

# Crude awakening

## OIL PIPELINES IN DEVELOPMENT ACROSS THE GLOBE

Buoyed by record profits in 2021–22, the oil industry is moving ahead with a massive expansion of the global oil pipeline system, according to new data from Global Energy Monitor (GEM). Over 24,000 km of crude oil transmission pipelines are in development, about 40% of which are already under

construction. Despite taking a backseat to the global gas boom in recent years, this expansion of crude oil infrastructure creates a substantial stranded asset risk for project developers and is dramatically at odds with plans to limit global warming to 1.5°C or 2.0°C.

### Executive Summary

- According to GEM analysis, 24,166 kilometers (km) of oil transmission pipelines are in development globally. Of this, 10,351 km are in the construction phase, and the remaining 13,813 km are in a pre-construction phase (Figure 1, on page 2).
- Led by the United States, India, China, and Russia, the projected cost of this buildout is USD 75.4 billion, much of which risks becoming stranded assets as countries transition to renewables.
- The United States and India have the most new pipeline capacity by length under development. The U.S. has 2,829 km costing an estimated USD 7.9 billion being developed, the majority of which is associated with the Permian Basin, whose untapped oil and gas reserves make it one of the biggest “[carbon bombs](#)” in the world.
- Tied for first with the U.S. is India with 2,824 km of new oil pipelines in development, costing an estimated USD 4.0 billion. The third-biggest developer is China with 2,533 km costing an estimated USD 4.2 billion.
- Facing boycotts by the EU and U.S. over its war on Ukraine, Russia is developing 2,051 km of new pipelines costing an estimated USD 4.0 billion, with an eye to replacing these lost exports with new exports to India and China. GEM’s data finds several European countries still invested in Russian oil projects, despite these boycotts.
- Regionally, Sub-Saharan Africa leads the world in planned development, with 1,950 km of oil pipelines under construction and an additional 4,540 km proposed (Table 1 on page 3).
- Poor disclosure of pipeline capacity makes it difficult to estimate total greenhouse gas (GHG) emissions from these expansions. GEM has capacity data for 66% of projects. Globally, projects under construction would add about 8.3 million barrels per day (bpd) of crude oil transmission capacity, and projects that are in pre-construction would add an additional 21.8 million bpd. Together these additional capacities would generate 4.61 billion tonnes of CO<sub>2</sub> annually.<sup>1</sup>

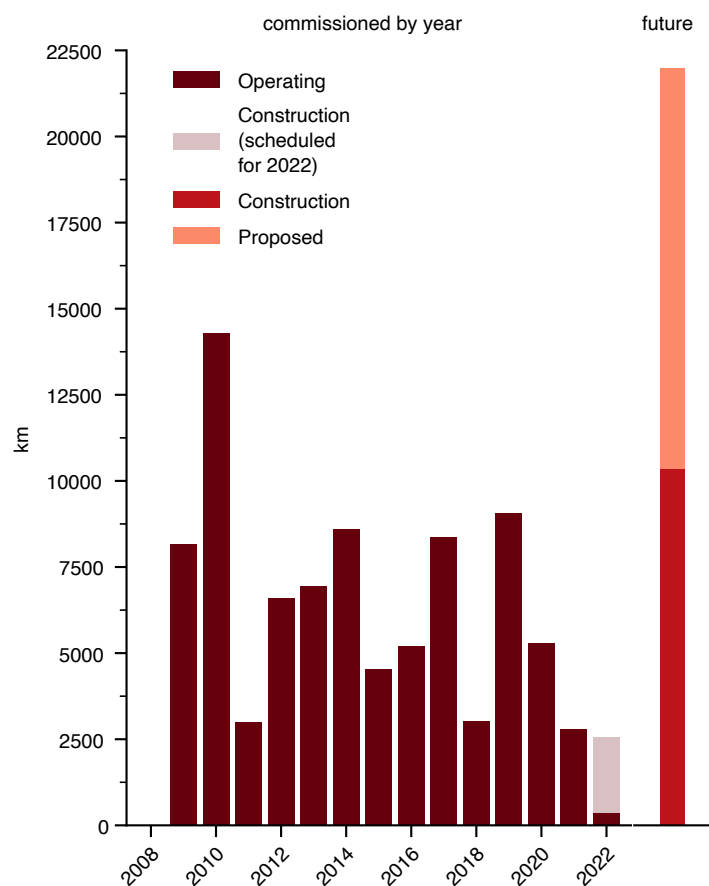
1. Potential CO<sub>2</sub> estimates are calculated using an emissions factor of 152.789 tonnes of CO<sub>2</sub> per bpd, from [Kuhne \(2022\)](#). Note this estimate is a straightforward sum of capacity data, available for ~66% of in-development projects in the GEM database, and it does not take into account potential double-counting of crude oil transmission.

## A global oil boom in the making

Two years ago, Covid-19 brought chaos to the oil industry as demand cratered and Covid-related logistical difficulties delayed new projects and project expansions. In 2022, Russia’s war on Ukraine has contributed to a contradictory “best of times, worst of times” scenario for the industry. The EU’s boycott of Russian oil is accelerating the continent’s shift to

renewables, which in turn will reduce demand. At the same time, the industry enjoyed record profits in 2021–22 and is using this moment of chaos and crisis to push ahead with massive expansions of oil pipeline networks—a buildout that [disregards](#) climate goals and the long-term economic viability of fossil fuels.

**Figure 1. Kilometers of oil pipeline built since 2008 and in development.**



Darkest red shows operating pipelines on the left, and those under various stages of development are shown as light red bars on the right. Pipelines that are under construction and are slated to become operational in 2022, but as of September 2022 had not been completed, are shown as a light red bar in 2022. GEM classifies any project that has not advanced in two or more years as “Shelved.”

## The pipeline expansion in numbers

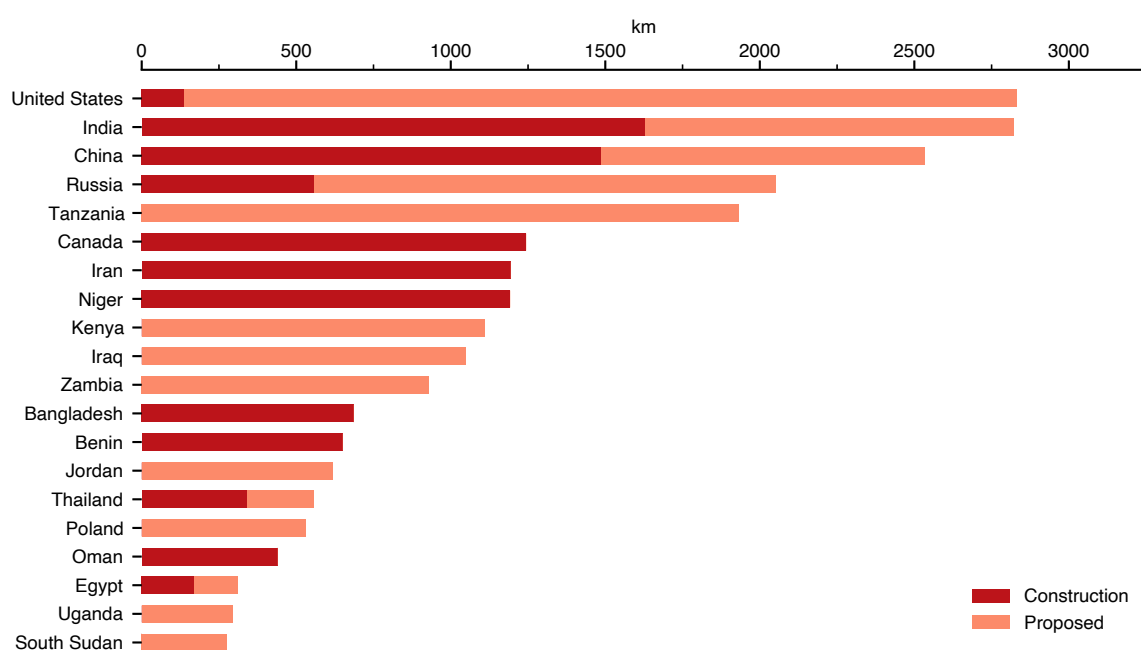
Regionally, Sub-Saharan Africa leads the world in planned development, with 1,950 km of pipelines under construction and an additional 4,540 km proposed (Table 1). North America and the Middle

East and North Africa (MENA) are next, with 4,074 km and 3,708 km in development, respectively. The leading countries are spread across North America, Asia, Russia, and Africa (Figure 2).

**Table 1. Regional breakdown of planned oil pipeline expansion, in km.**

	Proposed (km)	Construction (km)	Proposed+ Construction (km)
Sub-Saharan Africa	4,540	1,950	6,490
North America	2,693	1,381	4,074
Middle East and North Africa	1,805	1,903	3,708
South Asia	1,194	2,316	3,510
East Asia	1,047	1,486	2,533
Eurasia	1,494	768	2,262
Europe	800	207	1,007
SE Asia	240	342	582
Australia and New Zealand	0	0	0
Latin America and the Caribbean	0	0	0
<b>Total</b>	<b>13,813</b>	<b>10,353</b>	<b>24,166</b>

**Figure 2. Top 20 countries ranked by km of in-development oil pipelines (under construction and proposed).**



See Table A1 on page 11 for more information.

GEM estimates that the global oil pipeline build-out would require an investment of USD 75.4 billion (Table 2) for laying new pipeline infrastructure across 78 projects. USD 36.0 billion of this is attributed to projects under construction, and the remaining USD 39.5 billion is in the pre-construction or proposed phase. This capital expenditure estimate is led by North America at USD 25.6 billion.

These estimates do not include capacity expansions to existing infrastructure, of which there are 9 projects totaling an additional 3.16 million bpd worldwide. 2 million bpd of this capacity expansion is under construction as part of the [East-West Crude Oil Pipeline](#) expansion in Saudi Arabia.

These cost estimates are just a part of the broader chain of the upstream, midstream, and downstream oil life cycle. A recent analysis places the upstream oil and gas stranded asset risk at [USD 1 trillion](#). The Carbon Tracker Initiative calculated that a high-investment pathway in developing oil assets would cost over [USD 500 billion](#).

The 10 longest pipelines in development globally (Table A2 on page 12) are geographically wide-spread and underscore the potential for a further lock-in of oil consumption globally. Many of these projects are described in more detail below.

**Table 2. Regional estimates of capital expenditure to build pipelines in development, in USD billion.**

	Proposed	Construction	Proposed+ Construction
North America	7.5	18.1	25.6
Sub-Saharan Africa	10.0	7.0	17.0
Middle East and North Africa	9.1	2.1	11.2
Europe	7.1	0.1	7.2
South Asia	1.2	4.6	5.8
East Asia	1.8	2.4	4.2
Eurasia	2.8	1.3	4.0
SE Asia	0.0	0.3	0.3
Australia and New Zealand	0.0	0.0	0.0
Latin America and the Caribbean	0.0	0.0	0.0
<b>Total</b>	<b>39.5</b>	<b>36.0</b>	<b>75.4</b>

See the [online methodology](#) for more on how these estimates are calculated.

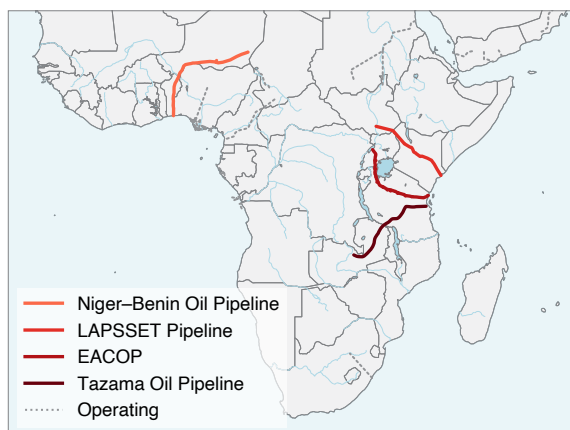
## Regions and countries leading the buildout

### Sub-Saharan Africa

Sub-Saharan Africa is home to some of the most ambitious oil pipeline proposals in the world (Figure 3). The 1,444-km [East African Crude Oil Pipeline \(EACOP\)](#) is by some reports already under construction, though groundbreaking still doesn't seem to have occurred as of September 2022. Environmentalists have criticized the assessment process by which the project was approved as “shoddy” and inadequate, and project developer Total has been criticized for planning to build the project through open-trenching. [StopEACOP](#) has successfully pressured some international banks to reject financing the project, though the insurer Marsh McLennan is still [committed](#).

After Covid-19 delays, the 1,950-km [Niger–Benin Oil Pipeline](#) is again under construction to transport oil from Niger oilfields to the Port of Seme Terminal, Benin. The Tanzanian and Zambian governments hope to modernize the operating 1,710-km [Tazama Oil Pipeline](#) by increasing its capacity and/or building a parallel pipeline. The proposed ~1,500-km [Lamu Port-South Sudan \(LAPSSET\) Pipeline](#), for transporting crude from South Sudan's oil fields to Kenya's Lamu Port, was initially slated to go

**Figure 3. Oil pipeline infrastructure in Sub-Saharan Africa.**



“In development” includes pipelines that are proposed and under construction.

into service in 2022, but there is no evidence as of September 2022 that construction has begun.

The African continent is also being [courted](#) as a potential source of hydrogen and liquefied natural gas (LNG) in the REPowerEU plan, as the European Union attempts to zero out its use of Russian fossil fuels.

### North America

#### Canada

Canada's [Trans Mountain Oil Pipeline's](#) TMX expansion project (Figure 4), a 980-km pipeline under construction running parallel to the original route, is facing delays and opposition; and throughout its construction history, costs have ballooned from USD 6.8 billion to USD 24.1 billion. The Canadian Parliament's budget officer [claims](#) the pipeline has a net present value of negative CAD 600 million, based on the pipeline's current cash flow and the CAD 4.4 billion purchase price.

In addition, an expansion of the [Enbridge Line 5 Oil Pipeline](#) (Figure 4) running under the St. Clair river in the Great Lakes region would help lock in future Canadian oil exports to the U.S. The project is [encountering](#) heated opposition as an oil leak or spill could have a catastrophic impact on the ecology and economy of the Great Lakes region.

**Figure 4. Oil pipeline infrastructure in northern U.S. and Canada.**



“In development” includes pipelines that are proposed and under construction.

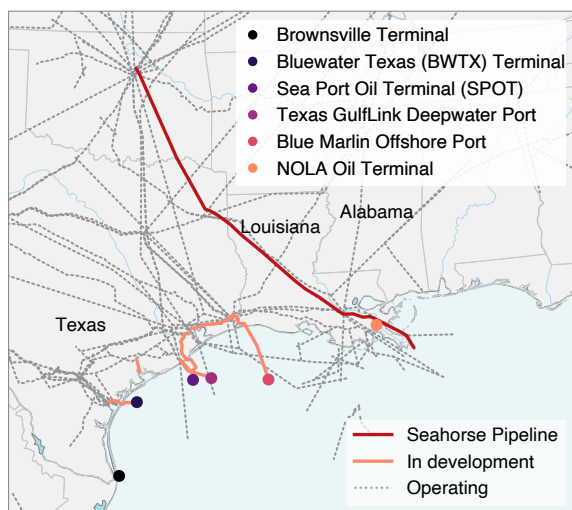
### United States

The U.S. is the world leader in in-development pipelines, but a relatively small fraction of those are under construction (Figure 2 on page 4). A major push to [increase](#) crude oil export capacity out of the Permian basin along the Gulf Coast (Figure 5) is arguably a make-or-break moment for the industry, which is gradually losing its social license to build new projects as the impacts of the climate crisis become more severe. A project that can't be built now—during a worldwide energy crisis caused by the war in Ukraine—likely can't be built at all.

The Permian basin, which straddles Texas and New Mexico, contains enough untapped oil and gas to make it one of the biggest “[carbon bombs](#)” in the world. The Texas Railroad Commission approved a record number of drilling permits in March 2022, and while property rights arguments are able to stall groundbreaking for some pipelines, these cases are difficult to win. In contrast, larger interstate oil and gas pipelines are becoming increasingly more difficult to build, as with the recently cancelled [Atlantic Coast Gas Pipeline](#).

The largest pipeline project in development in the U.S. is the [Seahorse Pipeline](#) (Figure 5), a joint venture

**Figure 5. Oil pipeline and terminal infrastructure along the U.S.**



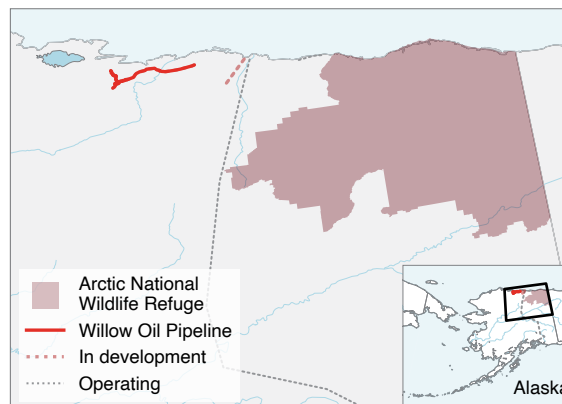
“In development” includes pipelines that are proposed and under construction. Proposed oil export terminals are shown as shaded circles.

between Blackstone Group and True Companies. The proposed project aims to transport 800,000 bpd of crude oil from the Permian basin to the Gulf Coast for export. This, along with a slate of proposed oil export terminals (Figure 5; Table A3 on page 12), will further entrench the U.S. in long-term oil production.

The [Willow Oil Pipeline](#) (Figure 6) is a [controversial](#) oil project proposed along Alaska’s coast. The project includes five drill sites and a 620-km oil pipeline to transport crude oil out of the Willow oil field in Alaska, and resistance to the project has arisen due to the impacts it would have on wildlife and greenhouse gas emissions.

In a major concession to the US oil and gas industry, President Biden’s recently passed climate bill, the Inflation Reduction Act, includes an expansion of a federal tax credit for fossil fuel projects that include a carbon capture and storage (CCS) component. In casting the decisive vote in favor of the bill, Sen. Joe Manchin (D-WV) exacted a promise from Congressional leaders to advance legislation in support of the stalled [Mountain Valley Gas Pipeline](#) and create a list of 25 energy projects to be fast-tracked as projects of national interest, five of which would “be projects to produce, process, transport, or store fossil fuel products, or biofuels, including projects to export or import those products.”

**Figure 6. Oil pipeline infrastructure in Alaska.**



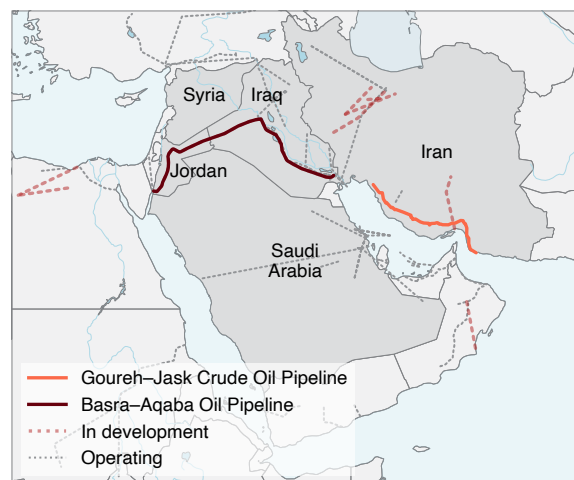
“In development” includes pipelines that are proposed and under construction.

## Middle East

Middle Eastern countries are also set to expand their oil infrastructure in the coming decade. Saudi Arabia has announced its intention to [increase](#) oil production capacity up to a maximum of 13 million bpd by 2027. Egypt is planning to [grow](#) storage capacity at its El Hamra oil terminal, which was originally built to handle crude oil from Egypt's Western Desert, and the terminal will benefit from the 170-km [Abu Sennan–El Hamra Oil Pipeline](#) currently under construction.

The Iraq Ministry of Oil's 1,665-km [Basra–Aqaba Oil Pipeline](#) (Figure 7) was first proposed in 1983 to transport crude oil to Jordan, and in January 2022, the Iraqi cabinet approved a framework agreement to install the pipeline. The 1,100-km [Goureh–Jask Crude Oil Pipeline](#) (Figure 7) was completed in 2021 to transfer oil from the Goureh oil terminal to Jask Port in Iran.

**Figure 7. Oil pipeline infrastructure in the Middle East.**



"In development" includes pipelines that are proposed and under construction. Five countries are shaded darker gray to better visualize their boundaries.

## Asia and Eurasia

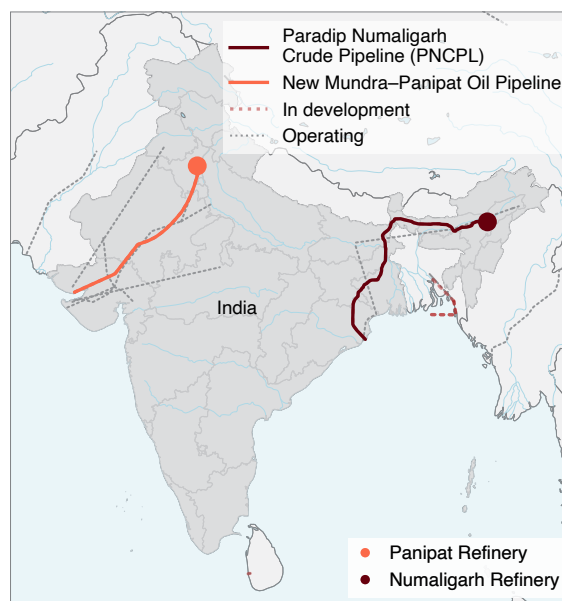
### India

As nations place sanctions on Russian oil due to its war in Ukraine, Russia hopes to [unload](#) excess storage on Asian buyers. India has begun [buying](#) the discounted crude, as Indian refiners in particular [capitalize](#) on the cheaper imports to further [entrench](#) the nation's role as a petroleum products exporter.

The 1,630-km [Paradip Numaligarh Crude Pipeline \(PNCPL\)](#) (Figure 8) is under construction and is an important part of an expansion project for the Numaligarh Refinery in Assam, India, which is [expanding](#) its processing capacity by 200%. The project was proposed in 2020 and under construction by late 2021, and the additional refinery capacity and associated pipeline are expected to come online in late 2024.

In addition, Indian Oil Corporation announced a new project in December 2021 to increase crude oil transmission to the Panipat Refinery in Haryana, India. The project includes the proposed 1,194-km [New Mundra–Panipat Oil Pipeline](#) (Figure 8) that is slated to come online in late 2024.

**Figure 8. Oil pipeline infrastructure in India.**



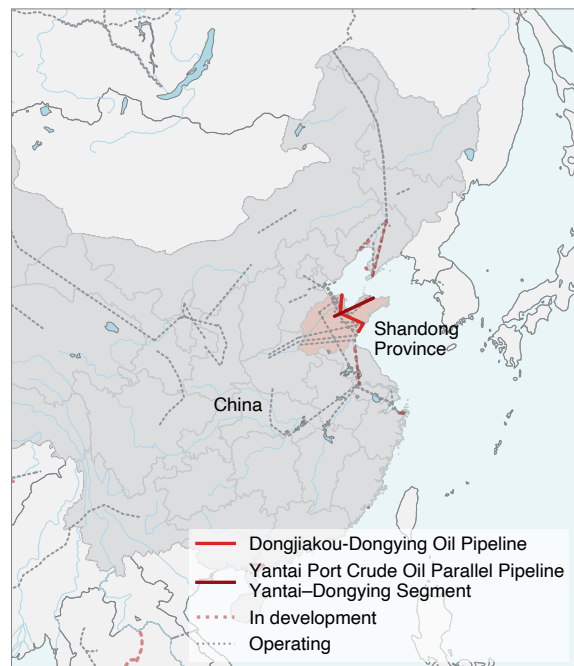
"In development" includes pipelines that are proposed and under construction.

## China

China is the world's largest crude oil importer, and in July 2022, Russia surpassed Saudi Arabia to become China's [largest](#) crude oil supplier. Like India, China has a large refining capacity and imports crude to [refine](#) and sell products to other, mostly Asian, countries.

China's 14th Five-Year Plan guides the nation's near-term expansion in oil and gas pipelines, [focusing](#) on increased oil and gas storage and production. China's operating oil pipeline network is extensive and old, and many pipeline projects found in the provinces' five-year plans are to replace retired routes and fortify existing ones. This is particularly true for the transmission pipelines throughout Shandong Province. Major projects under construction include the 364-km [Dongjiakou-Dongying Oil Pipeline](#) and the 322-km [Yantai Port Crude Oil Parallel Pipeline](#) (Figure 9). Another major proposed project is the New Tieling–Dalian Segment of the [Tieling–Dalian Oil Pipeline](#).

**Figure 9. Oil pipeline infrastructure in eastern China.**



"In development" includes pipelines that are proposed and under construction. Shandong Province is colored light red.

## Russia

Russia's invasion of Ukraine has led to sanctions and companies pulling out of fossil fuel projects in Russia, [threatening](#) its current and future position as a major global oil exporter. State-owned Rosneft and Lukoil may have the equipment needed for construction of proposed projects, but without the involvement of western oil majors, they lack the expertise and in some cases the proprietary software required to develop new oil reserves, especially in the Barents Sea.

Russia is aiming to expand its crude oil export capacity by over 1.8 billion bpd along the Northern Sea Route in the Barents Sea by the end of the decade. The proposed [Vostok Oil Pipeline](#) (Figure 10) is a 1,600-km system that will link major oil and gas fields in the Taymyr Peninsula in the Far North. The system is part of Rosneft's ambitious Vostok Oil project, and the pipeline will be constructed in three phases that become operational during 2022–2024. First [proposed](#) in 2019, the project is thought to be the world's [largest](#) current investment in a new oil project. It is estimated to cost USD 85 billion and will include the [Sever Bay Oil Terminal](#), which is under construction and will [ship](#) about 15% of Russia's total oil exports by 2024.

The project is experiencing substantial [opposition](#) from environmental groups, as its construction and route are expected to impact reindeer migration

**Figure 10. Oil pipeline infrastructure in Russia.**



"In development" includes pipelines that are proposed and under construction.



routes and Indigenous communities. As of early 2022, the project's owners included Transneft, Singapore's Trafigura, Dutch MME, and Swiss trading company Vitol. Following Russia's invasion of Ukraine, Trafigura claimed to have [frozen](#) its investments in Russia but did not explicitly [sell](#) its stake in the Vostok Oil project until July 2022, to Hong Kong-based trader Nord Axis. Other owners of the project have not announced their intention to divest as of September 2022.

In addition to the Vostok Oil Pipeline, one other pipeline in active development in the GEM database has non-Russian foreign investment. The [Caspian](#)

[Pipeline](#) transports crude oil from Kazakhstan's Tengiz field to a Russian marine terminal for oil export. It is owned by the Caspian Pipeline Consortium and is undergoing a 320,000 bpd capacity expansion aimed at a 2023 startup. [Shareholders](#) in the consortium include oil companies in Russia and Kazakhstan as well as subsidiaries of U.S.-based ExxonMobil and Shell, UK-based BP and BG Overseas Holdings Ltd, and Italy-based Eni SpA. Broader investment in fossil fuel projects in Russia continues; the Leave it in the Ground Initiative (LINGO) has [identified](#) 41 carbon bombs in Russia—including oil extraction sites—that have substantial foreign investment.

## Companies leading the oil pipeline buildout

The companies leading the global buildout are a combination of state-owned enterprises, publicly-traded companies, and private developers (Table 3). Capacity data are available for about 66% of these projects in the GEM database (see Table A4

on page 13 for a regional breakdown), and the estimated potential emissions for the available data would amount to 4.61 billion tonnes of CO<sub>2</sub> per year, nearly one third of which is associated with projects already under construction.

**Table 3: Top 20 companies leading the global oil pipeline buildout, ranked by estimated km of pipeline.**

Parent	Headquarters country	Length in development (km)	Capacity in development (bpd)	Potential emissions (million metric tonnes CO <sub>2</sub> per year)
China National Petroleum Corporation	China	1,950	90,000	14
Iraq Ministry of Oil	Iraq	1,677	2,500,000	382
Numaligarh Refinery Limited	India	1,630		
TotalEnergies SE	France	1,288	441,000	67
Indian Oil Corporation	India	1,194	430,068	66
Iran Ministry of Petroleum	Iran	1,193	750,000	115
Rosneft	Russia	1,190	319,479	49
Government of Zambia	Zambia	1,141	22,000	3
Canada Development Investment Corporation	Canada	980	290,000	44
True Companies	United States	784	950,000	145
Transneft	Russia	755	617,547	94
ConocoPhillips	United States	701	350,000	53
Petrobangla	Bangladesh	686	60,000	9
Tullow Oil	United Kingdom	601	225,000	34
Power Solution Technologies Plc	Thailand	570	93,838	14
Government of Tanzania	Tanzania	569	22,000	3
Blackstone Group	United States	563	800,000	122
Sultanate of Oman	Oman	440	700,000	107
Sarmatia	Unknown	398	245,753	38
Africa Oil	Canada	392	225,000	34

Capacity information is summed when available for individual pipeline projects; at the time of writing, capacity data was available for about 66% of in-development projects in GOIT.

## Conclusion

The current planned oil pipeline expansion will cost an estimated USD 75 billion. With available capacity data, this infrastructure, if built, would be associated with at least 4.6 billion tons of CO<sub>2</sub> each year for decades, if the projects continued operating through the end of their typical lifetimes.

The [IPCC](#) and the [IEA](#) have both stressed the immediate need for deep cuts to fossil fuel emissions to meet the Paris goal of limiting anthropogenic climate warming to 1.5 °C. Under the constraints identified by the IEA's [Net Zero by 2050](#), “no new oil

fields are necessary” to meet energy needs consistent with the Paris Agreement. This would include the development of any new pipeline infrastructure related to these fields, as well as any infrastructure intended to increase transmission capacity from them beyond what is currently developed, creating a risk of stranded assets. The current proposed oil pipeline buildout therefore implies a deliberate failure to meet these goals and a disregard of their importance by oil majors and the institutions financing them worldwide.

## Appendix

**Table A1: Top 20 countries ranked by km of in-development pipeline.**

Country	Proposed	Construction	Proposed+ Construction
United States	2,693	137	2,829
India	1,194	1,630	2,824
China	1,047	1,486	2,533
Russia	1,494	557	2,051
Tanzania	1,932	0	1,932
Canada	0	1,244	1,244
Iran	0	1,193	1,193
Niger	0	1,192	1,192
Kenya	1,109	0	1,109
Iraq	1,047	0	1,047
Zambia	929	0	929
Bangladesh	0	686	686
Benin	0	650	650
Jordan	618	0	618
Thailand	215	342	557
Poland	530	0	530
Oman	0	440	440
Egypt	140	170	310
Uganda	294	0	294
South Sudan	276	0	276

**Table A2: Top 10 in-development pipelines globally by length.**

Pipeline	Status	Length (km)
<a href="#">Niger-Benin Oil Pipeline</a>	Construction	1,950
<a href="#">Tazama Oil Pipeline</a>	Proposed	1,710
<a href="#">Basra-Aqaba Oil Pipeline</a>	Proposed	1,665
<a href="#">Paradip Numaligarh Crude Pipeline (PNCPL)</a>	Construction	1,630
<a href="#">East African Crude Oil Pipeline (EACOP)</a>	Proposed	1,444
<a href="#">Vostok Oil Pipeline</a>	Proposed	1,400
<a href="#">New Mundra-Panipat Oil Pipeline</a>	Proposed	1,194
<a href="#">Seahorse Pipeline</a>	Proposed	1,127
<a href="#">Trans Mountain Oil Pipeline</a>	Construction	980
<a href="#">Willow Oil Pipeline</a>	Proposed	620

**Table A3. Proposed oil export terminals along the U.S. Gulf Coast.**

Oil Export Terminal	Status	Type	Capacity (bpd)	Developer(s)	Associated new pipeline infrastructure	Associated pipeline km
<a href="#">Brownsville Oil Terminal</a>	Proposed	Onshore		Jupiter MLP LLC		
<a href="#">Bluewater Texas (BWTX) Terminal</a>	Proposed	Offshore	1,920,000	Trafigura; Phillips 66	<a href="#">Bluewater Texas (BWTX) Terminal Pipelines</a>	90 km
<a href="#">Sea Port Oil Terminal (SPOT)</a>	Proposed	Offshore	2,000,000	Enbridge; Enterprise Products Partners	<a href="#">Sea Port Oil Terminal (SPOT) Pipelines</a>	97 km
<a href="#">Texas GulfLink Deepwater Port</a>	Proposed	Offshore	1,100,000	Sentinel Midstream	<a href="#">Texas GulfLink Oil Pipelines</a>	81 km
<a href="#">Blue Marlin Offshore Port (BMOP)</a>	Proposed	Offshore	1,900,000	Energy Transfer	<a href="#">Blue Marlin Offshore Port (BMOP) Pipelines</a>	60 km
<a href="#">NOLA Oil Terminal</a>	Construction	Onshore		NOLA Oil Terminal LLC (Christian Amedee; Roy M. Carubba)		

**Table A4. Percentage of in-development projects per region that have reported capacities.**

Region	% of projects with reported capacity
Latin America and the Caribbean	93.8%
Australia and New Zealand	82.1%
North America	75.2%
South Asia	72.5%
Eurasia	66.7%
East Asia	57.5%
Europe	54.9%
Middle East and North Africa	44.4%
SE Asia	40.7%
Sub-Saharan Africa	30.0%

## About Global Energy Monitor

This briefing was written by Baird Langenbrunner and Julie Joly of Global Energy Monitor (GEM), a nonprofit research organization that develops information on fossil fuel projects and renewables worldwide. Global Energy Monitor data is used by the International Energy Agency (IEA), the OECD Environment Directorate, UN Environmental Programme, U.S. Treasury Department, and the World Bank, among other institutions.

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### Data and methodology

Oil pipeline data comes from the [Global Oil Infrastructure Tracker](#) (GOIT), Global Energy Monitor, June 2022 version. More information about data and methods can be found in the [online methodology](#). Researchers who have contributed to GOIT include Nagwa Abdallah, Greig Aitken, Sophia Bauer, James Browning, Natalie Cherot, Gregor Clark, Hanna Fralikhina, Joshua Frank, Christina Haidar, Erik Hazard, Mason Inman, Ben Inskeep, Ahna Kruciz, Baird Langenbrunner, Ted Nace, Lydia Plante, Aiqun Qu, Christine Shearer, Janna Smith, Adrian Wilson, and Scott Zimmerman.