

Proceedings of a Quiet Ecological Catastrophe  
and Factors Hindering the Greening of Kazakhstan

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### **Abstract**

The dissertation describes ecological catastrophe by reason, considering it entailed a chain of other far-reaching problems, such as: air pollution, the evanescence of the legacy of a great country - the Aral Sea, and the shallowing of the coal-filled black Caspian Sea along with the inability to preserve the Kazakh steppe from disappearing from this world.

According to history books and studies that served as a basis for this concept, it was found that the pollution of the public environment began in 1925. Indeed, it was March 30, 1925 when the Republic was declared suitable for the construction of production facilities. However, Kazakhstan, after the end of the Second World War, paid considerable attention to the development of industry.

Much attention is paid to ensuring the ongoing critical situation does not escalate to catastrophic proportions.

It has been found that sooner or later the man cannot refrain from nature's vengeance for thoughtless interference threatening deserts, diseases as well as salinization of the land. In fact, the Republic of Kazakhstan has the potential to acquire a healthy lasting life by cultivating environmental surveillance throughout the country and, more importantly, by negotiating a compromise with neighboring states.

*Keywords:* air pollution, ecological catastrophe, environment, pollution, nature

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## 1. Introduction

Kazakhstan ranked 33rd out of 115 in the ranking of countries in terms of urban pollution in 2022 (Kudaybergenov, 2022). Many residents of the country are frustrated by those statistics, as the environmental situation is completely catastrophic. Currently, there is a strong deficit of facilities and technologies for the treatment of industrial enterprises that cause toxic exhausts; thus air pollution is not regulated in all aspects. Apart from the above, transport is exploited with low-cost and low-quality fuel, and water supplies across the country are vulnerable to damage.

Kazakh people used to lead a nomadic way of life in ancient times. Nevertheless, even those humanity was able to handle the Earth they tended to navigate with care. However, the delicate human-nature relationship only lasted for a limited length of time. Modern scientific and technological progress, as well as human activity, has disturbed the balance of nature and created global environmental problems for future generations.

The interaction of society and nature in the second half of the twentieth century has resulted in a complex ecological condition in the country. Industries were widely expanded, leading to a high demand for raw materials, and underground and surface minerals were developed at an accelerated pace.

25-30 percent of top-oils are in terrible shape in the northern region of Kazakhstan. In the western part of Kazakhstan, pollution by wastes of oil and gas industry amounted to approximately 2.5 million tons (Rizuan, 2019).

Air pollution is a topic that has been wide for a long time in Kazakhstan. Notwithstanding the high volume of air pollution, the country still has a shortage of monitoring facilities. Regrettably, qualified monitoring is also carried out only in large cities of Kazakhstan.

Ecological concerns are even more complicated in the central part of Kazakhstan. One of the reasons is the environmental catastrophe caused by spacecrafts at Baikonur, as

technogenic, industrial pollution, radioactivity and rocket-space waste contamination has a major impact on the degradation of soils and pastures.

As for East Kazakhstan, there are numerous other ecological problems in those regions. The non-ferrous metallurgy, Wolfram, lead, zinc and other industries are causing harm to the local communities and inhabitants of the cities. Nowadays, Ust-Kamenogorsk is one of the biggest ecological cities in the world. The concentration of PM<sub>2.5</sub>, which means suspended solid Microparticles and the smallest droplets of liquid contained in the air, these days in Ust-Kamenogorsk is 1.1 times higher than the standard of the average annual air quality value recommended by the World Health Organization (IQAir, 2023).

Within 1949-1996, 503 nuclear weapons were tested on the territory of the country. Big amounts of hectares of land have become an ecologically catastrophic zone, and it took the lives of thousands of people, and still it does. However, government executives have not provided the population with any information or assistance (Rizuan, 2019).

The oil petrochemical, oil production, and refining industries all release hydrocarbons and different other foul-smelling substances into the atmospheric air. Around 184,000 tons of all kinds of hazardous substances from oil and gas production facilities are emitted into the atmosphere in the Caspian region (Sansyzbai, 2017).

The National Government issues a concept for the transition to a green economy in 2013. The main sectors of this concept were: the management of waste, water supply management, sustainable energy, and transport.

This concept is an extremely relevant asset for the whole country, because Kazakhstan occupies the third place in the world in terms of land and the fifth place in terms of pasture area around the world, which illustrates the scale of the country's natural resources. Though the aforementioned program was released back in May 2013, people have not yet understood or seen the final results of any of the efforts made by the government.

However, similar to other ecological projects, this concept has remained more in document than in practice, as it is not popularized (Rakhimbekova, 2019).

The purpose of this research is to investigate the causes of the ecological catastrophe in Kazakhstan, as well as the factors that prevent access to the transitioning to a green ecology. The main question of this thesis is as follows: «When did the imbalance between humans and the surrounding environment start, which led to a number of colossal ecological problems that are insoluble up to this day, because of the «shadow economy» in the country. What is preventing the state and residents from shifting to an environmentally friendly lifestyle».

The study also examines several factors affecting the ecology of the country. These factors contribute to the explanation of the gap in ecological relations between man and nature.

This thesis consists of four chapters. At the beginning of the thesis, the second chapter mentions the theoretical foundations. Chapter three describes the chosen method of the research, in addition, the collection of data and information collected from the research. The last chapter is about the measures and the results of the submitted hypotheses, and conclusion.

## 2. Literature Review

### 2.1. Concepts

#### 2.1.1. History of the emergence of industrialization and its expansion in Kazakhstan

Contamination of Kazakhstan's environment commenced in the 20th and 21st centuries because of the improper use of earth's resources (Kusainov, 2015). Since the end of World War II, the country was in a serious condition. During that time, the Heads of the Presidium of the Supreme Soviet of the Kazakh SSR devote all the resources to the development of industry, such as: ferrous and non-ferrous metallurgy, cement production, as well as mining and coal industry. Noteworthy is that even during the period when Kazakhstan was still a member of USSR, since 1925 on March 30 a committee on non-ferrous metals was held, where the main issue was «Production and economic opportunities for smelting lead and copper in the steppes of the Republic of Kazakhstan». It was stated at the conference that the Kazakh land was technically well positioned to carry out production of non-ferrous metals.

As written by Berdyguzhin et al. (2019), the history of oil in Kazakhstan originated even earlier, when in 1892 the Geological Committee determined to organize an expedition to study natural resources between the Emba-Ural rivers under the guidance of a Russian geologist. He decided to drill several boreholes in Dossor, Eskene and Karachungul. Notwithstanding, at that time, no results were found, thus all the documents and rights on the exploration data were sold to the heirs of the St. Petersburg entrepreneurs.

After 1894, lands between the Emba and Ural rivers were assigned to the possession of the company at the command of the imperial authority. The company was considered the first oil partnership in Kazakhstan, although it was first founded in St. Petersburg under the direction of colonel A.N. Lehman. By 1898 the company had excavated 60 boreholes in Dossor, Eskene, Karachungul and Karaton. One year later, in one of the holes of Karachungul was discovered gusher. Consequently, it was the first oil fountain in

Kazakhstan, which marked the starting point of the history of Kazakh oil (Berdyguzhin, Akserikova, Kaluova, Kupashev, & Maksutova, 2019).

*Figure 2.1. Karachungul cluster, which was the location of the first oil fountain (VoxPopuli, 2021)*



Karachungul is located south of the Nizhne-Emben fortification, which is not far from the Caspian Sea. This place has held special sacred significance for both the Kazakh and Kyrgyz populations. Earlier, the neighbors of the Kazakh people, the Kirghiz, had contributed to the appearance of the tombs of Muslim personalities before the well was drilled up here. Such patios are used by Muslims for regular visits and Muslim prayers. After the appearance of the oil bore, the villagers first turned to using it on their cattle to prevent various diseases (Trokhimenko, 2019).

How did the industry of the country evolve after such a significant event?

The first Alma-Ata combined heat and power plant was launched on October 25 in 1935. The CHP generated 1.8 million kWh of electricity from the very beginning to the end of 1935, which was capable of supplying the entire city at those times. Currently, however, this is not even enough for two days. After its launch, by 1940 three boilers and three

turbines were installed at the CHP, which resulted in a total capacity of 10,5 MW. Through such advances and entrancements of capacity, industry began to progress strongly and all sorts of factories were started to be built (Polskih, 2010).

One of Kazakhstan's primary industries is stone coal mining, established in Ekibastuz in 1867. The Council of National Commissars signed a declaration to form Ekibastuz Coal Mine in 1918. However, it was only transferred into operation in 1954, after which coal became supplied to Russia («Bogatyr Komyr», n.d. para.2).

The history of the Ekibastuz city originates from the time when the geologist Kosym Pshembaev first discovered a coal reservoir in this town. Furthermore, history is divided into three phases, starting from 1866 to 1946. This period to be associated with the discovery of the coal basin. The second phase begins from 1946 to 1977; in this interval were reached the first results in the development of coal industry. Also, the construction of the city of Ekibastuz has started precisely in this period. The last stage was initiated with the decree of the Communist Party on the construction of the local fuel and energy complex in 1977 (The history of the city, 2022, para.7).

*Figure 2.2. Bogatyr Komyr construction, (Bogatyr Komyr, n.d.)*



Concerning the environmental damage of the Ekibastuz land, the village of Atygai, founded in 1989, may be cited as an example. The village is located about one and a half kilometers from the «Shygys» coal mine of the Ekibastuz coal deposit (Karimova, 2018). The atmosphere and environmental conditions of the city are one of the most critical problems of the country. The affected industries include the Combined Heat and Power Plant, Limited Liability Partnership Bogatyr Access Komyr and many others. However, those industries are vitally significant for the social infrastructure of the city. Beyond industrial emissions, the air is likewise deteriorated by vehicles. Automobile emissions are extremely damaging to population health, since there is insignificant wind in the city, and for this reason, the gasses are hardly dispersed (Adylhanova, 2018).

As of today, the largest combined heat and power plant in Kazakhstan is Ekibastuz state district power plant, which is located in Ekibastuz city, Pavlodar region. The first facilities of this type of industry were started constructing at the beginning of January 1974. The first turbine of the plant was launched as early as April 12, 1980. In 1984, the construction of the country's largest thermal electric power plant, consisting of 8 energy units, was completed (The country's largest thermal power plant, 2015).

«ArcelorMittal Temirtau» JSC is a leader in metallurgical enterprises of the country. The construction of this largest factory originated in the fall of 1950, to which all young generations from all over the Soviet Union are related. This is where Nursultan Nazabayev, the first President of Kazakhstan, officially commenced his career. The President once said: «The history of Magnitogorsk, the history of Temirtau, the fate of its people is inseparable from my fate. If in my life there were no Magnitogorsk and Temirtau, I would not become the President» (Graduation class of the first president, 2017, para.13).

In the period from 1991 to 1995, the economic conditions in Kazakhstan were very challenging. Many existing industries simply disappeared. It was not only the situation in the country that led to the crisis, but also the fact that the employees themselves were quitting

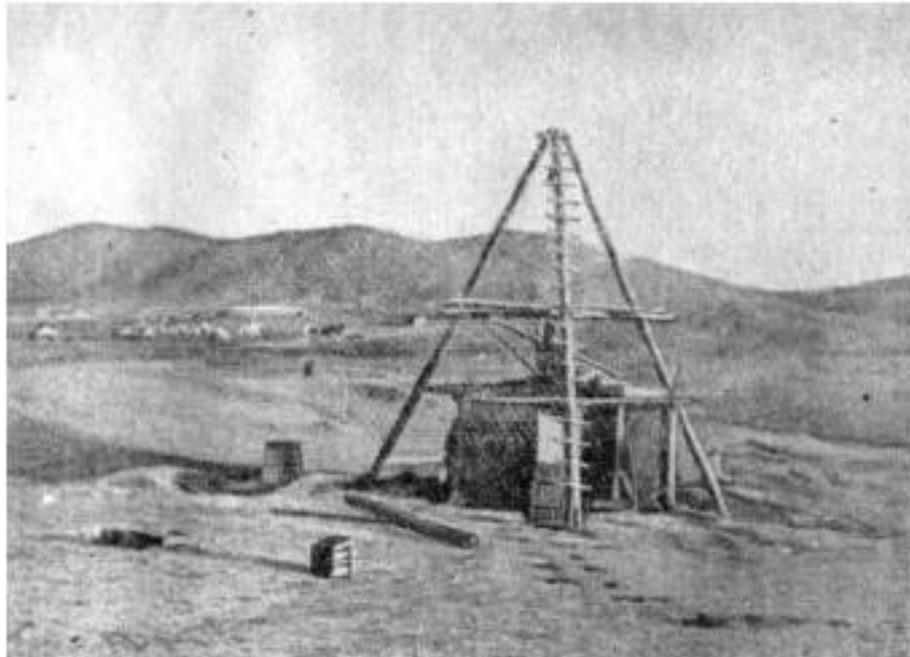
their careers in Kazakhstan and migrating abroad. In addition, a major metallurgical plant in Temirtau was about to close as well. The country's first president, N.A. Nazarbayev, because of the country's different negotiations with foreign leaders, was able to initiate the population out of the difficult, rough times and situation. Meanwhile, ArcelorMittal (NLM Group at that time) acquired the assets of a large metallurgical plant in Temirtau. As a result, these assets generated a strong impetus for the country's economic and sustainable development. ArcelorMittal is currently attempting to minimize its carbon footprint in order to improve the environmental image not only in Temirtau, yet country-wide. Therefore, the company is implementing a number of steps to achieve ecological goals (Bidzhu, 2021).

It should be noted that the town of Balkhash, known for its lake, is also one of the leading cities of Kazakhstan, which is the center of non-ferrous metallurgy. Air pollution in this city is in a critical condition, because of the proximity of the residential area to the industrial zone (Beisenova, Ye & Kurbanaliyev, 2019).

The history of Balkhash reaches to the beginning of the intensive five years of Soviet power, when the city had already become one of the largest production centers at that period. The establishment of the city was influenced by the famous engineer I.P. Rusakov in 1928; yet first of all, during geological works in the Konyrat mountains, he discovered that the land was wealthy in copper reserves. That was when all the young people, workers of the Soviet Union gathered together to help build this city of Balkhash. Thus, by combining forces in 1937, the city of Balkhash had been built (History of Balkhash city, 2012, para.1).

It is remarkable to point out the history of Balkhash copper, that has been acknowledged as a quality benchmark at the London Non-Ferrous Metals Exchange. The history of this complex takes place in 1928, when M. Rusakov, a Leningrad geologist, explored considerable resources of ore in the Konyrat hills, and after this discovery the construction of a copper giant on the shore of Lake Balkhash proceeded.

*Figure 2.3. Photo evidence of the spot for Balkhash copper smelter (Semenov, 2018)*



Geologists charted the area and it was on this spot that the Labor and Defense Council approved the decision to build the Balkhash copper smelter (Semenov, 2018).

Since 2012, Kazakhmys Smelting LLP has operated as a separate unit within the Metallurgical Complex. The division consists of the Balkhash smelter. The Zhezkazgan smelter, the Kazcat smelter, the copper and enamelware production workshop and last but not least, the oxygen production facility. Kazakhmys Corporation LLC is the largest copper producer in Kazakhstan. The company includes 10 underground and open pit mines, five concentrators, two copper smelters and two coal mines (Yefimenko, Issatayeva & Zhelayeva, 2018).

Under the influence of the production waste of the Balkhash metallurgical facilities, the level of heavy metals and sulfur oxides in the Balkhash lake continues to grow. The various amounts of gas are released into the air from the Balkhash Basin, and this gas combines with the evaporating moisture on the surface of the lake to produce acid rain down to the ground (Toleubek, 2014).

The city experienced an incident in 2014 that decimated hundreds of birds. The reason for the mass deaths of birds was a large emission of gas into the atmosphere. Regrettably, the ecological condition of Lake Balkhash is unknown, and is not an open access information, as research and any observations were canceled earlier in the 1990s (Balkhash Mining and Metallurgical Plant, 2010, para.17).

The country's territory was as yet an agrarian after the World War II, which focused mainly on agriculture activities. The unemployment rate started to increase due to the lack of industry. Despite the suitability of land for building industrial production, the level of industrial process in the country proceeded extremely slowly.

It is relevant to note that the program, which was called the «Law on the Five-Year Plan for the Reconstruction and Development of the USSR National Economy for 1946-1950». Following this plan, the country began to shift from a backward, semi-feudal economy to an agrarian-industrial one, with a solid socialist sector. In this context, Kazakhstan is on the verge of transforming itself from a country with a predominance of feudal-clan relations into an agrarian-industrial country with socialist development rates equal to those of the advanced regions of the Soviet Union (Smirnov, 1931).

The specific results of the Fourth Five-Year Plan, from 1946 to 1950, were the effective development of industrial enterprises, and the Soviet government reached the pre-war level in the evolution of manufacturing industries. Along with this, the USSR authorities were able to breakthrough in terms of heavy industry, electric power and steel industry. On the basis of those achievements, the Soviet people benefited slightly from a material improvement in their life style as well (Melnikova, 2018).

Yet, long before the Great October Socialist Revolution, a mining industry had sprung up in the country, and afterwards a local small smelter for lead, silver and copper was built in Altai in the 18th century.

The coal industry commenced its exploitation during the second five-year plan (1946-1950), with the Karaganda Coal Combine having the lead role in coal production. The beneficial geographical location of the basin, its huge coal reserves and its coking power has resulted in the establishment of a massive coal base. Over that period, charcoal was distributed to all states of the ex-USSR and eastern European countries.

British Petroleum Company (2016) reported that the country's consumption in 2016 was 56,5% of coal, 20,9% of oil and 19,1% of natural gas, which was the main reason why the coal industry was and is still the most essential sector in the country's economy. Yet, if we are referring to the latest 2022 data, Kazakhstan's carbon consumption for the period 2022-2023 remains at 71%, according to coal miners.

In the last quarter of the twentieth and the beginning of the twenty-first centuries, humanity faced serious environmental problems in mining operations. Large scale and intensive activities lead to the accumulation of environmental problems, decrease economic capacities of the natural environment (Alimbaev et al., 2019).

Meanwhile, the most powerful industry in the country's economy is the oil and gas industry. Again, it is impossible to introduce the industry of this country without the main element, which is «KazMunayGas». JSC NC «KazMunayGas» is a integrated national oil and gas company that was established in 2002 and is dedicated to the exploration, transportation, production and processing of hydrocarbons. «KazMunayGas» Company reported (2021) that the company is providing 25% of oil and gas condensate production in the country, as well as 15% of natural gas production.

«KazMunayGas» had decided to approve an emissions management policy on the World Bank's initiative to cease normal combustion of associated petroleum gas in 2015 (Environmental responsibility and safety, 2021, para.3).

The company proceeded to advance its environmental system after the approval of the above policy. World Wildlife Fund, Creon Group and the rating agency ACRA (2021)

reported that «KazMunayGas» has ranked the top position among the Kazakh enterprises in terms of the accessibility of environmental monitoring data for several years (KazMunayGas tops the environmental openness rating for the 5th consecutive year, 2021, para.1).

### 2.1.2 Chronology of eco-conditions of large industrial cities of Kazakhstan

Previous Governor of Almaty Bakytzhan Sagintayev (2020) said that there is black smog over the city. The dirty suffocating «hood» contains the most dangerous gasses for people, and one that can be a reason of serious illnesses such as heart disease, stroke and lung cancer...

The city of Almaty is steadily enlarging its demand for coal, heat and as well as for an electricity. Every year in this city, especially in the wintertime the average of daily concentration of PM2.5 regularly reaches 250 micrograms per cubic meter, which is highly harmful to the health of the population (Airkaz, 2018).

Almaty ranked among the 100 most environmentally hazardous cities in the world in 2019. The atmospheric pollution index of this city is 7, when the standard index is 9 (Sahova, 2020).

Almaty city is emitted daily by such emissions as: carbon dioxide, carbon monoxide, sulfur dioxide, phenol, nitrogen dioxide, and many others. Apart from this, in 2021 out of approximately 107 thousand tons of emissions 50% belong to motor transport, 46% are produced by industrial enterprises, and the last 4.3% belong to residential areas (Galushko, 2022).

Starting from 1854 to 1921, the city of Almaty had the name of Verny. The number of inhabitants of the city originally, before Verny was renamed Almaty, was only 40 thousand. However, the city reached 100 thousand population when the name Almaty appeared. Nevertheless, during World War II of 1941-1945, many educational institutions, industrial enterprises, and cultural centers were transferred to Almaty from Russian and

Ukrainian cities. Upon the end of the Second World War, in 1981, the city's population was first estimated at one million people (Sultan, 2021).

In fact, how did the environmental catastrophe become an issue in Astana? In 1997, the Supreme Soviet of the Republic of Kazakhstan made a decision to move the capital from Almaty to Aqmola. By the presidential mandate already in 1998, Aqmola was renamed to Astana. Notwithstanding, until 1997, Almaty had been the capital of Kazakhstan since 1927 (Arslan, 2014).

Presumably, the reasons for this relocation were: the environmental problems of the city, which had even existed at that time, and the increasing congestion of the Almaty city (Baygarin, 2021).

There is an abundant degree of atmospheric air contamination in Astana. The reasons for this are thermal sources, motor vehicles, and the private sector. The authorities are currently unable to take action on the issue of how to make the urban population stop using coal stoves to dispense heat in their homes. Some households are still without access to gas, because the cost of connecting gas is not quite affordable and not every resident meets the expense of it. Still, there is a process to help them connect the gas, government simply need to accelerate the process and extend residents with gas.

Director of the Department of Ecology and Industrial Safety of the Association of Mining and Metallurgical Enterprises of Kazakhstan, Talgat Temirkhanov (as cited in Pokidaev, 2018) said that the smog that is commonly spoken about in our cities is related to Astana and Almaty, albeit I would like to highlight that there are no significant oil production companies in these cities. Nevertheless, the environmental situation leaves much to be desired.

The country's ecological issues may be described by dividing them into several categories. First category A, including the cities of Atyrau, Mangystay and near the Caspian Sea, where oil is produced.

Atyrau town, as mentioned above, is located in the west of Kazakhstan. The history of this city has its origins at the beginning of 1640. In ancient times, this town was called Guryev. This was because in 1640 the Guryev dynasty predominantly settled on the rivers Ural and Emba to fish on the coast. Since the Guryev lived in this region for a considerable time, the present-day city of Atyrau was called Guryev (Bekmyrza, 2018).

The fundamental problems of this town are: oil, utility waste disposal landfill and evaporation of wastewater dropped on the territory of the city (Zhumash, 2020).

The most significant cause of atmospheric pollution in Atyrau is the region's large manufacturing enterprises, which contribute the majority of air pollutants; i.e., about 85 percent. Furthermore, the emissions of those industrial waste, emitted into the air by the enterprises, do not comply with any environmental laws of Kazakhstan. However, the oil mining industry in the city profits immensely from the country's economy. During the 2013-2014 interval, an unscheduled inspection from the sewage system wells of the Join-Stock Company «Locomotive Service Center» branch revealed that ammonia nitrogen-27.1, petroleum products-1.27, which had proved that the wastewater was not adequately treated (Kuanov, 2015).

Across the Atyrau region, there are 54 landfills of municipal solid waste. Among them, only 14 landfills are in compliance with environmental requirements, and 40 of them have not had any permission to emit emissions into the environment. The reason for this deplorable situation is the lack of investors. This means that most investors are not willing to invest in the small villages of this country. Because in such villages, the profitability of projects at a lower level, and besides polygons for waste disposal in Kazakhstan does not fit with all the rules at all (Kaziev, 2021).

There is a rather well-known evaporation area called the «Rotten gully», which has existed since 1945. From that year on, all the sewage and waste from the local drainage system had begun to be poured into that place. The nearby community has lived for many

years within a few kilometers of this place, where the ominous smell emanates from. However, the municipality of this region proceeded with a project to drain this «Rotten gully» in 2021 (Rustamzhan, 2021).

In the city of Atyrau in 2018 there was a terrible ecological disaster, or, to be more precise, there were consequences, which should be expected in such a terrible treatment of nature. The entire surface of the Ural River, 5-10 kilometers long, was all covered with dead fish.

*Figure 2.4. Landfill in the city of Atyrau (Ogurzov, 2020)*



The first fatality was captured in the Nizhnyaya Peretaska channel accessed by two large industries: the Atyrau Oil Refinery and the Atyrau Thermal Power Plant. The cause of this incident may have been a toxic effect of some active chemical substance, which is one of all the other possible causes, since there is no exact known cause until now (Kazangapov, 2021).

*Figure 2.5. Illustrative photo of the mass death of fish in Atyrau (Kazangapov, 2021)*



Nevertheless, after several examinations, it was revealed that there were no toxic substances in the water itself. Although the water in the Ural turned out to be clean, ammonia was detected in the fish carcasses, which, in the end is not the key cause of such mass deaths. Prior to this examination, environmental experts stated that the water had a slightly elevated level of chloride. The fact that the fish suffered from local industrial waste and all kinds of emissions into the water is no secret, accordingly, following with such a fatal situation, they proceeded to the inspection of all enterprises, which are closely connected with the emissions that are discharged into the water of the Ural River. As it was indicated earlier, the people responsible for this accident have not been found (The export of fish from the Atyrau region was restricted after mass deaths, 2018).

Mangystau region has a number of environmental problems. Those include the Koshkar-Ata waste polygon, unauthorized garbage disposal, and as well as the problem of dust.

Describing the history of the location, it was named in honor of an elder who resided in ancient times. According to the legend, he was the one who had rescued nomad Kazakh people from death («The river Koshkar-Ata», n.d. para.2).

The Koshkar-Ata basin is considered the largest radioactive repository not only in Kazakhstan, but also in the world. The damage caused by this storage facility to the

population of this region is quite extensive. Beyond the population, it has been found that also animals living on the territory of that very same repository have a mutation process. More than 105 million tons of toxic, including about 52 million tons of low-level radioactive waste, are preserved there (Musabaev, 2021). As for the dust problem, it was caused by various enterprises that extracted the sand needed for the construction. The local population made multiple appeals to the municipality to relocate the enterprises. However, insufficient reserves of raw materials in other places prevented the case from being implemented. Those companies have failed to fulfill environmental norms, although some of them have already paid serious fines. The rest of them have been saying that the dust reduction device is not available; the reason for this is that it is sold abroad (Kashakov, 2020).

The second category is B, this one consisting of cities with well-developed industry. Cities such as Pavlodar, Karaganda, Astana and the northern region of Kazakhstan.

JSC «ArcelorMittal Temirtau» is located in the Karaganda region and it is the major multinational company in Kazakhstan, which focuses on the recycling of metal and production of manufactured goods (Pannir, & Gazaliev, 2012). Nowadays, «ArcelorMittal Temirtau» is one of the head companies in the steelmaking market. This company name was rebranded from JSC «Mittal Steel Temirtau» to JSC «ArcelorMittal Temirtau» in 2007.

According to a recent article («Our history,» n.d., para.1) the history of formation of the Karaganda Metallurgical Plant, also known as JSC «ArcelorMittal Temirtau» originates from October 1, 1942 by order of the Council of National Commissars of the USSR. July 3, 1960 is considered the first day of operation of the Karaganda Metallurgical Plant. Later, within 10 years, a further Karaganda Metallurgical factory was established on the basis of this plant. Karaganda is on the list of the greatest manufacturing regions of the republic. Since industry is still growing, it has a tremendous impact on atmospheric air. Moreover, the primary air pollutant is JSC «ArcelorMittal Temirtau».

The range of air pollution in Karaganda and Temirtau was estimated by a quite high level of pollution according to a stationary observation network. Following a measurement completed by Republican State Enterprise «Kazhydromet» (as cited in Omarova, 2020) defined by the values of the ISA, the indicator at the minimum value was 7, which is a high level. This year turned out to be the exact 31st year since the termination of the Semipalatinsk test polygon. The Semipalatinsk nuclear polygon was first established on August 21, 1947, by a decision of the USSR Council of Ministers. The Council of Ministers selected this place for a reason. There were no other populated areas in this place up to 100 km away. In addition, there was an airfield on the outskirts of Semipalatinsk that the training ground could use. There were 470 nuclear explosions at this polygon from 1947 until it was closed in 1989 (Durmekbayeva & Memeshov, 2014).

During the «Cold War» from 1949 to 1989, there were 2400 nuclear explosions engaging in various places globally. In general, 456 nuclear explosions were made in Kazakhstan. On August 29, 1949 the first atomic bomb exploded in the Semey polygon in North-East Kazakhstan. In 1949-1962 the first phase of the explosions took place above ground and in the air, this was the reason why the air and soil were highly contaminated. However, as soon as 1963-1989, the explosions moved underground (Asau, 2021). This polygon was the world's second-largest after the Marshall Island explosion site. The number of explosions was second after the Nevada test site. The Semipalatinsk nuclear test site, once it was converted to underground explosions, became a source of radioactive contamination of rock masses. Each explosion caused an 8-magnitude earthquake and a maximum temperature increase in the atmosphere. Additionally, each explosion produced a crater that varied at least 50 meters in diameter and up to 30 meters deep. However, local residents, and residents of the whole country had no idea how many emissions and whether the whole process was carried out in safe conditions for residents. Along with Semipalatinsk, other regions had witnessed serious underground bombing. Those communities were deceived and persuaded

that the nuclear explosions were only for national economic purposes, and did not disclose any information, which is still not available anywhere since there were no environmental regulatory agencies at that time. It is more likely to be said that the holes created by the detonations are now a dangerous environmental time bomb (Khamiev, 2014).

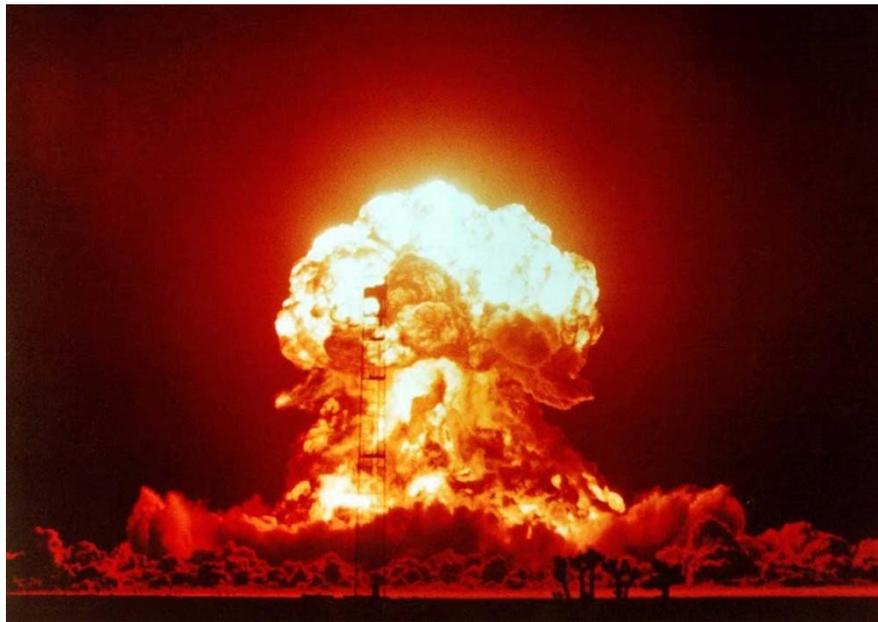
People became aware of the enormity of the explosions and of the terrible negative impact on the environment only by the end of the 1980s, through political changes in the Soviet system. Such a change contributed to the worldwide visibility of the nuclear test site and its harm on televisions and in the media. It was after those horrifying realizations that people protested and held rallies to close the landfill. As a result of those rallies and public concern, the USSR government supported the population and determined to ban nuclear weapons testing (Kilybaeva & Dussanova, 2020). Subsequent research has shown that its environmental impact and effects on humans have been exacerbated. For example, there are leukemia, cancer, and psychological illnesses among the population near the polygon (Bhat & Lone, 2013).

On March 20 of 2022 a frightful accident occurred at one of the thermal power plants in the city of Petropavlovsk. A chimney collapsed at CHPP-2. The winter of 2021 has not been an easy one for the residents of this city. There were another three similarly serious accidents (Malgavko, 2022).

According to a recent article («How it all started. That fateful 1961...», 2016, para.5) today it completes 61 years. The history of CHPP-2 goes back to 1953, when the authorities decided to construct a new essential CHPP. Construction commenced within two years, when enthusiastic people from all over the Soviet Union have joined, as everyone had an understanding of the relevance and importance of this station. Since the beginning of construction six years later, it was time to activate the plant. On December 22, 1961, shift supervisor A.M.Dobrodeyev and turbine engineer A.Y. Kokorev launched the first turbine generator into operation.

Kazakhstan, on top of these ecological problems, has certain environmental unmanageable issues, which are related to the country's agriculture. In the northern areas, particularly, attention should be paid to such problems as depletion and pollution of soils, adding up to water pollution because of the use of fertilizers and pesticides, which are the «legacy» of the former Soviet period.

*Figure 2.6. A picture of the test site during a test explosion on the ground (Gelaev, 2015).*



In 1954-1960, the natural grass plantation was eliminated, which caused the disturbance of the upper layer of the soil. Thus, in the period 1954-1960 25.5 million hectares of barren land and fallow lands in Kazakhstan were plowed. Alas, in the period when the Republic of Kazakhstan obtained its independence, several million hectares of land were not utilized and no one controlled soil erosion (Bekbenbetova, 2013).

Finally, yet extensively, category C. The final category covers the southern zone. In that area, environmental problems are mainly related to the improper use of water resources, in addition, air pollution is the chief and scariest concern of the city of Almaty in the eastern region. From 1990 to 1996, greater than 10 million hectares of rangeland lost productivity, and 17 million hectares of arable land were excluded from production (Osanova & Bozshataeva, 2002).

One of the largest rivers in Central Asia, the Syrdarya, is located in the southern region of Kazakhstan. This river historically had several names-Seyhun, Dzhaksarteks, but their meanings are still unknown. The Seikhun river was renamed Syrdarya in the period from 1219 to 1224 during the Mongol invasion (Taizhanova, & Tungyshbay, 2020).

Today the ecological situation in Syrdarya province is one of the most urgent matters. Factors affecting the ecological condition in the Syrdarya river valley: arid climate, lack of water, salinization of land surface, as well as pollution of the natural environment by various anthropogenic sediments. The system of desertification of the river covered 2 million hectares of land. During 1966-1990, there were many weaknesses in agricultural and water management works. In this regard, they some of them are: scientifically grounded collector-drainage systems were not built on developed lands, river water salinity was not taken into account when calculation crop irrigation quantity, variable fields were used incorrectly, etc (Nauatbek, 2018).

Over the past 35-40 years, harmful chemicals have entered the Syrdarya water areas. Research completed by Rust, Abdulaev, Hassan and Horinkova (as cited in Taltakov, 2015) found that crop production is the main polluter of the Syrdarya river, as half of the water returns back to the river due to drainage infrastructure, thereby downgrading water quality. The salinity of water increases up to 2.9 in the deltas of the river. Wetlands existed in the Syrdarya, however, which have turned into a drying bottom of the Northern Aral Sea since the 1960s. Thus it has led to the disappearance of fish in the water and also to air pollution because salt-containing particles have penetrated into the cropland.

Nowadays, this river poses a serious threat to the settlements on its banks (Amangeldy, 2022). The Syrdarya never shattered or dried up during its entire history, as it is happening now. The river has gone out of its limits nine times. The last huge overflow situation occurred in the 1950s and 1960s. That is, when the Kyzylorda hydroelectric complex was first constructed; however, it was turned into operation in 1956 (Ondiris, 2021).

The Syrdarya, as well as the Caspian Sea and the Aral Sea, is subjected to pollution due to industrial emissions and waste. By the early 21st century all types of enterprises were rapidly developing in the country, resulting in the volume of wastewater reaching 6000km<sup>3</sup>, which caused disasters that significantly affected the ecology (Kedelbaev, Iztleuov, Abduova & Ukibay, 2022).

Southern Kazakhstan in the Turkestan region, has a town called Kentau, well-known for its large-scale mining facilities. The city was discovered because of the mines from which silver, copper and lead were mined between the 9th and 11th centuries. However, the city was reformed into Kentau in August 1955. During Soviet era, the second largest factory in the world was built in this city, based on oxidized ores. Early on, there were people of various nationalities arriving and later relocating to the city. Despite the inhabitants, Kentau was meant, and built as an industrial center of Kazakhstan; that is, the government did not consider the town in any other way (Pazilov, 2017).

*Table 2.1. The nationality composition of the population Kentau (Pazilov, 2017)*

<b>Nationality</b>	<b>Number 1959</b>	<b>Number 1979</b>
Kazakhs	18830	31290
Russians	12352	21103
Ukrainians	1576	2163
Uzbeks	2994	5407
Greeks	8276	5270
Tatars	2453	4326
Other	3019	2560
<b>Total</b>	<b>49500</b>	<b>72109</b>

Environmental conditions in this city are particularly disastrous. A vivid example of this is the Achisai Polymetallic Combine, an industrial complex that developed and produced multi-metal mines and other metals. That combine was launched in 1927, yet after the

collapse of the Soviet Union, the combine ceased to exist (Dzhunusbekov & Akbasova, 2020).

Why is Kentau considered to be almost the main polluter in South Kazakhstan region? On account of its natural resources, the city of Kentau is significantly polluted with heavy metals (Zhylyysbaeva & Nurdillaeva, n.d.).

In the history of the formation of the towns of Kentau and Ashyzai, the purpose of establishing the town was essential; as mentioned above, the town was built for economic purposes only. The authorities of that period turned their attention to the entertainment and needs of the laboring people, and also approached the issue of urban greening in a special way (Dalayeva, 2019).

### 2.1.3 An eternal story of the Kazakh steppe's past

The Caspian Sea is the largest enclosed reservoir in the world.

The Caspian Sea originated in the Ancient Neogene epoch as a result of the uplift of the earth's crust underfoot, i.e. the Caspian Sea separated from the Black Sea (Dzhumaniyazova, 2022).

Before the dissolution, the Caspian Sea belonged almost entirely to the USSR, and only a minor part to Iran. Once the Soviet Union collapsed, nevertheless, the Caspian Sea became the main topic of disputes between five countries. Those are Kazakhstan, Russia, Iran, Azerbaijan and Turkmenistan.

The disagreement was eventually resolved through a mutual agreement among the countries. While the countries managed to achieve a common solution, disagreements within these countries could not be avoided. Arguments have arisen between Kazakhstan, Azerbaijan and Russia, and these kinds of disputes have been resolved through the conclusion of legal documents, for instance, in 1998 and 2001, an agreement was signed on the delimitation of Caspian Sea bed and subsoil (Movsumzade, 2020).

As stated by Zeinolabedin et al. (2009) the Caspian Sea is a plenteous in ancient stories. Research completed by Nadsa (as cited in Zeinolabedin et al., 2019) originally, this sea is sacred and significant for all mankind, according to its geographical location. For an extended period, the sea possessed numerous altered names. The sea in the past used to have names such as: Sea of Titis, as well as the Hyrcanian Ocean. As mentioned above, the sea partially belonged to the Republic of Iran. There is evidence that the name «Caspian» is absolutely appropriate for the sea, and the name was in the interest of Iran Republic, as, in ancient times there was an Iranian tribe «Kaspi», consequently, hence the name.

Since Kazakhstan has gained independence, all of the littoral states of the sea have been managing energy resources in their territories. After the collapse of the Soviet Union Kazakhstan's economy was desperately catastrophic. Consistency, exploitation of natural resources emerged in order to increase the country's budget, as well as to modernize the economy (Sarkulova, 2019). The ecological condition of this sea is simplified by the rise in water level in recent years. In the middle of 1990s oil and gas brought an influx of foreign investment in energy development in the region. Commencing in 1978, the initial upward trend in sea level was observed. At the end of the 20th century the level of the sea had reached 3 meters. Consequently, many oil derricks, oil storage facilities, municipalities and industrial plants were submerged. All pollutants and oil had mixed with the sea water, which successfully affected the expansion of the sea zone (Durmekbayeva & Memeshov, 2014).

Society, industry and even nature itself are the key causes of the catastrophic condition of the Caspian Sea. The factors responsible for the pollution of this sea are, first of all, emissions of oil into the sea, secondly caused by chemistry and likewise by the construction of hydroelectric power plants on rivers and lastly, by the accident of the oil tankers. This has been continuing for 23 years, since the drilling of the first borehole started as early as August 11 in 1999 (Maytanov, 2010). The oil spreads over the surface of the sea very quickly. Some of it will evaporate and some of it will dissolve into the water. Oxidation

and photochemical reactions will occur on the water surface (Jafari, 2009). Oil and gas extraction, along with transportation and industrial production has been the source of soil, air and water pollution in the Caspian region (Efenfiyeva, 1994).

There are some alarming occurrences in the Caspian Sea, such as wind surges. A wind surge is a situation that occurs when the water level rises vertically as the wind blows, which causes the water to flow in the direction of the wind and flood parts of the shore. Such surges have been observed in the Caspian Sea almost every year during the autumn and spring months. They caused enormous damage not only to the country's economy, in addition to being detrimental to the environment. As an example, every time the water level reached a high level, the sea was polluted with oil products, which had a negative impact on the inhabitants of the sea. Besides, since the country has been producing more oil, harmful hydrocarbon pollutants such as acid tars, crude oil and many others have been released into the environment (Alimbaev, Omarova, Tuleubayeva, Kamzayev, Aipov & Mazhitova, 2021).

Widely known regional ecological crisis-the Aral Sea. The Aral Sea is the jewel of Kazakhstan, moreover, the Aral Sea originates from the Kazakh word, and the definition of this word is that it represents an island.

Considering the history of the Aral Sea, its beginning was in the Cenozoic era, when the Aral Sea was connected to the Caspian Sea, and in the 19th century the island combined with the Mediterranean Sea. Subsequently, the Aral Sea had been divided into several small basins in the Alpine fold because of the formation and uplift of the earth's crust, and thus the island was originating. The name of the sea, Aral, was established in the 17th century because it is when exploration of the sea was first initiated. The greatest influencer over the history of the sea was geodesist Ivan Murauyn, who has explored the Aral Sea and Syrdarya in Kazakhstan and has drawn a map of the Aral Sea (The Aral Sea, 2012).

Through the 1970s, the Aral Sea region was considered to be a socially and economically well-off region. As the population grew in 1960-1987, the amount of water

flowing to the island decreased. From the bottom of the sea, which at that time started to dry up, 2 million tons of salty dust with an extremely high level of harm to the air, and the environment rose annually, which immediately began to be dispersed by the winds all over the place. The reasons for the collapse of the Aral Sea are ignoring the historical-natural features of the area, failure to consider water reserves, increasing the area of water-intensive rice and cotton crops, for which there is only Soviet Union's authorities to accuse.

The water level has decreased rapidly by almost 15 meters from 1961 to 1990. Further to such reductions in water levels, the Aral Sea divided into a smaller, i.e., the Small Aral, and a larger, the Large Aral during 1988-1989 (Mikhailov, 1999).

The Small Aral Sea had noticeably decreased in its salinity level, and the composition of flora and fauna had also changed. The state had a mission to preserve the Small Sea, and for this they formulated a plan «Regulation on the Syrdarya River Channel and Preservation of the Northern Part of the Aral Sea». However, despite the plan, the ancient Aral Sea could no longer be returned (The Small Aral Sea, n.d. para.6).

The Large Aral Sea had also been split into two parts, called the Eastern and Western part. Those two parts were connected by a waterway, but this waterway had dried up afterwards (The Aral Sea, n.d.).

As previously indicated, the diminishing of the water level first started in the 1960s, as a result of land reclamation building in the city of Moscow. It was this situation that caused the shrinkage of the Aral Sea (Baikhozha, 2018).

The authorities of the Soviet Union embarked on a process to intensify cotton production as soon as the Soviet Union was established. Besides, Stalin's Five-Year plan required them to be independent in cotton production, which just as well led to global irrigation projects in the Aral Sea Basin.

Following the end of the Stalinist period, or rather after his passing, a period called the Khrushchev Thaw commenced. During the reign of Nikita Khrushchev, he insisted,

equally as Stalin, on a large-scale cotton production, in addition, he desired that the people of the Soviet Union plant their own rice and be self-sufficient in this regard. It was found by Glantz (as cited in Whish-Wilson, 2002) that this further demand for production and cultivation of rice, which greatly influenced the consumption of irrigation water.

Regrettably, Soviet Union leaders concealed the disastrous state of the Aral Sea, which had already been in existence for a long time. This continued until Gorbachev ascended to power in 1985. For a long time this obstacle sheltered their attention, and only Gorbachev spoke about it publicly for the first time, however, there was a lack of intervention afterward (The Aral Sea, 2016, para.4).

Research completed by Micklin and Williams (as cited in Glantz, 1999) found that in merely another quarter of a century, the Aral Sea Basin has evolved into a massive ecological and socio-economic disaster.

In 1992, the portion pertaining to Kazakhstan of the Aral Sea region was declared an ecological disaster zone by the government. The laws of the Republic showed that the area around the island had become desolate, the living conditions of the inhabitants of the area had deteriorated and the number of diseases had increased (Saniyazova, 2020). Currently, the health of people living in this particular province has greatly deteriorated. According to recent data, rates of tuberculosis, pneumonia remain high (Durmekbayeva & Memeshov, 2014).

Supplemental Kazakh steppe is the Baikonur Cosmodrome, which has celebrated its 67th anniversary this year. The word Baikonur possesses a distinct and noteworthy definition, it is translated as a rich valley. Indeed, it was that place of the flight of the first man, Yuri Gagarin, who conquered outer space on April 12 in 1961 (Jenks, 2019).

Baikonur Cosmodrome was established back in 1955, that is, when the Central Committee of the Communist Party of the Soviet Union and the USSR Council of Ministers signed a protocol on the opening of the test site for the launch of rockets on February 12,

1955. The fact that this city was chosen has its reasons, and those reasons include the city's proximity to the equatorial surface, and the lack of settlements at that time (What do we know about the Baikonur space station, 2015, para.3).

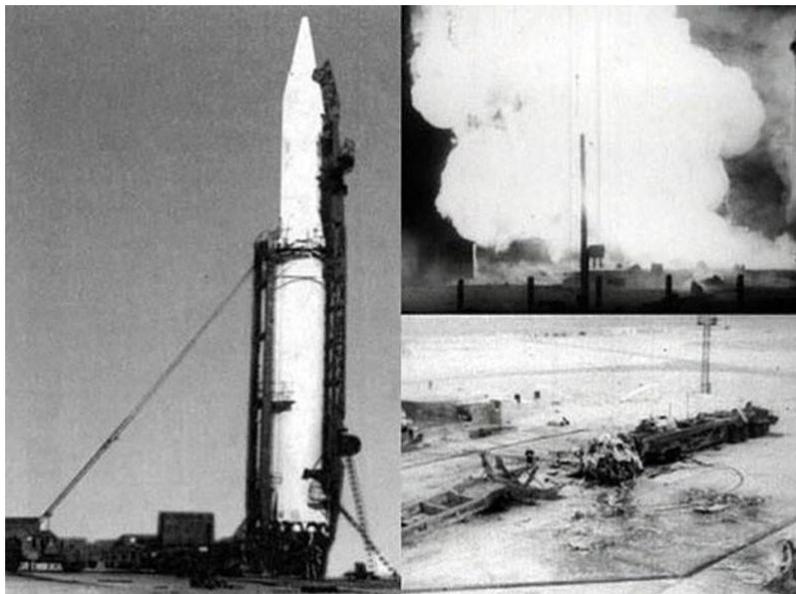
Nonetheless, despite the fact that Baikonur is the pride of our country, it has a dramatic negative impact on the biosphere of our earth. Despite this, all the information pertaining to the damage caused by of all those rocket attempts remains highly confidential and protected. In the history of the spaceport, there was an incident that ended up causing the deaths of about 150 people on October 24, 1960. The story of that tragic day is heartbreaking. That day, before the launch of the R-16 rocket, one of the construction crews on site noticed a small flash, but those engineers had not even had time to drive out of the spaceport when a powerful explosion occurred abruptly, which enveloped everything around in darkness and flames. One of the employees at the moment of the accident was staying quite close to the rocket. Therefore, when the blow happened, the man remained seated, except he was no longer alive. The reason for this terrible catastrophe was a deviation from agreed and approved technology, leading to a premature launch of the second stage's thrust engine (Baikonur disaster, 1999, para.2).

As of now, the Baikonur Cosmodrome is under lease, and Kazakhstan has extended the rent to Russia until the year 2050. The Russian Federation receives on lease the territory of the cosmodrome with all the necessary technical facilities, and critically, the city is likewise included in the lease (Zhubatov, 2011).

On account of the space rocket launches at this cosmodrome, there are too many horrendous threat to the inhabitants not only of this city, but of the whole planet. One of the main scary substances is liquid rocket fuel, which is dimethylhydrazine. This substance is highly toxic and volatile. It can irritate the respiratory tract, gastrointestinal tract, and so forth (Alimbaev, Mazhitova, Bogenbayeva, & Omarova, 2020). Additional substances that have a detrimental effect on the environment includes samin and mélange, which are the toxic

oxidative variety of rocket fuel.

*Figure 2.7. Baikonur cosmodrome catastrophe (Zavalishyn, n.d.)*



This compound is among the very first class of severely toxic ones, such as the dimethylhydrazine, mentioned above. The sum of these compounds could go so far as to destroy the entire surface of the universe. In addition, the ozone layer of the atmosphere is badly destroyed after the rockets and again the territory of the cosmodrome is damaged by the remnants of the vehicles.

Chronologically, terrifying accidents have occurred since 1999, each time the Russian «Proton» rocket has been launched, albeit with a few interruptions. One of the largest explosions materialized in the summer of 2013. Russian environmentalists, who possess a lease on the site, insisted that the «Proton» explosion had not harmed anyone. Local ecologists claimed a vast scale of danger from the burst. After that, residents started to notice a toxic cloud that was formed from a component of the burned rocket fuel, heptyl. Meanwhile, the country's government decided to inform urban people of nearby towns that they should stay indoors, whereas environmentalists immediately attempted to investigate and understand the scale of the disaster, though unfortunately they were not able to do so (Akhmatova, 2014).

So far more than 100 M-Proton launch vehicles have been operated at the Cosmodrome. However, despite all this, more than 20 rockets in a year are still headed into space (Amankulova, 2011).

2.1.4 What prevented the state from transitioning to an ecosystem-supporting state at the origin?

Bureau of National Statistics of the Agency of the Republic of Kazakhstan for Strategic Planning and Reforms (2022) reported that emissions to the atmospheric air from sustainable sources of pollution in 2021 amounted to 2,407.5 thousand tons of pollutants, which is 1.4% less than it was in 2020.

In the twenty-first century, the population of Kazakhstan confronted many novel matters, such as air pollution, depletion of natural resources, shortage of clean water resources, threat to global food security, energy security and others. In 1991, Nursultan Nazarbayev became the First President of the country, while only in 2003 he issued an enactment aiming at state policy in the field of environmental security. Alas, over a period of time, no action was taken to ensure the protection of the environment, and no efforts were made to fulfill the aforesaid goals. Four years have passed since then, and in 2007, the National Assembly of Kazakhstan approved a new «National Ecological Code», which was supposed to deal with environmental and nature protection measures. On the other hand, it is worth considering that this law was adopted without careful consideration, and only in order to report on time. In the end, this draft turned out to be a failed and unfinished project, precisely for this reason it has been amended more than 50 times during the 10 years of its existence (Ecological Code, 2017).

It should be emphasized that Kazakhstan initiated its way to a green economy through the adoption of a number of legislative documents. In 2009, another law to support the use of renewable energy sources was adopted. Research completed by Trofimov (2010) showed that the purpose of this law was to obtain an increase in the utilization of regenerative energy

sources, as well as to create favorable conditions for the usage of green energy supplies. Under this legislation, in 2014, a strategy for the efficient use of energy for sustainable development until 2024 was developed.

The Republic of Kazakhstan in 2013 for the formation of a «green economy» embraced the «Concept of Transition to a Green Economy». The Concept was accepted due to the Astana initiative, which took place at the Astana Economic Forum in 2010. At the mentioned forum, the First President of Kazakhstan proposed his initiative for a Partnership program, which is called «green bridge», between the countries of Europe, Asia, and the Pacific Ocean (Masanov, 2019).

The Concepts strategy is divided into 3 phases:

1. The first stage includes the creation of an eco-structure, increasing the efficiency of environmental protection activities, extending from 2013 to 2020;
2. The second stage is to introduce renewable energy sources, as well as rational utilization of natural resources from 2020 to 2030;
3. The last stage considers the transition of the National Economy based on the principles of the third industrial revolution in the period from 2030 to 2050 (Semenyuk, Sadykova, Ernar, Belousova, Nechay, Listkov & Jamankulova, 2017).

The «Green Bridge» concept aimed to foster collaboration among the 15 countries (Kazakhstan, Russia, Kyrgyzstan, Germany, Hungary, Georgia, Mongolia, Belarus, Montenegro, Latvian Republic, Albania, Finland, Bulgaria, Spain and Sweden) and 16 non-governmental organizations in transitioning from traditional growth models to a more environmentally sustainable approach. For Kazakhstan, this meant adopting strategic tools to drive this «green» growth. The key directions of this idea were: sustainable lifestyle, «green» business and investments, investments in ecosystem services, plus development of urban settlements, and last but not least, low-carbon evolution (Shabanova, 2013). The specified program does not have any donor states. There are two directions under this scheme, one of

them is eco-friendly products, the second is environmentally friendly green goods, which are on top of that produced using green technologies. Leading states furnish packages of advanced green technologies on a turnkey basis free of charge. Regardless, when blooming, countries need to provide favorable conditions for attracting green technologies and investments (Diyar, Akparova, Toktabayev, & Tyutunnikova, 2014).

At the time of its conception, the country's economy relied on exhibited a significant degree of dependence on oil, mining, and heavy manufacturing, with a shadow economy still present. However, there were limited opportunities for the state to implement measures to enhance the field of environmental recycling. The «shadow» economy is denoted as illegal or hidden assets, as well as informal occupations engaged in by the authorities, states and governments of the country. What is captivating is that the «shadow» part in Kazakhstan exists on account of weak protection of entrepreneurial activity, prohibited cashing out through legitimate businesses, the inconsistency of the legal framework, and, importantly, the lack of transparency in the economy. News agency Kazakhstan today (2021) reported that the percentage of the «shadow» economy in Kazakhstan in 2021 indicated 20.23%.

Despite the fact that the Green Bridge concept was confirmed nearly 13 years ago, the country's environment continues to be impacted by thermal power plants, factories, transportation, and as well as from many other waste wares that exist as of «shadow» economy. Thus, according to local ecologist, the ecology of Kazakhstan is catastrophic because of the greed and corruption of the authorities. As an example, the holder of JSC «ArcelorMittal Temirtau», Lakshmi Mittal, has several factories that produce steel around the world. Nonetheless, waste emissions in one city of Temirtau are much higher than those of other plants around the world. This is because the country has no regulations, control, and strict requirements for environmental standards from the government (Iskakova, 2020). The shadow economy would also cover local thermal power plants, which are deteriorating every year and spoiling the climate with waste emissions. Year by year, the energy sector in

Kazakhstan faces wide-ranging troubles. The industry is operating with a low coefficient of performance (COP). As of today, all functioning thermal power plants in Kazakhstan were constructed back in Soviet times. Since the country's independence, no additional thermoelectric power plants have been built. Notwithstanding the fact that these stations have been subject to frequent major accidents that have affected the population, they are still in operation without any renovation. The reasons behind the government's reluctance to invest in plant upgrades are the exorbitant cost, which experts claim would cost around 34\$ billion to modernize. Instead, the national budget is allocated to cross-subsiding the tariff every year (Khairushev, 2022).

The subject matter for corruption originated in the era of Soviet times. The bureaucracy, the opacity of the Soviet economy and the dictatorship policy were very convenient for the authorities to enrich themselves with other people's property. Historically, there is a concept of post-Soviet corruption, which dates back to the late 1980s. At this time, corruption reached a critical state and there was a lack of control over the bureaucracy. Once the most prominent state functions privatized, the institutional boundaries between the formal and informal spheres blurred, the state resembled a «stationary bandit» or even a set of them (Volkov, 2005).

An outstanding example of corruption in the country is a project called the LRT. LRT is an abbreviation for light rail, intended to reduce traffic congestion in metropolitan areas such as Astana and Almaty. This project is also supposed to contribute to the reduction of traffic accidents on the streets of the big cities. As for the environment, the design is appropriate; in addition, the reduction of transport would lead to a better change in public health. The capital of Kazakhstan started to draft the project in 2005 on the command of the First President of the country. However, the way to implement the system was quite challenging, as the authorities of the state have tried to abandon it, and to implement another program. The financial part of the project was estimated at about 2.3 billion US dollars. The

government promised to launch the LRT for the EXPO-2017, which was held in Astana. Unfortunately, the project was not completed by that time. The population of the country did not agree on the construction of the new system from the beginning. They suspected it would be followed by plenty of financial problems. As a result, the National Anti-Corruption Bureau found in 2014 that the official representatives for that system were engaged in transferring large amounts of money to other accounts of contracting organizations. For example, initially transferred about 2 million US dollars, and a year later it was also discovered that there were another transfers of 48,7 million US dollars. Despite those financial issues, the state decided to start construction in 2017. During 2018-2019, monetary thefts were also identified, which involved the Head leader of the passenger transport and roads department and the Head leader of the economy and budget planning department of Astana. In addition to these people, several more individuals were detained as somehow they were involved in embezzlement of the money, which was funded for the construction of LRT. At the moment, not completed construction of the LRT is frozen, and no one knows when those «ugly» structures will be done or removed from the capital and megapolis of Kazakhstan (Koskina, 2019).

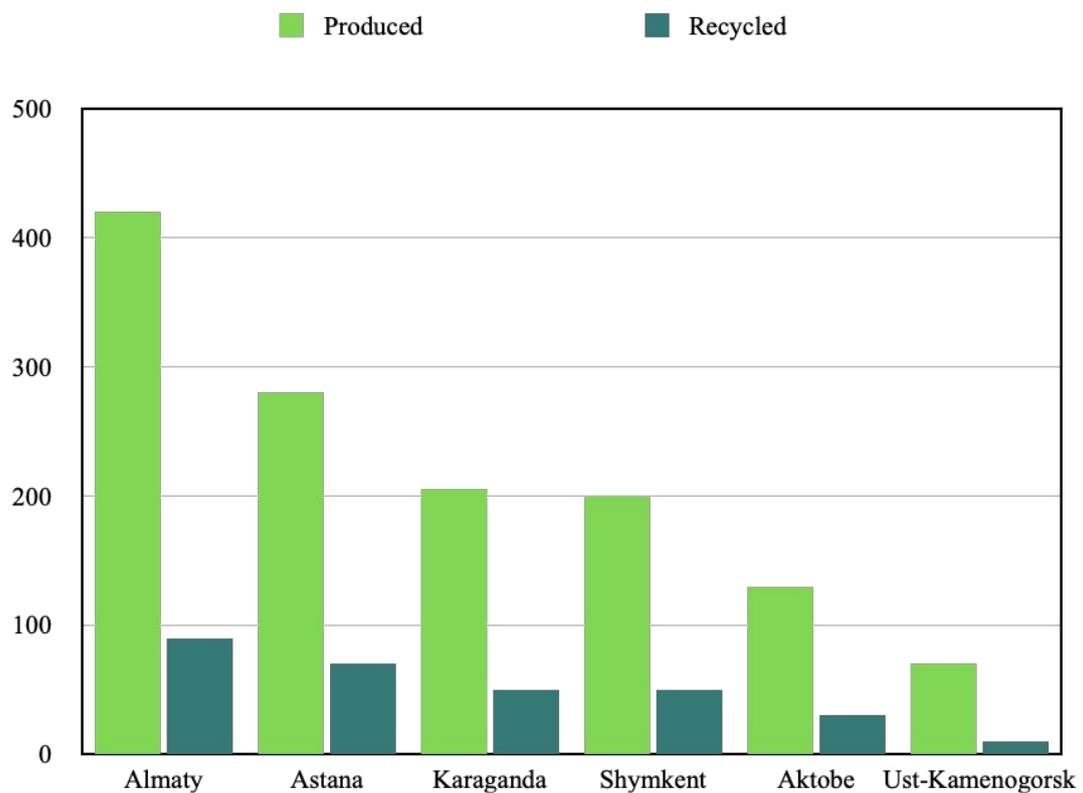
In Kazakhstan up to the present day, there are still political elites (including kinship ties) who have retained control over the distribution of resources since USSR times. In 2007, the regulation «Requirements for Emissions to the Environment from Combustion of Various Fuels in Boilers of Thermal Power Plants» was approved by agreement of the government. This document specifies the emission specifications for absolutely all boiler plants. As was mentioned above, none of the power plants had been reconstructed since the time when they were built, so they did not qualify for this regulation. The limits of the new regulation meant that the plants had to be upgraded, which entailed a large amount of money.

*Figure 2.8. The structures of the Astana LRT project (CABAR.asia, 2019)*



This issue was handled by decreasing emission preconditions (Vorotilov, 2012). The country neglects the recycling of municipal solid waste, as well as the landfills where it is disposed of. The long-standing system of trash management was established as early as the Soviet era.

*Table 2.2. Production and processing of solid household waste in the cities of the Republic of Kazakhstan, thousand tons/year (Ministry of Ecology, Geology and Natural Resources of Kazakhstan, 2022)*



Mostly the places for waste disposal were landfills, which were usually not far from residential areas. Furthermore, in comparison with Europe, Europe has unambiguously moved long ago to the separation of waste, both in cities and in suburban areas. Yet in Kazakhstan, the level of the system for sorting garbage is extremely low, and separate garbage cans, which were made to cultivate a new culture and habit in people, are still ineffective.

As indicated before, the President of Kazakhstan has set the task to figure out utility waste, as it was the first step in the «Green Economy» transition. More precisely, the head of state mentioned that it is required to reach a recycling rate of 40 percent by 2030 (Urnaliev, 2019). The country had built a recycling plant in 2007, although the general managers and initiators of this project are accused of misallocation of the budget intended for the investment of this plant. Business plans for this facility were considered before its construction. However, the crisis dragged all the expectations of the founders to the bottom, and the state had decided to re-locate the factory and instead to construct a huge marketplace. The same scenario had happened with the waste recycling plant in the capital of the country. The project was launched in 2006, and Astana city Council was supposed to contribute with the internal technical work; but in fact all promised assistance remained on the documents, and the financial parts fell on the founders of the plant. Considerable amount of discussions and plans for recycling and waste management to improve the ecological situation occurred. One of these conversations evolved into the formulation of a concept along the lines of European best practices in countries such as Italy, Spain and so on. The new concept was planned to concentrate on domestic solid garbage management, thereby affecting the environmental situation in the country. However, this concept turned its attention to other projects, but not to recycling cases (Vidyanova, 2017).

The ongoing situation in Kazakhstan is attributable to the fact that there is still historical industrial waste. Over the previous decades, significant historical volumes of toxic

and radioactive waste from industrial and agro-industrial complexes have been accumulated.

*Table 2.3. Management of hazardous waste (Bureau of National Statistics Agency for Strategic of the Agency for Strategic Planning and Reforms of the Republic of Kazakhstan, 2023)*

	Unit	2019	2020	2021
<b>Existing of hazardous waste at the beginning of the year</b>	1000 ton	2,519,167.6	2,649,914.1	476,286.5
<b>Dangerous waste generated during the year</b>	1000 ton	180,506.7	137,828.0	42,090.0
<b>Hazardous waste treated or disposed of during the year</b>	1000 ton	370,582.8	147,288.9	38,141.9
<b>Recycle</b>	1000 ton	36,087.4	30,268.6	4,411.6
<b>Combustion</b>	1000 ton	558.0	443.2	512.4
<b>Burial</b>	1000 ton	332,459.1	116,277.8	31,245.9
<b>Other types of removal</b>	1000 ton	1,478.3	299.3	1,972.0
<b>The amount of hazardous waste at the end of the year</b>	1000 ton	2,329,091.2	2,640,451.5	480,234.6

Moreover, residents of small towns do not have access to solid waste removal services (Kabdoldanova, & Manapova, 2020).

The reason for the accumulation of garbage and the absence of recycling centers may be a lack of services provided by public utilities. Insufficient recycling centers cause all types of garbage to be mixed together, and accordingly the entire waste goes to different sites in Kazakhstan and creates new hazardous landfills (Nugumanova, Frey, Yemelina, & Yugay, 2017).

Table 2.4. Percentage of recycled and disposed solid waste (NJSC «State Corporation» «Government for Citizens», 2023)

<b>№</b>	<b>Name of the region, city</b>	<b>2017, %</b>	<b>2018, %</b>	<b>2019, %</b>	<b>2020, 3rd quarter</b>
1	Akmolinsk	2.11	2.93	3.02	3
2	Aktubinsk	3.52	11.69	10	11
3	Almaty region	24.77	27.55	23.28	15
4	Atyrau	44.33	1.69	10.44	11
5	East Kazakhstan	3.17	4.84	3.28	16
6	Zhambyl	3.47	3.11	8.53	9
7	West Kazakhstan	2.17	5.28	8.6	8
8	Karagandy	13.96	16.39	17.42	21
9	Kostanay	0.93	9.65	10.3	9
10	Kyzylorda	8.13	7.42	10.78	18
11	Mangystau	6.49	1.42	33.8	40
12	Pavlodar	0.23	0.12	15	16
13	North Kazakhstan	3.59	7.59	10.78	14
14	Turkestan	3.48	7.17	10.05	13
15	Almaty city	10.01	5.70	10.95	9
16	Astana	8.33	12.25	15.92	30
17	Shymkent	-	18.28	22.77	26
		<b>9.05</b>	<b>11.51</b>	<b>14.9</b>	<b>15.8</b>

The country experiences a significant number of issues with regards to water supply. In a large majority of settlements there is no access to the clean water. The current problem is of utmost urgency, primarily as a result of dilapidated infrastructure. To this day, due to the utilization of ancient equipment and construction methods, many of the settlements are supplied with non-potable drinking water by the trucks. The situation arose upon Kazakhstan gaining its independence.

As mentioned by Medeu, Malkovsky and Toleubayeva (as cited in Tursunova et al., 2022) water supply issue becomes more urgent every year, as the country is experiencing constant population growth. It is estimated that by 2050 the population could increase to 150 million people.

Commencing in 2002, the country initiated small steps to resolve the issue. As an example, in 2002, a «Potable Water Program» was undertaken to provide 7231 villages with a water distribution system. However, once this program had been negotiated, it became clear that the attempt had failed, as there had been specific cases of corruption and misuse of national funds by politicians. The very first program to procure water for villages ended up failing, likewise because of an improper reconstruction of water pipes, which caused enormous environmental damage by non-compliance with a desalination norms and technical work requirements (Galkina, 2017).

Research completed by Roberts, Stickley, Gasparishvili, Harper, and McKee (as cited in Tussupova, Hjorth, & Berndtsson, 2016) found that, in Kazakhstan, there were no particular improvements in the structure of access to piped water in either urban areas or villages from 2001 to 2010.

Following the collapse of the above-mentioned project, the state decided to renegotiate another «Ak-Bulak» water supply plan. The agenda was validated in 2011 for a quite long period, until 2020.

*Figure 2.9. Water shortage in urban areas (Kazangapov, 2020)*



This time the national authorities had pledged not to make the same mistakes, and under this program it was envisaged that approximately 85% of the village population and total 100% of the city population would be provided with potable water by the year of 2020 (Adilbekova, 2019). Speaking about finances, in this case the amount of investment was about 2 million, 450 thousand dollars, even so this was not the final amount, after the first contribution, there were another periodic installments of financing (Decree of the Government, 2010, №1176).

*Table 2.5. Quality of drinking water (Bureau of National Statistics Agency for Strategic of the Agency for Strategic Planning and Reforms of the Republic of Kazakhstan, 2023).*

Purified water in centralized water supply systems

		<b>2019</b>	<b>2020</b>	<b>2021</b>
Total number of samples	Unit	63.401	63.504	66.684
Number of samples exceeding the country's established standards	Unit	2.027	2.769	2.611
Percentage os samples that exceed the country's established standards	%	3.2	4.4	3.9

## 2.2 Relevant theories

Kazakhstan has made a comprehensive approach to the «Green economy» transition, and has become one of the first countries in Eastern Europe and Central Asia to take a step towards a «green» country (Rakhmetullina, 2016).

The country, in order to proceed to the «Green Economy» should accomplish a series of objectives, such as structural reforms of budget, tax, environmental, scientific and technical policy, development of a balanced policy of natural resource use (Madiyarova, & Dzhempeisova, 2015).

To implement the concept of a «Green Economy», it is necessary to improve

territorial planning, switching to sustainable urban development and green architecture. It is essential to use the principles of economic modeling and territorial and sectoral analysis to illustrate how public investment in the economy contributes to economic growth, job creation, and the solution of social and economic problems (Madiyarova, E., Madiyarova, K., Abdiev, B., & Ezhebekov, M 2015).

### 2.2.1 Air pollution of an independent country as of the earlier 20th century

The beginning of the twentieth century in Kazakhstan is defined by the two types of the economy, and these are the wide-spread development of capitalism and the colonization of Kazakh lands. Nomadic pastoralism was extensively influenced by capitalist Russia in the early 20th century, leading to the formation of new forms of economy. In pre-revolutionary Kazakhstan, the dominant industries that had gradually developed were the mining industry and the industry for processing agricultural products. Coal fields were developed in Ekibastuz and Karaganda cities. The petroleum, mining and in addition the coal industry were as a target for foreign capitalists. The Atbasar copper mines, the Ridder mines, the Karaganda and Ekibastuz coal mines, and a series of such oil fields were sold and given into the hands of outside capitalists (Oskolkov, & Oskolkova, 2020).

Kazakhstan has for centuries possessed excellent reserves of natural resources. However, due to an absence of a nature protection base, the land and nature of the country turned out to be defenseless against all kinds of tests and misuse of the land resources. As the economy began to progress in the first half of the 1980s, the state moved into new locations to build new type of industries, and for this reason, they tapped a large amount of natural reserves.

The time of the economic growth is the second half of the twentieth and the beginning of the twenty-first centuries. Yet, this growth has seriously damaged the environment and affected the country's ecology at that time.

What were the contributing factors to the deterioration of the environment then? The

misuse of natural capital, the lack of control over pollution of the natural environment with all sorts of wastes, all these factors have led to the degradation of the environment (Kusainov, 2015). If I am being specific about who and what influenced air pollution in the early 20th century, I could mention the Semipalatinsk landfill.

The Union of Ministers of the USSR in 1947 adjudicates to construct a Semipalatinsk nuclear test site for the purpose of military tests. From 1949 to 1991, at least 616 thermonuclear and nuclear devices were detonated. Radioactive gas from 169 underground test and 55 air and surface explosions leaked outside the territory of the nuclear explosion. The president of the Kazakh branch of the international movement «Doctors for the Prevention of nuclear war» S. B. Balzhanov (2021) reported that the population of the Semipalatinsk district lives for three years less than in other cities of the Republic.

Day of the first explosion there was a dazzling glow in the sky, all the wooden objects had moved. As the residents described it, it seemed like there was a column in the sky that was burning inside. All the nearest buildings were destroyed and dust was all around the region, not only Semipalatinsk city (Musa, 2021).

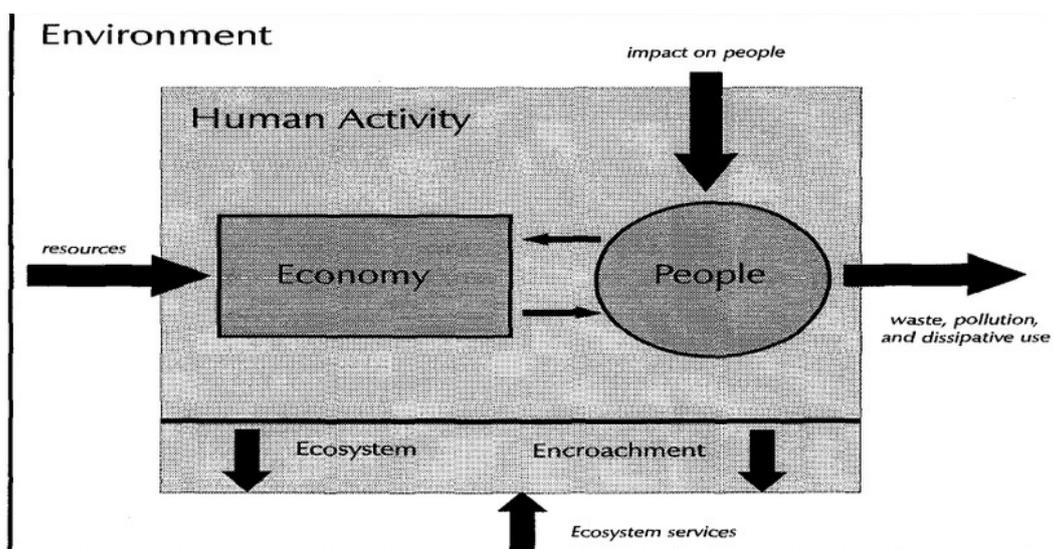
Thirty-four years have passed since the last nuclear explosion at the Semipalatinsk polygon. Throughout all of those three decades, people have fought to save the Earth and their lives (Zhandauletov, 2022).

### 2.2.2 Human Interaction with the Environment-Model

The model of human interaction with the environment was first recommended by Professor of Mathematics and Statistics A. Hammond and others (Yap, Leow, Peng, & Ismail, 2019).

Humans are directly dependent on and closely related to the environment and nature for their own survival. The interaction between humans and the environment has evolved and changed over time.

*Figure 2.10. Model of Human Interaction with the Environment (Akintunde, 2017)*



The theory of human interaction with the environment describes how humans affect the ecosystem that surround them and how the surrounding systems affect humans. For example, humans directly damage the environment and nature by cutting down trees in the forest to create farmland for themselves. Conversely, the environment influences the behavior of the people living in it, for example, by causing them to develop warm clothing for colder climates (May, 2022).

Allan Hammond and et al. (1995) reported that there are four ways in which a person and the environment interact. (See Figure 2.10.). First, it is a source when people obtain all the things they need from the environment. This includes vital resources such as water, food, minerals, and many other resources from nature that are used for the country’s economy. As a result, there is overexploitation by humans.

People always utilize various types of natural resources in their normal lives, more specifically, things like wood, metals, gas, oil, and more. As I mentioned earlier, humans obtain life-sustaining materials from nature, although they often consume energy, for example, to cook food or to have access to hot water. Humans need various resources to survive, such as simple things like making clothes or transportation to get around.

To illustrate, I would like to bring up the issue of deforestation in Kazakhstan.

Kazakhstan, unfortunately, is one of the countries with low forest cover. Forests in Kazakhstan are often exposed to numerous threats, be it natural disasters, natural factors, cutting of trees for construction purposes, mining, etc. In 2022, 706 forest fires were registered in Kazakhstan (Alkhabaev, 2022). These fire accidents are very harmful for the environment and the economy of the country, because the forest is the carbon reservoir of the whole Earth.

As an example of forest fires, it should be noted that the East Kazakhstan region, where the climate is suitable for combustion of forests, is considered the most dangerous. One town in this area has experienced a terrifying forest fire in 2021, causing extensive damage to the forest, and even to the town itself. On this occasion the man was the one who set the fire; therefore he was unable to extinguish it, and had to leave the area to ensure his own safety (Mayseyt, 2022). The second type of interaction is a people transform these ways and means into products through industrial areas. Whereas in ancient times people obtained food without the help of manufactures, i.e. actively hunted and led a nomadic lifestyle, today everything has changed (Hammond, Adriaanse, Rodenburg, Bryant, & Woodward, 1995).

The emergence of industrial enterprises helped to expand the extraction of natural resources. For example, the first automated techniques for cutting trees appeared around the 18th century. Such global modernization began because of the growing population (Weber, n.d.). Consequently, all kinds of wastes and emissions began to enter the environment, so that individuals polluted not only the atmosphere of their location, but also the atmosphere and the habitable environment of the whole world.

The next indicator should be identified as a life support. This explains how our earth's ecosystem supports the life of all humanity (Hammond, Adriaanse, Rodenburg, Bryant, & Woodward, 1995).

I would like to mention that psychology has taken a leading position in the study of human-environment relations. In 1992, historian T.Roszak coined the new term called «eco-

psychology». This term is a call to save nature from human destruction. The historian proposed to establish and improve a connection between psychology and ecology, so that people can understand what damage they do to nature and look at the situation from the other side (Shmeleva, 2010).

People have long exploited natural resources to satisfy their own needs. Today, however, there are many different ecosystems that also satisfy people's needs without harming nature. As an example, more and more people around the planet had started to switch to organic products, therefore, the industry of all-natural products is blossoming well nowadays. The fourth type of interaction is the influence of the environment on human well-being (Hammond, Adriaanse, Rodenburg, Bryant, & Woodward, 1995).

One of the most pressing environmental problems in Kazakhstan is air pollution. Air pollutants include coal, traffic, garbage, waste, and emissions from industrial plants. These pollutants inflict massive damage on the entire planet, in addition to being a huge detriment to a person's prosperity and life.

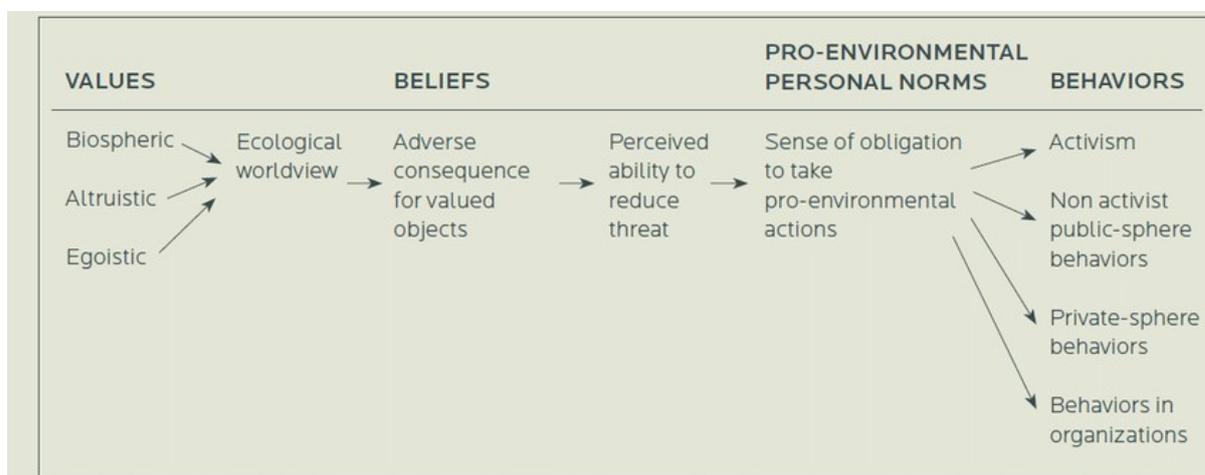
### 2.2.3 The Value-Belief-norm Theory of Environmentalism

The theory of the Value-Belief-norm was first proposed by Stern in 1999 (Ghazali, Nguyen, Mutum, Yap, 2019). This theory is tightly connected with a personal internal norms, and it can be explained that when this norm is activated, individuals choose not to harm anyone or anything because they internally recognize that any negative impact will negatively affect their own morals and values. Personal values are the antecedents of environmental beliefs.

People who accept the major values of the movement, who truly believe that valuable objects are threatened, and who believe that their actions can restore these values, have a responsibility and tend to have a guilty conscience and an obligation to protect the environment. This results in a propensity to provide support, the results of which depend on

the abilities, and limitations of the individual (Stern, Dietz, Abel, Guagnano, & Kalof, 1999).

Figure 2.11. Value-Belief-Norm Theory of Environmentalism (Akintunde, 2017)



P. Stern divided values into three: biospheric, altruistic, and egoistic. Egoistic ecological values are based on the belief in the negative impacts of environmental risks on the welfare of people who use natural sources. In this type, people act for their own needs out of environmentally oriented motives. Altruistic values-this is the value when a person is strongly concerned about a healthy environment for all types of the population. If a person knows and appreciates the value of all nature and environment, this type belongs to biospheric values. The above types together form personal moral attitudes and stereotypes and beliefs of the subject. The complex of attachments includes an ecological view, adverse consequences for valued objects, and the perceived ability to reduce harm. Based on this sequence (See Figure 2.11), a complex set of environmentally friendly norms emerges. Based on these conclusions, four models of behaviors are formed: ecological activism, for example, when a person effectively participates in an organization that addresses an ecological problem. The second model manifests itself in less active forms, i.e. the person prefers to pay extra money and thus secure ecological sustainability. The next pattern is a private sphere of behaviors. It involves actions where an individual chooses organic goods and

prefers to collect garbage (Ermolaeva, & Ermolaeva, 2019).

Unfortunately, the population of Kazakhstan is not able to recycle waste due to the incompetence of public and private utilities and the scarcity of waste treatment facilities. Considering the increasing problems with littering in the country, two years ago the head of state mandated an increase in fines for environmental damage for individuals and for all sub-nations (Nering, 2020).

Last but not least, the fourth model is responsible for people having an impact through any kind of organizational behavioral practices (Ermolaeva, & Ermolaeva, 2019).

#### 2.2.4. Collective action theory

Collective action theory was first published by American economist Mancur Olson in 1965. This theory is defined as any coordinated political or social intervention that meets the needs of people (Cloud, 2016).

It is equally worth remarking that there is the concept of rational choice, according to which an individual pursues an action by being rational and thinking only of his own benefit. Such a person has only a self-interest in his personal benefit from the results of the action. Regardless, such an individual is also capable of making all kinds of moves to achieve collective and social benefits, but, as it was mentioned above, only in pursuit of his own goals.

According to an article by Kornhauser (as cited in Sokolov, 2018), it is claimed that if at some point the authorities lose control over society, this is likely to lead to collective actions of mass society, resulting in an anti-democratic collapse of the state.

It has been analyzed by Stryker, Owens & White (as cited in Sokolov, 2018) that this theory has been associated with less negative evaluation since the end of the 20th century.

An example of this theory is the protests that took place in Kazakhstan over environmental issues. The protest was scheduled for February this year in the center of Almaty, where more than 200 people gathered. This group of people was concerned about

urban environmental issues. The people who took part in the rally stated that they were not willing to suffocate under the many emissions that would ruin their lives in the future. They also want to encourage all people to slowly transition to a healthier, environmentally friendly lifestyle by, for example, giving up their own transportation and switching to more eco-friendly modes of transportation. It was pointed out that their goal was to improve the condition of the city in order to maintain their health (Zharbulova, 2022). As indicated in this example, a collective action has taken place in this case, where humans have acted for the public interest, although there is often a self-interest behind it.

*Figure 2.12. Photography of protesters (News Agency NewTimes.kz, 2022)*



### 3. Research methodology

#### 3.1 Research design

The dissertation aims to familiarize with the critical environmental situation of the Republic of Kazakhstan, and it is also dedicated to the factors that prevent the process of greening. The environmental catastrophe in the country has been explored by the ecologists until the present time, however, at this point the country's interest is mainly in the economy of the country rather than in ecology. In this dissertation, both quantitative and qualitative methods were used for the research. As the quantitative method is capable of constructing general conclusions from the study, which are numbers. The qualitative method was used for clarification of some questions in a descriptive format, because it was relevant to understand the attitude of the people who were questioned. The existing constructs have been used in the process of creating the survey.

#### 3.2. Research context

The research was conducted in Kazakhstan, where environmental problems started when the country was part of the USSR.

Kazakhstan adopted a Concept for Transition to Sustainable Development in 2006, which has been evaluated as a promising perspective. Special institutions were created for the transition, which were also supposed to contribute to the transition towards stable development among all domains. This concept was developed to balance social, economic and, most importantly, environmental objectives. However, as mentioned previously, the government has not been successful in maintaining a balance between the economy and the environment. This has happened with this Concept as well. After all, the Concept, in spite of the various actions and goals aimed at achieving stable development, was more oriented towards economic development.

In main cities of Kazakhstan, ecological topics are one of the major problems that must be solved. Overall, the population of the country almost constituted 19.7 million people

(Asgarli, 2022). For example, in the megapolis of Almaty, the number in 2022 amounted to 2.03 million people, and in the capital of the country, the population exceeded 1.33 million people (Dusumov, 2022).

In Almaty, the number one issue is smog. The causes of this smog are non-gasified private buildings, an increase in vehicle transportation, and thermal power plants.

### 3.3. Data collection

Considering the fact that ecological issues are more prevalent and locals may be aware of urban issues in their cities, data were gathered from residents of nearly all Kazakhstan cities.

*Figure 3.1. Smog over the city of Almaty (Kiseleva, 2021)*



I have used convenience sampling to collect data in my study. It allows me to be able to spread out my questionnaire by using my network. The questionnaire was first formulated in English and then translated into Russian. I chose to use Google Forms to create the survey. Therefore, I decided to incorporate my social networks such as TikTok and Instagram, to

involve as many people as possible. Moreover, people that have seen my questionnaire on social media have also been circulating my survey to their friends and people they know. On the social network TikTok, my video with a message encouraging people to participate in the survey gained more than 6,000 views, which helped me not only to spread the survey throughout Kazakhstan, but also to remind them about our ecological conditions. Besides, I used the WhatsApp platform, where I messaged my family and friends, asking them to do a kind gesture for me. Within 10 days, 245 questionnaires were collected. The questionnaire was conducted between 3rd and 13th January 2023.

### 3.4. Structure of questionnaire

The survey is divided into five segments, such as: personal information, type of activity, demographic information, attitudes toward the environment, and evaluation of the effectiveness of government efforts to protect the environment. This questionnaire commences with personal questions for further research. The second sector to clarify the type of occupation of each person. It was meaningful to understand if people in high-ranking positions or just students had a concern about ecology situation. The following segment is responsible for the behavior of individuals when it relates to the environment. In this sector, respondents had to indicate their familiarity with the history of environmental degradation in Kazakhstan. To be accurate, it was important to determine whether all people were aware of air pollution, and, if so, whether they had any awareness of the causes that led to their own suffering. Lastly, some questions were used to clarify the position and level of government efforts in ecology. I also used a 5-point scale ranging from unsatisfactory to excellent.

The survey was completed with a question about the state's reporting of air pollution to the country's population.

### 3.5 Measures

The measures I have used in this dissertation were appropriate for the construction of reliable survey methods. On this survey method there are 2 scales that are used, one scale is a

5-point scale that starts from unsatisfactory to great, the other 10-point scale from critical to very good.

Furthermore, there were questions about personal information such as age, activities, and place of residence, which were formed as multiple choice questions. As well, the questions were specifically tailored to fit the Kazakh context.

### 3.5.1 Independent variables

The questionnaire begins with questions about personal data, followed by a part that focuses on the independent variable. The first question in this part was generated in order to discover the human empathy towards the environment, and is measured by asking the responding person about his or her agreement with the statement of his/her interest regarding the surroundings.

The next item concerned the respondent's intention to protect the environment.

A 5-point scale from critical to very good is an instrument, which measures satisfaction in the environmental efforts that are carried out by government programs. The scale consists of the question: «In your opinion, how effective are the environmental activities carried out by state and municipal authorities?» The given measurement indicates to which degree the person is convinced in the efficiency of any activity on protection of the environment, which are undertaken by the state authorities, as well as the question is self-developed.

### 3.5.2 Dependent variables

There are dependent variables in this survey:

1. Statements of the level of air pollution
2. A detailed description on the emergence of an environmental problem, more precisely air pollution in Kazakhstan.

Understanding the consumer's assessment of the level of air pollution, the respondents were supposed to scale from 1 to 10. A 10-point scale ranging from 1 - «critical»

to 10 - «very good» is used. Additionally, there is an open-ended question for respondents, and provides a narrative of people's opinions about how long air pollution has been an ecological problem in Kazakhstan.

4. Results

The total number of valid questionnaires answers in this study is 238 out of 245. 7 of them were invalid because there were duplicates of the same responses, and some of the replies were from people who were not residents of this country. Among the entire questionnaire, the majority of respondents were female (79,2%), and the rest (20,8%) were men. Concerning their age, the largest percentage of participants were under 20 years old (45,3%). Most individuals (55,7%) are students.

Likewise, 95 people (38,8%) indicated that they are located in Almaty, and 42 of those (17,1%) reside in the capital of Kazakhstan. For more information, see table 4 below:

*Table 4.1. Personal information (own elaboration)*

		N (238)	%
<b>Gender</b>	Female	194	79,2%
	Male	51	20,8%
<b>Age</b>	Under 20	111	45,3%
	21-25	83	33,9%
	26-30	24	9,8%
	31-35	9	3,7%
	36-40	3	1,2%
	40 and more	15	6,1%
<b>Activity type</b>	Salaried employee	63	25,8%
	Civil servant	18	7,4%
	Entrepreneur	16	6,6%
	Unemployed	11	4,5%
	Student	136	55,7%
<b>Living city</b>	Almaty	95	38,8%
	Astana	42	17,1%
	Other	101	44,1%

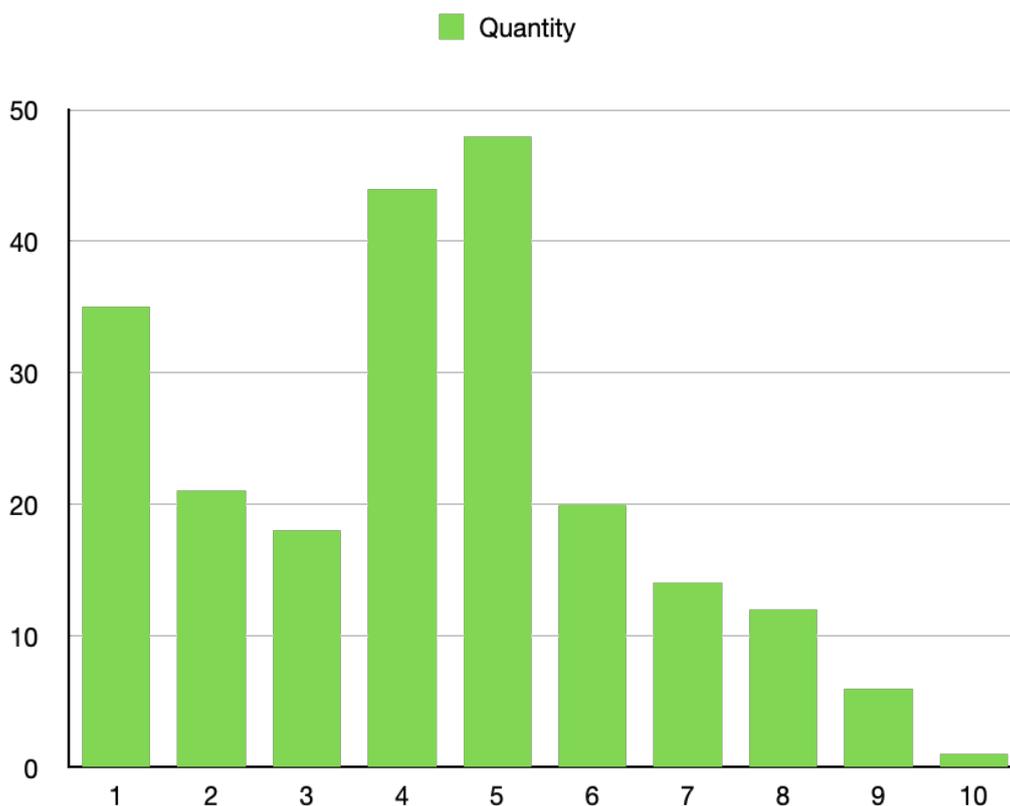
According to the correspondent's answer, 96,7% indicated that pollution of the public environment was of concern to them. The survey contained an open-ended question that required comments from participants. The purpose of inquiry was to identify the level of awareness of the environmental crisis among the citizens of Kazakhstan and to identify the most urgent ecological problems in the country from people's point of view. Air pollution had the highest percentage of responses (87,6%), although other respondents also highlighted

several prominent environmental concerns, as well as emissions from thermal power plants, a shortage of recycling centers, and the shoaling of rivers and lakes across the country.

It is worth remarking that 25% of the population, unfortunately, take no action to protect the environment, while the remaining 75% claim to be committed to preventing pollution of the public environment by depositing garbage in recycling centers. Additionally, the majority of answers revealed that the situation with air pollution became particularly acute 10 years ago. Furthermore, there is an important question that requires a rating on a ten-point scale, where 1 indicates a critical rating and 10 represents a very good rating.

The statistics for this question are presented below.

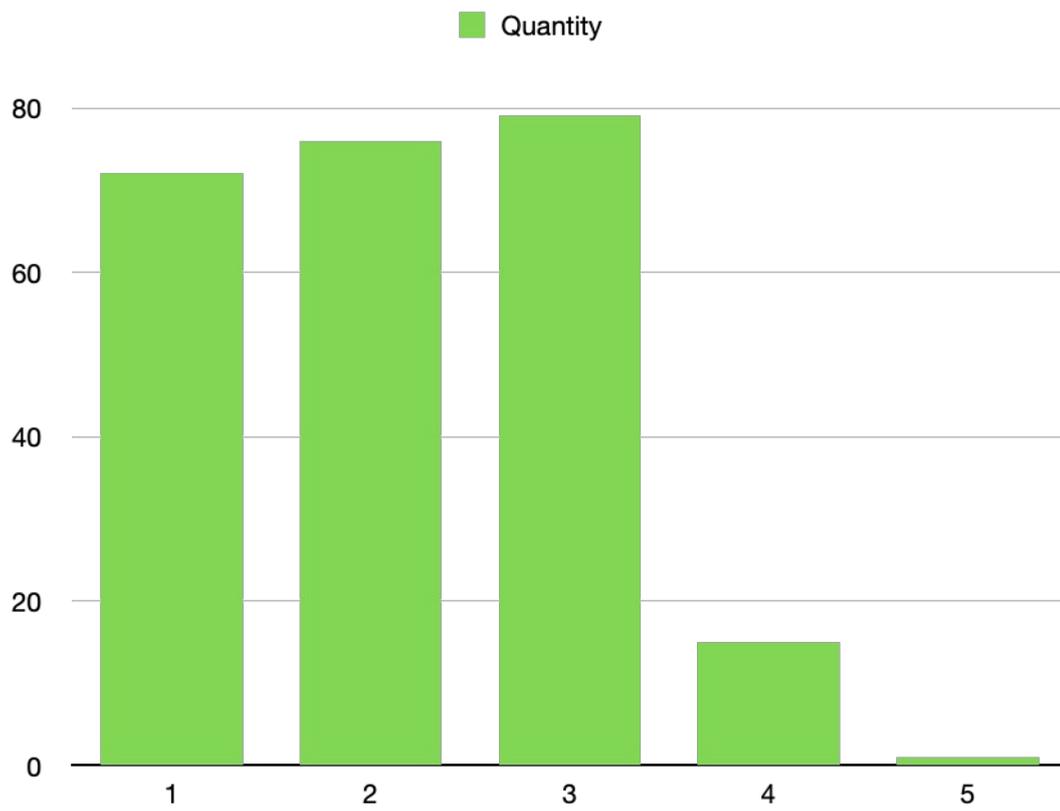
*Table 4.2. Statistics on the answers to the question: «Please rate air pollution in your city on a 10-point scale» (own elaboration)*



Respondents have also posed a question about the effectiveness of government measures to provide environmental protection. Participants had to evaluate them on a five-

point scale, with 1 being unsatisfactory and 5 being excellent. The following are the statistics of the answers to this question.

*Table 4.3. Statistics on the answer to the question: «Do you think that the environmental protection measures implemented by state and municipal authorities are effective?» (own elaboration)*



## 5. Conclusion

In this thesis, I analyzed the arising and current condition of environmental catastrophes all over Kazakhstan cities, as the reasons that prevent the process of the greening of the country. The focus of this study was devoted to the development and establishment of industrialization in the Republic of Kazakhstan, as well as the negative impacts of that economic evolution on the surrounding environment.

The study revealed that the leading causes of environmental disasters are such factors as air pollution, pollution of the environment by domestic waste, a lack of recycling centers, and insufficient water resources in some cities of Kazakhstan. All of the above-mentioned reasons have their origin in Soviet times, since numerous thermal power plants have not replaced solid fuel with gas, which would have contributed to the reduction of emissions. In terms of the East Kazakhstan region, all the cities near Semey used to be the location of the nuclear test. There were underground and aerial explosions in those testing grounds, affecting the entire land of the East Kazakhstan region, and beyond.

The study considered both managerial and some socio-political implications with the objective of improving knowledge of the ecologically critical situation in Kazakhstan, and encouraging them to lead an eco-friendly lifestyle.

Management and socio-political implications have to target comprehensive concerns, such as reducing air pollution, developing new recycling facilities, likewise, enhancing government attention to the greening of Kazakhstan's cities. Public awareness and promotion of environmental awareness is always a crucial spectrum in Kazakhstan, where the level of ecological understanding is quite low. Through the improvement of this environment, people that are already aware of the ecological issue, have the opportunity of influencing others to consider and start taking actions to protect the environment.

As of now, the country's environmental system is not yet reaching a new level. The country is still experiencing corruption issues, that do now allow to enhance the condition of

industrialization, thus the ecology suffers. As an example, the study indicated that many communities are not connected to a water supply system, and this means that there may be only one water pipe for the entire settlement. The same situation applies to the heating system, many houses also lack heating, and people often have to use coal-fired stoves, as a consequence of which fires occur. Furthermore, the condition of the country's ecology prevents it from reaching another level, as residents are generally unaware of the subsequent consequences of their actions, and of the damage, caused by their actions, to nature. Besides, the majority of residents remain clueless about how they can influence the process of ecological progress.

Based on the results of the survey, it is clear that most of the respondents were young students. Moreover, Kazakhstan's young people are not particularly concerned and do not initiate any activities to protect the environment. However, the fact that since their childhood, young generations are not educated in environmental knowledge is the problem. There are not enough centers or other methods in which they could avoid harmful effects, even though their intention is to improve the state of the environment.

Indeed, ecology should be an area of concern among all people, not only in Kazakhstan as well as across all countries. There are various ways to effectively approach the process of protecting the environment. First, the formation of a school curriculum on ecology, as well as lecture projects in different academic institutions, so that environmental knowledge is evaluated on an equal level with other subjects.

## Appendix

## Questionnaire

## English version

Dear Gentlemen!

I kindly offer you to take part in this study by participating in the following questionnaire.

The purpose of this survey is to investigate the relationship between environmental awareness and the maintenance of greening in Kazakhstan. It would take only 5 minutes to fill out this survey.

Thank you for taking the time to help me with this research. The questionnaire is a huge opportunity for me to accomplish my master's thesis research.

The gathered data is strictly confidential and will be used for academic purposes only.

Thank you for your consideration!

1. Type your email
2. Please indicate your gender
  - Male
  - Female
3. Please specify your age
  - Under 20
  - 21-25 years old
  - 26-30 years old
  - 31-35 years old
  - 36-40 years old
  - 40 and more
4. What is your occupation?
  - Salaried employee
  - Civil servant

- Entrepreneur
- Unemployed
- Student

5. Please choose your city

- Almaty
- Astana
- Other

6. Are you concerned about the deterioration of the environment?

- Yes
- No

7. What issues do you find most pressing?

- Air pollution
- Overcrowding of streets with transport
- Mass election of a thermal power plant
- Other

8. Do you take any measures to protect the environment?

- Yes
- No

9. If yes, which ones?

- Avoid polluting public space
- Recycling household waste to a collection point
- Participate in various activities to protect the environment
- Other

10. Please rate air pollution in your city on a 10-point scale

(on a scale 1 to 10: 1 = critical, 10 = very good)

11. How long do you think air pollution has been a problem in Kazakhstan

- Detailed response

12. Do you support an environmental lifestyle?

- Yes

- No

13. Do you think that the environmental protection measures implemented by state and municipal authorities are effective?

(on a scale 1 to 5: 1 = unsatisfactory, 5 = great)

14. Do the executive authorities inform you adequately about pollution and the impact on public health?

- Yes

- No

Russian version

Господа!

Приглашаю Вас принять участие в этом исследовании, пройдя следующий опрос.

Цель этого опроса-исследовать взаимосвязь между осведомленностью об экологической ситуации и поддержанием озеленения Казахстана. Для заполнения данного опроса потребуется всего 5 минут.

Благодарю Вас, что нашли время помочь мне с этим исследованием. Данный опрос даст мне огромную возможность закончить работу над магистерской диссертацией.

Собранные данные останутся строго конфиденциальными и будут использоваться исключительно в академических целях.

Спасибо за внимание!

1. Введите email

2. Укажите ваш пол

- Мужской

- Женский

3. Укажите ваш возраст

- До 20 лет
- 21-25 лет
- 26-30 лет
- 31-35 лет
- 36-40 лет
- 40 и старше

4. Чем вы занимаетесь?

- Наёмный работник
- Госслужащий
- Предприниматель
- Безработный
- Студент

5. Укажите ваш город

- Алматы
- Астана
- Другое

6. Беспокоит ли вас ухудшение состояния окружающей среды?

- Да
- Нет

7. Какие проблемы кажутся вам наиболее актуальными?

- Загрязнение воздуха
- Перегруженность улиц транспортом
- Массовые выбросы теплоэлектростанции
- Другое

8. Предпринимаете ли вы меры защиты окружающей среды?

- Да

- Нет

9. Если да, то какие?

- Избегаю загрязнение общественного пространства

- Сдаю бытовые отходы в пункты приема

- Участвую в различных акциях по защите окружающей среды

- Другое

10. Оцените, пожалуйста, уровень экологического состояния в вашем городе?

(по шкале от 1 до 10: 1 = критическое, 10 = очень хорошее)

11. Как долго, по вашему мнению, загрязнение воздуха является проблемой в Казахстане?

- Развернутый ответ

12. Поддерживаете ли вы экологически чистый образ жизни?

- Да

- Нет

13. По вашему мнению, насколько эффективны мероприятия по охране окружающей среды, осуществляемые государственными и муниципальными органами власти?

(по шкале от 1 до 5: 1 = неудовлетворительно, 5 = отлично)

14. Информировуют ли вас с достаточной мере органы власти о загрязнении окружающей среды и влиянии на здоровье населения?

- Да

- Нет

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