



VI. QUADRILÁTERO FERRÍFERO

ETH Studio Basel
Contemporary City Institute
Samuel Leder, Nadine Spielmann

Prof. Roger Diener, Prof. Marcel Meili
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Christian Mueller Inderbitzin

Autumn Semester 2013

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MINING AS A SYSTEM OF ORDERING THE TERRITORY

MINING AS URBANIZING FORCE

The Baroque Capital Ouro Preto
Tax Money Generator Miguel Burnier
The Steel Giant of Ouro Branco
Living Next to a Steel Plant in Barão de Cocais
No Mining Revenues for João Monlevade

VALE: RELATIONSHIP BETWEEN THE GIANT AND THE REGION

Mineworker Town Mariana
Genesis of Industrial Quarrying in Itabira
Vale, the Mining Giant

IRON ORE PROCESSING

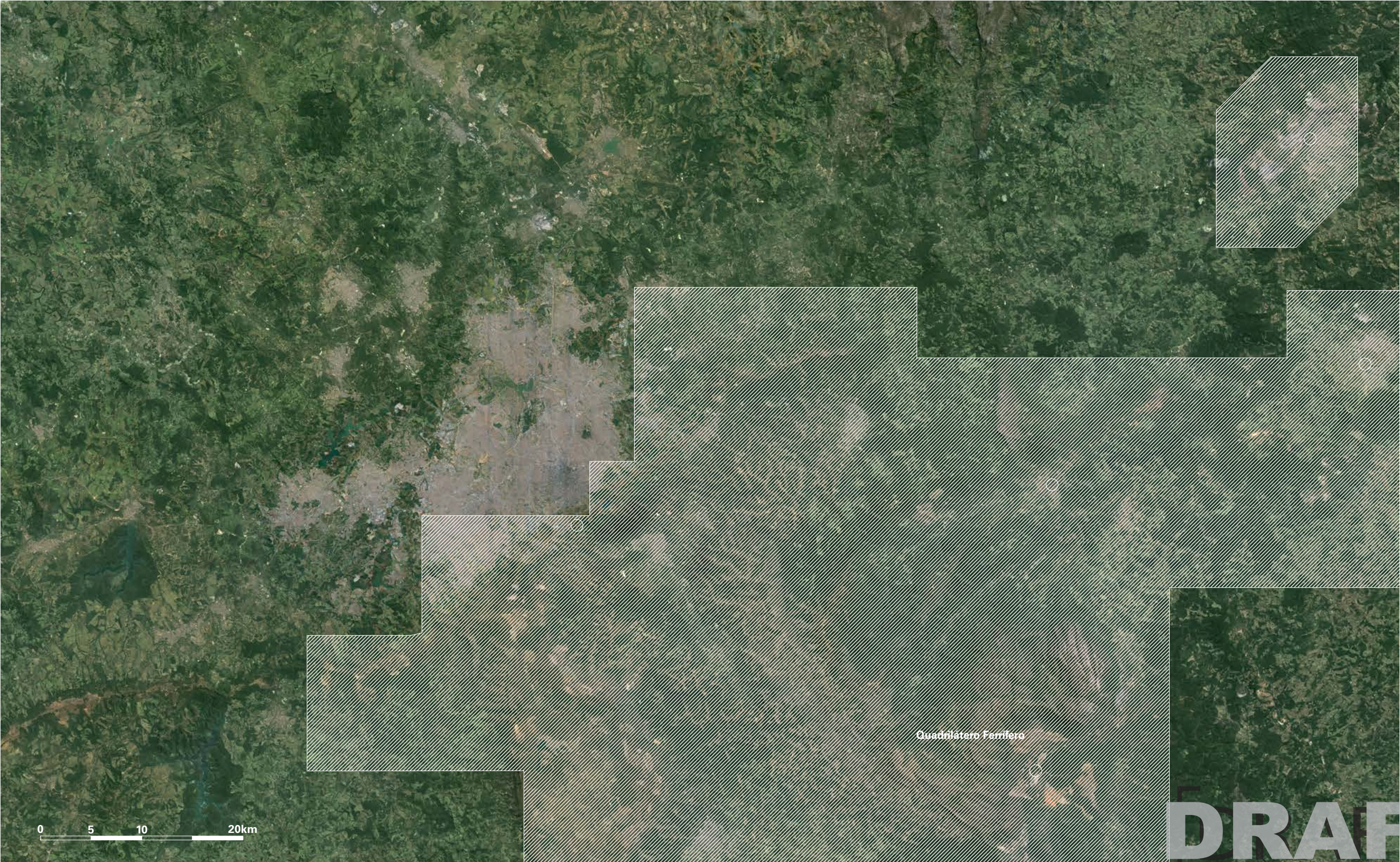
Extraction Site
Iron Mining in the Global Context

THE EFFECT OF CONSTANT MINING ON THE SHAPE OF TERRITORY

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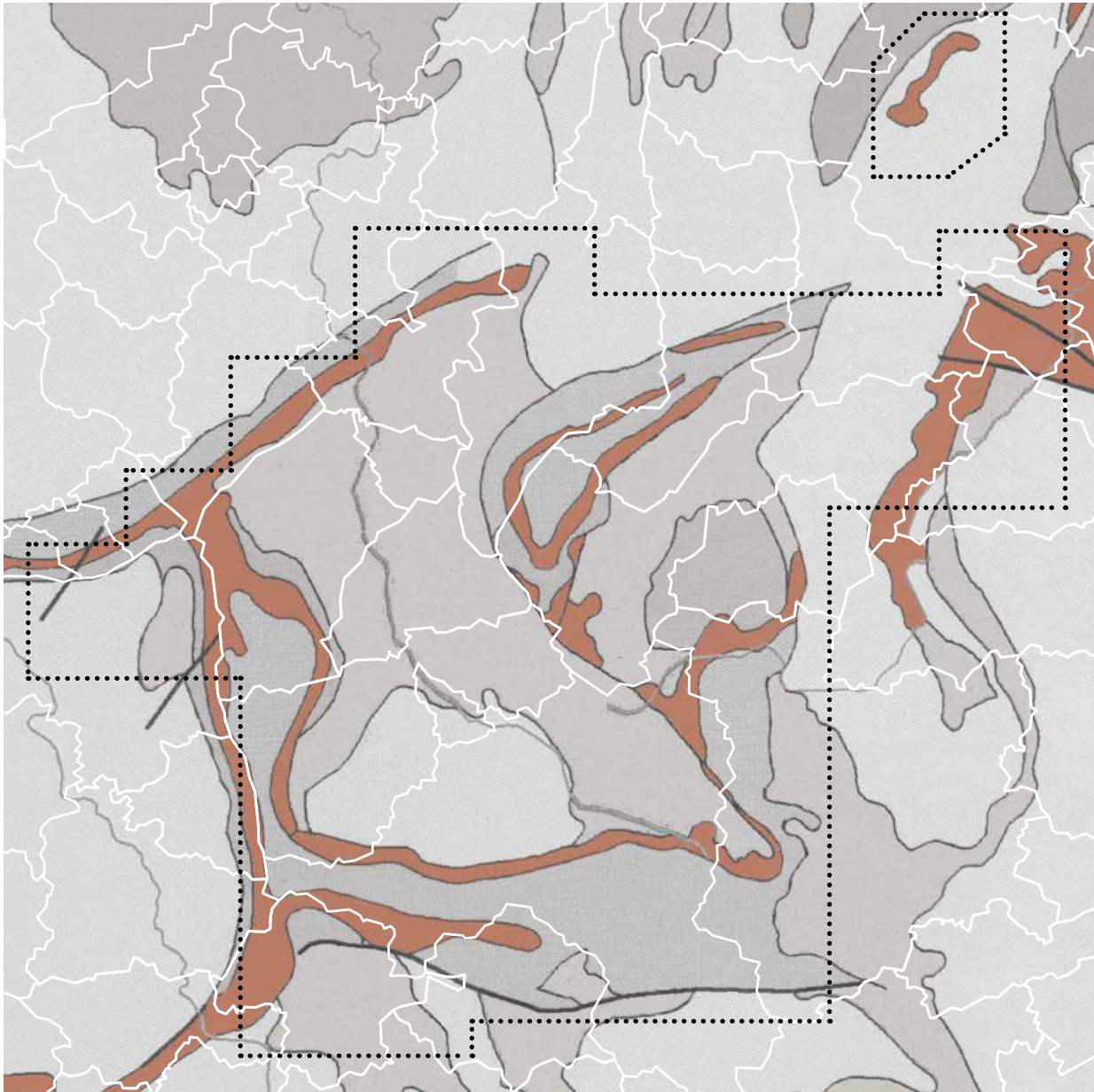


MINING AS A SYSTEM OF ORDERING THE TERRITORY

The rich metalliferous veins in the mountain range south of Belo Horizonte form the ‘Quadrilátero Ferrífero’, where the logic of a globally oriented mining industry re-orders the aspect and use of the landscape as well as the flow of people, money, and goods; all on the preconditions of geology and ancient political borders.



Tailings pond in Itabira

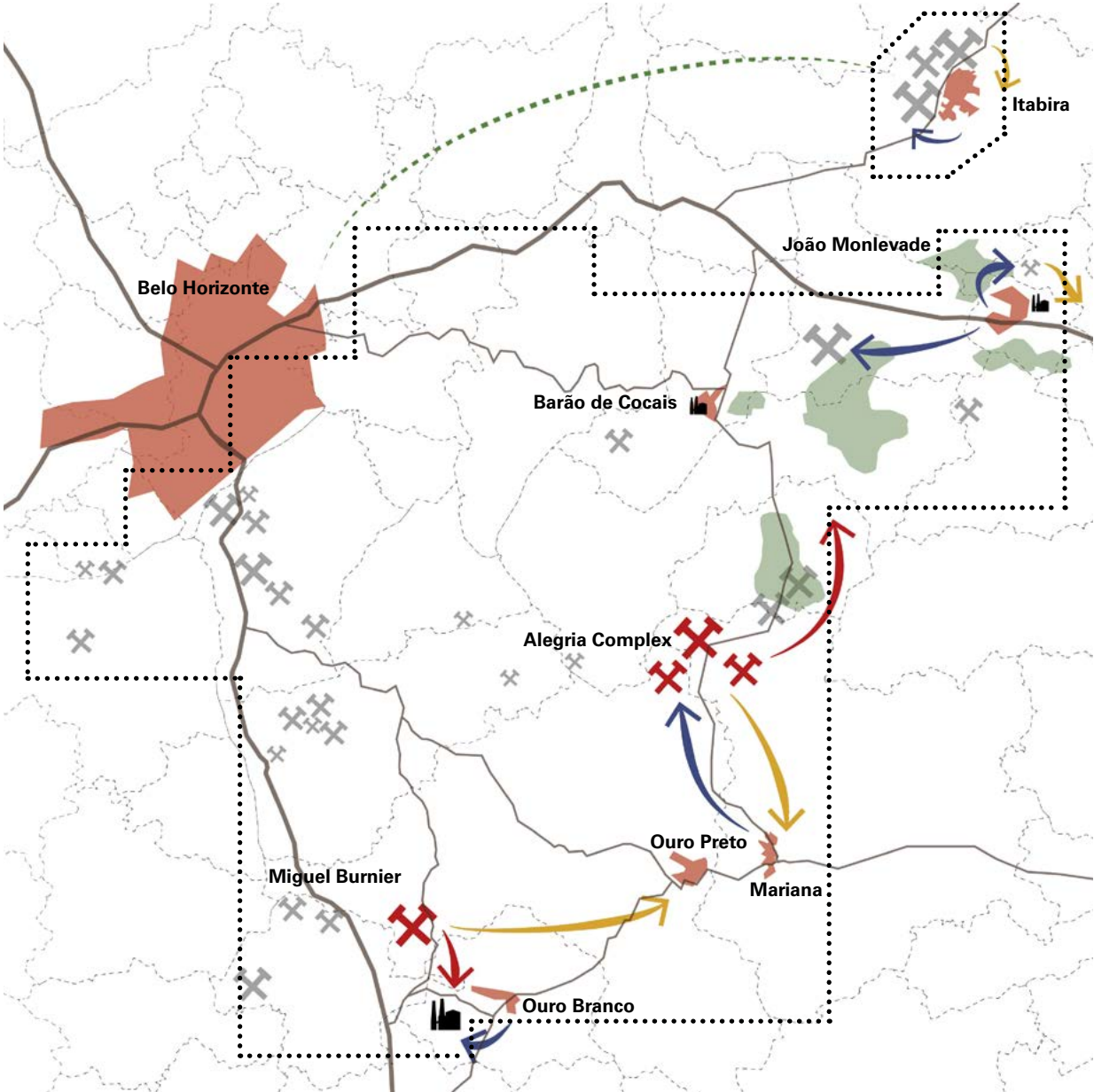


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1:440 000

- • • Quadrilátero Ferrífero
- Municipality Borders
- Metalliferous Veins
- Non-Ferrous Rock

Geology and Municipality Borders

With the rise of industrial mining and new tax laws for mining after the military regime, geology and municipality borders became the most crucial preconditions for all territorial process in the Quadrilátero Ferrífero.



0 5km 10km
1:440 000

- Iron Mine
- Eucalyptus Tree Farm

- Iron Ore Flows
- People Flows
- Money Flows

Fluxes and Traces

Networks of iron ore, money and people flows are triggered and nurtured by mining and its beneficiation. This research assembles and maps stories of these flows and follows their spatial traces through the territory, portraying the specific character of the region.

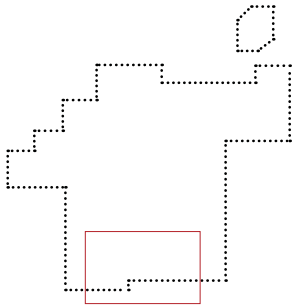
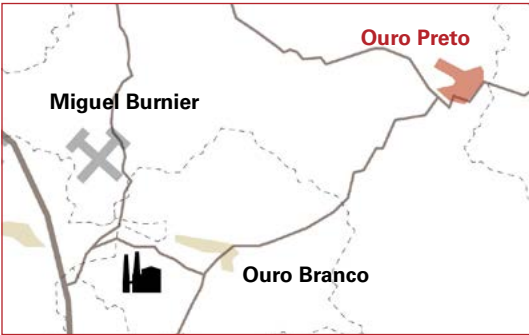
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MINING AS URBANIZING FORCE

Mining has introduced a type of scattered urbanization into the undulating landscape, which appears to be difficult to occupy and unproductive for farming. After the Ouro Preto gold rush in the 18th century, a locally based steel production emerged in the late 19th century. This again was outpaced by industrial iron quarrying, developing even remote valleys, and vanishing after the exploitation finished.

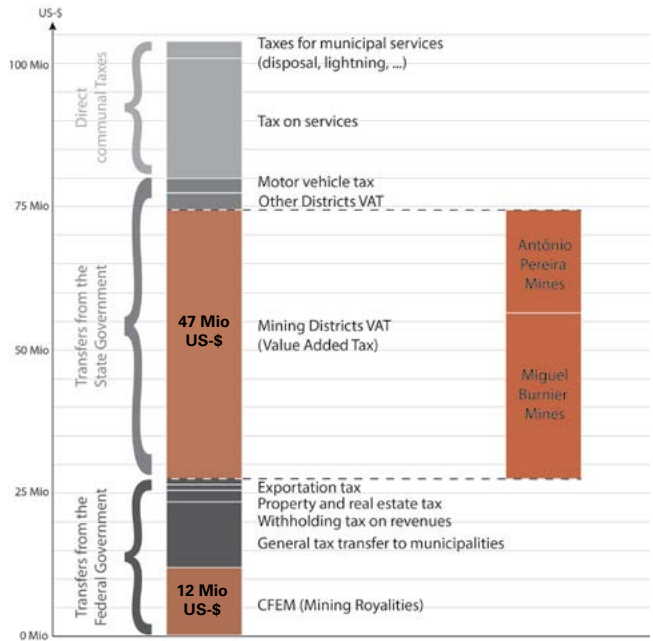


Urban expansion to the south in Itabira



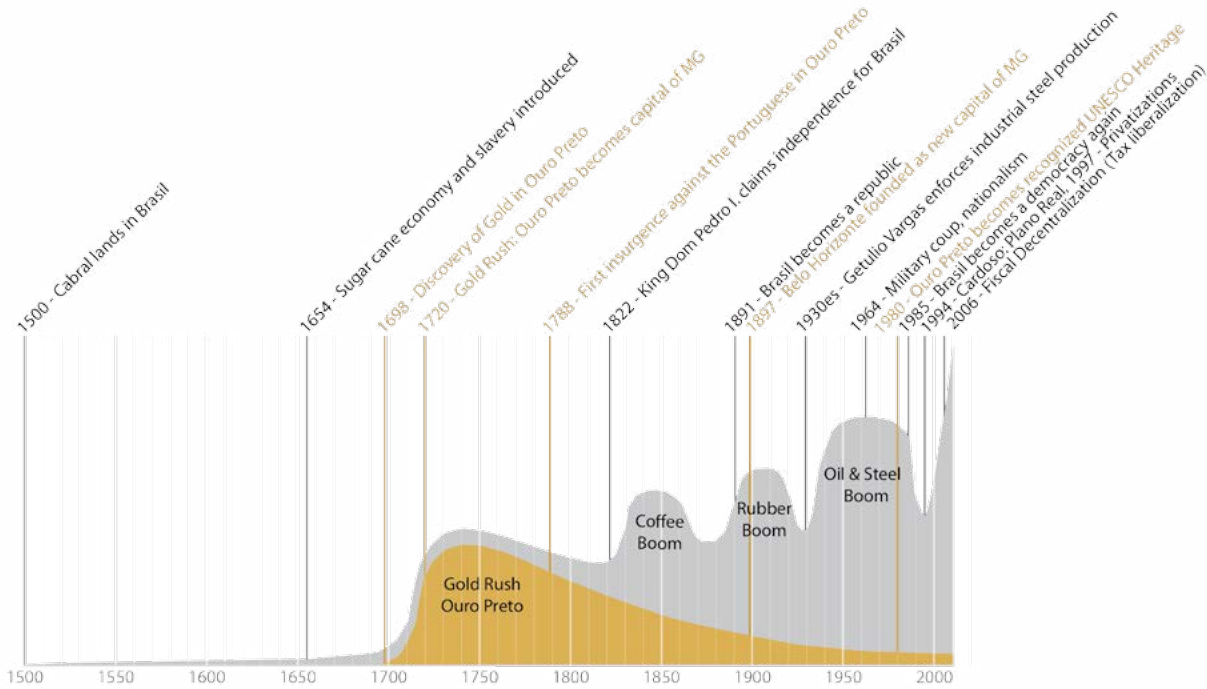
The Baroque Capital Ouro Preto

In the early 18th century, several gold mining towns affiliated to the city of Vila Rica, later called Ouro Preto, which became the capital of the new state Minas Gerais. Ouro Preto grew to one of the biggest cities outside Europe and adapted the european baroque building style. When the hills in the late 19th century became to narrow for further development, Belo Horizonte was founded as new capital. Although being a popular touristic destination, the main income source of Ouro Preto today is iron quarrying in remote areas of the extensive municipal area. There is no direct road connection between Ouro Preto and it's mines, and consequently, most of the workers and companies active in these mines have their quarters not in Ouro Preto, but in neighbouring towns.



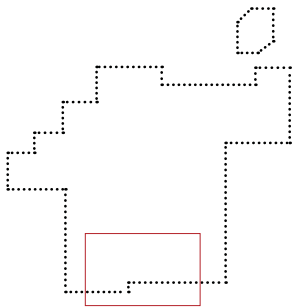
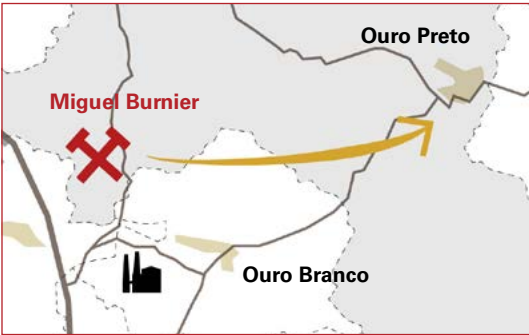
Iron Quarrying Nurtures the Gold City

In 2012, about 60% of all tax revenues of Ouro Preto came from the iron mines at the fringe of the municipal territory.



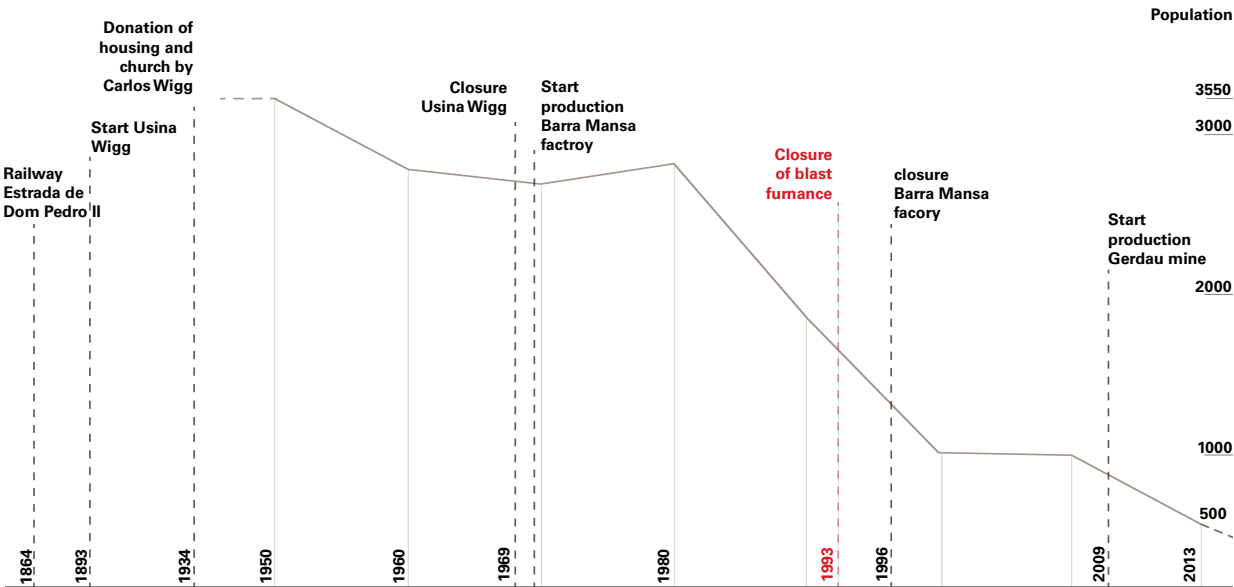
Ouro Preto's Role in Brazil's History

The Ouro Preto gold rush was the first of a series of economical booms in Brazil, making the colony rich and preparing ground for the detachment from Portugal in 1822.



Tax Money Generator Miguel Burnier

The village of Miguel Burnier in the west of Ouro Preto municipality lies at a junction of the ancient railway to Rio de Janeiro, which today is a cargo route for iron transportation. It had also a small iron mine and, for its strategic situation, it was one of the first sites in Minas Gerais that got a blast furnace for steel production in the late 19th century. The mine and the blast furnace closed down in 1993, but recently, the shrinking village became the biggest source of Ouro Preto's tax money, when the steel and mining company Gerdau discovered big amounts of iron around the village and in 2004 started to establish facilities to extract the deposits. The big scale exploitation has far reaching effects on the still starving village, since the mining company continually extends into the village buying properties and reusing them for own purposes.



Ore Extraction and Population

Miguel Burnier used to be a larger town with a direct railway connection to Rio. One had to change trains here to go to Ouro Preto. Many hotels opened up to meet tourists demand. The railway and the ore deposits brought mining as early as 1839, when Carlos Wigg installed his Usina Wigg company. Wigg cared for the community, so when he died, his wife Alice Wigg donated a church and around 100 houses for workers in 1934. Mining expanded after World War II and the railway was closed for passengers. This provoked the closure of the hotels and emigration of residents. Finally, after closing the blast furnace in 1993, people strongly feared the ceasing of their town. This is why Gerdau was highly welcomed in 2004, announcing its plans to start mining again. The residents saw hope in Gerdau to bring new life and prosperity to their village. However, population continued to drop so far.



2006



2012

Mutation of the Territory

Gerdau made the territory of the north western village inaccessible for the public, and erected working and processing facilities. The area is highly supervised and visitors are not allowed to talk to people.



0 0.25km 0.5km

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- Protected Area
- Town
- Gerdau Company
- Destroyed Houses

Friction of the Town

Although the municipality of Ouro Preto defined a protected area, Gerdau destroyed houses and installed itself.



Public Property Island

The church is the only public property left in the mine area.
Church visit is allowed only under surveillance.



Real Estate Takeover

The former orphanage is now housing the canteen of Gerdau, where mineworkers eat for free.



Living in the Mine

The only left resident in Gerdau's area is the sextant of the church. She received permission to eat in the canteen, too.



Herald of Mutation

The train station in town has been repaired recently, since it is a listed building. However, the only one arriving is the mine pit behind the hill, coming closer every day. Extraction of the rock can already be seen on the horizon.

2012



2013

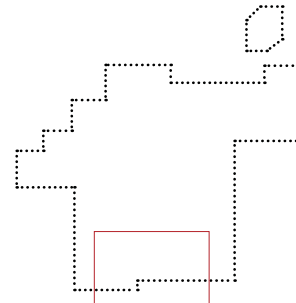
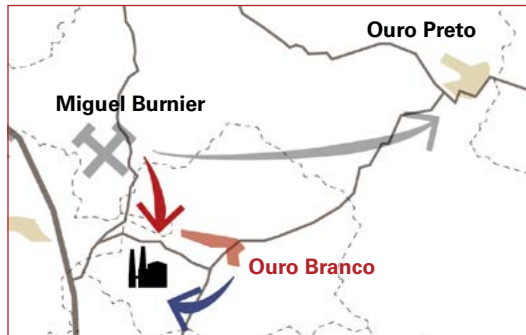


2016



Expansion Plans

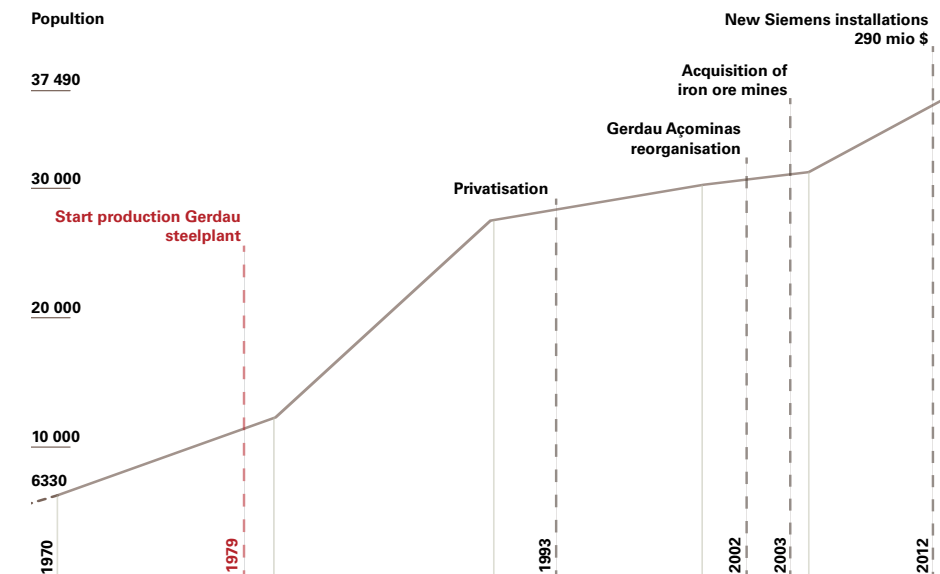
The Miguel Burnier mine produced 6.5 million tons of iron ore in 2012. One year later, an increase of the capacity by 75% is estimated, boosting the annual production to 11.5 million tons. A further expansion to deliver 18 million tons is aimed by 2016. One truck above symbolizes 2500 truck loads of 400t iron ore each.



The Steel Giant of Ouro Branco

Ouro Branco used to be a small town in the south of the municipal realm of Ouro Preto, whose economy mainly consisted of potatoe agriculture, until it voted to become independent from Ouro Preto in the 1950s.

Today, Ouro Branco is a autonomous city of 35 000 inhabitants, owing it's prosperity to the big Gerdau steel factory, that opened up in 1979 and has been extended several times. To meet the working force demands of this factory, Ouro Branco was developed and urbanized by the steel company.



Reflection in Population

The restructuring of the company and the acquisition of iron ore mines, Miguel Burnier amongst them, to secure resources already announced expansion plans of Gerdau in the early 2000s. This was confirmed in 2012 when Siemens receivead a large order to install new machinery. A direct reflection of this expansion can be seen in the population development of the city.



Motor of the City

The steelfactory southwest of Ouro Branco is the largest in Minas Gerais, producing mainly profiles for construction. It processes iron ore of Miguel Burnier and other mines owned by Gerdau.



Engineer Neighbourhood

Old Ouro Branco



- Developing neighbourhood since 2000
- Expansion 1979 - 2000
- Settlement before 1979

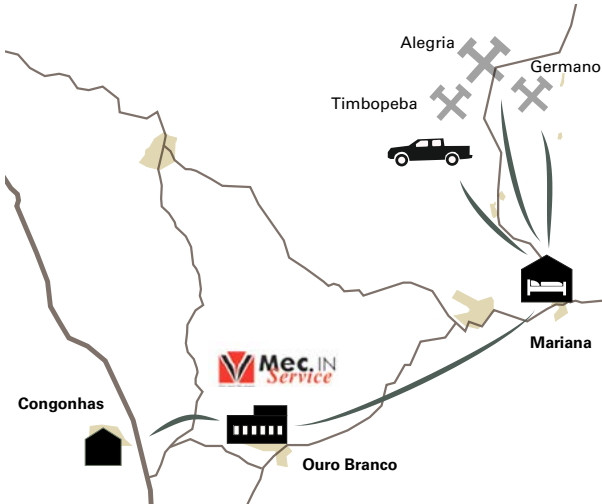
Grid Expansion

Gerdau started to urbanize Ouro Branco in 1979, applying its typical grid of neighbourhood patches by Eolo Maia. Each patch is designated to a certain job type, splitting engineers from factory workers. Architects were hired to build eight model homes and a financing arrangement was set up for the workers through long term payments.



Working at Different Locations

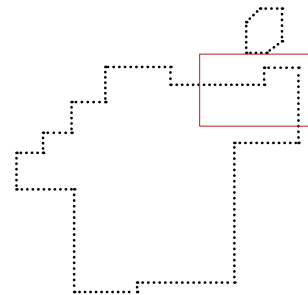
Antonio Alfonso Paula Filho and Marcello Pereira da Silva work for MecIn, a steel structure company based in Ouro Branco. MecIn receives orders by Gerdau, Namisa and Vale. Antonio and Marcello live in Congonhas and stay for two weeks at a hotel in Mariana to maintain machines in the Germano mine. They drive a typical mine subcontractor car: Silver color with red-white stripe and identification stickers of the company, the area and the personal number.



- Home
- Subcontractor Base
- Hotel
- Operation Area

Subcontractor Attraction

Besides factory workers, also subcontractors install their operation base in Ouro Branco, prospecting work commissioned by the steel factory.



Living Next to a Steel Plant in Barão de Cocais

Barão de Cocais emerged together with its steel factory, that was established in the late 19th century, when small-scale steel production based on locally grown charcoal burgeoned.

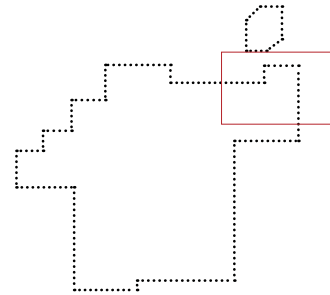
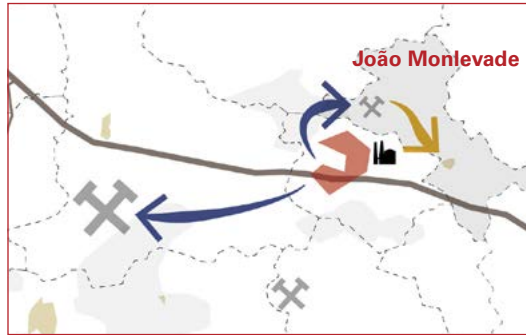
1988, the Gerdau company bought the steel factory in an auction. The raw iron for the steel plant is produced in the Gongo Soco mine owned by Vale, which also lies on the territory of the municipality. Contrary to other steel cities, the settlement in Barão de Cocais has almost encompassed the steel factory, which is delimited by a 5m high wall, that in some places has been used as a rear wall for buildings or shops. Nevertheless, the steel remains visible and strongly contrasts with everyday street life.



Tree Plantations For Steel Production

The steel industry in the 19th century used charcoal as energy source, causing deforestation and erosion problems. Steel plants became more independent from close energy forests only when improved railway connections in the late

20th century allowed also to import mineral coal. But still today, the landscape between Barão de Cocais and João Monlevade is shaped by eucalyptus tree plantations.



No Mining Revenues for João Monlevade

From its early founding in 1827 until the late 20th century, the steel factory of João Monlevade was the biggest in whole Minas Gerais, producing two thirds of all mineiro steel in 1943.

The company Belgo Mineira, which back then operated the factory, strongly influenced the development of the city, fulfilling diverse public functions.

Unlike most other cities in the Quadrilátero Ferrífero, João Monlevade has no iron deposits within its narrow municipality borders, and has to get along without the revenues from the mining business. This becomes increasingly difficult, since the steel companies during the last decades gradually withdrew from social investments like financing schools or healthcare, meanwhile the population still is growing, attracted by jobs in the steel factory and the new big Brucutu iron mine nearby.



An Exemplary Company Town

In 1936, Belgo Mineira arranged an urban design competition to expand the town to a worker's city. The concurrence was won by Lincoln Continentino, rebuking concurrents as the afterwards well-known Lucio Costa to the rear places.



Withdrawal of Public Commitment

Belgo Mineira kept to be the main managing force in the urban government and built the Margarida hospital that achieved regional reputation, as well as 4 schools, and granted scholarships to good students, until in the 1980s the Company gradually forwarded responsibilities on urban development to the municipal authority.

When in 2005 the company was bought by Arcelor Brasil (later Arcelor-Mittal) it completely stopped any social involvement, while still expanding production capacities in João Monlevade. The city in consequence is having troubles funding the public services on its own.



The Steel Factory Is Located at the Periphery of the Town

Unlike in Barão de Cocais, the steel factory of João Monlevade is not located in the city center, but in a valley in the east of the city with access to a river and a railway track.



Heavy Traffic Due to Mining Activity

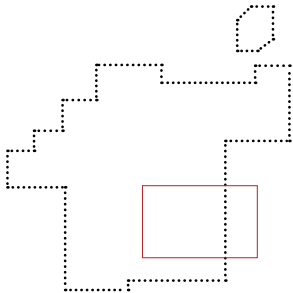
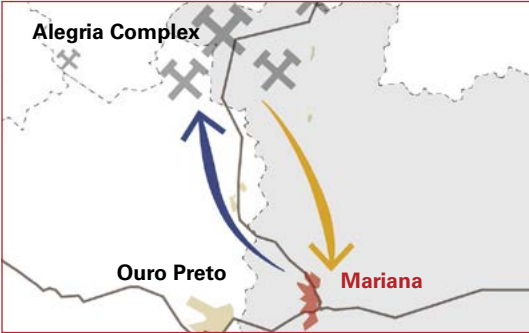
One of the negative effects of mining that affect João Monlevade without any kind of recompensation is the high cadence of heavy vehicles on the main roads.

VALE: RELATIONSHIP BETWEEN THE GIANT AND THE REGION

The mining giant Vale, initially founded by Getulio Vargas as public enterprise to foster development in Brazil, has always played an ambivalent role of both nurturing and affecting life in the Quadrilátero Ferrífero. After the privatization 1997, the formerly tight relationship between the company and the communities dwindled and Vale became increasingly inaccessible for local concerns.



Portal of the Vale headquarter Aguas at Claras, close to Belo Horizonte



Mineworker Town Mariana

One of the largest mining complexes in Minas Gerais is located on Mariana's municipal territory. At the same time, the town itself represents the residence of most of the people working in that complex, thus making it to the main job and money source of Mariana.



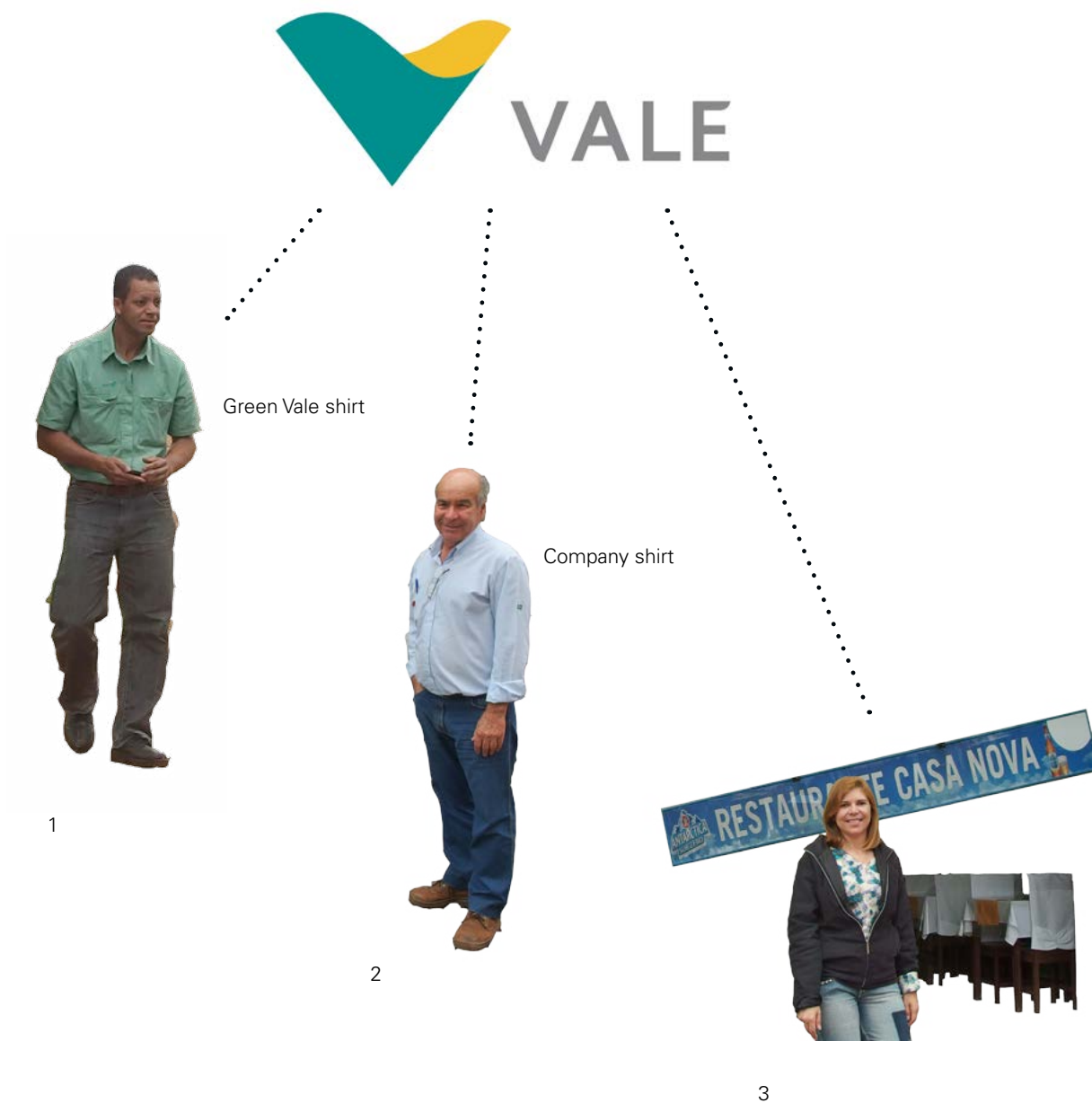
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2

Neighbourly Rulers

Bringing jobs and tax money to Mariana, Vale also holds a certain degree of power in its hands. There is a prefeitura (townhall) existing in the city (1), but it is depending strongly on the regional headquarter of Vale (2) right on the opposite side of the street. According to the law, the municipality has to agree with each new project announced by the company, but in practice, rather than refuting a proposal, the municipality would just ask for a monetary recompensation for caused inconveniences.



Employment Relations

Working for Vale can be done in different relations. Some jobs are directly hired by Vale like for example the mineworkers (1). This is the case when employees work full time on site. If jobs ask for short term work, like maintenance or construction of machines, estates and installations, subcontractors (2) are hired and an indirect but strong relation exists. There is a third type of relationship to Vale which is shown by the third-profiteurs like hotel and restaurant owners (3).



Residential Worker

Many Vale employees live in Mariana. Before privatization in 1997, they were offered a house by Vale in one of its neighbourhoods. Now employees are located through the whole city and do not profit of special conditions anymore.



Non-Residential Workers

Non residential workers stay at hotels in the city (1) and seasonal workers reside in low standard housing outside Mariana (2).



Short-Stay Workers

Subcontractors working in the mines, doing maintenance for some days, stay at hotels that are paid by their company. Here the hotel also serves lunch and dinner to the workers.



Seasonal Subcontractor Workers

160 seasonal workers of a subcontractor live in this camp for 3 months to 1.5 years. Most of them come from the northeast of Brazil. Every three months, they receive a ticket from their company to see their families at home.

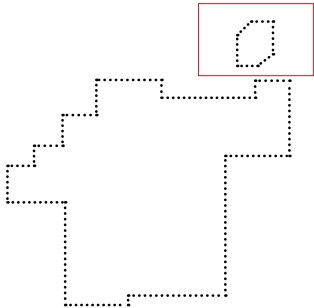
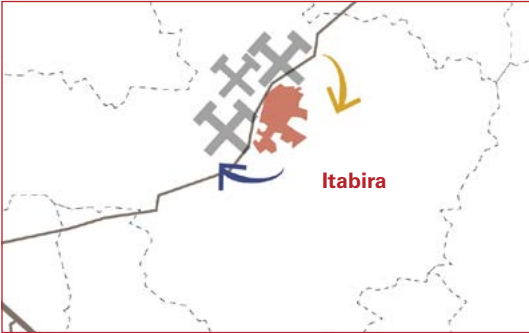


An aerial photograph of a city, likely in Brazil, showing a dense urban area with a grid-like street pattern. The city is surrounded by dark, forested hills. Several labels are overlaid on the image: 'Vila del Rey' at the top, 'Vila Maguiné' to the right, 'Jardim dos Inconfidentes' to the left, 'Rosário' at the bottom left, and 'São Sebastião' at the bottom right. The city itself is a mix of light-colored buildings and darker areas, possibly parks or undeveloped land. A river or stream is visible winding through the city.

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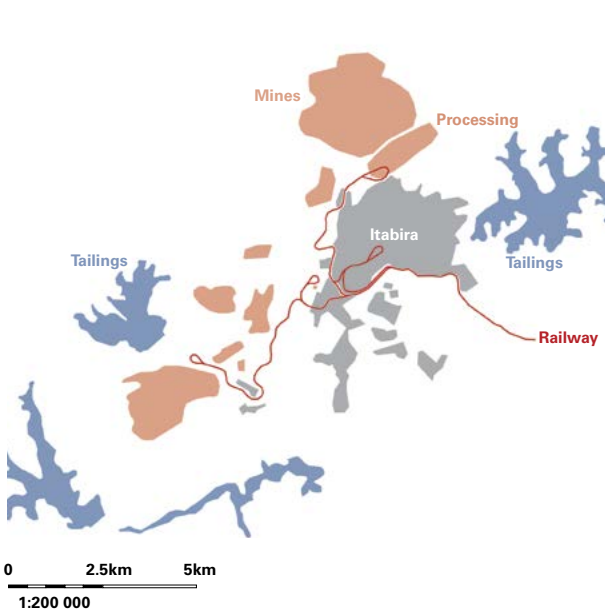


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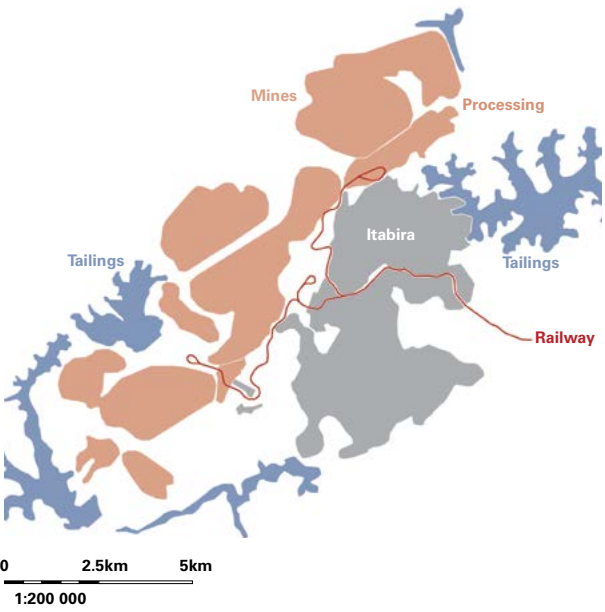
Genesis of Industrial Quarrying in Itabira

Itabira is the place, where the mining company Vale has been founded in the 1940s, the early years of brazilian industrialization. The city emerged alongside an easily accessible, extensive deposit of iron ore, which to quarry a big amount of workers was needed. The city for several decades grew in complementarity to the mines, although the demand for working force decreased due to rationalization. But during the last decades, the mines with their associates, the tailing ponds and the barely crossable cargo railway tracks, increasingly affected the city. The conflict finally escalated after 1997, when Vale became a private company acting on the global scene.



The City of Itabira 1972

The rich iron deposits are the source of the city's wealth and connect it via the railway to the Port of Vitoria/Tubarão as well as to other cities in the Quadrilátero Ferrífero.



The City of Itabira Today

The mines and tailing ponds have overtaken most of the surrounding area and conflicts with residents increase. The passenger railway station has been abandoned.



Iron Quarrying in the 1940s

High labour intensity provides jobs for many people, quarrying goes at low speed.



Iron Quarrying Today

Rationalized quarrying makes it necessary to extend the extraction speed to still provide enough jobs.

before 1997	<div>MOTHER VALE</div> <p>As a state owned company, Vale provides housing, medical-, dental- as well as childcare. Employees are paid a large salary. Their life turns around the company.</p> <p>People accept damage done to the surroundings.</p> <p>Anxiety starts to rise, people fear loss of job and care, layoffs, early retirement, salary fall and outsourcing of services.</p> <p>1986 CONAMA Brings up environmental assessment and environmental licensing for potentially damaging activities & legislation for public participation trough public meetings.</p> <p>1992 UN Conference on Environment, Rio awareness of the environmental issues arising.</p> <p>1995 Vale files for LOC Licence In order to continue extractions, the State environmental foundation of MG (FEAM) calls to seek an environmental licence (LOC).</p> <p>1995 Vale announces privatisation.</p> <p>1997 Vale is privatized.</p>
1997 - 2000	<div>VALE</div> <p>Community starts protesting against Vales actions and asks for improvement of pollution and water supply, a park and infrastructure creation and community environmental education.</p> <p>The mayor, FEAM, the Secretary of Environment and the civil society work together with community to form conditions bound to the LOC.</p> <p>1998 Public meeting Itabira.</p> <p>2000 LOC is granted with 52 conditions.</p>
2000 - 2004	<div>STEPMOTHER VALE</div> <p>Vale starts to implement some of the conditions. Inaugurations with free concerts were promoted widely.</p> <p>As projects became realized, community stops pressure on Vale.</p> <p>FEAM reduces attention to Itabira because LOC is granted.</p> <p>Neighbourhood associations stop talking of conditions because they think the municipality would take care of them.</p> <p>Vale starts slowing down implementations by reassessing conditions.</p> <p>2000 Municipal elections The new mayor J. I. Querino Coelho elevates interests of Vale over those of community.</p> <p>2001 Vale announces new jobs The expansion of mining and reextraction from tailings guarantee new jobs. Concerns about layoffs decline.</p> <p>2004 LOC is renewed behinde locked doors</p>
after 2004	<p>Investments are getting damaged because no one takes care of them.</p> <p>The municipality states that Vale is responsible to train people for management and caretaking. Vale sais the municipality is responsible.</p> <p>Difficulties to talk to Vale are rising because of high turnover of Vale staff.</p> <p>Pressure comes more and more from the global network.</p> <p>2007 New Reference Group Vale negotiators stop by the neighbourhood only once a month.</p> <p>“Vale is not the government... we are no longer state owned.”¹</p> <p>2005 Diagnostico Territorial Vale starts analyzing areas and decides in private what is needed.</p> <p>2012 Vale recieves the public eye award</p>

1: Devlin Tubino (2011), p. 155

Mother Vale: A Difficult Relationship

The public meeting in 1998 was one of the rare occasions where the invisible conflict between mining company and community was brought to the surface.



Fenced City

As a result of the public meeting 1998, the whole city was fenced in 2000 with only a few openings, to protect people from the mine and respective facilities.



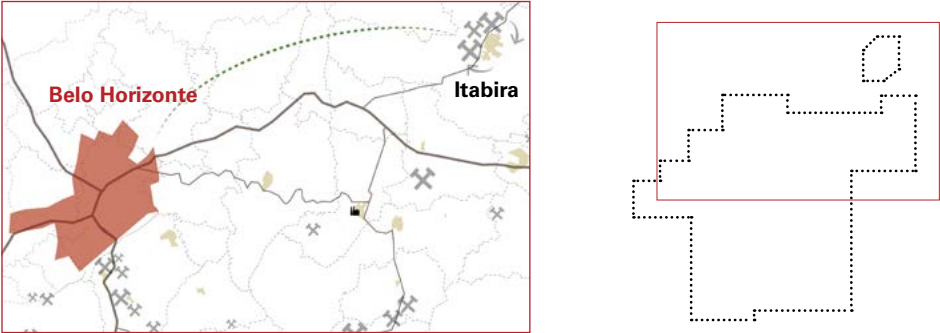
Sport Facilities and Protection

The collection, stabilisation and rehabilitation of tailings are achievements of the public meeting in 1998. Also, the sportsfield was granted by Vale through an obligation.



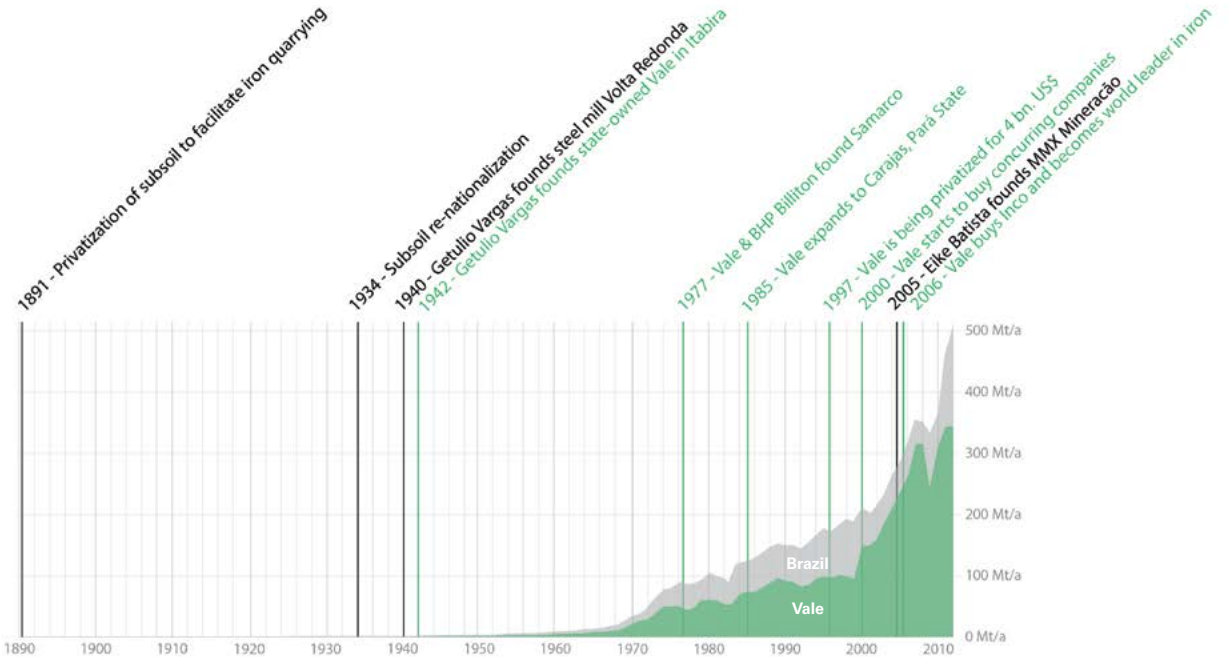
Fenced Railway

People asked for more security along the railway and Vale fenced it with iron poles through the whole city. There are only a few crossing possibilities.



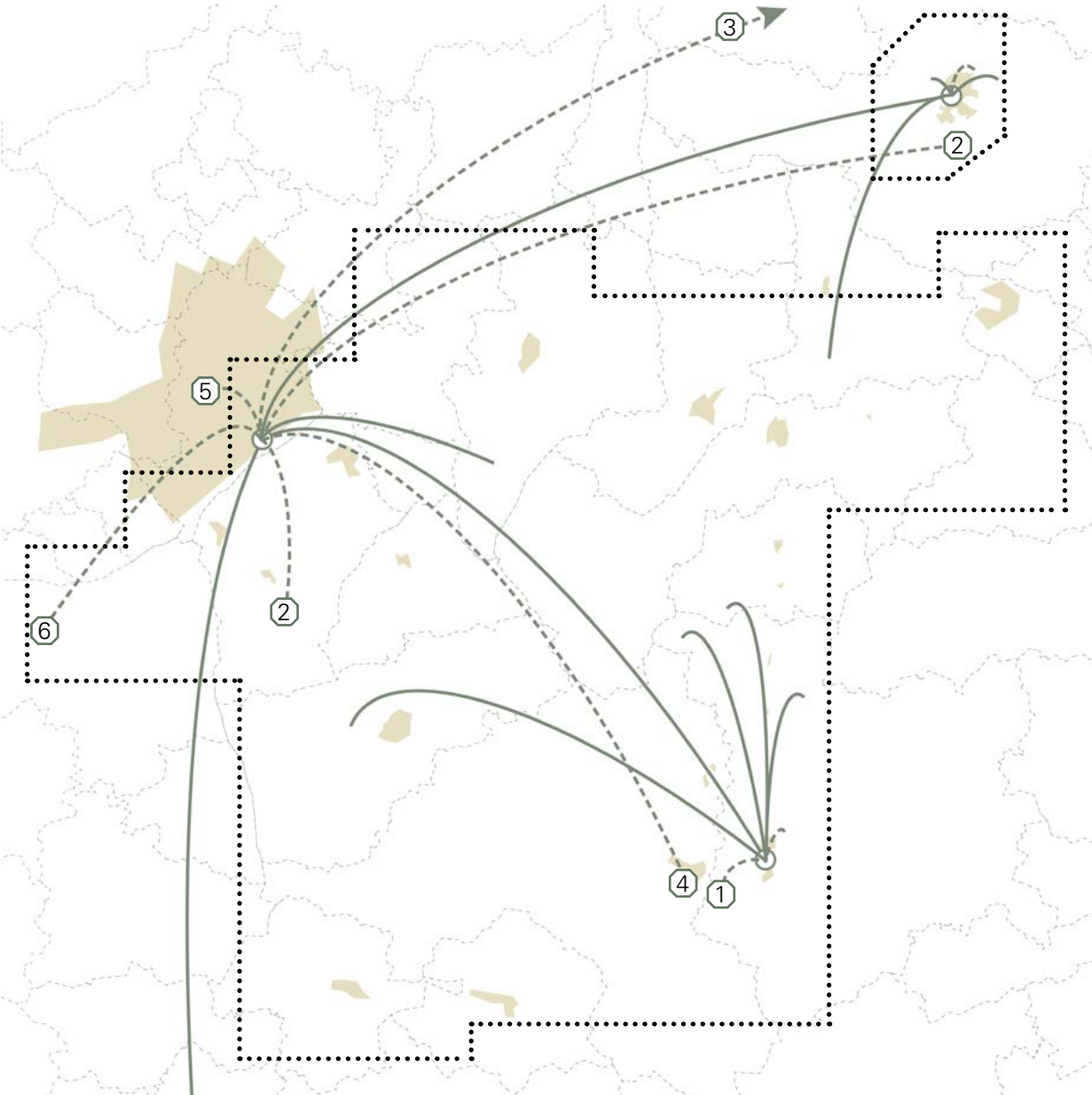
Vale, the Mining Giant

Vale was founded 1942 in Itabira as state-owned mining company under the Name “Companhia Vale do Rio Doce” (CVRD). The regional headquarters later were moved to Belo Horizonte, and when Vale expanded also to the north of Brasil, even to Rio de Janeiro. During the recession of 1997, the idly state's company was sold to a consortium of brazilian and japa- nese investors. Since then,Vale is focusing on mining; it sold all it's stakes in wood pulp and in return bought some of it’s mining competitors, and expanded to Canada and several other countries. After a decade of rapid growth,Vale today is the second biggest mining company worldwide, with an annual revenue of 46 bn. US-\$ (2012) and 85 000 employees, of which about 50% work in iron production.



Iron Mining - a Federal Affair?

Throughout the 20th century, several federal governments tried to push the national steel production to become less dependent on steel imports. One of the first measures was the privatization of sub-soil property rights in 1891 to make iron quarrying more attractive. But the iron quarrying only slightly augmented, because several hindrances remained: The iron could not be processed locally due to the shortage of charcoal, and at the same time the iron could also not be exported, nor could mineral coal be easily imported, due to the poor state of the transportation infrastructure. And eventhough entrepreneurs like Percival Farquhar aimed to build such an infrastructure, the lack of accessible capital made it unfeasible for a private company. Therefore Getulio Vargas in the 1940s federally intervened, and founded the Companhia Vale do Rio Doce (CVRD) in Itabira to foster iron quarrying, as well as the Volta Redonda steel mill, which he strategically located between the Quadrilátero Ferrífero, Rio de Janeiro and São Paulo.



— Vale Main Mining Business Relations
- - - Vale Involvements in Public Services

Vale as Provider of Public Services

Vale relocated its global headquarters to Rio de Janeiro, with Belo Horizonte as center for the mines of the Quadrilátero Ferrífero, where Vale still funds many public services, amongst which are education, culture and tourism.



1 Tourist Train Ouro Preto-Mariana

Vale owns the last 3 remaining passenger trains of Brazil.



2 Cargo Railway Network

1998 Vale bought the former state railways FCA and EFVM.



3 Univale Private University

Private education always played an important role in Brazil.



4 Co-financing a Federal University

The UFOP University educates mining engineers.



5 Museum on Popular Culture

Heritage Museum at Praça Liberdade in Belo Horizonte.



6 Funding of Inhotim Art Park

Vale also sponsors the Land Art park in Brumadinho.

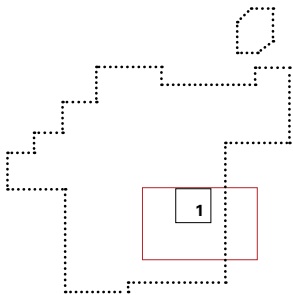
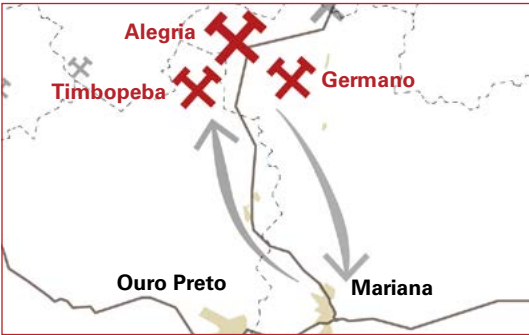
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IRON ORE PROCESSING

Post World War II industrialization introduced a new, export-oriented kind of mining. Large scale extraction with big machines, automatized processing and efficient cargo infrastructure accelerated the landscape transformation, which on base of local soil conditions in areas remote to former settlements is aiming to satisfy the demand of global commodity market.

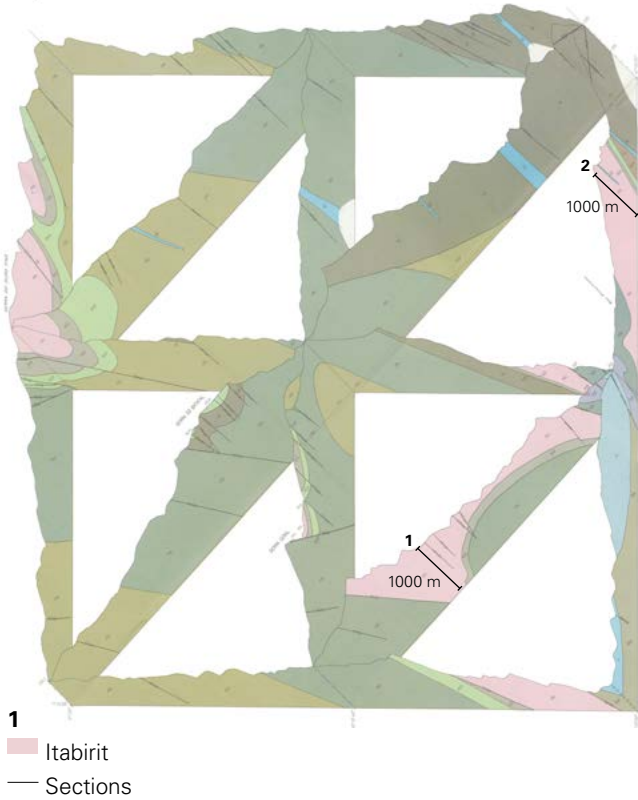
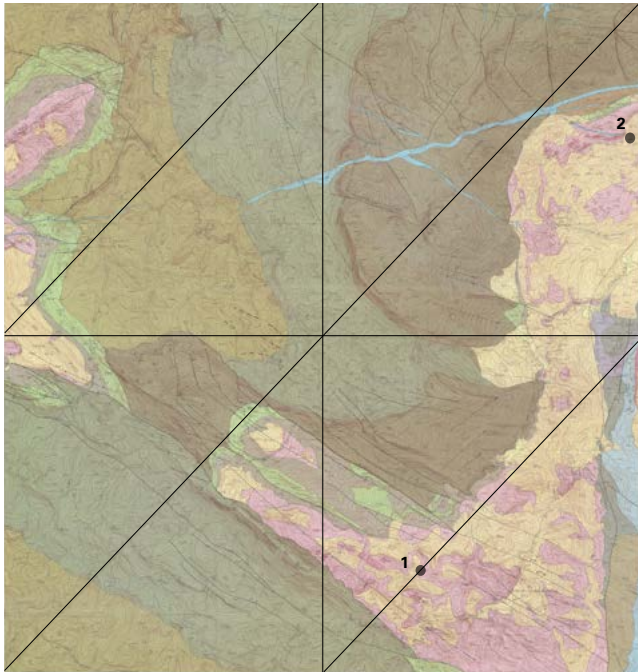


Brucutu Mine



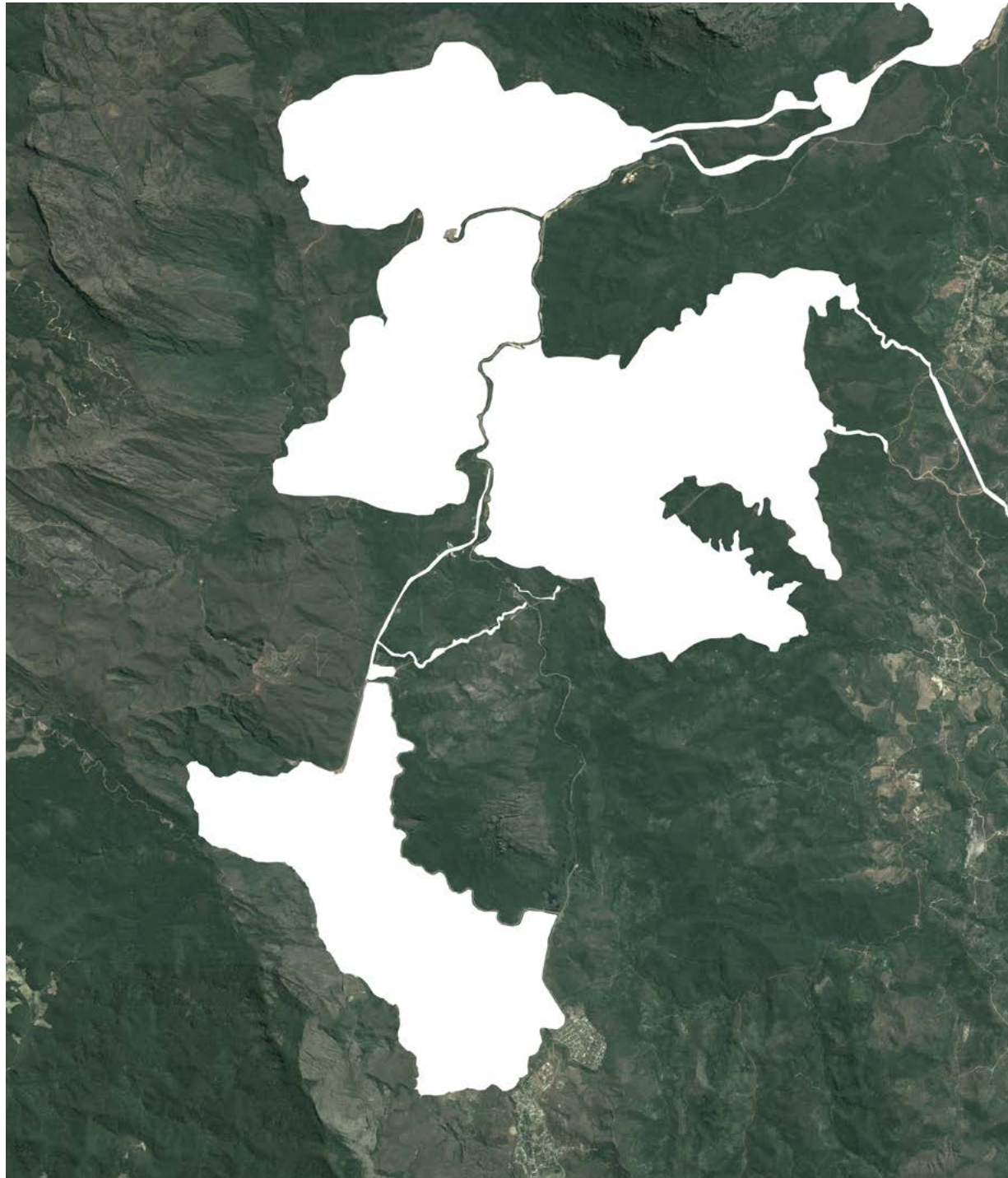
Extraction Site

The Alegria mining complex is the economical motor of Mariana, and is located about 30 driving minutes north of the city. It is composed of several larger mines: Timbopeba, Germano and Alegria. Because of its rich subsurfacial Itabirite deposits at 35 % iron content, it is one of the major and most active mining complexes in Minas Gerais.



Itabirite: Iron Ore Deposits

The reason of the huge extraction is found underground in the ore veins. Some of them reach a local thickness of up to 1000m, securing sources for several years.



Restricted Area

Each part of the Mariana Complex is fenced or restricted by natural barriers like coppice, hollows or hills. The only way to come close to the mine is the access road to the main entrance gate.

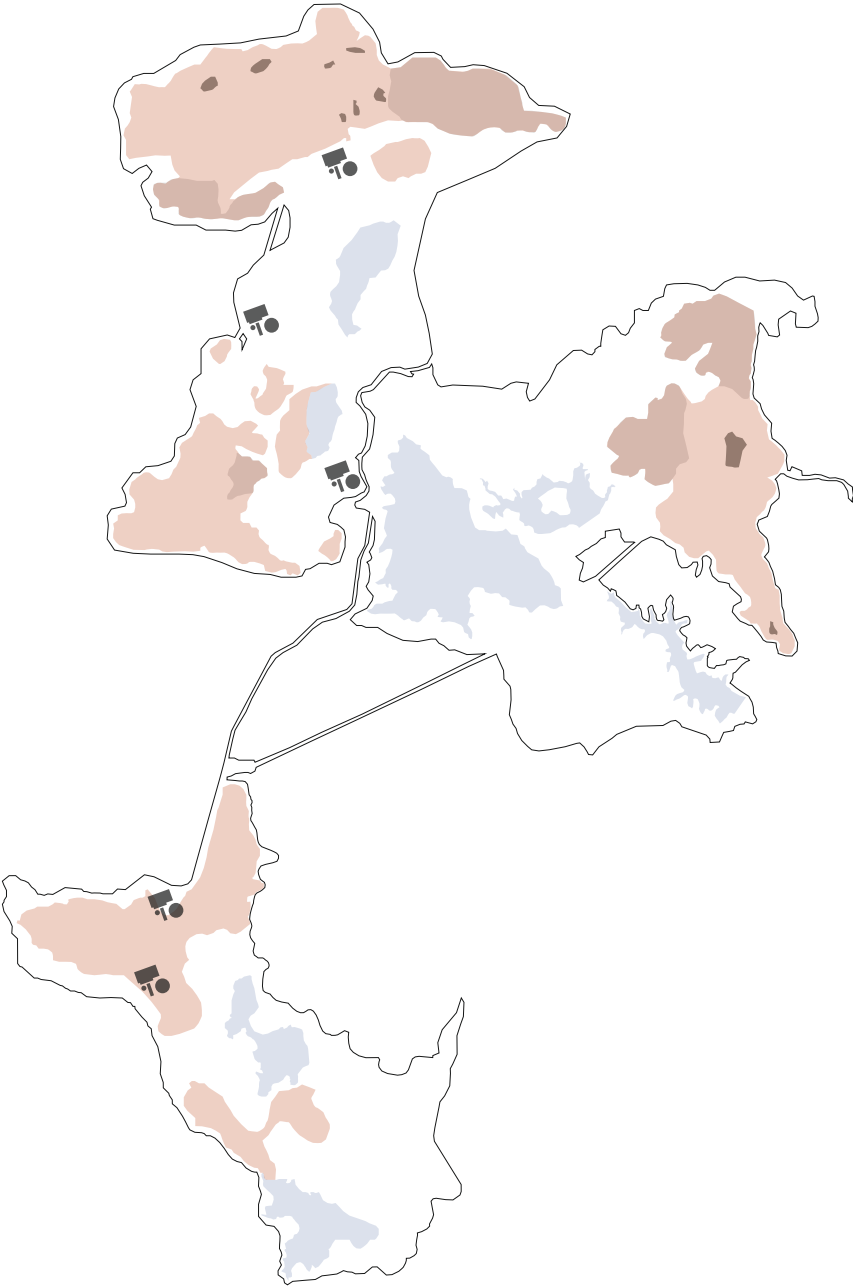


Gates

The routes branching off the main road are controlled with simple gates. Sometimes they have little shelters for guards. Fencing connected to the left and right side lead into the coppice.



Changing Surface
The Mariana complex covers a large area. Most of the surface is constantly changing due to digging, dumping and sedimentation. Facilities for operation and iron processing remain as fixed spots in the altering landscape.



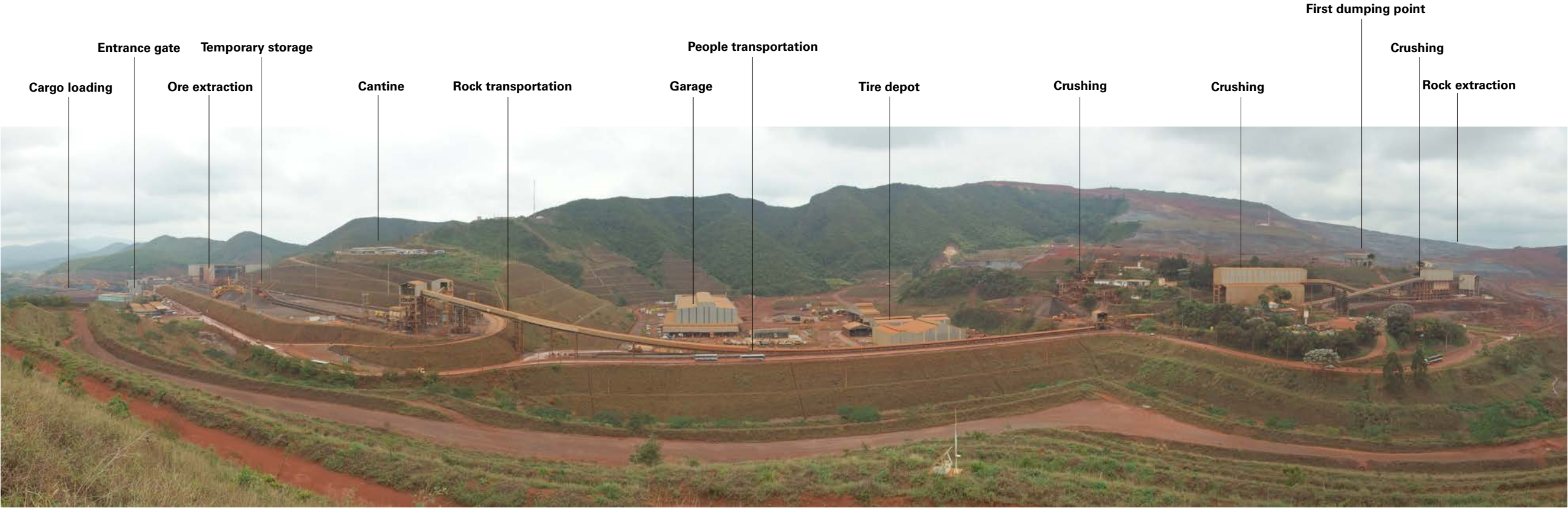
- Tailings Fitting
- Digged Surface
- Dumped Surface
- Extraction Spot
- Processing Facility

Snapshot of the Surface Character



- Truck Transportation
- Automatic Transportation
- Rail Transportation
- Waste

Iron Ore Extraction Process



Iron Extraction Minescape
The newer mines are organized like assembly lines. First, the terrain is shaped for the placement of machines, facilities and infrastructure. The new landscape involves plateaus, dams and banking, forming a system for material and people flows. Every step is highly controlled so that each bus or miningcar, each ore load is monitored and observed. Security is set first priority.



Unloading the Carved Rock Material

Extracted rock is brought from the excavation pit by mining trucks each carrying a load of 400t at a time.



Temporary Storage

The already crushed rock is stored for some time before it is brought to the ore extraction plant.



Crushing Station

To be able to extract the iron ore, the rock needs to be crushed several times into fine sediments. Crushed rock is loaded to trucks and brought to the ore extraction plant.



Iron Ore Extraction

In this machinery the ore is separated from the non ferrous rocks by magnets. Next to the iron ore, also waste like slurry and non ferrous rocks are generated.



Rock Waste - Dumping

Rock waste contains non ferrous material and is disposed in banks. For each ton of iron ore, one tone of waste is produced. Dumping piles need to be designed carefully as they transform vast areas of landscape.



The New Landscape

Today, dumpings are carefully sketched with 3-D modelling programmes and constructed with GPS coordination. After 20 years the artificial landscape slowly starts to blend in with the natural, but the artificial character is still visible.



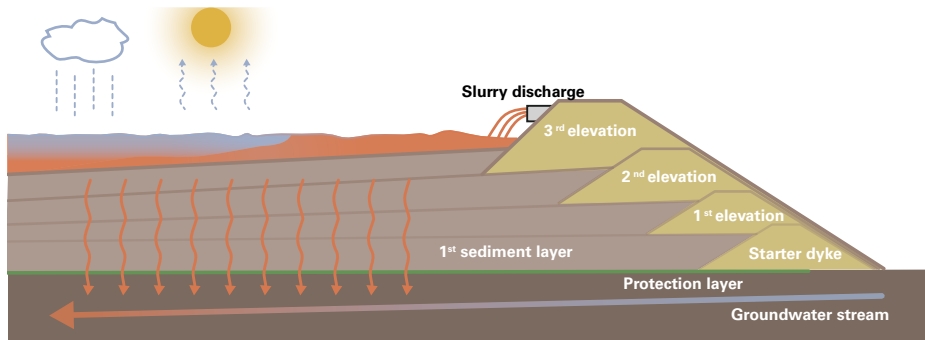
Sediment Waste - Tailings

Slurry contains non-ferrous sediments, water and additives of the ore extraction process. This highly viscous and foamy broth is collected in large ponds to separate the water from the sediments.



Grassy Pond

Closed tailing ponds feature a high concentration of silicate what makes it difficult to grow trees on. A grass-covered swampy terrain remains 10 years after the closing of the mine.



Development of a Tailings Pond

While the water stays at the surface, the sediments of tailings settle on the ground forming new layers. This makes the pond raise over time and the dyke holding the tailings needs to be elevated. Regardless of the measures to protect the environment from impacts, some substances still trickle down into the groundwater.



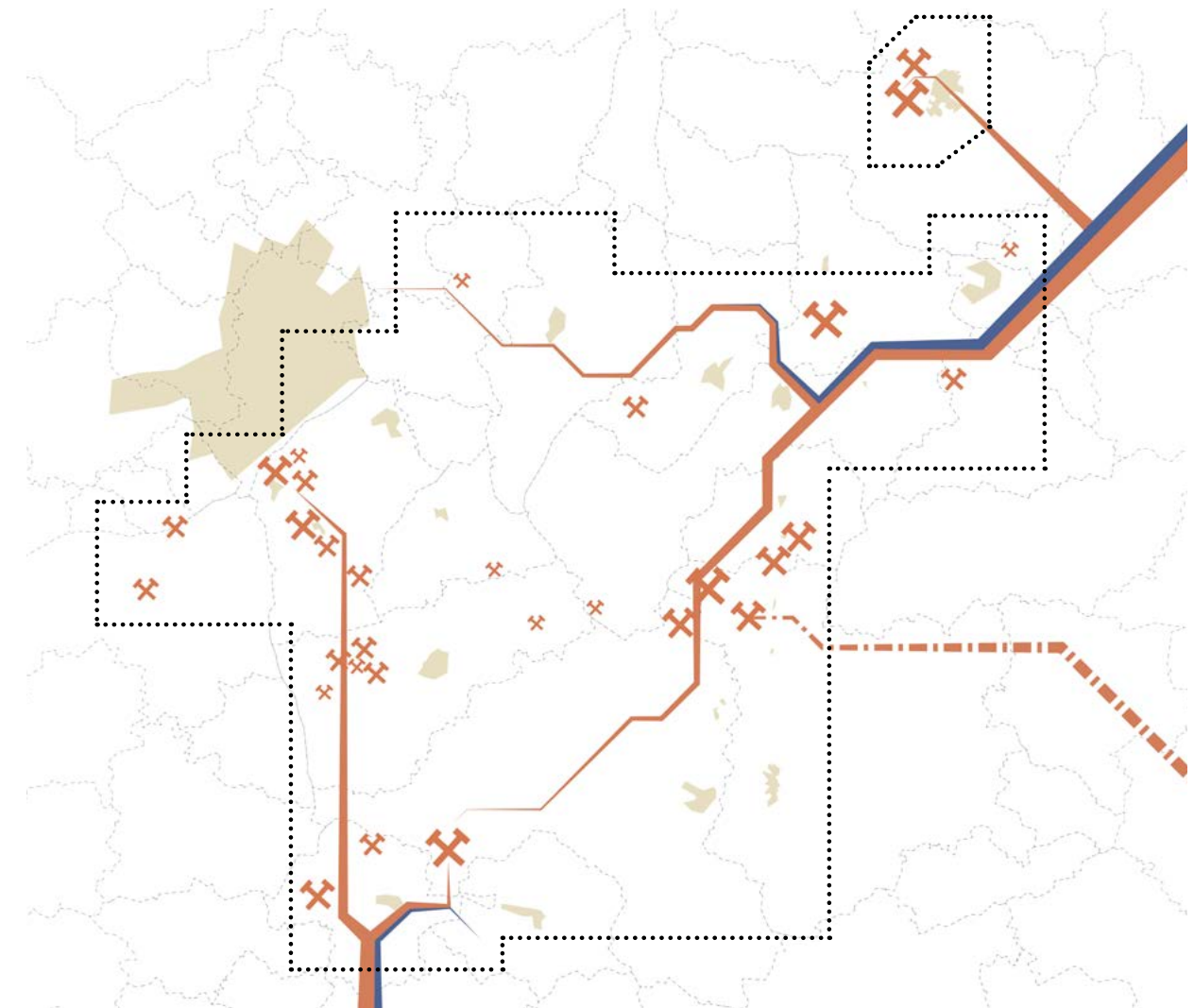
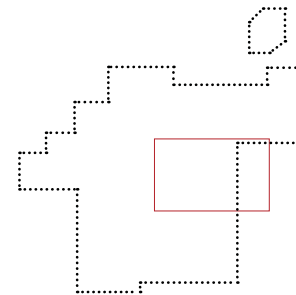
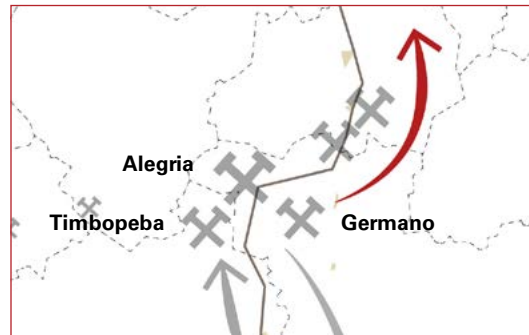
Dam Elevation

The street crossing the dam separates two tailing pond basins. When the pond level rises, the street has to be elevated too, to keep the valley crossable.



Reuse of Tailings Water

The remaining water at the top is separated from the sediments. While the foam is retained, the water is pumped back into the ore extraction plant, where it is reused for the ore extraction process.



0 5km 10km
1:500 000

- Iron Mine
- Iron Transportation Route (Railway)
- Iron Transportation Route (Pipeline)
- Steel Factory
- Steel Transportation Route (Railway)

Iron Mining in the Global Context

Today's large scale iron extracting economy of the Quadrilátero Ferrífero is based on exportation, and thus highly depending of efficient transportation infrastructure, namely railways connecting the mines to sea ports or, for the smaller share, to steel factories, that produce for the inland market.

For this reason, many of the ancient railways of the Quadrilátero Ferrífero, which partly were also used for passenger transportation, have been replaced or extended to cargo lines in the decades after World War II. The two main lines leading out of the Quadrilátero Ferrífero are today operated by Vale, which bought both lines when they were privatized in the 1990s.

Two Cargo Railway Corridors Form the Backbone of the Iron Economy

The two railways link the iron extraction sites directly to important sea ports, and on the way mostly avoid touching cities, including Belo Horizonte. Their path is determined only by topography and, in some parts, by historically established trails or older rail tracks.

In 2008, Samarco introduced the first iron pipeline, a technique that might become broadly used in future.



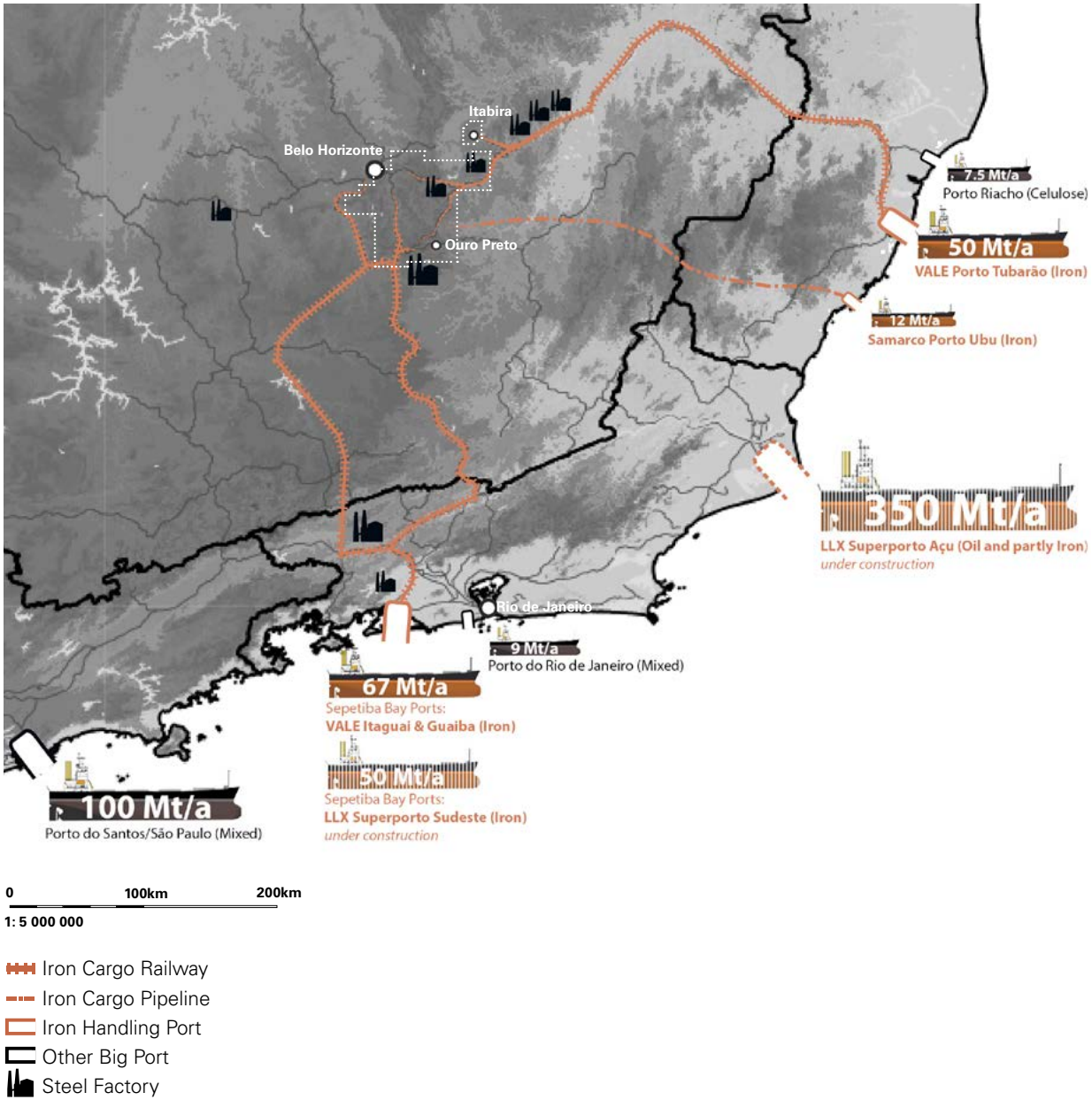
Samarco Slurry Pipeline for Iron

The partly Vale-owned company Samarco recently introduced a pipeline that carries water-iron-composite, linking the Germano mine to the Ubu Port.



Cargo Loading

To connect a mine to the railway and to enable the trains to turn, ample earthworks are required to re-shape the terrain. In big mines like the pictured one, Brucutu iron mine, about 1t of material is loaded per second.



Exportation Routes

The first merely export oriented railway was established in the 1940s, connecting the mines to the city of Vitoria, where Vale built the Tubarão port. Later, also the old railways to Rio were extended to carry large cargo trains.



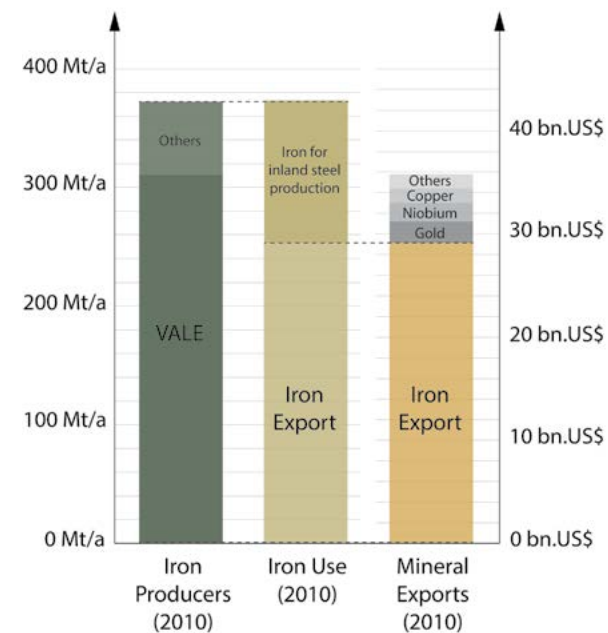
Vale Ordered Bigger Bulk Carriers

The bulk ships Vale recently ordered are the world's biggest, in size only surpassed by some supertanker ships.



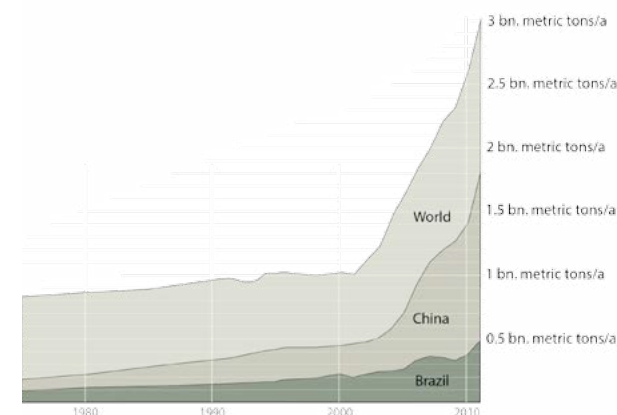
Swiss Companies Might Buy LLX-Port

Eike Batista, son of the former Vale-director Eliezer Batista and founder of LLX and other enterprises, offered the LLX Superporto Terminal for sale when he went bankrupt in 2012. Amongst the interested parties were the two commodity traders Glencore-Xstrata and Trafigura, both registered in Switzerland.



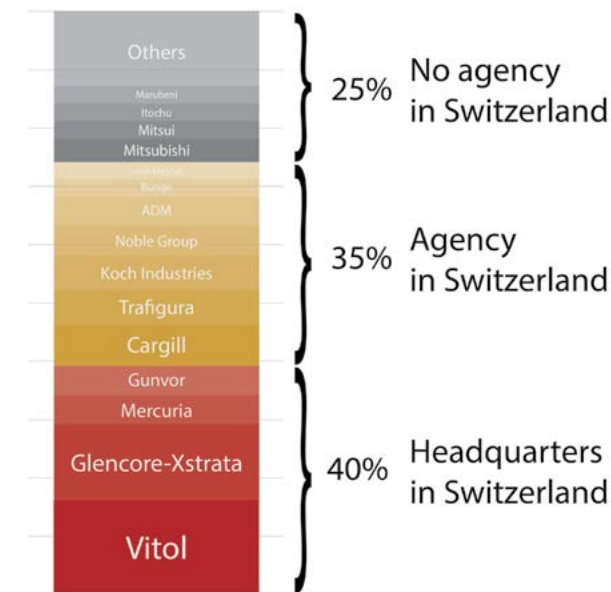
Most of Brazil's Iron Is Being Exported

The relatively high taxation and the need to import mineral coal make steel production in Brazil economically rather unattractive. Thus, only the domestic steel demand is covered by inland production, the rest of the iron is being exported.



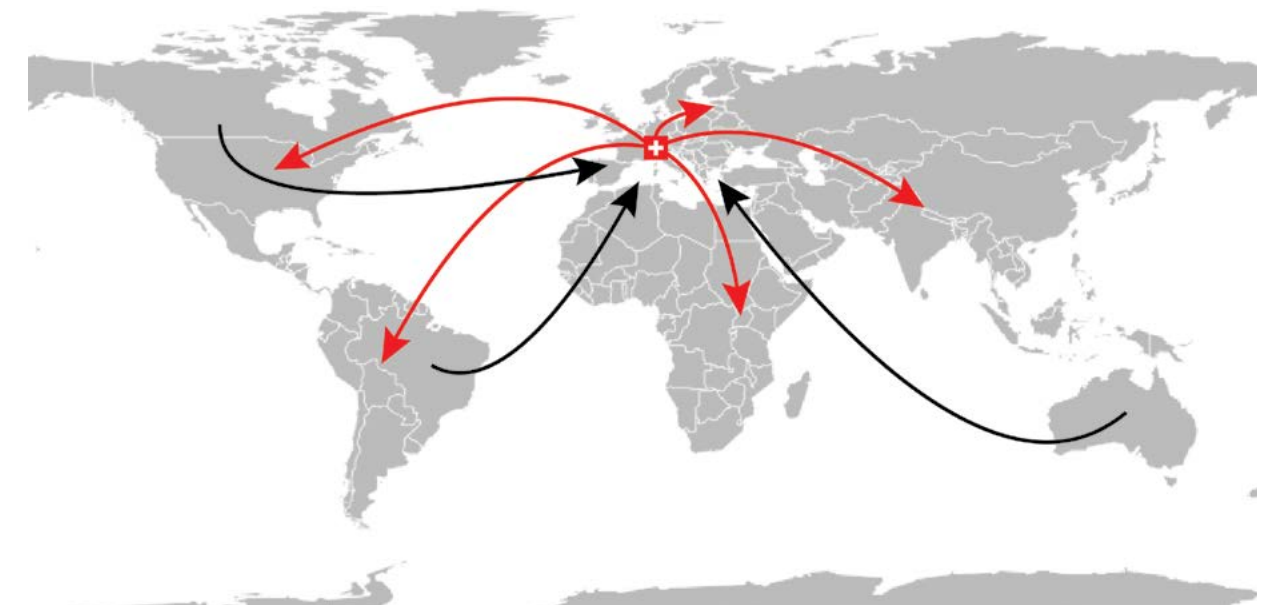
Recent Global Iron Boom

The global steel demand has exploded since 2000. Brazil since then doubled its iron production, outpaced only by China, that expanded even faster.



Commodity Traders Based in CH

Some of the world's biggest commodity trading companies have their headquarters in Switzerland, taking advantage from the lax swiss fiscal legislation.



The Role of Switzerland

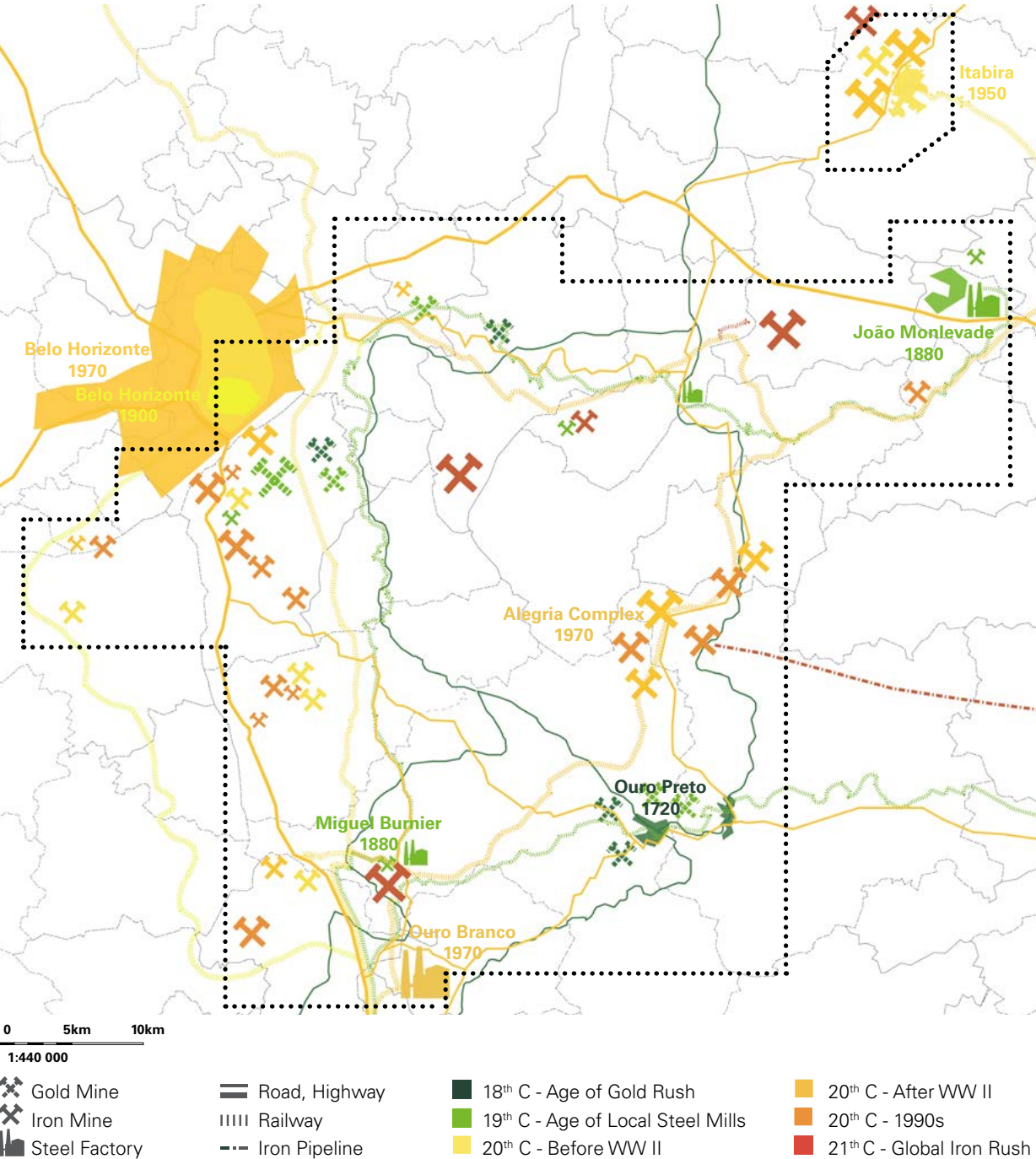
Since 2000, Switzerland has become an very big hub for mineral commodity trading - not physically, but legally. Also Vale joined in and founded an agency in Switzerland in 2006. In 2012, the Tagesanzeiger Newspaper reported, that Vale had defaulted cantonal taxes for several years.

THE EFFECT OF CONSTANT MINING ON THE TERRITORY

Mining is continuing to reconfigure the territory of the Quadrilátero Ferrífero for already three centuries, coining a particular cultural landscape and a mesh of superimposed infrastructures and networks. The focal points of urbanization oscillated in the area and shaped a lifestyle of continuous alteration.



Modified landscape with tree farm, close to Pico mines, Itabirito



Scattered Urbanity: Infrastructure and Urbanization Centers

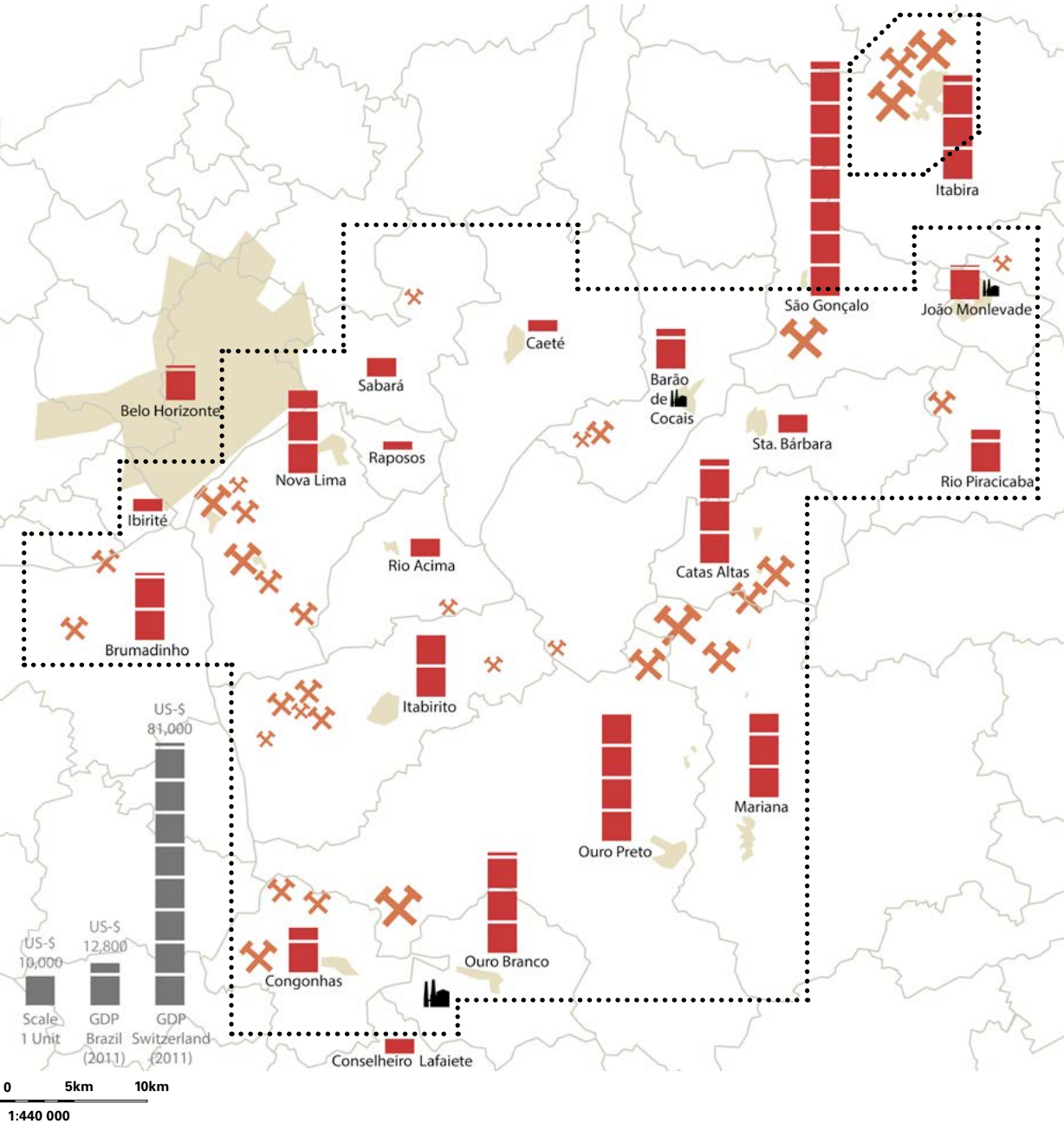
After the initial gold rush era when Ouro Preto became the capital of the new state Minas Gerais, the focus of urbanization in the 19th century shifted to steel producing cities like João Monlevade and Miguel Burnier. In the 20th century, Belo Horizonte was founded, and the federal government actively pushed iron quarrying in Itabira. After World War II, efficient highways and cargo railways opened up the territory for mining sites remote to cities like Alegria. They broadly ignored historical ties, and allowed a new scale of mining and of processing facilities, like the steel factory of Ouro Branco.



Mine Urbanism Today

Many of the recently established mines are remote from any existing settlement, temporarily introducing a abundant range of infrastructure to these places, from unpaved access roads and a cargo railway loop to water and electricity circuits.

A residential development in proximity to the mine on the other hand is neither necessary nor desirable anymore, since the unprecedented pace of extraction leads the mines to be exploited within few years, and all the equipment as well as the well-established commuter bus system are optimized to be adaptable to that.



GDP Comparison Shows: Rich Soil Leads to Inequality Among Towns

The municipality borders, that date back to the pre-iron age, became increasingly important with the industrial iron production, because of the enormous revenue they generate for their respective municipalities via Value Added Tax and the royalty recompensations, which for iron are set at 2% of the release value. Especially small communities become instantaneously wealthy when a big mine opens on their territory, as it happened in São Gonçalo do Rio Abaixo with the Brucutu mine in 2006. This temporary bonanza causes a very uneven wealth distribution, as well as a strong financial dependency on the mining industry, threatening even bigger cities like Ouro Preto, that have no physical impacts to fear of the iron mining at the outskirts of their territory.



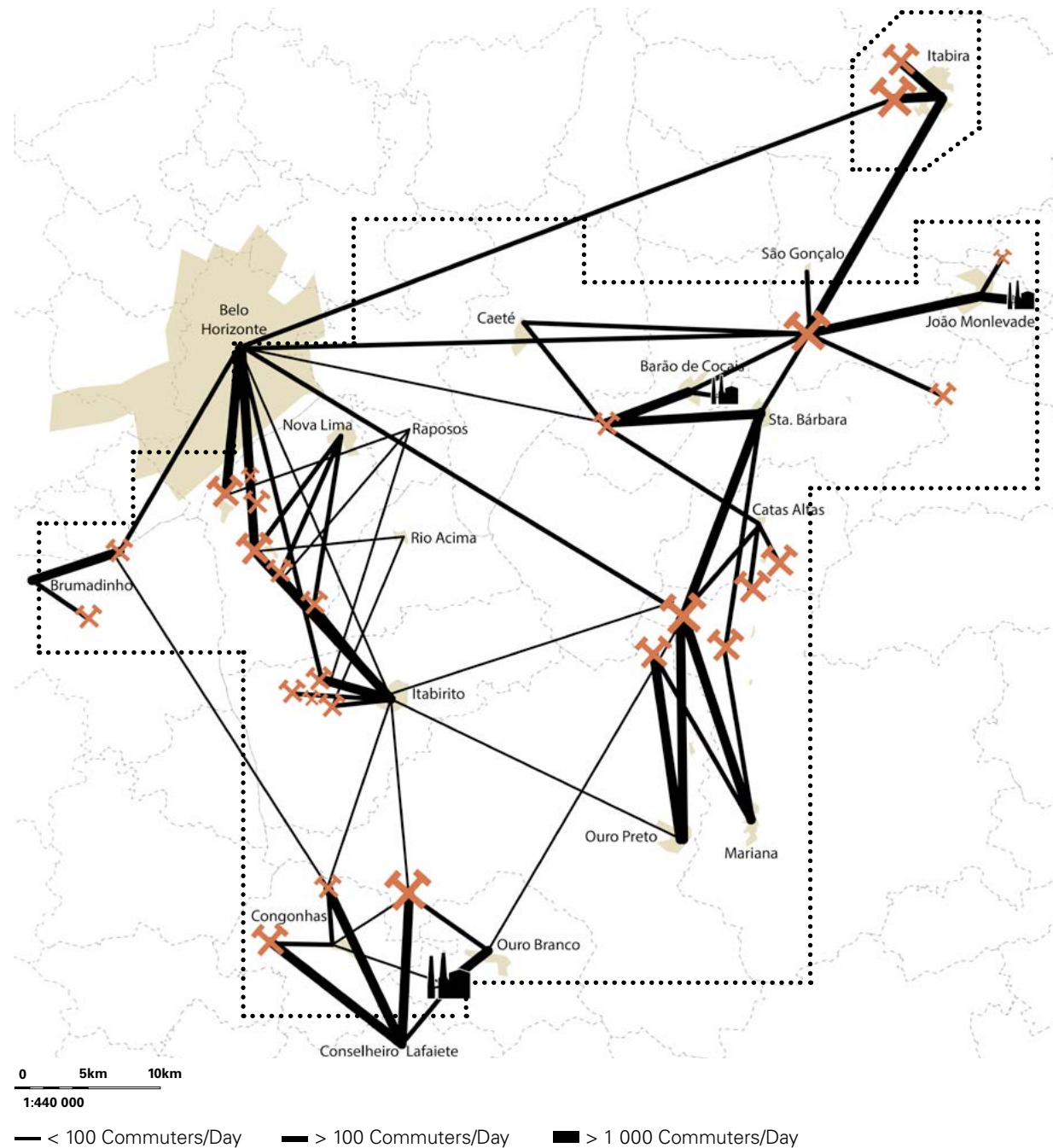
Public Park in São Gonçalo

A extraordinarily tidy park in the village of São Gonçalo.



New Infrastructure in São Gonçalo

Positive effects of mining become especially visible in the small villages like São Gonçalo do Rio Abaixo. Thanks to the revenues of the new Brucutu mine, São Gonçalo can improve it's public infrastructure, which they could not afford otherwise.



Commuter Lifestyle

Belo Horizonte is the main hub for the regional administration, and serves as home base for ambulatory engineers, doing maintenance in various mines reachable by car in one or two hours.

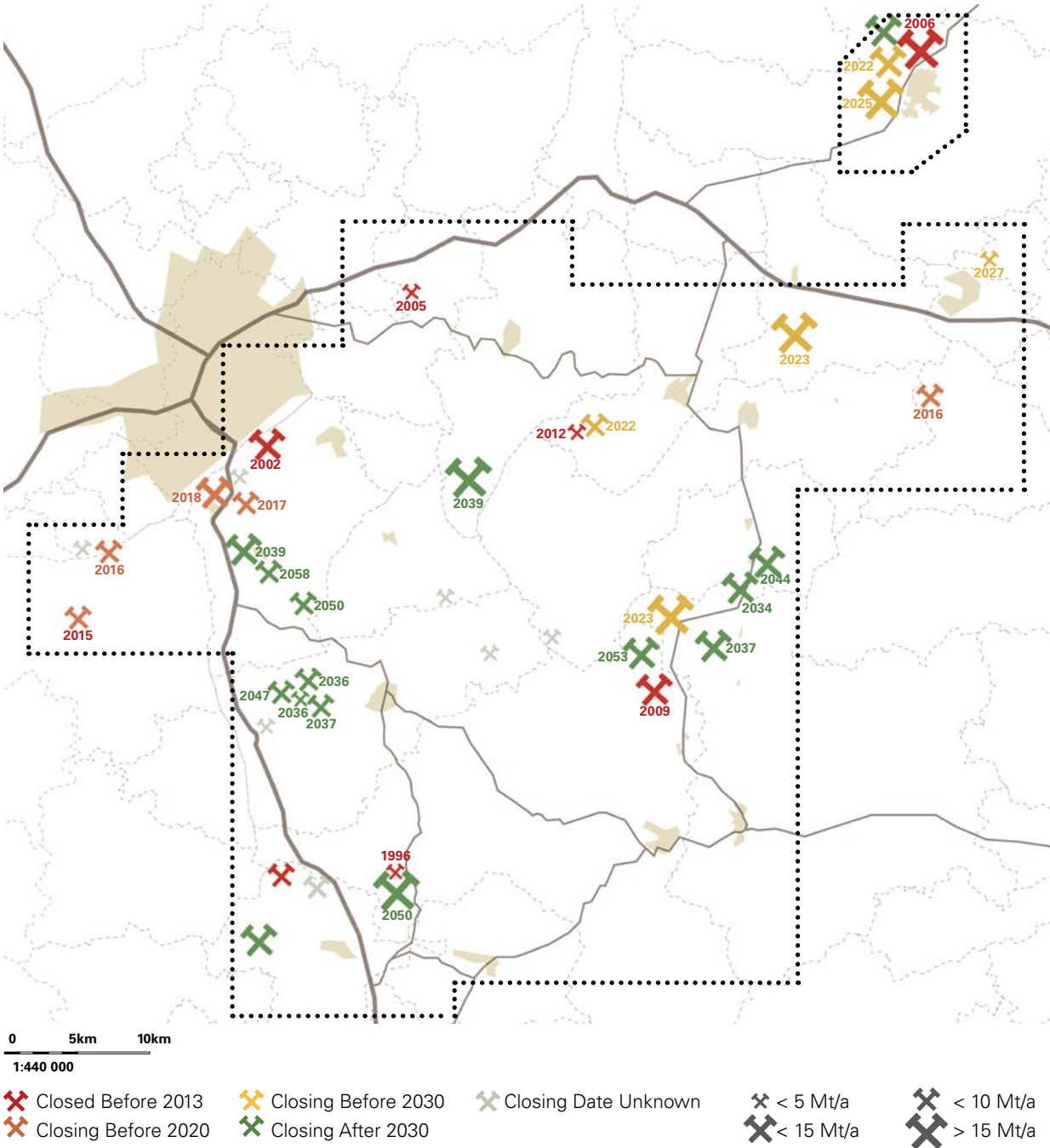
The majority of the mine related workers live in towns within the Quadrilátero Ferrífero, ranging in size from 2 000 to 100 000 inhabitants, summing up to about half a million residents scattered in the hilly area that is nurtured mainly by the mining industry.

Transportation is provided by the employing companies, either by lending a company car, or by provision of a commuter bus network. Public transportation on the other hand is barely existing.



Bus Service Provided by Companies

Commuting happens mostly over distances of about 30 min, with buses operated by Vale or by private companies. The buses are serving stops placed along the roads, collecting people to bring them to the mine for their working shift.



Mining Heritage

The gradually depleting iron mines leave behind losses in the balances of the local tax office, but also large infrastructures and reconfigured landscapes, which raises the question of what comes after. The proposals on how to deal with the mining heritage reach from renaturalization over re-use for a different purpose, e.g. as a water reservoir, to including the mining activities into a integrated tourism- and landscape preservation strategy under the label of the UNESCO Geopark. And new proposals might appear, if the perception of industrially and humanly reconfigured landscapes undergoes a similar shift in aesthetic perception as in several places like the Zeche Zollverein in Germany.



UNESCO Geopark Proposal

Academics of various universities proposed to enlist the Quadrilátero Ferrífero to the UNESCO Geoparks, in order to preserve the unique geological and mining heritage as touristic attraction, and aiming at establishing a better dialogue between mining companies and the affected population.



Post-Mining Landscape at Pico Mine

The remnants of mining form an impressive landscape that one day even might become a touristic attraction itself.

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IMAGE CREDITS

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