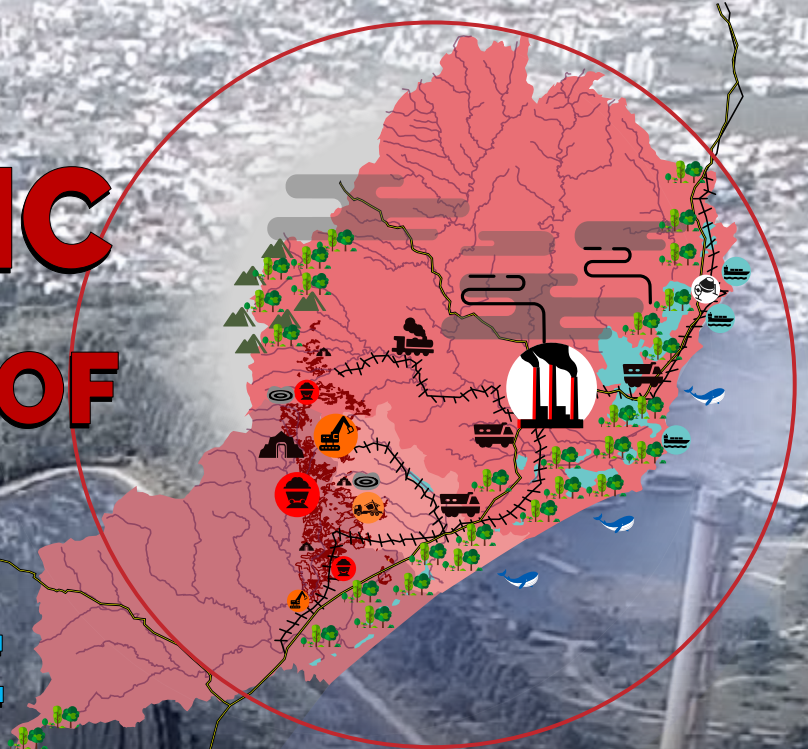


BRAZIL: **THE TOXIC** **LEGACY OF** **ENGIE** **DIAMANTE** **FRAM CAPITAL**



ARAYARA
.org

Map of the Contamination and Destruction
Caused by the Jorge Lacerda Thermoelectric
Complex and the Coal Mines that Supply it



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THE TOXIC LEGACY OF ENGIE FRAM CAPITAL IN BRAZIL

Map of the Contamination and Destruction Caused by the Jorge Lacerda Thermoelectric Complex and the Coal Mines that Supply it

Through the publication "THE TOXIC AND CRIMINAL LEGACY OF ENGIE - FRAM CAPITAL IN BRAZIL: A Map of the Contamination and Destruction Caused by the Jorge Lacerda Thermoelectric Complex and the Coal Mines that supply it", ARAYARA.ORG - ARAYARA International Institute, OCM - Mineral Coal Observatory and COAL WATCH make public to the world a criminal denunciation that exposes the true map of contamination and socio-environmental destruction caused by low efficiency coal mining for energy purposes in the south of Brazil, more specifically in the state of Santa Catarina.

Since March 2021, ARAYARA.ORG has been carrying out recurrent collections of sediment, water, and soil in the surroundings of the Jorge Lacerda Thermoelectric Plant (CTJL) and the mines that supply it. The results of the analysis of these materials confirm data published by the ACP (Civil Public Action) of Coal on waters with high levels of acidity and concentrations of sulphates, manganese, and zinc above what is recommended by national and international agencies. The contaminated areas are residential and agricultural, exposing a population of more than one million people to severe health risks.

ARAYARA.ORG's technical team confirms in this diagnosis that the environmental damage caused by the coal production chain has left a trail of destruction throughout the JORGE LACERDA TERRITORY - Coal Contamination Valley. Numerous academic studies, articles, reports of Public Civil Actions proposed by the Brazilian Federal Public Prosecutor (MPF), investigative field surveys, laboratory analyses and interviews with the population carried out by ARAYARA.ORG support these conclusions.

The costs for the environmental recovery and compensation for damages caused to the health of the population of this territory are estimated at over R\$6.5 billion, of which R\$1.5 billion have already been contemplated

in Public Civil Actions in progress or under execution, and another R\$5 billion shall be required in new actions after updating the diagnosis of environmental, climatic, social, economic and public health impacts and damage that are being conducted by the teams of technicians and experts from ARAYARA.ORG, OCM - Mineral Coal Observatory and COAL WATCH, in studies on the JORGE LACERDA TERRITORY - Coal Contamination Valley, which include more than 47 municipalities in the State of Santa Catarina/Brazil and impact almost 1 million people.

According to the Brazilian Association of Mineral Coal (ABCM), 97% of the coal mined in the Santa Catarina coal basin is consumed by the Jorge Lacerda Thermoelectric Complex. This complex was designed in the 1960s and was part of the state-owned park of Eletrosul until it was privatised in 1997, when it became the property of the current ENGIE Brasil, a company that belongs to the French group ENGIE. In October 2021, ENGIE confirmed the sale of the Jorge Lacerda Complex to Fram Capital, in order to decarbonise its electricity generation portfolio.

Throughout the process of selling the Jorge Lacerda Thermoelectric Complex, ENGIE sought to exempt itself from liability for the environmental damage caused throughout the coal cycle outside of electricity generation, however, all existing jurisprudence and legislation in Brazil hold ENGIE-FRAM jointly liable for the damage caused by the mining, processing, transportation and tailings of the coal consumed by itself. ENGIE-Fram will not be able to clear its name without taking responsibility for recovering the enormous JORGE LACERDA TERRITORY - Coal Contamination Valley, an area of 10,000 km² destroyed by the coal cycle, and recognising and compensating for the damage to the health of almost a million people living in the region.



Foto Aérea: Complexo Termoelétrico Jorge Lacerda/SC -
Juliano Bueno de Araújo



Technical coordination: Prof. Dr. Eng. Juliano Bueno de Araujo

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Territorial mapping of the coal cycle that supplies the Jorge Lacerda Thermoelectric Complex

About the Study

All this study and research on “THE TOXIC AND CRIMINAL LEGACY OF ENIGMA - FRAM CAPITAL IN BRAZIL: Map of the Contamination and Destruction Caused by the Jorge Lacerda Thermoelectric Complex and the Coal Mines that supply it”, and the elaboration of the updated diagnosis and map of the environmental contamination and destruction caused by the exploration, transportation, processing, burning and tailings for energy purposes of the mineral coal in the Southern Region of the State of Santa Catarina/Brazil, is part of the mission of the ARAYARA International Institute, which has existed for 30 years to promote social, environmental and climate change justice through technical analysis, activism, advocacy, litigation and promotion of an economic environment with social, environmental and climate justice, promoting the use of efficient energy matrices and the broad right to a healthy life.

Throughout its existence, ARAYARA.ORG has been active in all regions of Brazil in the struggle against the exploitation of coal in Brazil. Among them, we highlight the victory obtained in the Federal Court, through the 9th Federal Court of Porto Alegre - RS, which determined in February 2020 the immediate suspension of the environmental licensing process of the Guaíba Mine Carbochemical Project, the largest open-cast coal mine in Latin America, which would be installed in the Metropolitan Region of the City of Porto Alegre, Rio Grande do Sul State.

The preliminary injunction is in response to a request made through a Public Civil Action filed by the Arayara International Institute which, with its technicians and lawyers, pointed out the errors committed by the mining company, Copelmi, and the State Environmental Authority (FEPAM) in the Study and Environmental Impact Report (EIA-RIMA) of the project, which ignored the presence of indigenous villages in the area directly affected by the Guaíba mine project.

This study is also being coordinated by the Mineral Coal Observatory (OCM), a non-profit institution dedicated to creating, mapping and disseminating information in Brazil and Latin America, and COAL WATCH, on the global scenario on coal mining and burning aimed at developing research and actions that effectively contribute to energy transition, that is, the use of clean energy. Among the future services that we are focused on carrying out we highlight:

- **Mapping of thermal power plants that use coal as fuel;**
- **Monitoring of state and federal public policies for tax incentives and subsidies for coal mining;**
- **Mapping the coal import chain for Brazil;**
- **Mapping of mineral coal reserves in Brazil, exploration mines (active or not) and their impacts;**
- **Mobilisation with public authorities and society for the energy transition from coal to renewable energies;**
- **Encouraging sustainable activities that generate employment and other opportunities for people in affected mining areas;**
- **Production of annual reports on the negative economic, social and environmental impacts of mining in Brazil;**
- **Specialised communication with the national and international media;**
- **Dissemination of information to society about the impacts of coal mining on health, economy, environment, and other sectors.**

JORGE LACERDA TERRITORY – Coal Contamination Valley

Jorge Lacerda Thermolectric Complex ENGIE-Fram Capital was built in the municipality of Capivari de Baixo, in the State of Santa Catarina - Brazil in the 1960s, to generate energy in periods of scarce rainfall. The 30-year concession from the National Electrical Power Agency (ANEEL) given to the Jorge Lacerda Thermolectric Complex expires on 28 September 2028.



JORGE LACERDA COMPLEX IS COMPOSED OF



Location:
Capivari de Baixo
(SCState)



Total installed capacity
857MW



3 power plants and 7
energy generating units

Lacerda A Thermoelectric Unit (UTLA)



2 units of
50 MW each



2 units de
66 MW each



Installed capacity
232 MW

Lacerda B Thermoelectric Unit (UTLB)



2 units de
131 MW each



Installed capacity
262 MW

Lacerda C Thermoelectric Unit (UTLC)



1 unity
363 MW



Installed capacity
363 MW

Complexe thermoélectrique Jorge Lacerda -
Capivari de Baixo /SC



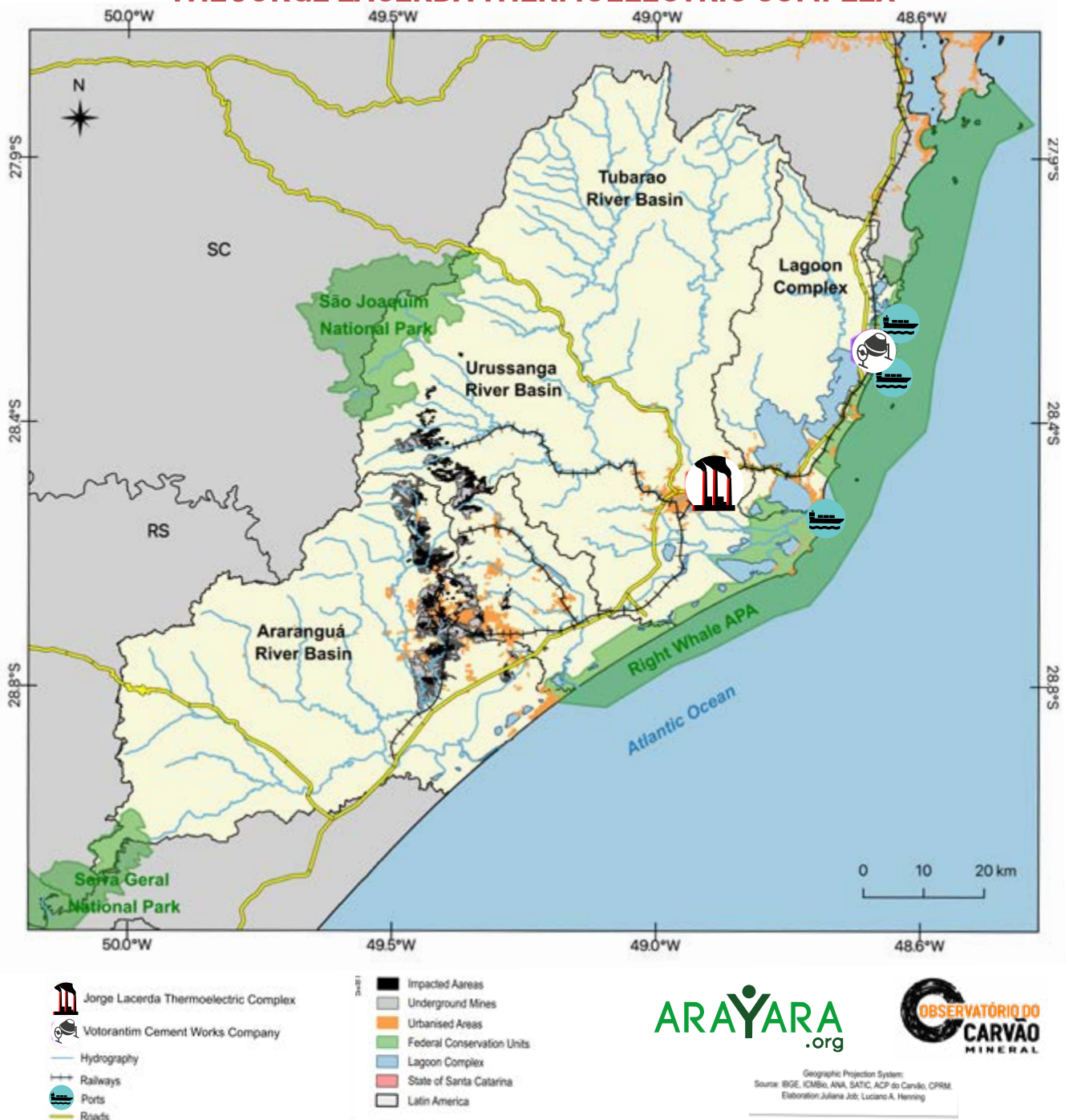
By considering in the mapping the complete cycle of coal utilisation, including extraction, processing, transport, burning and tailings, the conclusion is that concrete interconnected effects of the power generation activity, its implications and consequences are systemic. Therefore, this mapping named as **JORGE LACERDA TERRITORY - The Coal Contamination Valley** the whole area contaminated by the cycle of coal used by the Thermoelectric Complex.

The **JORGE LACERDA TERRITORY** is made up of three river basins and 47 municipalities, covering an area of 10,000 Km² which corresponds to 12 times the

size of the entire Paris metropolitan area, practically the size of the entire territory of Lebanon.

Besides being an area of extreme environmental sensitivity, with relevant watersheds, Environmental Protection Area and Conservation Unit, the **JORGE LACERDA TERRITORY** is inhabited by approximately one million people and its agricultural economy is based on rice growing, viticulture and farming/cattle raising. Moreover, Santa Catarina, due to the scenic beauty of its coastline, presents tourism as a relevant segment of its economy.

LOCATION MAP OF THE SOUTHERN COAL REGION OF SANTA CATARINA AND THE JORGE LACERDA THERMOELECTRIC COMPLEX



The central issue is that CTJL's activity undermines the entire ecological base of this environment that governs the entire socio-metabolic reproduction of the communities present, as well as CTJL generates global climate effects that are inconsistent with the efforts already declared by ENGIE to clean up its energy matrix. Evaluating the life cycle of coal, we can ensure that this toxic chain generates hundreds of contaminated areas, most of which are orphaned - or left under the State guardianship - by the strategy of decreeing the bankruptcy of mining companies.



Equipe Técnica do Instituto Arayara em coleta para identificação de resíduos tóxicos na água. Urussanga/SC. Foto: Renata Capuzo.

Socioenvironmental Toxicity in the JORGE LACERDA TERRITORY - Coal Contamination Valley

The environmental sensitivity of the region

The region includes the Water Basins of the Araranguá River, Urussanga River, Tubarão River and the Lagoon Complex, which characterize the connection between the Southern Catarinense Plateau and the State Coastal Zone with a diversity of impressive landscapes that include escarpments, springs, waterfalls and a complex hydrographic network that connects these environments until the mouth in the Atlantic Ocean. These

extremely sensitive areas include natural areas protected by Conservation Units due to the presence of remaining fragments of the Atlantic Forest biome between the Araucaria Forests of the Santa Catarina Southern Plateau and the Right Whale Environmental Protection Area - Right Whale APA, which serves as a breeding ground for this species on the coast.



Aerial photo: Abandoned mine - Juliano Bueno de Araújo

Atlantic Rainforest Biome

The geographical territory is fully inserted in the Atlantic Forest biome. The Atlantic Forest is considered one of the 34 world hotspots due to its degree of threat, being the second largest tropical rainforest of the American continent. It has also been declared a Biosphere Reserve by UNESCO. Upstream and to the south of the Araranguá River Basin are the Serra Geral and Aparados da Serra National Parks, which, although they are outside the study area, stand out for the particularity of their geographic conformation as plateaus, characterised by walls up to 700 m high in stark contrast to the smooth relief of the coastal plain. The Aparados da Serra

Park is formed by Atlantic Rainforest and Araucaria Forests, fields and canyons, which are home to red-tailed parrots, ocelots, raccoons and pumas. The São Joaquim National Park includes the western portion of the Tubarão River Basin and is located in the most upstream region of the basin, on the Santa Catarina Southern Plateau. The Park's objective is to preserve the remnants of the Araucaria Forests. In addition, the park includes areas of basaltic and sandstone geological formations where important groundwater recharge occurs, such as that of the Guarani Aquifer.



Itaimbezinho - Serra de Aparados National Park.
Photo: public domain.



Aquifere Guarani
Image : ecoa.org.br



National Park of Serra Geral
Photo : domaine public.

Right Whale APA

The Right Whale Environmental Protection Area (APA) and the Barra do Torneiro location (Jaguaruna/SC), southern coast of Santa Catarina is an “area historically used for artisanal fishing activities, but over time it has been directly impacted by various types of economic activities, especially those related to coal mining”. The Right Whale APA aims at protecting the southern right whale (*Eubalaena australis*) in its reproduction area, which in its migratory route passes through the region from June to November. In addition, it also aims to organise and guarantee the rational use of the region’s

natural resources, organise the occupation and use of the soil and water, organise tourist and recreational use, research activities and the local boat and aircraft traffic. The natural wealth protected by the APA also includes other species of native animals and plants, promontories, rocky coasts, beaches, islands, lagoons, marshes, salt marshes, sandbank areas, dunes, as well as archaeological sites, such as sambaquis and lithic polishing workshops. It is a conservation unit that allows the sustainable use of natural resources, territorial occupation, and various economic activities.



Foto aerea APA da Baleia Franca / SC ICMBio



Baleine franche (*Eubalaena australis*) - Domaine public



Artisanal Fishing (Tarrafa) Guarda do Embaú
EPA of Baleia Franca / SC - Photo: Mar Sem Fim

Impacts

Climate Changes

ENGIE - Fram Capital contributes significantly to climate change with its coal-fired power plants and the entire cycle that revolves around the activity. The resulting impacts of this production chain reach global scales due to its contribution to the emission of Greenhouse Gases (GHG). While the whole world plans to decommission coal mines and plants that are still in activity, due to the collective commitment to urgently reduce the effects of climate change, Brazil continues investing in coal mega-mining projects and opening new thermoelectric power plants.

Despite Brazil being a continental-sized tropical country with conditions to produce enough renewable energy to supply all its demands, which gives it a key role in reducing the impacts of global warming, the country chooses to ignore the assessments and warnings contained in the IPCC report (2021) and global agreements to reduce emissions.

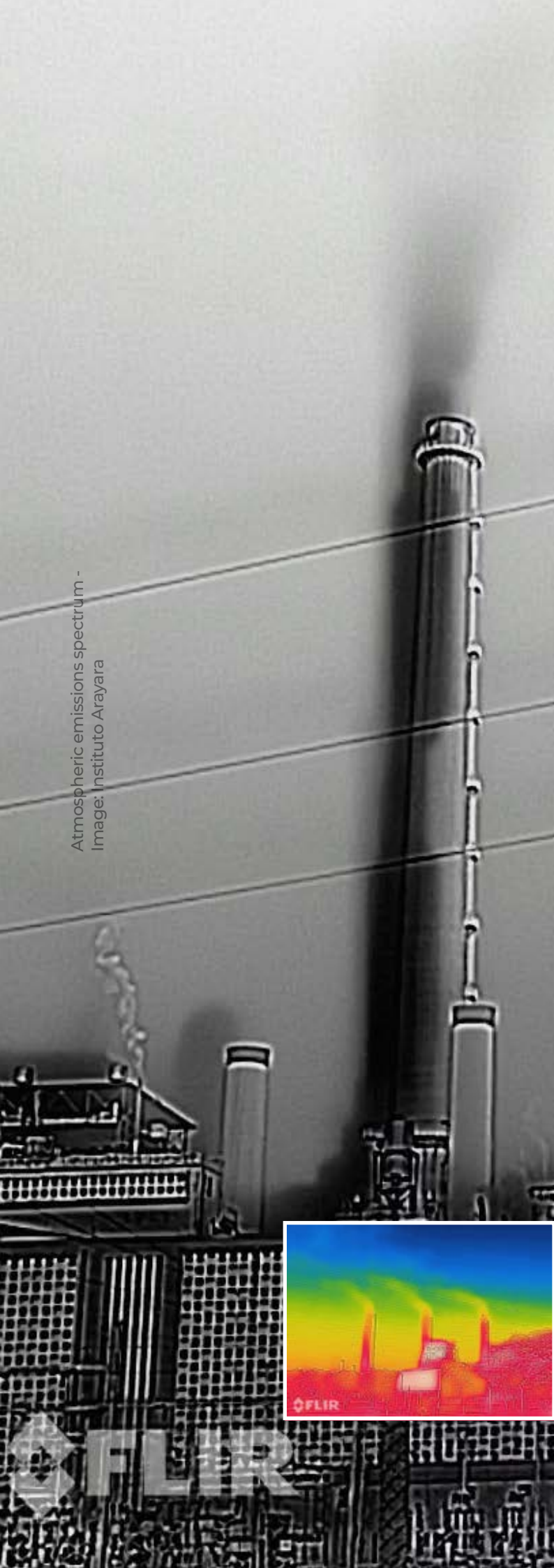
Atmospheric Impacts

The impacts related to air pollution go beyond the areas of the water basins, due to atmospheric dispersion and the formation of acid rain. According to the Atlas of Electrical Energy of the National Agency of Electrical Energy (ANEEL), the emission of particulate material and pollutant gases such as sulphur dioxide (SO₂) and nitrogen oxides (NO_x) cause acid rain and contribute to the acidification of soil and water in the region, besides favouring the corrosion

Atmospheric emissions spectrum -
Image: Instituto Arayara



Atmospheric emissions spectrum -
Image: Instituto Arayara



of metallic structures.

The burning of fossil fuels is responsible for the emission of large amounts of carbon dioxide (CO₂) among other GHGs. In coal-fired power stations they are even worse, because due to the incomplete combustion of coal, the unburnt fraction comes out of the chimney in small particles (particulates), which are the cause of various respiratory problems, often serious.

According to USEPA – US Environmental Protection Agency, “some particles less than 10 micrometers in diameter can penetrate deep into the lungs and some can even enter the bloodstream. Of these, particles less than 2.5 micrometers in diameter, also known as fine particles or PM 2.5, pose the greatest health risk.”

Polycyclic Aromatic Hydrocarbons (PAH) belong to a class of pollutants of great environmental concern because, besides being present in the air, water, soil and food, they degrade slowly in the environment and are harmful to the health of humans and other organisms.

Coal-fired power plants and coal-fired industrial boilers are considered point sources of mercury and mercury compounds emissions into the atmosphere by the Minamata Convention on Mercury. (Decree No. 9,470 of 14 August 2018 promulgates the Minamata Convention on Mercury, signed by

the Federative Republic of Brazil in Kumamoto on 10 October 2013).

In addition to the exhaustive process of environmental pollution, there is also the risk to health as a result of the damaging coalmining activity. Between 1980 and 1996 there were 77 fatal accidents. The most emblematic occurred on 10 September 1984 when there was an explosion in one of the galleries of the now extinct Santana coal mine of Companhia Carbonífera Urussanga (CCU), in the municipality of Urussanga (SC). There are also occurrences of diseases associated with this activity, such as: pneumoconiosis, psychological emotional problems, bronchitis, asthma, rheumatism, back pain and dermatitis.

The technology used in the Jorge Lacerda Thermoelectric Complex (whose plants have ages between 23 and 55 years) is outdated and presents several signs of obsolescence. At the end of the cycle, the **JORGE LACERDA TERRITORY** is flooded with a high content of ash coming from the coal consumed, since the inorganic fraction (the ash content) does not burn in the process of energy generation. It is emphasized here that the coals with high contents of ash accelerate the deterioration of the machines and filters of the thermoelectric plants, by incrustations and corrosions related to the minerals present in the coal.

Impacts on Water Resources

The contamination of the water resources in the **JORGE LACERDA TERRITORY - Coal Contamination Valley** covers the three hydrographic basins, compromising the quality of the surface water from the coal extraction areas to its mouth in the Atlantic Ocean, including the area of the Jorge Lacerda Thermoelectric Complex. The exposure and oxidation of iron sulphide is responsible for the production of Acid Mine Drainage (AMD), which results in high water acidity and consequent mortality of biota and availability of chemical elements potentially toxic to humans.

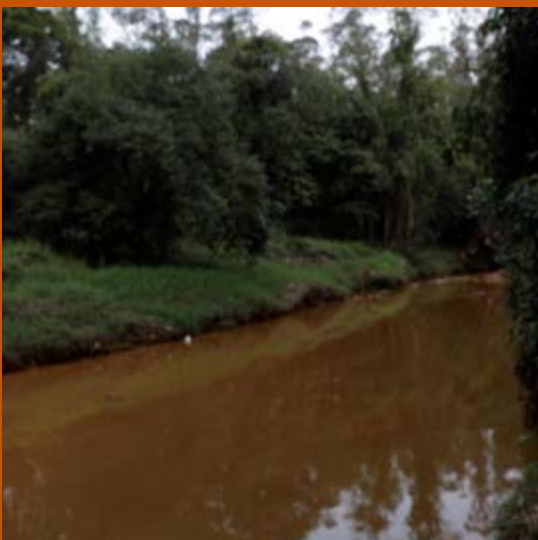
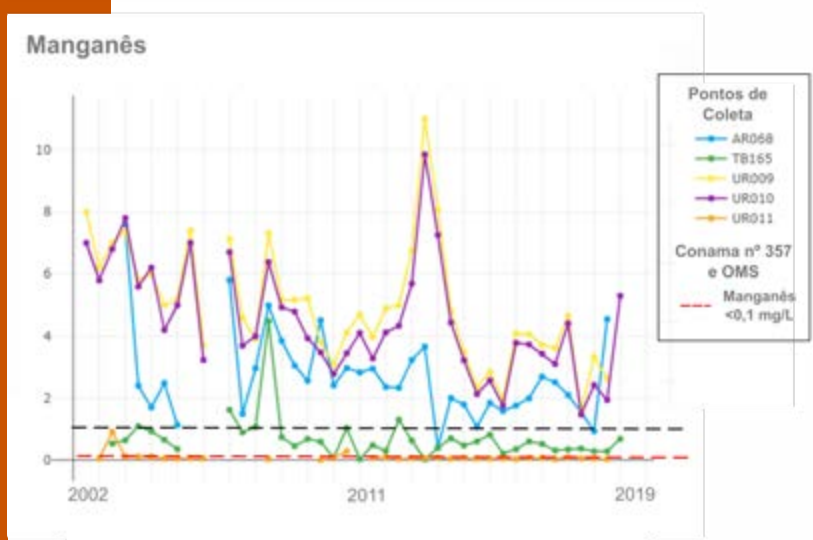
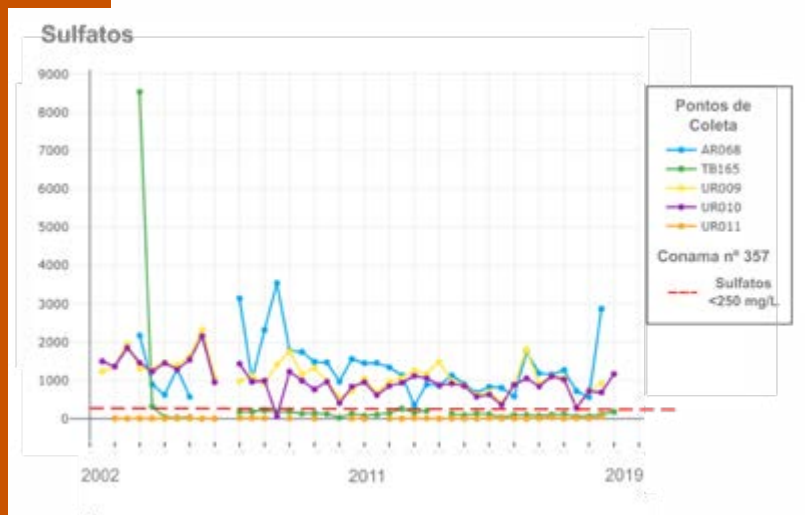
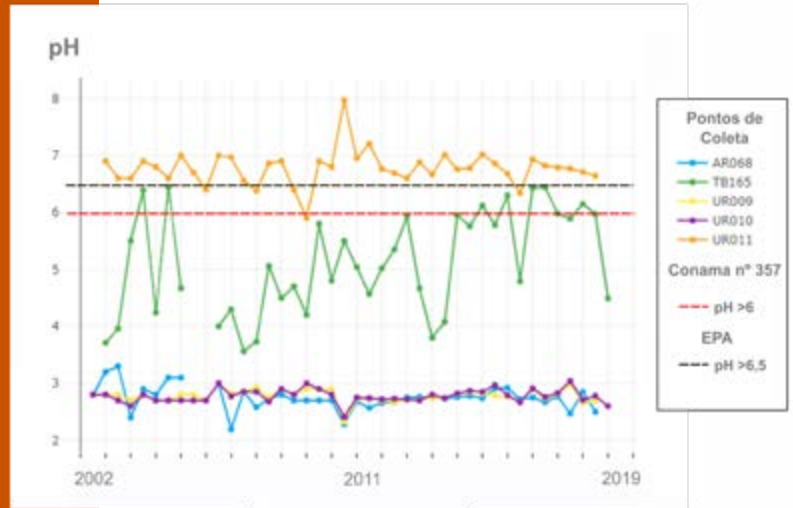
As per ABCM report, contamination of water resources is due to coal drainage from 134 open-cast mine sites covering a

total area of 2,964 ha, with 115 waste disposal areas on a total of 2,734 hectares, 77 sites on 58 hectares with acid pools and hundreds of mostly abandoned underground mines.

In order to illustrate the various environmental violations committed by the organizations that finance coal in the State of Santa Catarina (Brazil), we use as a reference the environmental monitoring carried out by CPRM - Geological Service of Brazil, between the years 2002-2019, presented on the website of the ACP of Coal that evidences the environmental crime, in which the waters are classified as acidic and do not fall into the Classifications for use established by the National Council of Environment - CONAMA, with persistent pH values around 3. As

CONAMA Resolution 357/2005 allows the use of water only within the range of pH between 6 and 9, such watercourses are prohibited from any uses allowed by the Resolution.

Among the parameters analysed by the ACP of Coal, sulphates and manganese are constantly very high, well above the limits recommended by CONAMA Resolution 357/2005. Little is known about the toxicity of manganese compounds. However, evidence indicates that several of these compounds may induce neurological effects, observed by chronic human exposure via inhalation, and chronic and intermediate exposure of animals exposed via oral route. According to the Environmental Company of the State of São Paulo (CETESB), the exposure to very high levels of this metal may result in neurological and neuropsychiatric effects, such as hallucinations, emotional instability, weakness, behavioural and speech disorders, culminating in a disease similar to Parkinson's disease, called manganism.



Tubarão River /SC - Renata Sembay

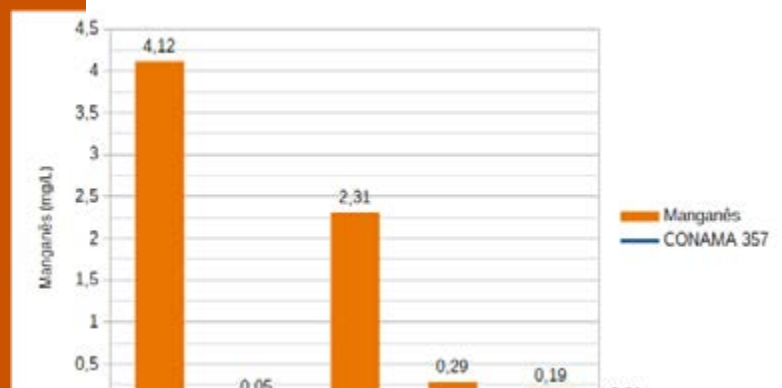
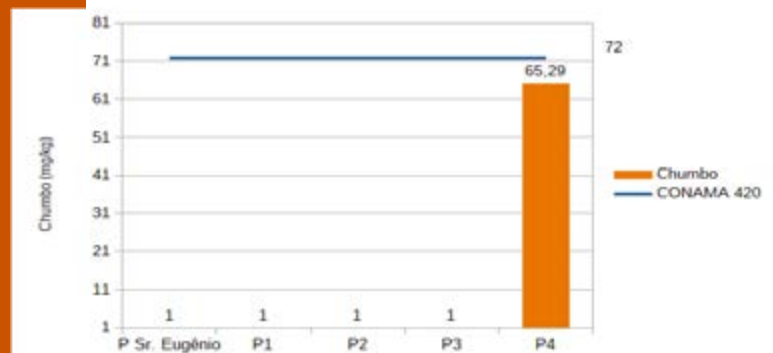
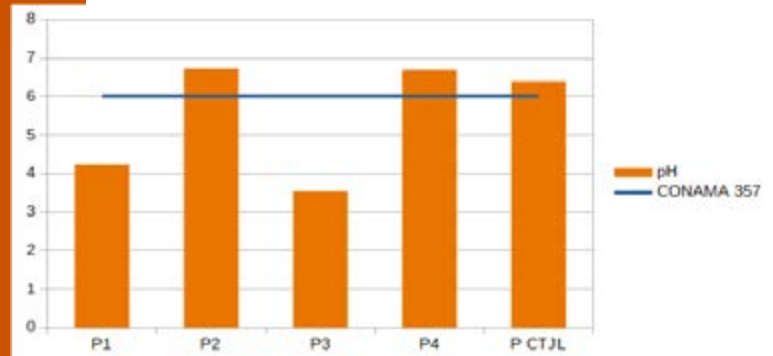


Urussanga River /SC - Renata Capuzo

The analyses carried out by ARAYARA Institute confirm the results of the historical series analysed by CPRM. Low pH values and high levels of sulphates were identified in 4 points of the Urussanga Watershed, indicating the acidity of the waters and high values of manganese, total iron and zinc, the results of which are not presented in the reports of the ACP of Coal.

In addition to concerns regarding the bioavailability of these contaminants, when used for crops and grazing, these metals can reach the water table and cause the contamination of subsurface water through natural processes.

According to the report prepared by ENGIE (2018) on the monitoring of the quality of the subsurface water of its ash basin and energy terminal areas, multiple peaks of heavy metals out of the limits required by CONAMA Resolution 420/2009 were identified, among them iron, arsenic, cadmium, lead, chromium, nickel, selenium, molybdenum, vanadium, and manganese (which was constantly detected above the permitted limits).



Graphics Water Quality Analysis - Juliana Job/Instituto Arayara

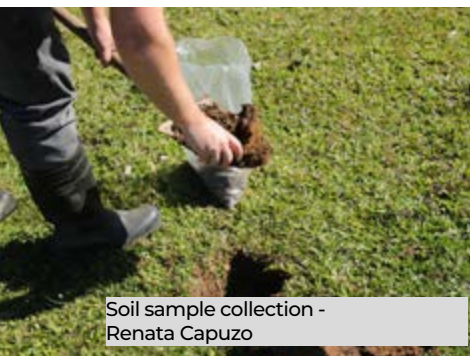
Impacts on Soil

The impacts on the soil caused by mining activities are the result of direct interference of the coal mining. This activity should be equipped with rigorous techniques of waterproofing and control of the exposure of the pits and tailings as to the water table, flooding and precipitation. Exposure of the material results in the generation of acid drainage that infiltrates the soil, solubilising metals and causing its contamination.

Besides mining, soil contamination occurs through the deposition of particles rich in potentially toxic elements that penetrate the soil. Especially the fine particles that infiltrate through the occurrence of acid rain

caused by the constant burning of this fossil fuel. Heavy metals that are enriched in coal-burning fly ash, such as mercury, arsenic, selenium, lead and other elements of relevant environmental concern may be present.

The analyses carried out by ARAYARA identified a specific peak concentration of lead near the north of CTJL, which despite being within the limits required by CONAMA Resolution 420/2009, drew attention for its asymmetry with the other collections.



Soil sample collection -
Renata Capuzo



Coal transport - Criciúma/SC - Carlos Tautz



Degraded area/SC - Renata Capuzo



Área degradada/SC - Sara Ribeiro

Political and legal aspects of the mineral coal in Santa Catarina

“SC-WG” SC Working Group

The SC Working Group (SC-WG) was created in February 2021 to carry out a diagnosis of the thermoelectric generation and mineral coal mining activities, as well as to indicate alternatives for the diversification of economic activities that can be developed in the mining territories of the state of Santa Catarina.

Without any participation and control by civil society and academia, the WG was

coordinated by the Executive Secretariat of the Ministry of Mines and Energy, with the participation of the Secretariat of Geology, Mining and Mineral Transformation, Secretariat of Energy Planning and Development, Secretariat of Electric Energy, Special Advisory Office on Economic Affairs and Special Advisory Office on Environment, all belonging to the ministry.

This group considered three scenarios for the Jorge Lacerda Thermoelectric

Scenario 1



Continuity of thermoelectric generation from the Jorge Lacerda Thermoelectric Complex with the transfer of the ENGIE asset to another holder until 2025, with the maintenance of the supply of mineral coal produced in the region for power generation at the plant;

Scenario 2



Program for sustainable use of mineral coal: independent of the operation of Jorge Lacerda Thermoelectric Complex, with or without decommissioning of the facilities by ENGIE, establishing condition for the installation of a new project for generation of thermoelectric energy, with maintenance of the supply of mineral coal produced in the region for the new plant;

Scenario 3



Decommissioning of the thermoelectric generation from the Jorge Lacerda Thermoelectric Complex: scenario that considers the discontinuation of the operation of the Jorge Lacerda Thermoelectric Complex, decommissioning of the plant by ENGIE by 2025, and extinguishing the supply of coal produced in the region for the generation of thermoelectric power in Santa Catarina.

Since there are no specific rules for decommissioning of thermoelectric plants in Brazil, the SC-WG cited the rules established by the National Petroleum Agency (ANP) to define the full scope of the Facility Decommissioning Program (PDI) as a reference. These rules consider, among other requirements, the definition of the necessary documentation to be submitted by the contractor, in addition to the essential requirements and minimum standards of operational safety and environmental preservation applicable to production facilities (ANP Resolution No. 46/2016). The information, projects and studies necessary for the planning and execution of the decommissioning of the facilities require the previous approval of the regulatory agency in conjunction with other competent authorities.

It is concluded, after reading and critically analysing the report and the record of the MINUTES of the 41 meetings of the WG (January and July 2021), that the **ENGIE - FRAM Capital corporation has endeavoured to create strategies to exempt itself from responsibility for the environmental liability, withdrawing from the need for environmental recovery of the largest degraded area in Latin**

America due to coal mining activity.

It can be stated that ENGIE, since it took over the Jorge Lacerda Thermoelectric Complex, has created strategies and obstacles, together with representatives of the Brazilian Coal Mining sector and politicians from the Federal, State and Municipal Governments of Capivari de Baixo and Tubarão, in order not to be held responsible for the compensation of damages caused to the quality of the environment and to the public health.

The ENGIE company in the GT-SC Report pointed out that it is important to note that, on the current company responsible for operating the Jorge Lacerda Thermoelectric Complex, to date, only the Public Civil Action of the environmental liabilities of Mina Verdinho weighs and, therefore, corresponds to half the estimated values of environmental liabilities identified so far, and that the continuity of mining and power generation activities is essential to maintain the financing of the works and other activities to reduce environmental liabilities accumulated over decades. In other words, more damage and waste will be accumulated to continue a supposed recovery, in an endless vicious circle.

Flawed licensing process

Within the context of environmental flexibilization in favour of the Jorge Lacerda coal-fired Thermoelectric Plant, the Technical Cooperation Agreement No. 11/2016 was signed between the Brazilian Institute of Environment and Renewable Natural Resources (IBAMA) and the Environment Foundation of the State of Santa Catarina (FATMA), currently called the Institute of Environment of Santa Catarina (IMA), the object of which was the delegation of the environmental licensing attribution of this undertaking to IMA, being the first time that this body licenses a thermoelectric plant of this size, not having any expertise in this activity.

The four environmental licenses issued by the Institute of Environment of Santa Catarina (IMA) for the Jorge Lacerda Thermoelectric Complex will expire in the first half of 2022.

The lack of execution of the Degraded Areas Recovery Plans of the areas mined to supply the Jorge Lacerda plants, as if coal appeared "by magic" to be burnt, is a fact. The

observation regarding the suppliers of its raw material and waste treatment was neglected.

The **Environmental Crimes Law** in Brazil is very clear in defining the measure of culpability of legal entities that will be held in the administrative, civil and criminal spheres in cases where the violation is committed by decision of its legal or contractual representative, or its collegiate body, in the interest or benefit of its entity through criminal conduct.

The attitude taken by ENGIE in being negligent in the recovery of environmental liabilities from coal mining in the south of Santa Catarina should be framed as an environmental crime, and its directors, managers, board members and members of the technical body, auditors, managers, as well as the agents or representatives of this legal entity, who even knowing the criminal practice of coal mining never bothered with the environmental recovery of this damage, **should be held responsible in legal proceedings.**

The new “State Policy for Fair Energy Transition of Santa Catarina” and its inconsistencies

The Government of Santa Catarina sent, in July 2021, to the State Legislative Assembly (ALESC) a bill that institutes the State Policy for Fair Energy Transition, considered as the new state coal policy. The bill still depends on its procedural protocol in the State Legislative Assembly for evaluation and approval.

This State Policy, despite calling itself responsible for the sustainable development of the coal production chains, does not follow the guidelines for a fair zero-carbon transition based on a green economy and within an equitable process of a Public Climate Policy, which should be based on dialogue and proactive planning between workers, employees, rulers, communities, and civil society.

The Government of Santa Catarina presented the first report of the instrument called Ecological Economic Zoning (ZEE) in October 2021, opting to carry out the study of another region and not the coal region, where the most potential and flagrant activities of pollution by the exploration and burning of coal are fixed.

The perpetuation and expansion of coal mining violates the main sustainability needs of the region, especially about territorial planning and the use of water resources, since the activity generates inherent environmental impacts, namely:



Área degradada - Sara Ribeiro

Intense topographic alteration with disposal of tailings piles resulting from the use of draglines in surface mines;



Rio Urussanga - Renata Capuzo

Intense generation of acid mine drainage (AMD) caused by oxidation of sulphides present in the coal seams and adjacent areas;



Rio Urussanga - Sara Ribeiro

Alteration of the water balance of aquifers caused by the interconnectivity of surface water with groundwater, resulting from the improper recovery of pillars in underground mines.

Besides a state policy that uses the words energy transition and sustainable development to continue contaminating and destroying the JORGE LACERDA TERRITORY - Coal Contamination Valley, it is important to highlight that ENGIE - FRAM Capital also uses the artifice of "greenwashing" or calls destructive and toxic processes as sustainable.

One example was the creation of the principle of "sustainable closure of coal

mines", aimed at making only the holders of concessions for mining coal responsible for the recovery of environmental liabilities, that is, the thermoelectric generator is not liable for any environmental damage remediation other than that related to the thermoelectric complex, based on its environmental operating license.

Public Civil Actions related to environmental and social liabilities in the JORGE LACERDA TERRITORY - Coal Contamination Valley

Regarding the context of Public Civil Actions - the main lawsuits related to the recovery of **environmental and social liabilities caused in the JORGE LACERDA TERRITORY - Coal Contamination Valley** are listed below, whose estimated values already accumulate to approximately **R\$1.5 billion**.

The Federal Court has been receiving numerous requests from the Federal Public Prosecutor's Office (MPF) to hold Engie responsible for the environmental liabilities caused by the coal mining chain in the Jorge Lacerda Complex.

Despite numerous complaints and lawsuits, the diagnosis made by the Arayara Institute proves that no action is being taken to reverse the contamination of the waters of the Urussanga River Basin, as well as the interruption of consumption of this polluted water intended for human consumption, the irrigation of tree, cereal and forage crops, amateur fishing and animal watering.

Case No. 5003906-46.2015.4.04.7207 TRF4 - Sonia Maria Machado Tournier x Engie Brasil Energia S.A.

We highlight the lawsuit filed against ENGIE, the Federal Government, IBAMA and FATMA (IMA), before the Federal Court of Tubarão (SC), of a social nature, regarding the action for damages filed by Sônia Maria Machado Tournier. The suit seeks compensation for moral damages allegedly

suffered because of the anencephaly-related death of her daughter, on April 16, 1986, allegedly caused by the emission of toxic substances from the plant's chimneys. The case has been ongoing since October 2015, having been determined to be sent to TRF4, where it has been awaiting trial for six years.

Case No. 2000.72.04.002543-9/TRF4 - ACP of Coal (R\$ 496 million)

Even with the environmental recovery conditions expressed in Public Civil Action No. 93. 8000533-4, called the Coal ACP, initiated in 1993 by the Federal Public Ministry (MPF), only in 2008 was a decision issued that imposed on the Union the duty to recover the degraded areas of bankrupt or insolvent companies (CBCA and Treviso); and only in 2013 did the Geological Service of Brazil (CPRM) start implementing the environmental recovery of the Santa Catarina Carboniferous Basin, as presented by this institution in its list of budget plans in December 2020 in the total amount of R\$ 7. 927,207. 00, of which only R\$ 1,146,207.00 (14%) were paid.

Therefore, from the information given by CPRM, we conclude that in 2020 the evolution of this project was below expectations, once again making clear the incompetence of the Federal Government in carrying out the environmental recovery

of the region, an action that should be financed and executed in partnership with the owners of the Jorge Lacerda Thermolectric Complex.

This conflict of interests is also registered in the MINUTE nº 9 of 13 July 2004 of the Araranguá River Hydrographic Basin Committee, where it was questioned the fact that the SC Coal Extraction Industry Union - SIECESC coordinates the Thematic Group of Environmental Recovery and at the same time stimulates the creation of the Sul Catarinense Thermolectric Plant (USITESC), which the Committee considered contradictory.

This record also includes the speech by Mr. Renato Bez Fontana, representative of the Agricultural Research and Rural Extension Company of SC State (EPAGRI), who expressed concern about the future and stated that it should be inhibited the opening of new pollution sources in the basin. Mr. Ricardo Kling Donini (Federal Public Prosecutor) said that the University of Extremo Sul Catarinense (UNESC) cannot be included as an NGO in the Steering Committee and questioned the fact that the Steering Committee includes the valorisation of coal as one of its goals. He also questioned, considering it contradictory, the fact that the Steering Committee makes the Recovery Plan and SIECESC makes recovery.

municipalities of Criciúma and Forquilha, in Santa Catarina State. In the process, it was determined that the ENGIE company, together with the company Carbonífera Criciúma, a supplier of coal used in the Jorge Lacerda Thermolectric Complex, should assume the environmental liability estimated at R\$ 500 million from the coal mine abandoned in 2015 by Carbonífera Criciúma.

**Case 5001478-03.2015.4.04.7204/TRF4
– ACP of Structural Safety (R\$ 245 million)**

In a public civil action filed by the Federal Public Ministry, the Federal Regional Court - 4th Region (TRF4) upheld the conviction of Carbonífera Criciúma S/A, Cooperativa de Extração de Carvão Mineral dos Trabalhadores de Criciúma Ltda (Cooperminas), the National Mining Agency (ANM) and the Institute of Environment of Santa Catarina (IMA) of reparation for environmental damage caused by the mining of mineral coal in the region of Criciúma (SC). In addition, the defendants were also ordered to compensate the owners of the properties located on the surface of the underground coal mines for the material damage (damage to buildings and lands, devaluation of properties and loss of profits) and for the moral damage caused.

**Case 5049506-46.2016.4.04.0000/TRF4
- ACP Mina Verdinho (R\$ 500 million)**

It is noted that in the Public Civil Action dubbed ACP Mina Verdinho filed by the Federal Public Prosecutor's Office in 2016, in which the Federal Regional Court - 4th Region (TRF4) confirmed the responsibility of the Federal Government and other public entities and bodies in complying with the injunction decision that seeks to prevent environmental damage arising from the abandonment of Mina Verdinho, a coal mine located between the

**Case 5017433-35.2019.4.04.7204 -TRF4 -
ACP João Sônego Mine (R\$ 0.3 million)**

Public civil action that condemned the National Mining Agency, the Institute of Environment of Santa Catarina (IMA) and the Federal Government to deal with the effluents from the João Sônego mine in the decommissioning phase, addressing the issues about the inadequate disposal of coal tailings from the mine, also involving the effluent treatment processes, which have been going on since 2013. In 2017, the court agreements provided that the activities at the mine would be suspended, which is currently in effect.

Case 2004.72.07.005581-6 TRF4

In 2015 the Judge Gysele Maria Segala da Cruz ordered an environmental audit to be carried out to reassess the environmental impact caused by the Jorge Lacerda Thermolectric Complex in Capivari de Baixo, Southern Santa Catarina.

It should be noted that, as published by the Santa Catarina Federal Court, the Judge found that the documents in the case allow to conclude that the content of the original Environmental Impact Study (EIA) prepared in 1987 is insufficient and superficial. "There is a need to re-evaluate the complex under the environmental aspect, because the EIA is questionable in its preparation and execution, therefore the State and Society need to be informed about the pollutants that are emitted, the quantity, possible excess, possible effects, control/monitoring methods and effectiveness of these," she said.

The requests for condemnation to recover the environment and the alleged material and moral damages were extinguished without trial of merit. According to the Judge, there is a difference between pollution and repressible pollution and to evaluate the occurrence of the latter is the objective of the audit. The extinction without examination of the merit aims "to guarantee future, adequate and ample discussion of the damages (...), based on the result of the audit or other evidence, since, inevitably, in the terms proposed, the condemnatory claims would fall for lack of evidence," the magistrate considered.



ENGIE,
your brand is
not cleaned
up with toxic
legacy.

**Decommissioning
and fair transition**

Degraded soil extracts/SC - Sara Ribeiro

Agricultural cultivation region near coal mines -
Robson Loureiro





Jorge Lacerda Thermoelectric Complex/ SC -
Renata Sembay

In relation to the decommissioning process of the coal-fired thermoelectric generation activity of the Jorge Lacerda Complex, the Working Group (SC-WG) highlighted that **ENGIE claims that there is a risk that it will be held liable for environmental liabilities generated in the JORGE LACERDA TERRITORY - Coal Contamination Valley, resulting from the activity performed by third parties of extraction of coal from the mines that supply fuel to the plant.**

It was also informed that, according to **ENGIE, the removal of this risk is a determining factor for the feasibility of selling the assets to FRAM Capital.**

It is worth remembering that in Brazilian legislation, the environmental responsibility of companies is considered objective, joint and several and with propter rem effects. These definitions bring important consequences for the business environment, especially in cases of corporate succession.

As the liability is objective, there is no need to prove the guilt of the company in committing the damage, but only the practice of the act that resulted in environmental damage. Furthermore, the joint and several and propter rem liability mean, respectively, that the obligation to repair the damage can be demanded integrally from each one of the chain of polluters, and will also be the responsibility of the one that has rights over the company.

In fact, the understanding consolidated by the Brazilian courts is that those who do environmental damage should be held liable for it; those who do not do it when they should do it; those who fail to do it; those who don't care if others do it; those who finance their actions; and those who benefit when others do it. This means that the commonplace legal and corporate engineering devised by large players is not enough to exempt them from liability when environmental damage occurs.

However, on the other hand, the company defends itself on the basis of its interactions with the National Mining Agency (ANM) and the Institute of Environment of Santa Catarina (IMA), arguing that the actions of the public sector should be diligent, in order to prevent the creation of new environmental liabilities on the part of the mining companies in operation, as well as those who may apply to the MME for new concessions for coal mining in the region. To date, this is not the case in the region, since the number of licensing requests for new coal mining projects is increasing every day.

ENGIE claims that it always complies with all applicable environmental legislation and business compliance rules. However, this corporation is discussing in court the rejection of charges to cover the cost of environmental recovery of liabilities, which it understands arise from mining activity.

Open-pit mine - Aerial photo: Juliano Bueno



Faced with all the reality of contamination and destruction denounced by the ARAYARA International Institute, **behind the route of destruction of the coal consumed by the Jorge Lacerda Thermoelectric Complex**, responsible for the current environmental crisis in the South of Brazil, we reveal how the **ENGIE** company, with the support of the Federal Government, through the MME and the Government of Santa Catarina, has successfully manipulated the narrative around it to present itself and sell to the world the image of a company that adopts:

1



High standards of corporate governance such as ESG (environmental, social and governance);

2



Which it acts with transparency and focused on providing a return on shareholders' investment and being aligned with the fight against climate change;

3



And that it has a social and environmental responsibility programme that goes beyond its legal obligations.

Populations affected by coal mining/SC - Robson Loureiro



The Environmental Policy of ENGIE is completely disregarded, by articulating the sale of a Thermoelectric Complex with serious environmental liabilities exempting itself from any responsibility and collaborating with the elaboration of the State Policy of Coal in Santa Catarina to only keep working the plants of the Jorge Lacerda Thermoelectric Complex, creating a "Greenwashing" that Santa Catarina draws the plan of **Fair Transition to coal through the Law Project 0270.0/2021**.

The State Government of Santa Catarina argues that coal is part of a sustainable transition - by securing jobs - and in line with international experiences, totally distorting the global context that is being proposed by the United Nations (UN) at the COP 26 - Climate Conference in Glasgow, an event where world leaders meet to discuss new commitments to mitigate climate change.

ENGIE, in the face of the fact that it has 10% of the installed capacity in Brazil coming from non-renewable energy sources and with high GHG emissions, **cannot be considered as a world reference in low carbon energy and services, especially as it has invested in 2019 more than R\$ 2 billion in the Pampa Sul coal-fired power plant, which is located in the gaúcho pampas, in the municipality of Candiota, State of Rio Grande do Sul (RS) and has only an installed capacity of 345 MW.**

We therefore reaffirm that these ENGIE - FRAM Capital coal-fired developments do not align with its Global purpose ("raison d'être") which is to act to accelerate the transition to a carbon neutral world through reduced energy consumption and more sustainable solutions, reconciling performance with a positive impact on people.

These companies together with the mining companies and licensing bodies must assume their responsibilities in a joint and shared manner for the environmental damage they have caused for decades, and which is mitigated by the continuity of this activity in disagreement with the current situation of clean energy projects that are aligned with the Paris Agreement, as well as the goals of the 17 UN Sustainable Development Goals (2030 Agenda).

ENGIE - FRAM Capital appropriate the values expressed in the ESG (Environmental Social Governance) that have been gaining importance in sectors such as clean, green and sustainable energy, not being possible to apply these principles in the practices adopted in the **JORGE LACERDA TERRITORY - Coal Contamination Valley**, where there is no transparency regarding the environmental liabilities of the entire life cycle of coal.

Coal tailings area/SC - Renata Capuzo



Decommissioning of the Jorge Lacerda Complex Coal-fired Power Plant

In response to the demand of SC-WG, ENGIE indicated a list of improvements with minimum additional investments, estimating an extension of the useful life of the plants, based on the **annual consumption of 2.4 million tons of coal without considering different scenarios of generation and future energy prices, engineering studies, regulation, legislation (including environmental), consultation with manufacturers, and other factors.** The list of activities identified as necessary to extend the useful life of the plants, with no expectation of efficiency gains with the improvements indicated, reveal that the **coal-fired plant is outdated and requires high investments for its operation. Particularly due to scrapping and obsolescence, it is suggested the decommissioning of this complex as soon as possible, in order to avoid a greater environmental tragedy.**

As presented in the SC-WG, it is at the end of the production stage that it is necessary to implement a decommissioning program, either by the end of a specific contract, or by the technical or economic unfeasibility of the activity, by the end of the useful life of equipment or facilities, or the prevention and control of accidents, among others.

In general terms, in Brazil, in recent years, **thermoelectric power plants units have ended their operations, particularly the Capivari de Baixo unit (SC), that were shut down in the early 1980s and have not been completely decommissioned until today, generating yet**

another environmental liability in the region.

This situation reinforces the failure of the Federal Government, through its regulatory agencies and autarchies, to establish specific norms and guidelines for the normatisation, supervision, audits and judicialisation of the decommissioning process of coal-fired thermoelectric power plants in Brazil.

The coal industry was and will be not only unsustainable from an economic, social and environmental point of view, but mainly from the point of view of the reproduction of life (socio-metabolic) of all living beings in line with effective existence.

Jorge Lacerda Thermoelectric Complex - Renata Sembay





Rio Carvão - Urussanga/SC - Renata Capuzo



Abandoned coke plant - Urussanga/SC - Renata Capuzo



Coal tailings area - /SC - Sara Ribeiro



Image: Robson Loureiro

Conclusion:

With the scenario of the construction of future coal thermoelectric plants, authorized in the ANEEL auctions, and adding the plants that use mineral coal, they represent about 12% of the installed capacity in thermal generation, placing Brazil very far from a Just transition, an equitable and green Climate Action with the reduction of greenhouse gas emissions and contributing significantly to global climate change.

ENGIE - Fram shall be held responsible for the environmental liabilities generated in the JORGE LACERDA TERRITORY, compensating their victims and restoring the degraded areas in a manner consistent with national and international environmental standards.

We also highlight the **urgent need to update the legislation on the environmental recovery of the areas degraded and contaminated by coal mining in Brazil, as well as the creation of guidelines and strict procedures for the decommissioning projects of the installations of Coal Power Plants**, assessing all the environmental liabilities arisen from the life cycle of the coal that supplied these enterprises, since today in Brazil there is no specific legislation for this activity of closure of coal plants, thus requiring urgent action by ANEEL and ANM in mining area, to enforce these laws.

The current moment is crucial for the State of Santa Catarina, as well as Brazil, to establish **stricter thresholds for the emission of atmospheric pollutants**, especially those originating from the burning of Toxic Mineral Coal from the South of the country for energy purposes, since the World Health Organization has set more restrictive limits for 6 atmospheric pollutants. With the update, the WHO recommends new limits for air quality levels for

6 pollutants for which scientific evidence has advanced the most in relation to health effects: particulate matter (PM), ozone (O₃), nitrogen dioxide (NO₂), sulphur dioxide (SO₂) and carbon monoxide (CO).

As highlighted by the Brazilian Consumer Defence Institute - IDEC and the Climate and Society Institute (ICS) in the publication: Thermoelectric Power Plants and the Crisis in the Brazilian Electricity Sector by COVID 19, nowadays, the whole world shuts down coal-fired power plants at a rate of about 10 GW/year, mainly due to the local and global pollution they cause. For electricity generation this is not a problem given the cheapening of sources with higher technological content, such as solar photovoltaic, wind power and batteries for storage. **The closure of coal mining in Brazil has already been on the agenda of the National Congress several times. The latest, in the conversion of MP579/2012 into law 12.783/2013, when it was agreed that the subsidy will last until December 2027.**

We urge an end to coal subsidies and incentives, early decommissioning of all existing coal-fired power plants in Brazil, and the termination of concessions to build new coal-fired plants, directing the resources that currently subsidise coal towards re-skilling workers and attracting new, more sustainable investment.

A real Fair Energy Transition must be sought, proposing new models of energy generation that are fair, sustainable, and that promote the strengthening of local economies.

Next Steps:

After the investigation on the real social and environmental impact of the mining process and burning of coal that supplies the Jorge Lacerda Thermoelectric Complex, the Mapping of the contamination and destruction of this territory that covers more than 10,000 km² in southern Santa Catarina, the so-called **JORGE LACERDA TERRITORY - Coal Contamination Valley** was elaborated.

Arayara Institute informs the society that this is the first phase of the investigative research that will cover again research and investigation of numerous academic studies, reports, reports of Public Civil Actions, field surveys, laboratory analysis and interviews with the population conducted by ARAYARA.ORG of the coal mining territories of Rio Grande do Sul, Ceará, Maranhão and Brazil, in order to compose the **Atlas of the Contamination of Mineral Coal in Brazil**. This document will be an unprecedented study that will present the real scenarios of the impacts and liabilities of all **the mineral coal chain for energy purposes** in the country.

The **Atlas of the Contamination of Mineral Coal in Brazil**, a complete and updated Report, Map and Socio-Environmental and Climate Diagnosis of the impacts of Mining and Coal-fired Power Generation in Brazil, will be launched by ARAYARA.ORG, OCM – Mineral Coal Observatory, COAL WATCH, Association of People Affected by Thermoelectric Power Plants and Coal Mines in the States of Santa

Catarina and Rio Grande do Sul, and ICS – Climate and Society Institute.

The mapping of this chain begins in the licensing projects for extraction, processing, transport, burning (thermoelectric) and waste (coal ash), as well as all social and environmental liabilities of these processes that, from this Atlas, will be closely monitored by technicians of ARAYARA.ORG. The studies, which are already underway, involved more than 3,000 collections or chemical, biological and atmospheric analyses in the States of Santa Catarina, Rio Grande do Sul, Ceará and other locations (still in field research) demonstrating hundreds of criminal and illegal activities.

This data will be used for the opening of new Public Civil Actions, Criminal Actions, denunciations to the Human Rights Commission of the Chamber of Deputies, Popular Actions for Collective Indemnity, denunciations to the CVM (Securities and Exchange Commission), MPF, ALESC (Environment Commission and Human Rights Commission), ANM (National Mining Agency), Euronext Paris, French National Assembly, French Senate, French Courts. Our Journey in Defence of Life and for a True Energy Transition with Social, Environmental and Climate Justice.



Attachments

To put an end to the denialist speeches on the context of climate change and the fair and green transition scenario issued by politicians in Santa Catarina, we highlight some of these speeches by Mr. Luciano Buligon, state secretary for Sustainable Economic Development:

“It is important to say that coal is not the villain, sustainable solutions must be found. In this process, it is very important that no one is left behind; therefore, a fair transition.” Santa Catarina is part of Brazil’s coal stronghold, alongside Rio Grande do Sul and Paraná.

The approval of a legislation that brings an environmental solution for the sector is also awaited for the unfolding of the negotiation of the sale of the Jorge Lacerda Thermoelectric Complex.



Luciano Buligon, secretário estadual de Desenvolvimento Econômico Sustentável/SC.

Photo: Alô Notícias

The Economy, Science, Technology, Mines and Energy Commission of ALESC, which discussed the continuity of the activities of the Jorge Lacerda Thermoelectric Complex (CTJL), the largest thermoelectric power plant in Latin America, located in Capivari de Baixo.

By that date, the state representatives who proposed the meeting - Ada de Luca (MDB) and Jair Miotto (PSC), president of the Economy Commission - hope to have more clarity on the negotiations to facilitate the conclusion of the sale of the complex by the ENGIE company to FRAM Capital and that the meeting with the Ministry of Economy to review the tax issue has

“This historic public hearing, with the participation of all entities involved in this extremely important issue for the State, brought us two consensuses: coal will end in 2050 and, before that, we have to make a fair transition. We cannot turn Jorge Lacerda off today,” said the Sustainable Economic Development Secretary, Luciano Buligon.

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State Representative Jair Miotto evaluated that the public hearing was a success. “The State Executive Power, with the Legislative Assembly, showed the importance of safeguarding the more than 20,000 direct jobs, highlighting that there is clear interest, as President Jair Bolsonaro said, to make this transition to clean energy by 2050, which means not giving up coal, but giving up carbon dioxide (CO²), until a technology is

found to really eliminate it. It may even be with coal. This State Plan for new public policies for coal, suggested with an application schedule, means that the State is doing its part, and we will seek support from the other state representatives to ensure the continuity of the Jorge Lacerda plant.”

Miotto also stressed that there will be a strong mobilisation of the State Parliamentary Forum, with the presence of entrepreneurs and mayors of the municipalities of the south region, to show the Minister of Economy, Paulo Guedes, the importance of maintaining the plants of the Jorge Lacerda complex and discuss the reduction or elimination of the collection of PIS and Cofins taxes, which were not previously charged.

The state representative Ada de Luca said she was satisfied with the State government position, which is committed to prepare and forward to Alesc a bill to create the Santa Catarina Carboniferous Transition Plan. “We will study, mature, work and approve this matter. Jorge Lacerda cannot be turned off in 2025, 2027, or even if it is at the end of the decade we are living. If the end date is 2050, so be it. Let's work for that fair transition.”

The mayor of Capivari de Baixo, Vicente Corrêa Costa (PSL), and the mayor of Criciúma, Clésio Salvaro (PSDB), highlighted at the meeting the concern of the region's municipalities with the possibility of the closure of the Jorge Lacerda plant's activities. “It will be a social and economic catastrophe for our municipality,” Costa noted. For the mayor of Criciúma, the activity is viable and should continue in the region, because the exploration and burning of coal are more modern and rational.

ENGIE company's CEO Eduardo Sattamini recalled that the complex was privatised in 1997 and now belongs to ENGIE, which since 2017 has adopted business strategies in Brazil that include decarbonising its portfolio, in order to reduce emissions and invest in renewable sources. He confirmed that ENGIE has signed an exclusive agreement with Fram Capital for the sale of the Jorge Lacerda Thermolectric Complex, whose installed capacity is 857 MW per year, and that the negotiations should move forward, despite the concern with the environmental liability, which should be resolved with the new state coal policy that the government will send to the Legislative Assembly, and with the issue of PIS/Cofins taxes, which should be renegotiated with the Ministry of Economy.

The representative of Fram Capital, a company that was born in 2007 as an independent asset manager, Nicolas Gutierrez Londono, confirmed the interest in buying the plant, but stressed the concern with the 'ghosts' of the PIS/Cofins taxes issue. “From our perspective, we want to be part of the solution to this problem and basically for a year we have been studying and working to close this transition

[https://www.sc.gov.br/noticias/temas/desenvolvimento-economico/audiencia-publica-define-criacao-de-nova-politica-estadual-do-carvao-para-a-usina-jorge-](https://www.sc.gov.br/noticias/temas/desenvolvimento-economico/audiencia-publica-define-criacao-de-nova-politica-estadual-do-carvao-para-a-usina-jorge)

Images:

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Huge mountains formed by neglected coal tailings in southern Brazil.
Urussanga, Santa Catarina, Brazil, 2021. Photo: Juliano Bueno de Araújo.



Coal tailings deposit with evident spontaneous combustion of Pyrite (FeS_2) considered one of the most toxic minerals in the world in contact with the atmosphere.
Urussanga, Santa Catarina, Brazil, 2021. Photo: Sara Ribeiro.



Animals affected by air and soil pollution grazing in front of a thermoelectric power plant in southern Brazil. Candiota, Rio Grande do Sul State, Brazil, 2021. Photo: Sara Ribeiro.



Contamination of a river source with heavy metals in an abandoned underground mine mouth that exploded in 1984, killing 31 workers. Urussanga, Santa Catarina, Brazil, 2021. Aerial Photo: Juliano Bueno de Araújo.



Harmful gases that affect all living beings in the urban and rural surroundings of the Jorge Lacerda ENGIE Thermoelectric Complex - Fram Capital. Capivari de Baixo, Santa Catarina, Brazil, 2021. Photo: Juliano Bueno de Araújo.



Contamination of a river source with heavy metals in an abandoned underground mine mouth that exploded in 1984, killing 31 workers. Urussanga, Santa Catarina, Brazil, 2021. Photo: Sara Ribeiro.



Tailings craters in unrecovered area causing extreme soil pollution.
Urussanga, Santa Catarina, Brazil, 2021.
Photo: Sara Ribeiro.



Giant area of abandoned tailings with evident heavy water contamination.
Urussanga, Santa Catarina, Brazil, 2021.
Photo: Juliano Bueno de Araújo



Aerial view of the Jorge Lacerda Thermoelectric Complex, ENGIE - Fram Capital. - Photo: Juliano Bueno de Araújo.

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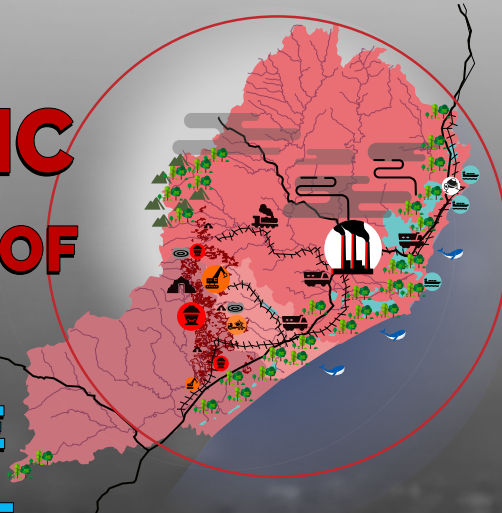


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