NEW FOSSIL GAS TERMINALS

PROFITS OVER PEOPLE

MAY 2019

LINGO
Leave it in the Ground Initiative

[GAS]TIVISTS

Contents

Impressum

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EXECUTIVE SUMMARY

Fossil gas[1] is a dangerous fuel which harms the climate and the environment wherever it gets extracted and used. The current report summarizes some of these harms and looks at who pays the price for new fossil gas infrastructure projects.

Key messages

Fossil gas is dangerous for climate, environment & communities.

➡ We all pay for new gas infrastructure through our bills, taxes, subsidies & guarantees.
➡ Building new liquefied fossil gas terminals relies on shaky assumptions and could lock people into debt.
➡ Liquefied fossil gas terminals are underused and if demand goes down, the LNG bubble will burst.

The current report looks at two cases of big new gas projects in the Global South. We summarize the publicly available information on the public and private finance and related debt. We show the impacts of these projects on the ground and point out which foreign entities, including European actors, are driving these extractive projects.

The price for more fossil gas is paid by gas consumers, taxpayers through direct subsidies to the fossil gas industry, by local communities who bear the damages and by everyone through the impacts of an accelerating climate crisis.

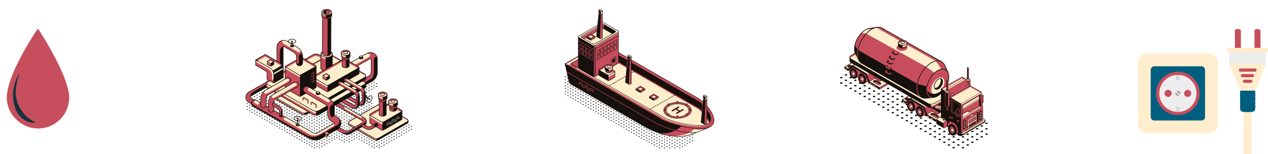
1 UNDERSTANDING FOSSIL GAS

THE FOSSIL GAS SUPPLY CHAIN

FOSSIL GAS EXTRACTION IS MASSIVE AND STILL INCREASING

In 2017, over 3 680 billion cubic meters (bcm) of fossil gas were extracted globally.[2] This is 5% more than in 2015, the year of the Paris Agreement, so instead of the globally agreed phasing out of fossil fuels, extraction is massive and still increasing.

The fossil gas supply chain can be roughly divided into the following legs:



Exploration | **Extraction[3]** | **Transport** | **Distribution** | **Consumption**

Gas can be transported either per pipeline as a gas, or by ship in liquid form. In the second case the steps involved in transportation are: Liquefaction - Shipping - Regasification.

For all of these legs, investments in infrastructure need to be made and operating costs occur. In this report we will look at the structure of these investments to understand who is assuming debt and bearing which risks. The overall finance landscape is very complex, with sometimes dozens of different entities involved along one single supply chain. We try to capture the different sectors of the business in Table 1 below.

Table 1. The steps of the fossil gas supply chain and its finance

	Costs incurred	Sources of finance	Example cost	Needed for FID[4]
Exploration	Exploration licenses, Seismic surveys, Exploratory wells	Operating cash flow of oil & gas companies, equity, bank loans, reserves-based lending, bond issuance, project financing, infrastructure funds	Average deepwater exploration well: US$133 million[5]	Sufficient market price, credible data on prospects
Extraction	Wells, pipelines, loading facilities, taxes	Investment: Equity, exchanging equity for services & equipment, deferred payments linked to first oil/gas in exchange for services work / Operation: Spot market sales, contract payments	Example price: 3.92 USD/mbtu[6]	Sufficient market price, infrastructure in place to bring gas to market
Liquefaction	Liquefaction plant, access pipelines, gas input	Investment: Export credit guarantees, Bank loans, equity / Operation: Contract payments, LNG sales	Example price: 1.1 USD/mbtu[7]	Long-term feedstock supply contract, long-term output buyers

Transport	Pipelines, compressor stations, tanker ships, customs duties	Investment: Bank loans, export credit guarantees, equity, subsidies / Operation: Transport fees	Example price: 0.6 USD/mbtu[8] from Canada to Europe	Demand in target market, Extraction capacity & reserves in origin area or subsidies
Regasification	Regasification plant, floating storage and regasification unit (FSRU), LNG input	Investment: Bank loans, equity, subsidies / Operation: Gas sales, contract payments	Example price: 0.4 USD/mbtu[9]	Long-term output buyers or subsidies
Distribution	Pipelines, storage, taxes	Investment: Bank loans, equity / Operation: End consumer payments, subsidies	Example price: 0.95-2.12 USD/mbtu 1.299 - 2.895 S$[9] (2)	Market demand or subsidies
Consumption	/	/	Example end consumer price: 10.35 USD/mbtu[10] Example tax: 1.83 USD/mbtu[11]	/

Exploration

The formation processes of oil and gas are closely related. Therefore, fossil gas is often found together with oil in so called hydrocarbon reserves. Because oil has much higher value, gas usually piggybacks on oil exploration and until recently, gas exploration was an exception to the normal "oil and gas exploration". Since the fracking boom in the United States, shale gas has become an interesting prospect and shale gas exploration has become a thing. Because investments in exploration wells are very high, and the pay-off is over a very long time, exploration is a very cyclical business which moves forward when oil and gas prices are promising and oil and gas companies have money to spend. Activity tends to die down when prices are low or companies have not fully financially recovered from the last crisis.

Extraction

Where gas is associated with oil, project economics are usually driven by oil. Associated gas is sometimes even burnt off, as has been happening in Nigeria illegally for decades and continues to be legal in the United States.[12] Where strong regulations are in place, it is captured and sold[13], but not always at a profit: the price of associated gas has even been lower than zero at times, i.e. companies had to pay those willing to receive the gas.[14] Extraction can only start once the infrastructure to bring the gas to market is in place.

Pipelines

Consumers of gas are rarely located at the same places as extraction - and if they are, this may bring additional problems, as the example of Groningen mentioned below shows. When the place of extraction and consumption are removed, pipelines link them up. Europe is already covered with an extensive network of 2.2 million kilometers of gas pipelines, but additional ones are still being proposed and built.

LNG - Step 1: Liquefaction

In this very expensive step of the supply chain (investments for liquefaction facilities usually range in the billions of Euros), fossil gas is cooled to below -161°C and turns into a liquid, taking up 625 times less space so that it can be stored and transported. So far, liquefaction facilities have been built on land, but more recently, floating liquefaction facilities have also been built. The sector is known for cost overruns - projects turn out to swallow more money than originally projected.[15]

LNG - Step 2: Shipping

Oil and gas companies, as well as dedicated shipping companies (e.g. from Japan, Greece and Bermuda) bring the liquefied gas from the countries of extraction to European or Asian ports closer to where the gas will be used. Because of the shifting availabilities and prices around the world, gas tankers can go in all different directions. Even Russian gas has been sent to the US, which is usually a gas exporter.[16]

LNG - Step 3: Regasification

In order to make use of the global availability of liquefied fossil gas, regasification facilities are needed. These are also quite expensive. A cheaper alternative to onshore installations are so called floating storage and regasification units (FSRU).

Distribution

The last step to the final consumer is sometimes done by other companies. See Figure 1. for a schematic view, showing the example of gas distribution in Germany.

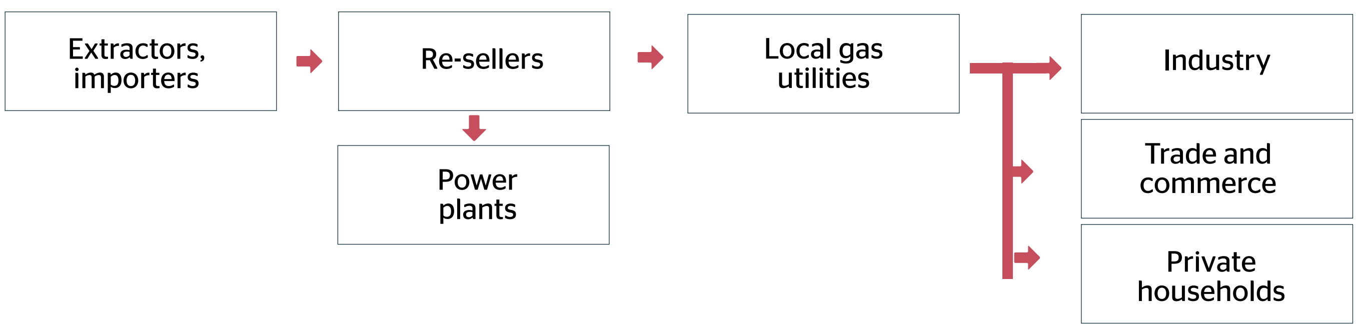
Consumption

Fossil gas is burnt in most cases. The biggest use is for generating electricity in gas-fired power plants. In that market, gas competes against renewables, coal and nuclear power which are all cheaper once they are built and whenever they are available. Because energy storage and demand-side management[18] are not yet built out, and initial investment needs are smaller for gas-fired power plants than for the other technologies, they still exist.

Fossil gas is also used as so-called feedstock in the production of plastics, fertilizer and different chemicals. It is used in a number of countries for cooking, heating houses and water, air conditioning and even drying clothes. In transport, the industry has been trying to establish a new market, but gas-powered vehicles remain an exception on a global scale, and the global trend is going from gasoline towards electric vehicles, not gas-powered ones.

RENEWABLES, COAL AND NUCLEAR POWER ARE ALL CHEAPER THAN GAS

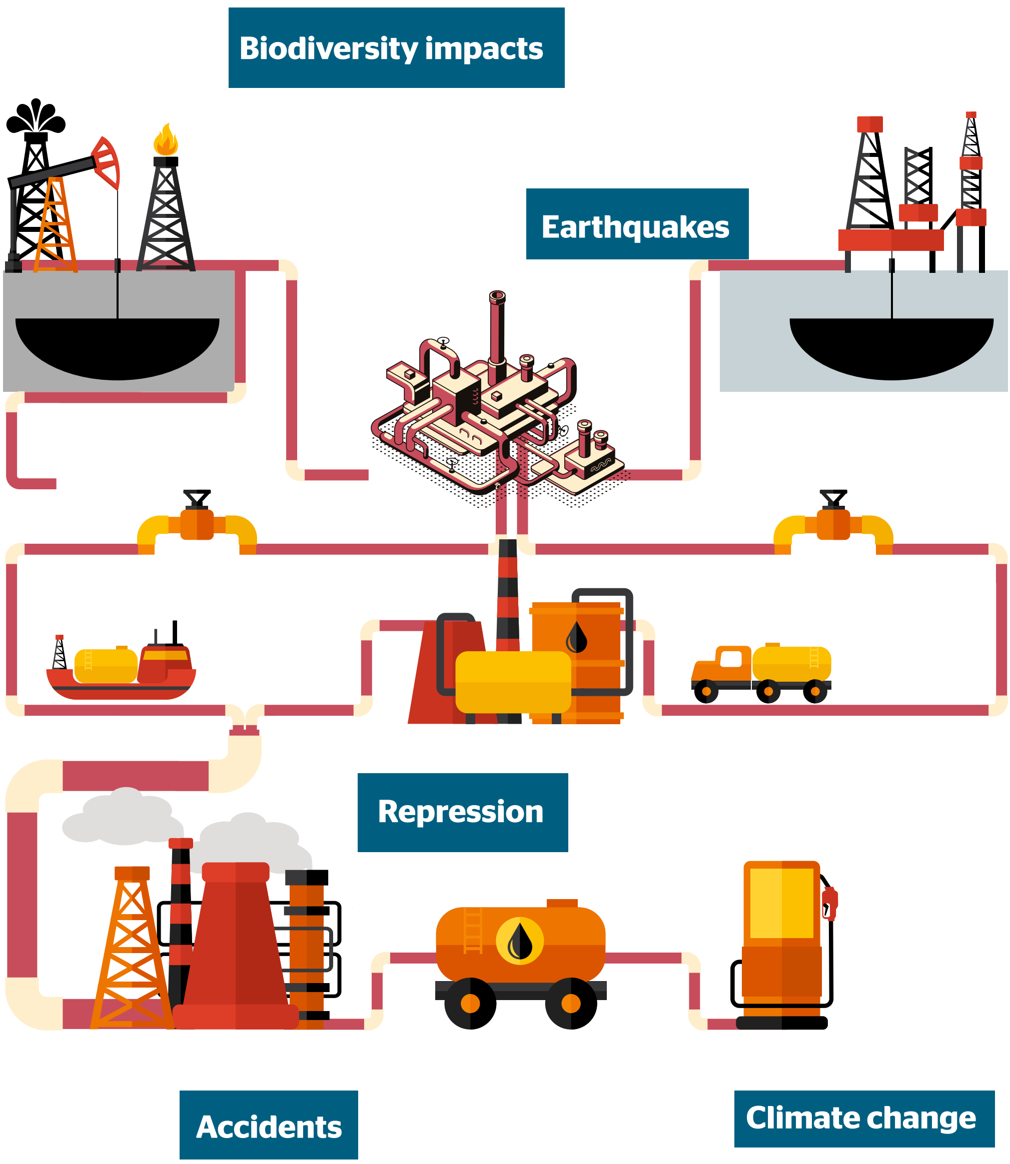
Figure 1. The gas distribution chain in Germany[17]



Conflict along the supply chain

All along the supply chain, conflicts arise. From whales and dolphins killed by seismic exploration activities, to the manyfold impacts on health of fracking, negative impacts occur, and people get upset about them. In Groningen, Netherlands, mass protests about earthquakes during extraction[19] have led to plans to close down the gas field early. In Italy, the NoTAP movement is trying to stop a gas pipeline that would bring more fossil gas from Azerbaijan and Russia into Europe, Pipelines are often marred in controversy, such as the Nord Stream 2 pipeline that is dividing the European Union or the Trans Adriatic Pipeline (TAP) which destroys the livelihoods of communities in Southern Italy and has led Italian authorities to put in place overly restrictive measures to suppress community opposition. In Nigeria, corruption has led to decades of disregard to laws that prohibit flaring, among others. People who suffer the pollution on a daily basis are fed up, but often face a violent response by the state and company security apparatus when they raise their concerns.

PEOPLE OFTEN FACE A VIOLENT RESPONSE BY THE STATE WHEN RAISING THEIR CONCERNS



GAS PRICES

Figure 2 gives an example of a break up of final consumer gas prices. Table 1 also has some sample expenses for different legs of the supply chain.

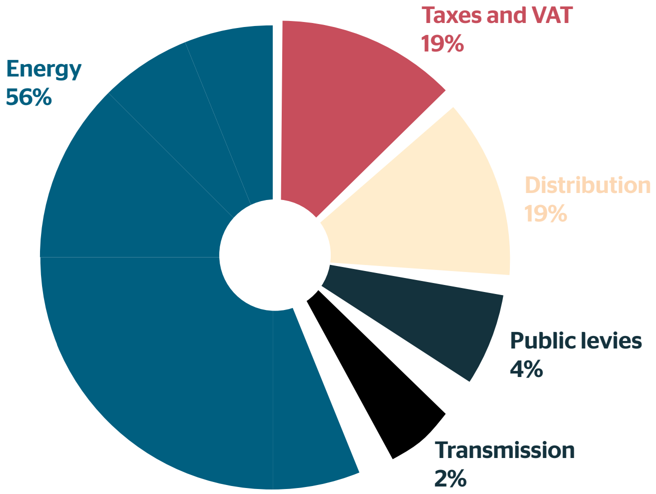


Figure 2. Consumer gas price breakup in Belgium[20]

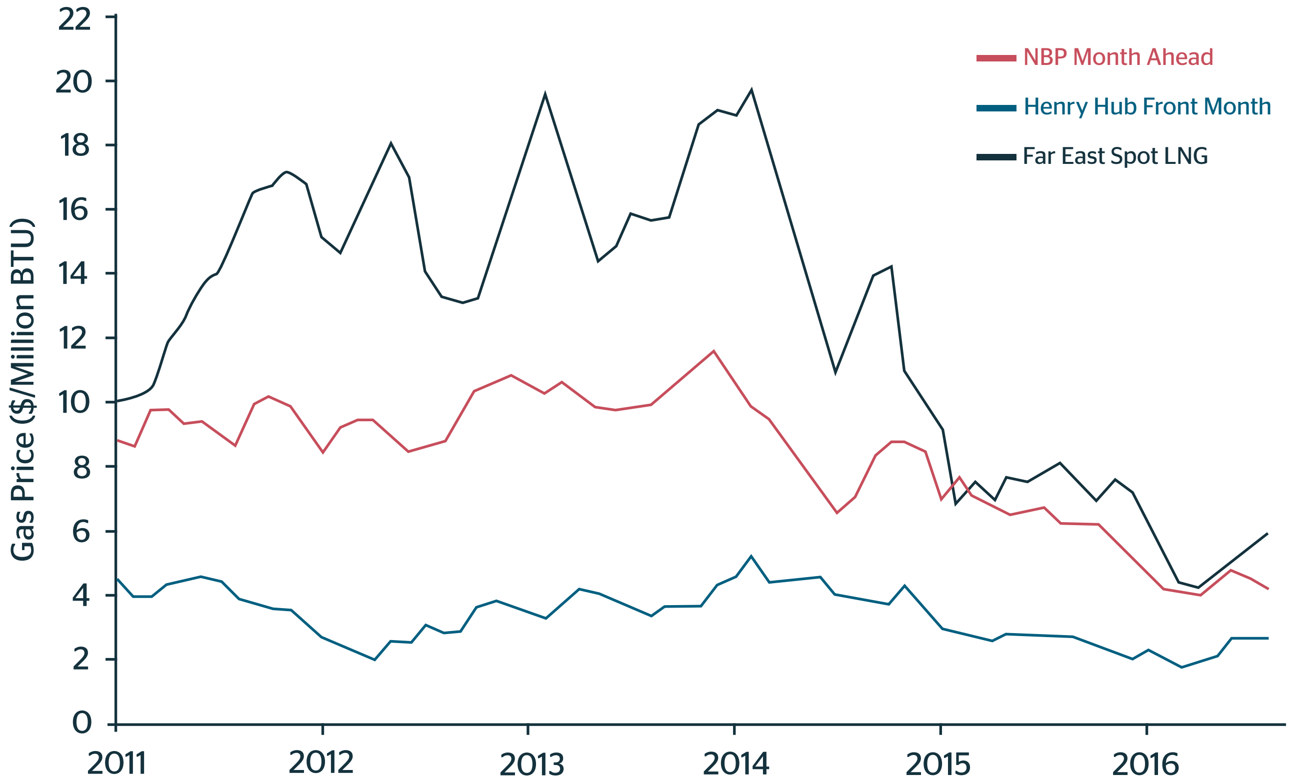
There are three big regional markets for fossil gas with different prices: In North America, after the increase in shale gas extraction through fracking in the first decade of the 2000s, gas is cheapest: in 2018 it sold at around 3 USD/mbtu[21] at the Henry Hub in Texas.[22] In Europe, gas is more expensive and sold for around 7.5 USD/mbtu at Austria's Baumgarten Hub in 2018[23] and between 5 and 6.33 USD/mbtu at the Dutch Title Transfer Facility (TTF) in the first three months of 2019.[24] Asia so far has the highest gas prices: 11.40 USD/mbtu for the East Asia Index (EAX) in July 2018.[25]

At least in Europe, there is scope for gas becoming cheaper, because the cost of extracting and transporting Norwegian and Russian gas to Europe is estimated to be around 3.5$/mbtu.[26] Especially in the Russian case, environmental destruction is an externality not included in this price.

ENVIRONMENTAL DESTRUCTION IS AN EXTERNALITY NOT INCLUDED IN THE PRICE

Opportunities to sell gas at a higher price in a different country have given rise to the growth of the liquefied fossil gas industry.[27] Transporting gas in tankers (some call them dragon ships) carries a relatively high cost, because the gas has to be liquefied first and regasified on arrival. Liquefaction is often the most cost-intensive element of an liquefied fossil gas supply chain, because even though labour and maintenance costs are low, 8%-10% of the gas is consumed in the process to cool down the gas.[28] The gap between North American, European and Asian gas prices shown in Figure 3 was one of the key drivers for a big number of fossil gas terminal proposals. Now that some projects have started working and others get closer to completion, the price gap has already greatly reduced, calling into question the profitability of additional fossil gas terminals. The key assumption upon which they rest, that you can buy gas cheap e.g. in North America and sell it expensive in Europe or Asia no longer holds true, because as of 2015 the price gap has become relatively small. When more actors compete against each other in an oversupplied market, margins trend towards zero, leaving no money to pay off the huge investment in the gas tanker terminals.

Figure 3. North American, European and Asian gas prices 2011-2016



Sources : ICIS, Heren, NYMEW

THE LNG BUBBLE

The huge price gap between Asian and US gas prices due to the coincidence of the Fukushima accident (which resulted in a surge in gas demand in Japan) and the fracking boom (with a drop in prices) has led to the development of many new huge (normally in the value of billions of USD) liquefied fossil gas terminal projects. The financialization of megaprojects mentioned earlier has led to these proposals attracting a big amount of funds. The shipped fossil gas market thus finds itself in the midst of a boom precisely at a time when the Paris Agreement indicates that fossil fuels should be phased out.[29]

The price differentials of the first half of the 2010s have evened out since (see Figure 3), leaving much less money to earn. Each new terminal that gets finished now, increases competition and reduces profitability. Another problem may be too optimistic demand projections.

As an example, Gazprom alone had 150 bcm/year of unused production capacity in 2015.[30] This illustrates the limited necessity for growth of liquefied fossil gas imports into Europe. So far, European fossil gas import facilities have only been used at about 22% of their capacity.[31] In that situation, subsidies become essential for building new infrastructure. The sad story of the liquefied fossil gas terminal in Krk, Croatia shows this: in the absence of interest from the market, the project is supposed to be financed by a mix of an EU subsidy, buying of the output at higher than market prices by a state-owned company, and obliging end-users to foot the bill through a specifically designed law.[32] On top of all that, the local opposition to the project is countered by a top-down determination to follow through with the project.

SUBSIDIES, LOCK-IN, STRANDED ASSETS & DEBT

Many gas infrastructures around the world receive public subsidies in different forms: reduced or no taxes, governments providing guarantees for risky projects, loans at below market rates, etc. Another form of subsidy are negative externalities, such as health costs and environmental damage, including climate change, which are so far usually not accounted for, but should be.[33]

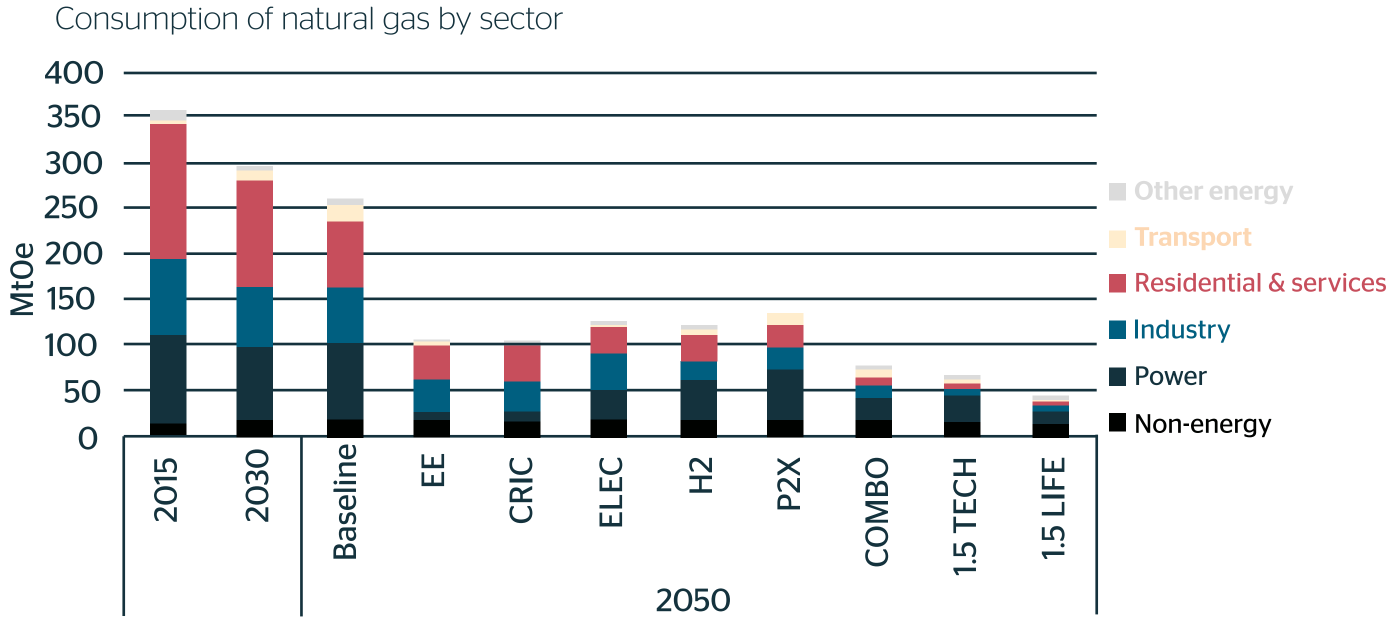
The gas industry tends to have excellent connections with governments such as the European Commission: the European Commissioner for Climate Action and Energy, Miguel Arias Cañete used to be CEO of two gas companies and is known to push the gas agenda. This has led to billions of public funds being spent on gas infrastructure projects in Europe in past years, both through direct subsidies[34] and concessional loans from public banks such as EBRD and EIB.[35]

In Europe, piped gas from Russia and Norway tends to be cheaper than liquefied gas and therefore government subsidies play an important role for the industry. In the absence of a direct economic case for these huge investments, "diversification of supply" is named as argument for committing enormous amounts of public money. The paradigmatic case is the Klaipeda LNG terminal in Lithuania with low usage[36], but which helped convince Russia to lower its gas prices for Lithuania. The question remains how big the benefit was to Lithuanian gas users, who are now paying the cost of the underused regasification facility. In a similar case, the Musel LNG in Spain, the cost is paid by consumers, although the plant was never used.

BILLIONS OF PUBLIC FUNDS HAVE BEEN SPENT ON GAS INFRASTRUCTURE PROJECTS IN EUROPE

The electricity market is experiencing increasing competition from renewable energy sources, and other key markets (heating, industry) are also prone to being impacted by greenhouse gas mitigation efforts in the medium term. Therefore, growth of the gas industry in the coming decades is highly questionable, in spite of optimistic projections by industry-backed groups and the International Energy Agency. A growing number of gas-fired power plants are already economically unviable and have been mothballed by their owners.[37] The European Commission now foresees a steep decline in gas consumption in 2050 in all of its decarbonization scenarios. (see Figure 4) Intense efforts to get people to shift to gas for transport have not been very successful so far.

Figure 4. European Commission scenarios for fossil gas demand in the EU in 2050[38]



Note . «Residential and services» also includes agriculture.

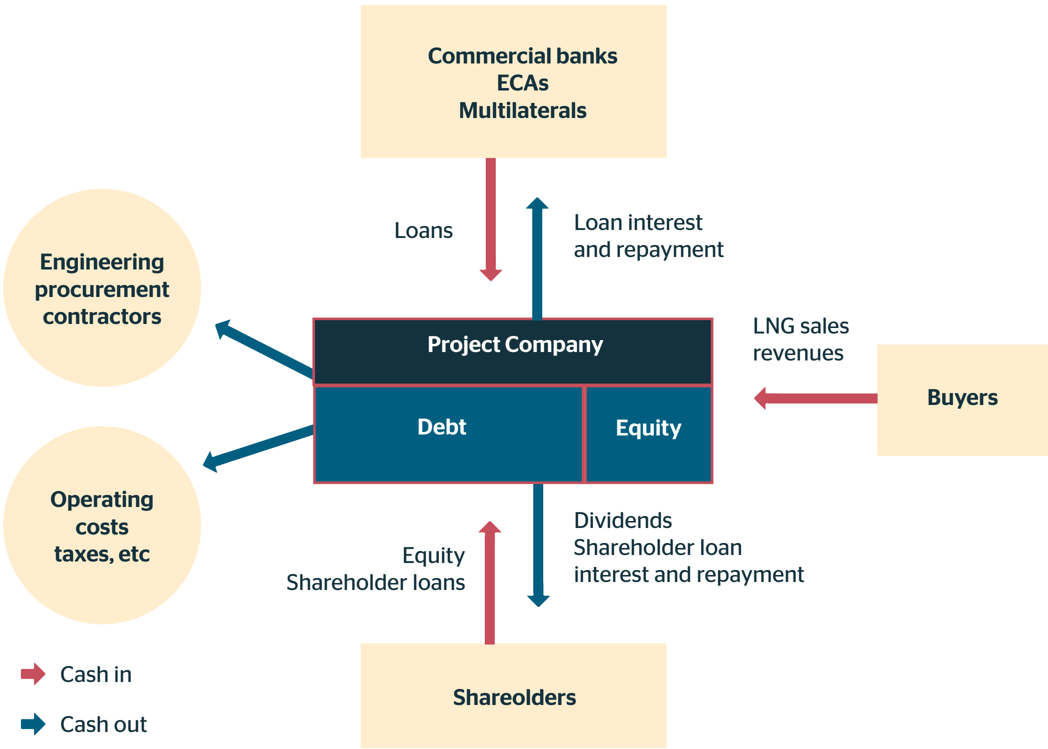
Source : Eurostat (2015), PRIMES

A FOSSIL GAS TERMINAL IS A HIGH-RISK PROJECT

At the same time, gas prices worldwide are moving from long-term contracts towards a free market, dominated by "spot prices" (immediate sales) which go up and down every day and can not easily be planned for.[39] This creates an uncertainty for investments in gas infrastructure that have a long payback time and a useful lifetime of many decades. Promoters of gas projects try to mitigate this risk by entering long-term contracts to secure both suppliers and buyers of their product ahead of a final investment decision (FID). But even then, things can go wrong and have to be settled in court. In such a case in Egypt, the country was fined USD 2 billion for failing to supply enough gas to a Liquefied Fossil Gas processing plant.[40] For the country, this means that failing to give a plant enough gas, may mean having to pay billions in compensation. For companies it means that even having a contract, may not get you the gas you need - and you may have to go through lengthy court processes (four years in this case) to start resolving the situation. What unites both sides is the perception of a fossil gas tanker terminal as a high-risk project.

Once the expensive new fossil gas infrastructure is in place, political pressure arises to keep it working: so called lock-in. But at some point the market has shifted so much that it simply does not make sense any longer and the investment becomes a stranded asset. Lock-in and stranded assets are two faces of the same coin.

Figure 5. : Dedicated "project finance" vehicles are often created to finance liquefaction facilities.



Typical financing structure for the liquefaction portion of the LNG chain

In recent years, big infrastructure projects, including fossil gas tanker facilities have increasingly become "financialized". Financialization means that instead of normal investments by governments in infrastructures that carry the greatest benefit to the public, private money is attracted with the promise of extracting a high profit from the project. The better the legal environment and public guarantees for covering risks involved in the project, the more attractive the investment. The name of the game is how to extract more profit from a project, at the expense of the host country, the environment, and even clients. These private investments can then be sold on in financial markets, where the actual needs of populations, let alone local, poor populations, but also the environment and climate change are of least concern.[41] In the low-interest environment of the past years, there has been a lot of private capital looking for places to invest and earn a high interest. The process of financialization turned infrastructure investments into a new "asset class".[42] Money managers like to hold assets from different classes, because they follow different logics, and shocks in the market affect each of them differently, allowing to have a portfolio that will keep making money always. With much money looking for infrastructure assets, we are now in a situation where these projects are driven mainly by the necessities and interests of the financial sector, not by people's needs. The underlying mechanism that feeds this dynamic is the logic of "private gains, public losses". We will have a closer look at the debt generated through this process in the two case studies.

THE NAME OF THE GAME IS HOW TO EXTRACT MORE PROFITS AT THE EXPENSE OF THE HOST COUNTRY, ENVIRONMENT AND CLIENTS

THE CLIMATE CRISIS & FOSSIL GAS

In 2019, the climate crisis is in full swing. The global temperature rise is accelerating. Natural processes which will contribute to further warming even in the absence of man-made carbon emissions have already been triggered: Arctic sea ice is disappearing, permafrost is thawing. As this happens, methane clathrates[43] melt and release methane into the planet's waters and into the atmosphere, causing even more warming. This illustrates the imminent danger of whole-planet runaway climate change.

In this context, the importance of methane emissions from fossil gas is much greater than previously believed:

Firstly, the role of methane has been underestimated by a factor of five. It used to be considered 21 times as potent as CO2 in causing global warming. This number relied on a convention to calculate CO2 equivalencies over a 100-year time frame. Methane, however, only stays in the atmosphere for 12 years. Calculating its effect over 100 years, then, shows a misleading number. In real life, methane[44] is over 100 times as potent in warming the planet as CO2 while it is present. The warming observed at the moment is caused by methane to a very significant degree (see Figure 5). To the ~7 Gigatons of CO2 emitted every year through global fossil gas consumption, we need to add about 2% leaked methane, which puts the overall contribution of the fossil gas industry at ~11 Gigatons of CO2 equivalent.

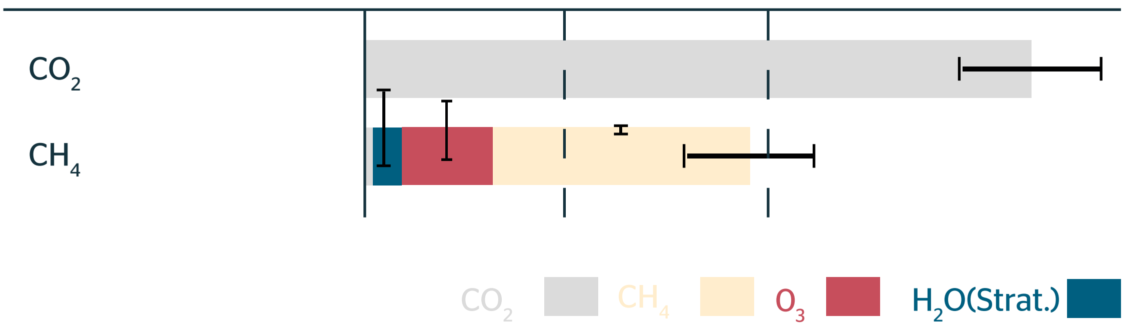
THE ROLE OF METHANE HAS BEEN UNDERESTIMATED BY A FACTOR OF FIVE

This alone - if it continues - is enough to take us beyond 1.5°C warming before the end of the century.[45]

Secondly, methane has shown a strong increase over the past years[46], mainly due to fossil gas extraction[47], most notably through fracking in the US.[48] Leakage rates of methane in the atmosphere are not well quantified, because this leakage does not get properly monitored. What we know is that they are much higher for fracked gas.
Up to 10% of all the methane escapes along the supply chain.[49] We also know that leaked methane emissions are higher for liquefied gas shipped in gas tankers ("LNG"), because the liquefaction and transport leaks some of the gas into the atmosphere.

Lastly, the "social cost of methane" which depends largely on its climate impacts is not included in economic calculations.

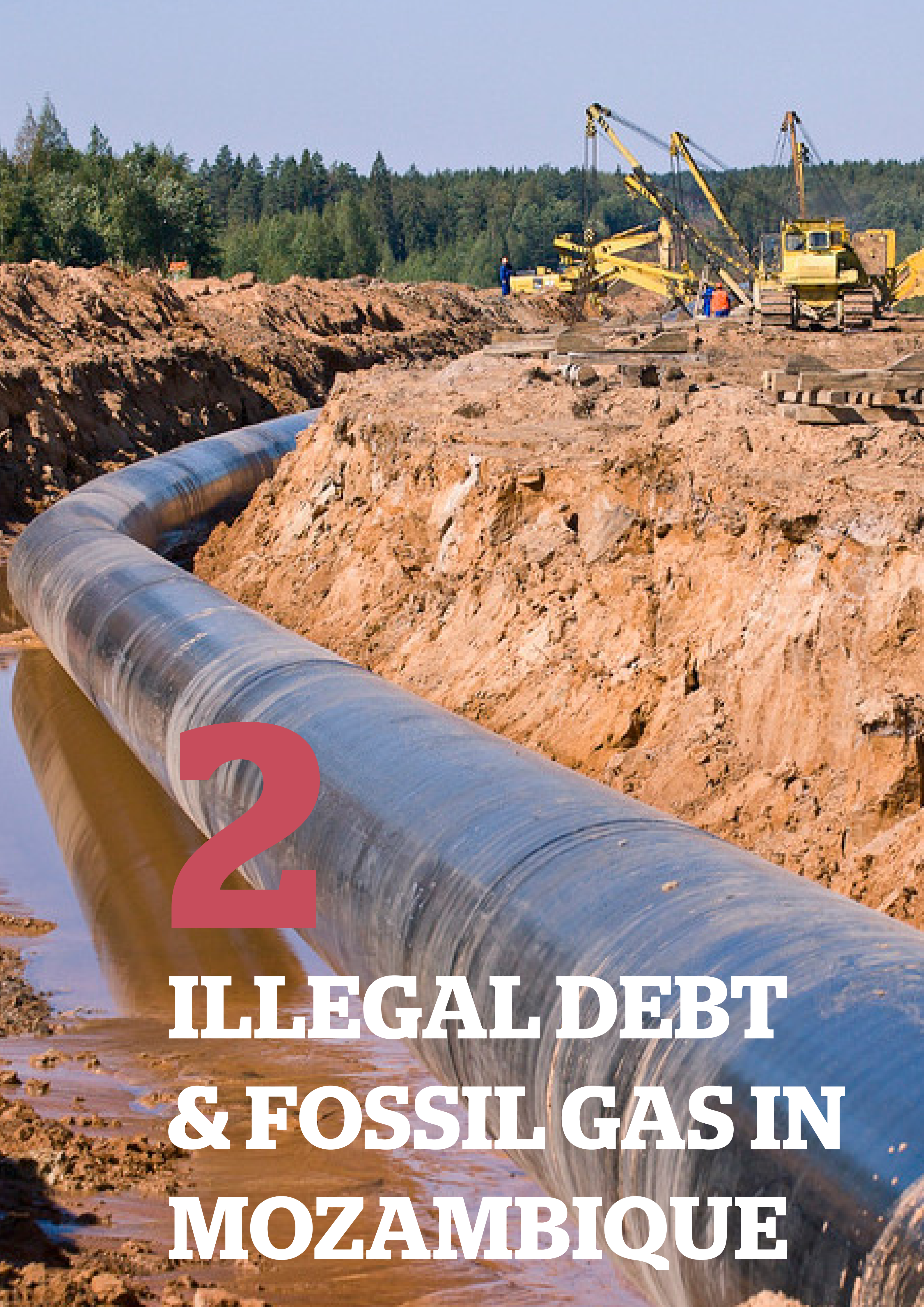
Figure 6. : Radiative forcing (heat trapping) of Methane (CH4) and Carbon dioxide (CO2), the driving forces of man-made global warming [50]



Gas tankers with liquefied fossil gas ("LNG") are veritable "climate bombs". The biggest LNG carriers hold an emissions potential bigger than the annual emissions of whole countries like Mozambique, Costa Rica or Nepal.[51]

Calling fossil gas "climate-friendly" is therefore highly misleading.[52] This notion is especially damaging since fossil gas infrastructures are often laid out for a lifetime of several decades, long after a full decarbonization of the global energy system must have taken place. They also require high investments, often in the billions of Euros, which on the one hand displace investments in renewables and on the other create a path dependency - a lock-in to fossil gas. New gas infrastructure (as well as coal and oil) has been shown to be incompatible with the Paris Agreement.[53] Fossil gas extraction and use will have to be reduced swiftly over the next years to allow the world to meet the 1.5°C target.

FOSSIL GAS TANKERS ARE VERITABLE «CLIMATE BOMBS» WITH AN EMISSIONS POTENTIAL BIGGER THAN THE ANNUAL EMISSIONS OF WHOLE COUNTRIES



2

ILLEGAL DEBT & FOSSIL GAS IN MOZAMBIQUE

A NEW EL DORADO

In Mozambique, a modest amount of fossil gas has been extracted since 2004 from the onshore Pande and Temane fields[54] and used mostly for export to South Africa. In 2019, the headlines are captured by the alleged huge potential in the Rovuma Basin in Northern Mozambique, where from 2009 a total of 85 tcf (2,428 bcm) potentially recoverable fossil gas has been discovered offshore.[55] This is one of the biggest finds on a global scale in recent years and actors from all around the world have flocked to Mozambique to take advantage of it (see the Annex for a full list). A 2.5$/mmbtu minimum wholesale price has been estimated as necessary floor price for extracting the gas, while the LNG netback price[56] could potentially be upwards of 6$/mmbtu in both the Asian and the European market, leaving a potential profit of 3.5$/mmbtu.[57]

According to that calculation, extracting all of the recoverable gas from these fields could thus potentially generate around USD 290 billion in profits.[58] For a country with a GDP of USD 12 billion in 2017[59] this is a game changer. But not only in financial terms: 85 tcf of fossil gas would produce close to 5 Gigatons of CO2 emissions, if burnt. Because leaks occur along the supply chain, not only CO2 gets into the atmosphere, but also methane, which is a hundred times more potent.

However, huge investments are necessary to drill offshore and construct the infrastructure necessary to bring this gas to the European and other markets. The investments will mostly be made by foreign entities, many of them private, and most of the profits will also be reaped by them, if the projects work out. The development of the Mozambican gas sector is another case of financialization. The government hopes to achieve annual gas sales worth USD 40 billion by 2029, through overall investments of USD 110 billion in the sector.[60] How much of that will stay in the country is unclear.

Planned projects

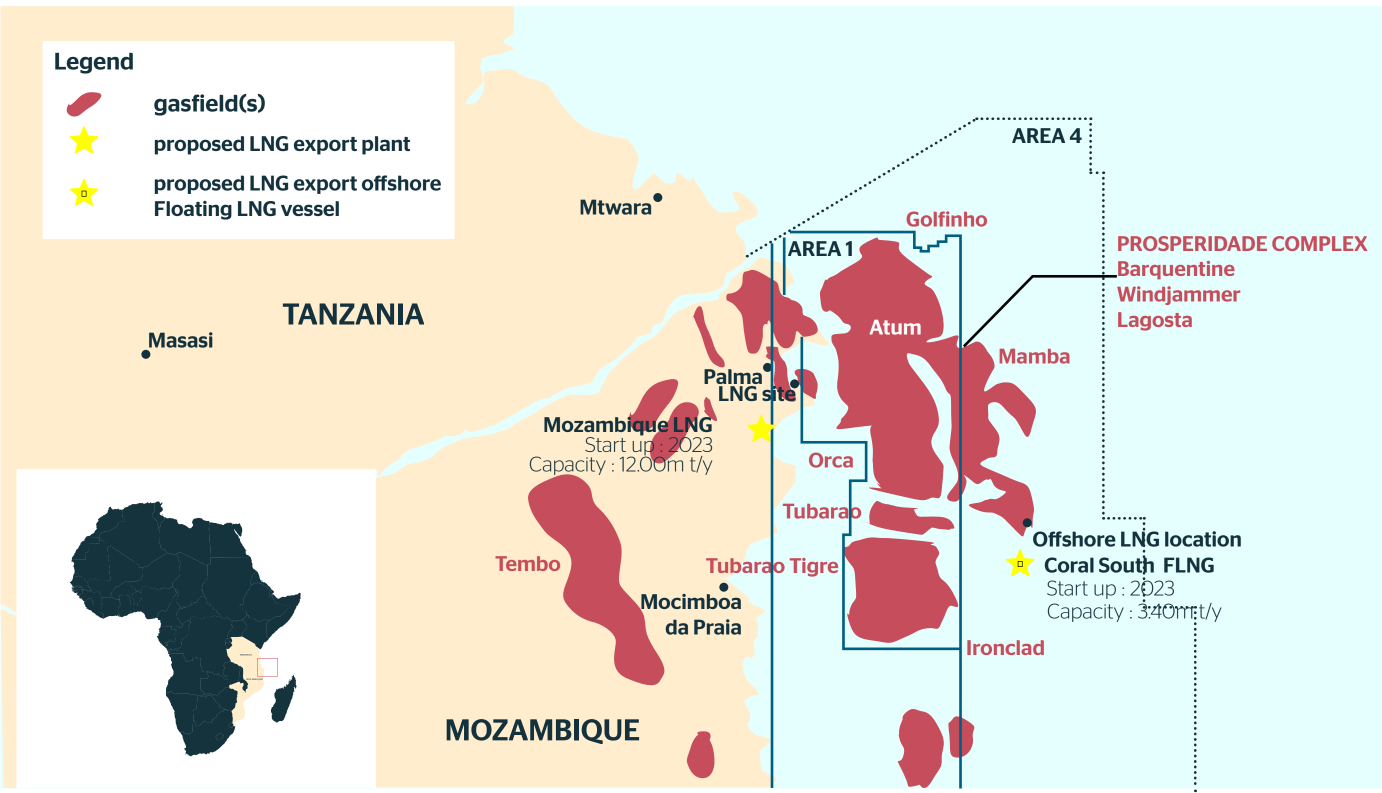
In Afungi, Cabo Delgado province, US company Anadarko, the operator of Area 1, is planning the **Mozambique LNG** terminal with an overall cost of USD 25 billion.[61] In a first phase, 2 liquefaction trains with 12.88 mtpa (equivalent to 17.5 bcm of gas) capacity shall be built and would cost around USD 7.7 billion.[62] Such a huge investment requires strong guarantees, and the project proponents are trying to receive the backing of governments. Export credit agencies from five countries have showed interest in providing guarantees for USD 12 billion of the USD 14-15 billion Anadarko is looking for: Italy (SACE), Japan (JBIC), China (China Exim), the US (US Exim) and South Africa (Export Credit Insurance Corporation).[63] The final investment decision is expected in the first half of 2019, with delays possible due to abundant risks (see below).[64]

In Area 4, operated by Italian company ENI, the **Coral South Floating LNG** project is planned with six subsea wells directly connecting to the ship and a capacity to process 3.4 mtpa of liquid fossil gas (4.6 bcm).[65] Final investment decision (FID) for the USD 7 billion[66] project was taken in June 2017.[67] Interestingly, it was the only FID for a liquefied fossil gas export project worldwide in 2017,[68] going against a global trend.

While others saw it as too risky to bet billions on another gas export terminal in a market environment with strong competition and unsure demand, this one is planning to take the risk - backed by taxpayer guarantees.

THE PROJECT IS GOING AGAINST A GLOBAL TREND, TAKING A RISKY BET OF BILLIONS - BACKED BY TAXPAYER GUARANTEES

Figure 7. : Fossil gas fields in Mozambique's Rovuma Basin. Source: Anadarko



Thirdly, the **Rovuma LNG project** is planned onshore with a production capacity of 15.2 mtpa[69] (20.7 bcm) at the same location as the Mozambique LNG plant (the Afungi LNG Park) by Exxon Mobil and ENI, the companies in charge of Area 4. The Mamba complex in Area 4 has estimated reserves of 75 trillion cubic feet (2,100 bcm) and would require a total investment of USD 50 billion.[70] Potential FID dates of 2019 or 2020 are mentioned in the media.[71]

Buyers are already lining up: French[72], British[73], Dutch[74], German[75] and Croatian[76], among many others. For a full list of involved entities, see Annex 2.

Problems and risks

The negative impacts of the projects on people and the environment have already started before the gas is even flowing. Whales, dolphins and turtles can be negatively impacted by exploration up to over 100km from the exploration site.[77] Land grabbing has been documented, as well as pollution.[78-79] The local population of fishermen is going to be negatively affected, but not involved in the decision making. Compensation is a major issue of contention. Resettlement schemes, as the one advanced in this case, often result in unacceptable conditions for those who lose their homes or lands to the project.[80] The Quirimbas National Park immediately South of the gas extraction area has recently been proposed as a UNESCO Biosphere Reserve.[81] Negative impacts on this important area, and not only its tourism potential are to be expected. The fact that Italian company RINA has been chosen to perform environmental impact assessments does not add to an atmosphere of trust either.[82]

In this context, some Mozambican groups, such as Justiça Ambiental (the Mozambican Friends of the Earth partner) reject fossil gas extraction altogether.

Since October 2017, the province of Cabo Delgado has also seen a series of "terrorist" attacks, where dozens of civilians died, as well as security forces and attackers.

NEGATIVE IMPACTS ON PEOPLE AND THE ENVIRONMENT HAVE ALREADY STARTED BEFORE THE GAS IS EVEN FLOWING

This rise in violence in the zone is believed by many communities to be at least partly linked to the planned gas extraction through a heightened sense of inequality in the young population from which these groups recruit their members.[83] Anadarko has responded to these concerns - among other measures - by ordering bullet-proof vehicles.[84] There is a whole private security industry of both local and foreign security coming to the area. The US[85] and the UK armies[86] are ready to intervene, according to media reports, and the US army is already there doing training exercises. Also, Tanzanian authorities reported that a Petrobras exploration ship was attacked off Tanzania by Somali nationals in October 2011.

A complaint that has been made is that companies are not contracting personnel locally or in the case of Coral South, operations are completely offshore, leaving little room for locals to participate in the economic activity - while the environmental risk is borne by them. Running operations completely offshore from a fossil gas liquefaction ship is seen as particularly appropriate for an African context, because it allows to "simply disengage" when the need arises.[87] What does that say, however about the commitment to supporting the local economy? And what if the projected gas prices do not hold? If gas markets do not provide enough incentive to keep the gas flowing - as is credible in a scenario with rapidly expanding renewables and a world that meets the Paris targets - billions in investments will be stranded.

Damages will be there to stay, benefits never materialize. Worryingly, neither Mozambican law nor the state's contract with Anadarko require that locals benefit from the gas projects.[88] While generating income from gas extraction is perceived as desirable by most actors, doing it quickly, in an unorderly fashion can create more problems than it solves, including an increased risk of corruption.[89] The situation in other African countries, such as Nigeria and Angola can serve as warning to the people of Mozambique that the resource blessing may end up being a curse.

Finance and debt

Exploration company Cove which discovered the Prosperidade field, earned a nine digit sum of money and due to legal loopholes, they were going to walk away without sharing anything with Mozambique. It was not until the energy minister pulled the emergency brake that they shared some of this with the Mozambican government.[90]

The international market environment for liquefied fossil gas is very competitive with many projects under construction and planned, and much capacity coming online simultaneously.[91] The financialization of fossil gas terminals and other infrastructure megaprojects[92] is key to understanding the Mozambican projects: in an environment with very low interest rates, projects that promise high returns for dozens of billions of USD are rare, and thus a lot of investors pile in, pushing the project proposals towards a bigger scale.

From the Paris Agreement arises the need to phase out all fossil fuels before the end of useful life of the infrastructure (40–50 years). Their willingness to go forward with these projects anyway indicate that the Paris Agreement is not taken seriously by the institutions involved.

A part of the infrastructure will be financed by third parties, such as the South African Standard Bank and the Industrial and Commercial Bank of China which are putting 8 billion USD into Coral South.[93] But a big amount of money also needs to be injected by the national oil company Empresa Nacional de Hidrocarbonetos (ENH). Because gas is not flowing yet, they may not have the money, needing to sell equity in the project to cover their share. That way, the Mozambican government ends up holding very little shares in the project - and receiving less revenue. The amount of revenue kept in-country from the fossil gas operations has been a contentious issue.[94] It is to hope that being a member of the Extractive Industries Transparency Initiative (EITI) will help Mozambique establish a transparent framework for payments made by the industry.

THE PARIS AGREEMENT IS NOT TAKEN SERIOUSLY BY THE INSTITUTIONS INVOLVED

Illegal debt - to be paid for by gas

A case of corruption and illegal debt shook Mozambique between 2014 and 2016: three state-owned enterprises, all presided by the same person, secretly borrowed 1.4 billion USD, among others for tuna fishing ships, breaking Mozambican law. Around 850 million USD had already been borrowed in 2014.[95] The companies later defaulted on the loans, leaving it to the Mozambican people.[96] This caused a major debt crisis. Mozambique has now committed 5% of the gas income it hopes to receive from fossil gas towards paying back the illegal debt.[97-98] This effectively turns the gas development into a tool to pay for illegal debt. The situation has been characterized as "hangover before the party started".[99]

MOZAMBIQUE HAS NOW COMMITTED 5% OF THE INCOME IT HOPES TO RECEIVE FROM FOSSIL GAS TOWARDS PAYING BACK ILLEGAL DEBT

3

INDONESIA: DESTROYING CULTURAL HERITAGE FOR FOSSIL GAS

INDONESIA AND FOSSIL GAS

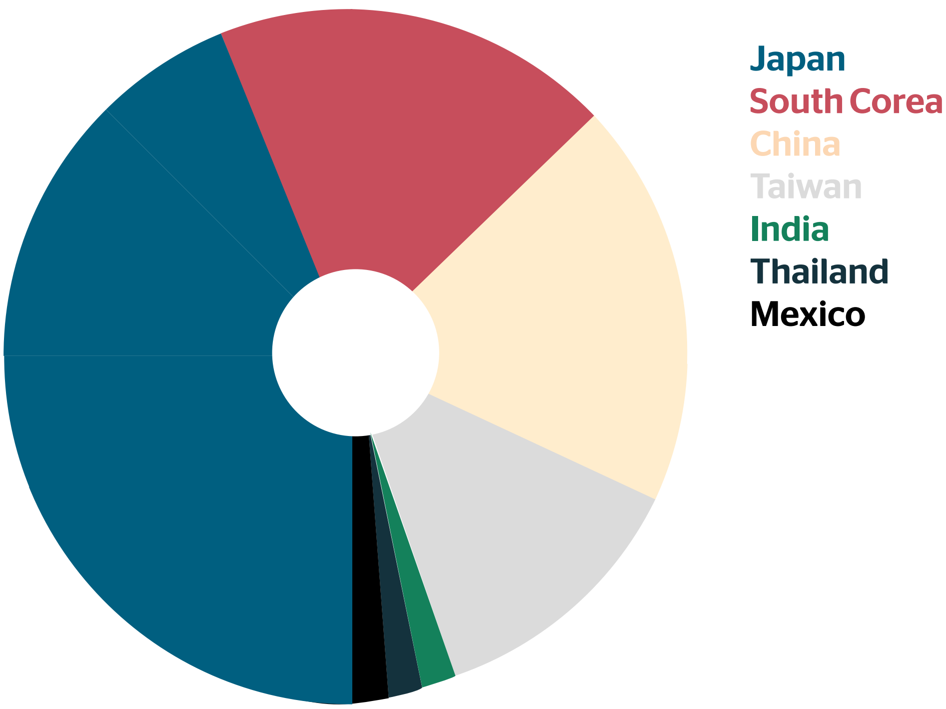
Indonesia is one of the biggest exporters of gas in Asia, and a liquefied fossil gas hub. International companies and financiers fuel displacement and human rights abuses, and huge new gas projects typically have little to do with local energy needs. As we will show below, communities pay a heavy price, being on the receiving end of heavy damages caused by fossil gas extraction in their home areas.

Indonesia is the biggest gas producer in South East Asia,[100] extracting around 70 bcm per year - approximately 2% of the world total.[101] It is the 5th biggest LNG exporter in the world, with 5.5% of the global market share in 2017.[102] Almost half of the exported gas is sold to Japan, and most of the rest to South Korea, China and Taiwan (see Figure 7).

Indonesia uses about half of its gas domestically and exports half, but is preparing to become a net importer around 2025 as reserves are in decline.[103-104] Once gas has to be imported, energy prices will likely rise for local people.

Royal Dutch Shell[105] and other international actors are already making moves to secure deals to sell gas to Indonesia, such as contracts to start importing gas from the US in 2018.[106] However, after more reserves were found it is unlikely that Indonesia begins importing from the US before 2020.[107] Italian company ENI is already extracting gas in the region, and is now securing deals for new projects to supply gas to LNG facilities.[108] British Petroleum is also a key player in the country.

Figure 7. . Indonesian fossil gas exports 2017 by country



(Source: data from BP Statistical Review 2018, graph by authors)

SIDOARJO MUD VOLCANO DISASTER

The infamous Sidoarjo case demonstrates the huge threat of gas infrastructure built near communities, and the extent of corporate impunity.

35 km from Indonesia's second largest city, Surabaya, mud, hot gases and water have been gushing from the ground in Sidoarjo since May 29th 2006. The phenomenon, locally known as "Lusi" (short for Lumpur Sidoarjo or "Sidoarjo Mud"), was caused by gas drilling by company PT Lapindo Branta[109], likely by their failure to install a casing around the drilling well to the level required by Indonesian regulations. The mudflow has since then never been brought under control and has turned into what is today the world's biggest mud volcano, covering several square kilometers in mud up to 20 meters deep. It has destroyed thousands of homes, government infrastructure, rice fields and other plantations, and continues to wreak havoc on lives and livelihoods. Between 10,000 and 50,000 people in the Sidoarjo villages were displaced, and many more affected in some way. Many people and affected companies are still awaiting compensation that they have been promised from the Government and from PT Lapindo Branta for the damages, although the company still insists it was a "natural disaster". [110]

The mud is still flowing from the eruption in Sidoarjo, and according to research conducted by Walhi East Java there is a heavy metal and polycyclic aromatic hydrocarbons content up to 2,000 times above the normal threshold in the area.[111] These are harmful, carcinogenic compounds, according to the United Nations Environment Program (UNEP). Heavy metals were also found to be contaminating community wells in surrounding villages. An examination found that 80% of people living in the local area experienced abnormal health conditions.»

The people of Sidoarjo have demanded that Lapindo, the company involved, bear responsibility.[112] In the Summer of 2018, Lapindo's licence to drill in the Sidoarjo region was extended until 2040.[113]

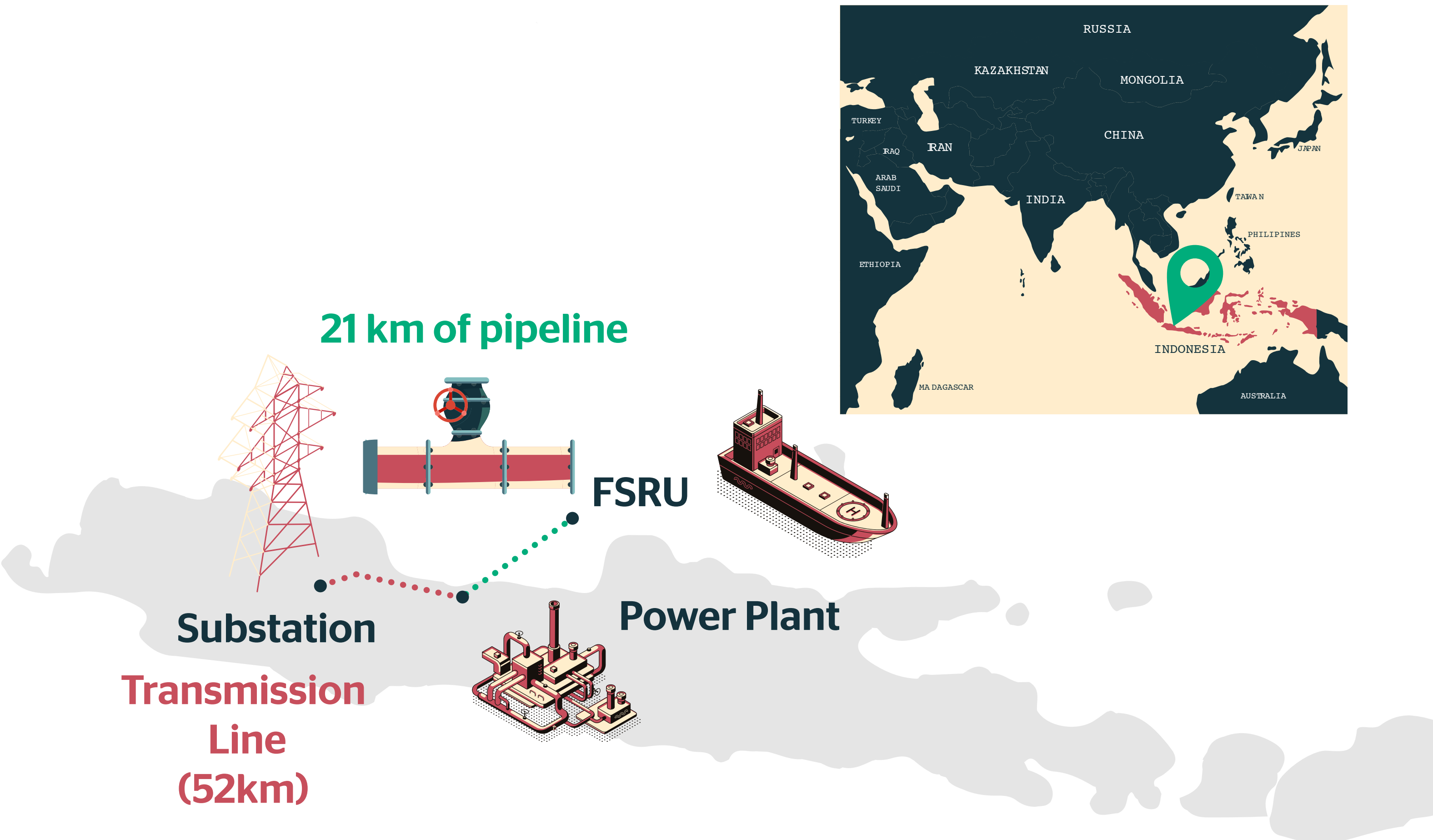
THE WORLD'S BIGGEST MUD VOLCANO

WEST JAWA 1 FOSSIL GAS-TO-POWER PROJECT

The Jawa 1 project demonstrates how communities are frequently displaced, fisherfolk's livelihoods disregarded and farmland destroyed to make way for new fossil fuel projects at a time of climate breakdown. As the Sidoarjo case has shown, the risks to communities are high and accountability from government and corporations is low, yet more dangerous projects are imposed on communities.

The West Jawa 1 Liquefied "Natural" Gas-to-Power project (Pembangkit Listrik Tenaga Gas dan Uap (PLTGU) Jawa-1 in Indonesian) is a mega-project driven by international markets and corporate interest rather than local energy needs. Construction started on the ground in late 2018.

Figure 8. Location of the project on the Indonesian island of Java (right). Map of elements of the project



The project

The West Jawa 1 project is the first of its kind in Asia. The project involves a floating storage and regasification unit (FSRU), a facility that receives liquified gas by ship, turns it back into its gaseous form, and stores the gas, until it is transported through an offshore and then onshore pipeline to a 1,760MW power plant, where it will be burnt to produce electricity. Transmission lines would then carry this energy to a substation. It would be the biggest gas-fired power plant in South East Asia, with an estimated cost of USD 1.3 billion,[114] and a total area of around 2.7 km2[115] - about a third of the size of the Sidoarjo mud volcano. Similarly to what transpires in Europe with unneeded projects, the arguments used to push this project forward are energy supply and security for the region, West Java being one of the most populated regions in Indonesia. Improving the environmental performance of the current energy mix by replacing diesel and coal with gas is also mentioned. However, nobody seems to have explicitly counted the lifetime greenhouse gas emissions of this enormous project. The cost of power generation will be comparatively low: 55 USD/MWh.[116]

Impact on communities

According to the Asian Development Bank,[117] a co-funder of the project, about 20 households will have to be 'resettled', and 724 individual landowners will be affected by the project. The electricity generated at the site will be sent through a transmission line, the route of which is going through fields and close to a residential area. All landowners involved will face restrictions on the height of trees and structures on their land because of the the transmission cable, and 'people under the transmission line alignment will not have a choice to refuse.'

The onshore pipeline and access road will also cut across paddy fields and fishponds, threatening food security in the region, which is a key paddy rice supplier. The region is known locally as the 'rice barn,' though in recent years it has been increasingly industrialised and rice production is already decreasing.[118] The project will reduce food security and push Indonesia further towards import dependency to meet Indonesia's significant need for rice. The FSRU will be located in areas near the shore currently used for fishing by local communities. These are just some examples of how this project will displace and disrupt livelihoods.

There has also been callous disregard for the cultural and historical significance of the site, and wishes of the local community. Archeological discoveries were made on the site of the project,[119] but before Karawang's Office of Tourism and Culture (Disparbud) has finished conducting research, the archeological site was destroyed to make way for the gas project.[120] A spokesperson of the community association voiced their deep disappointment.

Not only this, but the land for the onshore pipeline and access road formally belongs to the Ministry of Environment and Forestry (MOEF) and is categorized as a protected forest. Communities have long been carrying out subsistence agriculture in the forest. Deplorably, the project company exploits the presence of the locals in the area to argue that the forest is not actually "protected", and therefore disposable in their view.

PEOPLE UNDER THE TRANSMISSION LINE WILL NOT HAVE A CHOICE TO REFUSE

Who is involved?

The total amount of financing for this project is approximately USD 1.3 billion. USD 604 million is loaned from the Japan Bank for International Cooperation (JBIC),[121] this project being the flagship project of their newly launched scheme for Environmental Preservation and Sustainable Growth.[122] The Asian Development Bank (ADB) has approved two loans of a total of 400 million USD from the Leading Asia's Private Infrastructure Fund (LEAP), which is an ADB organized body with a contribution from the Japan International Cooperation Agency (JICA). Other co-financiers are Crédit Agricole (France), Société Générale (France), Mizuho Bank (Japan), MUFG Bank (Japan), and OCBC Bank (Singapore). The private sector finance is covered by a guarantee from Nippon Export and Investment Insurance (Japan).

The electricity produced by the power plant will be sold to the state-owned power utility Perusahaan Listrik Negara (PLN) for a period of 25 years. Two Indonesia-based consortiums of mostly Japanese companies, such as PT Jawa Satu Regas (JSR), which is made up of the Marubeni Corporation (Japan), Sojitz Corporation (Japan), Mitsui O.S.K. Lines (Japan), Ltd., PT. Pertamina (Persero), and more undisclosed members will construct, own and operate the site. Other companies involved are Samsung Heavy Industries[123] (South Korea) and MOL (Mitsui O.S.K. Lines, Japan).[124] General Electric (US) will manufacture gas turbines for the project.[125] The gas will be supplied mainly from the Tangguh Liquefied Fossil Gas terminal in West Papua,[126] which is operated by BP.[127]

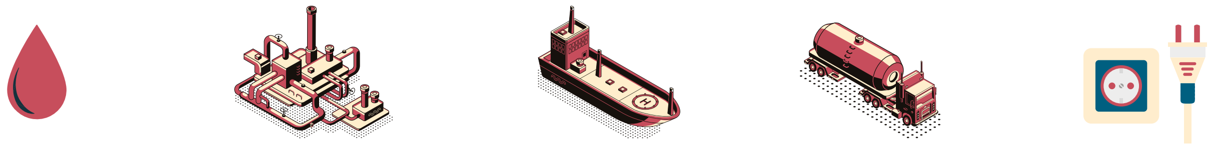
Questionable need

This huge project, which would be the biggest in Asia, is not only a bad idea because of the devastating impacts on local communities and on the climate. In West Java, there is an oversupply of energy at the moment. The Indonesian government is currently aggressively increasing the amount of coal-fired power plants. There is a lack of energy distribution infrastructure, rather than energy production. Energy consumption growth has been slowing down and was consistently lower than projected growth over the last years.[128] Sufficient energy supply and declining growth in gas production has been the downfall of several proposed projects in recent years, including a 9000-MW electricity project in Java[129] and an onshore LNG receiving terminal near Jakarta.[120] Project promoters mention that the project would generate electricity for 11 million households,[131] but in Java electrification is close to 100%,[132] so no new customers would be served.

The risk of stranded assets with new fossil fuel infrastructure is also huge; both Climate Policy Initiative (2014) and IRENA (2017) estimate that the value of fossil fuel assets at risk of stranding in Indonesia is in the range of USD 200–300 billion.[133] When looking at alternatives, unfortunately the Indonesian government is failing to meet its own modest renewable energy targets. These have huge potential to drive the 'diversification of the Indonesian economy and its fiscal transition away from fossil fuels,' according to the International Institute for Sustainable Development.[134] But the focus on making viable huge new fossil gas infrastructure takes resources away from the energy transition.

NEW FOSSIL GAS INFRASTRUCTURE TAKES RESOURCES AWAY FROM THE ENERGY TRANSITION

4 CONCLUSIONS



FOSSIL GAS IS A BAD DEAL

Fossil gas is a climate killer and must be kept in the ground, the same as oil and coal. In the name of sustainability, governments and industry are pushing the false narrative that gas is a transition fuel and climate solution. These companies and investors, who try to profit from the climate crisis, locking us into decades of fossil gas use must be stopped if we want to have a chance of stabilizing the climate.

As we have seen, these projects are generally driven by financial interest, not market demand, and much less local people's concerns. The profits are privatized, but debt and risks are socialized. In terms of paying the price for the new fossil gas infrastructure, we have seen that gas consumers pay through gas bills, taxpayers pay through direct subsidies to the fossil gas industry and everyone pays through the impacts of an accelerating climate crisis. Where there is no market, public guarantees - or alternatively laws that allow to make consumers pay the price are mobilized to achieve financial viability of the huge projects.

Local communities stand to lose, rather than benefit from these projects.

In summary, new fossil gas infrastructure is a bad deal. It is only beneficial for the project promoters who position themselves at the receiving end of a scheme that leaves the local and global community in worse shape than before.

ANNEX 1

Abbreviations, technical terms & unit transformations

Abbreviations & Technical terms

ADB : Asian Development Bank
FID : Final Investment Decision
FSRU : floating gas storage and regasification unit
JBIC : Japanese Bank of International Cooperation
Liqmeth : Liquid methane, another name for LNG that alludes to its addictive nature
LNG : liquefied fossil gas, Loads of Nasty Gas (gastivists), Liquefied Natural Gas (industry)
Minimum wholesale price : This price groups all the costs together that are incurred to bring gas to the market : exploration and extraction, including the financial deals to make them possible, and including a reasonable profit for the investor.
Netback price : The market price minus gasification, regasification and transport costs. Generally, when the netback price is higher than the minimum wholesale price, a project is economically viable.
Project financing : A finance structure that relies heavily on the cash flow generated by the project itself to pay back the loan.

Units & Transformations

Bcf : billion cubic feet. 1 bcf per day is roughly 10 bcm per year.
Bcm : billion cubic meters. 1 bcm = 0.035 tcf (1 cm = 35.3147 cf); 1 bcm = 10.350 TWh (10,350 GWh). Gas extraction is measured in billion cubic meters (bcm) or trillion cubic feet (tcf).
Boe : barrels of oil equivalent. 1 boe = 5,800 cf[135]
Btu : British thermal units
GtCO2 : gigatons CO2
KWh : Kilowatt hour. 1 KWh = 3412 Btu
Mbtu : Million British thermal units. Sometimes also written as mmbtu. Gas prices in North America are quoted in USD/mbtu. 1mbtu = 293.07107 KWh,[136] 1mbtu = 964 cubic feet[137]
Mta, mtpa : million tons per annum. LNG processing capacity is usually given in Million tons per annum (mta). 1 mta requires 1.36 bcm of gas input. 1 mta LNG capacity thus requires about 1 tcf or 30 bcm of input over 20 years to be running constantly and recover the high cost of investment.[138]
Mtoe : million tons of oil equivalent. Used for quantifying energy demand. 1mtoe = 39,683,207.2 mmbtu[139] (= 1.1237 bcm)
MWh : megawatt hour. 1MWh = 3.41214163 mbtu[140]
Tcf : trillion cubic feet. 1 tcf = 28.57 bcm (1 cf = 0.028 cm). Gas extraction is usually measured in billion cubic meters (bcm) or trillion cubic feet (tcf).

Emissions calculations

1,000 bcm fossil gas = 2 Gt CO2
1,000 cm fossil gas = 2 t CO2
1 cm LNG = 1.25 t CO2
1 million t LNG = 3.61 million t CO2
1 t fossil gas (CH4) = 100 t CO2
1 tcf fossil gas = 57.14 million t CO2

How much CO2 is it per cf, cm, t

	To					
	Bilion cubic metres NG	Bilion cubic feet NG	Million tonnes oil equivalent	Milion tonnes LNG	Trilion British thermal units	Milion barrels oil equivalent
	Multiply by					
1 bilion cubic metres NG	1.000	35.315	0.860	0.735	34.121	5.883
1 bilion cubic feet NG	0.028	1.000	0.024	0.021	0.966	0.167
1 million tonnes oil equivalent	1.163	41.071	1.000	0.855	39.683	6.842
1 million tonnes LNG	1.360	48.028	1.169	1.000	46.405	8.001
1 trillion British thermals units	0.029	1.035	0.025	0.022	1.000	0.172
1 million barrles oil equivalent	0.170	6.003	0.146	0.125	5.800	1.000

From BP (2018).[141] Check BP 2018 page 54 for more conversions.

Units	
1 metric tonne	= 22404.62 lb = 1.1023 short tons
1 kilolitre	= 6.2898 barrels = 1 cubic metre
1 kilocalorie (kcal)	= 4.1868 kJ = 3.968 Btu
1 kilojoule (kJ)	= 0.239 kcal = 0.948 Btu
1 British thermal unit (Btu)	= 0.252 kcal = 1.055 kJ
1 kilowatt-hour (kWh)	= 860 kcal = 3600 kJ = 3412 Btu

ANNEX 2

List of actors involved in the Liquefied Fossil Gas scheme in Mozambique

Angola ENHILS

Australia Efic

Canada ARQUE
Canada EDC

China Bank of China
China China Development Bank
China China National Petroleum Corp. (CNPC)
China CNOOC
China ExIm Bank
China Frontier Services Group
China Industrial and Commercial Bank of China (ICBC)

France BNP Paribas
France Bpifrance
France COFACE
France Crédit Agricole
France Electricite de France
France Engie
France Natixis
France Societe Generale
France Technip
France Total

India Bharat Petroleum Corp. Ltd
India Bharat PetroResources (BPRL)
India Gujarat State Petroleum Corp.
India Hindustan Petroleum Corp. Ltd
India Oil and Natural Gas Corp.
India Oil India
India ONGC Videsh
India others
India Petronet LNG

Indonesia Pertamina

International World Bank

Ireland Tullow Oil

Italy ENI East Africa/Mozambique Rovuma Venture
Italy ENI Group
Italy RINA
Italy SACE
Italy Saipem JV
Italy UBI Banca
Italy UniCredit

Japan Chiyoda Corp
Japan JBIC
Japan JGC Corp
Japan Mitsui
Japan MODEC/SOFEC
Japan NEXI
Japan Sumitomo Mitsui Banking Corp.
Japan Tohoku Electric Power Co.
Japan Tokyo Gas

Kenya government

Mozambique Beas Rovuma Energy Mozambique Limited
Mozambique Empresa Nacional de Hidrocarbonetos (ENH)

Netherlands ABN AMRO
Netherlands Atradius DSB
Netherlands Mammoet
Netherlands Shell
Netherlands Van Oord

Norway AKER
Norway Norsafe

Portugal Gabriel Couto
Portugal Galp Energia
Portugal Millennium BCP
Portugal Norvia

Qatar Qatar Petroleum

Russia VTB

Singapore Keppel Offshore & Marine

South Africa Brimstone Investment
South Africa CBS Resources
South Africa CBW
South Africa CCC
South Africa Export Credit Insurance Corporation of South Africa
South Africa Grindrod
South Africa Sasol
South Africa Standard Bank

South Korea Daewoo Shipbuilding & Marine Engineering
South Korea K-SURE
South Korea KEXIM
South Korea Kogas (Korea Gas Corporation)
South Korea Korea Development Bank
South Korea POSCO
South Korea Samsung Heavy Industries

Spain Cemosa

Switzerland Credit Suisse

Thailand PTT Exploration & Production (PTTEP)
Thailand PTT Group

United Kingdom Amarinth
United Kingdom BP
United Kingdom Centrica
United Kingdom HSBC
United Kingdom Linklaters
United Kingdom TechnipFMC
United Kingdom UK Export Finance

United States Air products
United States Anadarko
United States Baker Hughes
United States Chicago Bridge & Iron Co.
United States Ex-Im Bank
United States ExxonMobil
United States GE Oil & Gas
United States General Electric
United States KBR

ANNEX 3

List of actors involved West Jawa 1 Gas-to-Power Project

Indonesia	PT Jawa Satu Power (JSP) PT Jawa Satu Regas (JSR) PT Pertamina (Persero) PT PLN (Persero)
Japan	MUFG Bank, Ltd Mizuho Bank, Ltd The Japan Bank for International Cooperation (JBIC) Mizuho Bank Sojitz Corporation Marubeni Corporation Japan International Cooperation Agency (JICA) MOL (Mitsui O.S.K. Lines) Nippon Export and Investment Insurance (NEXI).
South Korea	Samsung Heavy Industries
Asia	Asian Development Bank
France	Société Générale Crédit Agricole
UK	British Petroleum
US	General Electric

FOOTNOTES

1 The industry misleadingly calls it "natural" gas in English. It is important to recognize that it is as natural as its sisters oil and coal. Because gas is also a generic term for any substance in its gaseous form, we use fossil gas for this particular gas which is usually mostly made up of methane (CH4). Methane also exists in different forms, so fossil gas is the most specific way to call methane from underground. Fossil gas includes both "conventional" and "unconventional" gas such as coal seam gas and shale gas extracted through fracking.
2 BP Statistical Review of World Energy 2018. Accessed on 17/04/2019
3 The industry calls this "production" which we reject as misleading, because "producing" fossil gas is a process that has happened underground over millions of years. The word also carries the notion that when you run out, you could "produce" more, which is untrue.
4 FID: Final investment decision. See the Annex for a list of abbreviations used in this report.
5 www.woodmac.com/news/opinion/four-themes-for-future-exploration/
6 For sale to Goldboro LNG terminal (including exploration). See: Laurentian Bank Securities Equity Research, January 16, 2018: Pieridae Energy Limited. On Track to Become Canada's First Major LNG Exporter.
7 See previous footnote.
8 See previous footnote.
9 See previous footnote.
9 -2 See Gas Transportation Tarriffs - 1.299 - 2.895 S$ average gas distribution tariff for customers in Singapore.
10 https://www.eia.gov/energyexplained/index.php?page=natural_gas_prices Originally 10 USD/thousand cubic feet. This equals 10.35 USD/mbtu, see conversions in Annex.
11 https://www.destatis.de/DE/Publikationen/Thematisch/Preise/Energiepreise/EnergyPriceTrendsPDF_5619002.pdf%3F__blob%3DpublicationFile Originally 5.5 €/MWh, this equals 1.61 €/mbtu or 1.83 USD/mbtu
12 See Space View of Natural Gas Flaring Darkened by Budget Woes. National Geographic, October 10, 2013. and North Dakota has a flaring problem that even industry recognizes. Environmental Defense Fund, April 3, 2018.
13 Associated gas can be re-injected into the reserve, in case it is non-economic to sell it. This is what the Nigerian law requires, for instance.
14 Natural Gas Prices Fall Below Zero In Texas. OilPrice.com, Nick Cunningham, Nov 28, 2018. https://oilprice.com/Energy/Gas-Prices/Natural-Gas-Prices-Fall-Below-Zero-In-Texas.html
15 https://www.naturalgasintel.com/articles/118174-lng-developers-said-better-armed-to-shrug-off-difficult-delivery-reputation
16 Does Russia really sell LNG to the US? Euractiv.com 5 April, 2018
17 https://www.destatis.de/DE/Publikationen/Thematisch/Preise/Energiepreise/EnergyPriceTrendsPDF_5619002.pdf%3F__blob%3DpublicationFile
18 This means that big uses of electricity are scheduled to coincide with moments when electricity is available and turned off when it is not, thereby balancing electricity production, reducing peak demand and smoothening electricity prices, which in today's market can go up and down very strongly, even into negative.
19 See https://dwarshuis.com/earthquakes-groningen-gas-field/visualisation/ for a visualization of the earthquakes over the years.
20 https://set.kuleuven.be/ei/images/EI_Factsheet_4_presentation.pdf
21 mbtu: million British thermal units, See annex for abbreviations and transformations into other measures.
22 https://ycharts.com/indicators/natural_gas_spot_price
23 http://www.cegh.at/gas-exchange-0 22 EUR/MWh equals about 7.33 USD/Mbtu
24 https://www.powernext.com/spot-market-data between 15 and 19 EUR/MWh
25 https://www.icis.com/explore/press-releases/soaring-asia-widens-spread-to-europe/
26 https://static1.squarespace.com/static/5795c94359c-c68a490d7c0b9/t/5884e13db3db2bdb920240a5/1485103432655/8_Bros_Chapter.pdf
27 By the industry it is called Liquefied Natural Gas (LNG). We reject this name or translate it as "Loads of Nasty Gas".
28 http://natgas.info/gas-information/what-is-natural-gas/lng
29 Kavonic (2017) It's A Brave New World For LNG. https://www.forbes.com/sites/woodmackenzie/2017/08/11/its-a-brave-new-world-for-lng
30 Bros (no date) Global LNG pricing dynamics and impact on Europe.
31 See this calculation by Food & Water Europe.
32 Friends of the Earth Europe & Zelena Akcija (2018), Pipedream - Debunking the myths of Croatia's Krk LNG terminal (December 2018)
33 See IMF (2015) IMF Survey: Counting the Cost of Energy Subsidies. which puts the annual global cost of fossil fuel subsidies at over USD 5 trillion. For an example of applying these externalities to a fossil gas project, see Kartha (2017) The AIIB's Energy Opportunity: Background research report.
34 E.g. 102 million Euros for the Krk LNG terminal in Croatia which is opposed by the local community which depends on tourism. https://www.foodandwatereurope.org/pressreleases/growing-doubts-over-adequacy-of-e101-million-eu-public-money-for-krk-lng-terminal-after-lex-lng-adopted-rejected-in-croatias-parliament-today/
35 See Energy doublethink. Contradictions at the EU bank in combatting climate change. CEE Bankwatch
36 Between 11 and 27%. Source: https://enmin.lrv.lt/uploads/enmin/documents/files/Economic_analysis_of_LNG_FINAL.pdf
37 Stranded generation assets: Implications for European capacity mechanisms, energy markets and climate policy. Ben Caldecott & Jeremy McDaniels. January 2014.
38 A Clean Planet for all. A European long-term strategic vision for a prosperous, modern, competitive and climate neutral economy. 28 November 2018, page 81.
39 https://static1.squarespace.com/static/5795c94359c-c68a490d7c0b9/t/5884e13db3db2bdb920240a5/1485103432655/8_Bros_Chapter.pdf
40 ICSID condemns Egypt to pay €1,735 million to Naturgy and ENI for a gas plant. 03.09.2018, Publics.bg, World News.21.
41 See ODG (2018) Mega-infrastructure as a mechanism of indebtedness. ODG, December 2017. for an in-depth discussion.
42 Company shares, bonds, real estate, cash and commodities are other asset classes.
43 Methane clathrate = methane molecule enclosed in a crystal-like cage by water molecules – found at the bottom of the ocean or deep freshwater lakes, in permafrost and in continental sedimentary rocks. When it melts, the methane is released.
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