

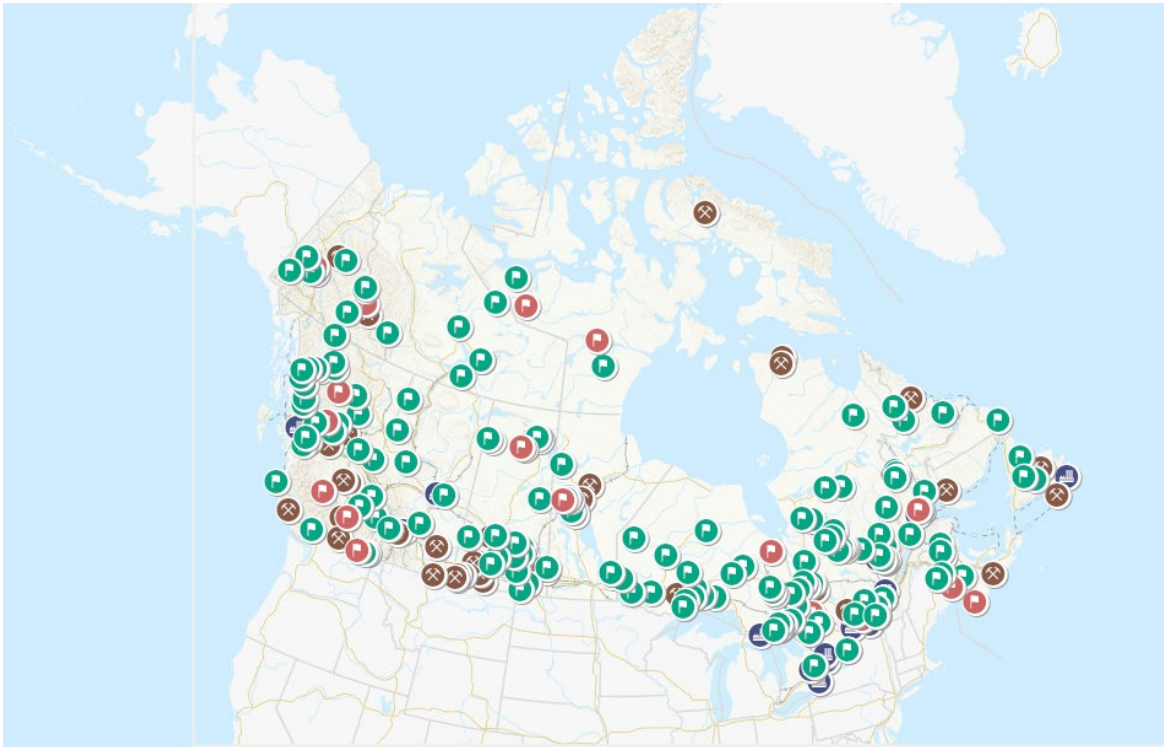
May 12, 2025

News and notes

Before going on to discuss the geology and geopolitics of Kazakhstan, here are some news items I thought were interesting.

Comments

If anyone has comments on any of my postings, please leave a comment on the LinkedIn page for the posting or email me at raymondreichelt@gmail.com.



Interactive Critical Mineral Map of Canada, click on the map to go to site
Credit: [Critical Minerals Centre of Excellence](#), ©[Government of Canada](#)

Geopolitics

- India and Pakistan:
 - [India and Pakistan's fragile ceasefire only the first step to tackling deep, acrimonious conflict.](#)
 - [‘Operation Bunyan-um-Marsoos’: Pakistan’s precision strike on Indian army positions.](#)
 - [The first drone war opens a new chapter in India-Pakistan conflict.](#)
 - Irony watch: [Amid Heightened India-Pakistan Tensions, A Caution From Taliban.](#)
 - [Pakistan downs 5 Indian jets, destroys brigade HQs, multiple checkpoints in retaliatory strikes.](#)

- From the Daily Mail (UK): [India missile attacks terrorist sites in Pakistan](#).
- [Exclusive: India starts work on hydro projects after suspending treaty with Pakistan, sources say](#).
- [India said to have cut water flow to Pakistan – media](#).
- [Pakistan Test-Fires Nuke-Capable Ballistic Missile As Tensions With India Soar](#).
- [‘No Room for Spectators’: Veteran RCMP Investigator Warns of Coordinated Hybrid Warfare Targeting Canada](#); related to William Lind’s concept of [Fourth Generation Warfare](#) and the proposal by Col. Qiao Liang and Col. Wang Xiangsui for [Unrestricted Warfare](#).
- [Are we heading for another world war – or has it already started?](#)
- [Why Regime Change in Iran Is Becoming Inevitable](#); colour revolution coming?
- [Leo XIV is the new Pope](#); apparently the previous Pope, Francis, was a friend of [planetary geology and astrobiology](#).
- Geopolitical risk: [U.S. Sanctions Disrupt Chinese Teapots’ Purchases of Iranian Oil](#).
- [OPEC+’s ‘healthy’ crude oil market looks like catching a cold: Russell](#).
- [The U.S. Threat Looming Over Canada](#); it’s not just Trump.
- Book review: [China, Russia and the remaking of the Eurasian supercontinent](#).

Research and News

- [Sedimentary evolution of debris avalanche deposits of the Lower Cretaceous Xiguayuan Formation, Luanping Basin, North China](#).
- [Melt-Supported Strain Localization at Eclogite-Facies Conditions Triggered by Syn-Metamorphic Strength Inversion](#).
- [Labile iron associated trace metals and REEs in estuarine surface sediments](#).
- Lunar geology: [A potential mantle origin for precursor rocks of high-Mg impact glass beads in Chang’e-5 soil](#).
- [Calibration of the relationship between oxygen fugacity and the oxidation state of iron in anorthitic plagioclase](#).
- Fluvial geology: [Incision history of the San Juan River, USA, in the past 1.2 million years](#).
- [Late Cenozoic Rise in Seawater \$\delta^{11}\text{B}\$ Not Driven by Increasing Boron Adsorption](#).
- [Elemental Geochemistry of Tidal Marsh Sediment and Its Potential as an Indicator of Sea-Level Change in Cascadia](#).

- [In situ mica Rb-Sr geochronology and microstructural analysis to evaluate the timing and sense of shear zone movement: Shannon and d'Abbadie Faults, Yukon, Canada.](#)
- [Crystal Fragmentation Inducing Euhedral Crystal Habits in Volcanic Rocks: Fracture Histories of Crystals from Various Tectonomagmatic Settings and Implications for Plumbing System Processes.](#)
- [Europium traces the impact of high temperature hydrothermal systems on the early oceans.](#)
- [Horizontal Transport of Picture Gorge Basalt Magma Through the Monument Dike Swarm Determined by Magnetic Fabric.](#)
- [Origin of metallic elements: Direct Evidence for r-process Nucleosynthesis in Delayed MeV Emission from the SGR 1806–20 Magnetar Giant Flare; Earth.com summary \[here\]\(#\).](#)

Plate Tectonics

- [The Anchimetamorphic Tectonic Mélange of Tempa Roccarossa \(Southern Apennines, Italy\): Insights on the Kinematic and Thermobaric Evolution of the Upper Miocene-Pliocene Orogenic Wedge.](#)
- [Miocene decoupling of surface uplift of the Central Anatolian Plateau interior \(Türkiye\) and its modern mountainous margins.](#)
- [How Do Passive Margins Convert to Active Margins?](#)
- [B-Type Olivine Fabrics Within the Cumulate Buck Creek Ultramafic Body Emplaced During Southern Appalachian Taconic Subduction.](#)

Paleontology

- [‘The result is spectacular’: Manitoba fossil museum reconstructs massive mosasaur skull.](#)
- [Taxonomic and ecologic transitions in Triassic marine bivalve communities.](#)
- AI and paleontology: [Classification of dinosaur footprints using machine learning.](#)
- [Adaptations to marine environments and the evolution of slow-paced life histories in endotherms.](#)
- [Shishania is a cancelloriid and not a Cambrian mollusk; Phys.org summary \[here\]\(#\).](#)
- [Cool-temperate riparian floras in the Early Cretaceous rift valley of Victoria, Australia.](#)
- [Ammonoids and inoceramid bivalves from the Upper Cretaceous shallow marine deposits of Taneichi Formation in Hirono Town, Iwate Prefecture, northeastern Japan: Implication for biostratigraphy.](#)
- [Re-investigation of the mid-Cretaceous ‘Skenes Creek’ dinosaur tracksite and discovery of distinct tracks at Browns Creek within the Lower Cretaceous \(Aptian–Albian\) Eumeralla Formation, Victoria, Australia.](#)

Mining and Energy

- [Column: Iron ore tells a different story to the China tariff pain narrative.](#)
- [JP Morgan says gold could hit \\$6,000 when Trump's term ends.](#)
- [Pembina Pipeline sees enough demand for potential expansion to Cedar LNG project.](#)
- Petroleum geology: [Phase behavior of nanoconfined continental shale oil and reservoir fluid phases in the Gulong shale of the Songliao basin.](#)
- [De Beers to shut down lab-grown diamond brand Lightbox.](#)
- [Ontario set to begin construction of Canada's 1st mini nuclear power plant;](#) GE Hitachi [BWRX-300.](#)
- [Japan poised to make history as the first country to transmit solar power from space to Earth.](#)
- Drill baby drill: [Well completions per location more than double in Lower 48 states as technology advances.](#)
- [USGS Releases Assessment of Undiscovered Oil and Gas Resources Hosston and Travis Peak Formations Along the Gulf Coast.](#)
- [Rio Tinto extracts first gallium from Quebec operations.](#)
- Ore geology: [Tectonic Evolution and Structural Control of Dike-Hosted Orogenic Gold Deposits in the Yana–Kolyma Collision Orogen \(Eastern Siberia\): Insights from the Eastern Margin of the Siberian Craton.](#)
- More ore geology: [The Origin and Enrichment of Sedimentary Basin Lithium Brines: A Case Study From the Upper Devonian Leduc Formation, Alberta Basin, Canada.](#)
- Tungsten: [Proposed N.B. mine with critical minerals gets \\$20M boost from U.S.](#)
- Permian Basin: [The heart of the US oil boom is slowing.](#)
- [Mining Major Hails Massive Copper Discovery.](#)
- Regulations matter: [This Country Holds One of the Largest Lithium Reserves, But No One Wants to Mine It.](#)
- [B.C. company wants to open \\$300M made-in-Canada sand mine to fuel anticipated fracking, LNG boom.](#)

Environmental Geology and Hydrogeology

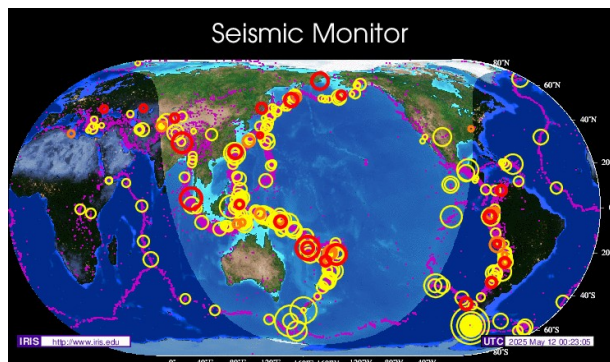
- Groundwater and [Land subsidence risk to infrastructure in US metropolises](#); Phys.org summary [here.](#)
- [Safety risk assessment of weak tunnel construction with rich groundwater using an improved weighting cloud mode.](#)

- AI and contaminated sites: [In silico machine learning-enabled detection of polycyclic aromatic hydrocarbons from contaminated soil](#); Phys.org summary [here](#).
- [Continuous Real-Time Detection of H₂, He, and ²²²Rn While Drilling DIVE-1 Boreholes \(ICDP\) Indicates Deep Fracture Fluid Migration in Crystalline Rocks.](#)

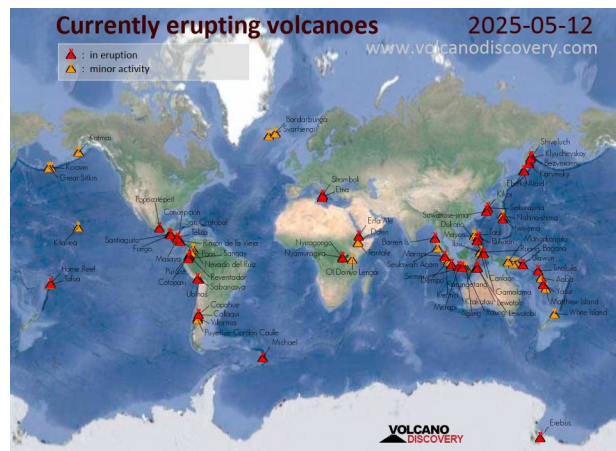
Glaciers and Climate Change

- [Topographic Effect Creates Non-climatic Variations in Ice-Core Based Temperature Records of the Last Millennium in Dronning Maud Land, Antarctica.](#)
- Calibrating stable isotope indications for past climates: [Spatial biases in oxygen-based Phanerozoic seawater temperature reconstructions.](#)
- [Glacier-level and gridded mass change in river sources in the eastern Tibetan Plateau region \(ETPR\) from the 1970s to 2000.](#)
- History of climate change: [Recurrence rates of explosive volcanism in paleo-equatorial Pangaea, and implications for climate near the peak late Paleozoic ice age.](#)
- [Glacier Recession and Climate Change in Chitral, Eastern Hindu Kush Mountains of Pakistan, Between 1992 and 2022.](#)
- [Postglacial bioweathering, soil nutrient cycling, and podzolization from palaeometagenomics of plants, fungi, and bacteria.](#)

Volcanoes, Earthquakes and Geohazards



[Seismic Monitor](#)



[Active Volcano Map](#)

Volcanoes

- United States Geological Survey (USGS) Volcano Observatories:
 - [Cascades Volcano Observatory Weekly Update.](#)
 - [Twenty episodes and counting: lava fountains continue in Kaluapele.](#)

- [Anticipating where future thermal areas may develop in Yellowstone National Park.](#)
- [Smithsonian / USGS Weekly Volcanic Activity Report.](#)
- Krakatoa and [The mystery of 1883](#); Phys.org summary [here](#).
- [Mile-wide underwater volcano ready to erupt off the West Coast.](#)
- Bolivia's Uturuncu volcano: [Scientists explore the anatomy of a 'zombie volcano' that's showing signs of activity.](#)
- [Volcanic eruption in deep ocean ridge seen by scientists for first time.](#)

Earthquakes

- [Euro-Mediterranean Seismological Centre \(EMSC\).](#)
- [Earthquakes Monitoring Live Worldwide.](#)
- [Two-Stage Systematic Forecasting of Earthquakes.](#)
- Earthquake research: [A Stress Memory Effect in Olivine at Upper Mantle Pressures and Temperatures.](#)
- [M4.1 earthquake rattles Tennessee](#); USGS summary [here](#); in the [Eastern Tennessee Seismic Zone](#).
- [Characterized source model of the 2023 Mw 7.6 Turkey earthquake for strong motion prediction of crustal mega-earthquakes.](#)
- [An Enhanced Focal Mechanism Catalog of Induced Earthquakes in Weiyuan, Sichuan, from Dense Array Data and a Multitask Deep Learning Model.](#)
- Update from Judith A Hubbard and Kyle Bradley on anthropogenic [Earthquakes in West Texas](#).
- [7.4 magnitude quake off Chile's far south briefly triggers tsunami alert but causes no damage.](#)

Landslides

- [Seismic, Field, and Remote Sensing Analysis of the 13 February 2024 Çöpler Gold Mine Landslide, Erzincan, Türkiye](#); Phys.org summary [here](#).
- [One of Earth's largest natural disasters hides in plain sight in California.](#)

Free Geology Books and Other Stuff

Free geology books can be downloaded from these sites:

- [OreZone Readers and Experts Telegram Channel](#); the Ore Zone channel also shows employment opportunities for geologists.
- [The Groundwater Project](#) has many groundwater geology books for free download; also they now have a [Free Online Learning Module: Pumping Test Analysis](#).

- Free Groundwater Modeling Course – [HydroGeoCenter](#).
- From Western Australia: [Carbonatite, lamprophyre and host rocks in the northern Aileron Province](#).
- Two volumes of Geology of Indonesia now can be accessed for [FREE/GRATIS](#). The books can be accessed from: vol 1 <https://lnkd.in/eH6Gcka4>; vol 2 <https://lnkd.in/egTYmpjk>.
- Brett Davis’ book on veins in a deforming rock mass: “[The Veining Bible](#)”; also at [this site](#).

Upcoming Events

- [May 15, 2025: NGWA’s Problematic Contaminant Webinar Series: Limiting Metals Mobilization During Managed Aquifer Recharge](#).
- [Sedimentary Geology and the Energy Transition Conference, June 2-5, 2025 – Salt Lake City, UT USA](#).
- Calgary, AB: [2025 Bootleggin’ Breakfast – July 8th & 10th](#); during the Calgary Stampede.
- [Society for Sedimentary Geology conference, Mountjoy IV – August 10-13, 2025, in Montreal, Canada](#).
- [Copper to the World Conference, Tuesday 26 – Wednesday 27 August 2025](#), in Adelaide, Australia; report on 2024 conference [here](#).
- [The 52nd Congress of the International Association of Hydrogeologists, 15-19 September 2025, Melbourne Australia](#).
- [GeoManitoba 2025 78th Annual Canadian Geotechnical Society Conference & 9th Canadian Permafrost Conference, RBC Convention Centre, Winnipeg, Manitoba, September 21 – 24, 2025](#).
- [29 September – 1 October 2025, Stuttgart, Germany, Nature Conference on Advancing Perovskite-Based Photovoltaics](#).
- [November 3 – 4, 2025 Central Canada Mineral Exploration Convention 2025 Victoria Inn Hotel & Convention Centre, 1808 Wellington Avenue, Winnipeg, Manitoba R3H 0G3, Canada](#).
- [5th International Professional Geology Conference \(IPGC\), November 5 to 7, 2025, Zaragoza, Spain](#).
- 2025 [Society of Petroleum Engineers Distinguished Lecturer Schedule](#).
- [List of geoscience events in 2025 from the International Union of Geological Sciences](#).
- [American Geophysical Union List of Upcoming Meetings](#).
- The Geological Society: [Events & Courses](#).

May 12, 2025

Geology and the Fate of Societies – Kazakhstan



Figure 1a – Kazakhstan

Credit: [CIA World Factbook](#), public domain



Figure 1b – Location of Kazakhstan

Credit: [CIA World Factbook](#), public domain

Located on the [Great Eurasian Steppe](#) in [Central Asia](#), the [Republic of Kazakhstan](#) borders on [Russia](#) to the north, [China](#) to the east, [Kyrgyzstan](#) to the southeast, [Uzbekistan](#) to the south, and [Turkmenistan](#) to the southwest. Kazakhstan also has a coastline along the [Caspian Sea](#), to the west.

The government of Kazakhstan is a unitary [semi-presidential republic](#), considered authoritarian by the [Economist](#) magazine. The President is [Kassym-Jomart Tokayev](#) and the Prime Minister is [Oljas Bektenov](#). The [legislature](#) has two houses, an upper house called the [Senate](#) and a lower house called the [Majilis](#). The Capital City of Kazakhstan is [Astana](#) (pop. 1,550,000 in the metropolitan area) while the largest city is [Almaty](#) (pop. 2,249,500).

According to the [Central Intelligence Agency](#) (CIA) [World Factbook](#), Kazakhstan has a total area of 2,724,900 square kilometres (km²), of which 2,699,700 km² is land and 25,200 km² is water. Also according to the CIA, 20,260,006 people live in Kazakhstan 58.2% of whom live in urban areas. 71% of the people are ethnic [Kazakh](#). Of the remaining: 14.9% are [Russian](#); 3.3% are [Uzbek](#); 1.9% are [Ukrainian](#); 1.5% are [Uyghurs](#); 1.1% are [German](#); 1.1% are [Tatar](#); and the rest are something other. [Kazakh](#) and [Russian](#) are the official languages with 80.1% able to speak Kazakh and 83.7% able to speak Russian. English is the second language of about 35.1% of the population.

In terms of religion, the CIA reports that 69.3% of the people are [Muslim](#); 17.2% are [Christian](#); 0.1% are [Buddhist](#); 0.1% are something other; 2.3% are non-believers; and 11% are unspecified. In terms of education, 99.8% of the population aged 15 and over can read and write; people can expect to spend 16 years in school.

Economically, the per capita [GDP \(PPP\)](#) is \$43,610; the [Gini](#) coefficient is 27.8, indicating low inequality; and the [Human Development Index](#) is very high at 0.837. In 2023, [The top exports](#) of Kazakhstan in 2023 were crude petroleum, gold, radioactive chemicals, refined copper, and copper ore. These products were predominately exported to China (\$15.2B), the United Kingdom (\$14.3B), Russia (\$9.78B), Turkey (\$5.42B), and Italy (\$4.63B). In 2024, Kazakhstan was the world's largest exporter of radioactive chemicals, and chromium oxides / hydroxides.



Kazakhstan's [top imports](#) in 2023 were cars, broadcasting equipment, vehicle bodies (including cabs) for the motor vehicles, computers, and parts and accessories for motor vehicles. The products were sourced predominately from China (\$18.7B), Russia (\$16.1B), Turkey (\$2.39B), United States (\$2.36B), and South Korea (\$2.21B). In an interesting move, to [skirt around sanctions](#) against Russia, [Ural Motors](#) moved their [production facility](#) from [Irbit, Russia](#) to [Petropavlovsk, Kazakhstan](#), beginning in 2022.

Figure 2 – My son's Ural

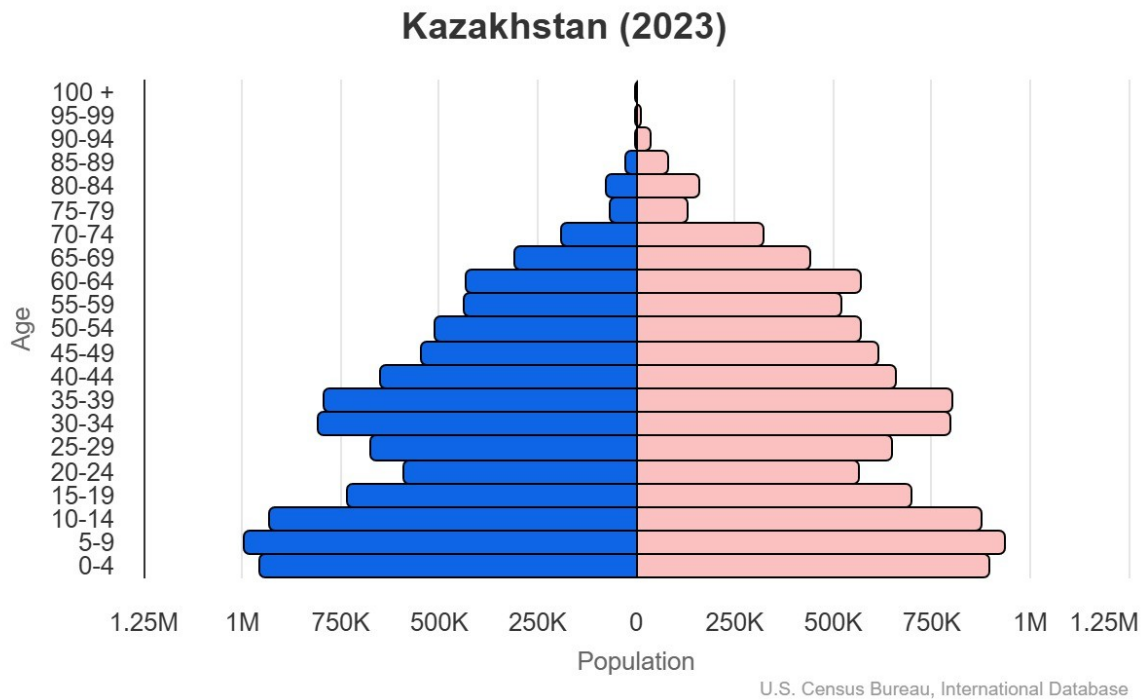


Figure 2 – Kazakhstan Demographics
 Credit: [U.S. Census Bureau, International Database, public domain](#)

The [demographics of Kazakhstan](#) show a middle aged country with a growing population. The median age is 31.9 years, 27.6% of the population is under 15 and 62.8% is between 15 and 64. The total fertility is 2.59 births/woman, above the replacement rate of 2.1. Annual growth in the population is 0.90% and the net migration rate is -0.4 migrant(s)/1,000 population. Men in Kazakhstan can expect to live 69 years while women can expect to live 77.9 years.

Geology

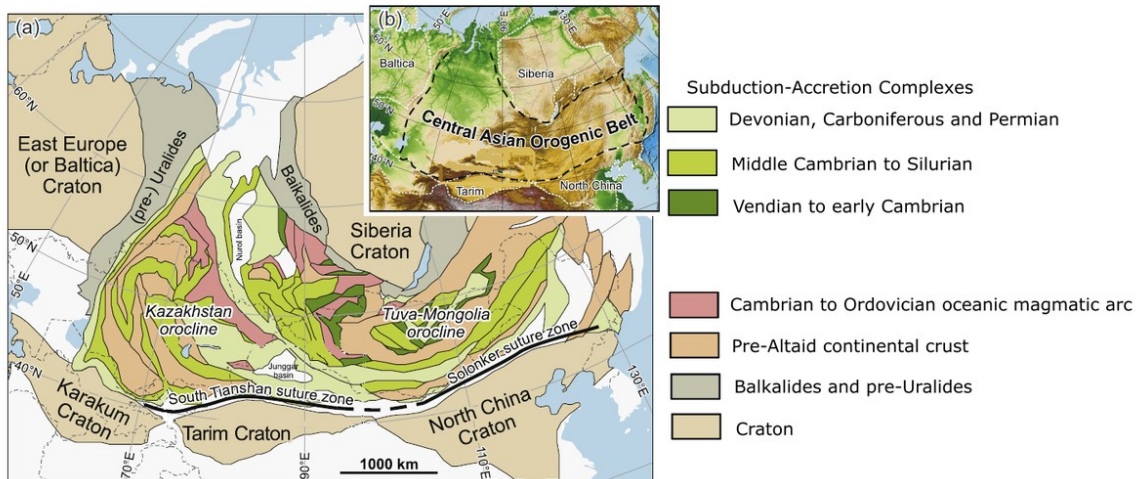


Figure 4 – Central Asian Orogenic Belt

Credit: Wongtzyanyuki, [Creative Commons Attribution 4.0 International license](#)

Tectonically, Kazakhstan sits in the middle of the [Eurasian Plate](#). Much of Kazakhstan sits within the [Central Asian Orogenic Belt](#) (CAOB). Sub-units of the CAOB within Kazakhstan include the [Kazakhstan Orocline](#) and the [Tuva-Mongolia Orocline](#). The CAOB was formed by the accretion of various fragments of [continental crust](#), [magmatic arc](#) and subduction-accretion complexes. The subduction-accretion complexes are made up of sediments and/or [oceanic crust](#) that were pushed onto continental crust at a subduction zone. The orogeny that formed the CAOB is often called the [Altaid Orogeny](#) that occurred during the [Paleozoic Era](#).

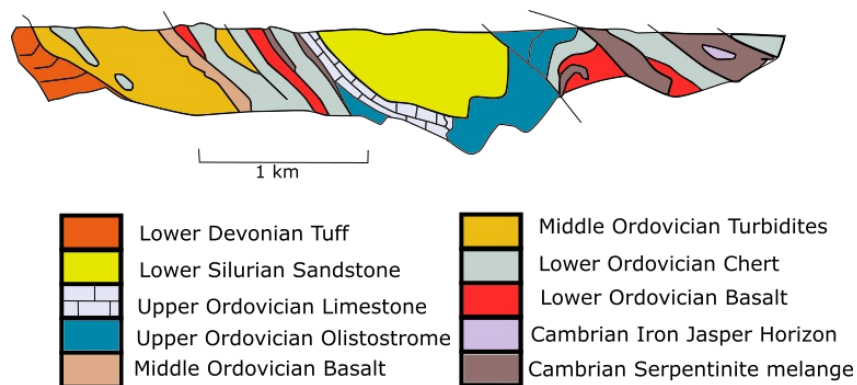


Figure 5 – Cross-section Across the Kazakhstan Orocline

Credit: Wongtzyanyuki, [Creative Commons Attribution 4.0 International license](#)

Looking closer at the Kazakhstan Orocline, the oldest, and basement rocks are in a [Mesoproterozoic](#) aged metamorphic terrane, possibly related to the terranes in the [Gondwana Supercontinent](#). Overlying the

basement rocks are [Neoproterozoic](#) sediments which are in turn overlain by [Cambrian](#) to [Ordovician](#) aged volcanic rocks from an [island arc complex](#) as well as [cherts](#) formed in deep sea environments.

During the [Ordovician](#) and [Silurian](#) the core craton of the Kazakhstan Orocline was largely complete. Later [Devonian](#) and [Carboniferous](#) aged deposits were mostly volcanic rocks formed in [continental arcs](#). Also formed during the [Devonian](#) and [Carboniferous](#) was the [Balkhash-Yili volcanic belt](#) when the Kazakhstan craton collided with the [Tarim Craton](#). [Carbonates](#) and [turbidites](#) also formed as the result of these tectonic movements over which were thrust [ophiolites](#), some accreted high-grade metamorphic rocks, basalts and cherts formed in deep sea environments.

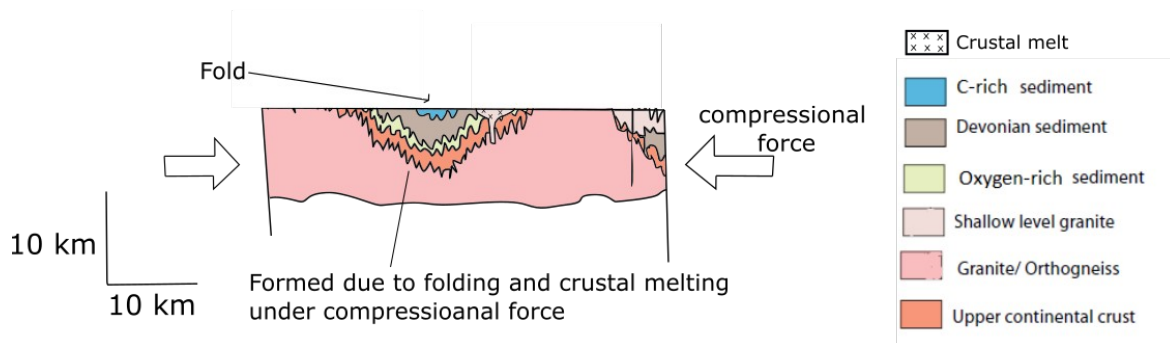


Figure 6 – Cross section of part of the Tuva-Mongolia Orocline

Credit: Wongtzyanyuki, [Creative Commons Attribution 4.0 International license](#)

The oldest rocks in the Tuva-Mongolia Orocline are [Precambrian](#), generally located in the northern part of the orocline. These older deposits, ranging in age from Precambrian to Paleozoic include: metamorphic rocks, ophiolites, volcanic rocks from island arc complexes, [volcaniclastic sediments](#) overlain by Devonian and Carboniferous aged sediments.

In the southern portion of the Tuva-Mongolia Orocline are Paleozoic aged volcanic rocks and ophiolites ranging in age from [Late Permian](#) to [Early Triassic](#). There are also Carboniferous to [Permian](#) aged volcaniclastic sediments and [granite](#) intrusions. Overlying these are [Jurassic](#) to [Cretaceous](#) aged volcanic and sedimentary rocks.



Figure 7 – Rock outcrop in the Mugodzhzar Hills, Kazakhstan **Credit:** Николай Максимович, [Creative Commons Attribution 3.0 Unported license](#)

The western portion of Kazakhstan includes the [Mugodzhar Hills](#) which are the southern end of the [Ural Mountains](#). The Ural Mountains were formed during the [Uralian Orogeny](#) that occurred during Late Carboniferous and Permian periods by the collision of the CAOB with the [Baltica](#) craton. The [Mugodzhar Hills](#) are divided into two main ranges: an eastern and a western range. Between the two ranges is the [Bershogyr Depression](#). The western range consists of [porphyritic rocks](#), crystalline schists, Devonian limestones, and Carboniferous and Permian sandstones. The eastern range consists of Precambrian aged crystalline schists, porphyritic rocks, and other volcanic and metamorphic rocks.

The final orogeny to affect Kazakhstan was the [closure of the Tethys Ocean](#) during the [Oligocene](#) and [Miocene](#), which had the effect of land locking the Caspian and Aral Seas.

As you can guess from the brief discussion above, the [geology of Kazakhstan](#) is fairly complex. For more information start by checking out:

- The [Government of Kazakhstan Geportal](#);
- [The Petroleum Geology of Kazakhstan](#) from the AAPG;
- [Geology and tectonic evolution of Kazakhstan Paleozooids](#);
- [Regional Geology and Exploration Potential of Kazakhstan and Uzbekistan Utilizing Public Domain Information Including Gravity and Magnetic Data](#); and
- [Geology and evolution of the Central Asian orogenic belt in Kazakhstan and the western Tianshan](#).

Figure 8, below, links to an [interactive geology map](#) of Kazakhstan on the [Macrostrat](#) website.

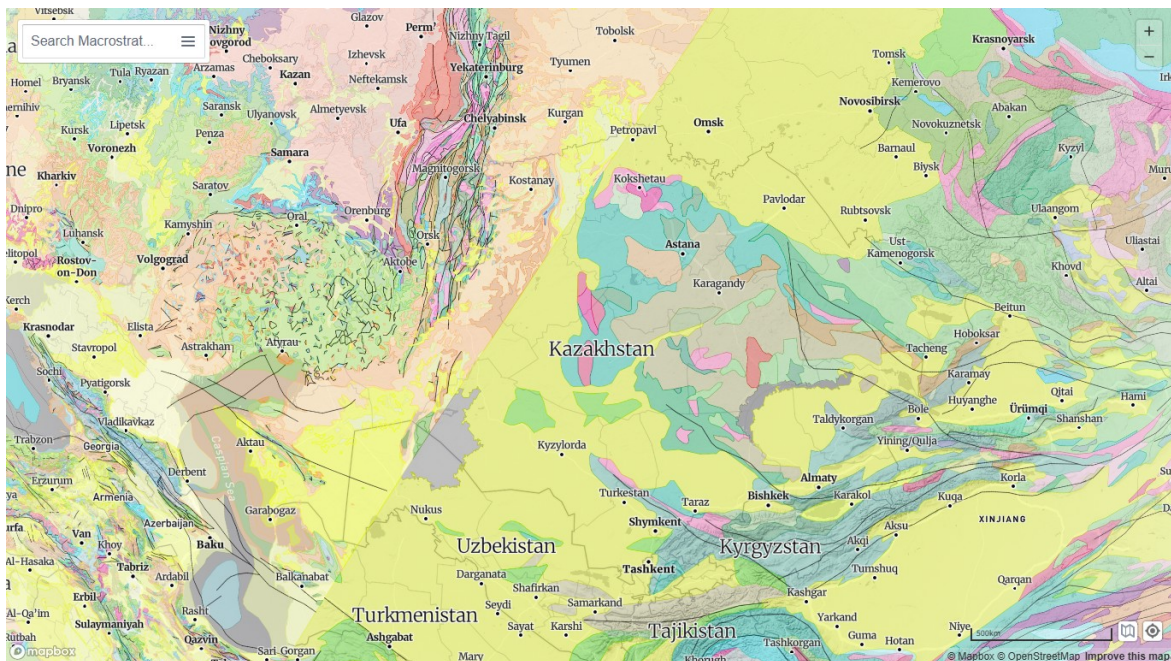


Figure 8 – Interactive Geology Map of Kazakhstan, (click on the map to go to interactive function)

Credit: [Macrostrat](#), [Creative Commons Attribution 4.0 International license](#)

Resources

Agriculture



Figure 9 – Kazakh Shepard with Dogs and Horse
Credit: [Airunp](#), [Creative Commons Attribution 3.0 Unported](#) license

According to the CIA, 79.4% of the land in Kazakhstan was used for agriculture in 2022, the last year for which data is available. Most of the land, 68.3%, is permanent pasture – this is consistent with the history of land use in the country. Arable land makes up 11% of the country, much of which is irrigated; there were 17,794 km² of irrigated land in 2022. Only a small portion of the land, 1.3%, is covered by forest and 19.3% of the land has other, or no, use. Also according to the CIA, the top ten agricultural products, based on tonnage, are wheat, milk, barley, potatoes, watermelons, cantaloupes/melons, sunflower seeds, maize, onions, tomatoes. Production statistics from the [United Nations Food and Agriculture Organization](#) (FAO) can be found [here](#). The FAO also indicates that between 2021 and 2023 only 2.2% of the population suffered from moderate to severe food insecurity.

Not in the FAO statistics is cotton production. The [USDA Foreign Agriculture Service](#) indicates that in the 2024/25 crop year, [Kazakhstan](#) produced 265,000 480 lb bales (= 57,697 tonnes) of cotton. Note that the average amount of water needed to grow cotton ranges from 1,500 to 4,000 litres per kilogram of harvested cotton. Irrigation agriculture, especially to grow cotton, was encouraged when [Kazakhstan was part of the Soviet Union](#) as part of their [Five-Year Economic Development Plans](#). Unfortunately, the water withdrawn from the [Amu Darya Syr Darya](#) rivers for irrigation in Kazakhstan and Uzbekistan, did not make it into the [Aral Sea](#), resulting that water body [essentially drying up](#), as shown in Figure 10. Attempts to repair this damage are [underway](#).

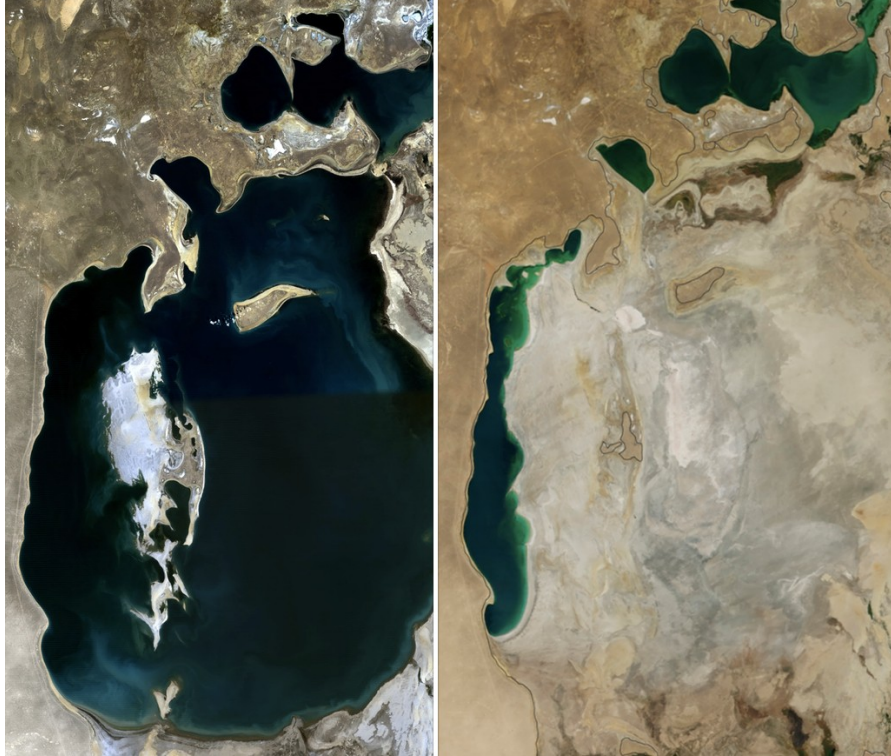


Figure 10 – Aral Sea in 1989 (left) and 2014 (right)
Credit: [NASA](#), Collage by Producercunningham, [public domain](#)

Mineral Resources



Figure 11 – Diopside Sample from Altyn-Tyube, Karaganda Oblast, Kazakhstan
Credit: [Lech Darski](#), [Creative Commons Attribution 4.0 International](#) license

As you might guess from the complex geology of Kazakhstan, the country has a wide variety of mineral resources. According to the [USGS 2022 Minerals Yearbook on Kazakhstan](#), and the mineral industry accounts for about half the country's industrial output. Table 1 of the USGS Yearbook shows the production statistics and Table 2 of the yearbook lists the locations of the production facilities.

Metallic minerals produced in Kazakhstan include: antimony, bauxite, beryllium, bismuth, cadmium, chromium, copper, gold, indium, iron, lead, magnesium, manganese, molybdenum, nickel, niobium, rhenium, selenium, silicon, silver, tantalum, tellurium, titanium, thallium, uranium, vanadium, and zinc. Significant mines and facilities include:

- The [Donskoy Chromite Mining and Processing Plant](#) operated by [Kazchrome](#);
- [Copper mines operated at three sites by Kazakhmys](#);
- Lead/zinc mines at the Ridder Polymetallic complex, Ust-Kamenogorsk Lead and Zinc complex, and Zyryanovsk Lead Complex operated by [Kazzinc JSC](#); and
- Uranium mines operated by [Kazatomprom](#) (they are taking [registrations for mine tours](#) September 8th to 9th, 2025)

Industrial minerals produced in Kazakhstan include: asbestos, barite, cement, gypsum, lime, limestone, phosphate rock, and salt. Industrial mineral mines include

- The [Dzhetygara Open Pit Asbestos Mine](#);
- The [Zhairem barite mining complex](#), operated by Kazzinc JSC;
- Phosphate rock mined at the [Kazphosphate Mining and Processing Complex](#);
- Salt works at [Zhaksykylysh](#) operated by [Araltuz](#).

Fuel minerals produced in Kazakhstan include: coal, petroleum and natural gas. Ammonia nitrogen, sulphuric acid, and sulphur are also produced as byproducts of natural gas and petroleum production. Significant production centres include:

- Five main coal mines: [Bogatyir Komir Mine](#), [Vostochny Mine](#), [Shubarkol Mine](#), [Severny Coal Mine](#), and the [Molodezhny Mine](#);
- The [Pre-Caspian Oil and Gas Basin](#) in the western part of the country, behind the Mugodzhar Hills;
- The [Mangistau-Usturt Oil and Gas Basin](#) lies in the Mangistau and Aktyubinsk areas of Kazakhstan.
- The [Central Kazakhstan Oil and Gas Basin](#) lies in the eastern and southern areas of Kazakhstan; and
- The [Western Siberian Basin](#) is in the northern and northeastern region of Kazakhstan, north of the [Kokshetauskikh](#) Mountains.

Figure 12 links to an [interactive map](#) of mineral occurrences in Kazakhstan.

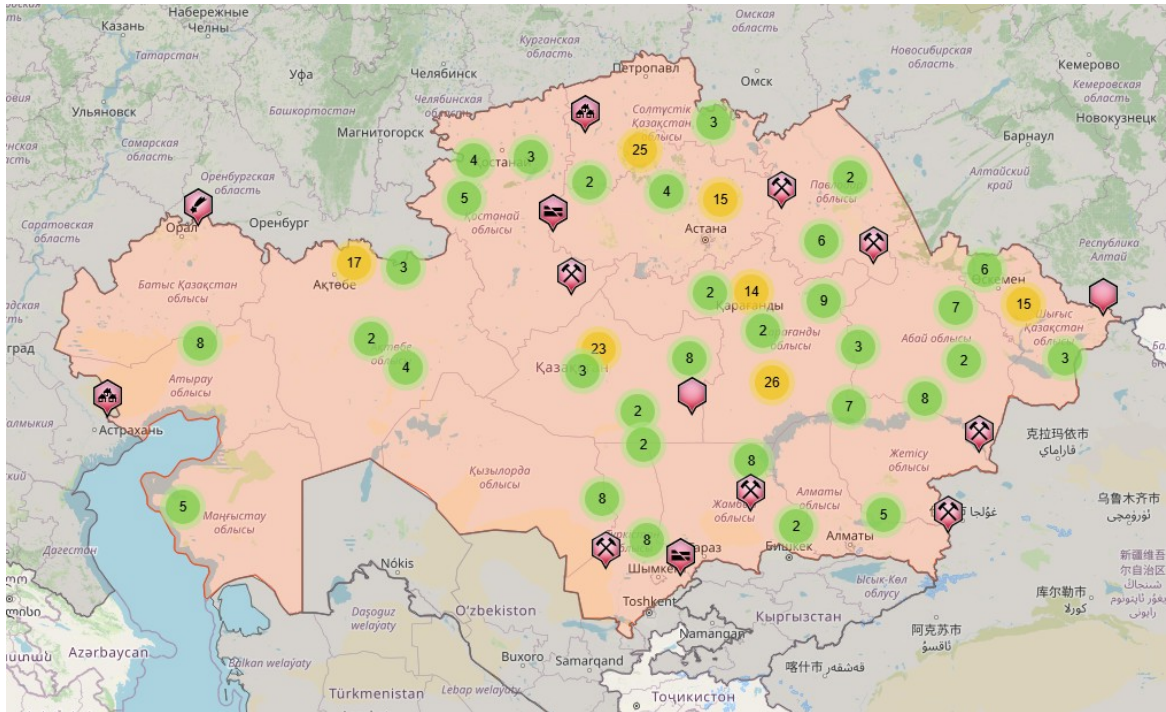


Figure 12 - Interactive Map of Mineral Occurrences in Kazakhstan
 Credit: ©Mindat.org

Climate

Kazakhstan map of Köppen climate classification

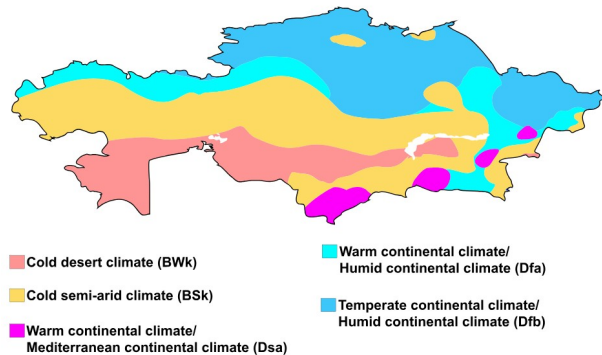


Figure 13 – Köppen Climate Classification, Kazakhstan Credit: [Ali Zifan, Creative Commons Attribution 4.0 International license](#)

The climate of Kazakhstan varies from cold desert to more moderate continental climates. The five main climate zones: cold desert climate ([BWk](#)), cold semi-arid climate ([BSk](#)), warm continental / Mediterranean continental climate ([Dsa](#)), warm continental / humid continental climate ([Dfa](#)), and temperate continental / humid continental climate ([Dfb](#)).

Kazakhstan looks like an [interesting place to visit](#), such as if you want to take in the [mine tours](#) being put on by Kazatomprom in September 2025. Before you go, check out the travel advisories [here](#) and [here](#). Petty crime is a concern but there is also a potential for terrorism. You could also check out [Climates to Travel](#) and [Lonely Planet](#).

History and Geopolitics

History of a Steppe Land



Figure 14a – Genghis Khan
Credit: Clara-Agathe Nargeot
(1829 – ca. 1855), **public domain**

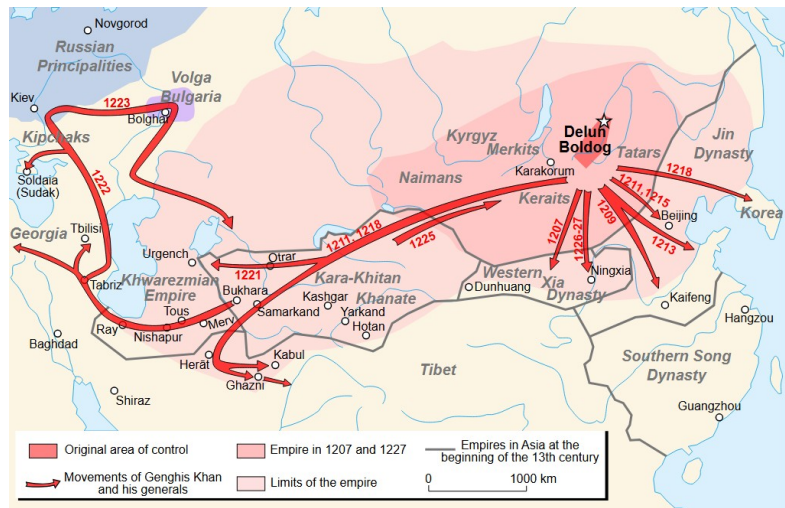


Figure 14b – Conquests of Genghis Khan
Credit: Bkkbrad, Creative Commons Attribution-Share Alike
2.5 Generic, 2.0 Generic and 1.0 Generic license.

The [history of Kazakhstan](#) is a history of the various peoples that lived on the Eurasian Steppe. Sometimes in the late [Neolithic](#) or early [Bronze Age](#), inhabitants of the steppe developed a system of [pastoralism](#) for raising a combination of cattle, sheep, and especially horses. They also developed effective weapons to use on horseback such as the [compound bow](#). Their lifestyle tended to produce more people than the land could support when [climate cycles](#) trended to dry, reducing the productivity of the steppe. Accustomed to fighting it out with their neighbours, the steppe peoples often imposed themselves on neighbouring settled societies, spreading their languages and genes. The list of steppe peoples raiding or migrating out of the steppes include the early [Indo-European tribes](#), the [Scythians](#), the [Huns](#), the [Magyars](#), the [Mongols](#), and the various [Turkic](#) tribes allied to the Mongols including the Kazakhs. For millennia, the steppe tribes lived their nomadic life and were generally impervious to conquest by any but other steppe pastoralists. They also were the facilitators of the ancient [Silk Road](#), spreading goods and ideas across Eurasia. The Silk Road also helped spread pathogens, like the [Bubonic Plague](#).

The geopolitical superiority of the steppe peoples ended with the invention of gunpowder weapons, [ironically spread by the Mongols](#). In the 1700's the [Russian Empire](#) began to encroach on the Kazakh lands and by 1848 they were fully incorporated into the Empire.

The [Bolshevik Revolution](#) in 1917 and the subsequent establishment of the [Soviet Union](#) changed the rulers but did not change the rule of Kazakhstan by Russians. [Soviet rule](#) was marked by brutal oppression of political dissidents, indeed of anyone who fell afoul of the Soviet authorities. Under the leadership of [Joseph Stalin](#), the Soviet rulers [engineered a famine](#) in Kazakhstan, killing about 1.5 million people. On the [positive side](#), Soviet rule improved public education, expanded agriculture, and built

industry, including the [Baikonur Cosmodrome/Space Center](#). Overall, Soviet rule raising the standards of living in the [Kazakh Soviet Socialist Republic](#), but at the cost of many lives.

In 1991, with the [breakup of the Soviet Union](#), Kazakhstan became an independent republic. Many non-Kazakhs migrated out of the new republic, especially Russians, and many ethnic Kazakhs migrated into the new republic. The leadership of the Kazakh republic was a first, dominated by former communist officials, including the President [Nursultan Nazarbayev](#) who served until 2019. In 2019 [Kassym-Jomart Tokayev](#). While the new leader is trying to liberalize the country's rule, it's a tricky situation. Overall, while [authoritarian](#) in style, the Kazakh government appears to be stable. However, I would be careful about taking on the government in that country, Stalin's ghost looms large.

Geopolitics – On the Old Silk Road



Figure 15 – View of Astana

Credit: Денис Гришкин, Creative Commons Attribution 4.0 International license

A modern, fairly prosperous country, Kazakhstan has three main challenges:

1. Maintaining internal peace and their authoritarian regime;
2. Responding to the challenge of radical Islam; and
3. Managing peaceful relationships with the nearby Great Powers China and Russia.

Maintaining an authoritarian regime, even if there is an attempt to free things up a bit, presents numerous challenges. First, there will always be opposition, it's pretty well human nature, and there is a [political opposition](#) in Kazakhstan. However, opposing the government in Kazakhstan can be dangerous, Human Rights Watch reports [numerous violations of human rights](#) by the authorities. The problem for an

authoritarian government is to rule with justice to keep the majority of the people, if not completely supportive, at least not willing to oppose openly. Authoritarian government can work, until it doesn't. Unjust rulers often find themselves at the end of a rope when [unjust rule](#), [political corruption](#), and the general accumulations of resentments blows up in a revolution. The rulers of Kazakhstan have a great challenge in the years ahead.

As if secular challenges to the status quo are not enough, Kazakhstan, like all Moslem states, must deal with those in the Moslem world who take the [call for Jihad in the Koran](#) as a call for revolution. In Kazakhstan, Islam is part of the [national identity](#) and reconciling the demands of the religion is a major challenge to what had been a secular society under Soviet rule. The [process continues today](#) and there is no way to predict how it will go. A dangerous path will be when opposition to the government becomes synonymous with being a good Muslim in the eyes of some. When that happens, there will be nothing but trouble. One thing about religion: oppression will not deter sincere believers, it may even further radicalize them.

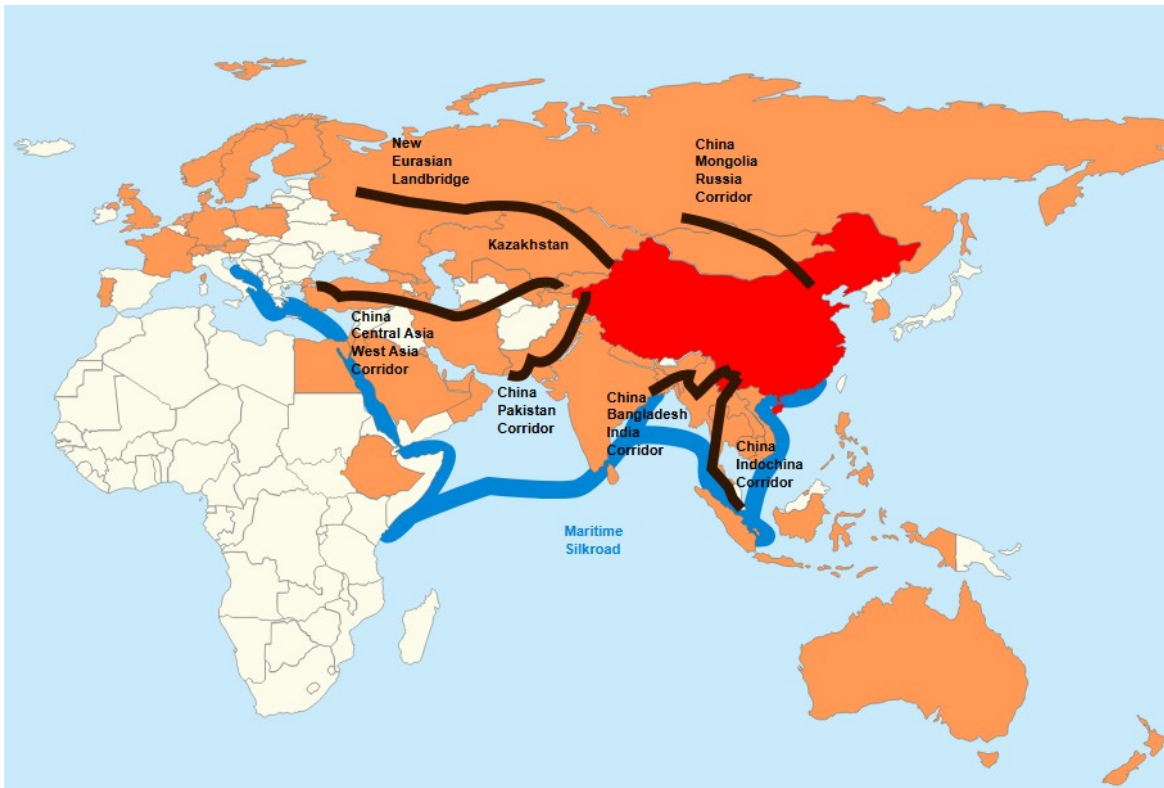


Figure 16 – Belt and Road Initiative

Credit: [Lommes, Creative Commons Attribution 4.0 International](#) license

As in ancient times, when the Eurasian Steppe was the highway between China and lands to the west, modern Kazakhstan sits on a New Silk Road – the Chinese sponsored [Belt and Road Initiative](#). With its abundant natural resources, Kazakhstan can derive immense benefits from a system of shipping goods to customers in all directions. A win-win situation, right?

Not quite – Chinese trade also comes with Chinese influence, as does trade with the other big player here, Russia. Kazakhstan [sits on a tightrope](#) between China and Russia and there is no predicting what the

increase in trade and human movement will bring. In ancient times, the steppe highway of the Silk Road brought goods and ideas from one end of Eurasia to another. That's how Islam got to the Kazakhs. The ancient highway also helped spread pathogens like the [Bubonic Plague](#), an affliction that [remains endemic](#) among rodents in the Eurasian Steppe. So, who knows what unexpected effects lie in wait as the New Silk Road is built across the continent.



Figure 17 – Eurasian Economic Union (orthographic projection), [Credit: Leftcry, Creative Commons Attribution 4.0 International](#) license

Speaking of the Russian influence, no discussion of the geopolitics in Central Asia would be complete without a mention of the current leading thinker on that subject, [Alexander Dugin](#). As Dugin points out in his book [Last War of the World Island](#), in 1994 Kazakh President Nursultan Nazarbayev proposed a Eurasian Economic Union but that the proposal was initially rejected in Russia. However, in 2014, [The Treaty on the Eurasian Economic Union](#) was signed on 29 May 2014 by the leaders of [Belarus](#), Kazakhstan, and Russia, coming into force on 1 January 2015. This [essay](#) from 2020, examines Dugin's analysis of the importance of the Union. Recently, Russian President [Vladimir Putin has proposed expanding the Union](#). Like the Belt and Road Initiative from China, the Eurasian Economic Union draws Kazakhstan closer into the economies of its neighbours – for good or ill.

That kind of wraps up this quick look at Kazakhstan. I don't have a clear view on their future. They will likely weather their many challenges but who knows what form their society will take as the result.

Standard Caveat

[J. Robert Oppenheimer on freedom and scientific inquiry](#)

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In science, the only authority is the evidence.