigation globally and increase the efficiency of achieving NDC targets. They should not lead to the sale of “low-hanging fruit.”

The global Article 6 market generates significant opportunities for the GCC as it has the potential to enable the region to build on its strengths as a global hub for trade in goods and services. In the short term, the sale of specific types of ITMOs for high-cost, high-reputation activity types, such as mangrove reforestation and technical removals and storage in peridotite rocks or empty oil reservoirs, could generate revenues to accelerate the net-zero transition in sectors with lower-cost mitigation options, which are needed for NDC implementation.

With a time horizon 2035, a mixed strategy of buying ITMOs from nature-based solutions at low prices in partner countries in Africa and then using them to make fossil fuel exports carbon

neutral could be chosen by GCC members. Some ambitious GCC member states might switch to a pure buyer strategy relatively quickly, and the remaining countries would likely do this a decade later.

Given that around mid-century, emission reduction credits will only be available from a very restricted set of countries, a forward-looking approach ensuring access to removals from nature-based solutions could reduce the pressure generated by high prices for technical removals.

Overall, Article 6 can therefore be a crucial enabling element in the GCC's transition to a net-zero future.

# References

- Abdelraouf, Mohamed, and Asuka Nagasawa. 2023. "Saudi Green Initiatives and Their Role in Achieving Environmental Goals in the Middle East." Gulf Research Center. <https://www.grc.net/documents/6530de99c93a7SaudiGreenInitiativesandtheirRole.pdf>.
- ACX. 2024. "Notice: Notification of Wind-Down of ACX's ADGM Exchange and Clearing House Operations." October 11. <https://acx.net/notices/notice-2024-10/>.
- Adams, Helen. 2021. "Climeworks and 44.01 to Unlock CO<sub>2</sub> Storage Potential in Oman." *Sustainability Magazine*, May 20. <https://sustainabilitymag.com/diversity-and-inclusion-dandi/climeworks-and-4401-unlock-co2-storage-potential-oman>.
- Al Abri, Mai. 2023. "Mangrove Project to Reduce 14m Tonnes of CO<sub>2</sub> Emissions." *Oman Observer*, October 16. <https://www.omanobserver.om/article/1144348/oman/environment/mangrove-project-to-reduce-14m-tonnes-of-co2-emissions>.
- Al Busaidi, Rumaitha. 2025. "Carbon Credits in a Thirsty Land." *Oman Observer*, May 21. <https://www.omanobserver.om/article/1170900/opinion/oman/carbon-credits-in-a-thirsty-land>.
- Al-Mutaz, Ibrahim. 2020. "MSF Challenges and Survivals." *Desalination and Water Treatment* 177: 14–22. <https://doi.org/10.5004/dwt.2020.24908>.
- Al-Sarihi, Aisha. 2024. "Gulf Transition to Low-Carbon Economies: The Role of Carbon Markets." *Middle East Council on Global Affairs*, November 14. <https://mecouncil.org/publication/gulf-transition-to-low-carbon-economies-the-role-of-carbon-markets/>.
- Aramco. 2025. *Investing in Growth: Innovating for Sustainability*. Aramco | Sustainability Report 2024. <https://www.aramco.com/-/media/publications/corporate-reports/sustainability-reports/report-2024/english/2024-saudi-aramco-sustainability-report-full-en.pdf>.
- Asharaf, Nabeel, and Richard Tol. 2024. "The Impact of Pradhan Mantri Ujjwala Yojana on Indian Households." *Economic Analysis and Policy* 84: 878–897. <https://doi.org/10.1016/j.eap.2024.09.026>.
- Bahrain News Agency. 2025. "Executive and Legislative Authorities Hold Joint Meeting on 2025-2026 State Budget." March 13, <https://www.bna.bh/En/Executiveandlegislativeauthoritiesholdjointmeetingon20252026statebudget.aspx?cms=q8FmFJgiscL2fwizON1%2BDtyvmNy8S3yJcWyYgMGqgJE%3D>.
- Benny, John. 2024. "Gulf States in Race to Make Low-Carbon Metals as EU Carbon Tax Looms." *The National*, October 5. <https://www.thenationalnews.com/business/economy/2024/10/05/gulf-states-in-race-to-make-low-carbon-metals-as-eu-carbon-tax-looms/>.
- Betz, Regina, Axel Michaelowa, Paula Castro, Raphaela Kotsch, Michael Mehling, Katharina Michaelowa, and Andrea Baranzini. 2022. *The Carbon Market Challenge: Preventing Abuse Through Effective Governance*. Cambridge: Cambridge University Press. <https://doi.org/10.1017/9781009216500>.
- Bloomberg. 2025. "Long-Term Carbon Credit Supply Outlook 2025." August 26. <https://about.bnef.com/insights/commodities/long-term-carbon-credit-supply-outlook-2025/>.
- Butler, Rob, and Steven Miles. 2021. "Lower-Carbon, Carbon-Neutral, and 'Green'." *Thomson Reuters*, August 12. <https://share.google/zYaBxP9A0923g4fGI>.
- Carbon Market Watch. 2012. "Carbon Market Watch Analysis COP-18: We Won a Game of Poker on the Titanic!" <https://carbonmarketwatch.org/wp-content/uploads/2012/12/cop-18-final-layout.pdf>.
- CDRfyi. 2025. "We Bring Transparency and Accountability to the Carbon Removal Market." <https://www.cdr.fyi/>.
- Clean Development Mechanism (CDM). 2025a. *PoA 9299: Renewable Energy Programme of Activities in Middle East and North Africa*. [https://cdm.unfccc.int/ProgrammeOfActivities/poa\\_db/COD5H497YNQZKMGF28W3PALEJTB160/view?cp=1](https://cdm.unfccc.int/ProgrammeOfActivities/poa_db/COD5H497YNQZKMGF28W3PALEJTB160/view?cp=1).
- Clean Development Mechanism (CDM). 2025b. *Project 5460: Compost from Municipal Solid Waste in Peshawar, Pakistan*. <https://cdm.unfccc.int/Projects/DB/Germanischer1322561409.34/view>.

Climate Action Center of Excellence (CASE). 2025. "Solutions." <https://cace.gord.qa/solutions/>.

Climate Cent Foundation. 2014. *Revised Final Report 2005-2013*. [https://www.klimarappen.ch/resources/Abschlussbericht\\_SKRE\\_140902.pdf](https://www.klimarappen.ch/resources/Abschlussbericht_SKRE_140902.pdf).

Climate Watch. 2025. "Climate Watch." <https://www.climatewatchdata.org/>.

ClimeFi. 2025. "ClimeFi Structures ITMO Transfer Between Norway and Switzerland Under Article 6 of the Paris Agreement." June 17. <https://www.climefi.com/blog-posts/climefi-structures-itmo-transfer-between-norway-and-switzerland-under-article-6-of-the-paris-agreement>.

Durand-Lasserve, Olivier. 2023. "Net Zero Emissions in Saudi Arabia by 2060. Least-Cost Pathways, Influence of International Oil Price, and Economic Consequences." Riyadh: King Abdullah Petroleum Studies and Research Center (KAPSARC). <https://www.kapsarc.org/our-offerings/publications/net-zero-emissions-in-saudi-arabia-by-2060-least-cost-pathways-influence-of-international-oil-price-and-economic-consequences/>.

Eidgenössisches Departement für Umwelt, Verkehr, Energie und Kommunikation (UVEK), and Stiftung Klimarappen. 2005. *Vertrag zwischen der Schweizerischen Eidgenossenschaft, vertreten durch das Eidgenössische Departement für Umwelt, Verkehr, Energie und Kommunikation (UVEK), und der Stiftung Klimarappen betreffend Klimarappen*. [https://www.klimarappen.ch/resources/Rahmenvertrag\\_20051.pdf](https://www.klimarappen.ch/resources/Rahmenvertrag_20051.pdf).

Emirati News Agency. 2023. "UAE Carbon Alliance Pledges to Purchase US\$450 Million in African Carbon Credits by 2030." September 4. <https://www.wam.ae/en/article/hszrhu67-uae-carbon-alliance-pledges-purchase-us450-million>.

Energy Intelligence. 2007. "Qatar Becomes Kyoto Pioneer in Heavy-Flaring Mideast." June 6. [https://www.energyintel.com/0000017b-a7af-de4c-a17b-e7efac720000?\\_amp=true](https://www.energyintel.com/0000017b-a7af-de4c-a17b-e7efac720000?_amp=true).

Environment Agency – Abu Dhabi (EAD). 2024. "Abu Dhabi Champions GCC Region with International Standard Carbon Measuring, Reporting and Verification Programme." December 26. <https://www.ead.gov.ae/en/Media-Centre/News/Abu-Dhabi-Champions-GCC-Region-2024>

EU Commission. 2025. *Proposal for a Regulation of the European Parliament and of the Council amending Regulation (EU) 2021/1119 Establishing the Framework for Achieving Climate Neutrality, COM (2025) 524 Final*. February 7. [https://climate.ec.europa.eu/document/download/e1b5a957-c6b9-4cb2-a247-bd28bf675db6\\_en](https://climate.ec.europa.eu/document/download/e1b5a957-c6b9-4cb2-a247-bd28bf675db6_en).

European Parliamentary Research Service (EPRS). 2023. *Carbon Border Adjustment Mechanism*. [https://www.europarl.europa.eu/thinktank/en/document/EPRS\\_ATA\(2023\)754626](https://www.europarl.europa.eu/thinktank/en/document/EPRS_ATA(2023)754626).

Future Investment Initiative (FII) Institute. 2024. "H.R.H Prince Abdulaziz bin Salman Al Saud, KSA Energy Minister on #Energy Transition at #FII8". YouTube, October 24. [https://www.youtube.com/watch?v=r9YeQV\\_tcxU](https://www.youtube.com/watch?v=r9YeQV_tcxU).

Global Carbon Council. 2025. "Global Carbon Council." *LinkedIn*. <https://www.linkedin.com/company/globalcarboncouncil/>.

Greenfield, Patrick. 2023. "Revealed: More Than 90% of Rainforest Carbon Offsets by Biggest Certifier are Worthless, Analysis Shows." *The Guardian*, January 18. <https://www.theguardian.com/environment/2023/jan/18/revealed-forest-carbon-offsets-biggest-provider-worthless-verra-aoe>.

Greenfield, Patrick. 2024. "Cookstove Carbon Offsets Overstate Climate Benefit by 1,000%, Study Finds." *The Guardian*, January 23. <https://www.theguardian.com/environment/2024/jan/23/clean-cookstove-carbon-offsets-overstate-climate-benefit-by-1000-percent>.

Greenfield, Patrick, and Lorenzo Tondo. 2023. "Who is the UAE Sheikh Behind Deals to Manage Vast Areas of African Forest?" *The Guardian*, November 30, <https://www.theguardian.com/environment/2023/nov/30/who-is-the-uae-sheikh-behind-deals-to-manage-vast-areas-of-african-forest>.

Gulf Times. 2012. "QP, Maersk Cut Al Shaheen Gas Flaring in Rare Feat." September 24. <https://www.gulf-times.com/story/149009/qp-maersk-cut-al-shaheen-gas-flaring-in-rare-feat>.

Haddad, Fidaa. 2024. "Leading the Way: Gulf Countries' Efforts in Mangrove Restoration." Regional Office for Near East and North Africa, July 26. <https://www.fao.org/neareast/news/blog/blog-details/greening-agriculture--water-scarcity-and-climate-action/2024/07/25/leading-the-way--gulf-countries%27-efforts-in-mangrove-restoration/en>.

- Hoch, Stephan, Peris Waweru, Ximena Samaniego, Holly Thomas, Bruk Tekie, Axel Michaelowa, Sandra Greiner, Marco Della Maggiore, Lydia Omuko-Jung, Anna Kovács, Anna Rodezno, José Ayestas, and Mauriz Schuck. 2023. *The Landscape of Article 6 Implementation*. Climate Finance Innovators. [https://www.carbon-mechanisms.de/fileadmin/media/dokumente/Publikationen/Bericht/CFI-Guidebook-the-landscape-of-article-6-implementation-Nov\\_2023.pdf](https://www.carbon-mechanisms.de/fileadmin/media/dokumente/Publikationen/Bericht/CFI-Guidebook-the-landscape-of-article-6-implementation-Nov_2023.pdf).
- ICAO Assembly. 2022. "Resolution A41-22: Consolidated Statement of Continuing ICAO Policies and Practices Related to Environmental Protection – Carbon Offsetting and Reduction Scheme for International Aviation (CORSA)." [https://www.icao.int/sites/default/files/left-menu-pdfs/Resolution\\_A41-22\\_CORSA.pdf](https://www.icao.int/sites/default/files/left-menu-pdfs/Resolution_A41-22_CORSA.pdf).
- International Emissions Trading Association (IETA). 2025. "Japan Emissions Trading Scheme (GX-ETS)." Business Brief, July. [https://www.ieta.org/uploads/wp-content/Resources/Business-briefs/2025/IETA-Japan-Emissions-Trading-Scheme-\\_GX-ETS-final-one\\_July.pdf](https://www.ieta.org/uploads/wp-content/Resources/Business-briefs/2025/IETA-Japan-Emissions-Trading-Scheme-_GX-ETS-final-one_July.pdf).
- Inside FIFA. 2022. "Greenhouse Gas Emissions: Offsetting GHG Emissions." <https://inside.fifa.com/tournament-organisation/world-cup-2022-sustainability-report/environmental-impact/greenhouse-gas-emissions/offsetting-ghg-emissions>.
- Kamboj, Puneet, Mohamad Hejazi, Yang Qiu, Page Kyle, and Gokul Iyer. 2023. "Long-Term Decarbonization Pathway for Saudi Arabia to Reach Net Zero GHG Emissions by 2060." Riyadh: King Abdullah Petroleum Studies and Research Center (KAPSARC). <https://www.doi.org/10.30573/KS--2023-DP30>.
- Kiernan, Peter. 2023. "Dubai's Blue Carbon Signs Article 6 Carbon Deal with Liberia." *Carbon Pulse*, March 29. <https://carbon-pulse.com/197396/>.
- Kingdom of Saudi Arabia. 2024. *The First Biennial Transparency Report*. Submitted to the UNFCCC. [https://unfccc.int/sites/default/files/resource/KSA\\_BTR1\\_20250320-2.pdf](https://unfccc.int/sites/default/files/resource/KSA_BTR1_20250320-2.pdf).
- KliK Foundation. 2024. *Annual Report 2023: Successfully Sailing into the Wind*. [https://a.storyblok.com/f/246794/x/d9392844cc/jahresbericht\\_2023\\_en.pdf](https://a.storyblok.com/f/246794/x/d9392844cc/jahresbericht_2023_en.pdf).
- KliK Foundation. 2025. *Annual Report 2024: Time is Running Out*. [https://a.storyblok.com/f/246794/x/5c88f24a1f/jahresbericht\\_2024\\_en.pdf](https://a.storyblok.com/f/246794/x/5c88f24a1f/jahresbericht_2024_en.pdf).
- Luomi, Mari. 2014. *Gulf Monarchies and Climate Change: Abu Dhabi and Qatar in an Era of Natural Unsustainability*. Oxford: Oxford University Press. <https://doi.org/10.1093/acprof:oso/9780199387526.001.0001>.
- Luomi, Mari. 2018. Leveraging Market Mechanisms for Climate Change Mitigation in the UAE and the Gulf Region. Emirates Diplomatic Academy, Abu Dhabi. [https://www.agda.ac.ae/docs/default-source/Publications/eda-insight\\_carbon-market-mechanisms\\_en.pdf?sfvrsn=4](https://www.agda.ac.ae/docs/default-source/Publications/eda-insight_carbon-market-mechanisms_en.pdf?sfvrsn=4).
- Luomi, Mari. 2021. "From the Year of Climate Ambition to Action in the Gulf." *Arab Gulf States Institute*, December 8. <https://agsi.org/analysis/from-the-year-of-climate-ambition-to-action-in-the-gulf/>.
- Luomi, Mari. 2022. "Carbon Markets and Related Opportunities for the Gulf." *Oxford Energy Forum* 132 (June): 42–45. <https://www.oxfordenergy.org/wpcms/wp-content/uploads/2022/06/OEF-132.pdf>.
- Luomi, Mari, Thomas Bosse, and Zlata Sergeeva. 2025. Lessons from Gulf Cooperation Council Countries' Participation in the Clean Development Mechanism. *Climate Policy* 26, no. 1 (January): 32–47. <https://doi.org/10.1080/14693062.2025.2479816>.
- Matter, Juerg, Joanna Speer, Christopher Day, Peter Kelemen, Amal Ibrahim, Sulaiman Al Mani, Ehab Tasfai, Moez Ilyas, Karan Khimji, and Talal Hasan. 2025. Rapid Mineralisation of Carbon Dioxide in Peridotites." *Communications Earth and Environment* 6: 590. <https://doi.org/10.1038/s43247-025-02509-5>.
- Mavandad, Shirin, and Julio Friedmann. 2025. "Inside Japan's GX-ETS Carbon Market and its Global Climate Impact." *Carbon Direct*, April 14. <https://www.carbon-direct.com/insights/inside-japan-s-gx-ets-carbon-market-and-its-global-climate-impact>.
- Middle East Business Intelligence (MEED). 2007. "Carbon Trading: Capturing the Market." August 10. <https://www.meed.com/carbon-trading-capturing-the-market/>.
- Middle East Business Intelligence (MEED). 2008. "Xenel Industries. The Saudi Conglomerate is Using its Wide-Ranging Business Interests to Expand into Other Countries." 16 December. <https://www.meed.com/xenel-industries-4/>.

Michaelowa, Axel, and Rainer Nerger. 2013. *Assessment of Blue Carbon Policies in the Red Sea and Gulf of Aden*. The Regional Organization for the Conservation of the Environment of the Red Sea and Gulf of Aden, Jeddah.

Michaelowa, Axel, Matthias Honegger, Michael Eschmann, Björn Dransfeld, Matthias Krey. 2014. "The Role of CDM and NAMAs to Promote Greenhouse Gas Reductions in the GCC. In *Political Economy of Energy Reform: the Clean Energy-Fossil Fuel Balance in the Gulf States*, edited by Rabia Ferroukhi and Giacomo Luciani, 143–182. Berlin and London: Gerlach Press. <https://doi.org/10.1017/9783940924414.007>.

Michaelowa, Axel, Igor Shishlov, and Dario Brescia. 2019. "Evolution of International Carbon Markets: Lessons for the Paris Agreement." *WIREs Climate Change* 10: e613. <https://doi.org/10.1002/wcc.613>.

Michaelowa, Axel, Ximena Samaniego, Juliana Kessler, Hanna-Mari Ahonen, and Christopher Spence. 2022. *Pocket Guide to Article 6: Under the Paris Agreement*. Oxford: Oxford Climate Policy / European Capacity Building Initiative (ecbi). [https://ecbi.org/sites/default/files/Pocket\\_Guide\\_to\\_Article\\_6.pdf](https://ecbi.org/sites/default/files/Pocket_Guide_to_Article_6.pdf).

Miriri, Duncan. 2023. "Hundreds of Millions of Dollars Pledged for African Carbon Credits at Climate Summit." Reuters, September 5. <https://www.reuters.com/business/environment/africa-climate-summit-opens-with-focus-financing-continental-unity-2023-09-04/>.

Müller, Benito, and Axel Michaelowa. 2019. "How to Operationalize Accounting Under Article 6 Market Mechanisms of the Paris Agreement." *Climate Policy* 19: 812–819. <https://doi.org/10.1080/14693062.2019.1599803>.

Offset8Capital. 2025. "Japan's Carbon Credit Market Guide: Structure, Government Initiatives, Credit Systems, and Future Outlook." <https://offset8capital.com/articles/japans-carbon-credit-market-guide-structure-government-initiatives-credit-systems-and-future-outlook/>.

Oman Government. 2025. "Host Party Participation Requirements for Article 6.4 Mechanism." [https://unfccc.int/sites/default/files/resource/A6.4\\_Host\\_Party\\_Participation\\_Oman.pdf](https://unfccc.int/sites/default/files/resource/A6.4_Host_Party_Participation_Oman.pdf).

Oman News Agency. 2024. "Oman Completes Final Draft of General Policy Framework for Carbon Markets." August 28. <https://omannews.gov.om/topics/en/79/show/118443>.

Padin-Dujon, Alejandra. 2023. "UAE-Based Firm Chalks up Secretive Carbon Credit Development Deals, Raising Integrity Concerns." *Carbon Pulse*, December 19. <https://carbon-pulse.com/247238/>.

Padin-Dujon, Alejandra. 2024. "UAE-Based Carbon Project Developer Blue Carbon Solicits Applicants to Support Activity Design, Monitoring." *Carbon Pulse*, March 5. <https://carbon-pulse.com/265820/>.

Pandey, Nikita, Alejandra Padin-Dujon, Roy Manuell, and Mike Szabo. 2025. "Briefing: Huge Sovereign Forest Carbon Deals Go Dark as Dubai-Based Blue Carbon Slips into the Shadows." *Carbon Pulse*, December 5. <https://carbon-pulse.com/463628/>.

Prabhu, Conrad. 2024. "Value of Oman's Carbon Market Projected at \$500m Annually." *Oman Observer*, October 1. <https://www.omanobserver.om/article/1159937/business/energy/value-of-omans-carbon-market-projected-at-500m-annually>.

Prabhu, Conrad. 2025. "Sirona Launches Project Moringa CO<sub>2</sub> Capture and Storage in Oman." *Oman Observer*, October 18. <https://www.omanobserver.om/article/1178301/business/sirona-launches-project-moringa-for-co2-capture-in-oman>.

Quantum Commodity Intelligence. 2023. "COP28: Paraguay, UAE strike Article 6 MOU in First for Both." December 10. <https://www.qcintel.com/carbon/article/cop28-paraguay-uae-strike-article-6-mou-in-first-for-both-19504.html>.

Rahman, Fareed, and John Benny. 2023. "UAE Securities Regulator Plans to Develop Carbon-Trading Mechanism." *The National*, January 19. <https://www.thenationalnews.com/business/markets/2023/01/19/uae-securities-regulator-plans-to-develop-carbon-trading-mechanism/>.

Rowaihy, Feras. 2024. *Techno-Economic Analysis of Decarbonizing Saudi Arabia's Energy and Industrial Sectors via Carbon Capture and Storage*. PhD Dissertation, King Abdulaziz University of Science and Technology (KAUST). <https://repository.kaust.edu.sa/items/544be48c-ddf6-4a84-99b3-4f1bed89e47b>.

Rwanda Ministry of Environment. 2023. "Rwanda Launches Carbon Market Framework to Advance Climate Action for a Sustainable Future." <https://www.environment.gov.rw/news-detail/rwanda-launches-carbon-market-framework-to-advance-climate-action-for-a-sustainable-future>.

- Saudi Clean Development Mechanism National Designated Authority (Saudi CDM DNA). 2023. GCOM Guidelines. V1. July 1. <https://gcom.cdmdna.gov.sa/Downloads/KSA-GCOM-GUIDELINE.pdf>.
- Saudi Clean Development Mechanism National Designated Authority (Saudi CDM DNA). 2025. "Methodologies." <https://gcom.cdmdna.gov.sa/Methodologies>.
- Saudi Press Agency (SPA). 2025. "Voluntary Carbon Market, Enowa Sign Agreement to Deliver Over 30 Million Tons of Carbon Credits." June 16. <https://www.spa.gov.sa/en/N2340669>.
- Saudi Water Authority. 2025. "Desalination Energy Consumption, Riyadh." [https://swa-cdn.swa.gov.sa/Reports/desalination\\_energy\\_consumption\\_report\\_2025.pdf](https://swa-cdn.swa.gov.sa/Reports/desalination_energy_consumption_report_2025.pdf).
- Shafi, Neeshad. 2025. "Carbon Markets and Emission Reduction Strategies for Achieving Net Zero Emissions in the MENA Region." Middle East Council on Global Affairs, February 20. [https://mecouncil.org/publication\\_chapters/carbon-markets-and-emission-reduction-strategies-for-achieving-net-zero-emissions-in-the-mena-region/](https://mecouncil.org/publication_chapters/carbon-markets-and-emission-reduction-strategies-for-achieving-net-zero-emissions-in-the-mena-region/).
- Sievert, Katrin, Tobias Schmidt, and Bjarne Steffen. 2024. "Considering Technology Characteristics to Project Future Costs of Direct Air Capture." *Joule* 8: 979–999. <https://doi.org/10.1016/j.joule.2024.02.005>.
- South Pole. 2021. *Study of Singapore as a Carbon Services Hub – Key Findings*. <https://www.enterprisesg.gov.sg/-/media/esg/files/industries/energy-chemicals/edbesgsouth-pole-carbon-services-hub-report.pdf>.
- Straits Times. 2023. "UAE's Biggest Oil Producer Plans to Start Trading Carbon Credits." June 19. <https://www.straitstimes.com/world/middle-east/uae-s-biggest-oil-producer-plans-to-start-trading-carbon-credits>.
- Suzuki, Noriko. 2025. "Qatar and Japan's LNG Relationship: Foundations, Evolution, and Strategic Outlook." Gulf Research Center, June 28. <https://www.grc.net/single-commentary/281>.
- Taarifa. 2025. "Rwanda, Saudi Arabia Launch Clean Cooking Project for 50,000 Households." October 29. <https://taarifa.rw/index.php/2025/10/29/rwanda-saudi-arabia-launch-clean-cooking-project-for-50000-households/>.
- The National. 2023. "New Alliance to Develop UAE Carbon Market." June 7, <https://www.thenationalnews.com/climate/road-to-net-zero/2023/06/07/new-alliance-to-develop-uae-carbon-market/>.
- Tracecdr. 2025. "Standard Development Organisations." <https://www.tracecdr.org/>.
- United Nations Framework Convention on Climate Change (UNFCCC). 2018. *Modalities, Procedures and Guidelines for the Transparency Framework for Action and Support Referred to in Article 13 of the Paris Agreement*. Decision 18/CMA.1, FCCC/PA/CMA/2018/3/Add.2. [https://unfccc.int/resource/tet/bg/bg1-01\\_decision\\_18\\_CMA.1.pdf](https://unfccc.int/resource/tet/bg/bg1-01_decision_18_CMA.1.pdf).
- United Nations Framework Convention on Climate Change (UNFCCC). 2019. "Information Note: Technical Note on Desalination Technologies." CDM-MP86-A01. [https://cdm.unfccc.int/sunsetcms/storage/contents/stored-file-20211001223640339/MP86\\_EA01\\_Technical\\_Note\\_desalination\\_technologies.pdf](https://cdm.unfccc.int/sunsetcms/storage/contents/stored-file-20211001223640339/MP86_EA01_Technical_Note_desalination_technologies.pdf).
- United Nations Framework Convention on Climate Change (UNFCCC). 2024. *Matters Relating to Cooperative Approaches Referred to in Article 6, Paragraph 2, of the Paris Agreement*. Decision -/CMA.6. [https://unfccc.int/sites/default/files/resource/CMA6\\_agenda%20item\\_15a\\_AUV.pdf](https://unfccc.int/sites/default/files/resource/CMA6_agenda%20item_15a_AUV.pdf).
- United Nations Framework Convention on Climate Change (UNFCCC). 2025a. "Activity Search." <https://cdm.unfccc.int/Projects/projsearch.html>.
- United Nations Framework Convention on Climate Change (UNFCCC). 2025b. "NDC Registry." <https://unfccc.int/NDCREG>.
- United Nations Framework Convention on Climate Change (UNFCCC). 2025c. *Article 6.2 Reference Manual for the Accounting, Reporting and Review of Cooperative Approaches*. V3 | April. <https://unfccc.int/NDCREG>.
- UNEP Copenhagen Climate Centre (UNEP-CCC). 2025. "Article 6 Pipeline." <https://unepccc.org/article-6-pipeline/>.
- United Arab Emirates (UAE) Cabinet. 2024. "Cabinet Resolution Concerning the National Register for Carbon Credits." <https://uaelegislation.gov.ae/en/legislations/2521>.

United Arab Emirates (UAE) Government. 2024. *The United Arab Emirates' Third Nationally Determined Contribution (NDC 3.0): Accelerating Action Towards Mission 1.5C*. <https://unfccc.int/sites/default/files/2024-11/UAE-NDC3.0.pdf>.

United Arab Emirates Ministry of Climate Change and Environment (UAE MOCCA). 2024. *The United Arab Emirates' First Long-Term Strategy Long-Term Strategy: Demonstrating Commitment to Net Zero by 2050*. <https://unfccc.int/documents/636722>.

VCM Company. 2025. "From Commitment to Action." <https://vcm.sa/en/about/>.

Verra. 2024. "Verra Hosts Workshop in Benin to Strengthen Local Carbon Market Expertise: Benin Event Points to Global Series Under MOU." July 26. <https://verra.org/verra-hosts-workshop-in-benin-to-strengthen-local-carbon-market-expertise/>.

Verra. 2025. "Registry." <https://registry.verra.org/app/search/VCS/Registered>.

World Bank. 2023. "Statement on High-Level Roundtable on Unlocking High-Integrity Carbon Markets." December 4. <https://www.worldbank.org/en/topic/climatechange/brief/statement-on-high-level-roundtable-on-unlocking-high-integrity-carbon-markets>.

World Bank. 2025. *State and Trends of Carbon Pricing*. International Bank for Reconstruction and Development / The World Bank. <https://openknowledge.worldbank.org/bitstreams/7fda7708-5f14-4628-941b-a7a7f901b780/download>.

Yi, Shi. 2024. "'Phantom' Rice Projects Expose Voluntary Carbon Market Failings." *Dialogue Earth*, December 19. <https://dialogue.earth/en/climate/phantom-rice-projects-expose-voluntary-carbon-market-failings/>.

Zakkour, Paul, Anwar Gasim, and Mari Luomi. 2025. "Carbon Markets and Saudi Arabia: A Review of Options and Analysis of Carbon Crediting Potential." Riyadh: King Abdullah Petroleum Studies and Research Center (KAPSARC). <https://www.doi.org/10.30573/KS--2025-DP06>.

Zawya. 2025. "Move to Introduce New Taxes in Bahrain." April 14, <https://www.zawya.com/en/economy/gcc/move-to-introduce-new-taxes-in-bahrain-tb92jfn>.

# About the Authors



## Axel Michaelowa

Dr. Axel Michaelowa is the head of the group on international climate policy at the chair “Political Economy and Development,” University of Zurich and Center for Comparative and International Studies (CIS). Besides his research work, he is senior founding partner of the consultancy, Perspectives. Axel is member of the editorial boards of the journals *Climate Policy*, *Climate and Development*, and *Greenhouse Gas Measurement and Management*, as well as of the board of the research network “Climate Strategies.” For over two decades, Dr. Michaelowa has been working on climate policy issues, and has published over 100 articles, studies, and book contributions, mainly on the market mechanisms of the Paris Agreement and the Kyoto Protocol. With regard to the Clean Development Mechanism (CDM), he served on the CDM Executive Board’s Registration and Issuance Team between 2006 and 2013, and has contributed to the development of eight approved CDM baseline methodologies. As one of the leading European experts on CDM institution-building in developing countries, Dr. Michaelowa has supported several governments in Asia and North Africa/Middle East. He was lead author of the chapter on international agreements in the 5th Assessment Report of the Intergovernmental Panel on Climate Change (2014), and he wrote on mitigation policies in the 4th Assessment Report of the Intergovernmental Panel on Climate Change (2007). He co-founded the Zurich Carbon Market Association in 2010 and has been its president since then.



## Mari Luomi

Mari Luomi is a Principal Fellow in the Climate and Sustainability Department at KAPSARC. She is a policy-oriented social scientist who has been studying climate change, energy transitions and sustainable development policy in the Gulf and globally for close to two decades. She has worked for other leading energy, sustainable development, and foreign policy research institutions, including the Oxford Institute for Energy Studies, the International Institute for Sustainable Development (Earth Negotiations Bulletin), Georgetown University, the Finnish Institute of International Affairs, and the Emirates Diplomatic Academy. Mari holds a master’s degree in Political Science and International Politics from the University of Helsinki and a Ph.D. in Middle Eastern Studies from Durham University. In addition to a broad research publications portfolio, she has substantial experience in executive training, presentations, policy advisory, and reporting services for multilateral environmental negotiations.

# About the Project

Carbon markets continue to receive increasing attention from governments worldwide. This trend is particularly pronounced in emerging economies. In parallel, global carbon market cooperation has received a boost from the full operationalization of Paris Agreement Article 6 in late 2024. Titled “Elements for Effective Government-led Carbon Market Strategies in Emerging Economies,” this project builds on KAPSARC’s previous research on carbon markets, which centers on the role of governments in enabling effective mitigation through carbon market frameworks and policies. The project has two thematic foci: (1) identifying elements for effective emission-compliance market schemes in emerging economies, and (2) examining how credit markets can be used for cost-effective mitigation pathways.

