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The Geopolitics behind the Cryptocurrency Mining in Kazakhstan

Hugo Estecahandy, June 2023

Working paper

On 25 January 2022, following a beginning to the year which had been affected by major political unrest resulting in the deaths of more than 230 people¹, Kazakhstan was hit by a major power blackout. For around twelve hours, the entire southern regions of the country were left without power, as were Uzbekistan and Kyrgyzstan, two neighboring countries with which the southern country shares the same electricity network. This event is the culmination of several months of over-consumption, power surges and localized outages on the Central Asian networks. In Kazakhstan, electricity consumption rose by 8% in 2021, according to Ministry of Energy², the national electricity operator, compared with the 1-2% annual increase previously recorded. This explosion in consumption is said to have been driven by the widespread development of cryptocurrency mining, a digital activity that can be extremely energy-intensive when operated on a large scale.

Mining involves running processors, and therefore computing power, to secure the digital networks that enable various cryptocurrencies, such as bitcoin, to be secured and operated. As a 'reward' for mobilizing this computing power and the resources consumed, verifiers – miners – can be automatically rewarded with cryptocurrencies. This is how bitcoins are issued, how they are 'mined' by machines, a process that accentuates the 'semiotic materiality' of bitcoin (Searada, 2020), or even a certain 'digital metallism' (Maurer & al., 2013), and which helps to reinforce the representation of a proximity between the value associated with bitcoins and the value associated with rare metals such as gold. The geography of this new kind of excavation industry is unusual in the sense that it is not constrained by the location of the resource to be 'mined', which can be reached by the presence of an Internet connection, but above all by the presence of the resource that enables the processors to carry out the mining, i.e. electricity. It is the availability and price of electricity that is the primary factor in locating the activity (Estecahandy, 2021), which began to develop on an industrial scale with the rise in value of bitcoin.

Most of this mining was conducted in China until May 2021, when Beijing's announcement that the activity would be banned from the country led to a massive relocation of hundreds of thousands of processors around the world. This event considerably accelerated the installation of energy-intensive computing power in Kazakhstan, speeding up the country's electricity deficit, and putting a strain on an obsolete energy infrastructure. Already weakened by the Internet blackouts implemented by the government to contain the social unrest of early January 2022, the industry was subjected to restrictions by the state, which asked the vast majority of miners to cease their activity, and police operations followed to close down sites whose managers did not cooperate. The situation stagnated until 2023, when a new law designed to regulate the industry came into force in April.

1 « Russia-Led military alliance completes withdrawal from Kazakhstan », Radio Free Europe/ Radio Liberty, www.rferl.org/a/kazakhstan-csto-troops-withdrawal-security/31661294.html

2 “Alexander Verbynyn, *Энергосистема Казахстана оказалась под угрозой из-за майнеров* [Kazakhstan energy grid threatened by miners] », *Kazakhstanskaya Pravda*, 11 novembre 2021. <https://kazpravda.kz/n/energositema-kazahstana-okazalas-pod-ugrozoy-iz-za-maynerov/>

The establishment of this activity in Kazakhstan has given rise to major energy problems, and its development has been driven by a number of geopolitical dynamics. It is impossible to precisely know and map the industry in Kazakhstan because, as this article explains, it has very often been developed in an opaque or even illegal way. In order to better understand and study these issues, a three-month field study was carried out in the country between February and June 2023, the results of which are presented in this article. The aim of this article is first to analyse the spatial logics of the industry in Kazakhstan, which have shaped both the geography and the forms in which mining has emerged there. Then, the paper focuses on the political dimension of mining in Kazakhstan, in order to understand how and by which networks of actors this energy-intensive activity has been developed, sometimes illegally, to the point of threatening the country's energy integrity, and how the government's management of this situation echoes the political transformations Kazakhstan has undergone. Finally, this paper discusses the industry's prospects for development in the country, analyzing the very specific legislation that has provided a double regulatory framework for mining since April 2023, but also how this legislation and the chaotic history of the industry in the country have conditioned a number of risks and limits to the sustainable development of mining.

The specific geography of crypto mining in Kazakhstan

Mining is thus a very material part of the complex, multidimensional infrastructures that are cryptocurrency networks. Not all digital currencies require computing power to operate, and some, such as ether, have even given up this process in favour of a less energy-intensive one, with Bitcoin being the network most concerned by this process³. This has led to the emergence of a geography specific to cryptocurrency mining, driven by a number of location factors, the main ones of which are similar to those of a data centre, a source of energy and cooling (cold climate, presence of water) and Internet connectivity (Bakis, 2013). But unlike a datacentre, whether it is used for storing or routing digital data, the location of a "mining farm", which contains just the "work force" and therefore the production tools, is not subject to any imperatives other than optimal profitability. On the other hand, the presence of such facilities on a sovereign territory can raise issues of monetary and digital sovereignty, since it refers to non-state players who claim the right to mint a currency that was initially created as a substitute for traditional currencies, as well as the State and traditional financial players (Nakamoto, 2008). With little or no supervision, mining can consume large quantities of energy, sometimes carbon-based, without benefiting the host territory. So, a country's legislation on mining and the stability of its policies are important factors in its location. When China banned mining in 2021, redrawing the global mining map, many players in the business had to adapt very quickly, if not abandon the industry altogether.

The China's Effect on the World Mining Map (and on Kazakhstan)

It is impossible to determine the precise geography of mining, and the location of each processor involved, as it is extremely fluid due to opportunities in energy prices or changes in territories legislation. However, some estimations, show that some areas are more affected than others. For example, the vast majority of Bitcoin's computing power was in China until May 2021 (De Vries & al., 2022), when the Chinese government announced a ban on mining (which will subsequently take effect in September). Officially, Beijing's decision to ban the activity was motivated by a desire to

³ This process is called Proof of Work, and needs computation power to secure the digital transactions ledger, the blockchain, unlike the Proof of Stake process (adopted by ether) which doesn't ask computation or any energy-intensive activity to operate.

reduce its consumption of coal, which accounts for the vast majority of the country's energy mix, in order to reduce its environmental impact (Fan & al., 2022), but also because the price of coal was rising sharply. It seems relevant to note that at the same time the Chinese government was tightening its control over electronic payment tools and methods, suggesting that the ban on mining was also a way of meeting these other internal Chinese policy objectives.

This decision led to the flow of processors across the Pacific Ocean, mainly to the United States, particularly Texas with its oil fields whose gas is used to generate electricity, but also to Canada and some South American countries⁴. But a very large proportion of this computing power has been sent eastwards, to Russia and especially Kazakhstan. Trucks loaded with processors crossed the China-Kazakhstan border, giving rise to an unexpected alternative and opaque version of the so-called Digital Silk Road.

Some miners already established in Kazakhstan, where the activity began to be developed on an industrial scale in 2017, found themselves inundated with calls from processor owners wishing to relocate there. Dmitri Ivanov⁵, head of the sales department at Kazakhstani mining company Enegix, explains that the number of calls exploded after the Chinese government's announcement. According to him, he was receiving dozens of calls a day from China, from industry players looking for infrastructure to host their processors, even though his company had just created the most powerful farm⁶ in Kazakhstan - with a capacity of 180 megawatts (MW) - to meet ever-increasing demand. Hosting processors belonging to third parties is a very common business model in the mining industry, and amounts to renting out storage capacity and electrical connections. This phone experience was shared by most of Kazakhstan's mining companies, even the smallest actors. Moldir⁷, a Kazakh entrepreneur who at the time owned various small mining farms (less than 5 MW each) in the south of the country, adds that Kazakhstan had so quickly emerged as a key destination for mining that investors were calling in, sometimes proposing to put millions of dollars into the business, without having any experience or knowledge in the field.

This situation has also led to an explosion in the trade of processors within Kazakhstan, as their former owners can no longer use them, officially, in China. This trend can be seen on Telegram channels dedicated to mining in Kazakhstan, but has also been keenly felt by Arman, who runs an Astana-based processor import and resale company, Pro Mining KZ. He explains that he was able to recover “a huge amount” of machines, and that they quickly found takers in the country. While it is impossible to quantify the number of processors that have been installed in Kazakhstan as a result of Beijing's decision, these various accounts give an idea of the scale of the phenomenon.

A geography of cryptocurrency mining shaped by Kazakhstan territorial divides

Whether before or after Beijing's decision, cryptocurrency mining has not been developed on the same scales and in the same forms across Kazakh territory. This is mainly due to a double divide in the territory, both energetic and climatic (see Map 1.). As early as 2017, it was in the north of the country, where there was an energy surplus, that Denis Rusinovich⁸ participated to develop some of the country's first mining projects for the Genesis company, which developed up to 280 MW of

4 Muir, Martha. “China’s exiled crypto machines fuel global mining boom”, Financial Times, November 22, 2021. <https://www.ft.com/content/0dbe4f9f-a433-4288-858e-c4b852f4c340>

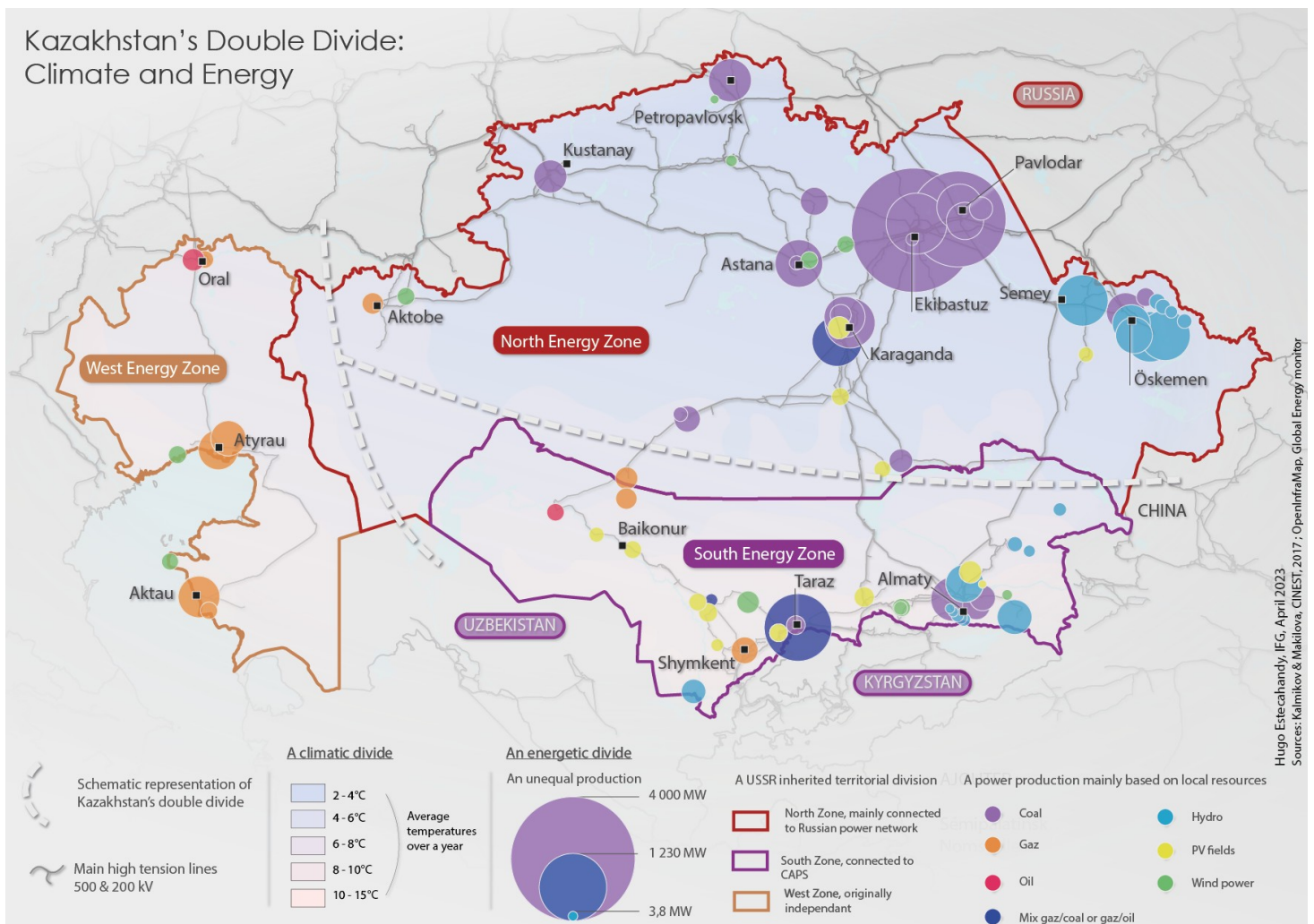
5 Interviewed on February 2nd, 2023 and May 17th, 2023 in Almaty (Kazakhstan)

6 A “mining farm” refers to a physical facility hosting cryptocurrency mining computation power.

7 Interviewed on February 3rd, 2023 and May 18th, 2023 in Almaty (Kazakhstan).

8 Interviewed on visio call on June 2nd, 2023.

mining spread over three sites. According to Dmitri Ivanov, from the company EneGix, which started the activity at the same time, the most powerful mining farms were installed in the north of the country, where the majority of electricity is produced and therefore where the availability of electricity is greatest. These areas experience extremely cold temperatures in winter (down to -40°C) and are mostly steppes battered by powerful icy winds and snowstorms at this time of year. While the imposing coal-fired power stations and powerful power lines that crisscross the region and interconnect it with the Russian grid, a legacy of Soviet territorial organization, make these steppes an ideal place to develop major mining facilities, these climatic characteristics require special infrastructure. The EneGix mining farm at Ekibastuz, for example, due to be completed in 2021, is in a highly strategic location, close to the country's most powerful power stations and a very high-capacity electricity transformer providing regional routing on 220-kilovolt lines (see Map 2). While using natural cold to cool the processors helps to optimize the operating costs of the mining farms, they must be able to withstand such bad weather and therefore be installed in specially adapted structures, built for the occasion or refurbished after the cessation of the industrial activity previously carried out. Dmitri explains that it is very complicated, in the north, to mine in specially equipped containers, as is often the case in regions with milder weather, which are very vulnerable to bad weather, especially snow that seeps into the cabin and can quickly destroy the machines.



Map 1. Kazakhstan's Double Divide: Climate and Energy. Hugo Estecahandy, April 2023.

This type of mining, carried out in containers, and more generally smaller-scale farms, has mainly been developed in the south of the country. The climate there is milder, but the amount of energy available is smaller. The electricity network in the south of the country has historically been part of the Central Asia Power System (CAPS), which interconnects these regions with Kyrgyzstan and Uzbekistan (Westphal & al., 2022). While the northern electricity network has been connected to Russia since the USSR, the Soviet government had planned for the interconnection of the CAPS countries, a situation which still persists and which has led to tensions between the countries concerned over the sharing of electricity and resources. Although, in theory, northern Kazakhstan produces enough electricity to meet the needs of the southern regions, the power lines installed in the 1990s to connect the two areas are not powerful enough to meet the demand for the transit of so much electricity (Assembayeva & al., 2018). The obsolescence of the country's power stations is a real problem, but so are the power lines. Apart from the recent lines that cross Kazakhstan from north to south, most of them and their transformers are old from the Soviet era. So, while the quantity of energy available is sometimes sufficient, it is the transit capacity that is not. And this is where mining poses a problem: by requiring large quantities of electricity, the activity has been able to weaken and even damage the network. These problems are exacerbated by illegal mining, where the electricity consumed could not have been foreseen, especially when it is installed in residential areas connected to a network that was not designed for high voltages. Wild farms have been installed in residential flats, as Madina⁹, a Kazakhstani student in 2021, observed. Invited to a party at the home of "friends of friends" in Almaty, she found herself in a three-bedroom flat, two of which were completely filled with working processors.

According to KEGOC, the national electricity grid operator, in the first 10 months of 2021 compared with the same months in 2020, electricity consumption in Kazakhstan increased by 11.6% in the southern zone, 5.7% in the northern zone and 7.5% in the western zone, and total power demand at national level was 1,500 MW higher than the previous year. Although mining projects have indeed appeared in the Western region, a region whose electricity grid has historically operated in isolation - although it is now connected to the Russian grid - mining has mainly been developed there directly on gas extraction sites, used to generate energy and not connected to the public grid (Rusinovich, 2023).

Networks of power on the power network

Illegal mining and multiscale gray zones

Illegal mining in Kazakhstan is not easy to define, even before the April 2023 law comes into force. It should be reduced to mining activity that is not declared to the authorities, powered by electricity that is stolen or purchased on an irregular basis. However, formalizing the activity itself may prove complex. Before this law, it was theoretically necessary to declare mining activity to the authorities, particularly in order to pay a specific rate for electricity. While operating her small farms, Moldir took the necessary steps to pay these taxes in 2021, at a time when energy consumption in the country was beginning to be critical. Shortly afterwards, representatives of the electricity company, accompanied by police officers, arrived on the scene and asked her to cease her activity. When she asked for an explanation, one of the policemen laughed and told her that they had found out where she was because she had declared her installations and told her that she shouldn't have done so. According to her, other undeclared mining farms, whose location and owners she knew, were able to continue operating. So, as long as mining remained small-scale, it seemed confined to operating in the shadows, in a "grey zone" where regulation norms were not applied (Martin, 2022) or simply

9 (Pseudonym) Interviewed on February 17th, 2023 in Astana (Kazakhstan).

did not exist. But the blackout in January 2022 changed all that, and the decision to reduce the country's electricity consumption came directly from President Tokayev.

From February 2022, police and Ministry of Energy operations, carried out over 5 days, enabled the shutdown of mining sites with a total capacity of 202 MW, according to official figures¹⁰. On 15 March 2022, Kazakhstan's Financial Monitoring Agency announced the closing of 106 mining farms following inspections and the announcement of measures: 55 voluntarily ceased operations and 51 were forced to close because they were deemed "illegal"¹¹. Of the 55 whose owners have cooperated, activity has been suspended and measures have been taken to prevent processors from being sold illegally. Some of these farms were owned by companies affiliated to political and economic figures in Kazakhstan, whose names are publicly mentioned in the official communication, an important fact covered in the next part of the article.

The 51 farms deemed "illegal" were plugged to undeclared or stolen electricity. For example, the same report mentions the closure of a farm in a special economic zone near Karaganda. Two other cases mentioned are also revealing of the forms that mining and the use of resources can take: two agricultural businesses growing crops in greenhouses were selling their surplus electricity to undeclared cryptocurrency miners. Finally, "companies associated with Teglen Matkenov", a former head of department at the Ministry of the Interior, were used to carry out undeclared mining. Finally, 25 criminal cases were investigated and a telephone number was set up to enable Kazakh citizens to report any illegal mining activity. According to the Financial Monitoring Agency, as a result of these interventions, the country's daily consumption has fallen by 600 megawatt hours. Other cases of illegal mining were subsequently reported. Later, in July 2022, the Kazakh police dismantled a gang specializing in extortion and armed operations, who were forcing computer engineers to operate a farm near Almaty under threat¹².

Most of the illegal farms were developed through the corruption of local law enforcement agencies or certain employees of electricity companies, as illustrated by one of the cases of illegal mining discovered in February 2022, near Taraz in the south of the country¹³. As with the illegal farm in Karaganda mentioned above, a mining site had been set up in a special economic zone, and its managers were paying a preferential rate for electricity, officially to make clothes. The farm was set up in a former textile factory by "foreign investors", who allegedly spent up to 1.5 million tenge (USD 3,000) to bribe employees of both the regional electricity grid (in the Jambol district of Taraz oblast') and the company that supplies electricity locally, AJK.

These various cases highlight the predominant role played by certain "power" players in the development of mining in Kazakhstan, particularly those with technical power. As the following examples show, this technical power can be a technical-political power, relating to control of

10 Ministry of Energy of Kazakhstan, "Министерство энергетики сообщает о выявлении 13 майнинговых ферм с суммарной мощностью 202 МВт [Ministry of Energy reports the identification of 13 mining farms with a combined capacity of 202 MW]", February 21st, 2022. https://www.gov.kz/memleket/entities/energo/press/news/details/329670?lang=ru&ysclid=lheshrbplr92_67297

11 Financial Monitoring Agency of the Republic of Kazakhstan, "По пресечению незаконной майнинговой деятельности [On cracking down on illegal mining activities]", March 15th, 2022. <https://www.gov.kz/memleket/entities/afm/press/news/details/340913?lang=ru>

12 Mukhametgaly, Fariza. "Сотрудники МВД и КНБ задержали бандитов-майнеров [Interior Ministry and KNB officers detain mining gangsters]", Polisia, August 1st, 2022. <https://polisia.kz/ru/sotrudniki-mvd-i-knb-zaderzhali-banditov-majnerov/>

13 Anti-Corruption Agency of the Republic of Kazakhstan, "Деятельность "Серых" майнеров пресекли в Алматинской области [Grey miners cracked down in Almaty region]", February 21st, 2022. <https://www.gov.kz/memleket/entities/anticorruption/press/news/details/330125?lang=ru>

resources and/or the distribution networks for these resources. Since the main resource needed for mining is electricity, it is the employees of electricity production and distribution networks who have this technical power, consisting of both knowledge and access to the electricity network, which can be bribed as in the case of the Taraz farm. But the results of the operations to dismantle illegal sites posted by the Financial Supervisory Agency clearly show some names of powerful personalities in the country. These players have two characteristics that are of major importance here. On the one hand, they wield considerable political and economic power through their activities and properties in the energy and political sectors, and on the other, this power is strengthened by their personal proximity, more or less direct, to former President Nursultan Nazarbayev.

The Governmental Crypto Mining Hunt: extension of the country's political transformation

Since President Tokayev took office in 2019, and especially since the riots of January 2022, the origin of which is attributed to Nazarbayev's political clan by the government now in power, a campaign to recover the assets owned by members of the former President's circle of influence has been underway. This process of "denazarbayefication" (Laruelle, 2019) aims to remove the residues of a patrimonial regime (Schatz, 2004, Fauve, 2013, Kudaibergenova, 2016), which enabled Nazarbayev "to maintain authority thanks to his personal authority and informal power networks [...] mobilized to capture the power of the state (or state property) in the interests of its members" (Isaacs, 2011), which was once completely embedded in all layers of Kazakh politics and the economy. This consolidation of power has therefore been achieved through a clan system, based on a model of quasi-vassalage to Nursultan Nazarbayev, to which the country's key figures belong, including members of the former President's family. And the names of the personalities involved in the mining cited by the Financial Monitoring Agency appear to mirror part of this network. There is an eminently political dimension to this fight against mining, in that it is cutting off part of the income of people close to the former President and publicizing their involvement in the opaque development of an industry that would have weakened the critical energy sector.

Among those named are the oligarch Alexander Klebanov and Bolat Nazarbayev, the former President's brother, who are alleged to have developed mining projects in the Pavlodar region, in the country's industrial north-east. The former Chairman of the Board of Directors of Qazaqgaz, Kairat Sharipbayev, married to Dariga Nazarbayeva, one of the former President's daughters and at one time Kazakhstan's second richest person, is also mentioned as having been involved in the development of mining in the Aktobie region, in the north-west of the country. Finally, Yerlan Nigmatulin, a well-known businessman, should also have stopped his mining activities in the Karaganda region. These figures are said to have stopped all mining at the request of the authorities, and are not being prosecuted for "illegal mining", but the public mention of their names is added to the many charges against them, notably for corruption and misappropriation of public funds.

All these people were linked to Nazarbayev, and the case of Alexander Klebanov is revealing of the way in which mining was developed through these networks of power in order to benefit their members directly. Klebanov was part of this 'captured state' dynamic from the 1990s, following the collapse of the USSR. In other words, he gradually bought up and privatized many former Soviet infrastructures, especially in the energy sector. Through its Central Asian Electric Power Corp group, he owns a large part of the electricity and heating generation and distribution infrastructure in north-west Kazakhstan, particularly in Pavlodar, where its subsidiaries own and manage both electricity and heating generation and distribution, as well as the exploitation of river water, all

essential resources for the population and the region's major aluminum industries¹⁴. At least 2 million people depend on the electricity generated by the group. Bayterek¹⁵, which developed small mining projects in the north of the country in 2020, was one of the main players in mining in the north of the country. The power it held over the electrical infrastructure enabled it to mine bitcoins on its own behalf, but also on behalf of other members of Kazakhstan's political and economic elite. Bayterek has had a panoramic view of the development of mining in these territories, and he has no shortage of anecdotes to illustrate the exercise of this power. According to him, "some Klebanov's electricity companies employees were asked to connect buildings, which were in fact mining farms, without being told why. But they complied, and so computing power was connected to the regional network, because the owner of the processors was a "friend" or had negotiated directly with Klebanov or the company".

Although Alexander Klebanov was not prosecuted after January 2022, he was nevertheless publicly criticized by the President and some of the population. While he owned the TETs-1 thermal power plant in Ekibastuz, major malfunctions left the inhabitants without heating at the end of November and the beginning of December 2022, when temperatures plummeted to -30°C¹⁶. Residents we met on site in May 2023 said that the malfunctions affected the whole town, with one woman summing up, not without humor, that "outside we were in the winter cold of northern Kazakhstan, and as soon as we got [to our homes], we landed in Alaska"¹⁷. As a state of emergency was declared in the city and stalactites formed inside the flats, criticism of the oligarch grew and President Tokayev threatened to state the plant. Klebanov, for his part, justified the dysfunctional state of the power station and, above all, of the municipal heating network by the fact that the price of electricity and heating was too low and capped by the state, which meant that he did not have enough capital to maintain the plant properly. That same month, one of the managers of the coal-fired power station was found dead in his car, before a rapid investigation concluded that he had committed suicide following a dispute with his wife. Klebanov's key position in the electricity sector and his involvement in opaque cryptocurrency mining illustrate a model of power that allows business to develop to serve quasi-personal interests to the detriment of the efficiency of infrastructure that is critical to the country. These are the types of logic that the new law that will govern the cryptocurrency sector, from trading to mining, want officially to complexify from 2023 onwards.

The uncertain future of crypto mining in Kazakhstan

The double regulation for cryptocurrency and its mining industry

Written at the request of President Tokayev and signed by him in February 2023, the "Law on Digital Assets", which also aims to regulate the mining industry, came into force on 1 April 2023. It follows on from an initial text in 2019, which gave a legal definition of crypto-currencies as "digital assets", and therefore "property", explains Janibek Mukhamedjanov¹⁸, head of the Department for the Development of the Electronic Industry and the Digital Assets Industry, a sub-structure of the Ministry for the Development of Digital Innovation and the Aerospace Industry. This new legal framework has the unique feature of involving two different jurisdictions: Kazakh national law, and

14 CAEPCO website: <https://caepco.kz/en/aboutus/about-corporation.html>

15 (Pseudonym) Interviewed in May 2023 in Kazakhstan.

16 "Во все многоквартирные дома Экибастуза подали тепло [Every Ekibastuz housing buildings are now receiving heat]", KazTAG, December 4th, 2022. <https://kaztag.kz/ru/news/vo-vse-mnogokvartirnye-doma-ekibastuza-podali-teplo>

17 Interview with Yulia, met on May 29th, 2023 in Ekibastuz (Kazakhstan).

18 Interviewed on February 27th, 2023 in Astana (Kazakhstan).

the jurisdiction of the Astana International Financial Centre (AIFC), an entity where digital services companies can be registered, inspired by British law. The head of department at the Ministry explains that within the AIFC, a legal "sandbox" has been implemented to "enable the registration and launch of FinTech startups, including the field of cryptocurrencies within a light legal regime". According to Aynur Akhmetova¹⁹, a lawyer specialized in finance and advisor on the drafting of this legal text, this new law provides a framework for the entire cryptocurrency sector, "it was primarily designed to respond to the issues that emerged with mining".

In practice, cryptocurrency mining farms, i.e. the physical industry that enables digital currencies to be "produced", are governed by Kazakh national law as an industry. These facilities can be operated under certain conditions, in particular by obtaining a double license, explains Dauren Karashev²⁰, legal advisor to several mining companies and one of the main authors of this new law. This license covers both the site itself, which must meet certain conditions, and the processors used. An initial license is granted for the operation of the mining farm if it is installed in one or more dedicated buildings, themselves located in an industrial zone, or at least an area away from residential areas. Nauryzbek Bizhanov²¹, spokesman for the Ministry of Digital Development, points out that this last point spares the electricity networks used by local residents, which are often fragile, from possible overloads and power cuts caused by mining.

The same law stipulates that a minimum of 55% of the amount of cryptocurrencies generated must be sent to and processed in dedicated services hosted by the AIFC, either to be stored in digital wallet services or to be exchanged for equivalent values in traditional currencies (euro, dollar, yen, etc.). In addition to making the AIFC the de facto regulator of cryptocurrencies mined in Kazakhstan, the aim here is to make it as easy as possible to trace them and, ultimately, to apply taxes to them. The introduction of a license for mining farms, which must be registered as a Kazakhstani industry, coupled with the centralization of mined cryptocurrencies within services approved by the AIFC and the State, would put an end to a practice that was previously widespread, according to Dimitri Ivanov, which consisted of registering the mining farm's parent company in a country with a low tax burden, "such as the United Arab Emirates", without any tax being levied in Kazakhstan. For Aidar Beknazarov²², legal adviser to the AIFC, this regulation "cannot satisfy everyone at first", but it is destined to evolve. He points out that this is also one of the advantages of the AIFC: unlike the Kazakh jurisdiction, the rules can be amended quickly. He adds that the new law, although it has come into force, will take time to be fully applicable by all players.

Crypto Kazakhstan futures between broken trust, energy issues and monopoly risks

For the time being, the prospects for positive developments in mining in Kazakhstan are fairly slim. The very fact of imposing a requirement to purchase electricity from abroad greatly undermines the project for a "national industry", as Janibek Mukhamedjanov put it. It would mean relying on electricity from Russia, the only neighboring country that generates enough electricity to export it, to power mining in Kazakhstan. Removing any principle of sovereignty over mining would weaken the sector for two reasons.

The first is that, since the start of the war in Ukraine, Russia has been the target of economic sanctions by various Western countries, and sanctions could be applied to customers located in Kazakhstan who buy this energy and generate income for Russian industries. In 2022, the US

19 Interviewed on March, 27th, 2023 in Almaty (Kazakhstan).

20 Interviewed on February, 21st, 2023 in Astana (Kazakhstan).

21 Interviewed on February 26th, 2023 in Astana (Kazakhstan).

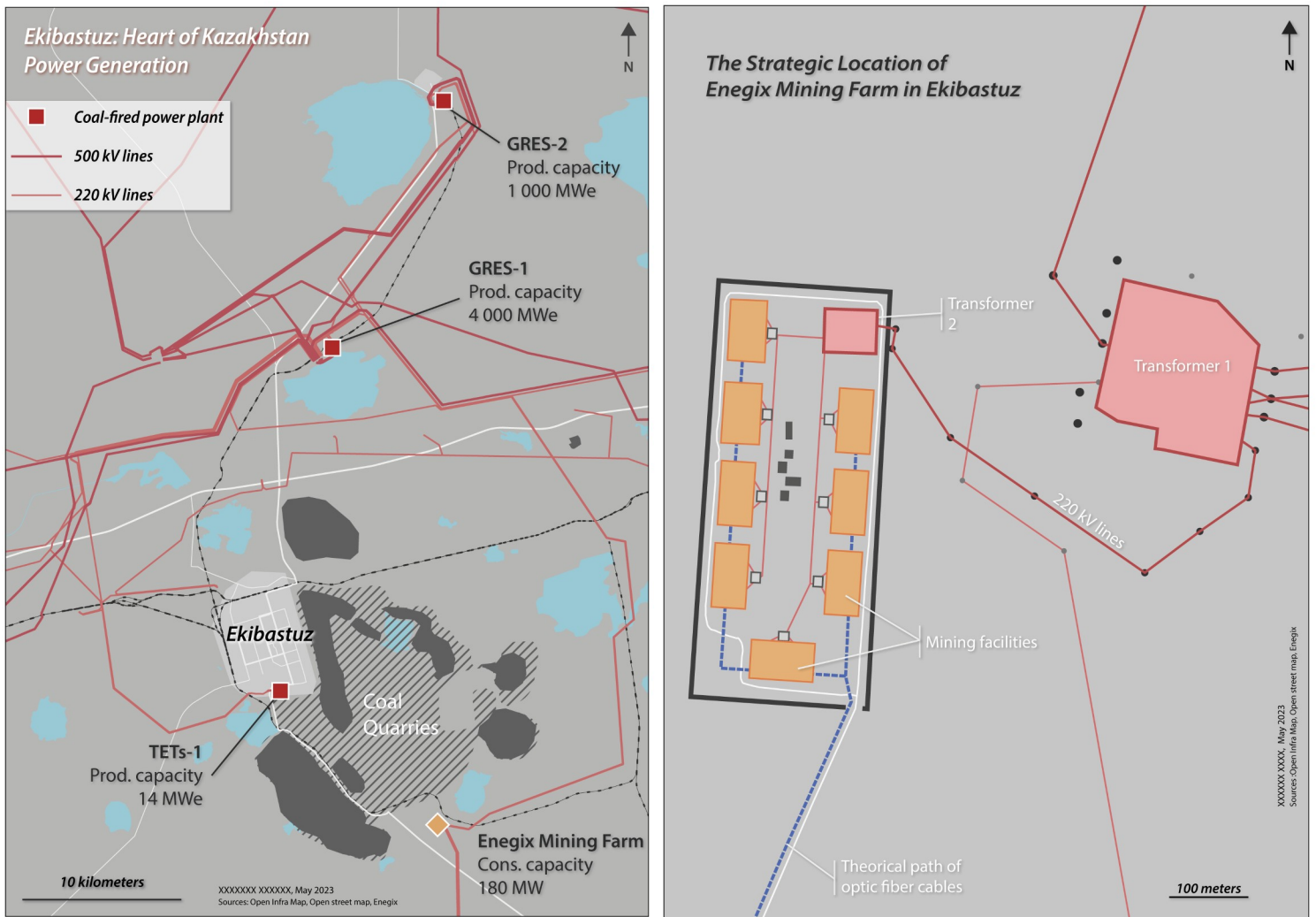
22 Interviewed on June 7th, 2023 in Astana (Kazakhstan).

Office of Foreign Assets Control initiated sanctions against the BitRiver mining company in Siberia (Russia), explaining that it allowed Russia to "monetize its natural resources"²³, since the BitRiver farm was powered by hydroelectricity produced by powerful rivers and housed many foreign companies' processors.

The second reason is that Russia itself could decide to cut off this supply. Since the start of the war in Ukraine, relations between Russia and Kazakhstan have been ambivalent. If mining develops strongly in Kazakhstan, becoming a significant financial manna for the country, its power supply would become a major geopolitical lever for Russia over its southern neighbor.

On a national scale, this new law also paves the way for the risk of the emergence of a monopoly in the sector. The technical conditions required to continue operating in the sector demand substantial financial investment. The Enefix farm, for example, fully meets the government's requirements (see map 2). In July 2022, there were 330 mining companies officially registered with the Ministry of Digital Development, of which less than half were operational. And although a "pardon" may be granted to miners who did not meet government requirements and whose farms were closed in 2021/2022 according to Janibek Mukhamedjanov, it is unlikely that they will be able to do so, unless they are "absorbed" by larger companies. So, for the time being, only the largest mining companies with the necessary capital and the ability to negotiate with the authorities seem likely to survive. An example of such a company is Enefix with its farm in Ekibastuz, located far from any populated area, connected to a 220 kV power line and strategically built next to a high-capacity electrical transformer.

²³ U.S. Department of the Treasury, "U.S. Treasury Designates Facilitators of Russian Sanctions Evasion", April 20th, 2022. <https://home.treasury.gov/news/press-releases/jy0731>



Map 2. Strategic Location of Ekibastuz Mining Farm. Hugo Estecahandy, May 2023

Finally, the country's political stability may be another factor holding back potential miners and investors. The recent political changes and unrest in Kazakhstan, from energy problems to Internet blackouts and the sudden cessation of mining, are all events that may discourage certain industry professionals from setting up in, or even returning to, Kazakhstan. An employee (who wishes to remain anonymous) of a Western mining company, speaks suspiciously of the violence and corruption his team had to face when the forces of law and order came to close down their facility in Kazakhstan at the end of 2021, before summing up: "Kazakhstan, never gain". Thus, the political stability of a territory and trust in the institutions that control it have become just as much a factor in locating this industry, undermining the idea of Kazakhstan being conducive to the development of cryptocurrency mining.

Conclusion

The geographical and geopolitical study of cryptocurrency mining allows us to understand several characteristics, both of the cryptocurrency mining industry and more broadly of digital industries, but also of Kazakhstan itself. The materiality of certain digital activities through their physical infrastructures follows spatial and geographical logics that are deeply linked to the characteristics

(climatic, technical, political) of the territory in which they are installed, and this is extremely significant for mining. In this sense, this work contributes to a field of research that can be defined as the geography of the digital (Ash & al., 2016). The study of mining also highlights the major problems associated with the country's completely antiquated electricity production and distribution infrastructure. While the fast and large-scale development of mining has obviously accelerated the process of network dysfunction, this problem existed before and continues to this day (Estecahandy, 2023, Runisovich, 2023).

This analysis also confirms the predominant role of politics in the geography and development of Bitcoin and other cryptocurrencies. Although they are based on principles of decentralization and the distribution of authority among their members, these cryptocurrencies are now at the center of political struggles and geopolitical dynamics. The adoption of bitcoin as legal tender in El Salvador and the Central African Republic, although the intended effect of these decisions seems to be more to fuel a discourse of emancipation by these countries from other powers that issue their national currencies (the United States and France respectively), is indicative of a state use of cryptocurrencies for geopolitical designs. Other direct state uses of crypto-currencies, such as by North Korea or Iran, which has developed a mining industry to circumvent Western sanctions, reinforce the use of cryptocurrencies by states wishing to redraw the geopolitical balance of power on international financial networks. It is therefore necessary to continue and consolidate the geopolitical analysis of cryptocurrencies and their industries, from the global to the local level, in order to understand the issues as clearly as possible. And this work seems all the more necessary today in Central Asia, where financial flows and the search for alternatives are at the heart of regional issues, at a time when Russia's strong regional roots make it a platform for circumventing Western sanctions and China, through its Belt Road Initiative projects, is increasingly imposing itself in the region.

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