Dynamics of Carbon Markets in Russia and Southeast Asia: Nature-based Climate Projects

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Abstract

Russia and Southeast Asia are pursuing strategies to enhance economic growth and industrial capacity, while taking into account environmental and climate-related limitations. In pursuit of carbon neutrality, both regions are prioritizing the implementation of natural and climate projects through a globally prevalent market mechanism: carbon markets. These markets are interpreted differently in diverse ways, ranging from the concept of absolute "freedom" in market dynamics to models characterized by substantial government and institutional involvement, facilitated by administrative and methodological regulations.

The present article has two objectives. The initial objective is to compare approaches to using natural capacity to achieve carbon neutrality in Russia and Southeast Asia. The second approach involves contextualizing these comparative characteristics within the broader framework of conceptual discourses

concerning the economic efficiency of natural and climate solutions, as well as the prospects for carbon markets in the context of the global climate change initiative.

The comparative analysis of the formation and dynamics of carbon markets in Russia and Southeast Asia reveals similarities in the formation of supply and demand for natural offsets. The experience of both regions demonstrates that the trading of carbon units is highly politically and ideologically determined, depends on the level of economic modernization, and is not a totally market-driven phenomenon. The current volume of issued carbon units remains minimal, precluding the discussion of a reduction in total greenhouse gas emissions and a substantial mitigation of climate change. However, despite the limited effectiveness of non-market measures, carbon markets are an important factor in stabilizing the climate in countries with significant state involvement in economic development, and it refers to both Russia and many Asian countries.

Introduction

Carbon markets are a globally widespread economic mechanism for combating climate change. According to the World Bank, mandatory and voluntary carbon markets cover about 20% and 10% of annual anthropogenic greenhouse gas (GHG) emissions, respectively,[1] and with countries and companies striving for carbon neutrality, the volume of carbon markets could increase to 80% of annual anthropogenic greenhouse gas emissions by 2030 [Ecosystem Marketplace 2023]. At the same time, nature-based climate projects remain one of the world's most popular tools for issuing certified carbon credits (CCUs).[2] Recent initiatives by major global greenhouse gas emitters—the US,[3] the EU, and China—are promoting greater integration of voluntary and mandatory markets to build a new generation of carbon markets capable of overcoming their main shortcomings: the unreliability of verifying the effects of natural climate projects, double counting and reselling of EUs, and the low quality and prices of carbon offsets.[4]

[1] The volumes of mandatory and voluntary carbon markets cannot, strictly speaking, be directly compared, as they have different metrics. The scale of mandatory markets is determined by the total GHG emissions of companies subject to carbon regulation legislation. The scale of voluntary markets is measured by the initial sales of carbon credits, which only record the balance of reduced or absorbed GHG emissions, not the total emissions of the crediting entity.

[2] A carbon unit is an asset in the form of prevention (e.g., renewable energy projects), reduction (e.g., energy efficiency projects), or increased absorption (e.g., reforestation) of 1 ton of CO_2 -eq, which one counterparty can purchase from another through exchange (e.g., Mosbirzha) and over-the-counter (e.g., bilateral direct agreements) trading.

[3] In the US, on May 28, 2024, a government decision was adopted defining the key principles for the functioning of highly integrated and high-quality voluntary carbon markets. See: https://www.whitehouse.gov/briefing-room/statements-releases/2024/05/28/fact-sheet-biden-harris-administration-announces-new-principles-for-high-integrity-voluntary-carbon-markets/ (accessed 11 July 2024).

[4] In this article, the terms *"carbon credit"* and *"carbon offset"* are used interchangeably; in reality, they should be distinguished, since carbon credits can be used for purposes other than offsetting a company's greenhouse gas emissions covered by scopes 1, 2, and 3 (e.g., for investment, to achieve other sustainable development goals), while carbon offsets can be implemented not only through the trading of carbon units.

Russia and Southeast Asia (SEA) have recently initiated the implementation of a carbon trading mechanism, recognizing the significant potential of nature-based solutions. A comprehensive analysis entails not only a comparison of the functioning of carbon markets in market economies as a whole, with the objective of achieving a balance between high rates of industrial and economic growth and reliance on natural and climate capacity to achieve carbon neutrality, but also taking into account the experience of Russia and Southeast Asia within the broader discourse on the merits and limitations of natural offsets and carbon markets.

A comparative analysis of Russia and the SEA has been carried out within a political economy approach, focusing on the driving forces behind the formation of demand and supply for natural offsets and the motivations of large reference groups (international organizations, NGOs, states, private businesses) within the strategic perspective. The analysis of carbon regulations in these two regions is conducted through the lens of subject-object relations, including various agents, structures, and institutions with their own interests, hierarchies, and motivations. The empirical basis of the study has been structured on the data from international programs (the Clean Development Mechanism (CDM), Joint Implementation (JI)), foreign and national registries (GS, VSC, etc.), a review of scientific literature and specialized analytical reports (Ecosystem Marketplace, Voluntary Carbon Markets Integrity Initiative, etc.). Moreover, a total of 29 sociological interviews were conducted in Russia during 2022–2023. These interviews were conducted as part of the implementation of the federal initiative of the Ministry of Education and Science of the Russian Federation concerning carbon supersites (polygons).

1. Common climate challenges for Russia and Southeast Asia

Russia and SEA have similar characteristics in terms of the development of their industrial and energy sectors, which makes them comparable in terms of their trajectories toward carbon neutrality. According to the UNIDO classification, both economic entities are classified as *middle industrial countries*, although in one case this mainly refers to raw materials and primary processing, and in the other to metallurgy, the chemical industry, and the beginnings of high-tech industries (see Table 1 on p. 46).

Table 1. Comparative characteristics of Russia and Southeast Asia

Indicators	Russia	Southeast Asia
Population (thousand people)	146,150	671,681
GDP per capita (in current prices, US dollars)	13,817	5,392
Greenhouse gas emissions from production, million tons CO_2 equivalent	1,712	1,805
Greenhouse gas emissions from consumption, million tons CO_2 equivalent	1,360	1,851
Net exports (+)/imports (-) of emissions, million tons CO_2 equivalent	3	-46
Energy Sector		
Length of main gas pipelines, km	113,073	17,665
Oil and gas production, million barrels per year	6,573	1,144

Liquefied natural gas storage terminal capacity, million tons per year	31.1	110.7
Energy intensity (kg of standard fuel per dollar of GDP at PPP)	134	144.8
Installed power of power plants, GW	275	310
Annual electricity generation (GWh)	1,115,093	1,164,276
Share of coal-fired power generation in electricity production, %	14.8	43.6
Share of renewable energy sources (excluding large hydropower plants) in electricity generation, %	0.36	10.04
Manufacturing Sector		
Share of industrial value added in GDP, %	15.1	21.8
Share of high-tech products, % of industrial value added	21.2	59.2
Share of employment in industry, %	14.2	14.5
Carbon intensity of manufacturing, kg CO_2 per $1 of added value in industry	1.27	0.58
Top 5 traded industrial goods, share in exports, %	1. Fuel (31) 2. Metals (29.3) 3. Chemical industry products (12.4) 4. Food products (7.7) 5. Wood products (3.7)	1. ICT (24.2) 2. Chemical industry products (11.0) 3. Food products (8.9) 4. Metals (6.9) 5. Machinery and equipment (5.7)

Source: compiled by the author based on the following databases: 1) key macroeconomic indicators from EMISS and ASEANStatistics 2) energy indicators from https://www.iea.org/data-and-statistics 3) industry indicators from UNIDO, Industrial Analysis Platform https://iap.unido.org/data/country?p=RUS 4) greenhouse gas emissions from https://globalcarbonatlas.org/emissions/carbon-emissions/

Firstly, energy is the primary source of anthropogenic greenhouse gas emissions, with hydrocarbons predominating in both regions in the medium term. A comparative analysis of the regions reveals that they are comparable in terms of electricity generation. While coal-fired power generation constitutes a mere 14.8% of the nation's total electricity generation, in certain megaregions, such as Siberia, this figure reaches 35.7%, a proportion comparable to the SEA, where coal-fired power plants generate 43.6% of electricity and heat. The intensive use of hydrocarbons is supported by comparable plans for the development of new oil and gas infrastructure. At present, 21,346 km and 9,936 km of pipelines are under construction in Russia and the SEA, respectively. The construction of liquefied natural gas storage terminals is also planned to increase. The capacity is expected to increase from the current 31.1 to 195.2 million tons per year in Russia and from 110.7 to 174 million tons per year in the SEA. The utilization of carbon-free energy sources, encompassing both nuclear and renewable energy, is constrained. Nuclear energy is not a viable option in the SEA, while renewable energy is underdeveloped in Russia, contributing a mere 0.36% to electricity and heat generation, in comparison to 10.04% in the SEA. This reliance on hydrocarbons, in conjunction with elevated energy intensity (134.0 kilograms of fuel equivalent per dollar of GDP at PPP in Russia and 144.8 kilograms in the SEA, in comparison to the global average of 104.2 kilograms), impedes decarbonization processes within the energy sector and prompts regions to explore alternative approaches to achieving carbon neutrality [IEA 2024].

Secondly, Russia and the SEA are medium-developed industrial economies (among the top 30 countries in the UNIDO Competitive Industrial Performance (CIP)), where the same proportion (approximately 14%) of the workforce is employed in sectors that are challenging to decarbonize. The carbon intensity of Russian industry is twice that of Southeast Asian industries. Concurrently, the latter's exports of industrial goods are increasingly contingent on the US, where progressively stringent requirements for the carbon footprint of products are being implemented [Volgina 2023]. The necessity to achieve and sustain elevated economic growth rates, predicated on both conventional and alternative energy sources, renders it challenging for both Russia and the Southeast Asian region to operate within the prevailing paradigm and disregard market-based approaches to carbon regulation.

Thirdly, the Russian Federation and the countries of the Southeastern European region, with their unique ecosystems, are facing the consequences of climate change and environmental degradation. Their extensive coastlines render them among the most vulnerable territories globally, as indicated by the 2050 Climate Change Index. Russia is particularly susceptible to the effects of global warming. Between 1976 and 2021, the country experienced an average temperature increase of 0.49°C per decade. In contrast, the global average temperature increased by 0.18°C during the same period.[5] The contemporary era is marked by an escalating frequency of natural disasters, with fires[6] and floods[7] becoming increasingly prevalent, particularly in the Siberian region. This phenomenon is accompanied by the thawing of permafrost, the drying up of swamps, the outbreak of peat fires, and the extinction of certain species of flora and fauna.[8] According to the Mekong Institute, 5,216 natural disasters were documented in Southeast Asia between 1980 and 2022, 41% of which were floods, resulting in annual damage to 80 million people. Concurrently, nature serves as a formidable instrument in the struggle against climate change. According to recent data, forests comprise 49.8% of Russia's total area. The pristine forests of Siberia are among the top five most valuable "megaforests" on the planet.[9] In the Far East, forests encompass 38.9% of the territory. In the early 2000s, the region functioned as a net absorber of greenhouse gases. However, as the population

[5] Eighth National Communication of the Russian Federation submitted in accordance with Articles 4 and 12 of the United Nations Framework Convention on Climate Change and Article 7 of the Kyoto Protocol. Ministry of Natural Resources and Environment of the Russian Federation and Roshydromet of the Russian Federation, Moscow, 2022.

[6] Over the past 20 years, the area of fires in Siberia has increased 200 times: if in 1997, 31.3 thousand hectares were engulfed in wildfires, then in 2018 it was already 8.5 million hectares.

[7] In the Siberia megaregion, where 90% of the country's water resources are concentrated, floods are becoming large-scale and destructive. For example, due to the flood in the city of Tulun in 2019, 10 thousand houses were destroyed, 40 thousand people were left homeless, and the costs of restoration amounted to 40 billion rubles (0.3% of the mega-region's GDP).

[8] In addition to weather anomalies, the nature of Siberia suffers from man-made disasters: the damage from the spill of 21 thousand tons of diesel fuel in Norilsk in 2020 was estimated at 146.2 billion rubles, and another 174 million rubles (about 250 thousand rubles per person) were paid to indigenous peoples due to restrictions on reindeer herding and fishing as the main types of economic activity of the small peoples of Taimyr.

[9] Four other "megaforests" are located in the United States (Alaska), Brazil (Amazon), Congo, and New Guinea.

grew and urbanization reached 64% by 2022 (75% in Russia), an increasing number of forest areas have been converted into agricultural land.

In this context, natural climate projects in Russia and the SEA are being considered not only for the production of natural offsets to achieve carbon neutrality, but also as important tools for nature-based solutions (NbS) to adapt to negative weather anomalies [Battle for Climate 2021; OECD 2024].

2. Theoretical understanding of the role of natural offsets and carbon markets in achieving carbon neutrality

Natural offsets are tools for combating climate change that are effective in theory [Stepanov, Galimova 2021] but controversial in practice [Miron, Soares 2021]. The importance of nature-based climate projects for the issuance of carbon credits is dictated by two circumstances. *First,* despite the anthropogenic cause of the current climate crisis, natural flows account for 95% of the annual carbon cycle, on which the desired stability of temperature fluctuations within acceptable limits depends. With minimal intervention in nature, it is possible to achieve large-scale effects. *Second,* nature has a huge carbon reserve (38,000 billion tons in the ocean and 2,300 billion tons in the biosphere), and in certain areas, its release due to, for example, fires or the melting of permafrost can quickly exceed the "heat effect" of annual anthropogenic emissions (which amount to 11.9 billion tons worldwide).

Natural offsets are usually complementary to carbon markets. There are different classifications of carbon markets depending on the type of supply and demand, as well as the mechanisms for trading carbon units. In this article, we adhere to the internationally accepted division into so-called **mandatory** and **voluntary** carbon markets, which differ from each other in the nature *of the intentions* of GHG emitters to participate in the carbon unit (CU) trading system.

Where governments set emission quotas that companies are required to meet, trading in emission permits with the corresponding potential use of carbon credits can be classified as *mandatory* carbon markets. Under another classification, these are referred to as "carbon *permit* markets" [Patnaik 2023]. Market advocates naturally also consider a carbon tax[10] as a market-based solution to global warming, although there are theoretical grounds for doubting its market nature (by analogy with the introduction of property rights)— relevant discussions are taking place in the context of the debate on ways to overcome the "tragedy of the commons" [Murphy et al. 2015]. *Mandatory carbon markets* cover about 20% of annual GHG emissions, and as more countries introduce carbon taxes and emissions trading systems, the size of these markets will also grow, according to some estimates, to 47% by 2030.

In the case of *voluntary* markets, demand is driven by the companies themselves. In another classification, such markets are referred to as "carbon *credit* markets" [Broekhoff et al. 2019]. *Voluntary markets* are not directly regulated by the state but are organized

[10] The system of state regulation using a carbon tax in some jurisdictions (e.g., Scandinavian countries) involves the use of *market* instruments such as carbon credits, which allow for a reduction in the tax base, so the carbon tax generally correlates with the functioning of *mandatory* carbon *markets*.

by international institutions (e.g. REDD+ under the auspices of the UNFCCC), non-governmental organizations (Gold Standard, Plan Vivo, etc.), which develop their own methodologies for assessing climate projects and programs and maintain registers of carbon credits issued and offset. Voluntary regulation of carbon markets is made possible by the existence of socially responsible companies that comply with norms and standards developed, for example, by the IOSCO and CFTC commissions for the California program in the US or the non-profit organization ICVCM's Core Carbon Principles in the UK, among others. As more private companies adopt *corporate strategies* of "net zero emissions" or "carbon neutrality," the volume of voluntary markets is expected to grow to 23–28% of annual GHG emissions, and its capitalization could exceed $3 trillion by 2030 [Forest Trends' Ecosystem Marketplace 2024].

Mandatory and voluntary carbon markets are interlinked, there are no strict demarcations between them, and they may overlap [IETA 2023]. Thus, voluntary carbon markets do not exclude government participation (see section II.1 of Table 2) and regulation by different entities. For example, carbon credits (CERs) were issued after a comprehensive analysis led by the UNFCCC, and if they received regulatory approval, these credits (known as secondary CERs) could be traded alongside emission allowances (EUAs) in the European ETS system; without UNFCCC approval (so-called primary CERs), they were sold at a significant discount (see, for example, the Bluenext trading platform).

Currently, natural offsets are mainly traded on voluntary carbon markets, although they are also used in several national or regional emissions trading systems (the US (California), South Korea, Singapore, etc.).

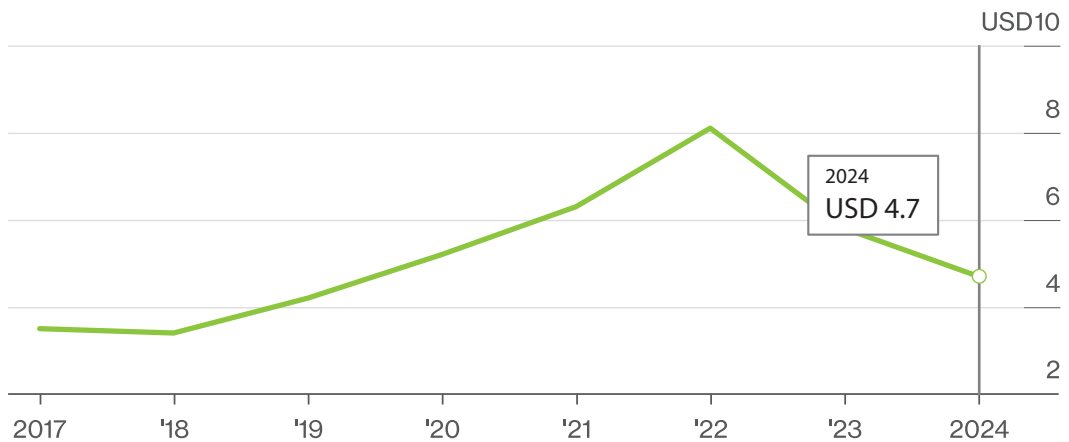
In theory, in both cases, natural offsets in both mandatory and voluntary markets allow issuers to offset part of their GHG emissions, but for different purposes: to meet government-mandated quotas or to voluntarily offset the carbon footprint of their products or services. In practice, however, modern carbon markets and natural offsets have a number of significant shortcomings that raise questions about their effectiveness.

1. In many jurisdictions, *the low cost* of carbon credits and emission allowances does not create adequate costs for emitters and expected benefits for climate project initiators, and lags significantly behind the social value of carbon[11] $80) (see Figure 1 on p. 51).

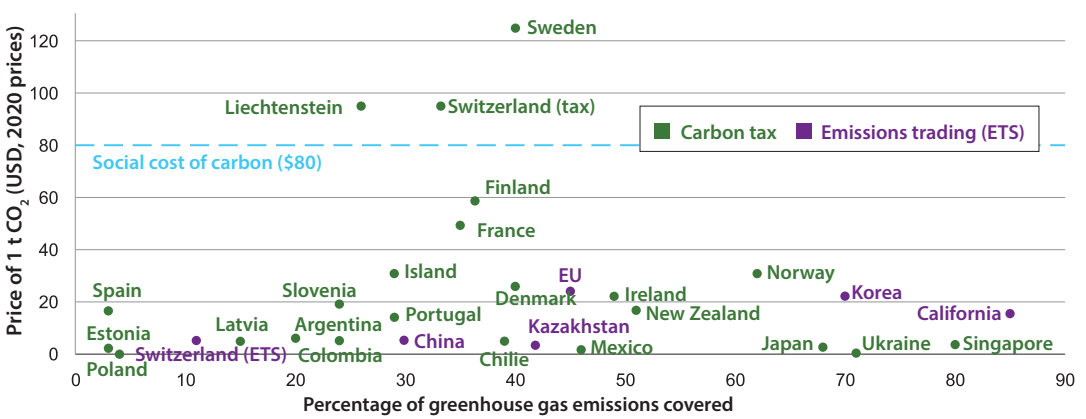
2. In some carbon markets where monitoring and verification systems are underdeveloped, various types of *opportunistic behavior* are observed. Major climate initiatives have increasingly failed. In 2023, the Cariba megaproject by US verifier Verra was discredited, which could lead to the write-off of "low-quality carbon credits" and the withdrawal of up to 38–51% of the verifier's insurance coverage. In 2024, the leader in marine biosecquestration, startup Running Tide (Maine, US), closed its microalgae aquafarm because it failed to achieve verified absorption levels.

[11] Social Carbon Cost (SCC) is an estimate of the likely socio-economic damage resulting from the emission of one ton of CO2 equivalent. Unlike market-based carbon pricing mechanisms such as carbon allowances, credits, offsets, and taxes, the social cost of carbon is a calculated indicator used purely for analytical purposes. Estimates vary significantly depending on the models used and are constantly being revised. We use an estimate based on the GIVE model (2021) with a discount rate of 3%: SCC 1 t CO_2 is estimated at $80, 1 t CH_4 at $1,316, and 1 t N_2O at $26,791.

Figure 1. Carbon price in voluntary (A) and mandatory (B) carbon markets, USD



A)



B)

Source: compiled by the author based on: A) weighted average price of carbon credits according to MSCI Carbon Markets, B) cost of allowances and carbon tax according to the World Bank Carbon Pricing Dashboard.

3. Carbon markets are seen as a tool of eco-capitalism [Rathi 2024] and create conditions for "greenwashing,"[12] helping big consulting firms thrive, which, according to [Mazzukato, Collington 2023. P. 211], earn good money from the obsession of businesses and governments with ESG metrics and carbon reporting. Critics of carbon markets suggest that reducing GHG emissions is the only way to save the climate [Coyle 2021] or even insist that "green economic growth" is an illusion [Schröder, Storm 2020]. Against

[12] "Greenwashing" originated from the English idiom "money washing" and is associated with fictitious carbon reporting, MRV procedures, etc.

this backdrop, non-market alternatives are being proposed, such as the concept of degrowth [Aronoff 2021] or the establishment of maximum permissible GHG emissions, geoengineering [Grubb et al. 2023], shifting the focus from regulating production to creating incentives to limit consumption [Makarov, Alataş 2024], or, instead of decarbonizing the economy, it is recommended to concentrate efforts and finances on adapting to the inevitable negative consequences [Porfiriev, Katsov 2011].

This criticism is accompanied by a lack of uniform understanding of the directions for reducing GHG emissions, as this process is interpreted by several concepts:

1) *Low-carbon development* emphasizes the gradual reduction of anthropogenic GHG emissions;
2) *Deep decarbonization* implies faster rates of emission reduction not only in the energy sector, but across all industries;
3) *Carbon neutrality* implies covering the annual volume of unavoidable CO_2 equivalent emissions through the use of any type of carbon credits;
4) *"Net zero"* requires achieving a state of "no impact on the climate" when the total volume of residual emissions (i.e., those that are difficult to reduce due to technological and financial constraints) is offset by reliable removal from the atmosphere and long-term storage of CO_2;
5) *"Zero carbon" development* is achieved through economic activity without any anthropogenic GHG emissions.

In Russian discourse, the first four approaches are understood as largely identical, which distorts the understanding of alternatives for decarbonizing the economy and narrows the range of solutions [Gorbacheva 2023].

These conceptual differences manifest themselves differently in Russia and Southeast Asia, which are united more by empirical reality than by ideological conviction in the effectiveness of carbon markets and natural offsets (see Table 2 on p. 52).

Table 2. Voluntary and mandatory carbon markets in Russia and Southeast Asia

Countries	Russia	Cambodia	Laos	Malaysia	Myanmar	Thailand	Vietnam	Singapore	Indonesia	Philippines	Brunei	Timor
Total emissions, 2021 (million tons CO_2 equivalent)	1800	75	43	368	247	451	458	64	1475	227	12	6
Emissions forecast, 2030 (million tons of CO_2 equivalent)	2170	155	104	-	842	927	927	60	1950	325	23.6	-
Emissions per capita (tons of CO_2 equivalent per person per year)	12.5	4.4	5.9	11.3	4.5	6.4	4.7	11.3	5.4	2.0	27.9	4.5
Carbon intensity (g CO_2 -eq/GDP)	1209	2892	2284	1091	3124	903	1334	186	1394	628	1018	3161
Target year for achieving carbon neutrality	2060	2050	2050	2050	-	2050	2050	2050	2060	-	-	-
I. Mandatory (compliance) carbon markets												
Year	2021							2019	2023			
Status	++			+		+	++	+++	+++		+	

Countries	Russia	Cambodia	Laos	Malaysia	Myanmar	Thailand	Vietnam	Singapore	Indonesia	Philippines	Brunei	Timor
Type (1-ETS; 2-carbon tax)	1			1		1	1	2	1+2		n/a	
Price per 1 ton of CO_2 , USD								18.5	0.61			
% of GHG emissions covered by the initiative								80	26			
II. Voluntary carbon markets												
II.1 Governmental Crediting mechanisms												
Year	2022	2012	2012			2014	2012		2012			
Status	+++	+++	+++			+++	+++		+++			
Scale (R-regional; N-national)	N	R	R			N, R	R		N, R			
Price per 1 ton of CO_2 (US$)	9–10					0.64–9.46			0.61			
Market volume since the start of implementation (Mt CO_2 e)	1.5	0.1	0.2			13.9	4.4		56.2			
II.2 Foreign NGOs (Gold Standard, Verified Carbon Standard, Plan Vivo)												
NGO	GS, VSC	GS, VSC	GS, VSC	VSC	GS, VSC	GS, VSC	GS, VSC	VSC	GS, VSC, PV	GS, VSC		
Year	2003	2003	2003	2005	2003	2003	2003	2005	2003	2003		
Market volume since the start of implementation (Mt CO_2 e)	0.8	51.3	1.27	0.52	0.51	15.1	9.93	1.28	91.1	0.69		
II.3 International program (Clean Development Mechanism, Joint Implementation)												
Year	2008	2005	2005	2005	2005	2005	2005	2005	2005	2005		
Market volume since the start of implementation (Mt CO_2 e)	266	9.7	4.5	13.9	7.0	16.7	32.7	0.56	49.3	5.1		
III. International transfer of carbon units (ITMO) under Article 6 of the Paris Agreement												
Year	-	2022				2022	2022	2023	2023			
Role (1-buyer; 2-seller)	-	2				2	2	1	2			
Number of contracts	-	1				1	2	13	1			
Counterparty	-	Singapore				Switzerland	Singapore, S. Korea	N	Norway			
Market volume since introduction (kt CO_2 e)	-	50				50	100	650	50			

Note: Status is indicated by + pending, ++ under development, +++ implemented.

Source: compiled by the author based on Gold Standard,[13] Verified Carbon Standard,[14] Plan Vivo,[15] Clean Development Mechanism,[16] Joint Mechanism,[17] World Bank,[18] Climate Watch.[19]

13 Gold Standard. https://registry.goldstandard.org/credit-blocks?q=russia&page=1

14 Verified Carbon Standard. https://registry.verra.org/app/search/VCS/All%20Projects

15 Plan Vivo. Access mode: https://mer.markit.com/br-reg/public/

16 Clean Development Mechanism. https://cdm.unfccc.int/Registry/vc_attest/index.html

17 Joint Mechanism. https://ji.unfccc.int/index.html

18 World Bank Carbon Pricing Dashboard. https://carbonpricingdashboard.worldbank.org/

19 ClimateWatch. Режим доступа: https://www.climatewatchdata.org/

3. Carbon market development practices in Southeast Asia

SEA is one of the world leaders in the development of voluntary carbon markets, with more than 311 million certified credits issued in the region, 68% of which are from forestry projects (see Figures 3 and 4 on p. 54).

Figure 3. Structure of carbon credit issuance in voluntary carbon markets in regions of the world, 1996–2023

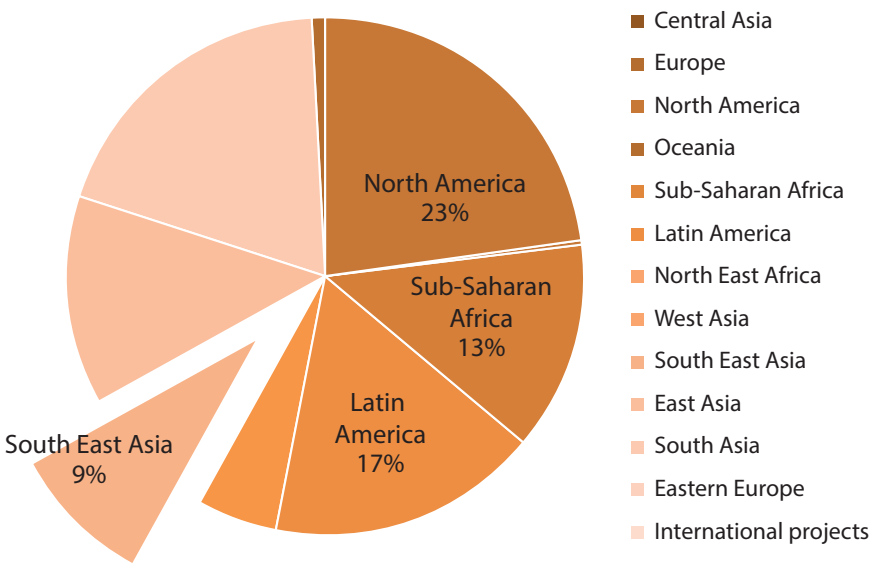
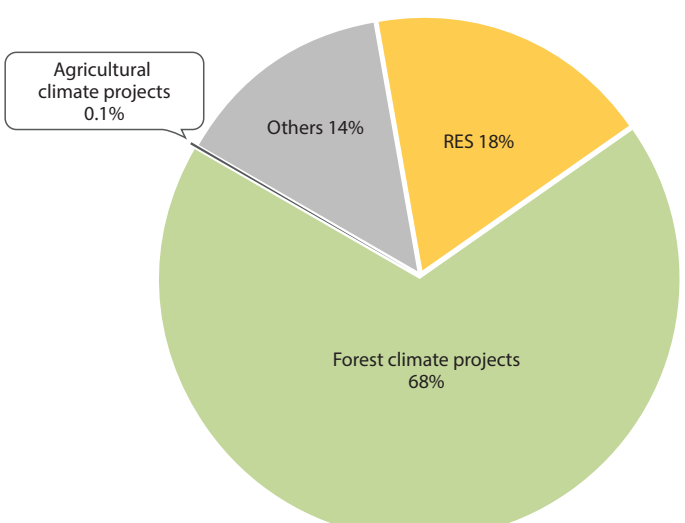


Figure 4. Structure of carbon credit issuance in Southeast Asia, 1996–2023



Demand formation

For carbon markets to function, demand for carbon credits must be created, which cannot be achieved without government programs or the involvement of foreign buyers. The voluntary carbon market in SEA began to take shape in 2003 with the introduction of the Clean Development Mechanism (CDM) under the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol, primarily for buyers from the European Union. Initially, the SEA was regarded as a provider of inexpensive CU, and Western countries, which had historically been responsible for accumulated anthropogenic emissions, utilized this market mechanism as an opportunity to employ the least costly options for offsetting the carbon footprint of their products [Rabe 2018]. In 2012, Japan initiated a voluntary carbon crediting system (Joint Crediting Mechanism, JCM) with the goal of reducing itſ international emissions. Under the JCM, Southeast Asian countries receive Japanese technology, technical support, and consulting from Japanese firms, and Japan utilizes their carbon credits to meet its international emission reduction commitments.

Domestic demand for carbon credits in the SEA region has been created by the introduction of national mandatory carbon regulation systems since 2019. SEA countries have adopted national carbon neutrality strategies, which they aim to achieve by 2050 (Indonesia by 2060, and Thailand by 2065, with plans to achieve "net zero" by 2065). Large-scale trading is only carried out in Indonesia in a hybrid format called the Carbon NEK Trading Scheme, where 146 large coal-fired power plants are benchmarked at 1.3 t CO2 -eq/MWh, and if the quotas are not met, the company will pay a carbon tax, which will be introduced in 2025 at the weighted average price of carbon on the domestic market. Natural offsets are not accepted, but other types of carbon credits are used, in particular renewable energy projects registered in the national registry. In 2023, 8,515 carbon credits were issued under the Indonesia Carbon Exchange (IDXCarbon) through large renewable energy projects in Indonesia: the PT Pertamina Geothermal Energy geothermal power plant (84.4% of carbon credit issuance), PT UPC Sidrap Bayu Energi wind farm (11.5%), and PT PJB UP Muara Karang solar power plant (1.1%).

Supply formation

A critical volume of certified CU issuance is required to maintain the liquidity of carbon markets. The establishment of bio-plantations in Southeast Asia can be traced back to the 1980s and 1990s, a period during which Japan actively relocated polluting industries, including petrochemicals and cement production, and initiated the cultivation of biomass for the purposes of wood processing and paper production. The implementation of artificial bio-plantations has been observed to cause a disruption to the water balance, as these bio-plantations require the extraction of water from much deeper than normal forest land. The absence of long-term oversight regarding bio-plantations has resulted in illegal logging, inciting protests in densely populated regions of Thailand and Indonesia [Dauvergne 1997; Laely, Davies, Alam 2020].

The implementation of CDMs in Southeast Asia was meticulously designed to enhance the quality of forestry projects and the culture of decision-making through the application of scientifically sound methodologies, consulting services provided by foreign NGOs, and the establishment of rigorous standards for assessing additionality effects. This positive experience has enabled the implementation of more than a hundred projects, primarily in Indonesia, and laid the groundwork for offering natural offsets. Government agencies in Southeast Asian countries exhibited minimal involvement, though in certain instances, they endeavored to regulate the situation by imposing additional charges (in Thailand and Vietnam) on international initiators for the privilege of implementing projects [Mehling et al. 2012]. The needs and rights of local residents were largely ignored due to the region's dependence on donor assistance and international consulting [Balboa 2018; UNEP 2023]. For instance, as part of a large-scale initiative known as The Southern Cardamom REDD+, implemented by the Cambodian Ministry of Environment and the international organization Wildlife Alliance [Chávez 2024], more than a hundred local banana farmers were forcibly resettled without the equitable distribution of benefits. According to a study [Parsons 2023], Southeast Asian countries have faced "carbon colonialism," in which natural resources continue to be exploited, exported, and profited from far from the places and people they belong to. In many ways, this is an old story, but what is new is the hidden costs of natural resource use, i.e., the "carbon bill" that is linked to resource feasting. The considerable distance between extraction centers and "dirty" industries, on the one hand, and the places where products are directly consumed, on the other hand, complicates direct environmental control. This, in turn, makes it difficult to account for the enormous volumes of greenhouse gas emissions that actually occur in the production of seemingly "clean" products. As an example, [Parsons 2023] cites English textile factories in Cambodia, which use large amounts of biomass from illegal logging to produce electricity and steam new, "zero-carbon" cotton shirts in the UK. Concurrently, Cambodia confronts considerable risks associated with global warming, which is adversely impacting the "profitable" land use and forestry sector.

As these countries have developed their own scientific expertise, five SEA countries—Indonesia, Thailand, Vietnam, Laos, and Cambodia—have initiated national voluntary CU programs since 2014, relying on domestic verification and validation organizations. The accelerated economic growth experienced by the Southeast Asian (SEA) region during the 2010s resulted in numerous countries' transition from the status of "least developed countries" and "lowest income countries." This transition, in turn, precipitated a decline in funding from international development institutions and financial entities. The emergence of carbon markets was perceived as a novel source of financing to compensate for lost government revenues. However, domestic demand for CU was found to be low, primarily due to the substantial subsidies received by the primary emitters, namely energy companies. These companies exhibited a lack of interest in acquiring carbon offsets to compensate for their high-emission activities. The services of foreign registries and verifiers remained inaccessible, leading to the resale of natural offsets at higher prices on Western secondary markets. The cost of natural offsets in Asia remains one of the lowest in the world: an average of $5.55, which is four times cheaper than in Europe, where they sold for $24.57 in 2023 [Forest Trends' Ecosystem Marketplace 2024].

Market formation

The success of carbon markets depends largely on the development of intermediary and consulting institutions (marketplaces, brokers, rating agencies, etc.) for the seamless integration of CU supply and demand. With declining donor support and external financing, SEA countries are strengthening state regulation of carbon markets, while facing challenges, primarily in data *collection and exchange* [The agenda for decarbonizing ASEAN... 2021]. The variability of natural ecosystem absorption makes these projects susceptible to "baseline" justification when determining "additionality" effects. Data exchange is difficult because various government agencies, international organizations, and independent NGOs are involved in carbon regulation, none of which are willing to share the data they have collected or require payment for its use. Many targets are set based on closed, unreviewed forecast models, and CO_2 sequestration estimates are based on fragmented, singular sources that are not representative of the diversity of SEA's ecosystems [Arimura, Sugino 2024]. For example, to justify the "additionality" of biomass utilization projects, data is collected from only 1/5 of a sample of nearly 500 sites in Vietnam.[20] Although climate policy in SEA is generally overseen by the Ministry of Natural Resources at the national level, there is bureaucratic competition for influence and funding sources. A telling example is Vietnam, where the Ministry of Natural Resources, as part of its 2011 national climate strategy (Climate Change Strategy 2011), is responsible for developing a mandatory emissions trading system based on its own scenario calculations, while the Ministry of Planning and Investment presented its own Green Growth Strategy in 2012, which establishes a voluntary mechanism for trading CU, taking into account greenhouse gas emission reduction targets that differ from those of the Ministry of Natural Resources [Asian Development Bank 2017]. Such divergent actions against the backdrop of fragmented carbon markets in Southeast Asia limit domestic demand for CU and increase dependence on foreign intermediaries.

Another problem is the lack *of in-house expertise* to assess the quality of climate projects. The reduction in the activities of international organizations has led to a shortage of highly qualified specialists who not only have the "fieldwork" skills to validate the results of climate projects but also possess the comprehensive knowledge to negotiate and consult with clients. The lack of research and development skills in Southeast Asia is linked to the overall low level of innovation in the regions where most forest climate projects are implemented. For example, research and development expenditure in Indonesia accounts for 0.28% of GDP, in Vietnam 0.43%, in Thailand 1.21% and in Malaysia 0.95%.

Nevertheless, over time, international experiments have created the conditions in Southeast Asia for the formation of an expert community that defends regional interests in the field of forestry. Consequently, under the direction of the ASEAN Secretariat, the Regional Knowledge Network on Forest Law Enforcement and Governance and the Regional Knowledge Network on Forest and Climate Change were established in

[20] What is needed to update and maintain a Safeguards Information System? Lessons from Viet Nam. UN-REDD Programme. Available at: https://www.un-redd.org/post/what-needed-update-and-maintain-safeguards-information-system-lessons-viet-nam (accessed 11 July 2024).

2007, unifying experts from prominent research institutes within the region. In order to coordinate reforestation efforts, the ASEAN Clearinghouse Mechanism (CHM) was established in 2004 to collect information on the current state of forest areas in the SEA. This platform is a "soft" environmental monitoring instrument intended for the establishment of an autonomous advisory environment and expert community that is not subject to external influence. Independent expertise, derived from meticulous research, has become a sought-after commodity among executive and supervisory bodies. This expertise is instrumental in the organization of cross-border monitoring of criminal activity and fire conditions in the region. The establishment of interregional ASEAN centers has played a role in the legitimization of public management of natural capital in the SEA, despite the unresolved issue of transparency of these structures [Urpelainen 2022].

Attempts to integrate mandatory and voluntary markets in SEA are being made through various platforms and network programs for the development of MRV procedures and blockchain data exchange technologies, such as the International Carbon Action Partnership (ICAP), the International Emission Trading Association (IETA), the Asia-Pacific Roundtable, and the World Bank's Partnership for Market Readiness (PMR) initiative to develop carbon markets. The carbon markets of China and South Korea, which accept natural offsets, are also considered promising in terms of international carbon transfer. However, these efforts remain sporadic, often dependent on bilateral agreements, and an important direction for the development of carbon markets in the SEA region is seen in strengthening the role of domestic expertise and interregional cooperation regimes for the issuance of high-quality natural offsets. In this context, Singapore, with its modest capacity to issue carbon credits, is an important trading platform for their secondary circulation. Established in 2023 by the Singapore government with the support of the World Bank, the Asian Carbon Hub[21] integrates the main carbon credit registries and trading exchanges (Climate Impact X, AirCarbon, etc.), and attracts more than 100 service companies for monitoring, verification, and insurance of carbon credits.

4. Russia's experience

Demand formation

In Russia, the use of carbon credits dates back to 2005, when the Kyoto Protocol came into force, although the first carbon credits were issued in 2003 under the Swiss Gold Standard registry. Moreover, at the beginning of the journey, before the emergence of voluntary markets, Russian environmental projects received international support,[22] but unlike donor support in the EU, here support was provided in the form of loans to Russian enterprises for the implementation of commercially viable projects (the internal rate of return reached, according to estimates [Safonov 2002], 70%) for reducing harmful

[21] International Emissions Trading Association Singapore Limited.

[22] Russian program for the organization of investments in environmental protection, established in accordance with the Agreement between the Russian Federation and the IBRD in 1995.

emissions, including GHG emissions. Overall, during the period 2003–2022, 268 million CUs were issued in voluntary programs led by the FCCC (Joint Implementation Projects) and foreign NGOs (GS, VCS) in Russia. Unlike in SEA, these were mainly implemented as part of energy projects to reduce[23] or prevent[24] greenhouse gas emissions for the needs of Russian energy companies, chemical and metallurgical enterprises. Natural offsets were practically not used. Only two projects are registered in foreign registries: project VCS1544 to reduce the impact of logging by the company "Terneyles" in Primorsky Krai and project GS3660 for reforestation by the non-profit organization Center for Environmental Innovation in Altai Krai. However, information about their validation is not reflected in the registries.

The state system of mandatory and voluntary carbon regulation began to be established after the adoption in 2021 of the Low Carbon Development Strategy[25] and the Federal Law "On the Limitation of Greenhouse Gas Emissions." Both the Strategy and the Climate Doctrine updated in 2023,[26] it is stated that Russia gives priority to the implementation of natural and climatic measures and plans to increase greenhouse gas absorption from 535 to 1,200 million tons of CO_2 by 2050 in order to achieve carbon neutrality by 2060. To stimulate domestic demand, mandatory carbon reporting has been introduced, which Russian companies emitting more than 150,000 tons of CO_2 e, submitted for the first time in their history in 2023, and after 2024, reporting will become mandatory for enterprises with emissions of more than 50,000 tons of CO_2. A system of fines and administrative sanctions will be introduced for providing incomplete or inaccurate data in reports.[27] The Russian Federation's constituent entities have initiated the Sakhalin experiment on quota trading.[28] In September 2022, the Moscow Exchange held its first commodity auction for the sale of 20 CUs for a total of 20,000 rubles, and in November 2023, 2,735 CUs were sold for 1,914,500 rubles.[29] In 2024, the St. Petersburg International Commodity and Raw Materials Exchange launched its first trading in carbon units in the amount of 100 tons of CO_2 equivalents at an initial price of 1,000 rubles per carbon unit. To date, 50 climate projects have been registered in the Russian registry and almost 20,000 carbon units have been credited toward reducing the carbon footprint.

[23] For example, under the Joint Implementation Projects program, projects were implemented to reduce fugitive emissions at oil and gas pipeline facilities in the Kostroma, Tula and Perm regions, among others.

[24] For example, the Swiss GS verified the issuance of 500,000 CUs from a biogas plant at the Kronostar factory; the American VSC registry registered 788,000 CUs for a biomass-based energy production project at the Arkhangelsk Pulp and Paper Mill.

[25] Decree of the Government of the Russian Federation No 3052-r of 29 October 2021.

[26] Decree of the President of the Russian Federation No 812 of 26 October 2023.

[27] Draft law No 265466-8 "On Amendments to the Code of the Russian Federation on Administrative Offenses". State Duma of the Russian Federation. Available at: https://sozd.duma.gov.ru/bill/265466-8

[28] Federal Law "On Conducting an Experiment to Limit Greenhouse Gas Emissions in Certain Subjects of the Russian Federation" of 6 March 2022 No 34. ConsultantPlus. Available at: http://www.consultant.ru/document/cons_doc_LAW_411051/ (accessed 11 July 2024).

[29] Information on the total number of contracts and the total value of contracts concluded at commodity auctions by National Mercantile Exchange (NAMEX). September 2022, October 2023. Available at: https://www.namex.org/ru/commodityauctions/realtimeCA/monthCA (accessed 11 July 2024).

In this context, natural and climate projects have become popular with Russian companies not as a way to offset direct emissions, but as a natural extra source of income. *"Business understands the law of economics, and every business has 'profit' written in its charter, so the 'carrot' method is very important in itself,' a respondent emphasizes. Another respondent agrees: "We have a lot of forests, a lot of land, a lot of territory. Why can't we make money from it?"* In the long term, this strategy by Russian businesspeople may prove to be misguided if the concept of "net zero emissions" begins to prevail globally, which would affect the principles of international non-financial reporting.[30]

Supply formation

Large Russian companies are not only demanding carbon credits but are also the main initiators of climate projects because, as one respondent noted, *"this is still a promising and business-oriented topic for us. Large corporations are currently heavily involved in this, especially those that depend on share prices."* In 2022, the Russian CU registry recorded the implementation of the first climate project by DalEnergoInvest, which involved preventing the emission of 1,800 tons of CO_2 as a result of electricity generation by a solar power plant on the Kuril Islands in the Sakhalin Region.[31] Natural and climate projects generate a multiple of the volume of CUs. For example, one of the first forest climate projects registered in Russia was the Poronaisky Forestry Project in the Sakhalin Region, which is expected to generate 1.5 million CUs by 2102.[32] However, the prolonged nature and ambiguity of the estimates of the effects give rise to justified doubts about their validity. *"To date, all estimates of absorption are theoretical, i.e., they do not have a solid evidence base. There is no need to prove that vegetation absorbs carbon. The question is: how much?"* This is the question asked by one of the respondents.[33]

To fill this gap, the Russian Ministry of Education and Science launched a carbon sink program in 2021. As a result, a network of diverse "carbon farms" *(forest-agriculture-aquaculture farms)* was created to produce natural and technological offsets in Russian regions. Large Russian companies have become industrial partners of these testing grounds [Gulev, Durmanov, Shashkin 2022]. The "farms" are designed to promote the use of the absorption and accumulation capacities of natural ecosystems, whose carbon potential on voluntary markets is likely to increase in value given their long-term nature and valuable indirect effects in terms of biodiversity protection, income diversification, job creation, etc. However, according to a survey of carbon sink operators, there remains "uncertainty regarding the verification of the data obtained

[30] It is no coincidence, for example, that in 2023, Google announced that it would stop purchasing cheap carbon offsets for "carbon neutrality" and intends to achieve "net zero emissions" by 2030 through CDR projects.

[31] Carbon Unit Registry of the Russian Federation. Registry publications. Available at: https://carbonreg.ru/ru/projects/ (accessed 11 July 2024).

[32] Validation report of the Carbon Polygon Research Center of Novosibirsk State University. Available at: https://carbonreg.ru/ru/projects/8/ (accessed 11 July 2024).

[33] Order of the Ministry of Education and Science of the Russian Federation No 74 of 5 February 2021.

(in particular, uncertified instruments may be used in current studies)" [Center for Strategic Research 2022. P. 13].

In parallel with this, a large-scale federal initiative, Major Innovative State Project "Unified National System for Monitoring Climate-Active Substances,"[34] is being implemented under the supervision of the Russian Ministry of Economic Development for scientific expertise on climate initiatives (including forest climate initiatives). However, these are assessed differently by experts. For example, some experts claim that the net absorption of GHGs by Russian forests "allows for the compensation of about 10% of GHG emissions in Russia" [Ptichnikov, Shvarts, Kuznetsova 2021], while others argue that "doubling the net sink in the LULUCF seems doubtful ... and achieving carbon neutrality in Russia's economy by 2060 is unlikely" [Klimenko et al. 2023]. According to other estimates, "Russia will achieve carbon neutrality 10 years earlier, by 2040, and subsequently become a net absorber of greenhouse gases" [Dmitriev 2022], "Russia will have the opportunity to sell its CO_2 assimilation services to countries with low CO_2 absorption capacity" [Fedorov, Moiseev, Sinyak 2011], because, according to estimates by the organizers of the "forest farm" at the Voronezh State University of Forestry a nd Technologies named after G.F. Morozov (VSUFT), income from the sale of natural offsets amounts to 595,000 rubles per hectare at the current price of CUs on the Moscow Exchange [Concept... 2023]. Against this backdrop, a respondent representing a large chemical company notes that *"many speculators have appeared in this area. We have been looking for contractors to inventory GHGs for four months now. There are a lot of speculative elements, and there are no independent experts who could help assess the capabilities of contractors. From this point of view, everything is very complicated. There are very few companies that can guarantee high-quality work."*

Market formation

To assist climate project developers in Russia, special calculators have been prepared for investors in "forest climate units" [Kuznetsov, Stetsenko, Nikishova 2022]; maps of Russian regions with an economic assessment of the potential for implementing forest climate projects have been published,[35] methodologies have been developed based on the system of approaches and methodological support for the implementation of climate projects adopted in the Russian Federation [Sorokina, Ptichnikov, Romanovskaya 2023]; various methodologies for their assessment have been developed,[36] which have undergone public discussion.

Validation and verification centers (see Table 3 on p. 62) registered with Rosaccreditation have already validated 50 climate projects.

[34] Order of the Government of the Russian Federation No 3240-r of 29 October 2022.

[35] Interactive map of climate projects in Russia. ESG Alliance. Available at: https://maps.esg-a.ru/climate-projects-map (accessed 11 July 2024).

[36] Carbon Unit Registry of the Russian Federation. Climate Project Methodologies. Available at: https://carbonreg.ru/ru/methodology/accepted_methodologies/ (accessed 11 January 2024).

Table 3. Register of accredited organizations for greenhouse gas validation and verification in Russia, 2022–2023

Organization	Region	2022	2023	Область аккредитации
Saint Petersburg Forestry Research Institute	Saint Petersburg	+	+	Verification. Forestry activities
Rusatom Infrastructure Solutions	Moscow	+	+	Validation. Energy
Federal Center for Analysis and Assessment of Technogenic Impact	Moscow	+	+	Verification. Energy
Atomenergoproekt	Moscow	+	+	Verification. Animal husbandry
NES Profekspert	Tatarstan	+	+	Verification. Energy
Nanocertifica	Moscow	+	—	Verification. Industry
PROMMASH TEST Ekologiya	Saint Petersburg	+	—	Verification. Industry
Yu. A. Izrael Institute of Global Climate and Ecology (IGCE)	Moscow	+	—	Verification. Plant and animal husbandry
Bauman Moscow State Technical University	Moscow	+	+	Verification. Agriculture
Innopolis University	Tatarstan	+	+	Validation. Energy
Center for Laboratory Analysis and Technical Measurements for the Siberian Federal District	Novosibirsk	+	+	Verification. Plant and animal husbandry
RUDN University	Moscow	+	+	Verification. Metallurgy
VNIIGAZ-Certificate	Moscow region	+	+	Validation. Energy
Ufa State Petroleum Technological University	Republic of Bashkortostan	—	+	Validation and verification
National Center for Validation and Verification of Environmental Information of the Institute of Global Climate and Ecology	Moscow	—	+	Validation and verification
Russian Energy Agency (REA) by the Ministry of Energy of the Russian Federation	Moscow	—	+	Validation and verification
SOYUZEXPERTIZA CCI RF (SOEX)	Moscow	—	+	Validation and verification (oil and associated gas production)
Russian University of Transport (MIIT)	Moscow	—	+	Validation and verification (railway transport activities)
Novosibirsk State University	Novosibirsk	—	+	Validation (agriculture, forestry, logging)
Coordinating Informational Center of CIS Member States on approximation of regulatory practices	Moscow	—	+	Validation and verification (production of organic and inorganic chemicals)
Union for the Protection of Environmental Rights of the Population of the Moscow Region	Moscow region	—	+	Validation and verification

Note: + indicates active status, — indicates termination of the organization's activities.
Source: National Accreditation System, Register of Accredited Entities, 2023.

As in Southeast Asia, assessment methodologies and standards in Russia are high-level in nature, similar in content to the Swiss GS and US Verra methodologies and based on a traditional approach that assumes an average additional absorption

over *100 years*. According to the Russian methodology, additionality effects must be demonstrated "through a reliable assessment showing that the activity would not have been carried out *in the absence* of project *incentives, taking into account all* relevant national regulations and legislation" [Guidlines No 001 2023]. For project initiators, for example in reforestation, *guarantees* must be provided that *"the project results will be maintained for 100 years"* to minimize the risks of permanence [Methodology ... No 0010 2023], otherwise a discount of 3–15% of the volume of "issued" CUs is proposed. To reduce the risk of double counting and resales, a *certification* is introduced stating that the project results "will not be transferred to third parties and will not be encumbered by third-party rights *during the implementation period* of the climate project".[37] Such utopian horizons and comprehensive and "soft" legal formulations cast doubt on the authenticity of the effects and create risks of unscrupulous behavior [Agafonov 2024].

Coordination among participants in the carbon market in Russia is complicated by a lack of consensus and the existence of different methodologies from different federal agencies and private services. For example, two methodologies are proposed for calculating direct emissions (scope 1): one by the Ministry of Natural Resources[38] and one by the Ministry of Economic Development,[39] which in some cases give discrepancies of 20–30% in the assessment of a company's greenhouse gas emissions. As in the EU, one of the main problems is the formation of an up-to-date information database. For example, auditors from the Accounts Chamber of the Russian Federation noted that "ambitious targets have been set for the coming decades to increase the capacity of forests to absorb greenhouse gases, but these have not been linked to forestry measures that would stimulate such capacity. The targets for forest absorption capacity in strategic planning documents are not consistent with each other" [Accounting Chamber of the Russian Federation 2022]. Data collection and exchange is difficult not only between carbon sink programs and state projects supervised by different ministries, but also within the research community itself. As one respondent noted, *"We have encountered the problem of processing large amounts of data. Our farmers are drowning in information, accumulating large amounts of data and acquiring digital skills to process it, but they do not understand the processes taking place in the soil and the causal relationships that exist today. These can only be understood on the basis of many years of observation."*

Moreover, there is a conceptual diversity of project types in official discourse: "adaptation",[40] "green,"[41] "climate," "sustainable development,"[42] and "ESG projects,"

[37] Draft resolution of the Government of the Russian Federation on the rules for creating and maintaining a carbon unit registry. Date: 20 October 2023. https://regulation.gov.ru/projects#npa=142902

[38] Order of the Ministry of Natural Resources of Russia No 371 "On the approval of methods for the quantitative determination of greenhouse gas emissions and greenhouse gas removals" of 27 May 2022.

[39] GIS Energy Efficiency, https://co2.gisee.ru/calculator

[40] Order of the Government of the Russian Federation No 1912-r of 14 July 2021.

[41] Decree of the Russian Federation No 1587 of 21 September 2021.

[42] Information letter of the Bank of Russia No IN-06-28/96 of 19 December 2021.

which are poorly correlated with each other. *"Right now, gather ten entrepreneurs, ask them about carbon credits and the ESG agenda, and four of them will say something intelligible, while the rest will have no idea what you are talking about,"* notes one respondent.

This departmental diversity explains the wait-and-see strategy of Russian businesses, which point out that *"we lack a call center that could consolidate all the information and all the companies on the climate agenda. We need to develop common approaches and methodologies in this area because the climate agenda in Russia is very fragmented."*

Indeed, at the regional level, the climate agenda is usually overseen by several ministries, blurring responsibility and the quality of decision-making, which affects, for example, the preparation of annual adaptation plans, the implementation of which, according to the Russian Ministry of Economic Development, remains low. As one respondent emphasizes, *"the whole system of quotas and carbon credits would be better formed at the regional level. This is not yet working very well at the national level." Another respondent disagrees, arguing that "it is preferable to focus on the federal level. At the local level, there will again be disagreements about who is responsible for what. I would like to see some uniformity."*

To consolidate research and strengthen management decisions, a *Siberian climate hub*[43] is being created for three regions with similar natural, climatic, and economic characteristics: the Novosibirsk Region, the Kemerovo Region, and the Altai Krai. The main goal is to carry out research work in two areas: first, how the economy of the regions affects the climate, i.e., how the economic activity of the three regions affects changes in greenhouse gas emissions; second, how climate change affects the regional economy, i.e., how certain weather phenomena (increases in average annual temperatures and precipitation levels, etc.) affect the socio-economic condition of the three regions (crop yields, public health, etc.). These studies enable ministries in neighboring regions to take scientifically sound action to combat climate change and its consequences (fires, floods, droughts, etc.) and to use cost-effective decarbonization options.

International transfer of EU is being developed along the EAEU vector, primarily with Kazakhstan, which in 2021 relaunched its mandatory quota trading system with the acceptance of natural offsets. The creation of "mirror" carbon supersites (polygons) in the BRICS countries in 2024 is intended to strengthen international cooperation on CU issues under Article 6 of the Paris Agreement [ICLRC 2023]. Some business respondents are skeptical about building equal international relations. *"The Chinese came to us for consultation. They knew we had free land, were ready to take tens of thousands of hectares from us on a long-term lease, and offered: 'We will bring our Chinese workers and equipment, sow the crops we need, take the harvest back to China, and we will only pay you rent.' That's a mutually beneficial relationship,"* notes a respondent from Altai.

[43] This research initiative was supported by the heads of three regions, and the Legislative Assembly of the Novosibirsk Region approved the Law on the Creation and Functioning of the Hub in its second reading (11 July 2024). See: https://zsnso.ru/proekt-povestki-47-sessii-zakonodatelnogo-sobraniya-novosibirskoy-oblasti-7-sozyva

Conclusion

A comparative analysis of the development and current net worth in carbon markets in Russia and Southeast Asia shows many similarities between them in the formation of supply and demand for natural offsets.

1. In both regions, large-scale experience in voluntary carbon crediting began in the early 2000s with the emergence of international programs under the auspices of the UNFCCC (JI in Russia and CDM in the SEA) and foreign NGOs (VSC, GS, etc.). Since then, a comparable number of credits have been issued, 268 million and 311 million CUs, respectively. However, in Russia, energy projects have mainly been implemented by Russian oil&gas and manufacturing companies, while in SEA, forest carbon projects have been implemented by European and Japanese manufacturers.

2. Domestic demand for CUs is still insignificant and began to form with the introduction of state programs. Although these processes began 10 years earlier in Southeast Asia, in 2012, and at present two countries—Indonesia and Singapore—have fully-fledged markets, unlike Russia, where quota trading is still operating on a pilot basis in one region—the Sakhalin region. In this context, natural offsets are seen not so much as a way to offset companies' direct emissions, but as a source of additional income for the initiators of natural climate projects. The expected return in both regions is limited by the volatility of domestic and external prices, as well as the lack of high-quality carbon units.

3. The integration of carbon markets in both regions is complicated by weak coordination between participants (government agencies, verifiers, consultants) and difficulties in collecting and processing data, which lead to inconsistent management regimes and dependence on external consulting and international expertise. The creation of national intermediary and assessment institutions (trading hubs, brokers, ratings agencies, insurance companies) could improve the situation, but this is difficult to achieve without a high level of expertise, on which the improvement of assessment methodologies for climate initiatives for the new generation of carbon markets largely depends. This is seen as a promising form of cooperation between Russia and SEA, which are equally focused on selling natural offsets while overcoming their dependence on international consulting. Moreover, this is of national and international importance. Both regions are interested in selling natural offsets to counterparties in other jurisdictions under Article 6 of the Paris Agreement. According to the guidelines of the UN Framework Convention, in order to avoid double counting, national commitments to reduce greenhouse gases[44] of "host countries" are increased by the amount of international carbon credit transfers. Incorrect methodologies and overestimation of carbon offsets may lead to overestimating of national commitments and underestimation of "additionality" effects in the national greenhouse gas inventory.

The experience of Russia and SEA shows that the trading of carbon units is highly politically and value determined, depends on the level of economic modernization, and is not a totally market-driven phenomenon, as its launch and establishment require

[44] The Russian Federation's nationally determined contribution to the implementation of the Paris Agreement (NDC).

some degree of state involvement. The prices and volumes of carbon units are still low, which does not allow us to talk about a reduction in total greenhouse gas emissions or a significant mitigation of climate change. Nevertheless, the effectiveness of non-market instruments is very limited, carbon markets are an important factor in achieving carbon neutrality in countries with significant state involvement in economic development, which is well suited for both Russia and many Asian countries.

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