

June 17, 2024

News and notes

Before going on to discuss the geology and geopolitics of [Egypt](#), here are some news items I thought were interesting.

Geopolitics

- Is this the beginning of the end of the [USD](#) as the world's reserve currency? [Saudi Arabia's petrodollar exit: A global finance paradigm shift](#).
- How are those sanctions working out? [Russia's Oil Product Shipments Jumped by 10.4% in May](#).
- Disorder in The Congo: [Dozens killed in DRC suspected Islamist rebel attack](#).
- [A New Chinese Megaport in South America Is Rattling the U.S.](#)
- Living next to the elephant: [Canada's Big Worry: A US Civil War](#).
- [Central African Republic suspends activities of Chinese mining company](#).
- Fun and games: [US attack sub, Canada navy patrol ship arrive in Cuba on heels of Russian warships](#).

Research and News

- [Generation of mantle-derived basaltic andesites in volcanic arcs](#).
- Pegmatite petrology: [Boron sources of tourmaline-rich Nb-Y-F-pegmatites in south Norway: Implications for pegmatite melt origin](#)
- Turbidite deposits: [Controlling factors of a submarine landslide on the Kumano-nada continental slope, West Japan](#).
- From out of this world: [Zircon microstructures record high temperature and pressure conditions during impact melt evolution at the West Clearwater Lake impact structure, Canada](#); Phys.org summary [here](#).
- [Depositional environments, hematite–chamosite differentiation and origins of Middle Ordovician iron ooids in the Upper Yangtze region, South China](#).
- Serpentinization and alteration of ultramafic rocks: [A non-methanogenic archaeon within the order Methanocellales](#).
- Planetary geology: [Bioenergetics of iron snow fueling life on Europa](#); Earth.com summary [here](#).
- Robots: [The Geologists of the Future](#).
- Playing in the mud: [Freshwater microbial mud: Punctuated diagenesis during marine transgression in the Florida Everglades, USA](#).

- Crystallography: [Enabling three-dimensional real-space analysis of ionic colloidal crystallization](#); Science Alert summary [here](#).
- Geophysics, music concerts and seismic events: [Swift Quakes Caused by Stomping Feet, Not Booming Beat](#).
- More geophysics: [Inner core backtracking by seismic waveform change reversals](#); Phys.org summary [here](#).
- Fluvial geology: [The impact of faulting-induced uplift and subsidence on terrace formation and abandonment: a case study of the Huangshui River, NE Tibetan Plateau](#); sorry, behind a paywall.

Geological History

- Defining boundaries: [The Eocene to Oligocene boundary and paleoclimatic indications based on calcareous nannofossils of Tonasa Formation, South Sulawesi, Indonesia](#).
- [Sea-level oscillations within the last interglacial: Insights from coral reef stratigraphic forward modelling](#).
- Cosmic influences on the Earth: [A possible direct exposure of the Earth to the cold dense interstellar medium 2–3 Myr ago](#); Space.com summary [here](#).
- Oxygen in the atmosphere: [Onset of coupled atmosphere–ocean oxygenation 2.3 billion years ago](#); behind a paywall, Phys.org summary [here](#).
- More on oxygen: [The Cambrian microfossil *Qingjiangonema* reveals the co-evolution of sulfate-reducing bacteria and the oxygenation of Earth’s surface](#); Phys.org summary [here](#).

Plate Tectonics

- [Low-Temperature Thermochronology Records the Convergence between the Anatolide-Tauride Block and the Arabian Platform along the Southeast Anatolian Orogenic Belt](#).
- [Evidence for an Imbricated Lower Crust and Its Role in Accommodating Crustal Shortening in Sikkim Himalaya](#).
- [Kinematic Evolution of the Santa Bárbara System in the Foreland of the Central Andes of Northwestern Argentina \(26°S\)](#).
- [Detection of slow slip events along the southern Peru – northern Chile subduction zone](#).
- [Assessing the impact of crustal architecture and along-strike rifting propagation on salt deposition and tectonics: Insights from the Moroccan Atlantic margin](#).

Paleontology

- [Using linear measurements to diagnose the ecological habitat of Spinosaurus](#).

- [A hyaena on stilts: comparison of the limb morphology of *Ictitherium ebu* \(Mammalia: Hyaenidae\) from the Late Miocene of Lothagam, Turkana Basin, Kenya with extant Canidae and Hyaenidae.](#)
- [You can help name LA's newest dinosaur fossil?](#)
- [Soft-tissue fossilization illuminates the stepwise evolution of the ray-finned fish brain;](#) behind a paywall, Phys.org summary [here](#).
- [A late-Ediacaran crown-group sponge animal;](#) Sci Tech Daily summary [here](#).
- [Haliskia peterseni, a new anhanguerian pterosaur from the late Early Cretaceous of Australia;](#) summary in The Conversation [here](#).
- [From the Berelekh ‘mammoth graveyard’ to Berelekh geo-archaeological complex: Paleoenvironment, site formation processes, and human-mammoth relationships;](#) mostly behind a paywall, Phys.org summary [here](#).
- [The late Givetian \(Middle Devonian\) ammonoid *Epitornoceras* Frech, 1902 from Argentina \(southwestern Gondwana\);](#) Sci News summary [here](#).
- Market forces: [The super-rich are buying up dinosaur bones – and now they want our near-perfect *Stegosaurus*.](#)
- [Primitive purine biosynthesis connects ancient geochemistry to modern metabolism;](#) Space.com summary [here](#).

Geology of Mineral Deposits and Reservoirs

- [Mineralogy and Origin of Vein Wolframite Mineralization from the Pohled Quarry, Havlíčkův Brod Ore District, Czech Republic: Interaction of Magmatic and Basinal Fluids.](#)
- Geology of fluvio-marine reservoirs: [From Seismic to Permeability Characterization: A Combined Rock Physics, BVW Modelling and Seismic Inversion Workflow.](#)

Mining and Energy

- Deep sea mining: [The Metals Company, SGS make world’s first cobalt sulphate from seafloor nodules.](#)
- [Serbia to give green light for Rio Tinto lithium mine.](#)
- [West Red Lake pours gold bar at Madsen mine.](#)
- Ooh, shiny: [Star Diamond Corp anticipates ‘decades of mining’ at Fort à la Corne diamond district.](#)
- [Iron ore price tumbles to 2-month low on concerns over weakening China demand.](#)
- [Canada adds high-purity iron, phosphorus, silicon metal to critical minerals list.](#)

- [Gold is getting harder to find as miners struggle to excavate more, World Gold Council says.](#)
- Sodium ion batteries: [Stora Enso and Altris collaborate to develop and commercialise world's most sustainable battery.](#)
- [Thefts of charging cables pose yet another obstacle to appeal of electric vehicles.](#)
- [Deadly and Wildly Profitable, Uranium Fever Breaks Out.](#)
- [Allseas to take Pioneering Spirit to huge North Sea field in 2026.](#)
- [In Wyoming, Bill Gates moves ahead with nuclear project aimed at revolutionizing power generation.](#)
- [Westinghouse opens new nuclear engineering hub in Kitchener;](#) related: [Phase one of building small nuclear reactor in Ontario is complete: energy minister.](#)
- Hydrogen generation technology research: [Theoretical Prediction and Experimental Verification of IrOx Supported on Titanium Nitride for Acidic Oxygen Evolution Reaction;](#) Phys.org summary [here.](#)

Environmental Geology and Hydrogeology

- Carbon cycle and remediation: [Disproportionate Carbon Dioxide Efflux in Bacterial Metabolic Pathways for Different Organic Substrates Leads to Variable Contribution to Carbon-Use Efficiency;](#) Phys.org summary [here.](#)
- From the USEPA: [Tracking Groundwater Remediation Efforts Using Rare Earth Elements.](#)
- [USGS – Led Study Estimates Lithium in Groundwater.](#)
- Hydrogeology research: [What lies beneath: Unraveling the Secrets of the North Saskatchewan River.](#)

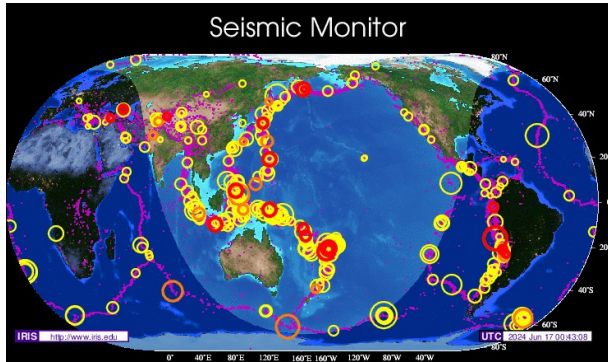
Glaciers and Climate Change

- [The Ice Man of Ladakh building artificial glaciers in the Himalayas.](#)
- [High-frequency climate forcing causes prolonged cold periods in the Holocene;](#) Phys.org summary [here.](#)
- Video on sudden climate change at the end of the [Pleistocene: The Younger Dryas Impact Hypothesis won't go away: more evidence!](#)
- [Massive fraud revealed in fake Chinese climate projects subsidised by the German fossil fuel industry in service of meeting arbitrary and deeply stupid emissions quotas;](#) sorry, much of the story is behind a paywall.

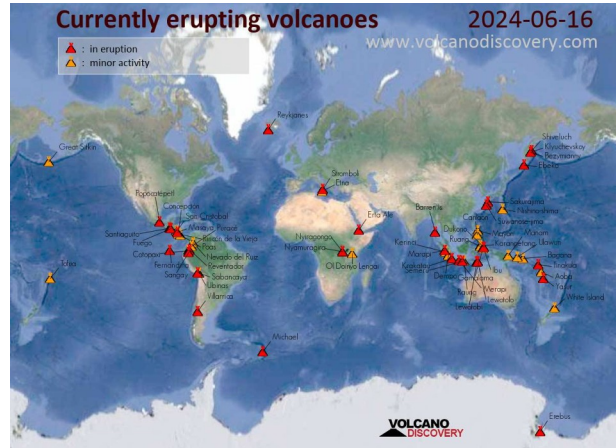
Neat Places to Visit

- [San Jacinto Mountains above Coachella Valley showcase extraordinary geology.](#)

Volcanoes, Earthquakes and Geohazards



[Seismic Monitor](#)



[Active Volcano Map](#)

- United States Geological Survey (USGS) Volcano Watch: [A decade later, remembering the Pāhoā lava flow crisis](#).
- USGS Yellowstone Volcano Observatory: [Going, going, argon! Determining volcanic eruption ages with argon geochronology](#).
- [Smithsonian / USGS Weekly Volcanic Activity Report](#).
- [Euro-Mediterranean Seismological Centre](#)
- [Earthquakes Monitoring Live Worldwide](#).
- Earthquake research: [Fault-network geometry influences earthquake frictional behaviour](#); Sci Tech Daily summary [here](#).
- [Insights into Temporal Evolution of Induced Earthquakes in the Southern Delaware Basin Using Calibrated Relocations from the TXAR Catalog \(2009–2016\)](#).
- From Kyle Bradley and Judith A Hubbard: [Why are some faults so creepy?](#)
- From the USGS: [Magnitude 6.0 Earthquake 23 km SW of Atiquipa, Peru](#).

Upcoming Events

- On now: [GeoConvention 2024, June 17 – 19, Calgary, AB Canada](#).
- If you are in Calgary for the Stampede: [Bootleggin' Breakfast 2024](#), Calgary, AB, July 9 & 11, 2024, plus [Stampede After Parties Announced!](#)
- [Goldschmidt 2024, August 18-24, Chicago IL](#), organized by the Geochemical Society and the European Association of Geochemistry.
- [Groundwater Week 2024](#), December 10-12 in Las Vegas, Nevada.

June 17, 2024

Geology and the Fate of Societies – Egypt



Figure 1a – Egypt

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



Figure 1b – Location of Egypt

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

Located on the northeast corner of [Africa](#), the [Arab Republic of Egypt](#) also encompasses part of [southwest Asia](#) in the [Sinai Peninsula](#). To the north of Egypt is the [Mediterranean Sea](#); to the east of Sinai are the [Gaza Strip](#) of [Palestine](#) and [Israel](#). Across the [Gulf of Aqaba](#) are [Jordan](#) and [Saudi Arabia](#). South of Sinai and east of the [Eastern Desert](#) region of Egypt is the [Red Sea](#). South of Egypt is the [Sudan](#) and to the west is [Libya](#).

Egypt is a unitary [semi-presidential republic](#) under an [authoritarian](#) regime. The President is [Abdel Fattah el-Sisi](#) and the Prime Minister is [Mostafa Madbouly](#). The Parliament consists of an upper house, the [Senate](#), and a lower house, the [House of Representatives](#). The Capital and largest city in Egypt is [Cairo](#) (pop. 22,183,000 in the metropolitan area).

According to the [Central Intelligence Agency](#) (CIA) [World Factbook on Egypt](#); the country has a total area of 1,001,450 square kilometres (km²) of which 995,450 km² are land and 6,000 km² are water. The CIA also says that 111,247,248 people live in Egypt. Of that approximately 111 million people, almost all, 99.7%., are considered [ethnic Egyptian](#). 43.1% of total population live in urban areas.

The official language of Egypt is the [Egyptian dialect of Arabic](#) although both [English](#) and [French](#) are commonly spoken among the educated class. 90% of the Egyptian population are [Muslim](#), mostly [Sunni Islam](#) and the remaining 10% are various [Christian](#) denominations with the native [Coptic Church](#) being predominant. In terms of education, 73.1% of the population over 15 years old are literate and typical schooling lasts for 14 years.

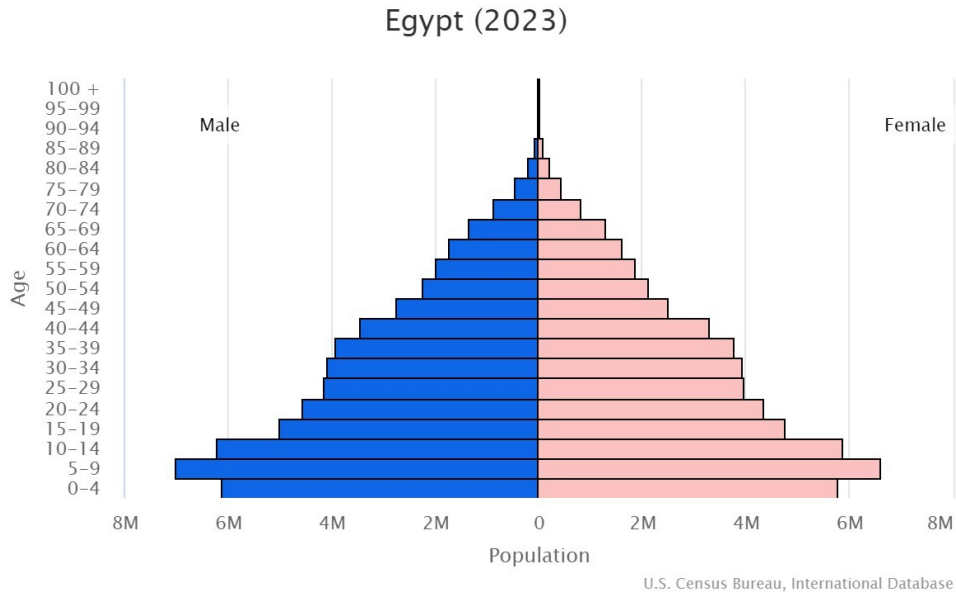


Figure 2 – Demographic Profile of Egypt
 Credit: [U.S. Census Bureau, International Database](#), public domain

The [demographic profile](#) for Egypt shows a fairly young population: the median age is 24.4 years and 33.8% of the population is under 15 years of age. The total fertility rate is 2.76 births per woman, which is above replacement rate, and the annual growth rate is 1.6%. Life expectancy at birth for both sexes is 74.7 years.

Geology

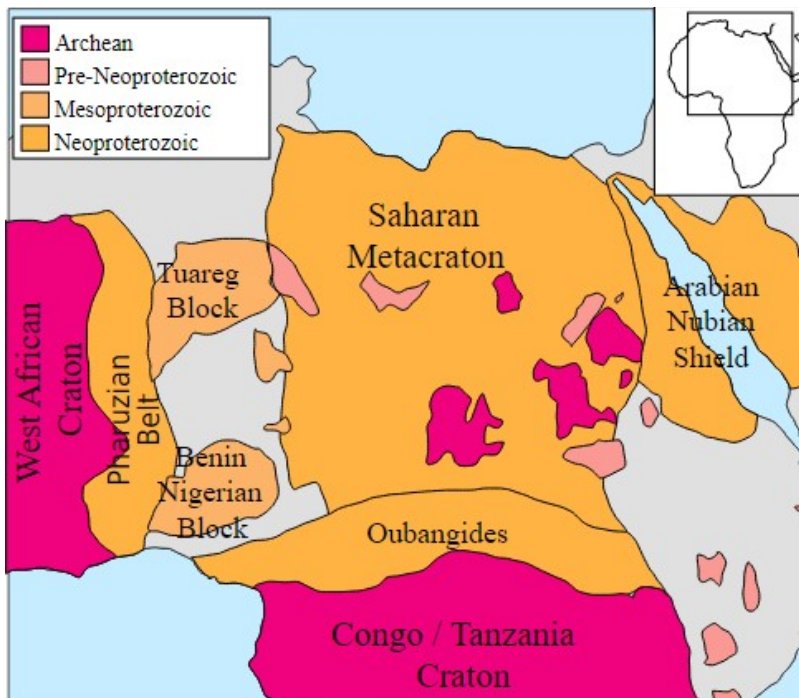


Figure 3 – Saharan Metacraton
 Credit: [Aymatth2](#), public domain

A good way to understand the [geology of Egypt](#) is to first look at the tectonic setting of the country. Egypt sits on the northeast section of the [Saharan Metacraton](#) and the neighbouring [Arabian-Nubian Plate](#). The Saharan Metacraton has an [Archean](#) aged core surrounded by [Proterozoic](#) rocks that were assembled during the [Pan-African orogeny](#). The Arabian-Nubian Plate is mostly [Neoproterozoic](#) aged rock assembled during the [East African Orogeny](#). Currently, the Arabian-Nubian Plate is being torn apart by [continental rifting](#) that began 500 Mya during the [Oligocene](#) – this rifting opened up the [Red Sea](#) and extends north into the [Dead Sea/Jordan Valley](#) and south into the [East African Rift Zone](#).

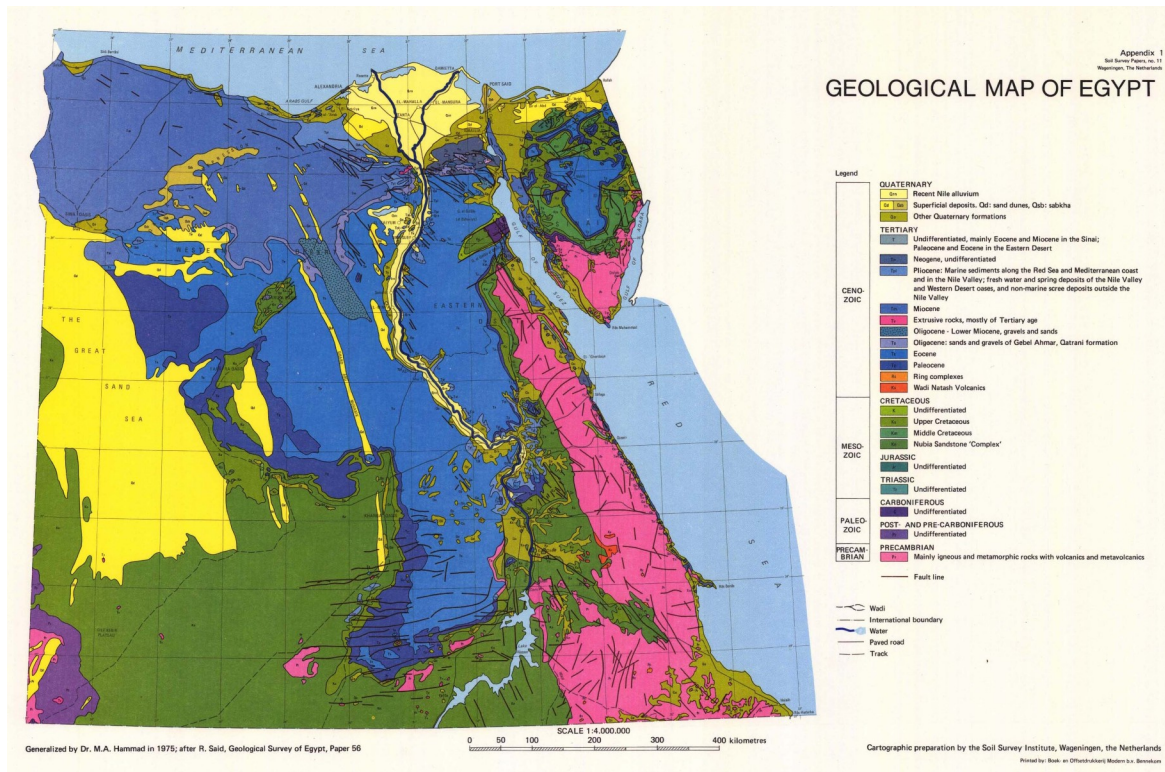


Figure 4 – Geology of Egypt

Credit: [European Soil Data Centre \(ESDAC\)](#), public domain

Overlying the cratonic rocks are younger, [Late Neoproterozoic](#) and [Phanerozoic](#) deposits ranging in age from [Ediacaran](#) to [Quaternary](#). Important deposits include:

- Ediacaran – [Cambrian](#) aged [clastic](#) deposits of the [Hammamat Formation](#);
- The [Late Ordovician](#) – [Early Silurian Gabgaba Formation](#);
- [Triassic](#) aged formations include the [Arif El Naga Dome](#) in northeast Sinai and continental Triassic deposits found over the rest of Egypt;
- Marine [Jurassic](#) deposits in the north and northeast Sinai as well as on the western side of the Gulf of Suez, such as at [Gebel Maghara](#) in North Sinai;
- Jurassic aged [fluvio-marine and fluvial](#) sections in the southern parts of Egypt;

- [Cretaceous](#) deposits are widely distributed on the surface and subsurface and cover about 40% of the total area of Egypt;
- Most of Egypt was covered by a [marine transgression](#) during the [Early Cenozoic](#);
- Three major event marked the [Cenozoic](#) in Egypt: (1) the closure of the [Neo-Tethys](#); (2) [rifting of the Gulf of Suez](#) associated with the gradual uplift of a [mid-ocean ridge at the bottom of the Red Sea](#); and (3) the [Messinian Crises](#) that lead to the desiccation of the Mediterranean.

For further information on the geology of Egypt, you might want to read:

- Zakaria Hamimi, Ahmed El-Barkooky, Jesús Martínez Frías, Harald Fritz, and Yasser Abd El-Rahman, *The Geology of Egypt*, 2020, Regional Geology Reviews, Springer Nature Switzerland AG, <https://doi.org/10.1007/978-3-030-15265-9>;
- Zakaria Hamimi, Hassan Khozyem, Thierry Adatte, Fadi H. Nader, Francisca Oboh-Ikuenobe, Mohamed K. Zobia, Haytham El Atfy, *The Phanerozoic Geology and Natural Resources of Egypt*, 2023, Advances in Science, Technology & Innovation, Springer Nature Switzerland AG, <https://doi.org/10.1007/978-3-030-95637-0>.

Resources

Agriculture

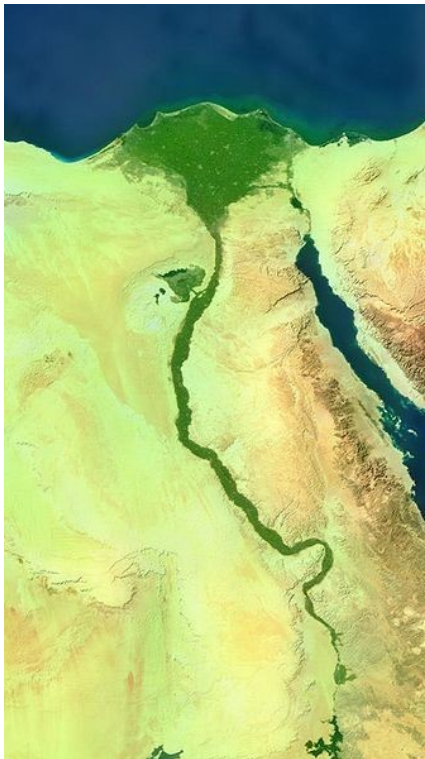


Figure 5 – Nile Valley in Egypt
Credit: NASA, public domain

According to the CIA, only 3.6% of the total land area is agricultural land – that is essentially the [Nile Valley](#). The rest of Egypt is desert, there are no forests.

Egyptians have been practising [agriculture in the Nile Valley of Egypt](#) since the end of the [African Humid Period](#) about 5,000 years ago during the [Piora Oscillation](#) cold period. The main crops are [wheat](#), [cotton](#), [maize](#), [rice](#), [sorghum](#), and [fava beans](#). The most important livestock raised in Egypt are [water buffalo](#), [cattle](#), [donkeys](#), [goats](#), and [sheep](#). Another important source of food in Egypt is [fishing](#) from the Nile River and [Lake Nasser](#) as well as offshore from the Mediterranean and Red Seas.

Almost all agricultural production in Egypt is commercial. Also, as the result of the 1952 [land ownership laws in Egypt](#), almost all the farms are small scale, less than 50 hectares. Statistics on food production in Egypt from the [United Nations Food and Agriculture Organization](#) (FAO) are found [here](#).

More information on food in Egypt from the FAO are shown [here](#). A couple of interesting facts on food in Egypt is that from 2020 to 2022, 28.5% of the population suffered from moderate or severe food insecurity. A big geopolitical issue for Egypt is also shown in [this FAO page](#); Egypt is expected to need to import 20 million tonnes of grain in the 2023/24 crop year. In other words, they are dependent on food imports to keep food prices affordable.

Mineral Resources



Figure 6 – Sukari Gold Mine

Credit: Taha Ahmed, [Creative Commons Attribution-Share Alike 3.0 Unported license](#)

Metallic minerals mined in Egypt include: [gold](#), [iron ore](#), and [manganese](#). Industrial minerals mined include: [barite](#), [bentonite](#), [kaolin](#), [feldspar](#), [gypsum](#), [lime](#), [mica](#), [phosphate rock](#), [quartz](#), [salt](#), [aggregate](#) (sand and gravel) for construction, [industrial sand](#), and [talc](#). Energy minerals include [petroleum](#), and [natural gas](#). Also connected to energy minerals is the production of [ammonia](#), [caustic soda](#), [methanol](#), and [sulphur](#).

Among the mines in Egypt are:

- Gold is mined at the [Sukari Gold Mine](#) and [Hamash](#) gold mines in the Eastern Desert;
- Iron ore is mined at [El-Gedida](#), [El Bahariya Oasis](#);
- Manganese, gypsum, kaolin, and industrial sand, are mined at the [Abu Zenima mine](#) in Sinai.
- Phosphate rock is mined at mines in [El Wadi El Gadid](#), [El Sebaaya](#), [Abu Tartur Mine](#), [New Valley Mine](#), and [Aswan](#).

Oil and gas fields in Egypt are shown on Figure 7, below.

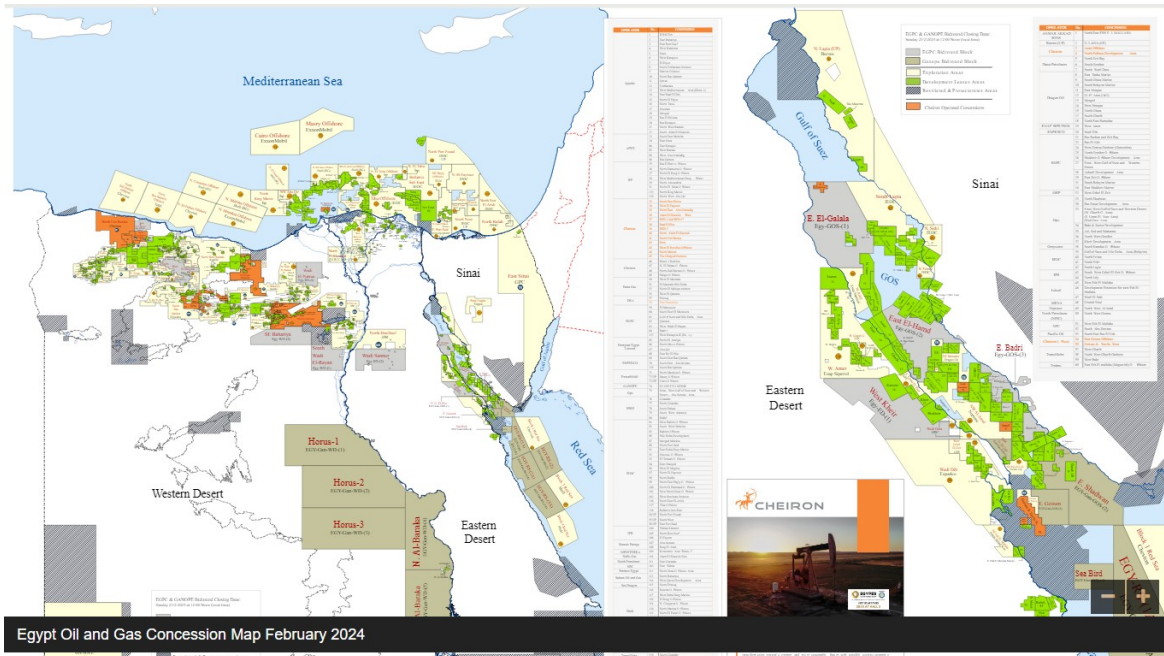


Figure 7 – Egyptian Oil and Gas Concession Map
Credit: [Egypt Oil and Gas](#)

The USGS summary on the mining industry in Egypt is [here](#) and their most up-to-date statistics on production are [here](#). Although Egypt produces natural gas, [they need to import gas to meet their needs](#). Figure 8, below, leads to an interactive mineral occurrence map for Egypt.

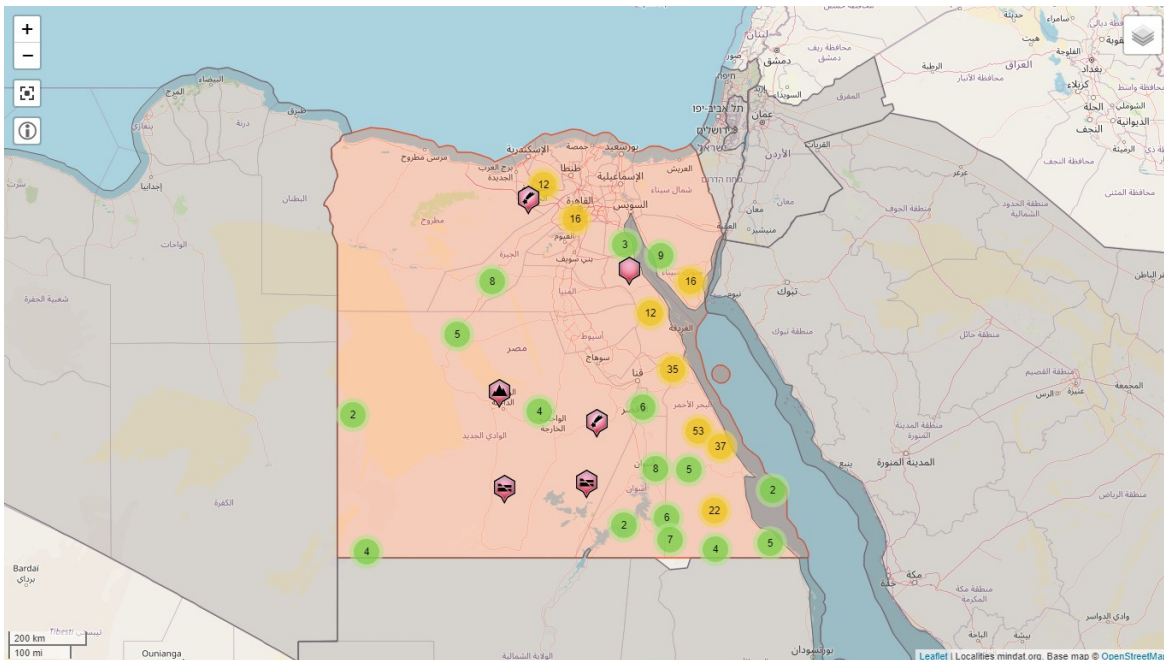


Figure 8 – Mineral Occurrence Map for Egypt
Credit: [Mindat.org](#)

Climate

Köppen-Geiger climate classification map for Egypt (1980–2016)



Source: Beck et al.: Present and future Köppen-Geiger climate classification maps at 1-km resolution, *Scientific Data* 5:180214, doi:10.1038/sdata.2018.214 (2018)

Figure 9 – Köppen-Geiger Climate Map of Egypt

Credit: [Beck et al, 2018](#), [Creative Commons Attribution 4.0 International](#) license

Egypt is one big desert. Most of it is a hot, arid, desert ([BWh](#)), where you can die of thirst and heat stroke; the highlands are a cold, arid, desert ([BWk](#)), where die of both thirst and cold; and a small section adjacent to Gaza is an arid hot steppe ([BSh](#)) where [death can come in many ways](#).

[Tourism is a major industry](#) in Egypt and if you plan to go, there is a lot to see. In recent years, tourism has [taken a dive](#) in Egypt, check these travel warnings [here](#) and [here](#). If you still want to go – it looks like a fascinating place – check out the [Climates to Travel](#) and [Lonely Planet](#).

History and Geopolitics

History – An Ancient Land



Figure 10 – The Pyramids at Giza

Credit: [Ricardo Liberato](#), [Creative Commons Attribution-Share Alike 2.0 Generic](#) license

The [history of Egypt](#) is that of one of the most ancient of human civilizations. I will outline it briefly here and you can follow up on it at your leisure. I divide Egyptian history into three main divisions:

1. Ancient Egypt under its own government, this includes [Prehistoric Egypt](#) and [Ancient Egypt](#);
2. Egypt under foreign rule including the [Persians](#), the [Greeks](#), the [Romans](#), the various [Moslem rulers](#), and the [British](#);
3. Modern [independent Egypt](#) since 1953.

If that is too brief for you, there are hundreds of books on Egyptian history, here is [one list](#). Some [people](#) make the study of Egyptian history their whole life.

Geopolitics of a Prized Land



Figure 12 – Egyptian Tank in Tahrir Square, 2011

Credit: [Ramy Raouf](#), [Creative Commons Attribution-Share Alike 2.0 Generic](#) license

Two takeaways from Egyptian history are:

- It has been a prize for conquerors for centuries;
- It has almost always had an authoritarian government.

Internally, the Egyptians have been happiest when their government is an authoritarian enforcer of the law. When things get out of hand, as they did during the so-called [Arab Spring of 2011](#), much suffering

ensues. The internal problems of Egypt also flow from their [dependence on foreign grain](#) to keep the price of bread affordable. No government wants [food riots](#).

Externally, Egypt has issues with its neighbours and the Great Powers. Egypt fought [major wars with Israel in the 20th Century](#) and only refrains from further conflict because:

- a) Israeli ambitions do not pose an existential threat to Egypt, and
- b) A war does not currently suit the ambitions of the [ruling clique in Cairo](#) and their relationship with the [United States](#) (see below).

On the other hand, a too successful attack on Israel could provoke [nuclear war](#).

Currently, the [Israeli war with the Palestinians in Gaza](#) has severely [strained Israeli-Egyptian](#) relations. Interestingly, the Egyptians have [sealed off the border between Gaza and Egypt](#), it seems they don't want [any Palestinian refugees](#) in their country. It is understandable when you see that Egypt can barely feed its current population. Also a large influx of angry people could destabilize Egypt. Egyptians generally support the Palestinian cause, but not to the extent of inviting them into their own country. Whatever happens, [living next to Palestine is a problem](#) for Egypt and all the other neighbouring countries.

[Libya](#) and [Sudan](#) are also headaches for Egypt. Ongoing disorder in both countries could spill over into Egypt in the form of refugees or terrorist activities.

A more distant, but existential threat to Egypt is [Ethiopia's new dam on the Nile River](#). This could reduce water supply to Egypt with a consequent reduction in food production. Keep an eye on this issue, it could provoke a war.

Finally, there is Egypt's relationship with the Great Powers. The United States provides [huge foreign aid to Egypt](#). This was part of the Camp David [peace deal between Egypt and Israel](#). Essentially, the USA pays Egypt not to go to war with Israel. Since the money is useful, this situation suits the ruling class quite well. Also, more seriously, when tourist revenues are down, Egypt needs foreign currency to buy grain on the world market.

The Egyptians used to be [close to the former Soviet Union](#), the move away from the Soviet sphere of influence was also part of the Camp David peace deal and American subsidies. Two of the successor states to the old Soviet Union, [Russia](#) and [Ukraine](#), remain important to Egypt. Both Ukraine and Russia are, or were, major exporters of grain to Egypt. The [current war in Ukraine has interrupted grain exports from Russia and Ukraine](#), threatening high food prices in Egypt. Remember those food riots? Entirely out of their control, foreign disorder threatens the internal affairs of Egypt – another headache for its long suffering people.

That kind of wraps up this brief look at Egypt. Here are a few videos that I thought were worth referencing with regards to Egypt:

- [Watch "Egypt Is A Ticking Time Bomb." on YouTube.](#)
- [Egyptologist Answers Google's Most Popular Questions About Ancient Egypt.](#)

- Paul Cooper's Fall of Civilizations podcast: [Egypt – Fall of the Pharaohs](#).
- The amazing [Ayoub Sisters](#).
- And who doesn't want to [Walk Like an Egyptian](#).

Standard Caveat

The purpose of my weblog postings is to spark people's curiosity in geology. Don't entirely believe me until you've done your own research and checked the evidence. If I have sparked your curiosity in the subject of this posting, follow up with some of the links provided here. If you want to, go out into the field and examine some rocks on your own with the help of a good field guide. Follow the evidence and make up your own mind.

In science, the only authority is the evidence.