GREENPEACE

THE MIRAGE OF EMISSION REDUCTION:

The Risks of Using Forestry Carbon Offset Credits in the Oil and Gas Industry

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01

Key findings

- **85% of all "carbon neutral" LNG cargoes have been sold to buyers in Asia.** PetroChina and CNOOC have already signed long term deals with Shell. The first sales of "carbon neutral" LNG began in June 2019, using carbon offset credits to market LNG, a fossil fuel, as "carbon neutral" [1] [2].

- Increased emphasis and marketing on carbon offsets come at a time when major oil and gas companies are either walking back previous climate commitments or remain wholly uncommitted to climate action. Major global oil and gas companies like **Shell, BP, and TotalEnergies have recently walked back major climate commitments**[3] [4].

- **PetroChina and Sinopec, meanwhile, have not made any short-, medium-, and long-term climate commitments with clear pathways**, despite Beijing's dual carbon commitments.

- China-based forestry carbon offset projects **account for almost one in four Verified Carbon Standard (VCS) projects** certified by Verra globally[5] [6].

- In addition to methodological issues that are common to forestry carbon offset projects around the world – impermanence, baseline, additionality, and double-counting[7]– Greenpeace's preliminary analysis found these types of projects in China **frequently evidence inconsistent project quality** due to fragmented development and non-coherent forest carbon standards, insufficient data collection and lack of scientific measurement standards, complex forest land tenure structure, issues in professionalism in accrediting and management, and potential ecosystem risks.

- A preliminary analysis of 15 forestry carbon offset projects in China, of which the carbon offset credits had already been retired by oil and gas companies, shows that more than **80% of projects planted tree species that are medium- to high-risk for flammability**. 20% of projects are low-risk for flammability.

02

Key recommendations

01

Oil and gas companies shall not count carbon offset credits towards emission reductions to meet decarbonization targets;

02

Oil and gas companies shall not advertise fossil fuel products as “carbon neutral”. It is net zero greenwashing and misleading to consumers, which shall not be tolerated;

03

Oil and gas companies shall be required by regulators to establish specific emissions reduction targets and action plans in line with the Paris Agreement, with a focus on limiting global warming to within 1.5°C, the emissions reduction targets of the regions in which they operate, and the impacts of related policies on their business;

04

The business portfolio of oil and gas companies must shift towards renewable energy, and the reliance on carbon offsets need to be stopped;

05

Disclosure of carbon offset investment, intended use of carbon offset credits, and other details of carbon offset projects, needs to be reinforced at both the corporate and regulatory level, through corporate annual reports, financial and ESG reporting, and other forms of external disclosure.

06

Oil production needs to be reduced in alignment with the Paris Agreement with clearly stated timelines and quantitative intermediate steps. Zero-carbon fuel supply needs to be supported and promoted at an international- to national-level in order to reduce the oil consumption in transport.

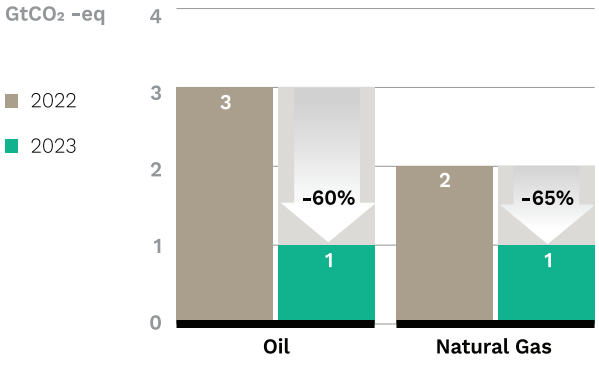
03

The oil and gas industry and climate change

Carbon emissions and climate action in the oil and gas industry

The oil and gas industry is a major source of greenhouse gas (GHG) emissions globally, with an 80-90% originating from Scope 3 emissions[8], including carbon dioxide (CO_2) and methane (CH_4) from oil and gas exploration, extraction, production, processing, transportation, and consumption. Oil and gas production activities (Scope 1-2 alone) account for about 15% of total global energy-related emissions, equivalent to 5.1 billion tons of GHG emissions, according to a report released by the International Energy Agency (IEA) in May of this year[9]. The emissions intensity of these oil and gas industry activities needs to be reduced by 50% by 2030 in the scenario projecting zero emissions by 2050 mapped out in the IEA's analysis. Factoring in necessary reductions in oil and gas consumption required to meet zero-emissions goals in this scenario, emissions linked to oil and gas production activities would need to be altogether reduced by 60% by 2030 (Figure. 1).

Figure 1. Total emissions of oil and gas operations in the Net Zero Scenario, 2022-2030



Source: IEA

In the IEA's Net Zero Roadmap: A Global Pathway to Keep the 1.5 °C Goal in Reach, the supply of oil would fall by 42% and natural gas by 47% by 2035 compared to the 2022 level. The pathway for the global energy sector to reach net zero emissions of CO_2 by 2050 would require deploying a wide portfolio of clean energy technologies, and reducing fossil fuel demand by more than 80% in 2050[10]. This is the future where oil and gas companies need to adapt to their business portfolios.

Shell has previously committed to cut production by 1-2% each year until 2030. However, in June this year at an investor event, it said that its production would remain stable until 2030 and that it would invest $40 billion in oil and gas production between 2023 and 2035[11]. Shell's CEO announced that Shell would double down on main profit-drivers like oil and gas[12]. Along with the sidelined climate commitments, Shell's previous carbon credit commitment to invest $100 million per year has now been put on hold[13]. BP and TotalEnergies have likewise announced reductions in previous climate commitments, and both have scaled back emissions reduction targets for upstream oil and gas production from a 35% to 40% reduction range to a 20% to 30% reduction.[14] [15]

Cutting the emissions intensity of oil and gas production activities (Scope 1-2) by half by 2030 globally will require an upfront investment equal to $600 billion[16], which is a fraction of the record revenues that oil and gas producers earned in 2022. Since the signing of the Paris Climate Accord in 2016, however, no major global oil and gas companies have made commitments commensurate with limiting global temperature to within 1.5 degrees Celsius, and most of them have not set Scope 3 net zero ambitions.

Only three of the top 10 oil companies by revenue have established net zero 2050 goals – Shell, BP, and Total – all of whom have recently announced walkbacks on the percentage of emissions reductions they previously committed to. Each of these companies continues to expand oil and gas extraction targets and associated sales. [17] [18]

Figure 2 tracks emissions reduction targets from ten of the highest-profiting oil and gas companies, showing that none have short- to medium-term emissions reduction targets consistent with limiting global temperature rise to below 1.5 degrees Celsius.

Figure 2. Global top 10 oil and gas companies' climate commitments

Company	Net Zero GHG emissions by 2050	Short term (up to 2026) GHG Reduction Targets	Medium term (2027-2035) GHG Reduction Targets	Long term (2036-2050) GHG Reduction Targets
Saudi Aramco				
Sinopec				
PetroChina				
ExxonMobil				
Shell				
TotalEnergies				
Chevron				
BP				
Marathon Petroleum				
Valero				

Met Climate Action 100+ standards

Partially met Climate Action 100+ standards*

Didn't meet Climate Action 100+ standards

**target is not aligned with the goal of limiting global warming to 1.5°C or does not cover the most relevant Scope 3 emissions categories*

Source: ClimateAction 100+ (data collected: Oct 31, 2023)

Over reliance on forestry carbon offset credits

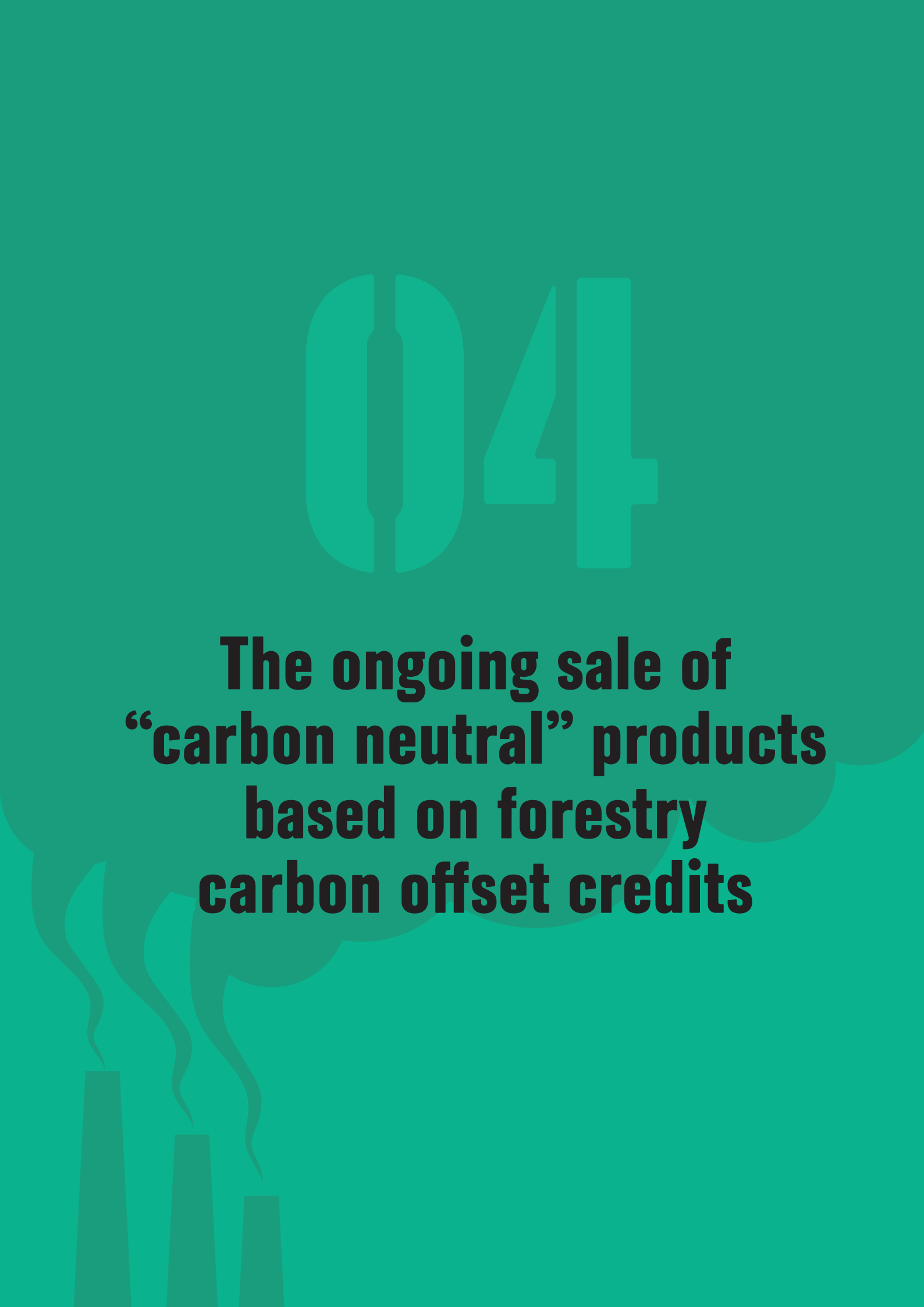
For oil and gas companies, purchasing carbon offset credits presents a relatively hassle-free way to fulfill carbon neutrality or emissions reduction targets on paper. And forestry carbon offset credits make up the largest share of the carbon credit market, supplying as much as 45% of the total market between 2015 and 2022.[19] The trend of oil and gas companies frequently opting for the relatively cheap option of directly purchasing carbon offset credits rather than spending the time and resources required to implement long-term, structural changes to develop clean and sustainable technologies, however, presents problems. Ultimately, corporate over-reliance on carbon offsets will prevent structural climate action and technological progress.

Ignoring required emissions reductions and instead purchasing carbon credits to offset emissions is a deeply flawed approach. The issue of permanence, in particular, is ignored by this approach. Extracting and burning fossil fuels that have been long stored underground releases GHGs that will affect the earth's atmosphere for hundreds of years, an impact that cannot be offset by temporarily storing them in ecosystems or by purchasing any credits that do not equate to additional GHG emission reductions.

As the climate crisis intensifies, reliance on ecosystems or forestry carbon offsets also becomes more risky and unreliable.

04

The ongoing sale of “carbon neutral” products based on forestry carbon offset credits



Advertisements and claims that certain products from oil and gas companies are "carbon neutral" in their production and use frequently rely on carbon offsets.

Frequently, claims for an entire supply chain are formed around a single carbon offset credit, such as a forestry or other carbon sink project. This practice fails to address GHG emissions generated throughout the oil and gas supply chain, including Scope 3 emissions from combustion.

Carbon Market Watch's 2021 global survey[20] of ten top energy companies, including Shell, BP, TotalEnergies, Gazprom, Eni, Petronas, PetroChina, China National Offshore Oil Corporation (CNOOC), Cheniere, and Occidental Petroleum, analyzing 18 carbon neutrality-related announcements between 2020 and September 2021, finds that none of the companies met the most basic requirements to make any of their products and especially their fossil fuel products carbon-neutral.[21]

"Carbon-neutral liquefied natural gas (LNG)"

"Carbon-neutral liquefied natural gas (LNG)" refers to LNG products whose CO_2 emissions from upstream extraction, processing, liquefaction, transportation, regasification, or end-use are offset via any of a variety of carbon offsets, mainly forestry carbon offsets, and/or supplemented by renewable energy generation, carbon capture, etc., such that offsets produce a net-zero emissions calculation in the LNG value chain.

Shell is one of the first companies in the world to supply "carbon neutral LNG". Shell's "net-zero carbon LNG" products primarily use carbon offset credits from deforestation prevention and afforestation projects. The global trade of "net-zero carbon LNG" products began in 2019 and by June 2021, 21 global shipments had been made, totaling approximately 1.47 million tons of LNG. "Net-zero carbon LNG" currently makes up around 1% of the total trade of LNG globally, and S&P Global anticipates at least half of all LNG trades will use "net-zero carbon LNG" over the next 10 years.[22]

"Net-zero carbon LNG" does not by itself reduce emissions, and only by combining offsets with structural emissions reductions can companies meet growing energy demand without jeopardizing global, national, and corporate climate change mitigation goals.[23]

To date, most buyers of "net-zero carbon LNG" are based in Asia, with 85% of all global "net-zero carbon LNG" cargoes.[24] Shell's Executive Vice President, for example, has said that in both China and Japan, Shell's customers are able to offer "net-zero carbon" LNG to their customers.[25]

A brief summary of global 'net zero carbon LNG' trading:

- In June 2019, Shell entered into the world's first "net-zero carbon LNG" trades with Tokyo Gas and GS Energy in South Korea.[26]
- The first shipment of "net-zero carbon LNG" to Europe was in March 2021.
- PetroChina and Shell signed the world's first long-term net-zero carbon LNG trading agreement in April 2021.
- In June 2020, Shell signed a 2-vessel net-zero carbon LNG deal with CNOOC using carbon credits from a number of nature-based projects around the world, including Qinghai and Xinjiang,[27] and in the same year Total delivered its first net-zero carbon LNG shipment to CNOOC.[28]
- From January 2021 to June 2021, net-zero carbon LNG accounted for 2% of all global LNG spot deals, with 13 shipments with a transaction size of about 1.47 million tons (around 70,000 tons per shipment).
- Shell was the first company to supply net-zero carbon LNG, accounting for 40% of the current global volume traded.[29]
- In June 2021, Oman LNG signed an agreement with Shell to deliver the first net-zero carbon LNG in the Middle East.[30]
- In February 2023, Shell delivered approximately 70,000 metric tons of LNG to the CPC Corporation in Taiwan, the first cargo certified by a new set of International Group of Liquified Natural Gas Importers (GIIGNL) as "greenhouse gas neutral". This shipment used carbon offset credits from a deforestation prevention project, a project type that climate scientists at the UN-backed Science-based Targets Initiative have said does little to sequester additional carbon from the atmosphere and should not be applied to net-zero emissions targets.[31]

Table 1. Global "carbon neutral LNG" trading history

Date	Total cargo	Buyer	Seller	Market	Did it use forestry carbon offset credits?
June 2019	1	Tokyo Gas Company	Shell	Japan	Yes
June 2019	1	GS Energy	Shell	South Korea	Yes
June 2019	1	-	Chubu Electric Power	India	No
March 2020	1	CPC Corporation	Shell	Taiwan	Yes
June 2020	2	CNOOC	Shell	China Mainland	Yes
October 2020	1	CNOOC	TotalEnergies	China Mainland	Yes
November 2020	1	CPC Corporation	Shell	Taiwan	Yes
February 2021	1	Hokkaido Gas	Mitsui Group	Japan	Yes
March 2021	1	Shell	Gazprom	England	Yes
March 2021	1	POSCO	RWE	Australia	-
April 2021	1	TOHO Gas Co.	Mitsubishi Corporation	Japan	-
April 2021	1	Shell	Cheniere Energy	Italy	Yes
April 2021	1	Pavilion Energy	-	Singapore	Yes
June 2021	1	Shell	Oman LNG	Import terminal unknown (Middle East/South Asia)[32]	Yes
July 2021	1	Osaka Gas Co.	Shell	Japan	Yes
July 2021	1	INPEX Holdings	Ichthys LNG	Japan	Yes
July 2021	1 (5 year long-term supply)	Sinopec	Shell	China Mainland	Yes
July 2021	1	Sempra Energy	BP	Mexico	Yes
August 2021	1	CPC Corporation	Eni	Taiwan	Yes
August 2021	1	Yonden	Petronas	Japan	No
September 2021	1	Shizuoka Gas Co.	INPEX Holdings	Japan	Yes
September 2021	1	CPC Corporation	BP	Taiwan	Yes
September 2021	1	Toho Gas Co.	INPEX Holdings	Japan	Yes
September 2021	1	Gas Natural Fenosa	-	Spain	-
September 2021	1	Toho Gas Co.	Sakhalin Energy	Japan	-
September 2021	3	Shenergy Group Co	Petronas	China Mainland	-
October 2021	1	Japan Petroleum Exploration Co.	Mitsubishi Corporation	Japan	-
December 2021	1	CNOOC	BP	China Mainland	Yes
January 2022	1	Hiroshima Gas	Petronas	Japan	Yes
September 2022	1	CPC Corporation	Chevron	Taiwan	Yes
January 2023	1	CPC Corporation	Shell	Taiwan	Yes

Source: BloombergNEF, S&P Global, Greenpeace East Asia

"Carbon-neutral oil fields"

Carbon-neutral oil fields similarly aim to reduce net carbon emissions that occur during oil extraction and production through ulterior means, including reducing energy consumption, improving energy efficiency, carbon offsets, and carbon capture and storage, with the ultimate goal of achieving a net-zero carbon emissions calculation or to otherwise minimize the carbon footprint of the product, with some products ultimately labeled "carbon-neutral".

In April 2021, the Swedish oil and gas company Lundin Energy announced the sale of the oil industry's first sale of certified carbon-neutral crude oil to Spanish refinery Saras, which had set a 2025 neutrality goal that includes Scope 1 and Scope 2 emissions, but excludes Scope 3 emissions (i.e., indirect emissions, including but not limited to the carbon dioxide emitted when the product is burned). Altogether, only 20% of carbon emissions in the fossil fuel energy chain are generated during production, while 80% are generated during product combustion.

Lundin Energy plans to invest $35 million to offset its estimated production of about 98,000 barrels of oil equivalent per day (bpd) from its Edvard Grieg oil field using afforestation. This field has been certified by the CarbonClear standard by Intertek Group plc, making it the world's first carbon-neutral oil field.

In June 2021, Lundin Energy announced that all crude oil produced at the offshore Johan Sverdrup field will be certified as carbon-neutral production per the CarbonClear standard. The field has been independently certified to emit 0.4 kilograms of CO_2 per barrel of oil equivalent, approximately 40 times lower than the world average. The John Sverdrup field sold its first batch of carbon-neutral production in June 2021 to GS Caltex, a South Korean energy and chemical company.[33]

"Carbon-neutral driving"

"Carbon-neutral driving" refers to the purchase of carbon credits to offset the carbon emissions from the production, transportation and use of automotive fuels, lubricants and other products.

Shell offsets emissions from these products by purchasing carbon offset credits generated from afforestation and forest protection projects. In April 2019, Shell launched Carbon Neutral Driving in the Netherlands[34] and became the first retailer in the UK to offer customers the option of Carbon Neutral Driving,[35] with plans to extend the program to Germany, Austria, Switzerland, and Canada in October 2020.

Shell's Carbon Neutral Driving program for both personal and commercial customers

- For personal users, customers buy in to Shell's GO+ membership program and opt into its carbon-neutral program at the point of purchase, paying a fee per liter of fuel for Shell to then purchase carbon credits to "neutralize" carbon emissions from the fuel's combustion, and Shell pays for the emissions generated in the extraction, refining, and transportation of the fuel.

- For commercial users, the offsets apply to a commercial vehicle fleet's emissions, and Shell calculates emissions of fuel purchased by the customer and purchases corresponding carbon credits. The customer pays the cost of purchasing carbon credits to offset emissions at a rate determined by the prevailing price of carbon credits. Shell pays for the carbon emissions generated during extraction, refining, and transportation of the fuel.

Shell's Carbon Neutral Driving program for individual customers in Germany

In Germany, individual customers pay €0.03 per liter of fuel purchased to "neutralize" carbon emissions from fuel use, and an additional €1.2 for purchases of more than 40 liters of fuel at a time. Shell claims to be paying for carbon credits from Verified Carbon Standard (VCS) afforestation and forest conservation projects such as the Cordillera Azul REDD+ Project in Peru and the Katingan Peatland Restoration and Conservation Project in Indonesia to offset the carbon emissions generated by the project.

Between its launch on October 7 2020 and July 31 2023, more than 223 million tons of fuel have been used in Shell's Carbon Neutral Driving program in Germany, claiming to offset more than 670,000 tons of carbon emissions.

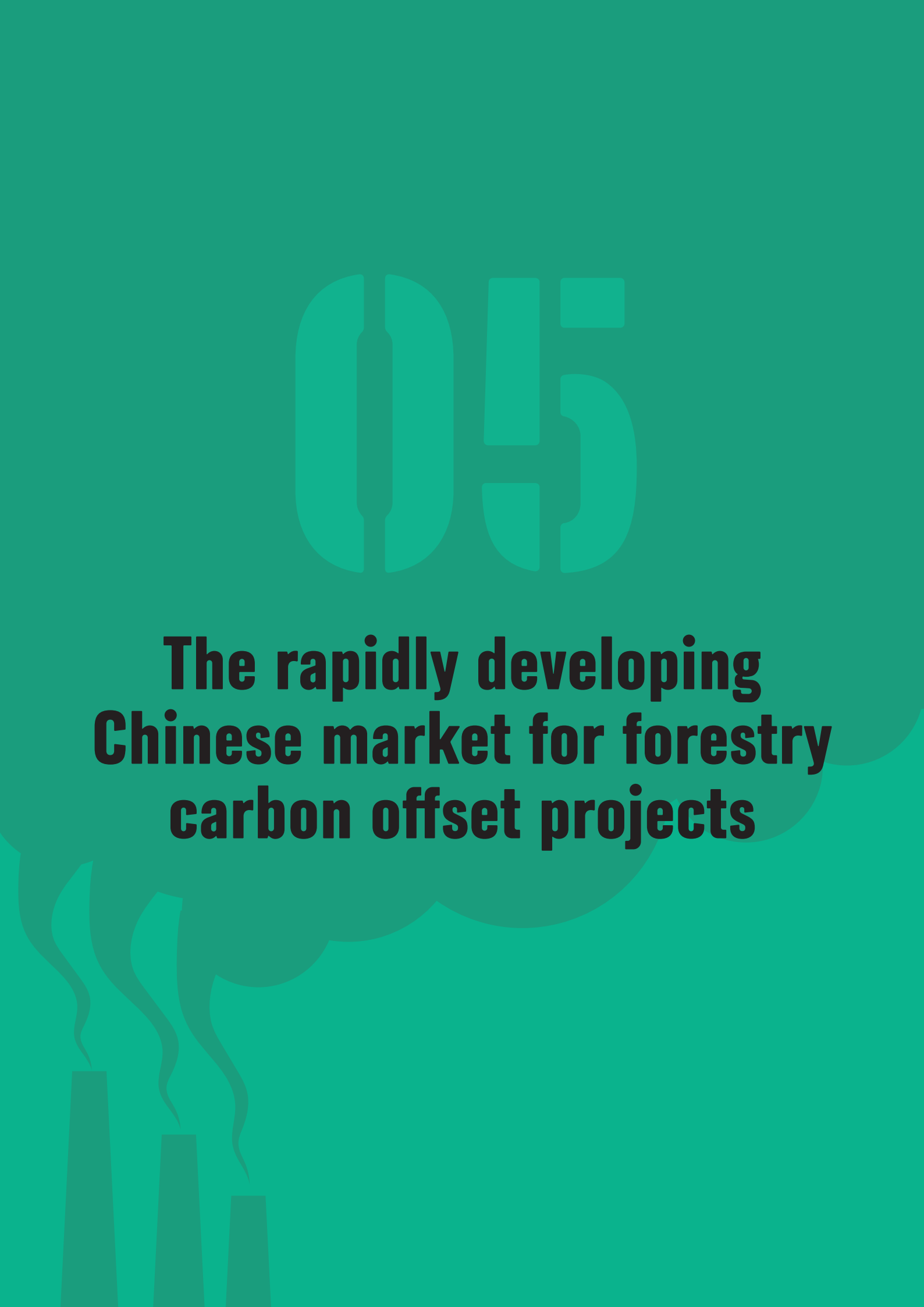
Shell's Carbon Neutral Driving program for individual customers in Austria.

Also in Austria, individual customers are charged €0.03 per liter of fuel to "neutralize" carbon emissions from fuel use. Between its launch on October 7, 2020 and July 31, 2023, more than 40 million tons of fuel in Austria have participated in Shell's Carbon Neutral Driving program, offsetting approximately 126,000 tons of carbon emissions.

In addition, since 2021, Shell has been rolling out its Carbon Neutral lubricants in key markets in Europe, Asia Pacific, the Middle East and North America, describing it as "one of the largest and most significant carbon neutral programs in the lubricants industry today". The program is expected to offset more than 200 million liters of lubricant emissions annually, equivalent to approximately 700,000 tons of carbon dioxide equivalent (CO_2e), by investing in nature-based carbon credits, such as the Katingan Mentaya project in Indonesia or the Qinghai afforestation project in China.

05

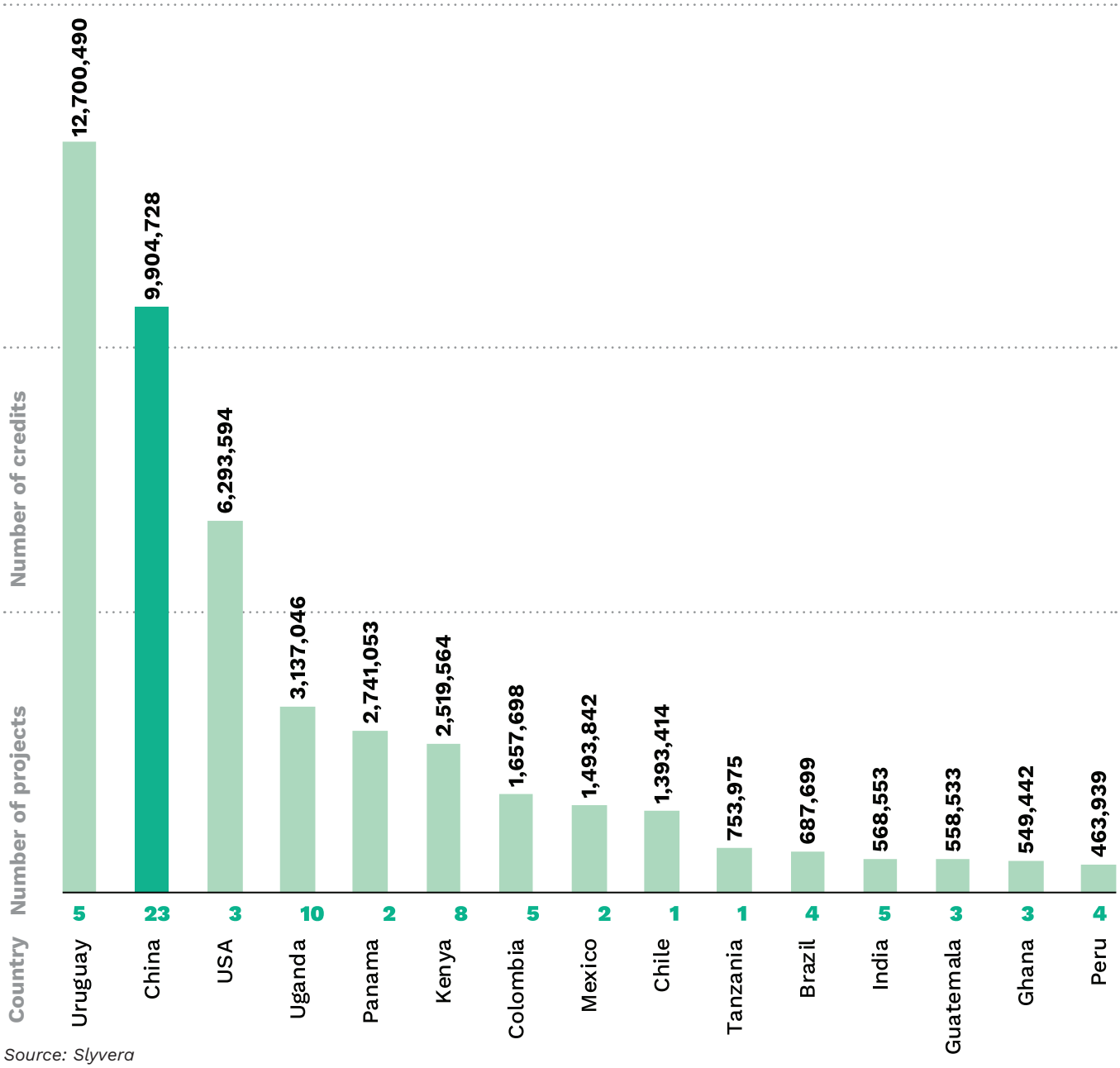
The rapidly developing Chinese market for forestry carbon offset projects



China has some of the largest forest resources in the world and is a rapidly emerging player in the market for carbon offset projects related to forestry.

After South America, East Asia is the world's second largest market for afforestation, reforestation, and revegetation (ARR) projects. Currently, all 23 ARR projects in the East Asia region are in China, with a total of 9.9 million carbon credits issued (Figure 3), 96% registered as Verified Carbon Standards (VCS), and 4% registered as Golden Standard (GS) projects[36]. Almost a quarter of the more than 2,000 VCS projects that Verra – the world's largest carbon credit issuer – has certified globally are forestry projects from China.[37] With the relaunch of the China Certified Emission Reduction Scheme (CCER), the market demand for these forestry carbon offset projects is set to expand further.

Figure 3. Top 15 global Afforestation, Reforestation, and Revegetation (ARR) projects, with carbon credits issued



Source: Slyvera

China's forestry carbon offset credit market and corporate participation

The National Carbon Emission Trading Market ("National Carbon Market") is one of China's core policy tools to realize its net zero 2060 dual-carbon targets. The National Carbon Market is divided between the Carbon Emissions Allowance (CEA) and China Certified Emission Reduction (CCER) scheme trades, where enterprises can invest in CCERs to offset a certain percentage of any CEA deficit.

According to the data of China Voluntary Emission Reduction Trading Information Platform, from the registration of the first CCER project in 2014 to the suspension of the acceptance of new projects in 2017, there were 2,871 CCERs publicized projects, and 49.8 million tons of emissions of issuance was completed. The CCERs currently circulated in the National Carbon Market or various local pilot markets are credits that have already been issued and transferred multiple times. As of June 17, 2022, the cumulative turnover of CCERs was about 454 million tons of carbon dioxide equivalent, with a turnover of about RMB 5.973 billion.[38] With the expansion of the carbon market and the gradual tightening of free carbon allowances, the market demand for CCERs will further increase.

A 2022 Beijing Institute of Technology Center for Energy & Environmental Policy Research report projected that seven key high-energy consumption industries will be gradually incorporated along with power generation industries during the 14th Five-Year Plan period (2021-2025): petrochemicals, chemicals, building materials, steel, non-ferrous metals, papermaking, and aviation), and that the total amount of allowances in the national carbon market may expand from the current 4.5 billion tons to 7 billion tons, covering about 60% of the total national carbon dioxide emissions. At a 5% offset ratio, the demand for CCERs would then reach 350-400 million tons of emissions per year. Currently, relevant departments are actively preparing to restart filings for CCER projects and the issuance of emissions reductions.[39]

Forestry carbon offset credits are explicitly included in the main types of CCERs, attracting widespread policy and market attention due to the low costs, the potential size of carbon sinks calculated from forestry projects, and the potentially high ecological value. According to

different methodologies, forestry carbon sinks can be further divided into two directions: forest management carbon sinks and afforestation carbon sinks. According to the forecast of Prospect Industry Research Institute, the compound annual growth rate (CAGR) of market demand of China's forestry carbon sink industry is 36% from 2022 to 2027, and the market demand of China's forestry carbon sink industry will reach 34.8 billion RMB by 2027.[40] The potential market value of forestry carbon offset projects will reach nearly 200 billion RMB during the 14th Five-Year Plan period.[41]

China has some of the largest forestry resources in the world and some of the fastest growing, with 3.465 billion mu of forest area as of today. And China has the largest plantation forests preserved areas in the world, at 1.314 billion mu.[42] According to the data compiled from China's Land Greening Status Bulletin, between 2016 and 2021, China will reforest an average of 6.95 million hectares per year. According to Ecosystem Marketplace, Asia, Latin America and the Caribbean have seen huge growth in ARR projects during 2019-2021, a growth that is inextricably linked to the rapid development of China's afforestation programs.

Table 2 shows a non-exhaustive list of oil and gas companies' use of forestry carbon offset projects in China to generate carbon credits over the past three years, including projects from Shell, PetroChina, and CNOOC. In the case of Shell, for example, public information on its official website shows that the multinational oil company has participated in the construction of a number of forestry carbon offset projects in Xinjiang, Qinghai, Hebei, and Guizhou provinces, and has claimed that its customers can realize carbon offsets through these forestry carbon offset projects.[43] As the target date for carbon neutrality commitments nears, more and more oil and gas companies are making use of forestry carbon offset credits. Carbon trading provides both revenue and promotes a company's social reputation for oil and gas companies, but the development of forestry carbon offsets still faces many challenges and presents investment risks.

Table 2: Non-exhaustive list of oil and gas companies' participation in forestry carbon offset projects in China

Project name	Province	Carbon Credit Buyer	Project area (hectares)	Crediting period (years)
Zhanjiakou Yuxian Afforestation Project	Hebei	Shell Energy (China) Ltd.	11,800	40
Afforestation Project in Xining City	Qinghai	Shell Energy (China) Ltd. Shell Tokyo Gas Co., Ltd. CNOOC Gas & Power Group Ltd.	12,874	100
Haidong Afforestation Project	Qinghai	Shell Energy (China) Ltd. Shell	12,849	100
Puzhen Afforestation Project in Guizhou province	Guizhou	Shell Energy (China) Ltd. Shell	26,551	30
Xiguan Afforestation Project In Guizhou province	Guizhou	Shell Energy (China) Ltd. Shell PetroChina International Company Limited ("PCI") Tokyo Gas Co., Ltd.	25,449	30
Xinjiang Makit County Afforestation Carbon Sequestration Project	Xinjiang	Shell Energy (China) Ltd. Shell CNOOC Gas & Power Group Ltd.	6,697	40
Jilin Linjiang Afforestation Project	Jilin	Shell Energy (China) Ltd.	25,085	60
Zhangjiakou Chongli Afforestation Project in Hebei Province	Hebei	Shell Energy (China) Ltd.	18,920	20

Hunan Northern and Northwestern Area Afforestation Project	Hunan	Shell Energy (China) Ltd.	41,317	20
Saihanba Mechanical Forestry Farm	Hebei	Shell	3,640	30
Qinghai Afforestation Project	Qinghai	Shell Energy (China) Ltd. Shell Tokyo Gas Co., Ltd.	13,862	100
Jiangxi Fenglin Carbon Sink*	Jiangxi	Shell	14,700	
Guinan Afforestation Project	Guizhou	PetroChina International Company Limited (“PCI”) Shell	46,000	30
Hechu Afforestation Project in Anhui Province	Anhui	Shell PetroChina International Company Limited (“PCI”)	30,057	20
Qianxinan Afforestation Project in Guizhou Province	Guizhou	Shell PetroChina International (Singapore) Pte. Ltd. (“PCSG”) PetroChina International Company Limited (“PCI”)	32,047	20

Source: Project development documents, Reforestum, BloombergNEF, Corporate Website, Greenpeace
* Project information was found on Shell’s website, but not in VCS database.

06

Risks of forestry carbon offset projects

Baseline and additionality:

The “baseline” in carbon trading is the estimated GHG emissions in a certain period of time without taking specific GHG emission reduction measures. It provides a reference standard for the carbon emission reduction of the project. By comparing actual carbon emissions with a baseline, the reduction in GHG emissions resulting from a project or measure can be calculated. These reduced emissions can be converted into tradable units on the carbon trading market. “Additionality” in carbon trading is the core concept for evaluating the effects of carbon offset projects. It means that the project must produce emission reduction benefits that exceed the baseline emission level, and this emission reduction benefit cannot be achieved without carbon market incentives.

- International projects with vague baseline and additionality issues: Cordillera Azul REDD+ Project and Katingan Peatland Restoration and Conservation Project (credits purchased by Shell, PetroChina, and CNOOC in both projects)

Double counting:

“Double counting” in carbon trading refers to an emission reduction (such as a carbon credit or emission reduction certificate) being accounted for multiple times or claimed as the result of offset activities multiple times.

- International project with the problem of double counting: Glengarry Reforestation Project (directly invested by Shell)

Leakage:

Carbon leakage refers to the fact that due to restrictions and intervention measures on carbon emissions in one region, some behaviors that will increase carbon emissions are transferred to other regions with looser emission restrictions, which in turn leads to an increase in carbon emissions in other regions.

Impermanence:

The CO_2 fixed by the forest ecosystem is not permanent, but fluctuates with the changing growth conditions of the forest itself. This fluctuation is affected by multiple factors, including factors inherent in the ecosystem (such as fires, and pests) and the uncertainty caused by global climate change. These factors will limit the actual effect of forest carbon sequestration, and may even lead to a reversal from the original carbon sink to a carbon source.

- International projects with impermanence issue: Colville Improved Forestry Management Project (credits purchased by BP) and Tŝilhqot’in Reforestation Project (directly invested by Shell)

Land rights:

In the course of forestry carbon offset projects’ implementation, it may lead to the expropriation or change of land use on indigenous territories. While these projects claim to serve the long-term interests of the globe and the environment, indigenous communities may face the loss of their traditional lands, with their livelihood and the preservation of their cultural heritage impacted.

- International project with this issue: Batéké Carbon Sink (directly invested by TotalEnergies)

07

Preliminary risk analysis for forestry carbon offset projects in China

Currently, forestry carbon offset projects in China are mostly VCS and CCER projects developed before 2017. The development of CCER projects before 2017 mostly borrowed from mainstream international forestry carbon offset methodologies, so these projects face similar risks and challenges as many international projects in terms of baseline, additionality, double counting, and other issues. In addition to these risks, China's policies and mechanisms related to forestry carbon still need further improvement due to the relatively recent and fragmented development of the carbon market. At the same time, the introduction of net zero dual-carbon targets has seen many stakeholders enter the market, exacerbating existing challenges and uncertainties.

Lack of coherent and synergistic policies

In terms of national- and local-level forestry carbon offset policies, fragmentation of standards and an overall lack of coherent and synergistic policies between the two levels exists.

Although China has put forward the goal of developing forestry carbon sinks at the national level, it is still in the process of exploring and piloting at the local level. Published on October 19 2023, "Management Measures for Voluntary Greenhouse Gas Emission Reduction Transactions (Trial)" put forward regulations on the methodology and verification of projects. Prior to this, and particularly during the CCER suspension period from 2017 to present, there's been a trend of carbon offset forestry projects turning to local or other alternative mechanisms for project development. Some local governments have also formulated their own carbon offset forestry project standards based on regional markets, including an Inclusive Certified Emission Reduction Program in Guangdong, carbon vouchers in Sanming, Fujian, and individual carbon sink in Guizhou, among others. The lack of uniform technical standards among different forestry carbon offset projects can also result in varying project quality. Some projects developed at the local level may have issues that do not align with the baseline and additionality principles.

Insufficient data collection and lack of uniform, scientific measurement standards

The measurement and monitoring of forestry carbon sinks rely on data accumulation and model development. For example, different tree species have distinct carbon sequestration capacities, and even within the same species, there can be significant variations in carbon sequestration abilities across different regions. At present, there is a general lack of relevant data collection in various regions. And the development of carbon sink measurement models and parameter determination are still in the initial stage, which makes it difficult to find a suitable local carbon sink prediction model in project development. Applying the models of other regions or relevant tree species as a substitute can lead to large calculation errors.[44]

Complex forest land tenure structure

The development process of forestry carbon sink projects involves many stakeholders, including land and tree owners, land leasers, forestry capital investors, local farmers, communities, enterprises, forestry authorities, etc., which implies complex ownership structures of forestry carbon sink projects. At present, the Forestry Law and the Property Law does not clearly define the rights of possession, use, disposal (including transfer) and income generated from forestry carbon sinks, which may lead to difficulties in achieving consensus and expected outcome in terms of the distribution of the returns from the project, and even bring legal disputes and affect the final implementation of forestry carbon offset projects.

Professionalism in accrediting and management

Although China's forestry carbon offset projects have developed over the years, the scope of coverage and the number of practitioners involved are still limited.

On one hand, there is a shortage of development and operation professionals in the field of forestry carbon offset projects. Forestry carbon offset projects are methodologically complex and difficult to develop, but at present there is no entry threshold for the ability and technical qualification of the relevant practitioners. Many projects are developed and managed by people with no forestry expertise and there are cases of project design plagiarization, which will directly affect the quality of forestry carbon offset projects.

Local governments lack relevant experience and professionals who are familiar with forestry carbon offset project standards and rules. A lack of management ability can overall put the qualification and authenticity of forestry carbon offset projects' qualification and authenticity into question.

Ecosystem risks

The development of forestry carbon offset projects with a focus on the carbon sequestration potential of forests can lead to either neglecting or actually impacting the comprehensive holistic benefits of forests. For example, large-scale afforestation affects water resources and wetland ecosystems. In northwest China, afforestation projects have been successful in the small-scale and short-term, but have resulted in the death or degradation of a large number of forests, led to the deterioration of soil and vegetation cover and exacerbated water scarcity.[45]

Plantation ecosystems are more homogenous than natural forests and more vulnerable to fires, pests, and disease.

Compared with natural forests, monoculture plantations are comparatively less resilient in their ability to resist pest infestation or disease, leading to a higher risk of concentrated outbreaks.[46] Pests that harm pine trees are prominent risks, such as the masson pine caterpillar (Scientific name: *Dendrolimus punctatus*) and pine wood nematode (Scientific name: *Bursaphelenchus xylophilus*). Infestations

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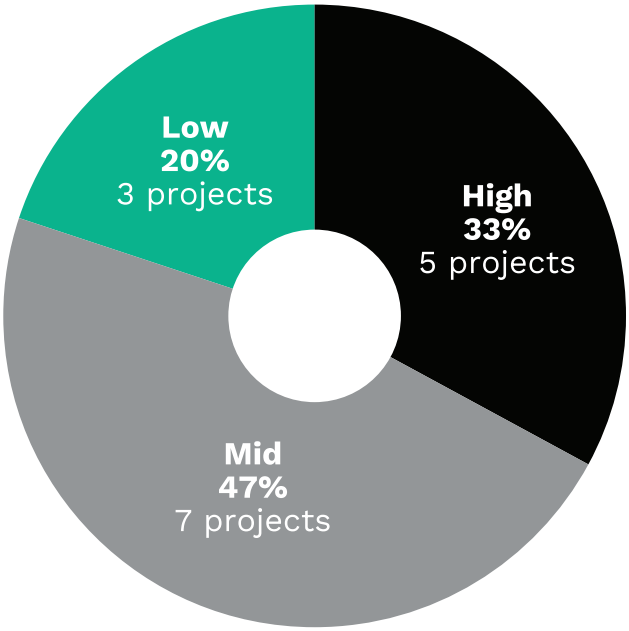
can cause decay of pine trees and impact the carbon sequestration potential, along with other ecosystem risks, or even lead to large-scale die-offs. The pinus tabuliformis, pinus koraiensis, and pinus yunnanensis are all common afforestation species.

Climate change can increase forests' exposure to invasive species, rising temperatures, and extreme weather, which may further exacerbate risks of fire, infestation, and the spread of pests or disease. This presents an increased range of risks for forest ecosystems, and relatively fragile monoculture plantations in particular. This has the potential to increase management and maintenance costs of forestry carbon offset projects, as well as instances of unanticipated losses.

In China, pines and firs are often chosen for afforestation projects because they are fast-growing, adaptable, and cost-effective, which maxmizes their carbon sink potential. But, the leaves and pine needles of these species are resinous and tend to dry out easily, which can lead to high risks of fires compared to other tree species.

Looking at the tree species planted in 15 forestry carbon offset projects in China that were used by oil and gas companies to create carbon offset credits, more than 80% of the projects used tree species that were medium- to high-risk for fires, with only 20% being confirmed low-risk. (Figure 4)

Figure 4 Flammability risk of tree species for 15 forestry carbon offset projects in China



Source: Slyvera

Appendix

Preliminary analysis on the flammability risk of 15 forestry carbon offset projects retired by oil and gas companies in China[47]

	Tree Species	Flammability *
Zhanjiakou Yu County afforestation project	*Larix* spp., *Pinus tabulaeformis*	High
Xining City afforestation project	*Picea crassifolia, Juniperus przewalskii, Pinus tabuliformis, Populus* spp., *Betula* spp., *Ulmus* spp.	Medium
Qinghai Province Haidong City	*Picea crassifolia, Juniperus przewalskii, Pinus tabuliformis, Populus* spp., *Betula* spp., *Ulmus* spp.	Medium
Guizhou Province Pujing Zhenning and Anshun afforestation project	*Cupressus* spp.	Low
Guizhou Province Xiguan afforestation project	*Cupressus* spp., *Cunninghamia* spp.	Medium
Xinjiang Makit County afforestation project	*Populus alba, Haloxylon ammodendron, Xanthoceras sorbifolium, Elaeagnus angustifolia, Lycium ruthenicum*	Low
Jilin Province Linjiang afforestation project	*Pinus koraiensis, Fraxinus mandshurica, Picea* spp., *Juglans mandshurica, Betula* spp., *Pinus tabulaeformis, Larix* spp., *Phellodendron amurense*	Medium
Zhangjiakou Chongli afforestation project	*Larix* spp., *pinus sylvestris, Picea* spp.	High
Northern and western Hunan afforestation province	*Cunninghamia* spp., *Pinus massoniana, Populus* spp.	High
Hebei Saihan Dam afforestation project	*Picea crassifolia, Juniperus przewalskii, Pinus tabuliformis, Populus* spp., *Betula* spp., *Ulmus* spp.	Medium
Qinghai province tree planting afforestation project	*Picea crassifolia, Juniperus przewalskii), Pinus tabuliformis, Populus* spp., *Betula* spp., *Ulmus* spp.	Medium
Jiangxi Fenglin carbon offset afforestation project	*Pinus elliottii*	High
Southern Guizhou afforestation project	*Cunninghamia* spp., *Pinus massoniana, Pinus yunnanensis*	High
Anhui Province Hefei and Chuzhou afforestation project	*koelreuteria paniculata, Quercus robur, Celtis sinensis, Zelkova schneideriana*	Low
Southwest Guizhou afforestation project	*Cunninghamia* spp., *Cupressus* spp.	Medium

* Flammability based on analysis of tree species.

Examples of flammability of different tree species*

Tree Species	Flammability	flammable components
Pinus tabuliformis	High	Bark, wood, leaf, and litter
Pinus sylvestris var. *mongolica*	High	Leaf, bark, branch, wood, and litter
Betula platyphylla	High	Bark, leaf, and litter
Populus tomentosa	High	Leaf and litter
Cupressus spp.	High	Leaf
Pinus koraiensis	High	Leaf, bark, branch, wood, and litter
Picea asperata	High	Leaf, bark, branch, wood, and litter
Glyptostrobus pensilis	Low	
Castanopsis kawakamii	High	Leaf, bark, branch, wood, and litter
Larix gmelinii	Low	
Liquidambar formosana	High	Litter
Populus cathayana	High	Leaf and litter
Populus szechuanica	High	Leaf and litter
Pinus massoniana	High	Leaf, bark, branch, wood, and litter
Pistacia chinensis	Low	
Lycium ruthenicum	Low	
Celtis sinensis	Low	
Firmiana simplex	Low	
Quercus palustris	High	Leaf, bark, branch, wood, and litter
Podocarpus macrophyllus	High	Leaf, bark, branch, wood, and litter
Populus euphratica	High	Leaf and litter
Pinus armandii	High	Leaf, bark, branch, wood, and litter
Alnus cremastogyne	Low	
Juniperus przewalskii	High	Bark, leaf, and litter
Cryptomeria japonica var. Sinensis	Low	
Juglans mandshurica	High	Leaf
Abies fabri	High	Bark, leaf, and litter
Phellodendron amurense	High	Leaf
Cunninghamia lanceolata	High	Leaf and litter
Elaeagnus angustifolia	Low	
Pinus yunnanensis	High	Leaf, bark, branch, wood, and litter
Populus spp.	High	Leaf and litter
Ulmus spp.	High	Leaf and litter
Betula spp.	High	Bark, leaf, and litter
Zelkova schneideriana	Low	

**Source: Tree species flammability based on plant traits: A synthesis*[48]

More research on the oil and gas sector globally can be found in the following reports:
The Dirty Dozen: The Climate Greenwashing of 12European Oil Companies, June 2023
Energy Crisis Scenario - Energy Policy Recommendations, December 2022

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Baseline: The estimated GHG emissions in a certain period of time without taking specific GHG emission reduction measures.
Additionality: The project must produce emission reduction benefits that exceed the baseline emission level, and this emission reduction benefit cannot be achieved without carbon market incentives.
Double-counting: An emission reduction being accounted for multiple times or claimed as the result of offset activities multiple times.

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