The Environmental Challenges of Pemex

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Abstract: Established in 1938, Petroleos Mexicanos (Pemex) is the Mexican state-owned petroleum company which is managed by the Mexican government. Pemex is the largest firm in Mexico and one of the largest firms in Latin America. It is considered to be the second most valuable brand in Latin America and is ranked tenth in oil production and twenty-second in oil reserves globally. For over 40 years, Pemex has been responsible for a number of environmental disasters which resulted in the cumulative loss of thousands of lives. In addition, Pemex continues to focus on its energy policy of increasing its oil and natural gas production instead of shifting to alternative energy sources.

Due to the interweaving of the government's national policies related to optimizing the level of fossil fuel production in the country, Pemex has become a showcase of how a firm that has failed in the commitment to support environmental sustainability.

Keywords: Pemex, Environmental Disasters, Oil and Gas Industry, Climate Change

1. INTRODUCTION

Established in 1938, Petroleos Mexicanos (Pemex) is the Mexican state-owned petroleum company managed by the Mexican government. Pemex is the largest firm in Mexico and one of the largest firms in Latin America. It is considered to be the second most valuable brand in Latin America and is ranked tenth in oil production and twenty-second in oil reserves globally. Pemex is a vertically integrated company and controls operations at every step in the hydrocarbon value chain. Those steps include exploration and extraction of hydrocarbons, processing of natural gas and refining of crude oil, the synthesis of gas and petrochemical liquids, and the storage and transportation of its energy products.

Pemex business areas include exploration, production and marketing of oil and natural gas, refining processing and marketing of oil, natural gas, petrochemicals and sulfur treatment, logistics services and transportation and storage of petroleum and petrochemicals, and the production and commercialization of fertilizers. Pemex describes its purpose as "the creation of economic value and the increase of national income, with a sense of equity and social and environmental responsibility."

2. Pemex's Future Vision

Shortly after he came into office in December 2018, Mexican President Andrea Manual Lopez Obrador presented his vision of Mexico's energy policy with Pemex being the leader. A committed socialist, President Lopez Obrador wanted Mexico to increase production in oil, gasoline and electricity relying on the power of the state-owned firms and reverse the previous five-year trend of encouraging private investment in Mexican based energy firms.

He accused previous governments of plundering the industry and vowed to return Pemex and other operations back to their former glory by making Mexico self-sufficient in energy, while generating hundreds of thousands of

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jobs for Mexican workers. The President's vision for Pemex was captured in the firm's new slogan of "For the rescue of sovereignty." While no longer a monopoly, President Lopez Obrador is committed in using Pemex as an extension of the government's policy of helping its citizens. Pemex is still one of Mexico's largest employers and funds 20 percent of the country's national budget. In 2019, oil production in Mexico had dropped almost in half from its high in 2004 and has Pemex's ranking dropped to the eleventh largest oil producer in the world from the fourth largest in 2002.

The previous President of Mexico, Enrique Pena Nieto allowed private investments in the Mexican oil industry. This was a break from the long tradition in Mexico of not allowing other firms access to its oil reserves. President Nieto encouraged private investments to attract both financial and technical capital in the Mexican operations. Under the previous regime, Pemex still kept most of the oil reserves, however the government allowed firms to buy rights for oil extraction through an auction process. The previous government also allowed foreign investors to expand their presence in the power industry, as well as the oil industry.

President Lopez Obrador stopped the opportunity for foreign investment in Mexican energy operations and replaced independent government energy regulators and Pemex board members with loyalists to him. In 2019, Pemex had $107 billion in debt and its oil production was at its lowest level in 40 years. Corruption and mismanagement led to higher operating costs and the Mexican government levied high taxes on the firm's profits. Gasoline from the United States accounts for approximately two thirds of the consumption in Mexico.

In March 2019, Greenpeace's Mexican branch complained about the abrupt changes that occurred in Mexican energy policies related to sustainability which resulted in Mexico not being able to achieve its Paris climate agreement sustainable commitments. The Mexican government had cancelled its fourth clean-energy tender which is a process where private firms can bid to produce renewable energy operations for a government-based utility. The previous Mexican government had three successful clean-energy tenders which resulted in contracts of over 7 billion (gigawatts) watts of power.

If Mexico had continued on its previous path of supporting renewable energy sources, it would have been possible to achieve its clean energy target of 35 percent of all power generated in Mexico by 2024. In addition, the Mexican government had brought back old thermal power plants into use and allowed Pemex to develop fracking projects. The government's explanation in the shift in energy policy was due to supplying the "cheapest possible power" to Mexican consumers.

3. Financial Challenges

In March 2019, Moody's released an evaluation of the financial standing of Pemex. Moody's evaluation of Pemex's Baseline Credit Assessment was poor due to a number of financial risks. Pemex's risks included issues related to declining oil production and proven reserves, a high tax burden, and a significant negative annual free cash flow. Pemex also had relatively low capital spending with high costs. Moody's also noted that Pemex will continue to be pressured to be financially sustainable in the future due to the reduction of its profit margins by selling gasoline to Mexican customers below market price. The government of Mexico wants Pemex to develop future growth opportunities without additional governmental financial support. This policy will result in a reduction of the incentives for private firms to invest in Pemex's operations.

4. Pemex Environmental Challenges

Due to the nature of the Oil and Gas Industry, there are inherently a number of environmental challenges which Pemex must address in order to be perceived as being committed to implementing a policy of environmental sustainability.

4. 1 Natural Gas Flaring

4.1.1 The Pros of Flaring

Gas flaring is the burning of natural gas that occurs during the oil extraction process. This wasteful and highly polluting process has taken place in the oil industry for over 160 years. The natural gas is burned because the oil

producers do not want to capture the natural gas so instead it is released into the atmosphere.

It is estimated that the amount of gas that is flared annually around the globe is 142 billion cubic meters which is enough energy to power the whole sub-Saharan African region. In addition, flaring is not an efficient burning process since it does not burn all the natural gas which also results in the release of large amounts of methane.
Economic circumstances related to the price of natural gas will determine whether oil companies will make the necessary investments in capturing, transporting, processing, and selling the natural gas. However, there are also other reasons why the flaring of natural gas can be justified. Flaring may be required due to safety issues. During the oil extraction process, the pressure can quickly increase or decrease creating a potentially dangerous situation. Flaring can be used to control and moderate the pressure variations.

Oil deposits can occur in remote and inaccessible places globally. Therefore, if the releasing of natural gas is not in large volumes or consistent, it is not economically feasible to capture and transport the natural gas.

As paradoxical as it sounds, there can also be regulatory reasons why a firm will flare natural gas. The country where the oil production takes place may have laws and regulations which make it difficult and can even forbid a firm from selling the natural gas that is released as part of the oil production process. The firm may only have rights to extract the oil and not the natural gas. In other circumstances, the country may not have explicit regulations regarding how the natural gas should be captured and distributed. This ambiguity can create uncertainty for the firm related to its potential legal liability. Furthermore, a country's penalties for flaring may be much lower than the economic feasibility of capturing and selling the natural gas.

4.1.2 The Cons of Flaring

In addition to being wasteful and generating GHG emissions, natural gas that is captured instead of being flared could be used to replace more polluting fuels such as coal and diesel as an energy source. Flaring generates soot which is also known as black carbon. The black carbon is created through the inefficient burning of the natural gas and is released into the atmosphere. It is estimated that black carbon could be the second largest factor in warming the atmosphere after the release of carbon dioxide. The environmental impact of flaring is immense in the Artic regions of the world where black carbon deposits act as a catalyst to the melting of ice and snow.
Pemex burned off 50 percent more of its natural gas from flaring in the first quarter of 2021 as compared with 2020. For 2020, Pemex increased its level of flaring by 28.8 percent, yet its oil production level remained the same as it was in 2019. Flaring contributes to approximately one percent of all man-made carbon emissions globally and can produce more than 10 times the nitrogen oxides of local cars.

4.2 Release of GHG Emissions

From 1965 to 2019, Pemex released 22.65 billion tons of carbon dioxide into the atmosphere. Pemex was ranked 9th of the top 20 companies that, combined, generated a third of all carbon emissions globally during this time period. In 2019, Pemex was identified as the most polluting company in Latin America and generated 1.67 percent of the total GHG emissions in the world.

With the completion of the 26th UN Climate Change Conference of the Parties (COP 26) in Glasgow, there is significant pressure for Mexico and Pemex to enhance their commitments to the natural environment as the world's leaders attempt to address critical issues related to climate change. However, the response from Mexican President Andres Manual Lopez Obrador to the COP 26 agreement was not encouraging. President Obrador accused the major political figures of being hypocritical by failing to identify the root causes of the problems and ignoring their own environmental commitments.

4.3 Government Corruption and Pemex's Environmental Issues

A major challenge for Pemex in being more proactive related to environmental issues is that due to its government control, it is susceptible to bribery and corruption. In 2020, the former Pemex CEO Emilio Lozoya went on trial for corruption and bribery of government officials. The bribes were used, in part, to ensure politicians would not support Mexico's 2013 energy reform which included allowing private companies to compete in the energy sector in Mexico. By eliminating a free market for energy in Mexico, Pemex is able to

implement a monopoly strategy of not being concerned about the needs of its stakeholders. However, as climate change becomes a more dominant focal point in political and economic discussion, Pemex must be more in sync with the needs of its stakeholders. For example, global environmental NGOs will continue to increase its pressure in exposing Pemex's self-inflected mistakes related to its environmental commitment.

5. Legacy of Pemex's Environmental Disasters

Due to its monopoly power and lack of accountability, it is not surprising that Pemex has developed a legacy of environmental disasters. Since the government controls Pemex, it is both the check and balance on holding Pemex accountable for its actions related to the natural environment. This section discusses a number of environmental disasters for which Pemex is responsible solely or in partnership with another company.

5.1 Ixtoc-I Well – 1979

On June 3, 1979, Pemex's Ixtoc-I well had a catastrophic failure. The offshore oil well was being drilled at a depth of 3,627 meters when the failure of the correct circulation level of the drilling fluid resulted in the collection of oil and gas in the pipeline which resulted in an explosion. The explosion occurred when the gas being released from the subsoil leaked into the pump motors.

The explosion caused the platform to collapse and generated a large oil spill and fire which lasted 280 days. An estimated 560 million liters of crude oil was spilled. It was also estimated that 50 percent of the spilled crude oil was burned, 16 percent was evaporated, 5.4 percent was collected, and 28 percent was dispersed. The crude oil reached the Mexican coastal areas of Campeche, Tabasco, Veracruz, Tamaulipas and also parts of the Texas coast. Pemex's attempt to close the well using divers failed and they had to resort to using floating containment barrels. A total of 200 ships, 12 aircraft and 500 workers were deployed to contain the oil spill. In addition, airplanes were also used to spread a chemical dispersant over the oil spill area which was 2,800 square kilometers in size. Pemex was finally able to inject brine through two relief wells and the fire was extinguished on March 9, 1980, with the final seals occurring on April 5, 1980.

The environmental impact of the oil spill was devastating to the surrounding area. There was enormous death of biodiversity including birds and marine species with permanent damage to mangroves, as well as soil and water contamination.

5.2 1984 Mexico City LPG (Liquid Petroleum Gas) Storage and Distribution Center

At Pemex's Mexico City LPG storage and distribution center, a liquid petroleum gas pipeline 20 centimeters in diameter ruptured in 1984 due to excessive pressure. The gas drifted to a flare stack which resulted in multiple explosions of vapors caused by the liquid boiling. The resulting fireball had an estimated temperature of 2,200 Fahrenheit. Six spherical LPG storage tanks and dozens of cylindrical containers exploded with debris flying in the air for over one kilometer in distance. The explosion resulted in 650 deaths, 2,500 injuries and the loss of over 25,000 homes.

5.3 1992 Guadalajara

In the city of Guadalajara, numerous gasoline explosions in the sewer system and subsequent fires took place in 1992. The explosions lasted over 4 hours, destroyed 5 miles of streets, and damaged 1,600 buildings. The number of deaths was over 200. It was reported that four days before the explosions, local residents complained about a strong gas smell. A ruptured Pemex gasoline pipeline that was connected to a city storage tank leaked into the sewer system. In addition, it was reported that the day before the explosions, Pemex officials knew that hundreds of barrels of leaded gasoline was flowing into the sewers and went home for the evening instead of taking any corrective action. It was also reported that representatives of the regional sewer authority measured explosive levels of gas in the sewers 24 hours before the blast but did not issue any warnings.

The initial response from Pemex was to blame the nearby La Central cooking-oil factory for dumping hexane gas into the sewers. An investigation concluded that the company had only played a minor role in the disaster.

5.4 2016 Petrochemical Facility, Veracruz

In 2016, an explosion occurred inside the Mexican Petrochemical Vinyl plant located in Coatzacoalcos, Mexico. The plant operated with a partnership between Mexichem and Pemex. The Explosion was due to pipe that had corroded. The explosion occurred in the facility's chlorinate 3 plant which resulted in a black cloud of smoke covering hundreds of meters and producing a strong smell of ammonia. The plant produces approximately 900 tons of vinyl chloride daily which is an industrial chemical used in making plastic piping. The plant generates estimated revenue of $260 million annually. The explosion resulted in the death of at least 28 workers and the impact of the explosion could be felt almost 6 miles away from the plant.

5.5 2019 Pemex Pipeline Explosion, Mexico City

In 2019, a Pemex pipeline ruptured and then exploded due to people stealing gasoline from the pipeline. The thieves would siphon the gas from the pipeline that was located in a poor rural area north of Mexico City. The explosion resulted in the death of at least 91 people with an additional 66 people injured. An investigation concluded that the static electricity from the clothing of people around the pipeline caused the blast. Numerous people near the pipeline were wearing synthetic fibers that could generate an electric reaction causing a spark which would ignite the gas being siphoned from the pipeline. Video footage before the explosion took place had shown that people were covered with gasoline as they were trying to fill their containers. In 2018, Pemex gasoline pipelines were siphoned illegally by local residents, on average, 42 times daily.

5.6 2021 Offshore Oil Well Platform Fire -Gulf of Mexico

In July 2021, an "eye of fire" was reported in the Gulf of Mexico from a Pemex offshore oil well. The fire was caused by the failure of an underwater value. The leak occurred about 150 yards from the drilling platform.

A circle of fire could be seen on the ocean surface and resembled molten lava. It was reported that the ocean water was bubbling from the heat. It took more than five hours to completely extinguish the blaze and the company employees used nitrogen to eliminate the fire. The executive director of Mexico's Security, Energy and Environment Agency, Angel Carrizales, puzzlingly stated that the leak "did not cause a spill" This statement seems unrealistic since by definition, a spill created the oil which caught fire in the ocean. Five workers were killed and six were injured due to the fire. The work crew was performing maintenance on the platform.

5.7 Dos Bocas, Tabasco Refinery

The Dos Bocas oil refinery was built in Tabasco, Mexico by Pemex with the agreement that protected land in the area would be preserved. In 2006 and 2007, Pemex agreed to the land protection in exchange for the drilling rights. Pemex was granted drilling rights of oil and gas fields for 20 years on the condition that Pemex would not develop any new infrastructure that would destroy the local trees, flora, and fauna.

The protected land had a rare mangrove forest. Mangrove trees are much more effective than most other trees in both capturing carbon and protecting the surrounding areas from flooding. The protected area included not only four types of mangroves but also twenty-three species of protected fauna.

However, Pemex built the $8 billion facility directly on the protected area destroying the mangrove trees and the protected flora and fauna when the area was developed starting in 2018. The refinery is expected to begin operations in 2023. The commitment of the Mexican government to the site may be due, in part, to the fact that the refinery is located in Mexican President Andres Manual Lopez's home state of Tabasco.

6. Summary

As the largest and most powerful firm in Mexico, Pemex has the power to be a pioneer and trendsetter in a proactive environmental commitment. However, with that great power should come great responsibility. Due to the interweaving of the government's national policies related to optimizing the level of fossil fuel production in the country, Pemex has become a showcase of how a firm has failed in its commitment to support environmental sustainability.

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