Keep It in the Ground

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Introduction

Thanks to the historic Paris climate agreement, the world now knows what it will take to stay within our global carbon budget. If the world is serious about tackling climate change, we need to fight for fewer oil wells and coal mines. This report explains where these campaign fights need to occur.

The global carbon budget describes how much carbon can be emitted into the atmosphere before warming surpasses 2˚C—the limit scientists and policymakers have established as the boundary for catastrophic climate change.

The adoption of the Paris Agreement by nearly 200 countries in December commits countries to this budget and requires that they take steps to reduce emissions.

At this critical juncture following the Paris Agreement, this report builds upon Point of No Return, a groundbreaking 2013 investigation commissioned by Greenpeace International and undertaken by Ecofys. Using a similar approach, this updated report reflects that a number of carbon threats from the 2013 report have abated, and it assesses emerging projects and trends that put the climate and planet at risk.

Keep It In The Ground examines the coal, oil and natural gas deposits around the world that pose the greatest risk to the climate if burned for fuel. Including an overview of efforts by fossil fuel companies and their political allies to develop these resources, the report provides a roadmap for the international climate movement in the post-Paris Agreement world.

Carbon Threats

Potential Emissions between 2013-2050 (in Gt CO2e)


Russia
34.4
Turkmenistan,
Kazakhstan,
Azerbijan
10.0
China
45.3
Iraq
21.1
Saudi Arabia
115.2
India
57.0
Indonesia
15.4
South Africa
12.0
Australia
36.0

The Carbon Budget

According to the Intergovernmental Panel on Climate Change (IPCC), the cumulative carbon budget between 2011 and 2050 is around 870-1,240 Gt CO2, which gives a better-than-even chance of avoiding warming above 2˚C and factors in other greenhouse gases.

For an 80 percent chance of limiting warming to 2˚C or less, Carbon Tracker's Unburnable Carbon report finds a carbon budget of 886 Gt CO2 for 2000 to 2050; we used up a third of that budget from 2000 to 2011 alone. To reach a four-in-five chance of preventing catastrophe, we have approximately 565 Gt CO2 left in our carbon budget until 2050. To limit warming to 1.5˚C or below—an ambitious goal stated in the Paris Agreement—emissions would need to be limited in accordance with an even stricter budget.

Carbon Tracker estimates current known global fossil fuel reserves at 2795 Gt CO2, while other research suggests the figure is closer to 2900 Gt CO2.[1] This means that if the world's proven reserves are developed before 2050, we will miss even the high-end estimated budget for a 50 percent chance of limiting warming to 2˚C—three times over. The calculations for the low-end estimate indicate the need for even trimmer carbon budgets, which would provide a better chance of avoiding catastrophe.

Unless these reserves stay underground or beneath the ocean, any chance of limiting warming to 2°C or less will be lost.

A recent study published in Nature recommends that a third of oil reserves, half of gas reserves, and more than 80 percent of current coal reserves worldwide need to be left alone and remain unused in order to meet the 2°C target.

The authors stress that, in order to stave off catastrophic climate change, the overwhelming majority of the large coal reserves in China, Russia and the United States as well as more than 260 billion barrels of oil reserves and 60 percent of gas reserves in the Middle East must all remain unused. Finally, the study finds that Arctic resources should be off-limits to development and that the exploration and usage of unconventional oil, like the high-carbon Canadian tar sands, undermines any efforts to limit climate change.

There is also growing international support for a moratorium on all new coal mines, led by President Anote Tong from Kiribati. The call has already been backed by several other small island nations. Recently, China also announced a three-year moratorium on all new coal mines.

In 2014, carbon dioxide emissions reached 35.9 billion tons, including a 2.9 percent increase in the United States over 2014, reversing a decline of the last four years, according to projections released in December 2015 by the Global Carbon Project.

The International Energy Agency announced in 2014 that their preliminary data showed that growth in carbon emissions from the energy sector had stalled. The agency also pointed out that this marked "the first time in 40 years in which there was a halt of reduction in emissions of the greenhouse gas that was not tied to an economic downturn." The Global Carbon Project's 2015 report also projected that carbon emissions declined by 0.6 percent in 2015.

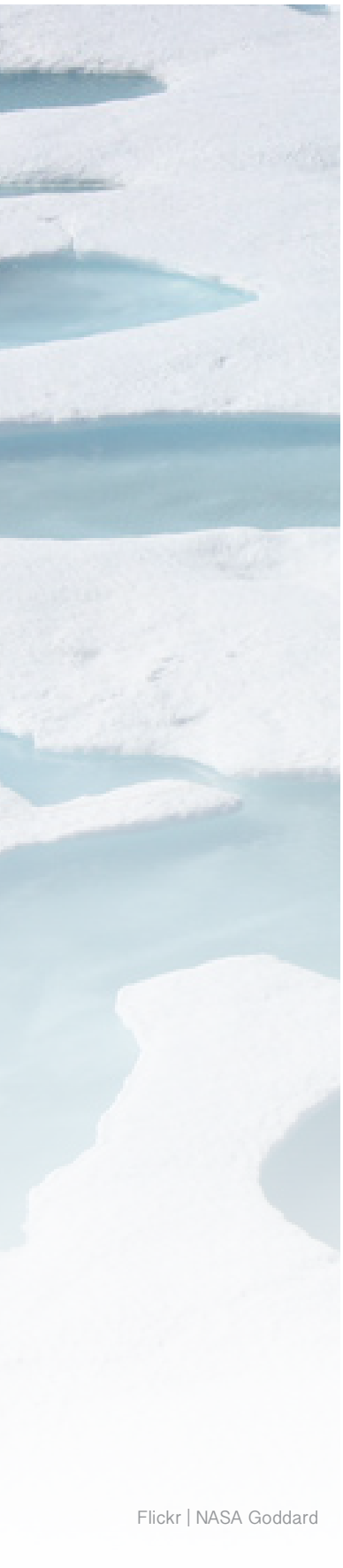
If carried to completion, these projects would emit a projected 300 Gt of CO2 over their lifetimes—equal to eight times current global emissions—which would destroy vital ecosystems, and threaten the security and prosperity of humankind.[2]

The reserves of coal, oil and natural gas outlined in this report contain enough carbon to rocket the planet far beyond the 2˚C limit. Warming from fossil fuels puts other carbon sinks at risk. As permafrost melts and peat bogs dry, they emit enormous quantities of carbon dioxide, furthering a chain reaction where the release of carbon results in a warmer world, which in turn releases more carbon.

We are already experiencing the dire consequences of climate change in the form of extreme weather events, including pervasive heat waves, droughts, floods, intense and destructive hurricanes and wildfires, and even monster snowstorms. Beating 2014's record, 2015 has earned the distinction of having been the hottest year since record keeping began. Experts expect 2016 to be warmer still.

The consequences of the mounting carbon emissions in our atmosphere are increasingly costly, and impossible to ignore. As part of an ongoing global effort to "Keep It In The Ground," the climate movement intends to confront the threats described in this report, as well as others at the local, state, and national level.

The Arctic



Global warming has contributed to the rapid melt of Arctic ice and exposed new avenues for the development of fossil fuel reserves. If extracted and used, these fuels will accelerate global warming and the melting of Arctic ice.

In anticipation of the newly exposed fuel sources, oil companies have started a rush on the Arctic, which is estimated to contain 90 billion barrels of oil and 1,670 trillion cubic feet of natural gas.[3]

According to Ecofys, oil production in the Arctic could grow to 3 million barrels per day in 2030. If the existing oil reserves are fully tapped, the drilling could add a total of 15.8 gigatons of carbon dioxide equivalent (Gt CO2-eq) between 2013 and 2050.[4]

The race to the Arctic, however, has become an uphill battle. Companies now face numerous legal challenges from environmental groups and obstacles within the federal permitting process.

Questions also remain on whether Arctic drilling is technically and economically viable. Some companies, including Chevron, have abandoned their near-term drilling plans as a result of the international slide in oil prices and a tougher regulatory climate.

Royal Dutch Shell, for example, announced that it would abandon its exploratory drilling plans in the Beaufort and Chukchi Seas off the Alaska coast, saying it found insufficient oil and gas to justify continuing the costly development process. After years of vying for drilling rights in the face of opposition by concerned citizens and regulatory reviews, Shell announced its reversal just months after President Obama's decision to allow drilling to proceed. A victory for environmentalists, it was the latest in a series of setbacks for the company. Shell has a history of errors and accidents in its Arctic fuel exploration, including the December 2012 grounding of a drilling vessel in stormy seas.

Flickr | NASA Goddard

"Shell's plans to drill in the Arctic, one of the world's most pristine and extreme regions – which was only made accessible by melting ice cover due to climate change – was not only a financial and environmental gamble, but it become politically toxic as people across the world joined together to raise the alarm.

You might have thought that a retreat from the Arctic by one of the biggest most established companies in the world would be a clear signal to the broader industry that Arctic oil is not worth the risk. However there are still both national and international oil companies with license blocks at the Arctic frontiers, and the struggle to save the Arctic seems far from over."

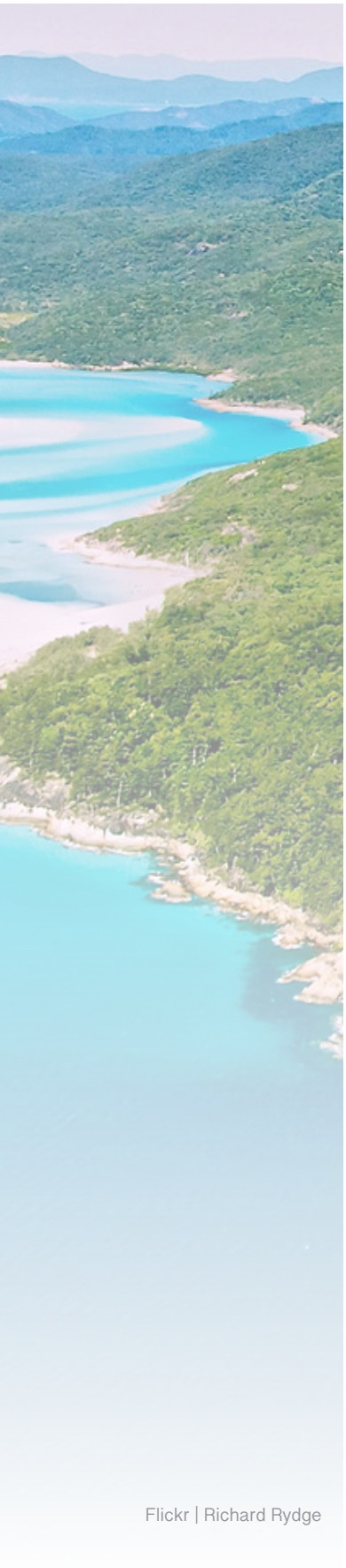
- Sophie Allain,
Arctic Campaigner, Greenpeace International

In more good news for opponents of Arctic drilling, in October 2015 the Department of the Interior canceled two Arctic offshore lease sales scheduled for 2012-2017. Under the current five-year program offshore oil and gas-leasing program, Chukchi Sea Lease Sale 237 was scheduled for 2016 and the Beaufort Sea Lease Sale 242 for the first half of 2017.

The Bureau of Safety and Environmental Enforcement (BSEE) also denied requests from Shell and Statoil for lease suspensions, which would have allowed the companies to extend their leases beyond 10 years. The Beaufort lease is scheduled to expire in 2017; Chukchi in 2020.

Recent research recommends against any drilling in the Arctic. In January 2015, the Obama administration proposed new protections for Alaska's Arctic National Wildlife Refuge, recommending that more than 12 million acres, including the oil-rich coastal plain, be designated as wilderness—the highest level of protection for public lands. This would halt oil exploration in the coastal plain, but this proposal will likely face heavy challenges from the current Republican-led Congress.

Australia



Flickr | Richard Rydge

Coal mining expansion in Australia could add a total of 36 Gt of CO2 equivalent to the atmosphere between 2013 and 2050. There are more than 60 coal mining projects in New South Wales and Queensland, with a targeted coal output of approximately 450 to 500 million metric tons per year, excluding projects that have been abandoned or shelved.[5]

This is a significant reduction from the outlook in 2012, when the World Resources Institute Global Coal Risk Assessment identified 800 to 900 million metric tons of planned production capacity.

However, the planned mining expansion in Australia represents an enormous threat to the planet, with the targeted additional output far exceeding what the International Energy Agency (IEA) sees consistent with a catastrophic 5 to 6˚C warming scenario.

Australian coal export volumes experienced double-digit growth in 2013 and grew strongly again in 2014 to roughly 375 million metric tons, a 24 percent increase from 2011 to 2012.[6] The pace of growth slowed from 2014 to 2015,with export volumes increasing by 4.8 percent (398 million metric tons), according to the Office of the Chief Economist.[7]

As the price of coal has plummeted, Australian producers are making up what they lost in value by working their employees harder. The tonnage of coal produced per employee in Queensland rose 18 percent in 2014.[8] Most of this extra volume came from existing mines, but some large new projects, like the Maules Creek coal mine in NSW's Gunnedah Basin and Caval Ridge in Queensland's Bowen Basin have started production.

"That is very disheartening…the slump in Asia has not led to a fall in volumes expected from Oz (Australia) – just the opposite. The lower value of the Oz dollar has meant our coal producers could ramp up production and grab greater market share, even while they are laying off workers in the thousands. Australia is, in effect, making itself more and more vulnerable to the volatile global coal market at a time when we should be putting in place programs and measures to diversify and shield people in our coal producing regions from dramatic changes to coal's prospects as a commodity."

-Georgina Woods,
Australian community-based energy and resources analyst

In 2012, according to the Bureau of Resource and Energy Economics (BREE), there were 97 new coal mining projects, including expansions and new mines, proposed in New South Wales and Queensland.[9]

By December 2015, of those projects:

- 34 were approved, but only five proceeded to construction
- 12 were withdrawn or shelved
- One was rejected by a determining authority
- One was stymied by impossible conditions imposed by a court
- Five are currently under legal challenge

Many more have been delayed beyond their expected start-up time. BREE predicted that five new projects would begin producing in 2013, but only three have done so. Out of the 16 that were expected to begin producing in 2014, only half of them did.

As of 2015, there are roughly 65 coal projects that still pose a threat to land, water and communities in New South Wales and Queensland, and to the global climate. Some of these projects already have been approved and present an immediate threat, while others have been delayed for years by the efforts of communities fighting them.[10]

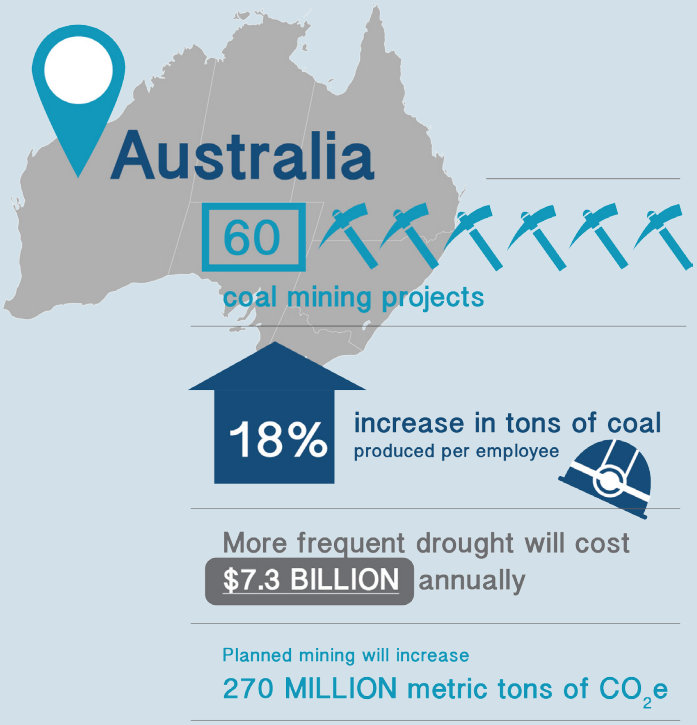
Most of these projects are in the existing and heavily exploited coal regions of southern Sydney, the Hunter Valley and Queensland's Bowen Basin. But six international coal companies are planning nine new mines in central Queensland's Galilee Basin. Altogether, the mines proposed in this new region would create 700 million metric tons of carbon dioxide every year, markedly increasing Australia's greenhouse gas emissions.

Five of the nine proposals received approval from the Queensland and Australian Governments, but the companies have yet to begin construction. In total, 11 international banks have refused to fund Galilee Basin projects.

While banks back away from fossil fuel investments, the Australian government continues to heavily subsidize fossil fuel projects. According to Reneweconomy, Australia subsidizes fossil fuel production with $3.77 billion a year, and also funds the industry with a further $262 million a year in public finance.

Australia's environmental ministry approved the Carmichael mine, country's largest mining project in October 2015, overturning a federal court's decision to halt the project just two years prior.

Current predictions suggest that coal extracted from the Carmichael mine would produce 128.4 million metric tons of carbon dioxide per year over the mine's lifetime.



That's almost a quarter of Australia's current annual emissions, which stood at 546.7 million metric tons of CO2 equivalent in 2014.

When added to the roughly 900 million metric tons of CO2 equivalent created by burning the 375 million metric tons of coal Australia is already exporting, the expanded coal mining would increase the greenhouse gas contribution of Australia's coal exports to 1.6Gt a year[11] over the next five years. Australia's Office of the Chief Economist expects total Australian coal exports to rise to 433 million metric tons by 2020, taking the greenhouse impact of Australian coal exports to more than a gigatonne per annum.[12]

If it allows mining in in the Galilee Basin, Australia faces the prospect of losing an iconic and irreplaceable natural and economic asset. The port and shipping activity required to export the additional coal would cause serious damage the Great Barrier Reef, which is already under severe stress from climate change. Indeed, the Great Barrier Reef Outlook Report 2014 identified climate change as the greatest threat facing the region, declaring that its deleterious effects already are at work.

But the Reef is not all Australia stands to lose. If these fossil fuels are not kept in the ground, Australia's already evident climate impacts – including powerful storms, heat waves and bushfires – will worsen.

Australia is already experiencing more frequent and intense heat waves. The Climate Council has warned that deaths from heat waves are projected to double over the next 40 years in Australian cities. From 2020 onwards, the predicted increase in drought frequency "is estimated to cost $7.3 billion annually, reducing GDP by 1 percent per year."[13]

Canada

Flickr | Kevin Dooley

Between 2013 and 2050, Canada could add a total of 17 Gt CO2 equivalent to the atmosphere.[14]

By 2020, Canada's tar sands projects are expected to add 420 million metric tons of carbon dioxide to the atmosphere each year, a rate equivalent to the entire annual emissions of Saudi Arabia.[15]

Without the implementation of strong policies to protect the climate and the local environment, production of oil from the tar sands in Alberta is forecast to triple from 1.5 to 4.5 million barrels a day by 2035, adding 706 million metric tons of carbon dioxide a year to worldwide emissions.

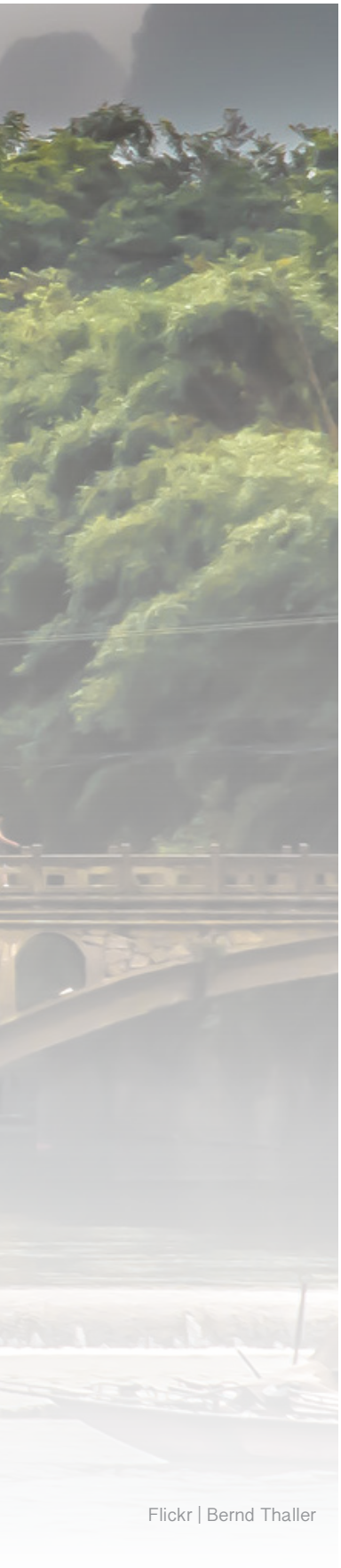
> *"Tar sands oil is the dirtiest oil on the planet. It requires turning a rock into a liquid, and requires a lot of energy, since it is very hard to get carbon out of the ground. Given climate change, we don't have a lot of spare carbon. It would be a major contributor to climate change, and it definitely has to stay underground."*
>
> – Jake Schmidt, international program director, Natural Resources Defense Council

In a highly significant decision—and a huge victory for environmentalists, indigenous peoples, ranchers, farmers, and more—President Obama recently rejected the Keystone XL pipeline, a proposed tar sands pipeline that would have connected Alberta with Gulf Coast refineries and carried 800,000 barrels per day of tar sands oil across the United States for refining, and export.

During the seven-year Keystone fight, the pipeline became a symbol of the highly contentious political debate over climate change. According to 350.org, the Keystone XL pipeline would have been "the fuse to the largest carbon bomb on the planet."[16] An NRDC report concluded that the Keystone pipeline would have contributed 18.7 million to 24.3 million metric tons of CO2 equivalent per year.

The Obama administration was bitterly castigated by Republican lawmakers and the oil industry for rejection of the controversial pipeline, but U.S. Secretary of State John Kerry declared that the United States "cannot ask other nations to make tough choices to address climate change if we are not willing to make them ourselves."

China



Flickr | Bernd Thaller

China is the world's largest CO2 polluter, and studies suggest that China will soon surpass the United States as the largest contributor to climate change since 1990, even though its emissions fell for the first time in 2014.

The World Resources Institute estimates that China's cumulative emissions will reach 151 billion metric tons by the end of 2016. Yet, changing energy and economic policies will enable China to peak its coal use before 2020.

China's coal production and consumption fell in 2014 for the first time this century. Recent statistics from China indicated that the country has been burning 17 percent more coal annually than previously reported, but its calculated carbon emissions remain the same.

In September 2015, President Obama and Chinese President Xi Jinping signed a landmark climate change agreement in which both countries pledged to limit their carbon emissions.

In the deal, China announced it would use a cap-and-trade system to peak CO2 emissions by 2030 or earlier, and to increase the non-fossil fuel share of all of its energy to approximately 20 percent by 2030. These commitments came on top of China's ambitious 2020 targets to limit total energy consumption, increase its share of non-fossil energy, and improve air quality by requiring prosperous eastern provinces to peak emissions and decline coal consumption by 2017.

China is expected to dramatically reduce its targets for coal-to-gas, coal-to-oil and other coal chemical conversion projects in its next five-year plan, eliminating the last remaining source of industrial coal consumption growth. In March 2015 Beijing announced that it will close its last major coal plant in 2016.

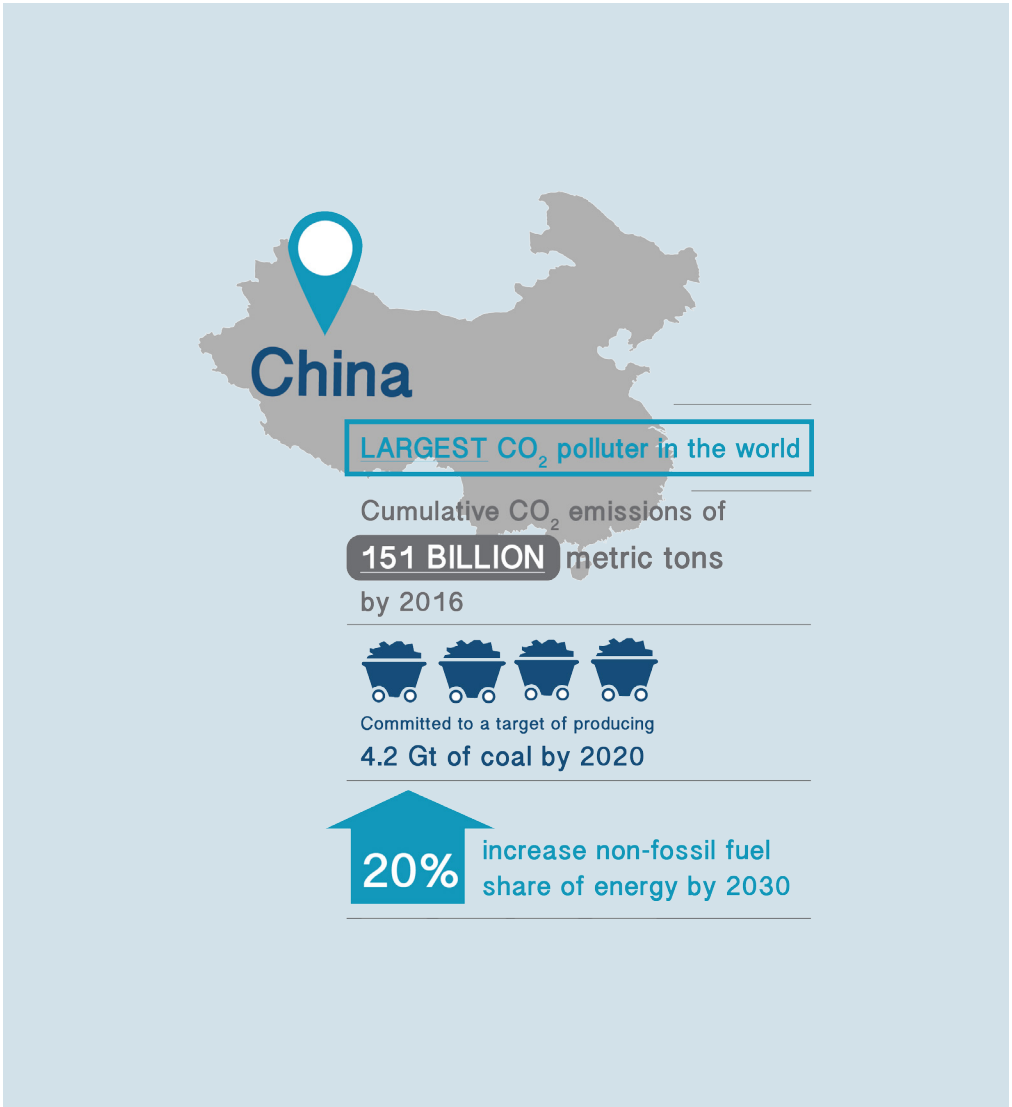
As a result of the lowered estimates for expected coal demand in 2020, the CO2 threat from China's western coal bases has shrunk significantly from the 2013 estimate of 45.3 Gt of CO2 equivalent to the atmosphere between 2013 and 2050.[17]

Nevertheless, the Chinese State Council is still committed to developing 14 coal bases, with the target of producing 95 percent of national total coal output by 2020.

The official target for coal consumption in 2020 is 4.2 Gt, which allows for a substantial increase of 600 million metric tons. Assuming coal output is equal to consumption, the coal bases would produce 4 billion metric tons—a significant threat.

"It is increasingly clear that the planned coal expansion in China flies in the face of the clean air and economic rebalancing agendas."

- Lauri Myllyvirta, senior global campaigner on coal, Greenpeace International



The United States

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Climate and energy policy in the United States has progressed substantially in recent years, with dramatic growth in renewable energy production and planned domestic actions to reduce greenhouse gases established under the Clean Power Plan. The U.S. has increasingly turned away from coal towards renewable energy. Production of shale gas has ramped up during this transition period, but it's key that the country turns away from gas and invests in renewable energy to meet its climate pledge.

In 2015 several Democratic senators introduced legislation that would prohibit new leases on coal, gas, oil and tar sands extraction on federal lands in the United States. The bill, sponsored by Democratic Senators Jeff Merkley of Oregon and Bernie Sanders of Vermont, would also ban offshore drilling in the Arctic and Atlantic Ocean and forbid the renewal of leases that have not yet produced fossil fuels.

In the face of tightening restrictions on coal use, the oil and gas industry has increased production of cheap and plentiful oil and shale gas. The International Energy Agency forecasts an increase of 249 billion cubic meters from 2012 to 2035 in U.S. shale gas output.

The boom in hydraulic fracturing ("fracking")—the process of drilling and injecting fluid into the ground at a high pressure to fracture shale rocks and release the natural gas inside—has given rise to more than 110 liquefied natural gas (LNG) export facilities and terminals in the United States, with more awaiting regulatory approval.

These terminals perform a variety of functions, including: transforming liquefied gas back to a gaseous state; exporting natural gas; providing a natural gas supply to the interstate pipeline system or local distribution companies; or storing natural gas for periods of peak demand.[18]

"Instead of blindly allowing destructive fracking to continue in our communities, we should extend statewide fracking bans, like the one in New York, and moratoriums, like the one in Maryland, that will keep dirty, climate-polluting fossil fuels like fracked gas in the ground and invest in truly clean, renewable sources of energy that don't come with the threat of poisoned drinking water and climate disaster."

- Michael Brune, Executive Director,
Sierra Club

A single LNG facility is not in and of itself a threat to the carbon budget. But collectively, these facilities play an important role by driving the drilling and combusting of fossil fuels and enabling the unconventional hydrocarbon boom in the United States, with major implications for the nation's carbon footprint.

Between 2013 and 2050, the United States is expected to emit a cumulative total of 34 Gt of CO2 equivalent emissions from shale gas and tight oil expansion.[19]

LNG Case Study: Cove Point, MD[20]

Dominion's Cove Point facility would be the first LNG export terminal on the East Coast. Its opponents, chief among them the Chesapeake Climate Action Network, argue that it would increase the demand for more fracking in the region and require an expanding network of new fossil fuel infrastructure. A rise in fracking and infrastructure-related emissions could have devastating effects on the local environment, as well as increase the region's contributions to climate change.

The Federal Energy Regulatory Commission has approved permits for Dominion's Cove Point project, but legal challenges and grassroots resistance continue.

The project would cost upwards of $3.8 billion dollars, require the construction of an energy-intensive plant to liquefy and cool the gas, draw a surge of tanker traffic into the Chesapeake Bay, and facilitate the export of more than 1 billion cubic feet of fracked natural gas per day.

The new liquefaction facility that Dominion would have to build on-site to process gas for export would emit more heat-trapping carbon dioxide than all but three of Maryland's existing coal plants. In all, given the energy-intensive process of extracting, transporting and processing gas for export, Cove Point would produce more greenhouse gas emissions than any other single source of climate pollution in Maryland. This LNG terminal is a prime example of a state-level carbon bomb.

Moreover, the process of exporting gas from Cove Point would require huge, 1,000-foot long tankers to carry volatile, potentially explosive liquid

fuel in an area important for its seafood and tourism. Harmful emissions from those tankers would worsen local air quality, and the ships would dump billions of gallons of dirty ballast wastewater into the Chesapeake Bay each year.

Finally, the project also would need new pipelines throughout the Marcellus shale states to move gas from new drilling wells to the export terminal—pipelines that could leak and break, causing explosions and fires.

"Natural gas is methane, LNG is 99 percent methane. It is, pound for pound, 86 times more potent than CO2 over 20 years, and 30 times as potent over 100 years. The negative environmental and climate change impacts that could be triggered by Cove Point are sadly not unique to that facility, but could in fact become the norm for LNG exports if that industry is allowed to expand in this country without serious regulations. Cove Point is the poster child for the environmental controversies around LNG."

– James McGarry, Maryland & D.C. policy director, the Chesapeake Climate Action Network

India

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India's rapidly growing energy needs and reliance on coal threatens to quickly eat away at the global carbon budget.

India's coal-fired power plant capacity surged from 90 gigawatts in 2010 to 165 gigawatts in 2014, a rate equivalent to adding a large coal-fired power plant every two weeks. This pace is set to continue for the next few years, with approximately 80 gigawatts of capacity under construction. India's planned coal expansion could add a total of 57 Gt of CO2- equivalent emissions between 2013 and 2050.[21]

But, several factors are darkening the outlook for Indian coal plants. Coal India's inability to meet production targets led to a shortage of domestic coal. Subsidies for expensive imported coal, successful citizen opposition to coal production, uncertainty in the international coal markets, competition from increasingly cheap renewables, plus a major political scandal in which the Indian government sold national coal deposits for much less than their market value have all led banks and other financiers to hesitate before investing in coal-fired power plant projects, causing a slowdown in construction.

Beyond the domestic factors, the Paris Agreement is a dominant force in the shift towards renewable energy. India, the third biggest emitter of greenhouse gases in the world, announced in its INDC a plan to obtain 40 percent of its electricity from renewable and other clean energy sources by 2030. France, the United Arab Emirates, and the United States, among others, have pledged to contribute funding or expertise to facilitate India's renewable energy development. Prime Minister Narendra Modi, an enthusiastic backer of solar power, advised the country's oldest coal-fired plants to bundle electricity from solar farms for sale to the grid.

"India's commitment to climate action puts the nation on a much more sustainable path while investing in a massive addition to the world's thriving clean energy economy. The planet's four largest emitters of carbon pollution have now shown that meaningful climate action is not only achievable, but that it's already happening."

- Michael Brune, Executive Director, Sierra Club

While the Indian government has set groundbreaking targets for renewable energy, it still supports coal projects. The Modi administration frequently cites the 237 million Indians without access to electricity as the reason for their continued dependence on accessible dirty fuels. However, in January 2016, solar tariffs dropped to a new low of INR 4.34 / kWh per hour, indicating that solar power is quickly becoming cheaper than new coal.

There are over 200 gigawatts worth of new coal-fired power plant projects in various proposal, planning and permitting stages in India. To bridge the gap between the domestic coal supply and the enormous demand for domestic coal that would be created by these projects, the Modi administration set a goal of increasing coal production from Coal India Limited upto one billion tons a year by 2019, and with another 500 MT expected from other private or captive mining sources. They also pledged to "clear hurdles" to new mines, including environmental and social safeguards.

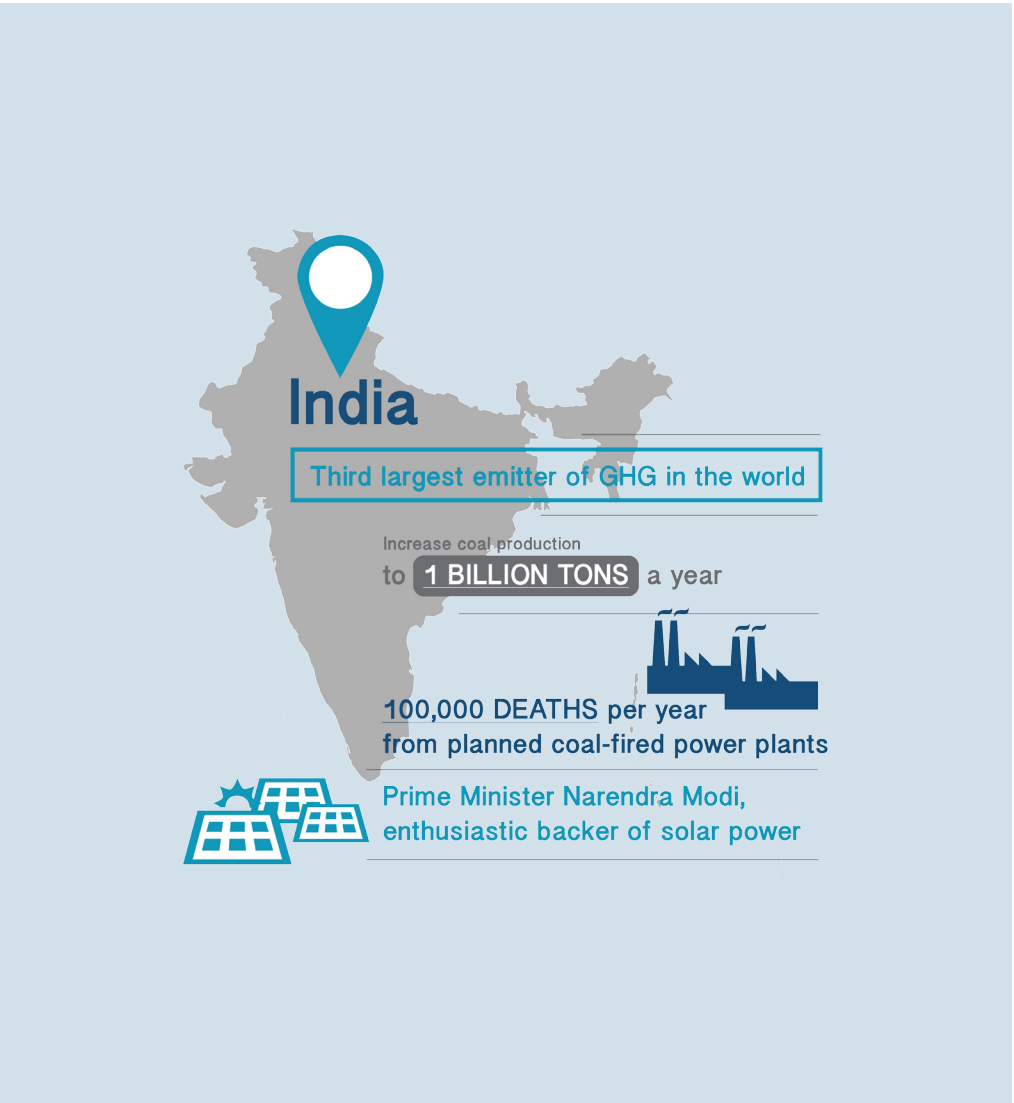
To achieve this target, coal production would have to grow by 9 percent annually. By comparison, from 2009 to 2014, coal mining increased by only 6 percent. India also missed its target to ramp up coal output to 680 million tons by the end of the 11th five-year plan (2007-12), as production touched only 540 million tons in 2011/12.[22]

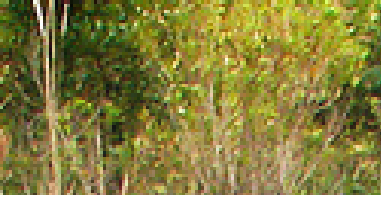
India's domestic supply target reflects the government's intention to aggressively develop India's coal resources, and therefore presents a major threat to the 2˚C limit.

It also presents a major threat to public health. According to a recent report, air pollution from India's existing coal-fired power plants cause an estimated 100,000 deaths per year.[23] The report also projects that the country's total premature mortality resulting from emissions from coal-fired thermal power plants would grow by two to three times, reaching 186,500 to 229,500 annually in 2030. In the same period, the number of asthma attacks associated with coal-fired power plant emissions is expected to increase to 42.7 million cases per year.

The projects would add approximately 2,100 million tons of CO2 per year into the atmosphere, almost equal to India's current total CO2 emissions, or 5 percent of global emissions from fossil fuel burning.[24] At the current rate of power plant additions, these plants could be commissioned in fewer than 20 years. The plan to increase Coal India's coal output could add 700 Mt of CO2 in just five years, more than the total emissions of Indonesia or Canada.

India's current per capita CO2 emissions are low, at only 1.7 tons per person, compared to China, at 6.9 tons and the United States at 17 tons.[25] However, as the European Union (EU) is committed to cutting its domestic emissions by 80 percent from 1990 levels by 2050, and the coal-fired power plant expansion could double India's per capita emissions in two decades, this development path could see India's per capita CO2 emissions overtake the EU in 20 years or less.





Brazil

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Deep underneath the Atlantic Ocean, a massive quantity of oil lies off the Brazilian coast. According to the Energy Information Administration, Brazil has 13.2 billion barrels of proved reserves, 94 percent of which are underwater (the Brazilian estimate is closer to 17 billion barrels). In 2013, Brazil produced 2.7 million barrels of oil a day and expects to drill almost double that amount by 2020, producing up to four million barrels a day. This could add up to 660 million metric tons of carbon dioxide to annual worldwide emissions by 2035.[26]

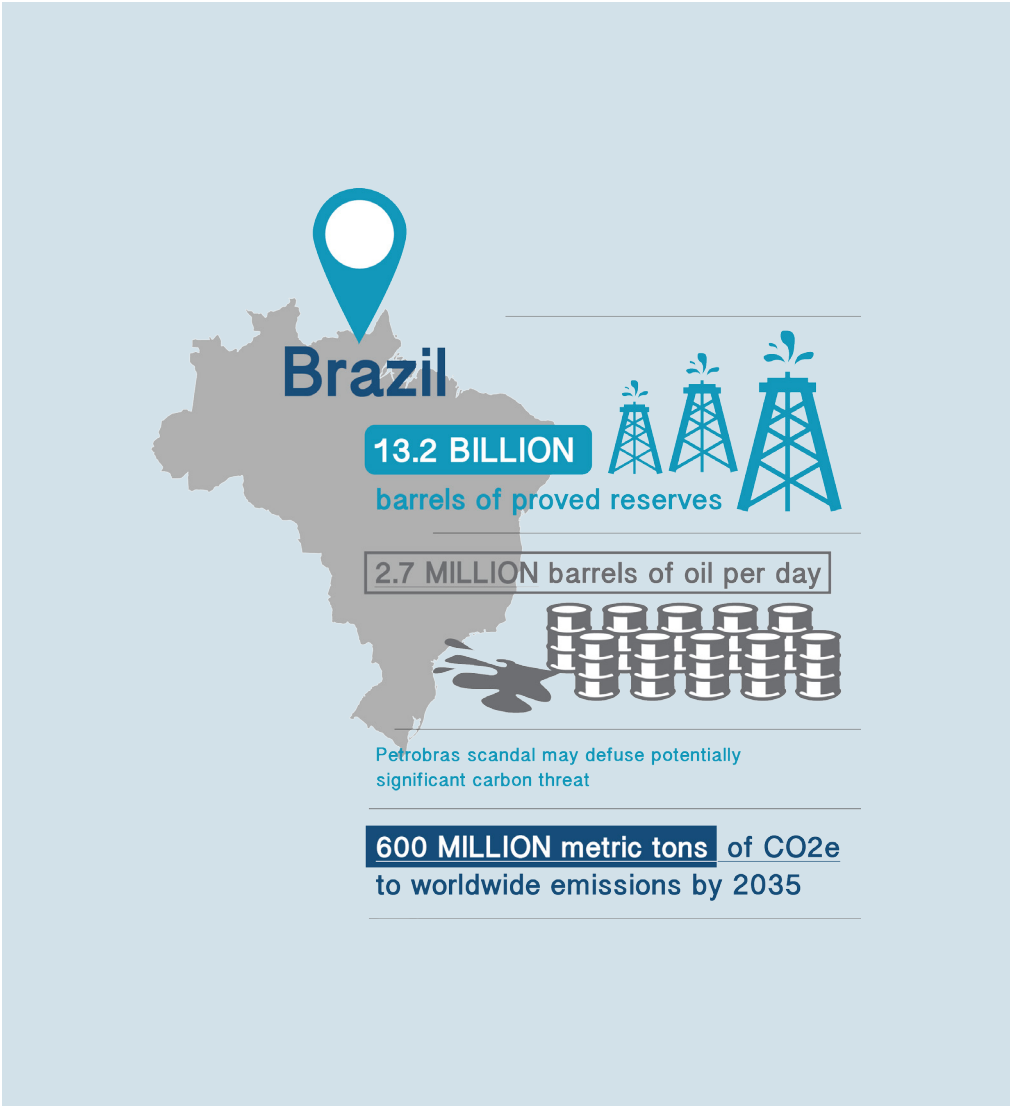
"Brazil has deep sea oil finds that are huge and that are just beginning to be exploited. Obviously, if they tap into it, there is a large amount of carbon that will go into the atmosphere."

– Jake Schmidt, international program director,
Natural Resources Defense Council

Between 2013 and 2050, the increased production and use of deep-water Brazilian oil is projected to release 17 Gt of carbon dioxide equivalent.[27]

However, a pervasive scandal involving Petrobras, the country's major oil producing company, and as many as 50 Brazilian political and business leaders—including the country's ex-president—has left Brazil reeling and the company's future as a significant oil producer uncertain. The oil giant recently cut its production target for 2020 by 3.6 percent to 2.7 million barrels a day.

Petrobras is under investigation for allegedly awarding contracts with inflated values, and then dividing the profits between its directors and the politicians. This, coupled with a worldwide decline in oil prices, has cast doubt on Brazil's potential to be major player in the world energy market and may end up defusing a potentially significant carbon threat.



Indonesia

Flickr | Marc-Andre Jung

By 2050, cumulative emissions from Indonesian coal output could reach 15.4 Gt of carbon dioxide equivalent. Only a fraction of Indonesia's coal output serves the domestic market, while almost 80 percent is exported. In 2013, over a quarter of the coal and more than one-third of the steam coal traded globally originated in Indonesia, making it the world's largest coal exporter.

Over the past two to three years, the Indonesian government has grown disillusioned with coal and mineral exports, moving toward quotas and tariffs that aim to restrict and reduce coal exports and revoke unlawfully granted mining permits.

Coal mining in Indonesia imposes enormous costs on the society in the form of water pollution, community displacement, flooding, destroyed farmland, and other serious impacts on livelihood and health. A 2014 Greenpeace investigation revealed that numerous coal mines in South Kalimantan were violating their water discharge standards, polluting the region's rivers and putting public health at risk.[28]

However, the mining industry still has significant expansion plans. Coal analysts Wood MacKenzie project that, by 2018, a scaling up of operating mines and "highly probable" projects would add 140 million metric tons of coal output over the 2013 level. Projects that are not locked in but deemed "probable" could bring the increase to 200 million metric tons by 2018.[29]

Higher-cost projects classified as "possible" are unlikely to take off, given the overcapacity in the seaborne coal market and weak outlook for demand growth, especially as China continues to reduce its dependence on coal-fired power.

The planned expansion in coal output would be solely for exports, as even the most bullish projections of domestic coal consumption put the increase by 2020 at around 50 million metric tons. That means that at current production levels without any further expansion, at least two-thirds of coal output would be exported in 2020.

In the face of the industry's expansion plans, the robust implementation and enforcement of the intentions and targets to constrain coal exports remain key challenges for the government. Furthermore, many of these projects rely on infrastructure projects that are still supported by the Indonesian government. Unless the expansion is curtailed through policies or by uncertainty over demand, the "probable" coal mining expansion could increase CO2 emissions from coal burning by 510 million metric tons per year by 2018.[30]

The African Continent

Flickr | South African Tourism

Natural gas production in Africa will deliver 64 billion cubic meters of natural gas in 2015 and rise to 193 billion cubic meters in 2035. Between 2013 and 2050 African gas will add a total of 12 Gt of CO2 equivalent emissions to the atmosphere.[31]

With a current overall electrification rate of 43 percent on the African continent, it is clear that numerous African countries are struggling to meet the energy needs of their citizens, and there is a risk that countries will turn to coal to meet their energy needs.

The current per capita emissions in low-income African countries is exceptionally low now, and population numbers are projected to increase by another one billion people by 2050. As a result, the long-term potential for CO2 emission growth is significant.

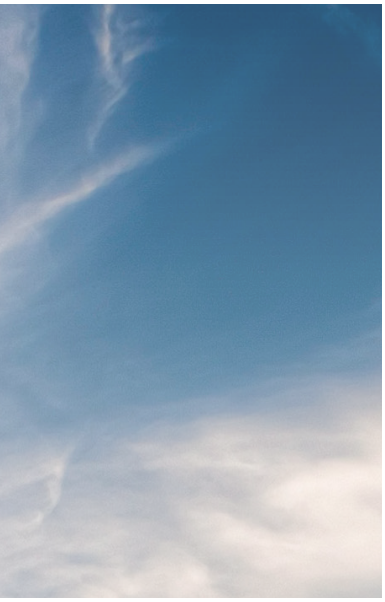
African countries must make significant investments in renewable energy capacity in order to leapfrog fossil fuels and meet their energy needs with clean energy, instead of coal or gas.

As the largest emitter on the African continent and one of the top ten coal-exporting countries in the world, South Africa's coal expansion plans are a major factor in the future emissions of the African continent. This further increases the importance of prioritizing African investments in renewable energy over more investments in coal.

"The true costs of coal are colossal: coal extraction and use damages people's health, uses up and pollutes scarce water resources, and drives climate change. The African continent is hugely vulnerable to climate change, but clearly has the potential to leapfrog dependencies on dirty and dangerous energy choices like coal. The energy choices that are made now will determine the continent's energy future. They will affect standards of living, levels of job creation, energy access and security, the environment, and the continent's economic future. Now is the time for change, and to keep oil, gas and coal reserves in the ground. As the continent's major emitter, it is essential that South Africa take its responsibility to urgently move away from fossil fuels in a just transition towards renewable energy much more seriously."

- Lindlyn Moma, Program Director,
Greenpeace Africa

Saudi Arabia



Despite remarks by Saudi Arabia's Minister of Petroleum and Natural Resources Ali al-Naimi that Saudi Arabia could phase out the use of fossil fuels by 2050, the oil-producing nation has been working hard to promote and extend global dependence on this fossil fuel.

Saudi Arabia had 268 billion barrels of crude oil in proven reserves in 2015, according to the US Energy Information Administration (EIA), second only to Venezuela. If Saudi Arabia were to burn through all its crude oil reserves, 115.24 Gt of CO2 would be released.[32] In 2012, Saudi Arabia was the fifth biggest exporter of refined oil in the world.

In July 2015, Saudi Arabia reached a record high production rate of 10.3 million barrels per day. Production has since tapered off, as oil prices have fallen worldwide. But the country is still extracting fossil fuels for export and combustion at a rapid rate.

Russia

Russia broke oil production records four times in 2015, reaching a peak of 10.77 million barrels a day in October. Production costs remain low, and Russian tax policies provide extraction companies with a buffer against market trends, protecting the companies even when oil prices are down.

According to Russian Energy Minister Alexander Novak, this rapid production rate will only increase in 2016. Russia recently surpassed Saudi Arabia as the largest supplier of crude oil to China, the world's biggest energy consumer.

The EIA estimates that Russia has 80 billion barrels of proven oil reserves, with the potential for undeveloped reserves to be discovered in oil fields in eastern Russia, the Russian Arctic, the Caspian Sea, and Timan-Pechora. Many new projects are in development, and Russia has not signaled a willingness to move away from extractive projects, despite their participation in the Paris Climate Agreement.

If burned, Russia's existing reserves would produce 34.4 Gt of CO2.

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Other Major Carbon Threats

Gulf of Mexico: Up to 2.1 million barrels of oil per day could be produced from Gulf of Mexico reserves by 2016. If developed, this new deep water oil drilling could add 350 million metric tons of CO2 emissions to the atmosphere – equal to France's total emissions in 2010.[33] Between 2013 and 2050, the Gulf's oil drilling would produce 12 Gt of CO2 equivalent.

In spring 2016, the Obama administration will lease 42 million acres of the Gulf, which could result in the production of 460 to 894 million barrels of oil and 1.9 to 3.9 trillion cubic feet of natural gas.

Turkmenistan, Azerbaijan, Kazakhstan: More than 100 billion cubic meters of natural gas is set for extraction from the Caspian Sea by 2020. If completed, projects in this region would add 240 million metric tons of CO2 emissions.[34] Between 2013 and 2050, Caspian gas is expected to produce 10 Gt of CO2 equivalent.

Iraq: By 2016, new production is expected to produce 1.9 million barrels of oil a day, increasing to 4.9 million barrels a day by 2035. By 2020, Iraqi oil production could emit 420 million metric tons of CO2. Between 2013 and 2050, cumulative emissions could total 21.2 Gt of CO2 equivalent.[35]

Carbon Sinks at Risk

Burning fossil fuels is not the only way to release carbon and methane into the atmosphere. Carbon sinks like forests, peat bogs, and permafrost lock away greenhouse gases that contribute to climate change. But a warming planet melts permafrost and dries out bogs, triggering the release of greenhouse gases and accelerating the warming cycle.

Deforestation

Shifting land use patterns are responsible for a large proportion of global carbon emissions. Forests are thought to absorb as much as 30 percent of manmade emissions each year.

In a study of 2.5 million hectares of tropical forest across 75 different countries, researchers calculated that forests sequestered 247 Gt of carbon. If destroyed through deforestation or wildfires, these forests would turn from carbon sinks into major sources of atmospheric carbon. Deforestation accounts for an estimated 10 to 20 percent of all manmade emissions. The conversion of forests to land for agriculture produced four Gt of carbon dioxide equivalent per year from 2001 to 2010.

The Amazon: The nine-nation network of Amazonian indigenous territories and protected natural areas contains 55 percent of the carbon stored in the Amazon. The indigenous territories alone store more forest carbon than some countries, including tropical countries like Indonesia and the Democratic Republic of the Congo.[36] The territory is under serious threat from illegal logging, mining, dams and agricultural projects. Overall, the Amazon is estimated to store 25 percent of all the carbon absorbed by natural sinks every year. This forest must be protected to ensure the stability of the global climate.

Indonesia: Deforestation rates in Indonesia are estimated at 1.17 million hectares per year, placing the third-largest tropical rainforest on the planet in jeopardy. Indonesia has a moratorium on the issuance of new licenses for development of primary growth forests or peat land, which was extended in May 2015 for another two years by the president but studies have questioned its efficacy to date.

The Congo River Basin: Similarly, in the Congo River Basin, plans for extensive agriculture could release huge amounts of carbon. The Democratic Republic of the Congo is the fourth largest carbon reservoir in the world, locking away 8 percent of the globe's forest-stored carbon. The rainforest covers 86 million hectares (about 40 percent of the country). About 60 million hectares are threatened by logging.[37]

"There are massive plans to convert [the rainforest] to plantations for agriculture [including palm oil trees] for palm oil. If this actually happens, it will unleash large amounts of carbon from chopping down the rainforest. The carbon is embedded in the woods. Once you cut the rainforest down, and burn it, all that carbon now in the trees is in the atmosphere."

- Jake Schmidt, international program director,
Natural Resources Defense Council

Drying Peat Lands

Found on all seven continents, peat is a deposit of plant material and organic matter mixed with soil that is too wet to support decomposition. Approximately 500 to 600 Gt of carbon is stored in peatlands worldwide. Peatlands make up about 4 to 6 percent of the Earth's land surface but store 20 to 25 percent of the world's soil carbon.

Peatlands are especially sensitive to drought, as drying allows oxygen to permeate the peat layer and inhibit carbon storage. As the planet warms and precipitation patters shift, peat-rich areas will become increasingly prone to drying and burning. Peat fires, which burn through carbon stores thousands of years old, have a larger carbon footprint than any other type of wildfire.

In 1997 and 1998, huge fires in Indonesia burned almost 25 million acres of peatland. A Nature analysis from 2002 estimated that those fires released as much carbon as 13 to 40 percent of the entire annual global fossil fuels emissions, and were largely responsible for the largest recorded yearly increase in atmospheric CO2 concentration since record keeping began in 1957.[38] Currently, peat fires are thought to account for 27 percent of Indonesia's carbon emissions.

Thawing Permafrost

Nearly a fourth of the Northern Hemisphere's land surface is covered in permanently frozen soil (permafrost). Permafrost is loaded with carbon-rich plant material, enough to double the amount of heat-trapping carbon in the atmosphere if melted.[39] Scientists estimate that about 50 percent of all global belowground carbon (approximately 1672 Gt) is stored in northern permafrost.

A 2013 study warned that 1.5°C of warming would be enough to melt the permafrost in Siberia, prompting the eventual release of hundreds of gigatons of carbon dioxide and methane, with grave consequences for the climate.

In the Arctic, melting permafrost is releasing large amounts of methane and carbon dioxide into the atmosphere, creating a feedback loop that will prompt additional warming. A recent study examined 71 wetlands worldwide and found that melting permafrost is creating wetlands known as fens, which emit large amounts of methane.

Another troubling feedback loop occurs in the permafrost itself, where warming temperatures trigger microbic decomposition, which produces heat and causes further thawing. Permafrost is expected to transition from a carbon sink to a carbon source before 2100.

Methane Hydrates

Very large amounts of methane are stored around the world in the sea floor in the form of solid methane hydrates, also known as clathrates. These structures form when huge amounts of methane are exposed to water under low temperatures and high pressure, creating an ice-like structure. Climate change and warming ocean waters, however, could cause the hydrates to destabilize on their own, releasing methane and further triggering warming.

Due to their extensive storage of methane gas, these formations are under consideration as a new source of fossil fuel energy. If developed, global methane hydrate reserves could release between 1000 to 5000 Gt of carbon.

"These are naturally occurring, with the potential to become huge bombs. If they are released, they could dwarf the effects of what humans have been doing."

– Melanie Fitzpatrick, a climate scientist,
the Union of Concerned Scientists

Conclusion

The adoption of the Paris Climate Agreement marks a historic turning point in the climate movement and provides a pathway for the world to follow to reach a final, lasting resolution to climate change. In addition to the Paris agreement, there were a number of key victories globally in 2015, in the U.S. these included: the closure of the 200th American coal-fired power plant; the White House rejection of Keystone XL; and Royal Dutch Shell's retreat from the Arctic.

Building on these victories, the climate movement must now turn their attention to the projects reviewed in this report. Ensuring that these fossil fuel reserves are kept in the ground will prevent warming beyond 2°C, securing a livable future.

Endnotes

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   Emission factors for additional developments were sourced from the Ecofys report. The emission factors include uplifts for upstream emissions, including non-CO2 greenhouse gases, based on a literature review carried out by Ecofys.
   The additional coal supply from the coal projects included in the report is within the demand growth projection for the Asia-Pacific region in the IEA Current Policies scenario, which is in line with 5-6 degrees Celsius global warming. For India, two different developments, coal mining and coal-fired power plant expansion, are included. These are not double counted, but the larger of the GHG emissions associated with the two is used in the totals for each year.
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16. http://350.org/
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