


SHOCK AGAINST NATURE: A COMPARATIVE ENVIRONMENTAL HISTORY OF OIL DRILLING AND OIL BOOMTOWNS IN BRAZIL AND CANADA DURING THE OIL SHOCK ERA (1967-1981)

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ABSTRACT

This article focuses on the environmental impact of the oil industry during the Oil Shock years in the 1970s. During this period, Brazil and Canada explored new oil sources in order to deal with the lack of supply from the Middle East. The expansion of the national oil industry in both countries affected the fragile environment of several regions and the urban life of these places, as well. In understanding how these factors affected the urban environment and nature, it is possible to achieve a new understanding about what the Oil Shock meant on a global scale.

KEYWORDS

Oil. Environmental Impact. Oil Boomtowns.

Brazil and Canada led one of the boldest experiments ever made in the oil industry in the late 20th century: the deep offshore oil in the Campos Basin and the Tar Sands oil in Alberta. In spite of the fact that there is a substantial amount of literature about the political economy of oil or the environmental impact of oil exploration, there are very few comparative studies. Therefore, this research paper intends to address this knowledge gap by bringing a comparative study between Brazil and Canada in a crucial period for the oil industry and the global economy crisis of the 1970s.

During the years that followed the Oil Shock of 1973, several countries had to cope with the embargo promoted by the Arab nations of the Organization of Petroleum Exporting Countries (OPEC). Given the fact that most of the Western nations were dependent on OPEC's oil, there was a pressing need to find ways to compensate for the lost oil supply from the Middle East. Amidst fuel shortages and rampant inflation, governments all over the West sought to find a solution through new technologies and domestic sources of energy. For Brazil and Canada, the crisis represented an opportunity to develop new sources of oil that were deemed too costly in the previous decade. This economic demand directly affected several urban communities, which out of nowhere were "invaded" by a corporate army of equipment and workers. As they struggled to cope with these immense changes, Boomtowns offer an interesting case-study to reflect about urban development in the frontier of the oil industry, as well as the social and environmental impacts.

Both Rio de Janeiro's deep offshore oil and Alberta's heavy oil (tar sands) showed a lot of promise, but with the global oil glut of the 1960s, developing those new sources was not worth the investment. Once economic conditions changed, projects such as deep offshore oil and the tar sands became not only feasible, but vital to the economic survival of both nations. Due to the need to implement these projects rapidly, environmental considerations were often set aside. Several new technologies and techniques were being applied to develop these new oil sources, and their environmental impact was still unknown by them. The fact that both Campos (Rio de Janeiro) or Athabasca (Alberta) had a rich ecosystem only made things more dangerous in what concerned long term environmental preservation.

In this complex context, there is an extra factor that makes this analysis even more meaningful, which is the fact that Brazil and Canada had a similar approach to a similar problem. Firstly, the Brazilian and Canadian economies found themselves at different stages of development at the dawn of the 1970s. While Brazil was a developing economy with endemic poverty levels, Canada was at a more mature point of its development as an industrialized capitalist nation. While in Canada environmental activism was already present by the 1960s at the core of the civil society, in Brazil it was still an afterthought. Only a few brave scientists dared to care and openly talk about the environment in Brazil during the Military dictatorship (1964-1985), and environmental legislation was still in its infancy. However, the sudden cut in the Middle Eastern oil supply in 1973, ended up creating a paradox where wealthy democratic Canada ends up emulating the attitudes and policies of an authoritarian Brazil. The study of this paradoxical situation is the main thrust behind this comparative case, allowing us to understand how economic needs generate environmental degradation.

In the first segment, we will analyze the important issue of the oil boomtown regions in both countries and how they affected urban development in those areas. The second part will deal with the environmental damages caused by the oil industry in the

oil areas of Brazil (Campos and Sao Paulo) and Canada (Alberta and Saskatchewan) and the struggle of the environmental agencies to hold the new oil exploration fields to minimum environmental standards.

OIL BOOMTOWNS IN BRAZIL AND CANADA

The immense changes caused by the Oil Shock of the 1970s affected urban spaces on a global scale. At that time, there was a growing concern about how industrial pollution derived from fossil fuels was affecting the major metropolitan areas of the world. As mentioned before, the substantial economic growth seen after 1945 brought a new era of consumption and production. In this context, the Oil Crisis highlighted the two sides of the urban dilemma. On one hand, cities that were overwhelmed by oil pollution. On the other, the new Boomtowns that were created after the demand for new oil sources in the West soared.

The surge in oil Boomtowns between 1974 and 1984 was an impressive phenomenon in urban history, covered by extensive literature on the subject. As governments in the West were desperate to increase oil output, a new frontier in oil exploration was opened. Huge investments in new types of oil, such as the deep offshore, heavy oil and the tar sands brought armies of engineers and workers to quiet small towns that happened to be located near the reserves. The changes brought by this sudden transformation in urban landscape affected the lives of the local populations and of the industry workers as well. In that sense, before we approach specific cases, it is important to analyze the broader impact of oil Boomtowns.

The literature on the subject extends throughout the fields of architecture, social sciences and psychology. All these works point out to some common features of oil Boomtowns in the Americas, which allow us to create a common narrative to explain how they impacted people in these regions. The first conflict generated by the arrival of the oil industry in a certain region is the urgent demand for new housing infrastructure to accommodate workers and equipment. Often, these Boomtowns were small and quiet, and relied on subsistence agriculture. When the oil industry arrived in the 1970s, they often were facing some form of economic decadence from a previous golden age, and the oil industry represented the hope to turn that around (GUILLIFORD, 1986).

Problems started to arise once an army of workers needed to be settled down. The few hotels, inns and condos were immediately crowded, increasing rent prices and displacing previous tenants in the process. Therefore, workers grew restless after weeks or months living in improvised trailers, which often led to substance abuse and domestic violence (FAYS-SMITH, 1983). Moreover, elderly inhabitants were also affected by rent hikes. Since rents often increased faster than retirement pensions in oil Boomtowns, the elderly saw themselves displaced by workers from the oil companies.

After the infrastructure was ready, new problems started to arise. The majority of the workforce used by the oil industry was composed of single men, who were used to a more nomadic lifestyle in other Boomtowns. A few married men and even fewer women were part of a tough, sexist work environment. Women in these places had a difficult time, where domestic abuse from husbands and boyfriends was rampant. In the work environment, the situation was not much better, gender prejudice and sexual harassment were regular features in the oil industry in those days. On top of that, single women that dared to work for the oil sector had to deal with prejudice in these

small conservative towns, which often led to loneliness, alcohol abuse, and depression (MOEN, 1981).

All these sorts of problems that involved oil Boomtowns reinforced the idea of a place of “sex and sin”. The arrival of the oil wealth was combined with a construction boom and a consumption boom. Out of nowhere, new neighborhoods and shopping malls became a part of the urban landscape. As workers from other regions were attracted to Boomtowns, robberies and thefts started to rise, especially because the Boomtown could not cope with such a large increase in population in such a short time. According to social scientists, a Boomtown population often grows between 200% and 300% per year in the first five years following the boom. After that, population tends to stabilize and urban violence tends to decrease (KASSOVI; MC KEOWN, 1981).

The understanding of the common features of Boomtowns is important to show how they repeat themselves in the cities that we are about to analyze in greater depth. What social scientists called the “*Gillette Syndrome*”¹ was such an overwhelming phenomenon, that it is possible to clearly see it in Boomtowns in different countries, such as Brazil and Canada. The vast oil exploration projects in these two countries created several Boomtowns, with results similar to the ones seen in the aforementioned scholarship. The 1970s represented a time of expansion in oil Boomtowns around the globe, and its existence helps us to understand how oil and economics shaped urban issues at that time.

For decades, the province of Alberta, in western Canada, was known for its wheat-filled prairies. Albertan wheat production helped transform Canada into a major agricultural exporter and gave the province an important role in the economic structure of the nation. Right after Premier Pierre Trudeau (1968-1974) started to implement his energy plan focused on Canadian oil to tackle the crisis, Alberta gained even more importance due to its vast oil reserves. In order to achieve Trudeau’s goals, it was pivotal to bring the oil infrastructure to the remote northern part of the province, on the shores of the Athabasca river. The small town of Fort McMurray, 400 km away from Edmonton, was chosen to be the sight of the tar sand exploration by the Syncrude consortium, mainly backed by American capital.

Fort McMurray was a quiet town of 7.400 inhabitants and it was known only for the fact that it was the last stop of the northern Alberta railway system. The town had a brief moment of importance during World War II, when between 1942 and 1946 the Americans built an airbase nearby. Right after the war, the USAF left and the Royal Canadian Air Force (RCAF) took over the airbase as a training ground for its pilots. However, by the early 1960s, RCAF decided to shut down the base in order to cut costs, putting Fort McMurray into what seemed to be at the time complete oblivion (WELLMAN, 2002).

By 1974, Fort McMurray joined other towns in the provinces of Alberta and Saskatchewan in stepping up its oil output in order to satisfy Canada’s needs. But, the effort made in Fort McMurray was by far the boldest in Canada’s energy strategy. It

¹ Gillette Syndrome is the social disruption that can occur in a community due to rapid population growth. Such disruptions usually include increased crime, degraded mental health, weakened social and community bonds, abnormally high costs of living, and other social problems. Psychologist Dean Kohrs coined the term “*Gillette Syndrome*” in an attempt to describe the social impacts of rapid coal mining development on the Boomtown of Gillette, Wyoming.

consisted in the attempt to transform bituminous tar sands into oil in a commercially viable way. Suddenly, an army of 30.000 workers descended upon the town to start assembling the infrastructure needed to exploit the oil. The first five years were chaotic in what regarded the urban environment of the town. The complete lack of housing made life in Fort McMurray miserable, with several workers having to live in car trailers nearby the Athabasca river, where all the trash and sewage was dumped into its waters (STELTER, 1997). Fort McMurray is the perfect example of how the Gillette Syndrome affected the Alberta's oil Boomtowns.

By the mid-1970s, Canada was going through a period of high unemployment right after the Oil Shock. The majority of the workers hired by Syncrude came from Newfoundland, one of the provinces that was struggling the most with the recession. The majority of them were under financial and psychological stress, which had clear effects into the town's life. While work was steady, mental illnesses and substance abuse were the norm in these early years of the boomtown. Fort McMurray had some of the highest rates of divorce, domestic violence, and depression in Canada. Although urban violence was not as high as some social workers expected to be, it took until the early 1980s for the criminality levels to normalize in the town (NEWMAN, 1993).

Authorities in Alberta became increasingly worried about the "sin and sex" reputation of Fort McMurray. The Conservative government of Alberta and Syncrude made huge investments in the city, which helped to start a building frenzy of houses, schools and roads. More attention was given to the social issues of the city and by 1981 several statistics regarding divorce and violence had improved. The prosperity of the oil business in northern Alberta helped to develop Edmonton, which became a boomtown in itself as the capital of northern oil. With Canada's economy struggling with high unemployment rates until 1984, northern Alberta was focal point of hope of those who sought jobs and steady wages. But even in a developed country like Canada, the process of urban development of Boomtowns was extremely problematic.

In Brazil, the core of oil operations was located in the southeast, more specifically in the states of Rio de Janeiro and São Paulo. As long as the needs of Petrobras demanded more infrastructure to drill oil from the Campos basin, oil Boomtowns started to arise all over the region. The main ones associated with the Petrobras activities in the 1970s were Macaé, Campos de Goytacazes, and São Sebastião. All these towns shared a common history of an economic apogee in the late 19th century, followed by a slow and steep decadence. When Petrobras arrived in the 1970s, the promise of prosperity came back. However, as often happens in oil Boomtowns, this promise brought a steep price attached to it. In the Brazilian urban spaces analyzed here it is possible to verify the same issues caused by the Gillette Syndrome in Canada.

By 1974, the federal government ordered Petrobras to start its offshore drilling operations in the Campos basin. Just like what happened in Alberta, lots of men and machinery descended upon the northern part of the state of Rio de Janeiro in order to conduct one of the largest energy projects in Brazilian history. Campos and Macaé were small towns for Brazilian standards, with a population of 50,000 and 74,000 people respectively in the mid-70s. Macaé soon became the epicenter of Petrobras operations in the Campos basin area, while Campos itself had only a secondary role. Both towns enjoyed a prosperous time during the golden years of the sugar cane plantations in the early 20th century. By the 1950s, the boom was over, due to the fact that its competitors in the global sugar market were more efficient (PEIXOTO FARIA, 2005).

After that, Campos and Macaé were essentially small towns with a large rural area devoted to subsistence agriculture. Macaé was also a touristic destination, with its beautiful beaches and the Imboassica lagoon, which was considered one of the jewels of the Rio de Janeiro coast. With the arrival of Petrobras, the urban landscape started to change dramatically. First, with the arrival of workers, the city became crowded and lost its bucolic environment. The higher wages offered by Petrobras lured a plethora of poor farmers from the entire region to the urban area, creating several “favelas” (slums) in the process (BARCELOS, 2014).

In Macaé, the situation became even worse, since Petrobras decided to build its headquarters and port right at the most popular and beautiful beach in town, the Imbetiba beach. The once pristine beach was affected by several oil leaks, which degraded the environmental wellbeing and the touristic allure of the region. Villagers of Macaé still argue today that Petrobras was responsible for the “destruction of Imbetiba beach”, with its frequent oil leaks and breakwater structures. The expansion of Petrobras activities, along with irregular real estate speculation also affected the mangrove areas nearby the Imboassica lagoon, directly affecting one of the most important preservation areas of Rio de Janeiro state (BARCELOS, 2014).

As the population of Campos and Macaé more than doubled between 1974 and 1981, another evidence of how the Gillette Syndrome affected Rio de Janeiro’s oil Boomtowns became clear. A severe process of *favelização*, in Brazilian urbanism jargon, started to shape urban space. These new “favelas”, without any infrastructure and crowded with poor workers, became the preponderant presence in both towns. Its lack of proper sewage affected the local mangrove areas and water sources. The lack of better living conditions brought a huge wave of urban violence in the 1980s and 1990s, where Campos and Macaé constantly were ranked among the 10 most violent cities in the state of Rio de Janeiro. Meanwhile, luxury condos were being illegally built in environmentally protected areas of Macaé in order to accommodate the oil executives that were coming into town. Its urban space was torn apart by social stratification and its social tissue still bears the scars of the huge changes brought by the oil boom of the 1970s.

São Sebastião, an old colonial town on the coast of São Paulo state, had similar fate to the one faced by Campos and Macaé. The town was an important transportation hub and prospered in colonial times and also during the coffee boom that happened in São Paulo after 1880. However, the town lost its primacy when the city of Santos became the most important port in Brazil. São Sebastião became a town of small landholders and artisanal fishery practiced by the Caiçara indigenous community. In the 1950s, this coastal area witnessed an economic renaissance following the inauguration of a regional port and its connection with a new highway that connected the region to the city of São Paulo (KUMORI, 2015).

This new economic moment for São Sebastião culminated when Petrobras announced in 1961 that it would build its newest oil terminal there. By 1968, the São Sebastião Maritime Terminal (TEBAR) was fully functioning and soon became one of the most important pieces in Petrobras’s strategy. During the boom years of the early 1970s, due to its proximity to the Brazilian industrial core and its perfect natural location for a port, TEBAR became the most important terminal for Petrobras’ oil imports. With increased industrial activity, the town became a point of attraction for oil workers from São Paulo, dramatically changing the region’s urban landscape (KUMORI, 2015).

Between 1970 and 2010, the northern shore of Sao Paulo saw a population growth rate that was double that of the rest of the state, confirming São Sebastião's Boomtown status.² These immense changes had a significant impact on the urban area of the town, which was transforming itself into a city at a very fast pace. Similar to what happened with other oil Boomtowns, the demand for housing became a pressing problem in São Sebastião, directly affecting local indigenous communities. Petrobras' workers preferred to live closer to the coast, the homeland of the Caiçaras, displacing them in the process. Since the indigenous community did not have papers that could prove their property rights, they were obliged to move to the more remote northern part of the town as real estate development boomed along the coast (SANDOVAL, 2014).

The displacement of the Caiçaras affected their way of living, which was strongly attached to artisanal fishery. After losing their access to the coast, they also lost their fishing rights and had to find a different economic activity to survive. This change meant the Caiçara culture was slowly being lost during the 1970s and 1980s, since their celebrations and rituals were connected to the sea, to which they had no access. With the increasing displacement of indigenous communities and the arrival of immigrants from other regions seeking a job in the oil industry, the level of poverty became substantially higher in São Sebastião during the 1980s. As the direct result of the economic changes in the region, caused by the arrival of Petrobras and the transformation of the region into a touristic hub, violence increased in the vicinity, especially in the city of Caraguatatuba. Even as São Sebastião prospered in the 1970s, it could not avoid the fate of other oil Boomtowns analyzed here.

It is interesting to underline how the phenomenon of oil Boomtowns impacted urban planning in Canada and Brazil in similar ways. The Gillette Syndrome, as defined by American literature on the subject of Boomtowns, was a strong feature of the urban history of the oil producing areas in both countries. Its upside was an increased economic activity, while the downside was the growth of all sorts of social problems that in the end degraded quality of life standards in those regions (AULY, 1993). This brief look into such a complex problem allows us to have a better understanding of how the oil market of the 1970s shaped the urban experiences of the oil Boomtowns.

THE ENVIRONMENTAL SHOCK

There is substantial knowledge about the 1973 Oil Shock and its economic and political consequences, but the environmental impact of the Shock has been largely forgotten. As we have seen, Canada and Brazil had a proactive attitude to the crisis, as the federal government in both countries took the lead to adapt their economies to a new reality. The priority was to build and develop, regardless of the financial and environmental costs. Amidst the rush of new oil projects in Campos and Alberta, it is important to consider how extractivist bureaucracies were instrumental in defining the oil policy of the period. In this sense, the framework developed by Eduardo Gudynas and Alberto Acosta is important to understand how extractivism prevailed over environmental concerns (GUDYNAS, 2019; ACOSTA, 2014). The stories and data contained in the reports analyzed here represent a small window to what happened

² São Sebastião population growth during this period was around 4% per year against 2% of São Paulo state.

to the environment during the 1970s oil rush and how environmental agencies tried to cope with that.

The development of the oil business in Brazil was spread out throughout the whole Atlantic coast, even though the Rio de Janeiro state was at the forefront of the exploration efforts. It is important to remember that Brazil was importing a substantial amount of oil during the 1970s, which created a huge demand for refineries, pipelines, and marine terminals. As much of a paradox it may seem, it was not Campos' environment that was the most affected area during that fateful decade: it was São Paulo's instead.

The economy of São Paulo was the dynamo behind the Brazilian industry, which had become, at that time, the largest industrial park in Latin America. Given the fact that almost the entire Brazilian car industry was located in São Paulo and that the majority of the heavy industry was also there, the state's need for oil was huge. Therefore, São Paulo concentrated the refineries, pipelines and terminals needed to develop its industrial activities. Because of its industrial nature, the state was the first in Brazil to struggle with the burden of urban pollution. The fact that politicians at that time saw pollution as a "sign of development" only made things worse (DEAN, 2008, p. 191).

One understated fact about the impact of the Brazilian oil industry was that São Paulo stored 38% of the crude oil imported by Petrobras. The majority of Petrobras' oil terminals were located in the coast of São Paulo, which is a part of the Atlantic forest (AMARAL; GRIESINGER, 1978, p. 3). The coast of São Paulo has a rich biodiversity in its biota, including several species of fish, which are the mainstay for communities that have lived on the coast for 300 years. The northern coast of the state of São Paulo is one of the most beautiful beach spots in Brazil, and a great part of that beauty is derived from the majesty of the natural life that surrounds it.

Once the frequency of oil tankers in Petrobras' terminals started to increase in the 1970s, the number of incidents involving the tankers got worse. In 1975 the Kuwaiti tanker Tarik Ibn Zavad leaked 6000 tons of crude at Guanabara Bay (Rio de Janeiro) after having technical problems. The damage caused to the fisheries and tourism of Rio was a wake-up call to the danger that the era of the supertankers brought to Brazil. In his report about oil leaks in Brazil during the 1970s and 1980s, engineer Phillipe Barcellos argued that Petrobras was most to blame, for a lack of meaningful safety procedures (BARCELLOS, 1987).

According to Barcellos, the most important cause of spills and leaks in Petrobras' terminals was waste generated by the tankers' ballast tanks. Not a single Petrobras terminal had the waste pools necessary to process the poisonous content from the ballast tanks. Moreover, in case a leak happened, the terminal was supposed to have floating barriers that barricaded the mix of oil and water from spreading in the sea, affecting the biota that surrounded it. But Petrobras' terminals were not equipped with the floating barriers, which meant that the company was not able to contain even minor leaks in an effective way (BARCELLOS, 1987).

The report also pointed to the fact that ballast waste had to be thrown away at least 60 miles from the Brazilian coast, but there was no control whether the oil tankers followed that rule. Barcellos also pointed to the fact the biota of the São Paulo coast was being affected not only by the waste that came from the tankers, but also from the refineries that were close to the terminals as well. Petrobras refineries in the 1970s were already aware of the damage caused by the release of toxic substances into the atmosphere, such as sulphur dioxide and carbon monoxide, but were completely

oblivious to other substances (BARCELLOS, 1987). Ammonia, benzene, and lead were released by the Petrobras refineries without any level of control. Still according to Barcellos, Petrobras was constantly fined and did nothing to address these issues or change its predatory behavior in the coast of São Paulo.

The combination of damage caused by the tankers and the refineries was putting the delicate ecosystem of the region under a great amount of stress, affecting not only the natural balance, but also other human activities like fisheries and tourism. The toxic gases released by the refineries affected the young natural predators of the region, killing them before they could mature (BARCELLOS, 1987). In addition to that, the oil and waste water that were thrown away by the ballast tanks were killing the plankton and phytoplankton as well as affecting the sea birds that lived along the coast of São Paulo.

Another report coordinated by Carlos Celso do Amaral e Silva and Bernhard Griesinger, two scientists of the São Paulo Environmental Agency (CETESB), dealt with the broader issues on why the environmental situation on the coast was collapsing. According to their analysis, Brazilian legislation for oil spills was too weak. When it was conceived in 1967, the new water pollution legislation did not consider the new age of the supertankers or the fact that Brazil would become one of the largest oil importers in the world (AMARAL; GRIESINGER, 1978). Any form of control was virtually non-existent, punishment was light, and impunity was a certainty.

Amaral and Griesinger also argued that Petrobras should invest more in safety technology in its terminals, in order to contain the spread of ballast waste water. Another necessary change was the creation of a federal environmental agency, which did not exist at that point. Although Amaral and Griesinger believed that CETESB was more than capable of dealing with the problem by itself, a stronger hand from the federal government seemed necessary. In spite of the frequent oil leaks occurring along the coast in the 1970s, São Paulo still had less coastal incidents than the United States or Argentina (AMARAL; GRIESINGER, 1978).

A proof of that came in 1978 when the tanker Brazilian Marina hit a rock close to the São Sebastião terminal, causing a large oil spill (6,000 tons) that affected 20 beaches around the area, spreading out in a 50km radius along the southern coast. It was the largest oil spill that ever happened in Brazilian history and both CETESB and Petrobras did not have the technology to deal with it. Advisors from the US Coast Guard and the EPA were sent to the coast of São Paulo to supervise the cleaning operation, which took 14 days (BARCELLOS, 1987). The Brazilian Marina accident was a watershed moment for CETESB and for Brazilian environmental protection scientists. The state government of São Paulo created a Committee of Coastal Protection (CODEL) to deal with this kind of incident and purchase the necessary technology to mitigate any damage. At the federal level, the spill had the effect of making the government speed up the implementation of protocols of marine protection suggested by the United Nations and ratified by Brazil (AMARAL; GRIESINGER, 1978).

In spite of all the environmental degradation faced by the São Paulo state coast, it did not mean that the situation in Campos was much better. Still according to Barcellos, if the situation regarding the terminals were bad, the one regarding the offshore platforms was potentially worse. Unfortunately, Barcellos did not mention any specific data on platform spills in his report, but he claimed to have “reliable scientific evidence” to back it up (BARCELLOS, 1987). Another problem was that Petrobras opted for a certain type of offshore platform that was cheaper than the ones used by

the American companies in the Gulf of Mexico. The Brazilian platform model, that was composed of a wet Christmas Tree and a monobuoy³ was unsafe and pollutant. On top of that, the flare burners malfunctioned, generating several episodes of gas and oil leaks into the sea (BARCELLOS, 1987).

Reports by Brazilian environmental authorities presented a difficult situation, where the coastal wildlife saw itself threatened by Petrobras' activities. The Brazilian state oil company was the elephant in the room, the factor that nobody wanted to talk about or act against in those days. Barcellos' tone against Petrobras was harsher because he was writing his report in 1987, when Brazil was again a democracy and Petrobras was facing a wave of criticism at home. However, Griesinger and Amaral wrote their own report, in 1978, and they did not dare to make the kind of criticism that Petrobras deserved. Brazil was still living the last days of strong censorship by the military junta and people were still afraid of losing their jobs (or something worse) if they dared to speak freely. On top of that, any tough action from the environmental agencies against Petrobras could be perceived as a provocation to President Geisel, who was a huge admirer of the company.

It is important to emphasize here that Petrobras was not simply an oil company, it was an embodiment of the Brazilian state. It represented the dreams and aspirations of modernity, wealth, and development as conceived by the elites and the military junta alike. Therefore, any criticism of Petrobras was tantamount to treason. The company did not have infinite resources to carry on with the burdening demands of importing/refining oil to Brazil and at the same time creating a whole new drilling business in Campos. The Brazilian oil industry of the 1970s was built at the expense of safety and environmental concerns. Brazilian generals and civilian planners could not care less about the environment. For them, the environment meant that Brazil was full of wealth and it was something to be used, not preserved or cherished.

Under the shield of an authoritarian state, Petrobras had complete freedom to harm the environment for the sake of economic development. Moreover, as long as spills, toxic gases, and minor leaks could be hidden from the public, the company had full authority to carry its own businesses the way it wanted. But once Brazil started to import record amounts of oil and accidents started to multiply, it became harder to hide that reality. In that moment, thanks to the effort of dedicated scientists and environmentalists, some small changes started to happen.

While Campos was the great Brazilian hope for oil, Alberta was the great Canadian hope to end the oil crisis. The Pierre Trudeau administration expected to increase the oil output of the province exponentially in order to cope with the supply problems that Canada was facing from 1973 onwards. Trudeau's economic policy was nationalistic and developmentalist, this meant the federal government was the forefront of the efforts to increase oil drilling operations in Alberta, even if that meant overlapping provincial authority. The main piece of Trudeau's strategy in Alberta was

³ In petroleum and natural gas extraction, a "Christmas tree", or "tree", is an assembly of valves, spools, and fittings used to regulate the flow of pipes in an oil well, gas well, water injection well, water disposal well, gas injection well, condensate well and other types of wells. It was named for its resemblance to the series of starting lights at a drag racing strip, called by that name. Monobuoy is a floating platform anchored offshore in deep water and equipped with pipelines leading to storage tanks onshore, to which large, deep-draft tankers moor to load or unload.

Petro-Canada, a Crown Enterprise (state company), created by him to explore and market Albertan oil.

Trudeau was not shy to antagonize the provinces and the American oil companies that dominated oil exploration in Alberta, if it meant reaching his economic goals. The Prime Minister, in a rather controversial way, established a cap to future oil exports from Alberta and taxed oil imports made by other provinces (NORRIE; OWRAM, 1991). In a single strike, Trudeau managed to enrage the provinces and the US government. Even under the political thunderstorm that lasted until the early 1980s, Trudeau was able to move forward with his plans of expanding oil exploration in Alberta.

Canada's oil demand at that time was of 1.7 million bpd and the federal government expected it to be met by oil from Alberta drilled by the American companies. Canada also had oil reserves in the Atlantic Provinces (offshore), Saskatchewan, and British Columbia. At that moment, Alberta held 75% of the proven oil reserves that existed in Canada, considering light and heavy crude oil, plus the oil sands. The light and heavy crude oil reserves in Alberta were expected to be around 2 billion barrels in 1980, which could potentially satisfy all of the Canadian oil need in that moment (CEIC, 2019). However, the real prize were the oil sand (tar sand) reserves, which were expected to contain at least 120 billion barrels (ENVIRONMENT CANADA, 1983). The problem was how to find a way to make it commercially viable, since the process that extracted oil from the bitumen was prohibitively expensive.

Given the urgency of the Canadian oil needs, Trudeau gave a green light to every conceivable oil operation in Alberta, no matter how expensive it was. Since the American oil companies demonstrated interest in giving another try at the oil sands, the moment was seized and the oil majors expected to reap great benefits from it (CHASTKO, 2004). Oil drilling in Alberta and Saskatchewan was conducted by a method called Enhanced Oil Recovery (EOR), which could be used with different types of oil that existed in the region. This method demanded that the companies set up a fairly small structure composed of the drilling station, pipelines, and waste tanks to deal with any hazardous substances.⁴

In contrast to the Brazilian experience, the Canadian environmental law was prepared to deal with the oil industry's possible damage against the environment. In addition to federal regulation established by Environment Canada, each province had its own environmental agency. Usually, provincial environmental regulations tended to emulate each other in certain segments, such as those related to oil exploration. The Alberta agency (ECRB) provided the framework and other provinces like Saskatchewan and British Columbia followed suit. The Water Act and the Clean Air Act approved in 1970 provided an extra layer of legislative protection in case these elements were affected by oil drilling (DOERN; AULD; STONEY, 2015). In theory, everything was in place for responsible resource exploration. However, the practice proved to be full of gray areas.

Since 1975, EOR methods applied in Alberta and Saskatchewan were a source of concern to federal authorities. Their main worries were related to the consequences of an oil spill, waste leak, and the effects of the chemical fluid that

⁴ Enhanced Oil Recovery – or EOR – is the process of increasing the amount of oil that can be recovered from an oil reservoir, usually by injecting a substance into an existing oil well to increase pressure and reduce the viscosity of the oil.

was injected underground to perform the EOR. There were great risks to groundwater reserves and to the soil where the drilling operations were happening. By 1981, a seminal report made by Environment Canada performed an extensive analysis on what was happening in the drilling sites where EOR was being used in Alberta and Saskatchewan (ENVIRONMENT CANADA, 1983). The report went through several categories to demonstrate in detail what happened in these places during the 1970s and the environmental impact of EOR drilling in these areas.

The borehole where the drill was supposed to function had to be isolated with concrete layers and two safety valves in case an incident happened. In case all these measures failed and a leak still happened, it had to be reported to the respective environmental agencies. The same applied to the waste pool, where strict regulations were also in place by the ECRB. Water disposal allowed by environmental agencies amounted to only 15m³ per month, following an authorization from the ECRB. The waste pool and the well had to be protected with a thin layer of clay to guarantee full protection of the site (ENVIRONMENT CANADA, 1983).

By the early 1980s, what concerned the staff of Environmental Canada was that they did not properly understand the risks posed by EOR activities soon enough. In 1980, some of the first wells that used this technique in the 1970s were discontinued (ENVIRONMENT CANADA, 1983). The problem with that was the fact that scientists did not know exactly how the well and the waste pool protection would hold once drilling operations in a certain area had ceased. There were specific guidelines for companies that were about to abandon a drilling site once and for all. But, these guidelines were more focused on a possible impact on immediate soil productivity, but not so much on what could happen below ground after a few years (ENVIRONMENT CANADA, 1983).

The report was quite clear in affirming that the federal agency did not fully understand the impact of fracking activities that were a major part of EOR. Another major problem was how the well and the waste pool dealt with problems such as corrosion, suspended solids and bacteria that could affect insulation over the years. The full extension of the damages was still unknown to Canadian environmental scientists and the measures to be adopted were not clear to the scientists of the federal environmental agency at that time (ENVIRONMENT CANADA, 1983).

The effects on groundwater sources were only one of the main issues that involved water contamination in Alberta and Saskatchewan. All EOR techniques involved a massive use of water, either to be used in the waste pool or as a substance to facilitate underground drilling. The fact that, by law, drilling facilities had to be at least 180 meters away from any body of water, demonstrated how dangerous those operations were for water sources in the region. Water produced from heavy oil steam stimulation wells were highly toxic. Water samples from Cold Lake and Fort McMurray were more toxic to fish than similar leftovers from oil refineries and mining (ENVIRONMENT CANADA, 1983).

Another issue that made waste pool operations dangerous was the use of brine, which was important to keep the water proper for EOR. When brine and oil mixed, they had a devastating effect on the land surface, rendering topsoil useless for agriculture for years to come. Because of that, brine disposal on the surface was not allowed. According to Environment Canada, until 1975 there were major issues with brine in Saskatchewan because of a lack of proper legislation. Approximately 160 incidents with brine were recorded in the province between 1970 and 1981. The amount of brine used each year by the Canadian oil industry was massive. It was more than the

amount used by entire Saskatchewan industry combined, or, if we could lay it along a highway, it would be the equivalent of dropping 196,000 liters of brine per kilometer (ENVIRONMENT CANADA, 1983).

EOR not only caused harm to water sources and the soil, but also affected the quality of the air. Analysis conducted by the federal agency since the 1970s pointed out that emissions from EOR operations into the atmosphere led to acid rain. One of the places where this phenomenon was verified was in the town of Lloydminster, right at the border between Saskatchewan and Alberta. Lloydminster had dense forest areas, which were logged by the oil industry. All this activity led to increased surface runoff and siltation of nearby lakes and sloughs.⁵ Negative impacts of siltation included: destruction of fish breeding areas, abnormal flooding and poor water quality that affects human and animal consumption.

The issue of the tar sands was left to the end of the report, since it was an industry that was still in its early stages of development in Alberta. The cycle of the tar sand extraction started by heating the bitumen, which could mainly be used with steam. However, there were other methods under study in the early 1980s.⁶ One of the main characteristics of the *in situ* tar sand exploration was the presence of an intense extractive activity in a small radius close to the well. Because of that, there were more workers, pipelines, and equipment clustered together, making the site more prone to accidents. Similar to other cases mentioned here, Environment Canada alleged that it needed more research on how the tar sand operation affected the local ecosystem (ENVIRONMENT CANADA, 1983).

What was clear by 1981 about the impact of the Alberta tar sands was the fact that there were two main problems regarding the “huff and puff” of bitumen. First, it was the actual physical recovery of bitumen. Secondly, there was the processing of recovered bitumen and associated wastes. Regarding problem number one, the clearing of land to obtain space for roads and infrastructure was certain to cause damage to the local environment. This activity rendered the soil near to the site useless for decades to come. Disturbances to wildlife and soil erosion were also other important issues. In relation to wastes derived from the tar sands, the potential of contamination of groundwater formations in Alberta was considered huge. Especially at the Manville formation (ENVIRONMENT CANADA, 1983).

Finally, there was still the little researched issue of fracking. This technique was a vital part of the extraction of heavy oil reserves that existed in Alberta. According to previous studies conducted in Europe in the early 1970s, fracking was dangerous not only because of spills, but also because it could generate minor earthquakes in the region. What was really interesting was when the report pointed to the fact that this kind of pressure injection had never been tried in Canada. Which meant that a potentially harmful technique was already being used without the proper scientific analysis to support it, endangering the ecological balance of the entire region (ENVIRONMENT CANADA, 1983).

⁵ Siltation is a process by which water becomes dirty as a result of fine mineral particles in the water. When sediment, or silt, is suspended in water, this is an example of siltation.

⁶ The method used to extract bitumen from the oil sands depends on the depth of the deposit. If the deposit is near the surface, the oil sands is mined and sent to a bitumen processing plant. For deposits that are deep below the surface, bitumen is extracted in-situ (or in place).

Interestingly, the report opted for a somber tone, but did not directly criticize the federal or the provincial's government for the state of the oil exploration in Alberta and Saskatchewan. However, in its subtle way, the report speaks volumes about government negligence. However, if there was a right time to do it without great political consequences from a possible environmental fallout, that time was in the 1970s. Polling among the Canadian population from the stagflation years showed that the environment fell from one of the main public concerns during the 1960s to a marginal one (WINFIELD, 1994). As stagflation got itself entrenched in the fabric of the Canadian economy, the concerns of the population became high inflation, unemployment, and fuel prices. With that scenario in mind, Trudeau was only following his rational instinct and gave to the public what they wanted. Nature was "leveraged" to solve economic problems, regardless of the costs and possible consequences of that economic need, and became an afterthought to be dealt by future generations.

CONCLUSION: EVERY TEARDROP IS A WATERFALL

One of the most interesting experiments in social sciences is to compare two aspects, apparently so different, but ending up in surprising similarities. Brazil and Canada in the 1970s represented different political systems, since one was an authoritarian dictatorship and the other was a solid democracy. However, on what concerned their approach to the oil shocks of the 1970s and the environmental impact generated by the attempts to restore their oil stocks, they were surprisingly similar.

Theoretically, Canada's technological development at that time, better environmental legislation and organized bureaucracy would give the country the edge when it concerned responsible oil exploration. Brazil barely had any legislation that protected the environment, and the little it had was outdated. There was no national environmental agency and the burden of protecting the ecosystem was put on the environmental agencies at the state level. These state agencies often had fewer resources and few legal tools to deal with the problems that were caused by intensive industrialization.

One of the most interesting aspects of this analysis was that all the legislation approved by the Canadian government in the early seventies was not enough when it really mattered. Even if Canada had managed to avoid major oil spills, like those that happened in the Brazilian coast during the seventies, several smaller incidents that also had a long-term effect on the environment went unnoticed. Abandoned oil facilities in environmentally sensitive areas and questionable use of untested drilling techniques and chemical products represented a major problem to Canada's environment. At least in the Brazilian case, the problems were so big, that even an authoritarian government struggled to hide them from the public and the scientific community. The outrage with the frequent oil incidents and urban pollution generated enough opprobrium that led to the creation of a National Office of Environmental Protection (SEMA) in 1983 and of the Brazilian Environmental Agency (IBAMA) in 1989.

Another interesting common point between both countries is how similar their reactions were to the crisis of the seventies, even in spite of the fact that Canada had a more robust economy when compared to Brazil's. The fact that both governments had a strong nationalistic feeling at the core of their political project helps explain that. The Brazilian military junta and Trudeau's Liberal party were in tune with the Keynesian



economic creed of the seventies, which argued for strong state intervention and centralization. In that sense, a top-bottom approach and the role of state oil companies were expected to be stronger. Although there have been several studies on the political economy of nationalism, there are fewer studies that establish the connection between nationalism and the environment. From this case study it is possible to see a correlation between nationalism and environmental degradation, even if nationalistic regimes often extoll natural prowess as a source of national strength.

This case study also analyzed the difficult position of the environmental agencies in Canada and Brazil, especially in a context of economic hardship. Environmental officials in both countries scrambled to deal with multiple fronts and had the unthankful task of establishing limits in the mighty oil industry. While the Brazilian state agencies asked for better legislation and more equipment to deal with the spills, Canadian authorities discreetly asked for more time to understand the impact of the new technologies being applied in Alberta and Saskatchewan. In both countries, extractivism surpassed the needs of environmental preservation.

Brazil and Canada conducted a bold experiment in oil exploration. It happened at the same time and under a similar economic scenario. The fact that this experiment was conducted in two regions with a rich and sensible ecosystem makes this case study even more relevant. The oil crisis of the seventies put nations under a huge economic stress, which made them seek solutions that focused on extractivist solutions, degrading the environment in the process. This comparative study is also important to reflect about how human societies are trapped in polluting development models which, as Alberto Gudynas empathized, are unsustainable in the long run. What happened in Alberta and Campos in the seventies had a tremendous impact in the oil industry for decades to come, but it had an even greater impact on the ecological equilibrium of those places. As the eighties arrived, the oil crisis would be gone. But oil exploration in Alberta and Campos would still be strong, as would be the need to understand the environmental and social impact of the oil industry in those areas.

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